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A

PRACTICAL TREATISE

ON

DISEASE IN CHILDREN

BY

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INSCRIBED TO

Sir Andrew Clark, Bart., M.D.,

IN TOKEN OF SINCERE FRIENDSHIP

BY THE AUTHOR.

PREFACE.

It was not without hesitation that the author consented to the proposal made to him by Messrs. Wood & Company, of New York, that he should write for them a complete Treatise on the Diseases of Infancy and Childhood. The length of time which would be required for the completion of a task so considerable, and, especially, the knowledge that many manuals of varying merit were already in the field, indisposed him to attempt a work which must necessarily prove not only long but laborious. Encouraged, however, by the reflection that his opportunities for studying these complaints had been abundant; that in the course of more than twenty years he had acquired a mass of valuable material, and that of existing books few dealt with more than a part of the subject, he thought himself justified in believing that a treatise which undertook to discuss the whole subject of disease in early life, and to deal with the matter purely from a clinical stand-point, might not be without its uses.

The constitutional peculiarities of childhood, and the weakness due to immaturity, so shape the course and symptoms of disease that there are few complaints which do not assume special features when present in the young. Consequently the author has not hesitated to admit into his pages descriptions of every form of illness which is capable of being influenced in its manifestations by the early age of the patient. Those only have been purposely omitted which, like diabetes, present exactly the same characters in the child that they do in the adult.

Each subject has been treated as fully as the space would allow, but many faults of omission may, no doubt, be discovered. The author, however, has striven to satisfy all clinical requirements, and where much must be left out, that the book may be kept within reasonable limits, has been anxious to omit nothing of real value to the practitioner.

In the composition of the work the use of statistics has been generally avoided, for unless dealing with enormous numbers little that is

trustworthy can be obtained from this method of inquiry. In fact, there can be little doubt that very erroneous impressions have been sometimes derived from statistical calculation based upon an insufficient number of cases.

In order to increase the usefulness of the book, much care has been bestowed upon the sections relating to diagnosis and treatment. No attempt, however, has been made to include in the directions for treatment an enumeration of all the remedies which have been suggested for the cure of the several forms of illness. Such excess of detail not only fills the page with information often of doubtful value, but tends rather to confuse the reader than to instruct him. Moreover, it gives to this branch of therapeutics an importance which, in the case of children, it does not always possess. In the case of a young patient, judgment in feeding and care in sanitary arrangements not seldom constitute the sole necessary treatment of the illness. Quiet, rest, appropriate food, and plenty of fresh air will often restore the health without the aid of physic; or if physic seem called for, the remedies needed are simple and few. But whatever be the nature of the malady, and however elaborate may be the medication required, the details of nursing should always take precedence of those of drug-giving. Keeping this truth in view, the author has been careful to give due prominence to the subjects of diet and hygiene; and in the matter of drugs has confined himself, for the most part, to recommending those only which experience has taught him to value, and upon which, therefore, he has himself been accustomed to rely.

For purposes of illustration a number of concisely narrated cases have been introduced into the text. Most of these have been selected from the author's case-books, but a few are taken from the practice of his hospital colleagues. To these colleagues, for their kindness in placing their cases at his disposal, the author desires to express his deep obligations.

GEORGE STREET, HANOVER SQUARE,

June, 1884.

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DISEASE IN CHILDREN.

INTRODUCTORY CHAPTER.

The difficulties connected with the investigation of disease as it occurs in early life may be easily exaggerated. The subject is no doubt a special one; but when the first strangeness has been overcome of dealing with patients who cannot describe their sensations, and who show their distress by cries and gestures which it requires experience to be able to interpret, the chief obstacle to progress has been surmounted. All necessary information as to the onset and early symptoms of the complaint can usually be obtained from the mother. Most women are good observers. Affection and anxiety increase their watchfulness, and make them fairly accurate recorders of every outward change. The stress laid by them upon particular phenomena is not, indeed, always a true measure of the real importance of the symptoms; but it is easy to correct any undue emphasis in the narrative by our own judgment and experience. Still, we must guard ourselves from being misled by the very fulness of the report: facts may be accepted with confidence, but volunteered explanation of these facts must on no account be allowed to influence our conclusions.

When called to a sick child our first care should be to give an attentive hearing to the statement of the mother, supplying any gaps in the history by suitable questions. Having thus been enlightened as to the previous health of the child and the nature of the earliest symptoms, we have next to collect what information we can from the appearance and manner of the patient. To do this with success we must possess already a certain familiarity with the ways of infants and young children; but this is easily acquired with a little practice. Again, we have so to regulate our own bearing as not to alarm the child, who is already perhaps in a state of disquiet. It has been said that a natural fondness for children is indispensable to success in this branch of medicine; but this is an exaggeration. A quiet, genial manner with a pleasant smile and a gentle voice will soon dissipate the apprehensions of the patient and gain his confidence. Lastly, we proceed to a physical examination of the various organs. This, if done deliberately and without abruptness or hurry, can be effected in most cases without much trouble.

The main difficulty in the diagnosis of disease in early life arises, not from the absence of intelligent speech on the part of the patient, nor from any uncertainty in the recognition of visible signs of suffering. It springs from the perplexity we often feel in referring these symptoms to their true origin. Children are not merely little men and women in whose bodies

disease manifests itself by exactly the same tokens that are familiar to us in the case of the adult. They have special constitutional peculiarities which give to disease in early life a character it does not afterwards retain, and invest the commonest forms of illness with strange features which may be a source of obscurity and confusion. The most striking peculiarity of childhood is a marked excitability of the nervous system—an excess of sensitiveness which any deviation from the healthy state brings at once into prominence. Consequently, a functional derangement which in the adult would give rise merely to slight local symptoms, in the child may be accompanied by signs of severe general distress; and the indications of local suffering may be thus overshadowed or completely concealed. A common example of this nervous excitability is seen in the disturbance which often results from swallowing some indigestible article of food. The skin becomes burning hot, the child is in a state of extreme agitation, is perhaps convulsed, or lies in a state of stupor from which he can with difficulty be roused. In such a case the state of the stomach is apt to be overlooked; for even if the child vomit, which does not always happen, the symptom may pass almost unnoticed as one of the consequences of the general nervous perturbation. General symptoms of a like character may accompany the onset of any acute illness, and their severity bears no relation to the importance of the ailment of which they are a consequence. As profound a disturbance may be excited by the simplest functional derangement as by the severest organic malady; so that to the eye accustomed to the orderly progress of disease in the adult symptoms seem to have lost their value and to be calculated rather to mislead than to inform. This excitability of the nervous system in early life is a peculiarity which must be taken into account in every case of acute illness; and we must endeavour to separate the local symptoms—those which point to mischief of a special organ—from others which are merely the expression of the general distress. Such local symptoms are the cough, rapid breathing, and active nares which point to acute lung disease, the squinting and immobility of pupils which are so characteristic of cerebral affections, and the peculiar jerking movement of the legs which, combined with hardness of the abdominal muscles, betray the existence of colicky pain.

Local symptoms are not, however, to be discovered in every case, and even if present cannot always be relied upon to furnish trustworthy indications. Owing to the exaggerated impressibility of the nervous system a peculiar sympathy exists between the various organs. Consequently, symptoms induced by irritation in any part of the body are seldom limited to the part actually affected. Signs of distress arise at the same time from other and distant organs; indeed, the organ from which the more definite symptoms appear to arise is often not the organ which is the actual seat of disease. These deceptive manifestations are most frequently noticed in the case of the stomach and the brain. In the case of the stomach the response excited in this organ by irritation in distant parts of the body persists more or less through life. The vomiting of pregnancy and disordered uterine function in the female, and of cerebral and renal disease in both sexes, is a matter of common observation. In the child, however, this sympathy is still more frequently manifested. Vomiting is a common symptom at the beginning of most forms of acute illness and in many children may be excited by any casual disturbance. The brain again shows a marked sympathy with irritation of the more important organs. Headache, vertigo, delirium, and stupor are phenomena by no means confined to cases of intra-cranial suffering. Any serious inflammatory disease

in the child may be accompanied by such symptoms; indeed, the expression of cerebral sympathy may be so decided as completely to divert attention from the part which is really affected. The onset of pneumonia is sometimes complicated by such deceptive symptoms, and the same cause for misapprehension may be found in cases of pericarditis and inflammation of the peritoneum. So, also, the violent nocturnal delirium—the so-called "night terrors"—of children who suffer from worms or other form of gastro-intestinal derangement must be within the experience of all.

One of the best illustrations of the excitability of the nervous system in early childhood is seen in the case of convulsions. An eclamptic attack is a symptom which, in the majority of cases, has a far less grave significance in the young child than it has in the adult. In the latter it is usually the evidence of some serious cerebral lesion, and its occurrence excites the greatest alarm. In the child, on the contrary, "a fit" is a common expression of disturbance in the nervous system. It may be induced in some children by a trifling irritant; and in cases of acute illness is often seen at the beginning of the attack, taking the place of the rigor which is so familiar a symptom at the onset of the febrile disease in the adult. Convulsions, however, are not always, in the child, of this innocent character. In earlier as in later life, they may occur as a consequence of cerebral disease; but in such a case they are repeated frequently, and are succeeded by coma, rigidity, paralysis, and other signs of centric irritation. As a rule, single fits, or convulsions unaccompanied by other indication of nerve-lesion, occurring in an apparently healthy child, are purely reflex, and have no gravity whatever.

Extreme excitability of the nervous system is, therefore, in early childhood, a natural physiological condition which exercises an important influence in disturbing the orderly evolution of symptoms. Into an otherwise simple case it introduces a number of redundant features which confuse the observer, and may possibly divert his attention from the actual seat of suffering. This normal nervous irritability is subject to variations. Thus, it may be temporarily intensified by causes which produce sudden depression of strength, such as severe acute diarrhœa, or rapid loss of blood. In rickets, again, a peculiar feature of the disease is the extraordinary excitability of the nervous system. As a rule, however, in chronic disease, when the interference with nutrition is slow and long-continued, an exactly opposite effect is produced. A young child, especially an infant, if exposed for a considerable time to injurious influences so as to suffer both in flesh and strength, gradually loses his susceptibility to reflex irritation, and the excitability of his nervous system becomes less and less obvious until it finally disappears almost entirely. In a child so enfeebled, the system, instead of reacting violently against any intercurrent irritation, appears almost insensible to nervous impressions. If an attack of acute illness occur, we look in vain for the usual signs of general disquiet. Even the ordinary symptoms of local suffering may be diminished or suppressed; and were it not for the increase of weakness, and perhaps for a rise of temperature, the complication might be altogether overlooked.

This obtuseness of the nervous system is only seen as a consequence of long-continued and profound malnutrition. In all such cases, therefore, we should watch very narrowly for inflammatory complications, remembering that such intercurrent diseases may give rise to but few symptoms, and may easily escape notice.

Another peculiarity of early life which attracts attention, is the large share taken in infantile disorders by mere disturbance of function, and the

serious consequences which may arise from derangement as distinguished from disease. Infants quickly part with their heat and are easily chilled. They are, therefore, peculiarly prone to catarrhal disorders, and these, if severe, may produce material interference with the functions of the organ affected. No doubt the excitability of the nervous system helps to increase the gravity of these derangements. The commotion into which the whole system is thrown by the attack, tends to exhaust the patient and greatly to enhance the enfeebling influence of the complaint. In infancy, death is a not uncommon consequence of these disorders; and it is for this reason that *post mortem* examinations in the infant are so often unsatisfactory. It constantly happens that a young child is seized with alarming symptoms of illness and quickly dies, yet on opening the body no sufficient morbid appearances are discovered to explain the fatal issue of the case.

Children differ from adults in yet another respect. Diathetic tendencies are especially active in early life. They exert a remarkable influence upon the growing body, shaping the figure, moulding the features, and so ordering the structure of organs that any interference with the nutritive processes, such as may be produced by ordinary insanitary agencies, is followed by widely distributed mischief. Sir William Jenner has drawn attention to the number of organs affected at the same time in cases of diathetic disease in the child. In a bad case of inherited syphilis, few tissues or organs escape ; in scrofula the lesions may be almost universal ; and in acute tuberculosis all the cavities of the body may be simultaneously affected. Thus, according to the constitutional character of the patient and the nature of his ailment, a child may die from mere arrest of function, with tissues sound, organs healthy, and no morbid appearances left to declare the nature of the complaint ; or may succumb to a profound and general disease which visits every part of the body and leaves scarcely any organ unaffected.

It is sometimes said that in a healthy child acute disease naturally tends to recovery, but this statement must not be taken without qualification. There are some diseases, such as typhoid fever, measles, and perhaps croupous pneumonia, which commonly run a milder course in earlier than they do in later life ; but there are others, especially acute affections of the gastro-intestinal tract, which weigh with peculiar severity upon the young. In infancy the patient is so dependent upon a frequent supply of nourishment that an abrupt interference with the nutritive processes, such as occurs in some forms of bowel complaint, is an event of the utmost gravity. Often it is followed by so much exhaustion that the infant rapidly sinks and dies. It is this sudden and complete cutting off of the nutritive supply which constitutes the chief danger of acute disease in the child ; and in early life illness is often serious in exact proportion to the degree in which the alimentary canal takes part in the derangement. When digestion is not arrested and the system still continues to receive nourishment, the child, if in favourable conditions and of healthy constitution, will probably recover. The recuperative power of nature is very great, especially in the young; but that it may be free to operate it is essential that no unfavourable condition be present to impede the natural course of the illness. Over and above grave implication of the digestive organs, other untoward elements may enter into a case, and each of these has an influence in weakening the natural tendency to mend. The age is a matter of great importance. A new-born infant has but a feeble hold upon life and quickly succumbs to an attack of acute illness. Later, the child may be burdened with a diathetic taint which has already impaired

his nutrition and lowered his vital energies. Moreover, he may be hampered by unhealthy surroundings which intensify the weakening influence of the original disease, and, indeed, by themselves are often powerful enough to prevent recovery.

Therefore it is only in children of healthy constitution who are placed under favourable conditions that illness can be said naturally to tend to recovery, and in them only after the period of earliest infancy has passed by, and in cases where, nutrition not being completely arrested, a limited supply of nourishment continues to be introduced into the system.

Sudden death in early childhood, is due, as a rule, to laryngismus, to syncope, or to collapse of the lung; and occasionally it is seen as a consequence of convulsions. Spasm of the larynx is the common cause of death in children who are apparently healthy. Those who die suddenly in the course of an acute illness or during convalescence, do so usually from syncope, or in rarer cases from thrombosis in the pulmonary artery. In wasted infants sudden death is more commonly the consequence of pulmonary collapse. When a disease is about to end fatally the extremity of the danger is shown by a marked alteration in the temperature. In some cases we notice a rapid fall, the thermometer registering only 96° or 97° in the rectum. In others there is a sudden increase in the bodily heat, and the temperature rises quickly to 108° or 109°. The ante-mortem cooling is usually noticed in chronic ailments and in bronchitis with collapse of the lung. The rapid increase in heat is common in cerebral affections and in cases of acute gastro-intestinal derangements. Other unfavourable signs are lividity of face, refusal of food, thrush, rapidity and feebleness of the pulse, heaviness and stupor.

In acute disease when recovery takes place, convalescence is usually rapid. In an uncomplicated case the strength appears to be recovered almost as quickly as it was lost. Directly the temperature falls, digestion and nutrition resume their course and in a surprisingly short time the child is well. If convalescence is delayed in such a case it is almost invariably the consequence of a complication, and it must be remembered that this accident is far from uncommon in the child. In all forms of catarrhal derangement—a variety of disease to which childhood, as has been said, is peculiarly prone—a gastro-intestinal complication may increase the gravity of the illness and delay the process of repair. Sometimes the depurative functions of the kidneys are imperfectly performed. Sometimes an unabsorbed patch of consolidation in the lung interferes with the return of strength. In all cases, therefore, where convalescence from acute disease is delayed, or having begun, appears to falter, we should make careful examination of the various organs so as to discover the mischief and apply a remedy.

In cases of chronic illness convalescence is usually tardy. The delay, no doubt, is partly owing to the fact that this class of disease is common in children of a scrofulous habit of body; and the strumous cachexia is in itself a bar to rapid improvement. It is, however, also often due to the nature of the illness. In early life, especially in infancy, chronic ailments commonly affect the alimentary canal, either primarily or secondarily, and the progress of such complaints to recovery is invariably slow.

In the following pages the term "infancy" is confined to the two first years of life, or to the period which ends with the completion of the first dentition; "early childhood" to the period between the close of the second and the close of the fourth year. The period of childhood ends at puberty. This important change occurs at various ages, especially in girls;

and some young people remain children both in mind and body to a much later date than others.

In the *examination* of an infant or young child every care should be taken to avoid abruptness or hurry. We must remember that we have to do with beings who act not from reason, but from instinct; that any sudden movement frightens them, a little pressure hurts them, and in either case a cry and a struggle bring the examination abruptly to a close. Again, young children, as a rule, dislike the sight of a strange face, and if old enough to understand the object of the visit, are already prepared to look with distrust upon the "doctor." Still, it is a mistake to suppose that children always make unmanageable patients. They are no doubt quick to take fright; but it should be the constant care of the practitioner to avoid any look or gesture which may arouse their suspicions. If he look, speak, and move gently, and do not hurry, most young children will let themselves be examined thoroughly without great difficulty.

On entering the room it is well to accustom them to our presence before we even appear to notice them at all. This interval can be usefully occupied by questioning the mother as to the onset of the illness, and the character of the early symptoms. We can also take this opportunity of inspecting the motions or vomited matters. In searching into the history of the case it is especially desirable to obtain some starting-point for our investigations. The question "When did the indisposition begin?" often receives only a vague reply; while an inquiry as to the time which has elapsed since the child was last in good health may elicit an account of more or less interference with nutrition and indefinite malaise extending over a considerable interval. Some tact is often required in obtaining a definite account of the beginning and early progress of the illness. It is important to avoid suggesting a reply by the character of the question, while it is often necessary to be minute in our inquiries in order to stimulate a flagging memory.

In infants and young children much may be learned from mere inspection of the face. It is an advantage in these cases to find the patient asleep. We can then study at leisure the colour and general expression of the face, the form of the features, the presence or absence of lines or wrinkles, and remark if the nares act in respiration or the eyelids close incompletely. We can besides notice the attitude of the child, can count the pulse and respiration, and can observe their degree of regularity or any deviation from the healthy state. Even if the child be awake, many of these points can be noticed if we approach quietly and do not speak to or offer to touch the patient. Any movements he may make at this time in his cot must receive due attention, for they often convey very valuable information.

These points having been noticed, the temperature should be taken. In doing this, if the patient be an infant, it is desirable to introduce the bulb of the thermometer into the rectum, for at this early age the difference between the internal and external temperature of the body is often considerable. The child should next be completely stripped of his clothes. The state of his skin can then be ascertained, noting the presence or absence of eruption; and a careful examination must be made of the abdomen and chest. If the child lose his temper at this time, the quality and strength of his cry should be remarked. At the end of the visit the gums, mouth, and throat should be inspected, and if any of the child's water can be procured, it should be examined for albumen, and its density and degree of acidity ascertained.

After this rapid sketch of the method upon which the clinical examination of the infant and young child should be conducted, the chief points to which attention must be directed may be considered more in detail.

In the new-born infant the *tint of the face* immediately after birth is a dull red. The redness, however, soon begins to subside ; in a day or two the complexion assumes a slight yellow tint, and then passes into its normal coloring. The yellow tint and its diagnosis from infantile jaundice are referred to elsewhere (see Jaundice).

The clear fresh complexion of a healthy baby or young child is familiar to every one. A loss of its purity and clearness is one of the first indications of digestive derangement. The face becomes muddy-looking and the upper lip whitish or bluish. Blueness of the upper lip in early life is a common sign of laboured digestion. In some children difficult digestion is shown by an earthy tint of the face which spreads to the forehead. It appears a short time after the meal and may last several hours. In chronic bowel complaints the earthy tint is constant. It is common in cases of chronic diarrhœa in the infant, and if at the same time there is much emaciation, the derangement is likely to prove obstinate. In syphilis the prominent parts of the face—the nose, cheeks, chin, and forehead—assume a swarthy hue. In lardaceous disease the complexion is peculiarly pallid and bloodless ; in rickety children whose spleens are greatly enlarged it has a greenish or faint olive cast ; and in cyanosis the face has a characteristic leaden tint, the conjunctivæ are congested, and the eyelids and lips thick and purple. Lividity of the skin round the mouth and nose with a purple tint of the eyelids is common as a result of deficient aëration of the blood. In severe cases the cheeks at the same time have a dull white color, and the symptom is an unfavourable one. In the spasmodic stage of whooping-cough the face looks swollen as well as livid, the lips and eyelids are purple and thick, and the conjunctivæ are congested and often bloodshot.

In addition to the actual tint of the face the general expression must receive attention. In a healthy babe the physiognomy denotes merely sleepy content, and no lines mark the smooth uniform surface. Pain is indicated by a contraction of the brows which wrinkles the skin of the forehead. This is especially noticeable if the head is the seat of suffering. If the pain be in the abdomen the nose often looks sharp, the nostrils are dilated, and the child draws up the corners of the mouth with a peculiar expression of distress. In every case of serious disease the face, even in repose, has a haggard look, which must not be disregarded. If this be accompanied by a hollowness of the cheeks and eyes the result is a ghastly expression which cannot escape attention ; but a distressed look may be seen in the face although there is no loss of roundness of feature. If this be the case, even in the absence of striking symptoms, we may confidently predict the onset of serious disease.

Often an inspection of the face will help us to a knowledge of the part of the body affected. Many years ago M. Jadelot pointed out certain lines or furrows in the face of an ailing infant which by their position indicate the seat of the derangement, thus :

The *occulo-zygomatic* line begins at the inner canthus of the eye, passes thence downwards and outwards beneath the lower lid and is lost on the cheek a little below the projection of the malar bone. This line points to disease or derangement of the brain and nervous system.

The *nasal* line rises at the upper part of the ala of the nose and passes downwards curling round the corner of the mouth. This line is a constant

feature of abdominal mischief, and is never absent in cases of gastro-intestinal derangement.

The *labial* line begins at the angle of the mouth and runs outwards to be lost in the lower part of the face. This is more shallow than the preceding. It is a fairly trustworthy sign of disease in the lungs and air-passages.

These lines have a distinct practical value and should be always attended to. We should also notice if the eyelids close completely, for imperfect closure of the lids during sleep is a common sign of weakness. Moreover, it must not be forgotten to ascertain the condition of the pupils and the presence or absence of squint. The value of these symptoms, and of others connected with the eye, is referred to elsewhere (see page 261). The nares must not be forgotten. If they act in respiration the movement is a common accompaniment of laboured breathing and often indicates an impediment to the respiratory function. It may, however, be present in cases where there is no conscious dyspnœa, and is sometimes seen in simple pyrexia. Even the shape of the features must be attended to. An elongated head with square forehead and small lower jaw are characteristic of rickets; a broad flat bridge to the nose, especially if conjoined with prominence of the forehead and absence of eyebrows, suggests syphilis; and a big globular head surmounting a small face and little pointed chin indicates unmistakably chronic hydrocephalus.

The attitude of the child as he lies in his cot is not to be overlooked. Sometimes it is characteristic. A healthy infant or young child, even if lying on his back, inclines to one side and turns his head so as to bring the cheek in contact with the pillow. If a baby be found lying motionless on his back, with closed eyes and face directed straight upwards to the ceiling above him, he is probably the subject of serious disease. This position may be seen when the child is unconscious, as from tubercular meningitis; or is profoundly depressed, as in acute inflammatory diarrhœa. If the child lie on his side with his head greatly retracted on his shoulders, it is a suspicious sign of intra-cranial disease. If in such a position the breathing is audible and hoarse, the case is probably one of laryngitis, or there is some impediment to the passage of air through the glottis. If the patient be found in his cot resting on his elbows and knees with his forehead buried in the pillow, or if he sleep lying on his belly, there is no doubt abdominal discomfort. These positions are common with rickety children. If the child press his eyelids against the pillow, turning partially on his chest, we may suspect intolerance of light.

Healthy infants and children sleep perfectly quietly. Frequent turning of the body or twitching of the muscles generally indicates feverishness or digestive derangement. If the child move his head constantly from side to side on the pillow, he is probably annoyed with pain in the head or ear. Frequent carrying of the hand to the forehead or side of the head has usually the same significance. If the child repeatedly flex the thighs on the abdomen, and cry violently in sudden paroxysms, he is probably suffering from colic.

The *cry* of the child is a symptom of considerable importance. It is usually elicited by hunger or uneasiness, and from the manner of crying we can often gather considerable information. A hungry infant in most cases clenches his hands and flexes his limbs—both arms and legs—as he utters his complaints; and will often continue to do so until his desires are satisfied. Thirst may also be a cause of crying, and may be suspected if the child sucks his lips repeatedly, has a dry mouth, or has been suffer-

ing from purging. If he be tortured by colicky pain, the cry is violent and paroxysmal, and is accompanied by uneasy movements of the body and jerking of the lower limbs. The belly is also full and hard, and there is often a blue tint round the mouth. A shrill scream uttered at intervals, the child lying in a drowsy state with closed eyes, is suggestive of tubercular meningitis. A constant unappeasable screaming is often the consequence of ear-ache. This painful affection is very common in infants, and should be always suspected if the lamentations continue without intermission, and the child frequently presses the side of his head against his mother's breast. The pain of pleurisy will also cause violent crying. In this case pressure upon the sides of the chest, as in lifting the child up, causes an evident increase in his suffering. Any alteration in the quality of the cry must be noted. It may be hoarse in a young infant from inherited syphilis ; in an older child from laryngitis or enlargement of the bronchial glands.

In a healthy infant a cry is excited at once by anything which causes him discomfort or inconvenience ; therefore the *absence of crying* is a symptom which should always receive due attention, as it may betoken serious disease. In inflammatory affections of the lungs, in pulmonary collapse, and in advanced rickets where the bones are softened, a child will bear considerable discomfort without loud complaint, for he has a pressing want for air and dare not hold his breath to cry. So, also, in severe diarrhœa or any other illness which causes great reduction of strength, the child, on account of his weakness, cries little if at all. In cases of profound weakness he will often be noticed to draw up the corners of his mouth and wrinkle his brows as if to cry without making any sound.

In the act of crying tears are copiously secreted after the age of three or four months. In serious disease, however, the lachrymal secretion often fails. Therefore the absence of tears must be taken to indicate considerable danger.

The *pulse* in the infant can seldom be counted, except during sleep ; and even if its rapidity can be ascertained the information thus derived is of little value. The rapidity of the pulse in infancy is constantly varying. The least movement excites the heart's action, and mental emotions, such as fright or anger, almost double the rapidity of the cardiac contractions ; so that, according as to whether the infant is awake or asleep, is perfectly quiet or has just moved, the pulse may vary from between 80 and 90 to 160 or 180. As a test of physical vigour in babies the pulse is worthless. In this respect the fontanelle is of far greater value. In infants under twelve months old a sinking of the fontanelle is a sure sign of reduction of the strength ; and in touching a child of this age our first care should be to pass the finger over the top of the head and ascertain the condition of this part of the skull. In wasted babies the fontanelle often forms a cup-shaped depression ; and if the loss of flesh is very rapid, as when a profuse drain occurs from the bowels, the cranial bones may often be felt to overlap slightly at the sutures. Excess of fluid in the skull-cavity or a hyperæmic state of the brain causes bulging and tenseness of the fontanelle. Unless very distended the membrane is not motionless. It can be seen to move with respiration and to sink appreciably as air is drawn into the lungs.

After the period of infancy has passed, the pulse becomes a far more trustworthy guide. During sleep it is fifteen or twenty beats slower than during the waking state, and may then be occasionally irregular in rhythm or even completely remittent. When the child wakes the pulsations in-

crease in frequency and usually rise above 100. If at this age the pulse is found to fall as low as 60 or 70 in a child who is not asleep, and to intermit completely, the sign may be significant of tubercular meningitis. This matter is elsewhere referred to (see page 359).

The respirations should be always counted. In new-born infants their number is about 40 or perhaps more in the minute. But the breathing soon becomes less rapid, although for a long time the movements are more frequent than in the adult, and even after the second year are usually over 20 in the minute. The normal average is difficult to ascertain, for like the pulsations of the heart the breathing varies greatly in rapidity. It is rather slower during sleep than when the child is awake, but is apt to become more hurried from slight causes. More important than the actual rapidity of either the breathing or the pulse is the ratio the two bear to one another. If the breathing become rapid out of proportion to the pulse, the discrepancy should be carefully noted. The normal ratio is 1 to 3, or 3.5. If this proportion becomes greatly perverted and we find one respiratory movement to every two beats of the pulse, we should suspect the presence of pneumonia or of pulmonary collapse. The regularity of the respiration is also to be noticed. A slight irregularity, especially in force, is common in infants; but if the breathing become markedly irregular, the symptom may be an important one. Frequent heavy sighs and long pauses, during which the chest is perfectly motionless, are very suspicious of tubercular meningitis.

The *temperature* of the child ought always to be ascertained. It must be taken with care. In a healthy infant the temperature of the rectum is about 99°, and is fairly constant throughout the day. It rises half a degree or so towards the end of digestion, but a marked difference between the morning and evening temperature is not noticed in a healthy baby who receives proper attention. According to Dr. Squire, if the bodily heat is found to vary considerably at different times in the day, the symptom should suggest neglect on the part of the nurse or delicacy of constitution on the part of the child. If the infant be kept too long without food the temperature falls, and will then rise again considerably after the meal. It also appears from Dr. Squire's interesting observations upon young babies, that the temperature is rather lower during sleep than when the child is awake. Even after the age of infancy the temperature is subject to frequent variations from slight causes; and in young children mental emotion will often induce a degree of fever which may be a source of perplexity. In children's hospitals it is a common observation that the bodily heat on the evening of admission is high even when the disease is not one usually attended with fever.

On account of the excitability of the nervous system in early life—a peculiarity of childhood which has been before referred to—children are very subject to what has been called "irritative fever," *i.e.*, to a form of pyrexia which results from fretting of the system by various sources of irritation. Dentition, as is explained elsewhere, is a frequent promoter of this form of febrile excitement, and a pyrexia induced by this means is apt to complicate derangements ordinarily non-febrile and be a cause of confusion. So, also, irritation of the bowels by scybala, indigestible food, or parasitic worms, is a common cause of elevation of temperature in the young. The febrile movement resulting from the presence of a local irritant, like other forms of pyrexia in childhood, is generally remittent; but the remissions are not always found at the same period of the twenty-four hours. There is not always a fall of temperature in the morning and a rise

at night. One of the peculiarities of this form of febrile disturbance is the irregularity of the fever. In a young child a temperature higher in the morning than at night should always suggest some reflex cause for the pyrexia.

It is very important not to neglect the use of the thermometer in judging of the heat of the body, for not only is the hand very deceptive as a guide, but the skin of the patient may appear to be cool although the internal temperature is several degrees above the normal level. It is not uncommon in cases of inflammatory diarrhœa to find the extremities so cold as to require the application of a hot bottle, while a thermometer placed in the rectum registers 104° or 105°. Sometimes in young children the pyrexia will reach a very high level. At the end of an attack of tubercular meningitis the temperature is often 109° or 110° ; and the same degree of febrile heat is occasionally seen in cases of acute gastro-intestinal inflammation. In either case the symptom betokens extreme danger ; although it must not be concluded that the illness will inevitably prove fatal. I have known a baby of a few weeks old recover after its rectal temperature had risen to the alarming height of 109°.

Sometimes instead of an elevation the thermometer may show a lowering of temperature. In infants any reduction in the bodily heat is usually a sign of deficient nourishment. In a baby exhausted by chronic vomiting or purging the temperature in the rectum may be no higher than 97°. This is of course an extreme case ; but a lesser depression is often found in infants insufficiently nourished, either from watery breast-milk or an unsuitable dietary. Again, in convalescence from acute disease the temperature usually remains for some days or even weeks at a lower level than that of health. This phenomenon may be often noticed after typhoid and the other eruptive fevers.

Before leaving the subject of temperature, reference may be made to the pyrexia which sometimes attends rapid growth. Several cases have come under my notice in which growing girls were exciting great anxiety by a persistent evening temperature of over 100°. In one such case, a girl of twelve had been kept in bed for five weeks and treated for typhoid fever, the girl all the time begging to get up and declaring herself to be perfectly well. The patient was brought to me from the country for an opinion, as the temperature for six weeks had varied every night between 99° and 100.6°. I examined the child carefully and could find nowhere any sign of disease. She looked healthy and was said to be growing rapidly. I accordingly advised that she should be no longer treated as an invalid, but should be allowed to get up, be put upon ordinary diet, and be sent as much as possible into the open air. This was done, and at the end of a fortnight the temperature became normal and did not afterwards rise.

Having obtained all the information we can without unnecessarily disturbing the patient, we should next, in the case of an infant or young child, have the clothes completely removed so as to be able to make a thorough examination of the surface of the body. We can thus notice the condition of the skin as to texture and elasticity, and remark the presence or absence of eruptions or signs of inflammatory swelling. In a healthy young child, the skin is delicate and soft, and of a beautiful pinkish-white tint. If it feel dry and have an earthy hue, the change is suspicious of chronic bowel complaint. If the skin is wanting in elasticity, we should suspect tuberculosis or renal disease ; and if the kidneys be performing their functions imperfectly, the skin may be often seen to lie in wrinkled folds upon the abdomen. Dryness, with a dingy hue of the skin, is also common in some

forms of hepatic disease, and occasionally in chronic tubercular peritonitis. At this part of the examination, any sign of tenderness either general or local should receive attention. The sharper cry of pain is usually to be readily distinguished from the cry of irritability or anger. In rickets there is general tenderness which makes all pressure painful. In pleurisy pressure upon the sides of the chest, as in lifting the child up, is a cause of acute suffering. Sometimes signs of local tenderness can be discovered, such as may accompany the formation of matter beneath the surface ; or again, slight tenderness of a joint may be the only indication of rheumatism in the child.

The attention should next be directed to the *respiratory movements*. In healthy young children respiration is chiefly diaphragmatic. Forcible movement of the thoracic walls is a sign of laboured breathing, and is a constant symptom of broncho-pneumonia. Great recession of the lower parts of the chest suggests an impediment to the entrance of air into the lungs. If at each inspiration there is great recession of the epigastrium, the lower part of the sternum being forced inwards so as to produce a deep hollow in the centre of the body, the obstruction is probably in the throat or larynx. Such a depression is seen in the case of retro-pharyngeal abscess, in stridulous laryngitis, and diphtheritic croup. If the chest fall in laterally so as to produce a deep groove, running downwards and outwards at each side of the chest, while at the same time a horizontal furrow form at the junction of the chest with the abdomen, the impediment is due to softening of the ribs. This is characteristic of rickets. Sometimes in children who suffer from enlarged tonsils a cup-shaped depression is seen at the lower part of the sternum. It is right, however, to say that this deformity is not confined to children with enlarged tonsils. I have seen it well marked in patients in whom the pharynx was perfectly normal, and in whom no impediment appeared to exist to the entrance of air into the lungs. If the chest move more freely on one side than on the other, we should suspect grave mischief on the side on which the movement is hampered. Still, in the child serious disease of the chest may be present without our being able to detect any such difference. Even in cases of copious pleuritic effusion, no impairment of movement in the intercostal spaces of the affected side may be visible. Marked contraction of one side of the thorax with curving of the spine is suggestive of a late stage of pleurisy, or of an indurated lung.

In the healthy child the *abdomen* moves freely in respiration. If it be motionless, therefore, an inflammatory lesion of the belly should be suspected. If the superficial veins of the abdomen are unnaturally visible, the symptom is suggestive of some impediment of the abdominal circulation, such as would be produced by enlarged mesenteric glands or hepatic disease. In young children the belly is always disproportionately large. Its size is due to shallowness of the pelvis, to flatness of the diaphragm, and to laxness of the muscular walls, which yield before the pressure of the flatus in the bowels. In some healthy infants the abdomen is much larger than it is in others. The difference is probably due in most cases to an exaggerated amount of flatus formed in the bowels during digestion. The size of the belly from this cause sometimes alarms parents ; and it is not uncommon to be consulted with regard to this point in the case of young children who are in every respect perfectly healthy. Often, however, the enlargement is due to increase in size of the liver and spleen, to the presence of a growth, or to accumulation of fluid in the peritoneum. The size of the liver and spleen may be ascertained by placing the hand flat upon

the abdomen, the fingers pointing to the chest, and pressing gently with the finger tips. In this way with a little practice the edges of these organs can readily be felt. At the same time, if the child be not crying, we can ascertain the degree of tension of the abdominal wall and the presence or absence of fluctuation. Abnormal tension of the parietes, especially if it be more marked on one side than on the other, is suggestive of peritonitis or ulceration of the bowels. For the means of diagnosis of the several conditions which give rise to abdominal enlargement the reader is referred to the chapters treating of these subjects.

If, instead of being distended, the belly is markedly retracted we have reason to suspect the presence of tubercular meningitis. To examine the abdominal organs at all satisfactorily the child must lie on his back with his head and shoulders raised by a pillow. The mother or nurse should sit upon the bed by his side, and the practitioner should take care that the hand he applies to the belly is warm and does not press too abruptly so as to give pain. This part of the examination is usually submitted to without opposition if the child be humoured and cheerfully talked to.

Even an examination of the chest can generally be undertaken without fear of failure. Infants, as a rule, seldom give much trouble ; and if there is any serious disease present in the lung, they are too much occupied by the needs of respiration to spare time to cry. In early childhood there is more reason to fear opposition, but with patience the examination can usually be carried to a successful issue. A stethoscope is seldom objected to if it be first placed in the child's hand and called a trumpet. For further remarks upon this subject and the peculiarities of the physical signs in childhood the reader is referred to the special chapter on examination of the chest in children.

Inspection of the mouth and throat should be always deferred to the end of the visit, as this part of the examination invariably produces every manifestation of displeasure. An infant will often protrude his tongue when gentle pressure is made upon his chin, and a finger can be usually passed over his gums without sign of opposition ; but to look at the throat we are forced to depress the tongue. If any symptoms are noticed requiring the operation, every precaution should be taken to render it successful. The nurse sitting in a low chair facing the window or a good lamp, holds the child straight upon her lap with his back resting against her chest. She then with her arm thrown round his body prevents the patient from changing his position or raising his hands to his mouth. At the same time an attendant standing behind her with a hand on each side of the child's face holds his head in a convenient position. Matters being thus arranged it is the practitioner's own fault if he do not obtain a good view of the fauces. Firmness is absolutely necessary at this point. Any other plan is equally annoying to the patient, and is almost certain to end in failure. Before inspecting the throat, the sides of the neck should be examined for evidence of swollen cervical glands.

In some cases it is important to ascertain if the child takes the breast, sucks the bottle, or drinks from a cup with ease. In infantile tetanus the mere fact that the patient is able to swallow enables us to speak less unfavourably of his chances of recovery. In cases, too, of apparent stupor, if the child still continue to take his food the sign is a favourable one. If a child be suffering from acute lung disease, he sucks by short snatches, stopping at frequent intervals to draw his breath. A syphilitic child with occlusion of the nares sucks with great difficulty, as his nose is useless for respiratory purposes and all air has to pass through his mouth. An infant

with bad thrush has much pain in drawing the milk from soreness of his mouth and tongue, and may refuse his bottle altogether. If the throat be sore the child swallows noisily, and often relinquishes the nipple to cough.

Lastly, the practitioner should be careful to inspect the vomited matters and discharges from the bowels, as the description of their appearance given by the best nurses is rarely to be trusted. The varieties of loose stool are elsewhere considered. Food vomited sour from the stomach indicates a catarrhal state of the gastric mucous membrane. Much mucus mixed with the ejected matters is also a sign of the same condition. Vomiting is not, however, always a symptom of distress. An infant who has swallowed too large a quantity of milk, or has taken his bottle too hastily, will often eject a part of the meal; but in such a case there is nothing offensive about the matters thrown up and the child himself shows no sign of distress.

In the *treatment* of disease in early life the actual administration of physic is of less importance than a careful regulation of the diet and attentive nursing. It is the duty of the practitioner to see that no impediment is thrown in the way of the proper working of the various functions; that the stomach is supplied with food it can digest, that the skin, the kidneys, and the bowels are encouraged to carry on their duties as emunctories, that the air of the room is kept pure and frequently renewed, and is moreover maintained at a suitable temperature.

Febrile attacks are very common in childhood, and if the temperature is high (*i.e.*, above 100°), which it may be from very slight and transient causes, the child should be confined to his bed and kept there as long as the pyrexia continues. In all forms of fever the child should occupy a large, well-ventilated room. This should be kept at the temperature as nearly as possible of 65°, and every care should be taken to maintain the air of the room fresh and pure. Still, no draught must be allowed. If the window is open the patient must be scrupulously protected from all currents of air. No discharges from the body, soiled linen, dirty plates or dishes should be allowed to remain in the sick-room a moment longer than is necessary; and in the case of the infectious fevers the excreta must be disinfected at once, and the soiled sheets and other linen steeped after removal in a tub of water containing carbolic acid or other disinfectant.

All noise and bustle must be prohibited; and few persons must be allowed at the same time in the room. If the child require amusement, he must be allowed only such unexciting diversions as books, pictures, and quiet games can afford. His food should be of a light, unstimulating kind, such as thin broth, milk, light puddings, and jelly. His thirst may be assuaged at frequent intervals, care being taken, however, that only small quantities of fluid are allowed on each occasion. Too large quantities of liquid distend the stomach, impair the digestion, and help to promote diarrhœa. This is a fact of some moment in the treatment of diseases where purging is a common symptom, as measles and typhoid fever. It is advisable to make use of a small glass holding about two ounces, for the child will be usually satisfied if allowed to drain this to the bottom. As the patient grows weaker and requires more decided support, he may be given pounded underdone mutton, strong beef-essence, yolks of egg, and, if stimulants are required, the brandy-and-egg mixture of the British Pharmacopœia.

In cases where deglutition is difficult or impossible, as in infantile tetanus or the paralysis which follows diphtheria, and in all cases where from wilfulness or incapacity an adequate supply of food is not taken, it may

be necessary to feed the child through a tube introduced into the stomach. This operation is best performed by passing an elastic catheter through the nose and down the gullet. The instrument is more conveniently introduced through the nose than through the mouth. Less opposition is aroused by this method, and little or no irritation appears to be set up in the nasal passages. The tube [1] properly oiled must be directed along the floor of the nasal cavity into the pharynx, and can be then readily pushed down the gullet into the stomach. If it catch against the top of the larynx, a spasmodic cough is excited. The instrument must be then withdrawn slightly and again pushed forwards. There is little difficulty about the operation if the child's head be directed well backwards. By this means liquid food can be administered regularly; and in certain diseases —especially infantile tetanus, where nourishment is urgently needed and is indispensable to success in the treatment—feeding through the nose becomes a valuable addition to our resources.

If the power of swallowing be unimpaired, a simpler method may be adopted. In such a case it is only necessary to carry the food into the fauces. If other means are not at hand, fluid nourishment may be poured directly into the nostril as the child lies in his cot. The liquid at once gravitates to the back of the throat and is swallowed as it reaches the pharynx. If preferred, the fluid may be injected through a short caoutchouc tube passed through the nose to the upper part of the gullet. In most of these cases, however, the simple and ingenious method devised by Mr. Scott Battams,[2] and introduced by him into the East London Children's Hospital, may be resorted to. In the case of weakly or collapsed infants this method is invaluable; but children of all ages, if prostrated by illness, can take nourishment more conveniently by this means than by any other. The apparatus is of the simplest kind, and consists merely of an ordinary glass syringe with a piece of India-rubber tubing, four inches long, slipped over the nozzle. The syringe is filled in the ordinary way by drawing up fluid through the tubing. The tube is then passed between the child's lips towards the back of the tongue and the contents of the syringe are slowly discharged into the mouth.

These different methods of feeding are all useful. The stomach-tube passed through the nose should be employed in all cases where deglutition is impaired, from whatever cause—either from inflammatory conditions of the throat, from loss of excitability of the pharynx owing to cerebral disease or narcotic poisoning, or from paralysis, as after diphtheria. The syringe-feeder just described may be used in cases of great weakness and prostration, and in all cases where the power of swallowing is not interfered with.

The question of *reducing temperature* when this rises to a dangerous height is an important one. Children often bear a high temperature well, and it is not always easy to say what degree of heat constitutes hyperpyrexia in a child. When the fever is due to a septic cause it is perhaps less well borne than when it is the consequence merely of a local inflammation. In any case if the temperature rise above 106°, or if the patient seem to be distressed by a less degree of heat, it is advisable to sponge the surface of the body with tepid water. If the fever be not reduced by this means, the

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[1] The best tube to use is a vulcanised india-rubber catheter sufficiently stiff not to kink. A No. 7 is the most useful size.

[2] Mr. Battam's paper on the Forced Feeding of Children, in the Lancet of June 16 and 23, 1883, in which the various methods of feeding are described, is full of interest and instruction.

child should be placed in a bath of the temperature of 75°, and be kept there until the pyrexia undergoes a sensible diminution. Usually sponging the surface will reduce the bodily heat by several degrees, to the immediate relief of the patient. In cases of inflammatory diarrhœa, even in babies of a few months old, the temperature often rises to 109° or 110°, and the child passes into a state of profound depression. When this happens death is inevitable unless the pyrexia can be quickly reduced; and tepid bathing is often successful in greatly retarding if it do not actually prevent a fatal issue to the illness.

In all forms of fever the comfort of the patient is greatly promoted by the use of two cots—one for the day, the other for the night. In cases of pericarditis with copious effusion, in the later period of typhoid fever, and in other instances where the debility is extreme or the action of the heart hampered and feeble, the change from one cot to the other must be made with every precaution to spare the child all spontaneous movement, and to keep him in a recumbent posture.

In the treatment of disease in early life the remedies at our command are the same as are useful for similar conditions in the adult. On account however, of the impressible nervous system in the young subject external applications are of greater importance in childhood than they become in after years. Amongst the remedies of the greatest value baths form a class of no little importance. According to the temperature of the water employed the bath becomes a sedative, a stimulant, or a tonic, as may be required; and in these different shapes is often resorted to with great advantage. The usefulness of tepid bathing in reducing fever has already been referred to.

The *warm bath* (80° to 85° Fah.) is very useful in cases of convulsions or great irritability of the nervous system, shown by agitation, restlessness, spasm or disturbed sleep. It calms the excitement, allays spasm, promotes the action of the skin, and induces sleep. On account of its diaphoretic effect warm bathing is of great service in cases of Bright's disease. In infants the warm bath has a sensible influence in promoting the action of the bowels, and in cases of constipation is often a valuable addition to purgative medicines. The child should remain from ten to twenty minutes in the warm water.

The *hot bath* (95° to 100° Fah.) is of great value as a stimulant where there is sudden and severe prostration, such as occurs in cases of profuse diarrhœa, urgent vomiting, shock, or other cause which induces a temporary depression of the vital energies. When employed in this way as a stimulant the child must not remain too long in the water or the stimulant effect will pass off and be succeeded by depression. For an infant three, and for an older child five minutes will be sufficient immersion. The patient can then be removed, wiped rapidly dry, and laid between blankets with a hot bottle to his feet. This bath may be made more stimulating by the addition of mustard. Flour of mustard, in the proportion of one ounce to each gallon of water, is mixed up with a little warm water into a thin paste and placed in a piece of muslin. This is squeezed in the hot water until the latter becomes strongly sinapised. So prepared, the mustard bath is an important remedy in cases of prostration and collapse. The child should be held in the bath until the arms of the attendant supporting him begin to tingle.

The *cold douche* is a tonic of the utmost value. It must, however, be employed with discretion, for the patient if weakly seldom obtains a proper reaction unless special precautions be taken. If the child look blue or

feel chilly after the bath, the shock to the system has been too violent. For a weakly child the cold douche should always be given in the following way: On rising from his bed the child is thoroughly shampooed all over the body, using steady frictions especially to the back and loins. His skin being thus stimulated and prepared to resist the shock of the cold water, the patient is made to sit in a few inches of water as hot as he can conveniently bear it, and then immediately a pitcher of cold water (55° to 60°) is emptied over his shoulders. He is then at once removed, and well rubbed with a rough towel to assist reaction. In winter the bath should be placed before the fire, and every care should be taken to make the process a rapid one. The shampooing will occupy from ten to fifteen minutes, but the douche should be over in as many seconds. It is well to allow the child a drink of milk or a biscuit before beginning the process; and when dried the child may return to his bed for a short time if thought desirable; but after one or two repetitions of the bath this precaution will be unnecessary. So employed, the bath must be regarded purely as a therapeutic agent, and not as a cleansing process. The body may be washed in the ordinary way at night before the child is put to bed.

The cold douche is of great service in all cases of weakness, whether this be due to acute or chronic illness, and is only inadmissible if the lungs are actively diseased or there is fever. It is especially useful in cases of long-standing derangement and in the scrofulous cachexia, and may be recommended without hesitation for children of very fragile appearance. In addition to its tonic effect the bath has another valuable quality in that it strengthens the resisting power of the body against changes of temperature, and lessens the susceptibility to cold.

The hot and mustard baths may be considered in the light of counter-irritants, which act through the surface generally and produce a powerful stimulating effect upon the flagging nervous system. A similar means of rousing the vital energies consists in the employment of stimulating liniments. Thus, in cases of atelectasis, energetic frictions with a strong irritating application will often enable the child to expand the collapsed portion of lung, and thus save him from immediate danger. In many varieties of local disease, counter-irritants are of extreme service. They may be used in the form of blisters, mustard poultices, and painting with the tincture or liniment of iodine. The kind of application best suited to each particular case will be described in the proper place. It may be here stated, however, that blisters must be used to children, especially to young infants, with great caution; and Bretonneau recommends that in every case a thin layer of oiled paper should be interposed between the vesicating surface and the skin. A blister applied too long leads, as M. Archambault has pointed out, to a sore equivalent to a burn of the third degree, and heals very slowly. Caution in the application of the more powerful counter-irritants is especially to be observed when the patient is very young, or is the subject of defective nutrition or of chronic disease. In such cases obstinate ulceration may be set up, or gangrene of the skin may be induced, not to mention the exhausting effect upon a weakly patient of the pain caused by the application of the irritant, and the effusion of a highly albuminous fluid. If diphtheria be epidemic in the neighbourhood, blisters should never be employed, as the resulting sore may become covered with the diphtheritic exudation. For a young child a blister should be of small size and ought quickly to be removed. Under twelve months of age cantharidine applications should rarely be resorted to. If used during the second year, the blister may remain in contact with the skin for an hour

and a half. For each additional year of life a further half hour may be added to the length of time the application may be employed ; so that for a child of four years of age the blister may remain two hours and a half ; for a child of five, three hours. If vesication has not been produced when the irritant is removed, a warm bread-and-water poultice will soon cause it to appear. The fluid can then be let out and cotton wadding applied. No other dressing will be required.

Amongst *internal remedies* alcoholic stimulants take a high place. Children reduced by severe illness respond well to the action of alcohol, and a few timely doses of this medicine have often, in a doubtful case, turned the scale in favour of recovery. So, also, weakly children with poor appetites and feeble digestions often benefit greatly by an allowance of wine with their principal meal. Stimulants may be prescribed for the youngest infants, and in cases of great weakness may be repeated at frequent intervals. When the patient is very young and requires energetic stimulation, a small quantity of wine or brandy often repeated is to be preferred to a larger quantity given at more distant intervals. The remedy should not be continued too long. It must be remembered that a stimulant is not a tonic. It is given for an immediate purpose, and should be withdrawn or greatly reduced in quantity when the object has been attained.

Tonics, such as quinine, iron, the mineral acids, and vegetable bitters, are also of great value in the treatment of disease in the child. But they require to be given with judgment, and must not be administered indiscriminately because the patients look weak and pale. A feeble-looking, pallid child, is not always to be benefited by iron and other tonics. Such a condition is often dependent upon a chronic form of dyspepsia, the result of repeated catarrhs of the stomach. In such cases a proper selection of food, and alkalies given to diminish the secretion of mucus and neutralise acidity, will soon produce a marked improvement in cases where tonics have been given without good result. It is only when local derangement has been remedied that the tonic becomes useful. The same remarks apply to cod-liver oil. This valuable remedy is inappropriate so long as any digestive derangement remains uncorrected. When the alimentary canal has been brought into a healthy state, the oil is of enormous service, and may be given in suitable doses to the youngest infants. It must be remembered, however, that the power of digesting fats in early life is not great. Under twelve months of age ten drops will be a sufficient quantity to be given on each occasion ; and if any oil is noticed undigested in the stools, even this small quantity must be reduced.

In cases where, although nourishment is urgently required, oil cannot be digested, the remedy may be rubbed into the skin. The external application of oil is of service in all cases of chronic weakness and wasting. It is useful not only as a means of introducing nourishment, but also as an agent in promoting the action of the skin, which in most forms of chronic derangement is apt to become inactive and dry. The application should be made at night. Any oil is useful for the purpose, and it is not indispensable that cod-liver oil be employed. The oil should be warmed and then applied to the whole body with a piece of fine sponge. At the same time if there is any special weakness in the back or elsewhere, vigorous friction with the oil may be used to the part it is desired to strengthen. Afterwards the child should be put to bed in a flannel night-dress.

In the administration of *drugs* to young subjects, we must remember that the dose is not always to be calculated according to the age of the child, but that children have a curious tolerance for some remedies and as

curious a susceptibility to others. Opium, it is well known, should be given with caution. The remedy is, however, of extreme value, and if care be taken to begin with only a small quantity, and to postpone a second dose until the effect of the first has been ascertained, no ill effects can possibly be produced by the narcotic. Thus, for a child of twelve months old suffering from purging, if one drop of laudanum has not produced drowsiness, a second may be given in six hours' time; and the remedy will be well borne three times a day.

Belladonna can be taken by most children in large quantities. Sometimes the characteristic rash is produced by a small dose, but a much larger quantity will be required to dilate the pupil, and a further considerable increase before we can produce dryness of the throat or other physiological effect of the drug. It is often necessary to push the dose so as to produce dilatation of the pupil. Many cases of nocturnal incontinence of urine show no sign of yielding until some symptoms are produced indicating that the system is responding to the action of the remedy. A child of twelve months old will usually take fifteen, twenty, or more drops of the tincture of belladonna three times a day; and often we can push the dose at this age far beyond this limit.

Besides belladonna children bear well quinine, digitalis, arsenic, lobelia, and many other remedies. Mercury rarely salivates a child, but has often a powerful effect in deteriorating the quality of the blood. A child is usually left excessively pale at the end of a course of this drug.

On account of the frequency of digestive disturbances and the tendency to acidity in early life, alkalies form a very valuable class of remedies. A dose of bicarbonate of soda or potash neutralises acidity, checks hypersecretion of mucus, and if given with a few drops of spirits of chloroform and an aromatic, stops fermentation, dispels flatus, and reduces spasm. In all varieties of dyspepsia in the child, and in many forms of looseness of the bowels, this combination is of the utmost value.

One word may be said with reference to the abuse of aperient medicines which is so common in the nursery. Delicate children have often died from the effects of a drastic purge, and many a case of typhoid fever has received a fatal impulse by this means. An aperient is the common domestic remedy—the corrective to be administered at once upon the slightest appearance of illness; and prescribing chemists invariably recommend it as an antidote for every ill. But constipation is only one of many causes of malaise, and to irritate the bowels unnecessarily with a strong purgative powder may do serious injury to a weakly child.

Part 1.

THE ACUTE INFECTIOUS DISEASES.

CHAPTER I.

MEASLES.

Measles (rubeola or morbili) is one of the commonest infectious fevers to which children are liable; and few persons arrive at adult years without having suffered from an attack. It affects children of all ages, and is far from uncommon in infants. Scattered cases of measles may be found almost at any time in large towns, but at certain periods of the year the complaint becomes epidemic. These epidemics vary curiously in severity and in the predominance of particular symptoms. One may be signalized by a high percentage of mortality. In another vomiting may be a prominent and distressing feature. In a third the catarrhal phenomena may be unusually slight; or again, they may be severe out of all proportion to the intensity of the rash. When fatal, measles is so generally through its complications. It rarely kills by the intensity of the general disease. Still, in some cases we meet with epidemics in which the disease tends to assume an asthenic type. In these the mortality is high. The fatal cases are marked by early and extreme prostration. The patient seems overwhelmed by the violence of the attack, and dies before any complication has had time to manifest itself. As a rule, one attack protects against a second, but cases where the disease has occurred two and even three times are not uncommon.

The contagious principle of measles is apparently communicated by means of the breath. It is said to be volatile, and to be capable of adhering to clothing. According to Meyer, it is easily removed, as the mere airing of clothes is sufficient to disinfect them. Messrs. Braidwood and Vacher have examined the expired air of measles patients by making them breathe through glass tubes coated in the interior with glycerine. On examination afterwards with the microscope, the glycerine showed in every case numerous sparkling colourless bodies, some spherical, others more elongated with sharpened ends. They were most abundant during the first and second days of the eruption. As a negative test, the breath from healthy children, and children suffering from scarlatina and typhus, was also examined, but without any result.

The infection of measles begins at the very beginning of the catarrhal stage, and lasts for some time after the rash has faded. Dr. Squire is of opinion that three weeks ought to elapse before the patient can be considered free from all chance of communicating the disease.

Morbid Anatomy.—The post-mortem appearances in cases of death from this complaint are those of the complication to which the fatal termination is owing. In cases where the child has died early from the severity of the disease, little is found except that the blood is dark coloured, deficient in fibrine, and coagulates imperfectly. There is also hypostatic congestion of the lungs and hyperæmia of the mucous membranes and organs generally, with extravasation into their substance. The spleen and lymphatic glands are often swollen. Sections of the skin made on the sixth day of the eruption were examined by Messrs. Braidwood and Vacher. There was swelling of the corium, and thickening of the rete Malpighii from great proliferation of cells, which extended along the hair and sweat-ducts into the glands. Sparkling, colourless, spheroidal, and elongated bodies, similar to those discovered in the breath, were found in the portion of the true skin lying next to the rete, in the lungs, and in the liver. In all these situations these bodies were mixed with other bodies, spindle-shaped, staff-shaped, and canoe-shaped. They appeared to be albuminoid in character.

Symptoms.—The incubation period of measles is ten or twelve days. The complaint then begins with the signs of catarrh. The patient is thought to have a cold: he sneezes, coughs, and his eyes look watery and red. With this there is fever; often headache; the appetite is poor; and the child generally feels ill and is languid. The catarrhal symptoms increase; the nose may bleed; there is some soreness of throat; and the patient is often hoarse, and complains of soreness in the chest. If the fever is high, the child may wander at night and be very restless. Sometimes the attack is ushered in by a convulsive fit, and occasionally the convulsions recur later on, either before the rash has appeared or afterwards. The skin is generally moist, although the temperature rises to 102° or 103°, or even higher. In a case which came under my own notice at this stage, a boy was seized with diarrhœa on July 10th. His temperature on that evening was 102°. The next morning it was 103°, but the bowels acted five times in the course of the day, and in the evening it had fallen to 101.4°. His pulse at that time was 160, and his respirations were 48. On the evening of the 12th the temperature was 102°, and on the morning of the 13th, when the rash appeared, the mercury marked 103°; pulse, 124; respirations, 48. Although pyrexia is the rule during the pre-eruptive stage, in exceptional cases the temperature may be normal. I have known this to be the case in two instances. In each of these young children the bodily heat, both morning and evening, for the four days before the appearance of the rash was between 98° and 99°; and when the eruption began the temperature only rose to 101°. The rash was typical in character, and all the catarrhal symptoms were present.

The digestive organs are usually deranged, partly on account of the fever; partly on account of the mucous membrane of the stomach sympathizing with the general derangement. The tongue is thickly furred; there is often vomiting; and the bowels may be relaxed.

The characteristic eruption appears as a rule on the fourth day, having been preceded by three clear days of catarrh and fever. In rare cases it is seen on the third day; or, again, it may be delayed until the fifth, or even longer; but these are exceptions. There is seldom any appreciable subsidence of the fever on the appearance of the rash. Indeed, the opposite

is usually the case. Both the fever and the catarrhal symptoms seem to be intensified when the rash comes out; and if diarrhœa have not been present before, the bowels generally become loose.

The eruption is first seen about the chin, the temples, and the forehead, as slightly elevated spots of a yellowish red colour, which disappear under pressure. Small at first, they soon reach one and a half or two lines in diameter, and have irregular edges. From the face the rash soon spreads to the trunk and limbs, and in twenty-four hours is generally found to cover the whole surface of the body and extremities. As it spreads, the borders of neighbouring spots unite so as to form crescentic patches. Between these the skin is of normal colour, unless the eruption be very profuse, in which case, as we often see on the face, the junction of the closely set spots may produce a uniform blush over a considerable extent of surface.

As the rash becomes more completely developed, its colour grows of a deeper red; and if the skin be very moist, vesicles with an inflamed base may be seen scattered over the surface. A child with the eruption fully out and the catarrhal symptoms well marked, presents a very characteristic appearance. His face is somewhat swollen, so that the features appear thick and coarse. A dull red flush occupies each cheek; and the forehead, mouth, and chin are speckled over with the crescentic patches. The eyes are red; the eyelids congested; and the upper lip is excoriated by the copious flow of thin mucus from the nose. Often crusts of dried blood are seen about the nostrils, for epistaxis is a very common symptom. The rash remains at its height for about twenty-four or forty-eight hours, and then begins to fade. The colour changes again to a yellowish red, and in a day or two has disappeared, leaving nothing on the skin but a faint reddish stain, which may last for a few days longer before the normal colour of the integument is completely restored.

There are varieties in the rash. Sometimes the spots when they first appear are hard, scattered, and prominent. These are the cases which are often mistaken for variola. Sometimes the eruption does not completely disappear under pressure, and we then often find little points of extravasation from rupture of small capillaries in the skin. This occurs in cases where there is great hyperæmia of the cutaneous tissue. It is of no bad augury. A further degree of the same phenomenon is sometimes seen in which the eruption grows darker and darker until it has acquired a deep purple tint. This is also the consequence of rupture of distended cutaneous capillaries. Such a rash does not disappear with pressure, and remains visible for a much longer time than an ordinary eruption, fading very slowly.

The fever and catarrh remain at their height until the rash begins to fade. The severity of the catarrhal symptoms varies very much in different epidemics and with different patients. Sometimes all the mucous membranes seem to suffer: the throat is sore; the eyes are inflamed; there is deafness from closure of the Eustachian tube, and the inflammation may even spread to the middle ear; vomiting may be distressing, and purging severe; a mild laryngitis may become intensified and be accompanied by spasm (stridulous laryngitis). All these symptoms are usually greatly relieved when the eruption begins to disappear; and if there be no complication sufficiently serious to maintain the pyrexia, the temperature falls at once to nearly its natural level, and the pulse loses much of its frequency.

The disappearance of the rash is followed by a fine desquamation of

the skin. The peeling differs much from the shedding of the skin which is such a marked symptom in scarlatina. The epithelium falls in fine bran-like scales which are often almost invisible to the naked eye, so that this stage not unfrequently passes quite unnoticed by the attendants.

In an uncomplicated case of measles the chest symptoms are usually mild. The cough is at first hard and hacking, and during the eruptive period is often paroxysmal, with a loud barking character. After the eruption has begun to fade, the cough becomes looser and less frequent; and if proper care be taken to avoid chills, it soon ceases to be heard. The physical signs about the chest are those of pulmonary catarrh. One consequence of the irritation in the lungs set up by the catarrh is seldom absent, especially in scrofulous children. This is enlargement of the bronchial glands. If there be much throat affection, there may be a similar swelling of the glands at the angle of the lower jaw and at the sides of the neck.

The urine during the fever is high colored, with abundant urates. It may contain a trace of albumen.

In some epidemics cases are seen which present all the characters of the complaint with the one exception that the rash is absent. These are no doubt cases of irregular measles. Cases have been also described in which the rash is present, but the catarrhal symptoms are absent (morbili sine catarrho). It is very questionable if these latter are classed rightly under the head of measles.

There is a form of measles which is distinguished by great prostration. Here the complaint assumes from the first an asthenic type. The pulse is small, feeble, and very frequent; the respirations are rapid; the tongue is dry, brown, and thickly furred; the temperature of the body is high, although the extremities feel cold to the touch; and the child is dull and seems stupefied. When the rash comes out, it is imperfectly developed and of a dark red or violet hue. The skin is thickly spotted with petechiæ. Soon the pulse becomes so rapid that it can only be counted with difficulty; the muscles become tremulous; there is muttering delirium, and the patient dies comatose or convulsed. These cases, fortunately very rare, almost invariably prove fatal. They are generally accompanied by hemorrhages from the mucous membranes as well as into the skin. Epistaxis is often obstinate; hæmaturia may occur; and after death ecchymoses may be found in various internal organs.

In a healthy child an ordinary attack of measles is a mild disorder with little severity of the general symptoms. The sharpness of the illness appears to be determined to some extent by the constitutional tendencies of the patient. One of the pathological consequences of the specific fever being the active congestion of the mucous membranes, we might expect that a constitutional state in which there is already a predisposition to derangement of these membranes would determine more serious symptoms than are found in cases where there exists no such predisposition. Children who start in life weighted with a scrofulous diathesis are generally bad subjects for measles. It is in these patients that catarrhal symptoms assume such prominence, and that ophthalmia, otitis, and the other troubles referred to above are so liable to be met with. Even in the mildest cases a certain depression follows the subsidence of the fever. The temperature sinks to a subnormal level, and the pulse is very slow and intermittent.

Of all the eruptive fevers measles is, next to typhoid fever, the one most liable to return. Many children have it a second time, often after

only a short interval; and in some cases the second attack may occur at so early a period after the first as to constitute a true relapse. Cases are met with from time to time in which a child sickens with measles, passes through a more or less severe attack, recovers, and after a brief interval of convalescence sickens with it again—and all this within a month.

Complications.—The complications which may render an attack of measles troublesome or dangerous have been already in part referred to. As a rule, they are exaggerations of ordinary or extraordinary symptoms of the complaint, and are determined either by the character of the epidemic, or by the constitutional peculiarities of the patient.

Convulsions have been already mentioned as occasionally marking the beginning of the disease. The fits may be repeated several times; but when limited to the first day or two of the disorder, although alarming to the friends, are seldem dangerous. Should they be repeated, however, during the eruptive stage, they must be regarded with more anxiety, for they may then prove fatal.

Epistaxis, a common symptom and generally insignificant, may become profuse and exhausting. In severe epidemics, where the type of the disease is a low one, this may be of serious moment. In any case it must tend appreciably to protract the period of convalescence.

Diarrhœa is also, as a rule, a symptom of little consequence; but sometimes the mild intestinal catarrh to which it is owing may be converted into a real colitis. The stools are then bloody and glairy, and there is colic with great tenesmus and pain in defecation.

Laryngitis is a marked symptom in some epidemics. There is generally a certain amount of hoarseness early in the disease from participation of the laryngeal mucous membrane in the general catarrh. If this get worse the voice becomes husky and almost extinct, the cough hoarse and "croupy," and the breathing noisy and oppressed. Great alarm is naturally excited by this condition of the patient, but the danger is really slight. When the rash begins to fade, an improvement is noticed in the throat symptoms; and they often disappear quite suddenly when the temperature falls. It must not be forgotten that laryngitis with marked spasm may arise quite at the beginning of the attack, and be out of all proportion to the signs of general catarrh. In such cases the existence of measles may not be even suspected until the eruption comes out and discloses the nature of the disorder.

Ophthalmia and otitis are less common symptoms. When these occur, it is usually in children of marked scrofulous tendencies. The first may form an obstinate complication, and the second may lead to very serious consequences. (See Otitis.)

Extension of the bronchial catarrh to the smaller tubes is a very grave accident. It is common in babies and young children, and almost invariably proves fatal, for in early life collapse of the lung is easily provoked, and once established quickly terminates the illness. The first indication of danger in these cases is oppression of the breathing, which becomes very rapid. There is lividity of the face, and the countenance is haggard and distressed. With the stethoscope we hear abundant fine subcrepitant rhonchus over both sides of the chest. When these symptoms are present, very active measures must be taken to avert a fatal issue to the complaint.

In children who have passed the age of twelve months catarrhal pneumonia is a more frequent complication than the preceding. If, in any case, on the fading of the rash the temperature undergoes little diminu-

tion, we may expect catarrhal inflammation of the lungs to be present. In such a case the child, instead of becoming better and more lively as the eruption disappears, seems to be weaker and less well than before. His face, the swelling having subsided, is seen to be pinched and haggard looking; there is lividity about the lips; the nares act in inspiration, and the breathing is quick and labored. A thermometer in the axilla marks about 102°, seldom higher. The patient is thirsty, but will take little food. He shows no interest in his toys, but often lies picking at his lips and fingers, indifferent to everything but his own uncomfortable sensations. Examination of the chest reveals all the signs of acute catarrhal pneumonia.

This complication may also come on at an earlier stage, when the eruption is beginning to appear. The development of the rash is then retarded, or the exanthem may even retrocede with great aggravation of the general symptoms. Catarrhal pneumonia is fully described in another part of the volume, but it may be mentioned in this place that catarrhal inflammation complicating measles often runs a subacute course, and persists long after all signs of the primary complaint have disappeared. It may end in death, in complete recovery, or may become a chronic lesion forming one of the varieties of pulmonary phthisis.

Sequelæ.—The sequelæ of measles are constituted in part by the above-mentioned complications, which, like catarrhal pneumonia, may become chronic and give rise to trouble and anxiety. Chronic laryngitis[1] and bronchitis are common sequences. Enlarged bronchial glands often remain for a considerable time relics of the disease which has passed away. Also, it may again be repeated that in children of scrofulous tendencies an attack of measles may light up the cachexia, and give rise to any or all of the troubles which are characteristic of that constitutional state. Even children who are free from this unfortunate predisposition may not escape unhurt from the attack. A condition of the system is often left which appears to favour the occurrence of secondary disease; and whooping-cough, croup, gangrene of the mouth and vulva may occur at such a short interval after the attack that they cannot but be looked upon as direct sequelæ of the illness.

Acute tuberculosis requires special mention as an undoubted and fatal consequence of measles. Measles, indeed, is followed by true tubercular disease with such frequency that in every case where we are called to a child who has been left weak and feverish after a recent attack of the exanthematous disorder, we may expect him to be the subject either of catarrhal pneumonia or of acute tuberculosis.

Diagnosis.—Before the stage of eruption measles is not easy to detect. A severe cold in the child is often accompanied by fever, and there is nothing in the catarrhal symptoms of measles which can be considered peculiar to that complaint. If such symptoms occur at a time when we know an epidemic to be raging, the probabilities are no doubt strongly in favour of an attack of this disorder: but in the opposite case, if we cannot ascertain that the child has been exposed to contagion, it is wise to wait before expressing an opinion. Still, we should never forget in any case of high temperature in a child with signs of general catarrh, that these are

[1] In all cases of hoarseness left after measles the vocal cords should, if possible, be inspected with the laryngoscope. The supposed laryngitis will be sometimes found to be really anæmia of the larynx, due to general debility, combined with weakness of the adductor muscles, which fail to approximate the cords. This local condition may be present although the signs of general anæmia are not pronounced. In such cases we should watch the child anxiously for any symptoms indicative of tuberculosis.

the early symptoms of measles; and we should inquire as to the existence of the disease in the neighbourhood.

The presence of the catarrhal phenomena will enable us to exclude scarlatina should the combination of sore throat and high temperature have led us to suspect the onset of that disorder. If laryngitis with stridor and spasm be an early symptom, the persistence of high fever after the spasmodic attack is at an end will suggest that these manifestations may be symptomatic of some latent febrile disorder, and we shall remember that measles is sometimes ushered in by laryngeal troubles.

When the rash appears we shall be less liable to fall into error. The crescentic, slightly elevated patches with the skin between them of a healthy tint, combined with coryza and cough, are very characteristic. If the eruption come out first as hardish isolated papules, small-pox may be suspected, and indeed this is a mistake which is often made. But the papules have not the hard shotty feeling peculiar to the variolous eruption; there is no history of pain in the back; and vomiting, if it have occurred, is much less severe than the vomiting of the pre-eruptive period of small-pox. Moreover, in variola the temperature falls notably on the appearance of the rash; while in measles, if any change occur at all in the fever, it is in the opposite direction; and the catarrhal symptoms become aggravated. Doubt is only permissible at the very beginning of the eruptive stage; for on the second day the rash of small-pox has completely changed its character on the face of the patient, the papules having become converted into vesicles.

The rash of roseola may bear a close resemblance to that of measles, but in the former complaint there is no catarrh, and the temperature is normal or only slightly elevated. Between epidemic roseola (or rötheln) and measles the difficulty of distinguishing is often very great. This subject is referred to in the chapter treating of the former disorder (see page 30). I have also known the early signs on the skin of an acute general eczema to present the closest possible resemblance to measles. But an exanthem should never be judged of by the rash alone. In every case we should search for confirmatory symptoms, and inquire as to the temperature and the initiatory phenomena of the illness. In measles we examine the eyes for injection, the throat for redness, and ask about cough, hoarseness, and catarrhal symptoms generally. If these are completely absent, and the temperature be below 100°, it is very unlikely that the disease is measles, however typical the rash may appear.

The stains left on the skin as the rubeolous eruption dies away have been compared to the mottling of syphilitic roseola, but the history and course of the illness are so different in the two cases that hesitation is impossible.

Prognosis.—The percentage of mortality in measles is small. Still, it is much higher in some epidemics than it is in others; and, therefore, in estimating the chances of a patient's recovery we must take into account the character of the epidemic. Another consideration is the previous state of health, especially the constitutional tendencies of the child. Unless the case be one of malignant measles, or the child have been previously in a state of great weakness, there is every hope of preserving life if ordinary care be exercised in nursing the patient through his illness. But it is less easy to avert injury to the health from the dangerous sequelæ of the disease. In spite of all we can do, a child of strong scrofulous predisposition may be left greatly the worse for the attack; and if his lungs be already the seat of caseous consolidation, it will be difficult

indeed to prevent his phthisical tendencies from receiving a distinct impulse.

In children under two or three years of age bronchitis is a common complication. Here the child's previous health is a point of very great importance. One danger in these cases is the occurrence of collapse of the lung, and this is predisposed to by the presence of rickets, or by general weakness of the patient. If the child be the subject of marked rickets, and bronchitis supervene, his chances of recovery are small. Another danger is the tendency of the bronchial inflammation to spread into the finer bronchial tubes and air-vesicles, and give rise to catarrhal pneumonia. The occurrence of this accident greatly increases the gravity of the case; but if the child be a healthy subject, and the epidemic be a mild one, the chances are in favour of recovery, for in measles catarrhal pneumonia tends to run a subacute course. If, however, the child be weakly, or the case occur in the midst of an epidemic of unusual severity, we should speak very guardedly of his hopes of escape.

Treatment.—In the early stage of measles the treatment is that of a severe cold on the chest. The child must be kept in bed, put upon a diet of milk and broth with dry toast, and take for medicine a saline with some unstimulating expectorants. While the cough is hard and the chest tight, the stimulating expectorants, such as ammonia, squill, and senega, should on no account be made use of, as they increase the tightness of the chest and make secretion more difficult than before. If vomiting be distressing, an emetic may be given to relieve the stomach of unhealthy secretions. Mustard, or sulphate of copper (gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$ every ten minutes), is to be preferred for this purpose, as ipecacuanha has a very irritating effect upon the bowels of some children. If there be diarrhœa, a small dose of castor-oil or of rhubarb and soda will be of service at the beginning of the attack; but the aperient should not be repeated, for in measles the bowels are very susceptible to the action of purgatives. If the diarrhœa continue, a mixture of aromatic chalk powder and rhubarb, five grains of each, may be given to a child three years of age every night for three nights; or he may take oxide of zinc with glycerine (two grains three times a day), and either of these will usually arrest the purging. Still a moderate looseness should not be interfered with. It is better not to employ astringent remedies unless the stools are very watery, and threaten by their number to reduce the patient's strength.

The general management of the child must be conducted according to the rules already laid down for the nursing of febrile complaints (see Introduction). In cases of measles special care should be taken to avoid draughts while insuring free ventilation of the room. A strong light hurts the reddened eyes, so care should be taken to keep the room in a half light, without making it actually dark. Due attention must be paid to cleanliness. It is not necessary in cases of measles to keep the child dirty. The skin should be cleansed every morning; using tepid water, and being careful to wash and dry separately each part of the body, so that the whole surface may not be exposed at one time. The patient may be allowed to take fluid often, but he must be prevented from drinking large quantities at once. The best drink is pure filtered water, and if a small cup or glass be used, the child will be satisfied if allowed to drain it to the bottom.

The condition of the throat usually requires little treatment. A strip of lint wrung out of cold water may be applied closely round the neck, and be covered with oiled silk and flannel. This can be re-wetted as often as is necessary. The same application is useful if there be much inflam-

mation of the larynx; and if spasm occur with stridulous breathing, the throat may be fomented by applying below the chin a sponge dipped in water—hot, but not hot enough to scald.

A single convulsion does not require treatment; but if the fits are repeated, the child should be placed for a few minutes in a warm bath and then be returned to his bed. A hot bath is useful if capillary bronchitis or catarrhal pneumonia occur early, and interfere with the development of the rash. If they occur later during the subsidence of the eruption, the child's back should be dry-cupped, or be covered with a large poultice made of one part of mustard to five or six parts of linseed meal. This can be kept in position for eight or ten hours, and afterwards the front of the chest can be poulticed in the same way In cases where the danger is great, the dry cups are to be preferred to the more slowly acting poultice; and I believe life may be often saved by the timely use of this energetic measure.

Stimulants are not required in ordinary cases of measles, but when the patient is of weakly habit of body or of distinct scrofulous type, or when he is suffering from an unusually severe attack of the disease, it may be necessary to support the strength by alcohol. The brandy-and-egg mixture of the British Pharmacopœia is very useful for this purpose, and may be given in such doses as the child's age and condition require. Children —even very young children—who are weakly or prostrated by illness respond well to stimulants, and can take them in considerable quantities with great advantage. I have often seen an infant of eight or nine months of age greatly benefited by a teaspoonful of brandy-and-egg mixture given every hour Of this quantity a third part is pure brandy. If without the occurrence of any severe complication the patient seems to be getting into a typhoid state, with dry tongue and small rapid pulse, stimulants are urgently needed. Also, the presence of bronchitis or pneumonia will demand a recourse to the same remedy, or the child may sink and die with startling suddenness.

Food must also be given with care and judgment, taking pains not to overload the stomach, but to proportion duly the nourishment, both in quantity and quality, to the age and strength of the child. In all cases of weakness the milk should be diluted with half or a third part of barley water, so as to insure a proper division of the curd. In addition, it may be guarded by fifteen or twenty drops of the saccharated solution of lime to prevent its turning acid upon the stomach. This must be given in small quantities at regular intervals. Strong beef-tea, or beef-essence made in the house, is also very useful when the strength is failing, but it must be given in very small doses at sufficient intervals. Brandy can be added if necessary.

When the rash begins to fade and the temperature falls, the child, if old enough, may take pounded meat, the yolk of an egg lightly boiled, and a little light pudding.

The chronic sequelæ must be treated according to the rules laid down in such cases, and the reader is referred to the chapters treating of these subjects. It may only be added that quinine is invariably required at the end of an attack of measles; and bracing sea-air is very beneficial in hastening the return of health and strength. This is of especial importance in the case of scrofulous children, who will also require cod-liver oil as soon as their stomachs can bear it.

CHAPTER II.

EPIDEMIC ROSEOLA.

Epidemic roseola, often called rotheln or German measles, is a mild infectious complaint which bears so close a resemblance to measles that it is in all probability frequently confounded with it. The two diseases are, however, not the same, for rötheln does not protect against measles, and is itself often seen to occur in a child who has been lately the subject of that disorder. The complaint is almost always a mild one, and has no complications or sequelæ.

Symptoms.—The stage of incubation is said to last a week. When the disease begins, the child is seen to lie about and to look poorly. He is slightly feverish and, if old enough, complains of headache. With this there are the usual accompaniments of thirst and want of appetite; and sometimes a pain in the back has been complained of—violent in character like the back-ache of small-pox. The pre-eruptive stage often lasts only a few hours, or, indeed, may be even absent. Perhaps its average duration may be taken at twenty-four hours. The eruption then comes out on the cheeks, and sides of the nose, as dusky-red slightly elevated papules, the colour of which disappears on pressure. The wrists and ankles are attacked almost as early as the face; and from these points the rash quickly spreads to the rest of the body and limbs. On the cheeks the rash is more papular than elsewhere. It differs from the eruption of measles in that the spots do not group themselves in crescentic patches; but resembles it in the tendency of the rash to become confluent in places. Thus a large patch of uniform redness is often seen on the cheeks; and sometimes we find the same confluence of rash on the wrists and forearms, the legs and the ankles. The eruption is attended with a good deal of irritation, and when it subsides, is followed by a slight fine desquamation.

The general symptoms during this stage are trifling. The fever may persist during the first day or two, but often subsides soon after the appearance of the rash. The conjunctivæ may be injected, but there is seldom coryza; and if cough be present, it is insignificant. One almost constant symptom is sore throat. This generally comes on with the rash, and, on inspection, the fauces are found to be the seat of diffused redness; and the tonsils may be inflamed and swollen. The soreness subsides in a day or two, but after a short interval is apt to return. The secondary sore throat is a characteristic symptom of rötheln. It occurs between the third and seventh day—usually, according to Dr. Tonge-Smith, on the fourth or fifth—and is accompanied by great pain and much swelling. In the severer cases the voice is altered, articulation and deglutition are distressing, and there is much secretion of sticky mucus. The temperature at this time may reach 103° or 104°; still, even when the throat symptoms are worst there is no prostration or even any feeling of general illness. Sometimes the glands of the neck are enlarged and tender, and in some epi-

demics the post-cervical glands have been noticed to be swollen. The axillary, inguinal glands, etc., may be also affected. The duration of the eruptive stage is three or four days.

An attack of rötheln is then, as a rule, a very insignificant matter. The difficulty is to distinguish it from measles, which it so much resembles. The two chief points of distinction are the shorter period of the eruptive stage in rötheln, and the non-crescentic arrangement of the rash. The milder character of the catarrh will hardly serve as a distinguishing mark, for sometimes in measles the cough and coryza cause little inconvenience to the patient. Another point is the lower temperature. Sometimes in rötheln there seems to be scarcely any fever at all; and when present, the pyrexia generally subsides on the second day. In spite of these points of contrast between the two complaints, we must often hesitate to express a positive opinion upon a particular case. The absence of any increase of fever when the eruption comes out may afford a suspicion that the case is not one of true measles, but we can seldom speak with certainty upon the first day of the rash. On the second or third day, however, if we find the general symptoms still retain their trifling character, and if the fever subsides before the rash has begun to fade, we may conclude the case to be one of rötheln. In doubtful cases the more or less general glandular enlargement, especially the swelling of the cervical and suboccipital glands, is a very suspicious symptom; and the occurrence of secondary sore throat with no actual sense of illness is very suggestive of rötheln.

The disorder has been described as a mild one, but it is right to say that some authorities hold that it may assume a much more severe character. Dr. Cheadle, from careful observation of two epidemics, which presented all the characters of measles and occurred in succession in the same district within the same year, concluded that the second of these epidemics was rötheln although the symptoms were severe, and the laryngeal phenomena especially well marked. He founded this opinion upon the shorter period of incubation during the second epidemic, and upon the fact that out of thirty cases in which absolutely trustworthy histories could be obtained, twenty-two had had measles before, and ten of these under his own immediate observation within the year. Still, we may remember with regard to this latter point that measles, although as a rule it protects the subject for the future against a similar attack, is perhaps of all the contagious fevers the one most liable to recur. A second or even a third attack in the same individual is far from uncommon, and sometimes the interval between two such attacks is curiously short.

Treatment.—The patient must be confined to one room while the fever lasts, and care must be taken that he is not overfed. No medicine is required.

CHAPTER III.

SCARLET FEVER.

Scarlet fever (or scarlatina) is, like measles, one of the commoner infectious fevers of childhood. It usually occurs in epidemics which vary greatly in severity. One attack, in the large majority of cases, protects against a second, for it is a disease which very rarely occurs twice in the same person. A second attack may, however, occur. Some time ago I saw a little girl, aged seven years, who had a significant history of fever followed by desquamation and dropsy, which had attacked her when she was in perfect health two years before. The child was a patient in the East London Children's Hospital, suffering from general amyloid disease dependent upon spinal caries which had followed the illness referred to. While she was in the hospital the girl again contracted scarlatina, and was sent away to the Fever Hospital, where she died.

Sometimes the disease appears in an abortive form in persons who are already protected by a previous attack. In every epidemic of scarlatina it is common to find cases of anomalous sore throat occurring in protected persons exposed to the infection. Such persons may communicate the perfect disease to others who are not protected.

Causation.—The fever is of a highly infectious nature, and is readily communicable from one individual to another. Sporadic cases are sometimes met with, but the illness generally occurs in epidemics. The infectious principle is probably not at all volatile, for articles of clothing, flannel, etc., have been known to retain their poisonous properties for long periods of time. It is a debated question whether the disease ever has a spontaneous origin. Some authorities hold that it may be generated *de novo* by cesspools and ill-ventilated drains. Different epidemics have different degrees of severity; but apart from the special type of fever prevalent, the intensity of the disease is dependent more upon the constitutional state and sanitary surroundings of the recipient than upon the severity of the disease in the person from whom the infection is conveyed. Scrofulous children, and those who are ill cared for, or are exposed for long periods to an impure atmosphere, are likely to take the disease badly.

During the first few days of the illness the patient is less dangerous as a source of infection than he afterwards becomes. The time of desquamation is probably the period at which the complaint is most likely to be carried away, for the particles of epithelium thrown off must be highly contagious, and the patient's power of communicating the disease does not cease until the peeling of the skin is at an end.

Scarlatina is seen less frequently than measles during the first twelve months of life; but between the first and second years the disease is a common one, and, according to the researches of Dr. Murchison, 64 per cent. of the cases occur before the completion of the fifth year. After the

tenth year the disease again becomes less frequent, although it may occur during adult life or even in extreme old age.

Morbid Anatomy.—After death from scarlatina we usually find evidence of the special complications which have determined the fatal issue. In addition the blood coagulates imperfectly, as a rule, although pale fibrinous clots may be found in the right ventricle.

The parts especially prone to suffer are the gastro-intestinal mucous membrane and the glandular system. In fatal cases inflammatory swelling is found in the lymphatic glands of the neck; also in the follicles at the base of the tongue, and in those of the pharynx, tonsils, and larynx. In the intestine the solitary glands and those of Peyer's patches are often enlarged, reddened, and softened. There may be also enlargement and softening of the spleen, liver and pancreas. In all these organs, according to Dr. Klein, there are changes in the small blood-vessels. A hyaline thickening is noticed in the arterioles, with a proliferation of the cells of the endothelium and of the nuclei in the muscular coat, together with an accumulation of lymphoid cells in the tissues around. In the gastro-intestinal mucous membrane there is hyperæmia of the subepithelial layers, and great proliferation of cells which distend and obstruct the gastric tubules. Sometimes casts of these tubules may be detected in the matters ejected from the stomach.

The cutaneous affection is not a mere hyperæmia. It is also an exudation into the rete mucosum. The cells in this situation are proliferated and swollen, and the sweat-glands may be stuffed and distended by their increased cellular contents. Serous effusions with migration of leucocytes may also occur. The lymphatic glands, especially those of the neck, are enlarged; the lymphoid cells disappear, and in places large giant cells become developed containing many nuclei.

The kidney presents the characters of acute Bright's disease. The whole organ is congested, and important changes are noticed in the glomeruli, the small arteries, and the convoluted tubes. According to Dr. Klein, these changes take place very early, so that in the first week of the disease proliferation of the nuclei in the Malpighian tufts and in the muscular coat of the arteries can be detected, as well as hyaline degeneration of the intima. At the same time there is hyaline thickening of the walls of the Malpighian capillaries, and cloudy swelling of the epithelium in some of the convoluted tubes. At a later stage the cloudiness and swelling of the tubal epithelium increases, and fatty degeneration takes place; infiltration of lymphoid cells occurs into the interstitial tissue around the tubules; and the tubules themselves are filled with hyaline casts.

In cases of uræmia the blood is sometimes found to contain an enormous excess of urea. In a case reported by M. D'Espine of Geneva, in which venesection was employed, the blood was found to contain 3.3 parts of urea per thousand, or about twelve times the normal quantity. The potash salts, also, were increased to three times the natural proportion, and of this two-thirds was contained in the serum, and not, as in healthy blood, in the red corpuscles. From the experiments of Feltz and Ritter, and others, it appears probable that the symptoms of uræmic poisoning are due not to the retained urea, but to the excess of potash salts in the blood.

Symptoms.—After exposure to infection a period of incubation precedes the actual outbreak of the fever. This stage is of very variable duration. It may last only twenty-four hours, or be prolonged to a week or more. Probably six days may be taken as the ordinary duration of this period.

Different cases of scarlatina vary so much in severity and in the violence of special symptoms that it will be convenient to divide the disease into two chief forms: The common mild form and the malignant form. Afterwards the complications and sequelæ will be described.

In the *common form* the invasion of the disease is abrupt. It begins with a chill; the child complains of sore throat, and generally vomits. Sometimes there are nervous symptoms, and in exceptional cases the disease may be introduced by a convulsion or a state resembling coma. The tongue is generally furred at the back, red at the tip and edges; the appetite is lost, and there is thirst. The skin is hot, and the pulse rises to 130°, 140°, or even higher. The rash sometimes appears within a few hours of these early symptoms: occasionally it is itself one of the early phenomena; and again in rare cases it may be delayed for three or four days, or, it is said, even for a week. As a rule it is noticed within twenty-four hours of the beginning of the disease. The temperature rises progressively through the invasion stage until the rash appears. The pyrexia is not, however, excessive. In the case of the little girl, before referred to, who was taken with scarlatina while in the hospital, her temperature had always been normal, but one evening it was noticed to be 100.2°. The next morning it was 101.2°, and the child vomited several times. Toward the evening the rash appeared, and the mercury reached 103°. In another case—a little boy aged eight months, who was teething—the temperature for several days had been 100°. One morning it rose to 102.2°; he vomited, and in a few hours the rash appeared. To the hand, perhaps, the skin gives the impression of being hotter than it actually is, for the heat is often accompanied by a peculiar dryness, which gives a burning character to it like that of pneumonia. Tested by the thermometer, the temperature will be rarely found to exceed 105°.

With the appearance of the rash the *invasion stage* comes to an end and the *eruptive stage* begins. The rash first appears as scarlet points, not elevated above the surface. These are closely set, and their borders, which are paler than the centre, unite so as to produce, when fully developed, the appearance of a uniform pink ground dotted thickly over with scarlet points. The rash rarely affects the face to the same degree that it does the rest of the body, and differs in this respect from the eruption of measles. Usually the region about the mouth is comparatively free, and contrasts by its paleness with the deep red tint of neighbouring parts. The colour of the rash disappears on pressure of the finger. When the eruption is confluent, as it is in a typical case, no intervening healthy skin can be seen. Often, however, the eruption is not confluent. The puncta are then more or less isolated, and may be separated by spaces in which the skin has the normal colour. The rash may be confluent in some places, not in others. On the cheeks, neck, chest, abdomen, and inner aspect of the arms and thighs, coalescence of the neighbouring puncta is usually complete. In other parts the spots may be more or less isolated. Sometimes the eruption is everywhere discrete. The puncta are then usually larger; and if at the same time the temperature is only slightly elevated and the sore throat insignificant, great doubt may be entertained as to the nature of the disease; especially as when thus discrete the spots are often a little elevated. These cases have been mistaken for measles.

Again, the colour of the rash may vary. It may be very pale, so as to be only discovered by careful examination; or it may be dusky and purple. Often it is more pink than scarlet. Sometimes it is limited to certain parts of the body, such as the sides of the neck, the chest, or abdomen,

and cannot be detected upon the limbs. It is usually said to begin about the root and sides of the neck and on the chest; but if so, these parts precede the rest of the body by a very short interval, and the rash becomes general very quickly. It is at its height on the third or fourth day of the illness. There is then often a good deal of irritation of the skin, and some subcutaneous œdema is present, which makes the fingers stiff and clumsy-looking. The rash may be accompanied by miliaria about the neck and chest; the skin is often rough from enlargement of the subcutaneous papillæ (cutis anserina); and petechiæ are not unfrequently present. These small hæmorrhagic spots do not necessarily indicate any special severity in the attack. Sometimes also vesicles or even papules may be noticed. When the eruption is at its height, a line drawn upon the reddened surface by the finger-nail remains visible as a white streak for about a minute. This sign has been considered to be pathognomonic. The rash begins to fade on or after the fifth day of the illness, and has usually completely disappeared by the tenth.

During the eruptive stage the symptoms of the invasion period increase in intensity. The tongue cleans and becomes deep red with swollen papillæ, so as to present the well-known strawberry appearance. The child is very thirsty, but in the milder cases has a fair appetite. Vomiting is seldom repeated after the first day; but in exceptional cases this symptom is an obstinate and distressing one, adding greatly to the gravity of the case. If severe, it may reduce the temperature. The soreness of throat usually increases during the eruptive stage; and examination of the fauces shows a bright redness of the soft palate, uvula, tonsils, pillars of the fauces, and often of the back of the pharynx. Sometimes these parts are also swollen from œdema, so that the uvula is broad and the tonsils nearly meet in the middle line. There is also in most cases excess of tonsillitic secretion, and yellow pulpy matter may be seen collected at the mouths of the follicular recesses, or even coating the surface in a uniform layer. If the matter do not escape, it may form an abscess in the tonsil, as in common quinsy. In the more severe cases the tongue loses its moist appearance and the mucous membrane of the mouth, and throat generally, looks dry and shining. Unless in the worst cases, ulceration does not occur until the disease is subsiding. Sometimes at an early period the disease is complicated with diphtheria. If the throat affection is severe, there is much pain and tenderness in swallowing; the voice is nasal in quality; and the glands of the neck become enlarged and tender. The inflammation may extend from them into the connective tissue around, and end eventually in suppuration. In an ordinary case the throat improves as the eruption fades; but the tonsils and the lymphatic glands may remain enlarged, although painless, for some time after the inflammation has subsided.

The degree of pyrexia as a rule is moderate. The temperature seldom rises above 105°, although in exceptional cases it may reach a higher elevation. Unless it be maintained by the presence of a febrile complication, the temperature tends to subside when the rash begins to fade; and a crisis then usually occurs, the heat of the body being normal for twenty-four hours. Should this crisis not occur, the pyrexia may be prolonged for several days. Even in a mild uncomplicated case I have known the temperature to remain elevated two degrees above the normal level for twelve days. As long as the fever continues, the pulse is as frequent as at the beginning, and slackens when the temperature falls. It often reaches 160, and this frequency is not to be taken as a sign of danger. So, too, deli-

rium may be present, and if slight and occurring only at night, is not of serious import. The child often complains of headache and of aching pain about the limbs.

The urine is scanty and high coloured. It may contain excess of bile pigment, and there is often a sediment of lithates or of free uric acid. According to Dr. Gee, the chlorides are sensibly reduced in quantity, and the phosphoric acid undergoes a decided reduction. The urea is not necessarily increased.

The *desquamative stage* begins a few days after the rash has faded. The exact period at which it can be first noticed is very variable. The first sign of peeling may be seen while the skin is still tinted with the remains of the eruption and before the pyrexia has subsided; or it may be delayed for some days or even weeks after the rash has disappeared. It usually occurs early in proportion to the intensity of the eruption, and if miliaria has been present, is often early and profuse. In the slighter cases it may be long delayed, and Dr. Page states that after a mild attack he has known desquamation to be postponed for five weeks. The epithelium at first looks dry and may be finely wrinkled. Then, on the neck, upper part of the chest, and front of the shoulders, the skin begins to fall in fine bran-like scales. Over those parts where the cuticle is thin and delicate the desquamation is very fine. Where the skin is thicker the particles thrown off are larger, and in some places, such as the hands and feet, large areas of epithelium may be cast off unbroken. On close inspection of the peeling surface the cuticle will be seen to be raised in the form of an empty vesicle. The crown of this elevation falls, leaving a minute circle, which gradually extends itself, until its circumference meets other circles widening in the same way. If the crown of the vesicle does not break off, the separation of the epithelium may go on, at the periphery until, by the coalescence of neighbouring centres of desquamation, large tracts of skin are thrown off.

The process may be over in ten days or a fortnight, or may be prolonged for weeks. It often lingers long about the fingers and toes. A secondary desquamation is even said to occur in some cases, and the peeling undergoes a species of relapse. Until the last flake of epithelium has been cast off the patient cannot be said to be completely free from infection.

In this stage the pulse is at first often slower than natural, and may intermit. The temperature, also, after the cessation of the pyrexia, remains subnormal for some days.

In *malignant scarlatina* the severity of the disease is shown either by violence of nervous phenomena which prove rapidly fatal; or by the early appearance and intensity of the throat affection, which causes death in the first or second week of the illness.

In the first form the disease from the beginning may show the utmost violence. The vomiting is repeated and distressing; the child is agitated and delirious or convulsed; the temperature rises to 107° or 108°; the breathing is quick and shallow; the pulse is rapid. After some hours or days, according to the violence of the symptoms, the patient sinks into a stupefied condition with haggard, dusky face, cold extremities, a feeble, rapid pulse, and a moist skin. He vomits frequently or may be violently purged, and dies comatose or in convulsions. In the worst cases the patient seems literally overwhelmed by the intensity of the fever poison, and dies before the rash appears or the sore throat has assumed any special prominence. Thus, a child may be found a few hours after his first attack

collapsed or unconscious, vomiting incessantly, and passing frequent, thin, watery stools. The throat presents a dusky redness; the pulse is very rapid and feeble; and the thermometer in the rectum marks 102° or 103°. In a few hours the temperature rises to 105° or 106°; convulsions come on, and the child dies. In other cases he lingers longer, and may appear to rally for a time; but the depression continues, the stupor returns, and death occurs by the end of the week.

When the disease assumes a malignant form from exaggeration of the throat affection, the course of the disease for the first few days presents nothing abnormal; but on the fifth or sixth day the fauces become excessively tender, and deglutition is very difficult and painful. The lymphatic glands at the angle of the jaw and the connective tissue around them are inflamed and swollen. On examination of the throat the mucous membrane is seen to be of a deep red or dark purple colour, and patches of ashy gray exudation matter are dotted over the surface of the soft palate, uvula, and tonsils. In the bad cases ulceration takes place in these spots, and, spreading, causes wide destruction of tissue. The face is often livid and haggard; the pulse is quick, feeble, and fluttering; there are sordes on the teeth and lips; the tongue is dry and brown; the fetor of the breath is extreme; and an offensive purulent discharge escapes from the nose. At the same time the neck swells and feels brawny to the touch; the skin melts away in places; and thin, purulent matter, with shreds and lumps of sloughy connective tissue, are discharged through the openings. The sloughing of the subcutaneous tissue of the neck is often accompanied by other serious symptoms. Hæmorrhage may take place from the large vessels; œdema of the glottis may occur; the patient may fall into a typhoid state or die from pyæmia. In one way or another such cases usually terminate fatally.

When the throat affection assumes a malignant form the prostration is generally marked, and the patient lies in a drowsy state, although he seems intelligent enough when roused. The temperature is not excessively elevated, seldom rising above 103°; but the pulse is very rapid and feeble. It is important to know that the swelling of the cervical glands is not always in proportion to the severity of the throat complication, and furnishes no ground upon which to establish a prognosis. Deep-seated sloughing and fatal hæmorrhage may occur in cases where the external glands are only moderately enlarged. If the throat affection is severe from the first, the appearance of the rash may be delayed for several days; and it may come out in a patchy manner, being most marked in parts where the skin is especially thin and delicate, as in the folds of the arm-pits and groins.

Sometimes we find the above two forms of malignant fever combined. The nervous symptoms are in excess, and there is also serious ulceration of the fauces and destruction of tissue. Convulsions occurring from any cause during the eruptive period are of very serious import, and generally end fatally whether the throat symptoms are mild or severe.

Complications and Sequelæ.—The intercurrent disorders which are liable to occur during or after an attack of scarlet fever may be looked upon as complications or sequelæ, according as to whether or not the disease is considered at an end when the temperature returns to a normal level. Most of them arise during the second week of the illness, although some may occur earlier. They will be described in the order of their occurrence.

During the *first week* the fever may be complicated by diphtheria, diarrhœa, and coryza. The ulcerative throat affection, which by many writers

is considered as a complication, has been described as a phase of the malignant form of the fever.

Diphtheria may be an early complication of scarlet fever, and may spread to the nose and larynx. It often comes on during the first week of the illness, but may occur later and at a time when the patient is supposed to be rapidly approaching convalescence. It generally proves fatal.

Coryza of a mild character occurring in the course of the first week is not a symptom of unfavourable omen; but if it persist into the second week, it becomes more serious. In such cases the catarrh may spread along the Eustachian tube into the tympanum and set up otitis. If in any case the nasal discharge becomes fetid, it suggests the presence of diphtheria.

Diarrhœa is sometimes an early complication. It usually ceases after a day or two, but may prove so severe as to endanger the life of the patient. According to Henoch it is preceded by swelling of the Pyerian and solitary glands. Sometimes as the rash fades the diarrhœa, which had at first appeared of little importance, passes into a true entero-colitis. The temperature which had fallen rises again; there is nausea and often vomiting; the belly is swollen and perhaps tender; and the child complains much of abdominal pain. The tongue, dry and hot, is furred on the dorsum, red at the tip and edges. The bowels are loose, and the stools contain much food partially digested, mixed up with mucus and sometimes with blood. The child looks excessively ill and rapidly loses flesh. He may die from the acute attack, or the complication may pass into a chronic stage.

In the *second week* bronchitis and pneumonia, rheumatism, and serous inflammations may be seen.

Bronchitis and pneumonia, which are common in measles, are comparatively rare complications of scarlatina. It is much more frequent to find inflammations of the serous membranes, especially of the pleura and pericardium; and these are often associated with symptoms indistinguishable from those of rheumatism.

Scarlatinous rheumatism may occur during the second week or beginning of the third, and is often met with as a complication or sequel of the fever. Whether the disease is to be looked upon as a true rheumatism quite independent of the scarlatina, or as an arthritis resulting from septicæmia, or as a further manifestation of the scarlet fever poison which may fasten upon the joints as it may fasten upon the kidneys or the throat, is still a matter of discussion. The rheumatic attack certainly follows the ordinary course of that disease; it frequently affects the serous membranes in and around the heart; and the joint inflammation subsides, as a rule, after a day or two, although in exceptional cases it may end in suppuration. This, may, however, occur in cases where there is no suspicion of scarlet fever. Endocarditis is as common as pericarditis, and heart disease in the child often dates from an attack of scarlatina. Pleurisy and pericarditis sometimes come on in the third week instead of the second, and may occur in cases where joint pains are not complained of. They may then be a symptom of Bright's disease; but pericarditis from this cause is not very common in the child as a sequel of scarlet fever. If pleurisy occur the effusion very rapidly becomes purulent.

In the *third week* the patient is especially liable to kidney mischief. At this time, too, or shortly afterwards, otitis may occur, and gangrene and abscesses may make their appearance.

The urine should be examined daily throughout the illness for albumen. This may be found at any time from the second to the twenty-first day.

It is, however, in the course of the third week that it is especially liable to be met with.

Albuminuria does not bear any relation to severity of attack. It may be present in mild cases and absent in severe ones. By itself it does not indicate serious renal mischief, and if small in quantity does not affect the prognosis.

If the albuminuria is due to anything more than a simple congestion of the kidneys, which is of little consequence, the urine soon shows signs of the presence of nephritis. Its quantity is reduced: its colour is smoky from the presence of blood, or even deep red if the hæmorrhage is copious; boiling throws down a copious precipitate of albumen; and renal epithelium, blood-disks, and casts, granular and epithelial, are discovered by the microscope. At the same time or shortly afterwards the face is pale or puffy-looking; the eyelids are stiff and swollen; and more or less œdema is noticed about the legs and ankles.

The beginning of the kidney complication is generally announced by vomiting, headache, loss of appetite, a dry skin, a pallid complexion, an irregular pulse, and a rise in the temperature. The temperature is not very high, seldom exceeding 101°; and the vomiting is not often repeated, although sometimes it becomes a distressing symptom. The œdema varies in amount. Sometimes it is little more than a puffiness of the skin. In other cases the swelling may be general and severe, so as completely to alter the natural expression of the face, and greatly distend the limbs and lower part of the back. At the same time effusion may take place into the serous cavities, the lungs, and even the glottis. If these effusions are rapid and copious, great lividity and dyspnœa may ensue, and death may take place with startling rapidity. The most violent attacks of dyspnœa may be induced by interstitial œdema of the lungs. The patient is found gasping for breath, with a haggard, livid face. His eyes are staring and congested, his lips blue, and his nails purple. His pulse is weak and rapid and his heart's action feeble and fluttering. On examination of the chest few physical signs are to be discovered. The rhonchi are scanty and scattered, for very little fluid, if any, exudes into the air-passages and alveoli.

In a certain proportion of cases uræmic symptoms may occur. The child is, perhaps, violently convulsed several times, and may lapse into a state of coma; or he may be seized with headache of a very distressing character. Fortunately these symptoms usually pass off under the influence of judicious treatment. It is exceptional for a child to die of scarlatinous nephritis. The occurrence of the renal complication appears to be dependent in a great measure upon the character of the epidemic; for while in some it is a common symptom, in others it is almost entirely absent. The popular impression that it is always the consequence of a chill has been disproved over and over again. There is no doubt that if albuminous nephritis be present, a chill may hasten the occurrence of dropsy; but that slight exposure, such as occurs during convalescence from scarlet fever, can determine the occurrence of the nephritis is now very generally disbelieved.

In the earlier stage of the nephritis the amount of urine is diminished and its specific gravity is raised. After a time the secretion becomes more copious and at the same time its density falls. Usually the pyrexia subsides when the quantity of urine increases. Dropsy is not an invariable symptom. It may be completely absent, although the other phenomena are well marked. As a rule the nephritis is rapidly recovered from, and

the albuminuria and uræmic symptoms quickly disappear; but sometimes, although improvement takes place in other respects, the water still continues to throw down a deposit on boiling; for a long time a certain amount of albumen may be present, and under the microscope the sediment may continue to exhibit casts of tubes. In exceptional cases a permanent albuminuria may be left. In other instances, and these are probably more common than is usually supposed, the urine ceases to contain albumen and casts, and, indeed, with the exception of a low specific gravity, may present all the characters of health. Still the restoration of the kidneys is not complete, and slight causes, such as a passing chill, may determine a return of all the acute symptoms which have been described.

Dropsy without albuminuria is occasionally met with, and this not a mere anæmic dropsy. In some of these cases albuminuria has been present, but has disappeared. In others there has been no precedent albuminuria.

Otorrhœa is a not uncommon complication of scarlatina. The discharge is often due to an inflammation of the external meatus, and is then, if attended to quickly, of little consequence. In many cases, however, it is a result of extension of the catarrh from the pharynx or nasal cavities through the Eustachian tube to the middle ear. It is then a more serious matter, for the tympanum soon becomes distended with its purulent contents. Destruction of the small bones of the tympanum usually follows, and the pus bursting through the tympanic membrane escapes by the external canal. The most serious consequences may arise from this complication, as will be described elsewhere (see Otitis, and its consequences).

Abscesses may occur in the second or third week, or towards the close of the stage of desquamation. These collections of pus often delay convalescence, and if they occur in the neck may be signs of serious import. In the cervical region they are nearly always the result of internal ulceration. In every case, therefore, a careful examination of the throat should be made, and active measures are required to prevent any spreading of the destructive process in the pharynx. A not uncommon seat of abscess at this period is the submucous tissue at the back of the pharynx. This subject is elsewhere considered (see Retro-pharyngeal Abscess).

Gangrene in various parts may occur. Cancrum oris occasionally follows scarlet fever; and gangrene of the vulva, the pharynx, the skin of the abdomen, and that over a suppurating gland may also be met with. Sometimes, as may happen in the case of any fever of a low type which causes rapid reduction of the strength, scarlatina, if severe, is followed by hæmorrhagic purpura, with bleeding from several mucous surfaces. Even death may ensue as a consequence of the loss of blood. Nervous sequelæ may be also met with. Infantile spinal paralysis has been known to occur; and hemiplegia from plugging of the middle cerebral artery is seen in rare instances.

In addition to the above complications, scarlatina is sometimes confused by the presence of other specific fevers. Diphtheria has been already mentioned. Besides this disease, measles and small-pox have been severally known to attack the scarlatinous patient, and run their course at the same time with it. Typhoid fever and scarlatina have been also met with together.

There is a form of scarlatina which has been called *latent*. In this variety the symptoms are mild and ill-defined, and the rash pale and imperfectly developed, or even quite absent. Indeed, the symptoms generally are so little severe that the existence of the fever is often not suspected

until desquamation begins. It is then remembered that the child had complained of a passing sore throat, and had seemed languid and heavy for a day or two, but nothing more. In these mild cases the after-course of the illness is not always in harmony with its beginning. Indeed, in no case of scarlatina, however slight the early symptoms may appear to be, can we venture positively to predict a favourable course to the illness.

It was long doubted if the form of scarlatina which occurs sometimes after surgical operations was a true scarlatina. The cases are usually of an inoffensive type and the general symptoms trifling. Still, a more severe form of the disease is occasionally met with. The rash appears a few days (two or three in most cases) after the operation, and may be almost the only symptom. There is often, however, high fever, but the soreness of throat is insignificant. Occasionally desquamation is absent. The healing of the wound is greatly retarded by the complication. That the disease is really scarlatina is shown by the fact that it protects the patient from the fever poison in after-life.

Diagnosis.—In a typical case scarlet fever is a disease which can scarcely be mistaken. The initial vomiting and sore throat, with elevation of temperature and rapid pulse, followed on the second day by a uniform pink rash dotted thickly over with scarlet puncta, is sufficiently characteristic. Unfortunately, many cases are not typical. The sore throat may be scarcely perceptible; the rash may be pale, discrete, and partial; and the temperature on the morning of the second day may be little elevated above the normal level. A child with chronic enlargement of the tonsils, who is subject to attacks of sore throat, is found to be feverish, to have some pain in deglutition, and to present a pale, ill-developed discrete rash limited to the neck, chest, abdomen, and thighs. In such a case it is allowable to feel some uncertainty as to the nature of the ailment. The appearance of the throat is, however, here of importance. The redness is not limited to the tonsils, but extends over the soft palate, uvula, arches of the fauces, and often the back of the pharynx. The redness is uniform, but at its margin on the soft palate some punctiform redness may be seen; or the redness may be punctiform in character on the soft palate, and uniform elsewhere. Such a throat, accompanied by vomiting, a hot skin, a quick pulse, and a white-coated tongue, is very suspicious of scarlet fever. Some forms of erythema imitate the rash of scarlatina very closely; and if there is a history of a recent unwonted indulgence in diet, the illness may be easily attributed to this cause. If such a rash be accompanied by a normal temperature, scarlatina may be positively excluded. But it is important to remember that the increase of bodily heat may be very moderate. I have known the morning temperature on the second day to be only 99.5°, or one degree above the normal level, although the disease was a true scarlatina, which afterwards became better developed. A pulse of 140, however mild the other symptoms may be, should make us suspect the existence of the fever very strongly; and in no case where the temperature reaches 100° or over should we venture positively to exclude the disease. An erythematous rash is seldom so widely diffused as is the eruption of scarlatina; and in particular is usually absent from the neck and limbs. It also spreads very irregularly. In all cases of doubt we should inquire about pains and stiffness in the articulations, and examine the joints, especially those of the fingers, for signs of swelling. We should also feel for enlarged glands in the neck. Often these symptoms are present early, when the eruption is very partial and incomplete.

When the rash is dark colored, discrete, and slightly elevated, it may

be mistaken for measles; but the absence of sneezing and lachrymation, and the presence of bright red injection of the throat, with an unusually rapid pulse, should furnish a sufficient distinction.

Roseola may be mistaken for scarlatina, but the rose eruption occurs in larger spots, and indeed more resembles measles than the disease we are considering. Moreover, in roseola there is little or no fever; no swelling of the joints; and the rapidity of the pulse is normal or only moderately increased.

Scarlatina may be closely simulated by ague. Dr. Cheadle has described the cases of two children in whom the skin during the hot stage was covered with a bright red rash. This eruption, combined with a quick pulse and a high temperature, was very suggestive of scarlatina, and might easily have been mistaken for it. The distinguishing points are referred to elsewhere (see Ague).

Sometimes in the mild anomalous cases of the disease desquamation may be long delayed, and the absence of peeling may be held to exclude scarlatina. In these cases we are directed by Sir William Jenner to examine the skin about the roots of the finger-nails for signs of scaling, as it may be discovered in this situation as early as a week or ten days from the cessation of the illness.

Scarlet fever is hardly likely to be confounded with diphtheria, for the invasion and general symptoms of the two diseases are very different. It is important, however, not to overlook the possible intercurrence of diphtheria as a complication of the fever. If this unfortunate accident happen early, during the first week, there is usually an offensive discharge from the nostrils; the voice often becomes hoarse; and there are symptoms of great depression. If it occur at a later period, when the patient seems approaching convalescence, the fever returns; the throat becomes again painful; the glands of the neck enlarge and are tender; there is a discharge from the nose; and in most cases the larynx becomes quickly involved. According to Trousseau, scarlatina avoids the larynx, while diphtheria has a well-known tendency to attack the windpipe. The occurrence of hoarseness, or the appearance of an offensive discharge from the nostrils, in any case of scarlatina, should cause us at once to make fresh examination of the throat; and probably the appearance in the fauces of the dirty-white tough-looking membrane on the deep red swollen surface will at once prove the accuracy of our anticipations.

Prognosis.—Scarlatina is a disease as to the course of which it is unwise to indulge in confident predictions; for an attack which begins mildly enough may end in a very different manner. Some of the worst cases are those which begin in such a way. Scrofulous children are bad subjects for scarlet fever, and in them an attack of apparently mild type may be followed by a distressing series of complications. Not long ago I attended a young girl who had been subject for years to scrofulous disease of bone in various parts of the body. She was taken with scarlatina. The symptoms were slight at first, and for a fortnight there was no cause for anything but satisfaction at the favourable progress of the illness. In the middle of the third week all this was changed. The patient first began to complain of rheumatic pains. She was then attacked in rapid succession by albuminous nephritis, peri- and endo-carditis, and double pleurisy. Ulcerative endocarditis then ensued, which led to cerebral embolism with left hemiplegia, and afterwards to renal embolism, with return of the albuminuria and casts which had previously disappeared. The girl eventually died suddenly on the eighty-ninth day, apparently from clotting in the

pulmonary artery. In cases such as this there may be positively no indication that the hitherto benign course of the disease is to change so seriously for the worse. When, however, the fever has assumed a severe form in other children of the same family, we must always be prepared for some such catastrophe; and until the disease is actually at an end we cannot put aside our apprehensions.

Previous ill health from other causes than scrofula does not apparently modify the prognosis; nor does early infancy influence unfavorably the course of the disease. The exact character the fever is to assume appears to depend upon the type of the epidemic and the constitutional peculiarities of the patient.

The malignant forms of scarlet fever are almost invariably fatal, especially those in which the nervous symptoms are violent. A mild nocturnal delirium is not of unfavourable omen; and slight wandering in the daytime, if there be no other symptom of nervous disturbance, need excite no anxiety; but if the delirium is active and persistent, with violent agitation and sleeplessness passing rapidly into stupor and prostration, we can have little hope of a favourable issue. Convulsions occurring after the first day, especially if repeated, are very serious. No indication is to be derived from the colour of the rash, for a dark tint of the eruption is not necessarily an unfavourable sign. There is cause for great anxiety if the temperature rise continuously; if the throat affection be severe; if there be frequent and long-continued vomiting or copious dysenteric diarrhœa; if nephritis appear early; or if there be great diminution or suppression of the urinary secretion. Uræmic symptoms are not so severe in the child as they are in the adult. At least, according to my experience, it is not common for a child to die of uræmic poisoning, if judiciously treated.

Treatment.—In cases where any member of a family is taken with scarlet fever, it is of importance to prevent the illness spreading to the others. Prompt isolation of the patient is of course to be insisted on; and it is well, if the step can be conveniently adopted, to send the other children away from the neighbourhood of the sufferer.

Various prophylactic measures have been recommended to arrest the disease in the incubative stage and prevent its further development. Belladonna, which was at one time largely employed with this object, has been now proved to be useless. It seems likely, however, that in arsenic we have an agent of greater value. It has been noticed that a person who is being treated with arsenic cannot be successfully vaccinated; and it is possible that the drug may have a counteracting influence upon other forms of infective matter. Practitioners who have made use of the remedy with this object speak favourably of its prophylactic virtue. Dr. W. G. Walford has given the drug largely to children who had been exposed to the infection of scarlatina, and states that out of nearly a hundred such cases in only two did the development of the fever follow, and both cases were extremely mild. He recommends the ordinary liq. arsenicalis (P.B.) in as large a dose as the age of the child will allow, with sulphurous acid (℥ xv.–xxx.), and a little syrup of poppy. The child should take the dose regularly three times a day at the first; afterwards less frequently.

When the disease actually declares itself, prophylactic measures must of course be laid aside. In a malady such as scarlatina, where the general symptoms are often violent, and the complications are various and may be severe, the therapeutic measures at our disposal are necessarily very numerous. Still, we must depend for a successful result more upon vigilant nursing than upon the actual administration of drugs;

although these, especially when complications occur, are often of sensible value.

However mild the symptoms may be, the child should be kept in bed in a well-ventilated room, from which all carpets, curtains, rugs, cushions, and other woollen articles not required for the comfort of the patient have been previously removed. In order to prevent the spread of the disease, a sheet kept wet with a solution of carbolic acid (one part in forty parts of water) should be fastened so as to hang over the door-way; and care should be taken to disinfect all excreta, soiled linen, etc., before they are removed from the room. The child may be allowed to drink as often as he desires of pure filtered water, but the quantity taken at each time of drinking must be limited. His diet should consist of milk, broth, light puddings, bread and butter, etc. The heat and irritation of the skin is greatly relieved by sponging the surface of the body several times a day with tepid water, and afterwards drying with a soft towel. This is a more pleasant operation than the inunction of fats, which is sometimes recommended, and is quite as serviceable to the patient.

In an ordinary case little medicine is required; but if the throat is painful, a draught of chlorate of potash may be ordered. Should the throat become much inflamed, and the cervical glands of the neck swell and be tender, the child should be made to suck ice, and hot applications (linseed-meal poultices, frequently renewed) should be applied to the neck; or we may use the cold compress, which, becoming heated by contact with the skin, acts in the same way. Cold thus applied internally, while the outside of the throat is kept warm, often produces a rapid amelioration in the symptoms. If, however, the throat affection, instead of improving, becomes worse, and ulceration is noticed, it will be necessary to apply some local application to the fauces. In such a case the throat having been carefully cleansed with a brush dipped in warm water, a solution of nitrate of silver (half a drachm to the ounce) should be applied freely to the whole of the ulcerated surface. Moreover, any special ulcer may be touched once with the solid caustic. The weaker application must be repeated every morning for three or four days; and in the interval a solution of common salt in water (half an ounce to the pint) can be injected frequently into the fauces. It is very important in these cases to keep the throat clean inside, in order to remove quickly the poisonous secretions thrown out from the diseased surfaces; and frequent syringing or gargling of the throat with a saline solution such as the above, which dissolves mucus and facilitates the separation of tenacious secretions, will be attended by marked benefit. If required to clean the mucous surfaces, the saline solution may be applied from time to time with a brush. In addition to these measures, disinfecting applications may be made use of; such as a weak solution (two per cent.) of carbolic acid, or a lotion composed of liq. sodæ chlorinatæ (℥ xx. to the ounce of water). In these cases of severe sore throat it is advisable, as much for the sake of others as for the benefit of the patient, to keep the air of the room saturated with a solution of carbolic acid (one part in thirty of water) by Dr. R. J. Lee's steam draught inhaler, or some similar apparatus. The application of sulphurous acid to the throat, as recommended by the late Dr. Dewees, is also useful. This remedy should be used with an atomizer, and the acid, pure or diluted with an equal proportion of water, should be sprayed into the throat for a few minutes every two or three hours.

If there be coryza, the saline solution may be injected into the nasal

fossæ, or the nose may be syringed once a day with a weak solution of nitrate of silver (gr. v. to the ounce).

Abscesses forming in the neck must be opened directly fluctuation is detected, and be afterwards well poulticed. If hæmorrhage occur, the wound must be stuffed with lint soaked in perchloride of iron. A post-pharyngeal abscess must be also opened early with a large trocar and cannula.

If otorrhœa be noticed, the meatus must be syringed out frequently during the day with warm water. If the tympanic membrane be perfect, the discharge proceeding only from the external canal, a syringeful of some mild astringent lotion should be injected each time after complete cleansing. Glycerine of tannin (one drachm to the ounce of water) or a weak solution of sulphate of zinc (gr. iij. to the ounce) answer well for this purpose.

In the case of any of the above complications quinine in full doses (gr. iij. four times a day for a child five years old) should be given; and a liberal diet should be allowed, due regard being had to the patient's powers of digestion. When the temperature has fallen in scarlet fever the child should have meat once a day, an egg or a little bacon for his breakfast, and should take plenty of milk. As long as the water continues clear we may be sure that he is not being overloaded with food; but the appearance of a thick deposit of lithates should at once make us reconsider his dietary, and limit the quantity allowed at his meals.

When the throat affection is severe, iron seems more beneficial than quinine, if administered energetically. For a child of this age fifteen to twenty drops of the pernitrate of iron should be given with glycerine and water every three or four hours. At the same time brandy-and-egg mixture must be supplied in such quantities as seem desirable, according to the degree of prostration of the patient. In such cases children will take with benefit large quantities of the stimulant. Strong beef-tea, meat extract, etc., can also be given.

If the disease be ushered in with obstinate vomiting, the symptom is best relieved by sucking ice. If diarrhœa occur, oxide of zinc (five grains for a child of five years old) or bismuth (gr. xv.) and chalk mixture should be resorted to. If at the beginning of the diarrhœa the motions are lumpy, a mild aperient, such as a dose of castor-oil or a rhubarb and soda powder, should be administered.

In cases of malignant scarlet fever with violent nervous symptoms every kind of treatment will unfortunately be often found to fail. If the temperature be high, it must be reduced by cold bathing. The child may either be placed in a cool bath (temperature of 70° Fahr.), and kept there until his teeth begin to chatter; or affusions with water of the same temperature may be practised, as recommended by Currie. I prefer the former method; and there is no doubt that the immediate effect of the bath in lowering the pulse and temperature, dissipating the delirium, and relieving the agitation of the patient is very decided. When the temperature rises again and delirium returns the process must be repeated. Unfortunately, although there is temporary relief to the symptoms, the patient is seldom cured by this means, and usually falls after a time into a state of prostration and collapse, in which he dies. A milder way of employing the same treatment is to wrap the child in a wetted sheet, and lay him upon a hard mattress, covering him merely with a thin blanket thrown loosely over him. When he shivers he should be released and returned to his bed. The milder practice is suitable in the less severe

cases, and has a distinct effect in reducing the temperature. It must be remembered, however, with regard to this question of hyper-pyrexia, that children often bear high temperatures very well; and it is difficult to lay down a broad rule as to the period at which it is necessary to intervene. It is better to be guided in this respect by the general symptoms than by the thermometer. If, as often happens, a child seems comfortable and composed, with a temperature of 105° or 106°, there is no occasion for any step more energetic than that of sponging the surface of the body with warm water; but if with a lower temperature (103° or 104°) he is delirious, agitated, and distressed, the cold bath may be used with benefit. Wet packing is often useful in these cases; but when thus enveloped in blankets the child's temperature must be carefully watched. If the skin be induced to act by this means, and the patient sweat profusely, the process is a beneficial one and the temperature will fall. If, on the other hand, the skin do not act, the effect of the packing is to cause a further increase in the pyrexia. Therefore, if the temperature be found to rise instead of falling, the blankets should be at once removed. In all these cases the bath, of whatever kind it be, should be supplemented by energetic stimulation in order to counteract the tendency to sudden collapse.

If the child is from the first in a state of prostration, instead of the cold bath the hot mustard bath may be made use of; but such cases are seldom benefited even temporarily.

If rheumatic pains are complained of and the joints swell, these parts should be wrapped in cotton wool and covered with a firmly applied flannel bandage; and Dover's powder should be given at night if the pains interfere with sleep. Attention must also be paid to the state of the bowels. Inflammation of the serous membranes must be treated upon ordinary principles.

If albuminous nephritis occur, energetic treatment must be adopted at once. A mere trace of albumen, such as is often met with in cases of scarlatina, is of little consequence, and requires merely tonic treatment; but the appearance of copious albumen in a smoky urine shows the presence of acute Bright's disease, and is a very different matter. We should therefore at once proceed to sweat and purge the patient. There is, perhaps, no condition in which the beneficial influence of free purgation is more striking than in this complication. A child of five years old should take every night a dose of compound jalap powder (gr. xxx.–xl.) alone, or mixed with five grains of compound scammony powder. Enough should be given to produce two or three watery stools. In the daytime he should be wrapped in a sheet wrung out of tepid water and be then well packed in blankets; taking at the same time a draught containing a solution of acetate of ammonia (℥ j.) and antimonial wine (♏ xx.) to insure the free action of the skin. His diet should be simple. As long as there is any pyrexia no solid food should be allowed; and the patient should have nothing but milk and broth with dry toast. Plenty of fluid is useful. If these measures be adopted, the albumen in the majority of cases will be found to disappear very quickly from the urine. Should it, however, persist, and the renal disorder seem to be passing into a chronic state, iron and ergot are indicated; or three grains of the hydrate of chloral may be given (for a child of five years old) three times a day. In cases of uræmic convulsions purging and sweating carried out briskly are of equal service, and will usually quickly relieve the symptoms, especially if aided by a diuretic. The following is a serviceable form:

℞. Liq. ammoniæ acetatis..... ♏ xxx.
Potassæ acetatis ..... gr. v.
Sp. juniperis ..... ♏ v.
Sp. ætheris nitrosi..... ♏ xx.
Glycerini..... ♏ xx.
Aquam ad ℥ ss. M. Ft. haustus.
To be taken every four hours (for a child of five years old).

A good diuretic for children is digitalis; and the drug is well borne in early life. Five drops of the tincture given three times a day with an equal quantity of spirits of juniper may be employed. Jaborandi and its alkaloid pilocarpine are useful in these cases; and can be given either by the mouth or by subcutaneous injection. The most convenient way of administration is to make a fresh solution of the nitrate or hydrochlorate of pilocarpine in water of the strength of one grain to twenty-four minims. Of this solution three drops (one-eighth of a grain) can be injected subcutaneously, and is a suitable dose for a child of five years of age. Children bear this remedy well. If the solution is freshly made, copious sweating follows the injection; there is often profuse salivation; and the secretion of urine is greatly augmented. The child should lie between blankets, so as to encourage the action of the skin. The dose may be repeated every day, if necessary. It often excites nausea and vomiting, but this is immaterial.

During the stage of desquamation measures should be taken to hasten the separation of the epithelium. The child should be oiled all over the body every night with carbolized oil (one part of the acid to twenty parts of olive-oil), and this should be well rubbed into the skin. Afterwards he should be thoroughly washed with soap in a warm bath. If this be carried out in a warm room, there is no fear of a chill.

Even in mild cases the child should keep his bed for three weeks, and his room for a month at least, from the beginning of his illness; and until the peeling has quite ceased the patient is unfit to associate with healthy persons. It must be remembered that desquamation may linger long about the wrists and ankles, the fingers and the toes; and that a considerable time may elapse before the mucous membrane of the throat has completely recovered its normal state. When the child is finally pronounced to be well, it is advisable to send him to the sea-side for change of air before he resumes his ordinary habits and mode of life.

CHAPTER IV.

CHICKEN-POX.

CHICKEN-POX or varicella is seldom seen except in young subjects. It is an infectious disorder which occurs generally in epidemics, and attacks by preference children aged from two to six years. At one time it was supposed to be a form of modified small-pox, but few are now of this opinion, for the evidence against it is overwhelming. Attempts have been made to impart the disease by inoculation, but without success.

Symptoms.—After a period of incubation, varying from seven to fourteen days, the child is noticed to be feverish, and within the next four-and-twenty hours a number of small rosy-red spots appear on the chest and over the body generally. These are slightly elevated, and number on the first day fifteen or twenty. In the course of a few hours—in any case by the next morning—the papule has changed into a vesicle or roundish bleb which is filled with clear serum. It has sometimes a very faint pink areola round its circumference. At the same time other papules have appeared, more numerous than on the first day. These in their turn become converted into clear blebs. In this way every morning finds a fresh crop of red spots, and of fresh blebs formed from the red spots of the previous day. The change from red spot to bleb may take place very quickly; in fact, the rash has sometimes been described as vesicular from the first. In any case it is completed within ten or twelve hours of the appearance of the red papule. The spots appear in no regular order, but are scattered about all parts of the body and limbs, and may even be seen beneath the hair on the scalp. They are also occasionally found inside the mouth, on the soft palate, the inner side of the cheeks and lips, and at the sides of the tongue; but when seated on mucous membrane the vesicle changes very rapidly to a small round ulcer. After appearing in successive crops for four or five days, fresh spots cease to be seen. The changes which each individual spot undergoes are as follows:—it increases in size for a day or two, and then its liquid contents, from clear, like pure water, become milky. Some burst and form crusts; others present, after a day or two, a speck of scab on the summit, which to a hasty glance gives a false appearance of umbilication; the vesicle then dries up and leaves a thin crust, which falls off after a few days. No scar is left, as in variola, unless the child have irritated the skin by scratching; in which case a shallow pit may be seen in the situation of the scab. It is difficult to prevent the child from scratching the spots, for the eruption is accompanied by considerable irritation.

The amount of fever varies. At the beginning the temperature may rise as high as 102°, especially if the rash is slow to appear. After the first day or two, however, the pyrexia subsides considerably, and is seldom higher than 99.5° during the remainder of the illness. In some cases a

slight exacerbation occurs with the maturation of the vesicles, but the temperature soon returns to the normal level. In the large majority of cases the constitutional disturbance is of the slightest. After the crusts have fallen the temperature sinks to a lower level than in health.

The duration of the disorder is ten days or a fortnight, counting from the preliminary fever to the final fall of the crusts. Afterwards the child may be left in a weakly state for some time; and delicate children may have the outbreak of serious disease determined by this apparently trifling complaint. Thus, I have known acute tuberculosis to succeed after a very short interval to an attack of chicken-pox.

In exceptional cases the complaint is not over so quickly. Mr. J. Hutchinson was the first to draw attention to the gangrenous eruptions which sometimes occur in connection with the chicken-pox. This dangerous complication is not confined to weakly, ill-nourished children, although it is most common in them. It is no doubt connected with the curious tendency to spontaneous gangrene sometimes met with in children, and described in another chapter.

In gangrenous varicella the vesicles, instead of drying up in the ordinary way, become black and get larger, so that a number of rounded black scabs, with a diameter of half an inch to an inch, are scattered over the surface of the body. If a scab be removed it is seen to cover a deep ulcer. Around it the skin is of a dusky red color. All the vesicles do not take on the gangrenous action, so that we find many varicellous scabs of ordinary appearance mixed up with the blackened crusts. The gangrenous process often penetrated deeply through the skin to the muscles, but under some of the scabs the ulceration is more shallow. These cases are very fatal. Mr. Warrington Haward has reported the case of a weakly baby of twelve months old, who weighed only six pounds and a half. This child was attacked with gangrenous varicella and died in a few days of pyæmia with secondary abscesses in the lungs.

Diagnosis.—It is often a very difficult matter to distinguish between chicken-pox and modified small-pox. If the eruption follows very rapidly upon the first signs of fever, the disease is probably varicella, for in the case of varioloid the rash is usually preceded by two or three days of fever and malaise with vomiting; and the pain in the back may be as intense as in the unmodified form of the disease. But there are many exceptions to this rule, for in some cases of varioloid the normal duration of the pre-eruptive period is considerably shortened. Again, the spots in varioloid, as in variola, are grouped in threes and fives, while in varicella their distribution is more irregular. Then, the papule in varioloid is always shotty and hard. In varicella it is peculiarly soft, and always disappears on stretching the skin. If there be an elevation left after the fall of the scab, it is conclusive in favour of modified small-pox; while a subnormal temperature occurring as early as the tenth day would point rather to varicella than to varioloid. According to Mr. Macuna, the varicellous vesicle is unilocular, and can be emptied by one touch of a needle. The vesicle in small-pox, on the contrary, is always multilocular, and cannot be emptied by a single puncture. In case of doubt this difference will serve as a distinguishing mark.

It is important to be aware that a shallow pit or scar may be left here and there upon the skin after undoubted varicella. Pitting may occur in any case where, from the irritation of continued scratching, or from some constitutional peculiarity of the patient, ulceration of the skin has been set up in the site of a vesicle.

Gangrenous varicella is distinguished by the history of the case, and the appearance of ordinary varicellous scabs mixed up with the blackened and gangrenous crusts.

Treatment.—A child attacked by chicken-pox must be removed from other children, and prevented, if possible, from picking or scratching the spots. If there be much fever, he should be confined to bed and his bowels must be attended to. When the disease is at an end, the child will require a tonic, such as quinine or iron. If convenient, he may be taken to the sea-side ; and if there be any consumptive tendency in the family change of air during convalescence is not unimportant.

In cases of gangrenous varicella little can be done beyond supporting the strength with good food suitable to the age and degree of feebleness of the patient, and giving the brandy-and-egg mixture as often as is required. If the gangrenous crusts are few in number, the scabs may be removed and the underlying ulcer filled with iodoform powder, as recommended by Parrot for gangrene of the vulva.

CHAPTER V.

COW-POX.—VACCINATION.

The cow-pox, or vaccinia, is a disease with is natural to the milch cow, but never occurs in the human subject except as the result of direct vaccination. In the cow it appears on the teats and udder as isolated spots, which at first are papular, but afterwards pass through the vesicular and pustular stages, as in true small-pox. They scab on the thirteenth or fourteenth day, and fall off in the following week, leaving pits on the skin. This disease is now satisfactorily proved to be the real small-pox, altered in character and modified by its passage through the animal, but still capable, when conveyed to the human subject, of imparting as much protection as would be derived from a direct attack of the original disease.

It is now a familiar story how Edward Jenner, then living as apprentice to a surgeon in Gloucestershire, determined to investigate the truth of a belief, current in the neighbourhood, that milkers who had become inoculated with cow-pox in the pursuit of their calling, were no longer susceptible to the contagion of small-pox; and how, by careful observation and experiment, he succeeded in establishing the important conclusions—that cow-pox communicated by inoculation to the human subject did actually confer immunity from small-pox; also that the disease, so engrafted, might be transmitted indefinitely from person to person without any abatement of its protective power. Since Jenner's time the practice of vaccination has become universal, and to this great discovery we owe it that small-pox, as it used to be, with all its dreadful consequences, is almost unknown in the present day.

Symptoms and Course.—After the introduction of the lymph under the skin of a child previously unvaccinated the following is the course of the induced disorder. For two days no change takes place, but at the end of the second day, or beginning of the third, a small elevated papule is seen at the site of the puncture. This enlarges, and by the fifth or sixth day has become a circular raised pearly-gray vesicle, with a depression in the centre. The vesicle grows, and by the eighth day is fully developed. It is then seen as a flattened, round, gray-colored vesicle, still depressed in the centre and filled with a colorless lymph. It does not remain stationary, but begins at once to lose its transparency; a red areola forms round its base and quickly spreads, so that by the tenth day the vesicle is found seated on a hardened red base, with the red areola extending for one or more inches over the skin around. The vesicle has now become a pustule with purulent contents, and around it the subcutaneous tissue is hard and swollen. After the tenth day the areola gradually fades; the fluid contents of the pustule undergo absorption; and by the fourteenth or fifteenth day a scab has formed, which gradually loosens and becomes detached. The crust usually falls in about three weeks from the time of puncture, and in its place is seen a round sunken scar pitted with little depressions.

The disease is at first purely local, but afterwards becomes general. According to Dr. Squire a continuous rise of temperature begins on the fourth or fifth day. This suddenly increases on the eighth day, and as suddenly falls a day or two afterwards, when the areola has ceased to extend itself. The maturation of the vesicle is also accompanied by other signs, showing that the disease has begun to affect the system. The child is restless and uneasy; there is some digestive disturbance; and the lymphatic glands in the armpit become tender. Sometimes a roseolous red rash makes its appearance on the affected limb, and may extend to the other extremities. This rash may become papular or even vesicular.

The above is the course of the disease when the inoculating lymph is taken from another child. Some practitioners prefer to use lymph obtained directly from the cow. But with "primary" lymph there is more difficulty in operating successfully; and when the vaccination takes effect, the constitutional symptoms are more severe. There is also another difference. With such lymph the whole process is retarded. The papule does not appear until a week or even a longer time has elapsed, and the areola does not become complete until the eleventh or even the fourteenth day. The swelling and hardness around the pustule are greater, and the secondary rashes are more frequently seen. The scabbing stage is also prolonged, and the crust may not fall for a month or six weeks from the day of operation.

Even when humanized lymph is made use of, the process is occasionally retarded. This may be the case when dried lymph is employed, and is invariably seen if the patient happen to be incubating measles or scarlatina. Sometimes, too, it appears to be owing to a constitutional peculiarity. Mere retardation does not, however, affect the value of the result if the development of the induced disease be normal. Instead of being retarded, the process may be accelerated; but this, again, is immaterial, provided the course of the pock be regular. If, however, for whatever reason, the course of the disease be not regular, and the pock be in any way incomplete, the result must be looked upon as unsatisfactory, and the protection so afforded cannot be relied upon. Vaccination is apt to be rendered irregular by the presence of acute febrile disease; of diarrhœa; or of certain skin diseases, especially herpes, eczema, intertrigo, lichen, and strophulus. In all such cases, directly the child's health is restored, the operation should be repeated. Unfortunately it will then often fail; for after a spurious vaccination the child may be left—temporarily, at least—insusceptible to the action of the lymph.

In cases of revaccination the result is often irregular. The whole process is then hurried. The papule appears early; the vesicle is fully developed by the fifth or sixth day; and then at once declines. On the eighth day a scab forms, and becomes detached a day or two later; so that in less than a fortnight the disease has run through all its stages. With this, the constitutional symptoms are more severe, and the itching and local discomfort greater, than in cases where the inoculation is practised for the first time.

Protective Value of Vaccination.—Effectually performed, vaccination is, in the majority of cases, a permanent protection against small-pox; that is to say, the protection afforded by it is as great as that furnished by an actual attack of variola. Jenner himself never claimed that it would do more than this. As a rule, an individual who has been successfully and sufficiently vaccinated is either insusceptible to the contagion of small-pox, or is capable of taking the disease only in a mild and modified form.

It is, then, very important to ascertain what constitutes an efficient vaccination. This question has been answered by Dr. Marson, who found, as a result of thirty years' observation of small-pox cases in the London Fever Hospital, that while in unvaccinated persons the mortality was as high as 37 per cent., the percentage gradually diminished in exact proportion to the number and completeness of the vaccination cicatrices; so that in persons who could show four or more well-marked scars the mortality was only .55 per cent. It should therefore be the aim of every vaccinator to produce four or five genuine well-developed vesicles upon the arm of the patient. With less than this number the vaccination, although it may be successful, cannot be considered to be sufficient, nor the protection as complete as it can be made. As a further precaution it is usual to re-vaccinate the individual after he has attained the age of puberty. Should this be unsuccessful, it is advisable to repeat the operation if at any time the person become liable to be exposed to the contagion of small-pox; especially if upon examination of the arms he is seen to bear only imperfect evidence of a former vaccination. The protective power of vaccination is well seen in the following figures, kindly supplied me by my friend Dr. Twining. The cases were under the care of Dr. Gayton, of the Homerton Small-pox Hospital. Between 1871 and 1878, 1,574 children came under observation, suffering from small-pox. Of these, 211 had been efficiently vaccinated, and one of them died: 396 had been imperfectly vaccinated, and of these 39 died: 179 were said to have been vaccinated, but bore no marks; of these 46 died: 788 were known never to have been vaccinated, and of these 385 died. Taking the last two groups together, the mortality in unvaccinated children was 44 per cent. under ten years of age.

Method of Vaccinating.—The lymph used should be taken from the arm of a healthy child at some time between the sixth and eighth day of vesication, while the vesicle still retains its purity and transparency. After the eighth day it should not be used. The child, the subject of the operation, should be in good health. If he be poorly, especially if he be feverish, or be suffering from some skin eruption, the operation should be postponed. It was Jenner's own direction to sweep away all eruptions before inserting the lymph. This rule is a very important one, for although the vaccination may possibly take effect, it is more likely that it will fail, and a spurious vaccination may render the child's system insusceptible to the vaccine lymph without affording the desired protection against small-pox. Many methods of inserting the lymph are now in use. The simplest, and perhaps the best, is to make three separate punctures on each arm, inserting the point of a perfectly clean lancet, moistened with fresh lymph, sufficiently deeply to draw a little blood. In making the punctures the skin is stretched between the finger and thumb, and the point of the lancet is inclined downwards, so as to enter the skin obliquely. If fresh lymph cannot be obtained from the arm of another child, lymph stored in capillary tubes, or dried on ivory points, may be used. The dry points must be first well moistened with water, and then inserted into the punctures made by the lancet. As many should be used as there are punctures made; and the points should be pressed down into the little wounds and allowed to remain for a minute. On being withdrawn, they should be pressed against the sides of the puncture, so as to insure the lymph being left in the skin.

Occasional Sequelæ of Vaccination.—Sometimes erysipelas has been set up by vaccination, and even pyæmia has been known to follow, and cause the death of the child. These unfortunate consequences are not to be

attributed necessarily to any carelessness or awkwardness on the part of the operator, nor to any impurity in the lymph employed. They are due to the constitutional state of the child at the time of the operation—a state in which the puncture of the lancet is followed by these untoward accidents just as any other trifling operation might be followed by them. A roseolous and papular rash has been already referred to as sometimes following the maturation of the pustule; but other rashes, such as eczema and the various skin eruptions to which children are liable, may be seen after vaccination. These rashes are always attributed by parents to the insertion of the vaccine lymph. In some cases vaccination may have been indirectly a cause of the skin affection by lowering the child's general health—a result which in childhood is apt to follow any feverish attack; but often the occurrence of the eruption at a short interval after the vaccination is a mere coincidence, and is owing to an entirely different cause. In out-patients' rooms of hospitals it is not uncommon to find even scabies attributed to a recent vaccination.

Syphilis and scrofula are said to have been conveyed from child to child by the vaccine lymph. With regard to the first of these diseases, it was long denied that such transmission was possible. Experiments were made, and in France children were deliberately vaccinated with lymph taken from other children suffering from inherited syphilis; but in no case was syphilis found to be communicated by the operation. Many cases, however, have been since published which leave no doubt that communication of the syphilitic virus may take place by this means. The old notion that the fact of a vaccine vesicle undergoing its normal development and presenting its normal appearance is distinct proof that the lymph within it is uncontaminated by foreign virus, appears to be a correct one. In syphilitic children vesicles may assume this appearance, and are then incapable of transmitting any disease other than the cow-pox. If, however, in taking lymph from these vesicles, the puncture be made carelessly, and, with the lymph, some of the blood be taken up by the point of the lancet and inoculated into a healthy child, syphilis may follow. No doubt many of the cases in which a syphilitic rash has followed vaccination have occurred in children the subjects of inherited syphilis, in whom the febrile movement induced by the process of vaccination has determined the outbreak of an already existing disorder. So also in scrofulous children, a little derangement of the health will often rouse up the latent cachexia, which but for this might have remained dormant a little longer.

CHAPTER VI.

SMALL-POX.

Owing to the beneficent discovery of Edward Jenner the full terrors of small-pox as it used to prevail can now hardly be realized. In unvaccinated persons, and those upon whom the operation has been performed imperfectly, the disease may still rage with all its natural violence, but in ordinary cases the form of the disease met with is the milder variety which is called varioloid. It is the same disease as variola, although modified more or less by occurring in a subject partially protected by vaccination.

Small-pox is one of the most infectious of the acute specific fevers, and in this respect the modified form is as dangerous as true variola. The patient seems to be capable of communicating the disease even before the eruption appears, probably, therefore, from the very beginning of the early fever. He also continues to be a source of danger to others as long as any particle of scale or scab remains attached to his body after the subsidence of the disease. One attack usually protects against a second, but it is far from uncommon for a person to take the fever two or even three times.

Morbid Anatomy.—As in most of the infectious fevers, the blood in fatal cases is dark and coagulates imperfectly; fibrinous clots are often found in the right ventricle of the heart; and in very severe cases hæmorrhagic extravasations are scattered about in the loose tissue beneath the serous and mucous membranes. Internal organs, such as the heart, liver, and spleen, are either pale, flabby, and soft, or deeply congested. The mucous membranes, especially of the air-passages, are intensely hyperæmic, and are thickened, softened, and sometimes ulcerated. Their epithelium is partially separated, and their surface is covered with a brown tenacious mucus. The same condition may be found in the mucous membrane of the nasal fossæ, the mouth, fauces, and gullet. In all of these parts small excoriations may be noticed. They are small round spots on the mucous surface, either covered by a whitish false membrane or presenting a round point of superficial ulceration. These are probably due to an eruption on the mucous membrane of a like nature to that which takes place upon the skin. No such appearances are seen upon the gastro-intestinal mucous membrane, but the intestinal follicles and the glands of Peyer's patches are large and projecting. The lungs are often intensely congested, and are sometimes the seat of pneumonia. Moreover, the pleura of one side may be filled with sero-purulent fluid.

In the skin the morbid changes are as follows: A punctiform hyperæmia takes place at various spots which extends through the cutis to the rete mucosum. The cells of this part swell and proliferate, so that a solid sharply defined nodule is formed at the inflamed spot. Next, the epidermis is raised up by fluid exudation into a vesicle. If this be formed round a hair-follicle or sweat-gland, it is umbilicated in consequence of the summit being held down by the duct. The vesicle is multilocular, for its in-

terior is divided into several chambers by delicate partitions. These are not fibrinous, as used to be thought, but are formed by compression of the altered cells by the effused fluid. They disappear, as well as the umbilication, when the process of maturation is complete. The vesicular fluid contains many leucocytes and some red blood corpuscles. As the proliferation of the cells of the rete mucosum continues, the fluid becomes purulent and the vesicle is changed into a pustule. The true skin is sometimes destroyed by this suppurative process to some depth, and there is a depressed permanent scar then left after the fall of the scab.

Symptoms.—The period of incubation of small-pox when contracted by infection is, according to Mr. Marson, thirteen times twenty-four hours, *i.e.*, twelve whole days and parts of two others. If the disease is produced by inoculation, the period is shortened to seven or eight days. During this stage there are no symptoms in ordinary cases, although a certain amount of irritability and peevishness is sometimes noticed, not usual with the child and indicative of uneasiness; but no definite symptoms can be observed. On the fourteenth day the first decided indication of the illness appears and the stage of invasion begins. Chilliness with a rise of temperature, sickness often distressing, and severe pains in the back and loins, sometimes in the limbs as well, are the characteristic features of this period. The pain in the back may be associated with temporary paraplegia, and is often combined in children with incontinence of urine and fæces. Other symptoms are: thirst, loss of appetite, a coated tongue, grinding of teeth, frontal headache, and constipation or diarrhœa. A severe amount of nervous disturbance is often seen, and the child may be thrown into violent and repeated convulsions with intermediate delirium and stupor. The violence and frequency of these attacks are not to be relied upon as an index of the severity of the illness which is to follow, as they are probably dependent less upon the intensity of the variolous poison than upon the natural nervous sensibility of the child. A little girl, aged six years, began to have fits on November 27th; they continued until the 29th. Between the convulsive seizures the child was drowsy and stupid, and often vomited. On the 29th the eruption appeared. The nervous symptoms then ceased, and the disease ran a particularly favourable course.

The period of invasion lasts for forty-eight hours. During all this time the initial symptoms persist and the temperature continues to rise. The pyrexia is not always great at this stage. A boy, aged eleven years, a patient in the East London Childrens' Hospital, suffering from heart disease and pleurisy, who had not been previously feverish, was found one morning to have a temperature of 101.6°. The next morning it was 99°, and in the evening 102°. On the following morning (the third day) the thermometer marked 102.2°, and the eruption appeared. In many cases, however, the pyrexia is greater, and the temperature may reach 105° or higher. In the case of the little girl before referred to it was 103.6° on the morning of the second day. Occasionally during this stage a roseolous eruption, very like the rash of scarlatina, appears upon the skin. This is most common in cases of modified small-pox. It is right to say that the symptoms of the pre-eruptive stage are not always seen in this marked form. Dr. Twining of the Homerton Fever Hospital informs me that of the children who are admitted into that institution suffering from variola, many have complained merely of malaise, headache, or sickness; and in not a few cases the first symptom noticed was the rash of the disease.

The eruptive stage begins on the third day. In exceptional cases—

usually those of a malignant character—the rash may appear on the second day. Occasionally it does not show itself until the fourth. These exceptions are found in all the eruptive fevers. The special small-pox eruption begins as small red papules scattered more or less thickly over the surface. They are first noticed on the chin, nose, or forehead, and then quickly spread to the whole face. They are next seen on the wrists, and in the course of the following twenty-four or forty-eight hours spread gradually to the chest, the arms, the trunk, and the lower limbs. The spots are not sprinkled irregularly over the surface, but may be noticed to group themselves in threes and fives, often arranged in a semicircle. Sometimes when two of these crescents come together, they may by their junction complete the circle. The spots are set more thickly on the face than on the body, and as they appear earliest in this situation, they run through all their stages, and scab earlier here than on the trunk and limbs. The papule is hard, and gives to the finger the sensation of a small shot embedded in the skin. All are not, however, of equal firmness. Some have much more of a shotty character than others. Between the papules the skin is of normal colour and appearance; but if the spots are set very closely together, there may be a general redness and granular look of the face without any intervening normal tint of the skin being visible.

At the same time that the papules appear on the skin, spots may be also seen, if looked for, on the inside of the cheeks and lips, on the inside of the nose, and sometimes even on the conjunctivæ. At first, as they cause little discomfort, these are scarcely complained of; but after a day or two they produce salivation, and pain in swallowing, and, if the air-passages are similarly affected, hoarseness and cough. There is also some snuffling, and the eyes are red and watery. Later, when the rash is appearing on the lower limbs, the mucous membrane of the vagina, or urethra and prepuce, also become the seat of eruption.

The changes which occur in the rash are as follows: The papule enlarges, becoming a flat-topped nodule, and in the course of the second or third day (fifth or sixth of the disease) changes into a vesicle. This change takes place, as has been said, earlier on the face than on the body or limbs; and, indeed, while the papules are coming out on the lower extremities, those on the face are already changing into vesicles. The vesicle is broad, flat-topped, and umbilicated. Its contents are opaque, and at first whitish in colour; but by the sixth day (eighth of the disease) have become distinctly purulent, a deep red areola has formed round the pock, and the subjacent skin is swollen by inflammatory effusion. The spot is now a pustule seated on a thickened base. From the eighth to the eleventh day the pock enlarges; and the union of neighbouring areolæ and the thickened bases of the pustules produces a general redness and swelling which completely obliterates all distinctive character in the features of the patient, and causes a distressing tension and smarting irritation of the skin which is greatly complained of. There may be also extreme tenderness, so that the slightest touch is painful. The eyes are often closed by the swelling, and the lids are glued together by the vitiated secretions from the Meibomian glands; the nose is stopped up; the secretion of saliva is profuse; and swallowing is very difficult and painful. The voice, too, is hoarse and the cough distressing. Often the eyes are inflamed, painful, and very sensitive to light. The process of maturing of the pustules (stage of maturation) lasts from the sixth to the ninth day (eighth to the eleventh of the disease) on the face; on the lower limbs it begins and ends a day or two later. Consequently, the vaginal and urethral

rashes and the distress they produce are at their height when the faucial and laryngeal mucous membranes have begun to improve. On these and the other mucous surfaces the eruption does not pass beyond the vesicular stage, but is accompanied by considerable redness and swelling of the membrane. While the pustules are maturing on the skin, the suppurating spots give out a peculiar and unpleasant odor, which is, however, characteristic of the disease.

The eruptive stage lasts about eight days—from the third to the eleventh of the illness. The appearance of the rash is usually the signal for a remission in the fever, and in the symptoms of general constitutional disturbance; but there is seldom a notable fall in the temperature until the eruption is fully out. If the pyrexia remain high after the papular stage is completed, the disease is severe and unmodified, or some complication is present. In confluent small-pox the remission is very imperfect and transient, the reduction of temperature is inconsiderable; and whereas in a mild discrete case the patient feels almost well at this time, in the severer form of the disease the alleviation to the distress is much less complete, and even at this early stage of the illness photophobia, salivation, pain in deglutition, and hoarse cough may be the source of great discomfort. In an ordinary case of discrete small-pox when the eruption is fully out, the temperature, although still above the normal level, is comparatively little raised; nervous symptoms are no longer noticed; and except for the local inconvenience of the state of the skin, the condition of the patient is greatly improved.

When the pustular stage is reached and the process of maturation begins (about the sixth day of the rash, eighth or ninth of the disease), the temperature rises again, and what is called "the secondary fever" begins. The intensity of this later pyrexia varies according to the severity of the attack. In mild cases it may be slight or even absent; but in severe cases, especially in the confluent form of the fever, the temperature rises to a higher level, perhaps, than in the earlier stage; the child is stupid or delirious, and often wakeful at night; his tongue is furred and often dry; his pulse gets quick and feeble; his weakness is great; and tremors, subsultus tendinum, with other symptoms of prostration, may be noticed. In not a few cases the disease has ended in death before the period of secondary fever is reached. In the severe cases, if the patient do not die at this time from the violence of the disease, he is very apt to succumb to an inflammatory complication.

The secondary fever lasts until the maturation of the pustules is completed on the eleventh or twelfth day of the illness. The disease then enters into its latest period, that of desiccation and decline. In the course of two or three days the pustules discharge their contents; the redness and swelling of the skin subside; the odor from the child's body becomes extremely offensive; and yellowish-brown, thick scabs form from caking of the purulent secretion. Nearly at the same time—unless some febrile complication arise—the pyrexia begins to subside and the tongue to clean; the painful symptoms connected with the mucous membranes disappear in the order in which they occurred; the pulse slackens and the appetite improves. The falling of the crusts is accompanied by some itching of the skin. It takes place earlier in some parts than in others, and is delayed in proportion to the amount of ulceration which is present in the cutis. If this be great, the scabs become very thick and horny, and remain attached for a long time. Sometimes successive crops of scab are thrown off before the underlying surface has become healthy. The size of the fallen crusts

is also subject to variety. If the pustules have been thickly set, the edges of the neighbouring scabs may unite, so that large pieces of dark brown, horny crust become detached at the same time. The separation of the scabs is often very slow on the scalp in children; and often new crusts continue to form after old ones have been removed with wearisome persistence. When the crusts have all fallen, the surface is left mottled with slightly elevated red spots, which eventually either disappear leaving no trace, or, if there has been ulceration, change into depressed white deep scars with inverted edges and an irregular floor.

Complications.—In severe cases, even if the child survive until the period of the secondary fever, he is very apt at that time to be carried off by some one of the many complications which are liable to come on in the third or fourth week of the illness. The severe forms of small-pox, especially the confluent variety, are most commonly attended by these accidents; but they may also follow the milder forms of the disease.

Boils are very frequently seen; and the intense inflammation of the cutis which occurs in the severer attacks may pass into partial mortification of the tissues. Spots of gangrene are thus formed in the skin, and the same thing may be observed in the genitals. If a scrofulous child who suffers from vaginitis be attacked by small-pox, there is great danger lest gangrene of the vulva supervene. Such cases, it need not be said, are very dangerous.

Abscesses and *acute cellulitis* may occur. Deep-seated collections of matter often form and may reach a considerable size. They are slow to heal. Sometimes the joints are the seat of suppuration.

Erysipelas and *pyæmia* are common in small-pox hospitals—less common in private houses, although they may be met with anywhere when the disease is confluent or very severe. The latter of the two sometimes succeeds to the former and is very fatal.

Otitis with suppuration in the middle ear is a not uncommon complication. The results which may follow from this distressing affliction are described elsewhere.

In all bad cases of small-pox there is *conjunctivitis*, which may come on as early as the fifth or sixth day of the eruption. If swelling prevents the lids from being opened, conjunctivitis may be suspected if the child complain of pain in the eyeball, increased by movement of the eye, and of a feeling of dirt beneath the lid. In very rare instances we meet with a development of small pustules on the mucous membrane of the eye; but slight ophthalmia of this kind as a rule is easily overcome. The severe inflammation which leads to ulceration of the cornea and destruction of the eyeball sets in about the beginning of the third week (on the fourteenth day, according to Mr. Marson). An ulcer appears on the margin of the cornea, sometimes on both sides of the cornea at the same time. The various layers are quickly penetrated; the aqueous humour escapes; and often the lens and vitreous humour are discharged. The process is generally very rapid, and may be accompanied by no pain to the child. Sometimes, instead of ulceration, general sloughing of the eyeball may occur.

To some form of *chest affection* many deaths in small-pox are owing. Pleurisy is common and very fatal. Pneumonia may begin insidiously, and is also a very serious complication. Bronchitis is sometimes a cause of death; and, according to Rilliet and Barthez, pulmonary œdema is occasionally met with. Besides these, peri- and endo-carditis may supervene, and it is stated on the authority of Desnos and Huchard that acute fatty degeneration of the walls of the heart may be a cause of sudden death.

The laryngeal symptoms during the period of secondary fever may be complicated by œdema of the larynx. This, however, is seldom seen except in cases of confluent small-pox. In other instances a severe laryngitis may be set up, leading to ulceration of mucous membrane, perichondritis, and necrosis of cartilage with consequent chronic aphonia. Laryngitis may be one of the earliest complications, and is sometimes seen on the tenth or eleventh day.

In the case of any of these complications the fever is high and the child, who is barely entering upon convalescence after an exhausting disease, is in a state of great weakness, which is instantly aggravated by the presence of the intercurrent lesion. So that, if the patient do not succumb to this new danger, his illness is seriously protracted and convalescence proportionately delayed.

Varieties.—Many varieties of small-pox have been described; but for practical purposes it will be sufficient to remember the special forms of Discrete, Confluent, and Malignant small-pox, and the modified form found in efficiently vaccinated persons which is called varioloid.

In the *discrete* variety the spots are separated from one another by healthy skin of normal tint. The general symptoms are usually milder, and the fever less high, especially the secondary pyrexia, which is much less severe. Still, even in this form serious complications may arise, and when death occurs, it is usually owing—unless the patient be a young infant—to one of these secondary lesions.

The *confluent* form is attended by a very high mortality. From the records of the London Fever Hospital it appears that of those attacked by this variety fifty per cent. die. In children probably the proportion of deaths would be much greater. The danger consists not only in the severity of the eruption, but also in the intensity of the general symptoms. The initial fever is very violent, and is often accompanied by high delirium; there is little remission in the pyrexia when the development of the rash is completed; tremors and signs of profound nervous depression come on early; the swelling and inflammation of the mucous membranes produce great distress; and the secondary fever is very violent. If the child survive to the third week, which rarely happens, a serious complication usually occurs, and this in his exhausted state proves rapidly fatal.

These cases, on account of their severity and fatality in young subjects, might be justly described as malignant. The term is, however, usually confined to cases in which the nervous symptoms are overwhelming, and the child dies rapidly from blood-poisoning in a state of profound depression and coma; or to cases where the disease assumes a hæmorrhagic character. In this hæmorrhagic form bleeding occurs from all the mucous membranes—the nose, the mouth, the air-passages, and the bowels. The urine is smoky or red with blood; the eruption is dark, and mixed up with petechiæ or larger subcutaneous extravasations; and the fluid in the vesicles is tinged with blood. The general symptoms are severe, the prostration great, and death takes place after a few days. My friend, Dr. Twining, has described to me a variety of the malignant form of small pox which has often come under his notice at the Homerton Fever Hospital. In this the child appears overwhelmed by the violence of the disease. He lies in a state of stupor, and has no true variolous rash nor any of the ordinary symptoms of the illness. On inspection of the skin a number of deep purple, almost black, spots are seen. These are well defined, and are more or less circular in shape. They vary in size from a rape to a millet seed,

and are twenty or thirty in number. Mixed up with them are larger patches of subcutaneous extravasation, like bruises. These patients have a very offensive smell, as if putrefaction had begun before death, and survive but a few hours.

Varioloid, the modified form of the disease, is usually a mild complaint. The early symptoms are the same as in true small-pox, and may even be of some severity. A child may have high fever, much pain in the back, repeated vomiting, and be convulsed; but the after-course of the disease is usually benign, and in particular the secondary fever is slight or completely absent. Often, the rash is preceded by a roseolous eruption. The proper rash of varioloid, which comes out at the usual time, is in most cases comparatively thinly scattered over the surface, and the spots are very rarely set sufficiently closely to be confluent, even on the face. As in variola, the mucous membranes are affected; and salivation, difficult deglutition, snuffling, hoarseness, and cough are common symptoms. The spots run through their stages more quickly than in the unmodified form, and the stage of desiccation usually begins on the fifth or sixth day of the eruption. The stage of maturation is also less severe; there is less swelling and redness of the skin; and pyrexia is slight or absent. Generally the pustules, instead of rupturing and discharging their contents, dry up, so that the pock gradually changes into a thin brown scab, which falls off in a few days. There is besides little or no ulceration of the skin, and consequently no pitting is left after the subsidence of the disease, except here and there where the inflammation had proceeded farther than usual. Lastly, in varioloid complications are rare, and the disease is usually at an end in a fortnight.

Diagnosis.—Before the eruption appears the diagnosis of small-pox is difficult in children, for fever and vomiting usher in many of their acute diseases, and pain in the back is not always complained of. In young children the existence of the spinal pain can seldom be ascertained; but if a child, in addition to vomiting and fever, loses control over his sphincters, we may suspect small-pox, for such incontinence is not a common symptom, and points to some special condition not present at the onset of an ordinary acute illness. In small-pox it may be the consequence of the spinal irritation.

When the eruption first appears on the face it is often mistaken for measles. The colour is very similar; and the early papules may be easily confounded with that form of measles rash in which the spots are more than usually elevated above the surface. On closer inspection, however, differences will be noticed. The measles spot is much less raised than the small-pox papule, and is not hard and resisting to the finger. Moreover, in measles the cough, coryza, and lachrymation are significant symptoms, and are quite absent in the early period of variola. The temperature, too, is less elevated in measles during the stage of invasion than in small-pox. In measles it is usually between 102.5° and 104°, while in variola it is often between 105° and 106°. After a day or two the change of the papule into a vesicle removes any doubts that may have been entertained as to the nature of the illness.

The roseolous rash which sometimes precedes the papular eruption may be mistaken for scarlatina. It is distinguished from it by noting its less complete diffusion over the surface, its brighter tint, and more mottled character. Moreover, according to M. See, in cases of small-pox, when the roseolous eruption is present, the variolous papule has already begun to appear, and may be discovered by careful examination.

The remission of the fever, which often takes place when the papular eruption is completed, cannot be relied upon for diagnosis, as it is very uncertain. In the boy whose case was referred to at the beginning of this chapter there was no remission of the fever at the early period of the eruptive stage. On the contrary, the temperature rose still higher, and when the patient was sent away to the small-pox hospital on the third day of the rash, the spots being then vesicular, his temperature (at 8 A.M.) was 103.4°

Varicella may be readily mistaken for modified small-pox. The differences between the two diseases are described elsewhere.

Prognosis.—The mortality from small-pox in childhood is very high up to the age of ten years. Infants usually succumb to the disease even in the discrete form. The previous health of the child is an important item in estimating his chances of recovery, for weakly children have small prospect of passing safely through so formidable a trial. Little information can be gained from the severity of the initial stage, for violent convulsions may usher in a benign form of the disease. Remission of the fever and constitutional symptoms at the beginning of the eruptive stage, scantiness of the rash, normal development of the spots, and absence of subcutaneous hæmorrhages, are favourable symptoms; but even in these cases a serious complication may arise during the third stage and carry off the patient.

Of special symptoms, profuseness of salivation is not an unfavourable sign, although it occasions much discomfort. Mr. Marson even regards it as of auspicious omen, especially if combined with much swelling of the face and marked tenderness of the skin. Bleeding from a mucous surface, if limited to one tract of that membrane, is not, according to Dr. Collie, to be viewed with apprehension; but if more than one tract is a source of hæmorrhage, the prognosis is very unfavourable. Hæmaturia is not necessarily dangerous; but hæmorrhage into the skin, if anything more than a few scattered petechiæ can be seen, is of very serious import.

Destructive ulceration of the eyes may be expected in cases of the confluent form of the disease when the secondary fever is high and the skin is very hot and dry. If, in such a case, the eyes do not suffer, some other serious complication is certain to occur, according to Mr. Marson. The same authority asserts that if an ulcer be found at the same time on each side of the cornea, that eye will be entirely destroyed.

Treatment.—In varioloid and the milder cases of discrete small-pox the child merely requires to be kept in bed in a large well-ventilated room, and to be fed with such articles of diet as are suitable to his age and degree of pyrexia. While the fever is high, he should take nothing but milk and broth; but when the pyrexia subsides, he may take fish or once cooked meat, light puddings, etc. His whole body should be sponged daily with tepid water, and if there is much heat of skin, this process may be repeated several times in the twenty-four hours. He may be allowed to drink freely of pure cold water, and his bed and body linen should be changed every day. No medicine will be required unless constipation be present, when a moderate dose of castor-oil is indicated. As in scarlatina, the room should be cleared of all carpets, rugs, curtains, and other woollen fabrics not absolutely indispensable. Open windows, whatever be the season of the year, are insisted on by Dr. Collie.

The severer forms of the disease, and especially the confluent variety, require very careful treatment. The diet should be liberal, given in such form as the child can digest, and in quantity suitable to his power of assimilation. Milk, strong beef-tea, essence of meat, yolks of eggs, light

puddings, and jelly can be given frequently and in small quantities at a time. Stimulants, such as brandy and the brandy-and-egg mixture, will also be needed whenever signs of failure of strength are observed. It is best, however, to withhold stimulants during the earlier period of the illness, unless they are imperatively required, for they will certainly be wanted at the end of the second or beginning of the third week, when complications generally appear.

If the patient be restless at night and wakeful, a little chlorodine may be given cautiously; but we must be careful in giving narcotics, partly on account of the easily depressed condition of the patient, partly because the air-passages become readily choked by the abundant mucous and salivary secretion.

The treatment of the skin eruption is an important matter; for in small-pox, unlike the other eruptive fevers, the dermatitis which accompanies the maturation of the pustules may produce severe local injury as well as marked constitutional disturbance. Very many different methods have been recommended and adopted for checking the ulcerative process and preventing pitting of the skin; but none of these can be said to be successful. The application of salves of various kinds appear to be useful, but rather through the oil or fat they contain than through the chemical ingredient which was supposed to give them their value. Dr. Collie pronounces against distressing the patient by efforts in this direction, which are certain to prove ineffectual, and merely recommends the use of olive-oil to the skin. A thirtieth part of carbolic acid increases the value of this application. German writers speak highly of cold compresses to the face and hands, and to any other part where the eruption is copious. They state that the application diminishes pain, heat, and redness, and contributes greatly to the comfort of the patient.

The sore throat is best treated by barley-water and other mucilaginous drinks. A draught containing perchloride of iron and glycerine, taken three times a day, is often of service.

At the end of the second week we must be on the watch for complications. Laryngitis is often the first to appear, and indeed this intercurrent disorder may begin as early as the tenth day. When this complication occurs, the room must be kept warm (a temperature of 70° is sufficient); the cot must be surrounded with an atmosphere of steam from some one of the many apparatus constructed for this purpose; and the throat should be enveloped in hot linseed-meal poultices. Stimulants must be given as seem desirable. If signs of suffocation are noticed, tracheotomy should be performed at once. In cases of œdema of the glottis, where life is in the greatest danger, and immediate measures have to be taken to avert a fatal issue, much benefit may be derived from rapid vesication. This is best done by means of boiling water. Dr. Owen Rees directs that the corner of a towel should be soaked in water as this boils on the fire, so as to acquire the full temperature, and that it should be then applied rapidly to the region of the throat. Before doing so, the surrounding parts which it is not wished to blister must be covered with thick cloths.

Diarrhœa, if it be troublesome, must be treated with a small dose of castor-oil, followed up, if necessary, by a draught containing dilute sulphuric acid and a drop or two of tincture of opium. An enema of starch with five or ten drops of laudanum is also useful. If the diarrhœa resist this treatment and become exhausting, nitrate of silver or gallic acid and opium must be resorted to.

The various forms of chest affection must be treated upon general prin-

ciples. They are excessively dangerous. As the patient is usually by this time in a state of great exhaustion, stimulants must be given liberally; and strong beef-essence and other forms of food containing much nourishment in small bulk must be administered in small quantities at a time.

If an ulcer appear upon the cornea, it should be touched with a solution of nitrate of silver (gr. xx. to the ounce), and afterwards some olive-oil should be dropped into the eye. A blister to the temple is also of service. The conjunctivitis may be treated in mild cases by a solution of sulphate of zinc (gr. iij. to the ounce), dropped into the eye three or four times a day; or a solution of the nitrate of silver (gr. j. to the ounce) may be used. If the case is severe, with much muco-purulent discharge, Mr. Makuna recommends the stronger solution of the nitrate to be dropped into the eye once a day. The lids may be prevented from adhering by bathing frequently with warm water, and then placing a drop of castor-oil between them.

Abscesses must be opened early. Any sign of suppuration is a signal for stimulants, and for quinine with or without perchloride of iron.

If hæmorrhage occur, the patient must be kept perfectly quiet, and stimulants must be given as required.

In all cases where the skin eruption is profuse, cleanliness is of the utmost importance. Dr. Collie especially directs the removal of all crusts about the nostrils and lips as they form, for they poison the air as it enters the body of the patient. He also insists upon the early removal of all scabs under which pus is forming, and recommends that the patient be bathed daily in a bath medicated with carbolic acid. He also points out the necessity of frequent changing of the body linen. If, as often happens, the child's head is slow in recovering, the scabs must be removed by poulticing, and zinc ointment must be applied, or the following:

℞. Liq. plumbi subacetatis..... ℥ j.
Zinci oxydi..... ℥ j.
Vaseline..... ℥ ij.
M.

Cod-liver oil and iron are also indicated.

In the malignant form of the disease no treatment is successful, and the patient invariably dies.

CHAPTER VII.

MUMPS.

Mumps, or Parotiditis, is one of the milder infectious disorders of childhood. It is rare in infancy, and cannot be said to be common before the fourth or fifth year. Again, after puberty the liability to the disease diminishes. It seldom occurs a second time in the same subject. Mumps is usually epidemic, and is especially common in the spring of the year. Its infectiousness is extreme, so that if the complaint break out in a school, or other institution where young people are congregated together, few are likely to escape. The virus is supposed to be conveyed in the breath. The duration of the illness is from a week to ten, twelve, or fourteen days. There is, besides, a period of incubation which has been variously estimated at from one to three weeks.

Morbid Anatomy.—The disorder consists in an inflammation of the ducts of the parotid and other salivary glands, with infiltration of the cellular tissue of the glands. Exudation also invades the subcutaneous tissue for some distance around, so that very widespread swelling may be the consequence. The diseased action does not go on to suppuration, but terminates in resolution in the course of a few days.

Symptoms.—After a period of incubation which, according to Dr. Dukes, varies from sixteen to twenty-five days, the earliest signs of the disorder are noticed. The first symptom is fever, which usually precedes by some hours any sign of local discomfort. The temperature is generally high, rising sometimes to 103°, and, as is often the case with children, the pyrexia is apt to be accompanied by headache and vomiting. Swelling of the parotid gland may occur at the same time as the fever, or may even precede it. In any case attention is soon attracted to the face. Aching and tenderness are complained of, situated immediately below the ear, and behind the ascending ramus of the jawbone; and on inspection the normal depression between the face and the neck is found to have disappeared. The swelling strikes forward into the face, and backward and downward into the neck, so that when fully developed it covers the whole of the parotid region. If, as often happens, the inflammation extends to the submaxillary glands, and attacks both sides, the familiar face is curiously disfigured, and is scarcely recognizable by the friends. It is enormously widened at the level of the nose and lip, and the chin may almost disappear in the swelling of the neck. The swelling is very tense and elastic, and is extremely sensitive to pressure. The skin over it is either pale or is suffused with a rosy-red blush. The full development of the swelling occupies from three to six days; then, after remaining unaltered for one or two days longer, it begins to subside, and by the tenth or twelfth day from the beginning of the disorder all fulness has disappeared. During the whole of this time the aching continues, and is greatly intensified by movement of the jaw; so that mastication becomes impossible, speech is

hampered, and even swallowing is difficult and painful. One consequence of this is that saliva tends to accumulate in the mouth, and is a cause of much discomfort. Fortunately, however, its secretion is seldom greater than natural.

While the disease is in progress the fever remains high. When the swelling has reached its full development, the temperature falls, suddenly or gradually, and during the process of resolution the heat of the body is natural. The disease seldom attacks the two sides of the face quite simultaneously. One side generally precedes the other by some hours or days. In rare cases the inflammation remains limited to the gland first attacked.

Although the parotid glands are primarily and principally affected in the large majority of cases, this is not the invariable rule. Sometimes the inflammation is localized in the submaxillary glands, and the parotids suffer little if at all. Dr. Penzoldt, of Erlangen, in an epidemic of undoubted mumps occurring in that town, noted some cases in which the swelling of the parotids was so slight as to be scarcely observable, while the submaxillary glands were considerably enlarged and very painful. In one case there was in addition swelling and redness of the tonsils.

One of the most curious features of this disorder consist in the metastases which occasionally occur. As the inflammation subsides, or even a day or two after the swelling has disappeared, a similar condition develops itself in a distant part—the testicle, in the case of a boy ; the breast, if the patient be a girl. These complications are accompanied by fever and general poorliness, but subside in the course of a few days. In rare cases orchitis has been known to precede the affection of the parotid gland. Thus, a young gentleman described to me how he had had an attack of orchitis, accompanied by severe pain but a normal temperature. At this time there was absolutely no symptom connected with the face. Sixteen hours afterwards, however, slight swelling and tenderness of the parotid gland began to be noticed, and the temperature was found to be 100.6°. As the mumps subsided, the second testicle became inflamed. In this attack the temperature rose to 105°, and for some days was as high as 104°, with delirium and distressing vomiting. Sometimes the appearance of swelling in the organ secondarily attacked is preceded by severe constitutional symptoms. There may be high fever and delirium ; or great prostration with coldness of the extremities ; or violent vomiting and purging. In any case, great alarm is excited by the condition of the sufferer ; but all apprehensions are removed by the appearance of the local lesion. These complications are less common in children than in adults who suffer from mumps, but it is well to remember that it is possible they may occur.

There is another and occasional after-consequence of mumps which it is important to be acquainted with. This is deafness, coming on some time after the parotiditis has subsided. The hearing may be affected in one of two ways. An extension of the inflammation may take place to the Eustachian tube and middle ear. These cases are very amenable to treatment and usually recover. There is, however, another class of cases of a much more serious character, to which attention has been directed by Mr. Dalby. In these the deafness comes on quite suddenly. The child goes to bed with his hearing perfect ; in the morning he is found to be deaf. Little can be done for this form of deafness. It is probably dependent upon some altered condition of the auditory nerve, for no appreciable lesion can be detected in the auditory apparatus. Whether the loss of hearing

be complete or merely partial, little hope of material improvement can be entertained.

In some rare cases an attack of mumps has been known to be accompanied by facial paralysis from extension of the inflammation to the Portio Dura.

Diagnosis.—Mumps can only be confounded with inflammation of the parotid gland of a non-specific character, such as may occur in the course of some fevers—symptomatic parotiditis, as it has been called, or parotid bubo. In this case both sides of the face may be attacked, but the fact of the lesion being a secondary, and not a primary disease, and of the rapid suppuration which takes place when the inflammation is symptomatic, should clear up any uncertainty which might be felt as to the nature of the case.

Mumps is probably infectious from the very beginning of the disorder, and remains so for some time after the swelling has subsided. Dr. Squire is of opinion that for at least two weeks after the disease has cleared away, the child should not be allowed to return to his healthy companions.

Treatment.—As the disease cannot be arrested, but must run its course, little active treatment is required. It is best to put the child to bed, and to keep him there as long as the temperature is elevated. Hot poultices should be applied to the parotid region and be frequently changed. If the pain be not relieved by this means, an ointment composed of equal parts of extract of belladonna and glycerine may be smeared gently upon the skin over the inflamed glands, and the poultice be applied as before. The jaws must be kept at rest, and no solid food can be allowed. Instead, the child should have strong beef-tea or gravy soup, meat jelly, milk, yolks of eggs, etc.; but if there be high fever, with foul tongue and derangement of the digestive organs, as is most usually the case, the stomach must not be overloaded even with liquid food, and care should be taken to supply nourishment in small quantities at a time. If the fever be high and cause restlessness, the surface of the body can be sponged with tepid water. The bowels must be attended to and constipation relieved by some gentle aperient, such as compound liquorice powder or the liquid extract of rhamnus frangula.

In cases of metastasis to the mamma or testicle, perfect rest must be enforced; and the local treatment recommended for the face should be had recourse to. The alarming symptoms which sometimes precede the appearance of the secondary lesion usually pass away in the course of a few hours. If there be great prostration, stimulants must be given, and warmth be applied to the extremities.

CHAPTER VIII.

CEREBRO-SPINAL FEVER.

(Epidemic cerebro-spinal meningitis.)

Cerebro-spinal fever is a specific inflammation of the membranes covering the brain and cord. The malady is no mere local disorder, but a blood disease, of which the inflammatory affection of the meninges is the anatomical expression. It usually prevails in epidemics, and outbreaks of the disease have been noted in various countries widely differing in climatic and other conditions.

Causation.—The epidemics of cerebro-spinal fever generally occur during the winter months; but isolated cases are often noticed for some time before the disease becomes more generally diffused. Thus, before the epidemic which prevailed in Ireland in 1867, sporadic cases had been observed in the country for some years. The disease appears to be mildly infectious. It fastens upon old and young, rich and poor, but males appear to be more liable to suffer from it than females. In 1846 some cases occurred in the Dublin and Bray Workhouses, and shortly afterwards in the Belfast Workhouse. In these cases the sole victims were boys under the age of twelve. The girls and adults escaped. In all epidemics children are largely affected, for unlike typhus, of which cerebro-spinal fever was at one time supposed to be merely a variety, the disease readily attacks young subjects, and is most fatal in early life. Although not generated, like typhus, by insanitary conditions, the onset of the fever seems to be favoured by them; and foul air, bad food (especially ergotized grain, according to Dr. Richardson), exposure to cold and damp, and physical fatigue, no doubt tend to encourage the spread of this fatal malady.

Morbid Anatomy.—The vessels of the pia mater, both of the brain and cord, are congested, and lymph is exuded into the subarachnoid tissue. Sometimes it is also seen in the ventricles. It usually consists of opaque purulent matter of a greenish-yellow color. The amount varies. It may occur only in patches, or may be more general. The lymph is especially abundant at, or is confined to, the base of the brain—usually the posterior portion, the surface of the medulla oblongata, and the upper part of the spinal cord. There is often congestion of the substance of the brain, and there may be serous effusion or actual extravasation of blood. The choroid plexus is much congested, and the cervical part of the cord may be covered with a thick layer of bright-red vessels. In the worst cases of the disease the blood is very dark in colour and unusually liquid.

The exudation appears to be thrown out with great rapidity, for it may be found in cases where death occurred within a few hours of the child being attacked. Ebert and others have found micrococci in the purulent effusion of the meninges, and according to some observers the disease is essentially due to micro-organisms.

Of the other organs: the spleen is generally unaltered, although sometimes it, as well as the other viscera, may be congested. There may be signs of pleurisy, and scattered patches of hepatization may be seen in the lungs. It is said that the agminated and solitary glands of the intestine have been found in some cases to be swollen.

Symptoms.—The disease generally begins suddenly during sleep, having been preceded by few or no premonitory symptoms. In certain cases —usually the milder ones—the child may complain, if old enough to do so, of wandering pains, and may seem poorly for a day or two before the outbreak; but there is seldom anything to fix the attention before the first violent symptoms of the disease make their appearance. In rare cases there may be headache, vomiting, and general tenderness for some days previous to the actual beginning of the illness.

As a rule, the first noticeable feature is a rigour or a fit of convulsions; and the younger the child, the more likely is the attack to begin with a convulsive seizure. Sometimes severe headache and vomiting may usher in the disease. If the patient, as is often the case, seems heavy and stupid after the fit, he still shows by his restlessness, his moans and cries, and by frequently carrying the hand to the head, that he is suffering severe pain. The pupils are contracted; the pulse is quick, seldom lowered in frequency; the temperature (which should always be taken in the rectum) is 101–2°; and the breathing is hurried. An early symptom is retraction of the head upon the shoulders. It has been suggested that this position is at first partly voluntary, to relieve the pain (which we know, from the case of the adult, to be of a very severe character) shooting down the back; but it soon becomes involuntary from spasmodic contraction of the muscles of the nucha. It may occur within a few hours of the onset of the illness, and is rarely delayed beyond twenty-four hours. The tetanic spasm of the muscles of the neck may extend to the whole back, the jaws, or even the limbs, and may be varied by clonic convulsive movements. In a short time the cries and manifestations of pain cease as the senses become duller and the stupor increases. If consciousness is lost early and does not return, the symptom is a very grave one.

About the second or beginning of the third day a herpetic eruption appears upon the face, and purpuric spots may come out upon the body and limbs. This eruption, which is not invariably present, has given to the disease one of its names—"spotted fever."

When the disease is at its height, the child lies on his side in the cot with his head retracted, his limbs flexed, and his spine often rigidly curved. He is completely unconscious, but still remains uneasy and restless, often moving one or both lower limbs monotonously. The pupils are now generally dilated, usually sluggish, and perhaps unequal. The belly is flattened; the bowels are constipated; the pulse and respirations are quickened. At intervals spasms are noticed; the head is drawn more backward, and the curve of the spine is increased. When the stupor is complete the bladder is evacuated involuntarily, or there is retention of urine.

In fatal cases the coma continues, the breathing is accompanied by rattling within the chest, and the child sinks and dies. If the case is to end favourably, the stupor grows less profound and the restlessness diminishes. The rigidity is late in relaxing, and usually the mind becomes clear while the head is still retracted upon the shoulders.

The special symptoms above referred to vary considerably in severity in particular cases:—

The fever is very variable and has no regular course. The internal heat, as tested by a thermometer introduced into the rectum, is generally higher than the surface of the body; but even in the rectum the mercury may only mark a degree over the normal temperature. At other times it rises to 104° or 105°. If early collapse come on, the temperature may sink to below the normal level.

The skin eruption is a valuable sign. In some epidemics it is a rare symptom; in others almost all the cases exhibit a number of purpuric spots. In every recorded serious outbreak both the maculated and the non-maculated forms of the disease have been observed, although one may have been more common than the other. The rash consists of dark purple spots or blotches due to effusion of dissolved hæmatin into the true skin and areola tissue beneath it. They generally occupy the legs, hands, face, back, and neck. They are sometimes slightly elevated, and vary in size from a pin's head to a walnut. According to Dr. J. A. Marston's observations in the epidemic which occurred in Ireland in the year 1867, there is no necessary relation between the occurrence, the number, and the extent of the spots upon the skin and the amount of the intra-cranial and intra-spinal mischief. Dr. Mapother, referring to the same epidemic, states that the spots cannot be produced artificially by pressure on the skin as in true purpura. Besides the petechiæ, there may be herpes, urticaria, and patches of erythema or roseola. The skin may have a dusky tint and is often moist. Cerebral flush is not a marked symptom.

The mental condition also varies in different cases. When the disease is violent and death occurs early, the child may be unconscious from the first. In other cases stupor comes on by the second or third day. In the mildest cases the mind may be little affected, or there may be slight delirium with curious hallucinations. Thus, Dr. Lewis Smith refers to a case in which the child answered questions with perfect clearness, but constantly mistook his mother for another person. Usually, in all cases before death the coma is profound.

The pains referred to the head and spine are always a distressing and prominent symptom. They are often so severe that the child, until he becomes comatose, is constantly moaning and screaming. The pain is increased by movements of the back, and especially by attempts to press the head forward. The general tenderness of the skin adds greatly to the child's discomfort; and sometimes a touch on the body, as in moving him to alter his position, causes the greatest distress.

In some cases paralysis is noticed. It is, however, a comparatively rare symptom, and is usually partial, being limited to one or more limbs. It may affect the cerebral nerves, especially the third, the sixth, and the facial. The lesion of the nerve-trunks is due to purulent infiltration of the neurilemma, or to contraction of the hyperplastic connective tissue of the nerve-sheath. In cases of recovery the paralysis may last through life, but sometimes it passes off as the patient improves.

Convulsions, general or partial, are comparatively common in the case of children, certainly much more common in them than in the adult. They are especially frequent in the more severe forms of the disease. The clonic spasms sometimes alternate with tonic contractions; and may be general or limited to one-half of the body. Nystagmus may be noticed.

Vomiting is seldom absent at the beginning of an attack. It is often severe, and like all forms of nervous vomiting is independent of taking food. The thirst is great. Constipation is the rule; although in some epidemics the disease has been noticed to be ushered in by purging as well as

vomiting. The tongue may be clean or furred ; towards the end of the disease it becomes dry. Abdominal pain, if present, is like the hyperæsthesia of nervous origin. The belly is seldom retracted, and never to the degree observed in cases of tubercular meningitis. Occasionally it is full or even tympanitic. The spleen is sometimes enlarged.

The pupils are at first contracted, but dilate as the stupor deepens. They are often sluggish, and may be unequal in size. A squint is sometimes noticed. Blindness may occur from keratitis owing to imperfect closure of the eyelids, or from neuro-retinitis due to the spread of the purulent inflammation along the optic nerve ; and in some rare cases the eyeball has been known to be completely destroyed by suppuration. The hearing may be also affected. A temporary deafness with noises in the head may occur during the first days of the disease and be afterwards recovered from. If it occur later, it is probably due in most cases to purulent inflammation within the labyrinth. This form of deafness is usually bilateral, complete, and permanent ; and if the patient be a young child, may lead to deaf-mutism.

The pulse is seldom otherwise than quickened ; but it rarely attains at first a high degree of frequency, and is subject to rapid alternations. It is not often intermittent, but is usually very feeble. The breathing is also quickened, and is often irregular and interrupted with sighs. The normal relation between the pulse and the respiration is preserved.

The urine is often natural in quantity, color, and reaction. It has been known to contain albumen and even blood.

There are many differences in the various cases of cerebro-spinal fever met with in the course of the same epidemic. In some the symptoms from the first are indicative of profound blood-poisoning. Consciousness is affected from the beginning ; there is extreme prostration, a feeble fluttering pulse, and labored breathing. Then spots appear early and are extensively distributed. The stupor deepens into coma, and death takes place with startling rapidity. In these cases the more special symptoms arising from the local inflammation are overshadowed by those dependent upon the general condition, and the patient dies from blood-poisoning. In another class of cases the symptoms of cerebro-spinal inflammation predominate, and the more marked phenomena are the convulsions, the drawing backward of the head, the hyperæsthesia, and the tetanic contraction of muscles. In this form if the disease end unfavourably, death is owing mainly to the local lesion. As a rule, the affection is most severe when the epidemic is still young. As the cases get more numerous they become milder ; and at the end of the epidemic it is common for recoveries to take place.

In some instances curious intermissions occur in the disease. These may be found quite at the onset, evident premonitory symptoms appearing, passing off, and returning, perhaps several times, before the actual outbreak occurs. In other cases during the course of the disease more or less complete remission of the symptoms lasting for several hours or a day may take place. According to Dr. Frey, this is very common at the end of the second or third day. Again, during convalescence the same variations may be seen, the headache and retraction of head being at times distressing, at other times scarcely noticeable.

According to Dr. Oscar Medin, of Stockholm, infants under twelve months old are especially liable to the disease. At this early age the illness generally ends fatally ; but sometimes mild cases are observed lasting from a day to a week. This physician, who at the Orphan Asylum of Stockholm had many opportunities of observing the malady, states that the

mild cases began with fever, somnolence, and twitchings during sleep. In most instances there were other symptoms, especially during sleep, such as restlessness, great heat of head, changes in the colour of the face and in the sensibility of the body. In a few of the milder cases slight convulsive spasms were noticed, with rigidity of the limbs and neck, strabismus, and dilatation of the pupils ; but in such cases these symptoms soon disappeared. In all the epidemics which came under Dr. Medin's observation such mild cases were the exception, and a large proportion of the infants died. In the severer forms the symptoms did not differ from those observed in older children.

Dr. Medin, like other observers who have had opportunities of studying this form of illness, speaks of a pneumonia of a low type, occurring without nervous symptoms, as being frequently present in epidemics of cerebro-spinal fever ; and holds with them that in such cases, the infective material attacks the lungs in place of the cerebral membranes. Still, meningitis may be present in such cases, although it gives rise to no symptoms ; for in some instances where during life the symptoms were exclusively pulmonary, inflammation of the cerebral and spinal meninges was discovered on post-mortem examination of the body. Besides pneumonia, peri- and endo-carditis, pleurisy, parotitis, and purulent effusion into the joints may be complications of the disease.

The duration of the attacks is very variable. Death may take place in five or six hours in the most malignant forms of the distemper. In other cases the illness may be prolonged for one, two, three, or four weeks, or even longer. Convalescence is always slow, and is often intermittent. A profound debility, lasting for a long time after the fever is at an end, is one of the characteristics of the malady.

Diagnosis.—Every case of rigid retraction of the head in a child is not one of cerebro-spinal fever. The symptom is the consequence of a basic meningitis spreading to the cervical portion of the spinal cord ; and it may therefore be present in any case where the membranes of the brain are the seat of inflammation. It is not uncommon in the course of a tubercular meningitis.

Cerebro-spinal fever not only gives rise to severe local symptoms, but is also accompanied by more general phenomena indicating a profound constitutional affection. Its epidemic form, its violent and abrupt onset, the extreme debility which is invariably present, and the petechial rash, remove the disease from the list of purely local disorders, and amply justify its being ranked amongst the specific fevers. The disease was at one time held to be merely a form of typhus fever complicated with meningitis ; but the difference between the two diseases are neither insignificant nor few. Cerebro-spinal fever prevails equally amongst the rich and the poor ; it particularly affects children, and is very fatal to them ; it runs a rapid course, often causing death in a few hours ; its temperature as a rule is little elevated ; the rapidity of the pulse is moderate, and when the fever is high, is not increased in proportion to the degree of pyrexia (indeed, according to some observers, it does not become rapid until the temperature falls) ; lastly, retraction of the head is one of the most common symptoms.

Typhus loves "fever haunts," and seldom attacks the well-to-do ; it rarely affects children, and if it do, runs in them as a rule an especially favourable course ; its duration is longer, and even in the adult it rarely appears in the overwhelming and malignant form so often seen in cases of cerebro-spinal fever ; lastly, meningitis with retraction of the head is a rare complication.

The diagnosis of cerebro-spinal fever is much easier in the midst of an epidemic of the disease. The abrupt and violent onset, the severe pain in the head and spine, the vomiting, the retraction of the head, the general stupor, and the petechial and other eruptions—this combination of profound constitutional symptoms with nervous excitement followed by depression, is sufficiently characteristic, especially if at the same time, as often happens, the temperature is only moderately raised and varies irregularly. In cases of simple cerebro-spinal meningitis the retraction of the head is not so extreme, and the stiffness and pain in the spine, the hyperæsthesia, and the pains in the joints are seldom present. As a rule, too, the non-specific disease is preceded by prodromata and runs a less rapid course. Still, this is not always the case, for in exceptional instances simple meningitis may prove fatal to a young child in the course of twenty-four hours. The fever in the latter is, however, always high, and the convulsions are in most cases repeated and general.

It would be difficult to confound tubercular meningitis accompanied by retraction of the head with cerebro-spinal fever. The hereditary tubercular tendency, the long prodromal period, the gradual onset of the illness, the more protracted and characteristic course, and the slow intermittent pulse, would serve to distinguish the tubercular disease.

In infants under twelve months old the disease is very difficult to detect. It may, however, be distinguished by close attention to the course and symptoms of the illness; especially if the case occur in the midst of an outbreak of the malady.

Prognosis.—In all cases of cerebro-spinal fever the prognosis is very serious. The disease is especially fatal to children, and the younger the patient the less hope can we entertain of a favourable termination to his illness.

In babies an arched and tense fontanelle, which shows the presence of profuse exudation and œdema, is a very grave symptom. In all cases repeated convulsions and signs of severe nervous excitation, such as violent and incessant vomiting, intense cephalalgia and pain in the back, strong tetanic spasms; also early appearance of depression, continuous coma or return of the stupor after a period of apparent improvement, and irregular breathing, are all signs calculated to excite the gravest apprehensions.

Treatment.—The disease unfortunately is little amenable to treatment. In all cases ice-bags should be applied to the head and spine as long as the period of excitement continues. When symptoms of depression are noticed, the ice should be removed, or supplemented by the application of hot bottles to the feet, and the administration of stimulants by the mouth. Sometimes hot applications relieve the severe headache better than cold. The ether spray has been used to the occiput and back of the neck, and is said to be of service. Large doses of chloral sufficient to produce signs of narcotism have been recommended. All writers, however, speak highly of the subcutaneous injection of morphia. For a child of three years of age one-twentieth of a grain may be used, and repeated every one or two hours until some sensible effect is produced; or four or five grains of chloral may be given by the mouth.

During protracted convalescence the iodide of potassium must be given to further absorption of the exudations; and iron and tonics, with removal to a dry bracing air, are of value to hasten the child's recovery.

CHAPTER IX.

ENTERIC FEVER.

Enteric or typhoid fever is common in children. A large proportion of the cases formerly described as "Infantile Remittent Fever" were no doubt cases of this disease. Fortunately in young subjects typhoid fever usually runs a mild course. It would be, no doubt, too much to say that, properly treated and nursed, no child should die of typhoid; but certainly when placed from the beginning under favourable conditions for recovery, death in the child from such a cause is very rare.

Infants and children during the first four or five years of life seem less susceptible to the typhoid poison than at a later age. Perhaps, however, it is difficult to recognize the disease in such young subjects; and it is not impossible that many cases of febrile diarrhœa in the young child may be cases of typhoid fever which have escaped recognition. Boys are more commonly affected than girls; and the fever seems to attack by preference previously healthy children. At any rate the patients who are brought suffering from the disease to the Children's Hospitals are generally well-nourished, strong-looking little persons, with exceptionally good histories.

Causation.—It is now well known that enteric fever arises as the consequence of absorption into the system of a specific poison which is generated by the decomposing discharges of typhoid patients. It is therefore largely distributed by the emanations from cesspools and faulty drains. Warm weather, which encourages putrefaction, increases the prevalence of the fever. Dr. Murchison has shown, from the records of the London Fever Hospital, that cases of enteric fever become more numerous after the warmth of summer, and diminish in number after the cold of the winter months. Thus, in August, September, October, and November, the fever prevails largely; while in February, March, April, and May, it is much less frequently seen. Whether the poison can be generated de novo is a question which has been often debated and on which opposite opinions are held. It seems certain that the decomposition of ordinary fecal matter under ordinary conditions of atmosphere cannot produce it; but it is probable that the specific poison may be generated from non-specific ordure under extraordinary conditions. At least, it is difficult under any other hypothesis to explain outbreaks of the fever in country villages where the strictest search fails to discover any means by which the disease can have been imported from without, and in which the same insanitary state has existed unchanged for years. There is no doubt that the discharges from the patient are highly contagious. The disease cannot, however, be communicated by the breath or by emanations from the skin. It is held by some that the discharges themselves are at first comparatively innocuous, and only become hurtful after putrefaction has begun.

The poison enters the system by the mucous membrane of the lungs or of the alimentary canal. In most cases, no doubt, contaminated water

is the means by which it is conveyed. Several epidemics of typhoid fever in London, of late years, have been traced to milk to which water containing typhoid matter had been added. It is also probable that untrapped or faulty drains, allowing the effluvia of cesspools charged with the specific poison to penetrate into a house, may be another means of imparting the disease.

One attack of typhoid fever does not necessarily protect against another ; and relapses are very common.

Morbid Anatomy.—The characteristic lesion in typhoid fever consists in a swelling of the solitary glands of the small intestine, of the agminated glands constituting Peyer's patches, and of the mesenteric glands in connection with them. The swelling is a pure proliferation of the cellular elements, which are seen by the microscope to be much increased in number. Some corpuscles become enlarged and develop smaller cells within their walls. The hypertrophic change in the glands begins early, probably at the beginning of the disease, and proceeds rapidly. It involves a certain number of Peyer's patches. These are fully developed by the ninth or tenth day, and form thick oval plates with abrupt edges and an uneven, mammilated surface. Their consistence is softer than natural, and more friable. The solitary glands may be unaffected ; but they also often swell and form small projections from the surface of the mucous membrane. After reaching their full size the glands, in mild cases, begin slowly to shrink. The newly proliferated cells undergo a fatty degeneration and are absorbed. The mesenteric glands also diminish in size by the same process of fatty degeneration, and gradually resume their former dimensions.

In more severe cases the diseased glands, instead of undergoing healthy resolution, take on a further morbid action. Small points of ulceration appear on the surface of the patch. These enlarge and unite so as to form an ulcer which may cover the whole of the diseased surface. Sometimes, instead of ulcerating at separate points, the mucous membrane covering the affected patch sloughs over a larger or smaller area and separates from the tissue beneath. If the whole of the patch have been thus uncovered, the resulting ulcer is oval, and has its longer axis in the direction of the canal. Smaller ulcers may be circular or sinuous. The solitary glands may also go through the same process, and leave small, round ulcers scattered over the surface of the mucous membrane. The edges of the ulcers are thick and sharply cut, or even undermined ; and the floor is formed by the submucous tissue, the muscular coat, or, in bad cases, merely by the peritoneal covering of the bowel.

After a time, a process of repair is set up and the ulcers begin to heal. This favourable change seldom occurs before the end of the third week, and the process of cicatrization occupies a variable time. Under favourable conditions it may be completed in two or three weeks, but it is often spread over a longer period. The healing of the ulcer is not followed by any contraction of the bowel.

The morbid process above described attacks especially the glands in the neighbourhood of the ileo-cæcal valve, and extends upwards for a variable distance. In some cases the solitary glands in the cæcum and part of the ascending colon may be also affected. The deeper ulcers are usually in the lower part of the ilium near the valve ; and when perforation occurs, it is by rupture of one of these, whose floor is formed only by the peritoneal coat of the intestine. That this accident does not occur oftener is due to a local peritonitis having been set up, gluing the affected part of

the bowel to a neighbouring organ. Children who die from this disease die almost invariably from perforation of the bowel; but an unfavorable ending to enteric fever is comparatively a rare accident in young subjects, in whom the unhealthy action in the glands often stops short of ulceration.

Besides the special changes in the glands, the whole mucous membrane of the bowel is swollen and relaxed. The enlarged mesenteric glands seldom suppurate in the child. They usually rapidly undergo resolution as soon as the process of repair has begun in the intestine. The spleen is enlarged and congested. It is dark red in color and is softer than natural. The kidneys are sometimes congested. In all cases of typhoid fever the lungs are the seat of catarrh, so that the mucous membrane of the air-tubes is red and congested, and the bronchial glands are enlarged and vascular.

Symptoms.—After exposure to the contagious poison there is a period of incubation varying from ten days to a fortnight, at the end of which the symptoms of the fever begin to manifest themselves. These are at first very slightly marked; so much so, that it is sometimes difficult to fix the exact time at which the illness began. In most cases, however, careful questioning of the parents will enable us to determine the first day of the disease. One of the earliest symptoms is frontal headache. It is common to be told that a child returned from school saying he had a headache, that he looked pale, was languid and could eat no dinner. There is fever at this time, but the child, not being supposed to be really ill, is not treated as an invalid. In other cases headache is not complained of at first. The child is merely pale and listless, with some fever, and cannot be persuaded to eat. For the first few days little else can be discovered. The tongue is coated with a thin, white fur, through which red papillæ project. There is often slight redness of the throat. The bowels are either confined, or one or two loose, rather offensive, stools are passed in the twenty-four hours. The child is drowsy, but sleeps restlessly, although without delirium. He generally complains of his head, and often of aching pains about the body and limbs. Sometimes there is vomiting after food, and there may be trifling epistaxis. Cough is a more or less constant symptom, but varies greatly in amount. Usually it is insignificant at the first. During this time, unless medical assistance be summoned, the patient is seldom confined to his bed, but is dressed in the morning as usual. Indeed, in mild cases, children will often walk considerable distances to the out-patients' room of a hospital, for the muscular weakness is much less marked than might be anticipated.

So far, then, the symptoms are vague; and if it were not for the decided character of the pyrexia, there would be nothing to help us to come to any conclusion as to the nature of the illness. It is only at the end of the first week that more characteristic symptoms are observed. About the sixth or seventh day the spleen begins to enlarge. The organ can be felt to project inward towards the middle line from under the cover of the ribs. Its texture is soft, so soft, indeed, in many cases, that the enlargement can be only detected by a practised finger; and it appears to be tender, for pressure over its substance usually produces some manifestation of discomfort. Tenderness can generally be noticed at this time over the whole belly, and is not confined to the region of the spleen. The belly is now a little swollen; borborygmi are frequent; and gurgling may be often felt on pressure in the right iliac fossa. This, however, is a symptom as often absent as present. The bowels are relaxed in the ma-

jority of cases, although, as a rule, only moderately so, and the stools exhibit the yellow ochre "pea-soup" appearance which has been so often remarked upon. Still, constipation is a more common phenomenon in the child than it is in the adult, occurring in at least one-third of the cases.

The headache now usually subsides, and the patient begins to have slight delirium at night. He asks constantly for drink, but seldom shows any disposition to take food. His expression at this time is dull and heavy, and he lies quietly on his back, often with a dull flush on his cheeks, taking little notice of what passes around him. By the end of the first week the fever has reached its maximum. The skin, however, although generally dry is not always so, and there is occasionally a tendency to perspiration. The breathing is quickened, and the frequency of the pulse is increased. There is no constant relation between the pulse and the heat of the body. The pulse may be only moderately quick with a high temperature, and its rapidity undergoes frequent variations. (Thus, Edith H——, aged thirteen, on the eighth day at 9 P.M. : pulse, 86 ; respiration, 36 ; temperature, 103.6°. At 9 A.M. on the following morning : pulse, 100 ; respiration, 36 ; temperature, 100.8°.) By the end of the first week the cough becomes more troublesome, and may assume such prominence that a lung affection is suspected ; but only dry rhonchus, with perhaps an occasional coarse bubble, is heard about the chest.

After the eighth day the typhoid eruption should appear. In children this symptom is sometimes absent ; but careful inspection of the chest, abdomen, and back will generally discover a few—it may be only one or two—of the characteristic spots. Sometimes they can be detected upon the limbs. The rash appears in the form of small, slightly elevated, lenticular spots of a delicate rose tint, varying in size from half a line to a line and a half, and disappearing completely under pressure of the finger. Their number varies, but they may be very numerous. These spots come out in successive crops, each one lasting two or three days. If scanty, they have to be searched for with great care, especially when the back is examined, for here, on account of the general congestion of the surface, they may not be readily seen.

In this the second week of the illness as each day passes the child seems to become duller and more indifferent. He is drowsy and sleeps much during the day, but at night may be more restless, and sometimes he tries to leave his bed. His weakness has now become more marked. The pulse is quick and feeble ; and towards the end of the week muscular tremors and twitchings may be noticed. The belly is much swollen and assumes the characteristic barrel shape. The looseness of the bowel continues, or is replaced by constipation, and sometimes—although this is rare in the child—the motions contain blood. At this time the heart-sounds become feeble and soft to the ear, and there is often a prolongation of the first sound at the apex, or even a soft systolic murmur. On the other hand, in old standing cases of cardiac disease a murmur previously heard may be lost as the heart's action becomes enfeebled, only to reappear when the strength is restored.

In the third week of the illness the fever usually begins to diminish. In the mild cases the temperature becomes natural as early as the fourteenth day. If it persist, its mean is lower than before, and the morning temperature may be almost normal. The feebleness of the patient is now sufficiently pronounced, but as the days pass by his symptoms become more favourable. He grows less heavy and lethargic ; the swelling of his

belly diminishes; the spleen retires under the ribs; diarrhœa, if it had previously existed, ceases, and the motions become more natural; and as the tongue cleans, the child begins to show some dissatisfaction at being still restricted to liquid food. As the fever subsides, the pulse often becomes intermittent, and is very soft and compressible. When the fever is at an end the child is left very weak in the mildest cases, and he only slowly regains his strength. In bad cases the prostration is very great, and the child has to be nursed through a protracted period of convalescence. Sometimes œdema, more or less general, is seen as a consequence of the impoverished state of the blood.

The above is a sketch of the ordinary course of enteric fever in the child. There are, however, many variations in the symptoms, and it is desirable therefore to refer again to some of the principal phenomena.

The Digestive Organs.—The tongue in mild cases remains moist throughout the whole course of the illness. It has a delicate coating of grayish fur, through which the papillæ are seen to project. The tip and edges are only moderately red. Thirst is often a marked symptom, and liquid food is taken readily to satisfy this craving for fluid. Appetite is generally lost, but not in every case. A little boy in the East London Children's Hospital complained to me on the sixth day of the disease that he was hungry, although his temperature was then 105°, and his tongue was thickly furred, with sordes on the lips. His mind was quite clear. If the symptoms are severe the tongue generally becomes dry in the course of the second week. It may be fissured across the dorsum, and the lips may be cracked and blackened. Sore throat is a very common symptom during the first few days, and there is some little redness of the fauces. Vomiting is frequent at the beginning; occasionally it recurs later and may then give trouble.

The swelling of the abdomen is due to accumulation of flatus through decomposition of food and inability of the bowels to expel their gaseous contents. This loss of contractility is the consequence of lack of nerve-power or of local injury from ulceration. Consequently, if in the third week of illness there is deep ulceration of the intestine and great bodily prostration, the distention of the belly may be extreme. The amount of abdominal tenderness varies. In the mildest cases it may be absent. When present it may be local, limited to the splenic region and the right iliac fossa, or may be general over the abdomen. It is sometimes a well-marked symptom, the slightest touch being productive of great pain, and this in cases where there is no reason to suspect the presence of peritonitis. The bowels may be confined throughout, or loose throughout, or constipation may alternate with a mild diarrhœa. It must be remembered that looseness of the bowels is due not to the ulceration but to coexisting catarrh. If catarrh be insignificant or absent, the bowels are not relaxed. As a rule, in children the looseness is not extreme and is easily controlled. The relaxed motions always assume at one time or another the "pea-soup" character; they have an alkaline reaction and a faint offensive smell. Hæmorrhage from the bowels to any amount is rare, but small black clots of blood may be sometimes found in the grumous matter at the bottom of the stools.

The *urine* is at first scanty, with a high density. It contains an excess of urea and uric acid, but is poor in chlorides. Later it becomes more copious, the specific gravity falls, and it may contain a trace of albumen. During the height of the fever there may be retention of urine, with distention of the bladder and tenderness over the pubes. Sometimes the catheter has to be employed. There is no gravity about this symptom, and it need cause no anxiety if care be taken to empty the bladder by

degrees. The distention is due to loss of contractile power of the muscular coat. If, then, a greatly distended bladder be suddenly and completely emptied of its contents, the organ contracts imperfectly, and a certain amount of air enters and causes great irritation. An obstinate cystitis may be produced in this way.

The *pulse* is quick as a rule, but sometimes for a time sinks in rapidity although the fever continues high. The frequency of the pulse is not, as has already been stated, any trustworthy guide to the degree of fever; nor, as taken at a single examination, is it necessarily any test of the severity of the illness.

The *respirations* are hurried, and there may be slight disturbance of the normal pulse-respiration ratio without any pulmonary complication being present. (Thus John H——, aged four years, sixth day, 4 P.M.: temperature, 103°; pulse, 120; respiration, 46). If a pulmonary complication actually arise, the breathing increases in rapidity and there is lividity of the face.

The *skin* may be moist at times during the course of the disease, and towards the end of the third week, especially if the fever has subsided, there may be copious sweating. Sudamina then appear on the chest. The abundance of the rash varies greatly in different cases. It may be very copious or completely absent; but these extremes bear no relation to severity or mildness of attack. It is well to be aware that fresh crops of rose-spots may continue to appear for a week after the temperature has fallen to the normal level. I have noticed this on several occasions. The facies is important. The child seldom looks very ill in the early stage; and even later, unless the abdominal mischief be severe, it is exceptional for his face to wear the anxious haggard look which is so common in many other serious diseases, and forms such a striking feature in acute tuberculosis. In ordinary cases the expression is more stupid and listless than anxious.

The *special senses* may be affected. Deafness is common. Epistaxis is a frequent symptom, and may be repeated again and again. The conjunctivæ look red, and the pupils are large. The headache in children is seldom very severe. It ceases about the end of the first week, when the delirium begins. Sometimes cervical neuralgia is noticed after the second week, and every movement of the neck may be accompanied by pain. Delirium is the rule, beginning towards the end of the first week. Sometimes from this cause older children try to get out of bed and are noisy. Convulsions may precede death in fatal cases; but typhoid fever, unlike many other febrile complaints in childhood, is very rarely ushered in by a convulsive attack. Still, a form of disease is usually described in which the early symptoms are those of high nervous excitement. The child is convulsed and has marked delirium. I have never met with a case of this form of typhoid fever in a young subject.

The *pyrexia*, like most forms of febrile movement in the child, is remittent, but the degree of remission varies at different periods of the disease. In the second week there is, as a rule, less variance between the maximum and minimum temperatures than at an earlier or a later stage of the complaint. To test the bodily heat with any exactness, the temperature should be taken every three or four hours, both day and night. Very false conclusions may be drawn from a merely diurnal use of the thermometer, for the mercury is not necessarily at its lowest point at 8 or 9 A.M., nor at its highest at 6 or 7 o'clock in the evening. Again the minimum temperature may be non-febrile, or even subnormal. (Thus, in the

case of Lilly F——, aged eleven years, a patient in the East London Children's Hospital, the temperature during the morning hours from 8 o'clock to noon was subnormal after the ninth day. It was often as low as 97°, and yet this was an undoubted case of typhoid fever. In the evening the heat was 102° or 103°.) It is difficult to lay down a rule in a matter which is subject to such endless variety; but perhaps the minimum temperature is reached more often between the hours of 10 A.M. and noon than at any other time, and the maximum shortly before midnight or in the early morning hours. In the third week of the disease the remissions generally become very marked, and the minimum registered is often little higher than a normal temperature. This is especially noticeable towards the end of the week.

During the first few days of the fever it is rare for the child to be under skilled observation, and a record of the temperature at this time is not easy to obtain. Occasionally, however, a hospital patient, admitted for some chronic complaint, sickens of the disease. Such a case occurred lately in a little girl, aged nine years, who was being treated for hip-joint disease in the East London Children's Hospital by my colleague Mr. Parker, and was transferred to my care on the outbreak of the fever. The child, whose temperature had been normal, complained of headache at 2 P.M. Her temperature was then found to be 102.6°. At 10 P.M. it had fallen to 100°. On the second day, at 6 A.M., it was 99°; but rose gradually, being taken every four hours, till 6 P.M. when the thermometer marked 103.2°. It then fell suddenly to 99° at 10 P.M. On the third day at 10 A.M. it was 102.4°; at 2 P.M., 102.4°; at 6 P.M., 101.8°; at 10 P.M., 102.6°. After this it varied between 101° and 103.8° in the twenty-four hours, until the middle of the third week when it rose rather higher.

In a case kindly communicated to me by my friend Dr. Gee, the temperature in a little girl under his care was 103° on the first day at 2 P.M., and at 10.30 P.M. it was 103.6°.

In a case published by Dr. Ashby, of Manchester—a little girl of nine years—the temperature was 100° on the first evening. On the second day: morning, 99.4°; evening, 101.8°. On the third day: morning, 100.4°; evening, 100.4°. Fourth day: morning, 101°; evening, 103.4°.

From these three cases it appears that there may be great variations in the degree of pyrexia at the beginning of the disease. In my own case the temperature reached its height on the second day at 6 P.M.; but during the first two days the variations were very great.

The duration of typhoid fever is from fourteen to twenty-six days as a rule. The temperature often falls in young subjects at the end of a fortnight; and sometimes, although very rarely, may become normal at a still earlier date. The possibility of so short a duration for the fever has been doubted, but that it may occur is proved by the following case.

A little girl, aged nine years, was perfectly well on September 14th. On the following day, the 15th, she complained of chilliness and frontal headache. That night the skin was noticed to be hot, and for the next week the child was apathetic, languid, and feverish, complaining of headache and abdominal pain. She did not vomit, and there was no bleeding from the nose. The child was seen on the 22d. Her temperature was then 102°, and a rose-spot was noticed on the abdomen by the house surgeon. On the 23d (ninth day) she was admitted into the hospital. The abdomen was then moderately distended; the spleen could be felt two fingers'-breadth below the ribs; no spots were to be seen; the temperature in the evening was 102.6°.

After this date the temperature was never higher than 99° and a fraction; the child looked and expressed herself as well; the spleen quickly retired under the ribs; the appetite was good, and the patient complained much at being restricted to liquid food. On October 5th, the temperature having been normal for twelve days (with the exception that on one occasion, in the course of September 27th, it rose to 100.3°), and subnormal for six, the child was put on ordinary diet. Two days afterwards the temperature rose to 102°, the spleen began to enlarge; rose spots appeared on the abdomen; and the patient passed through a well-marked relapse of typhoid fever which lasted the usual nine days.

In this case the early cessation of the pyrexia seemed to exclude typhoid fever; and as the temperature continued low, a meat diet was allowed under the idea that our first impression of the illness had been a mistaken one. The prompt occurrence of a typical relapse, however, at once removed our doubts as to the nature of the primary attack.

In some cases the temperature remains high after the usual time of falling at the end of the third week. In many cases this is due to progressive ulcerative enteritis. Indeed, Dr. Gee lays it down as a rule that when pyrexia and enteric symptoms last longer than twenty-six days this is the cause of the prolongation of the disease. He also suggests that "subintrant relapse" may be an occasional agent in producing the same result.

Death from the intensity of the general disease, so common in the adult, is very rare in early life. In very exceptional cases, however, the diarrhœa may be excessive; the temperature may rise to a high level; the pulse may be frequent, feeble and dicrotous; the abdomen may be swollen and tympanitic; the child is delirious, then comatose, and dies with a temperature of 108° or 109°. Still, although this type of the disease is occasionally met with in the child, it must happen to few practitioners to meet with such cases. When children die from typhoid fever, they die almost invariably from perforation of the bowel and general peritonitis. The rupture occurs in the floor of a deep ulcer and takes place quite suddenly. It is followed by an escape of gas and of the fluid contents of the intestine into the peritoneal cavity. Immediately, the abdomen becomes distended, and there is intense pain and tenderness. Sometimes there is vomiting, but the patient in any case sinks into a state of collapse with dusky haggard face, cool purple extremities, and small rapid pulse. Although the surface of the body feels cool, the internal heat remains high (103–104°). The respiration is thoracic. According to Niemeyer, sudden disappearance of the liver dulness, on account of that organ being separated by the tympanitis from the abdominal wall, is one of the most certain signs of peritonitis from perforation of the bowel. This accident does not often happen before the end of the third week. When the peritonitis is general, it is almost invariably fatal, and death is sometimes preceded by an attack of convulsions. If the intestine have been previously matted by local inflammation, rupture of the floor of the ulcer may not lead to such serious consequences. In such a case when perforation occurs, the extravasated contents of the bowel remain encysted, and the resulting peritonitis is limited to the neighbourhood of the lesion. In the end the abscess thus formed generally makes its way to the surface and discharges its contents at some point of the abdominal wall.

Other complications which give rise to discomfort or danger are:—inflammation of the parotid gland, or of the middle ear, bronchitis, pleurisy, pneumonia, and catarrhal pneumonia. In one case—a boy aged thirteen, under my care in the East London Children's Hospital—an extensive

plastic pericarditis arose during the third week of illness. Bedsores rarely occur unless the child is greatly reduced by protracted illness; but boils and abscesses are not uncommon. Ulceration of the larynx has been described, but must be very rare. Another rare complication is thrombosis of the veins of the lower extremities.

After the fever has subsided, the temperature usually remains subnormal for some time. Not unfrequently, however, after the lapse of a few days, the child is noticed to be feverish again. These secondary pyrexias are very common. They may be due to a real relapse; to the presence of some irritant in the bowel, such as hardened fecal matter or undigested food; or to some febrile complication which may be called accidental, as an abscess.

Real relapses are far from uncommon. They begin after a variable interval—four or five days, or longer—and seem in many cases to be determined by injudicious feeding in the stage of early convalescence. The temperature rises; the spleen again enlarges; fresh spots appear; and the bowels may be again relaxed. Usually the symptoms are milder than in the primary attack and last a shorter time. The average duration of a relapse is nine days.

Constipation and the irritation of the bowel by hard fecal masses is a common cause of secondary pyrexia. The temperature usually rises to 102° or 103°, but may be higher. When the irritant has been removed by a copious injection, the pyrexia at once disappears. These attacks of temporary elevation of temperature may recur again and again in the course of convalescence, but need occasion no anxiety.

Convalescence from typhoid fever is often tedious. The child is left weak and low, and nutrition may not at once be re-established. It is a remarkable fact—to which attention has been drawn by Dr. West—that the patient is enfeebled intellectually as well as physically by his illness. For some weeks after the fever is over he may remain dull and indifferent, taking little interest in pursuits and amusements which formerly delighted him. A child of three or four years of age may seem to have forgotten how to talk; and the persistence of this mental weakness for some time after the strength has been restored is often a cause of great anxiety to the patient's friends. Such anxiety is, however, groundless, for the return of mental tone at no long interval may be confidently predicted.

These cases appear to be due sometimes to defective action of the kidneys. In one case which came under my notice the child (a boy of seven) was left after typhoid fever in an apathetic, stupid condition, taking no notice of anything, and never speaking even to make known his natural wants. He appeared to be in a state of great weakness, and had occasionally nervous seizures in which he became quite stiff, and seemed to be unconscious. His skin was dry and excessively inelastic; there was no discoverable disease of any of his organs; his temperature was subnormal. At first he had a slight trace of œdema of the legs, but this quickly passed off. His urine never contained albumen, but its quantity was small. For a long time the boy passed no more than ten or twelve ounces in the twenty-four hours, with a specific gravity of 1.015. The excretion of solid matter by the kidneys was so evidently deficient that diuretics were ordered, and the boy was forced to take a larger quantity of fluid. Under this treatment he soon began to mend; his urine became more copious with a higher density; the elasticity of his skin returned; his nervous seizures ceased; and his strength, mental and bodily, rapidly improved.

A child with any diathetic taint may have his predisposition strength-

ened by his illness. Tuberculosis sometimes occurs; and scrofulous tendencies may receive a distinct impulse.

Diagnosis.—On account of the negative character of the symptoms at the beginning of the illness, enteric fever is often difficult to recognize in the early stage; and even at a later period the nature of the complaint must be sometimes a matter of doubt. Still, the disease is one of such frequent occurrence that we should always remember the possibility of its being present, and should never omit in a doubtful case to make inquiry as to the existence of the disease in the neighbourhood. The beginning of measles, scarlatina, and variola is sufficiently distinctive to prevent their being confounded with this disorder, and moreover, the absence of the specific eruptions of these complaints will serve for their exclusion. A high temperature on the second day in a child who suffers from nothing but an ill-defined malaise is enough to give grounds for suspicion. If, as the days pass, no other symptom develops itself, our suspicions are materially strengthened; and when at the end of the week, enlargement of the spleen with swelling and tenderness of the belly can be detected, especially if there is also looseness of the bowels, there is hardly room for further hesitation.

Acute tuberculosis may present a very close resemblance to enteric fever in the child, especially as we sometimes see a rose spot here and there on the bodies of tubercular children which, except for being rather larger than the typhoid spot, and perhaps a little less delicate in colour, may be, and indeed has been, mistaken for it. In both tuberculosis and enteric fever diarrhœa may be a prominent feature; in both there is fever; and in both the general symptoms may be very indefinite. Often, in these cases we cannot decide, but must wait for time to relieve our uncertainty. But in many cases we may venture upon an opinion, for in tuberculosis the absence of any definite time of beginning; the less elevated temperature, the bodily heat being rarely higher than 101° in the evening; the distressed expression of the patient; the absence of inflation of the abdomen, and the natural size of the spleen are all points in which that form of illness differs from typhoid fever, and may serve to help us to a conclusion.

Sometimes enteric fever may be mistaken for tubercular meningitis. The illness may begin with drowsiness and sickness; the headache may be severe and provoke cries from the child such as are common in the intracranial inflammation; the vomiting may persist, and the bowels may be obstinately confined. Still, the belly is distended, and has not the doughy, flaccid condition of the parietes so peculiar to tubercular meningitis; the pulse, until convalescence begins, is not slow and intermittent; the respiration is not sighing; the pupils do not become unequal, and there is no squint. The temperature, too, is much higher in the case of typhoid fever, for in the earlier stages of tubercular meningitis the bodily heat is seldom greater than 101°. Later, none of the symptoms of the third stage of tubercular meningitis can be discovered.

Acute gastric catarrh, accompanied as it is in scrofulous children with pyrexia, may cause some embarrassment, but here the temperature is less high than in enteric fever, and does not undergo the same alternations; there is no distention of the abdomen, and no enlargement of the spleen. Still, in many cases, before the fever subsides on the ninth or tenth day, we cannot say positively that we have not to do with the more serious disease.

When the purging is severe the case may be confounded with one of inflammatory diarrhœa, and it is possible that in young children under

three or four years of age the mistake is often made. I think, however, that the shorter course of a non-specific muco-enteritis, the severity of the purging from the first, the haggard aspect of the patient, and, if the disease last long enough, the absence of splenic enlargement, of the rosy rash, and of the signs of pulmonary catarrh, should be sufficient to furnish a distinction.

Simple or tubercular ulceration of the bowels with enlargement of the mesenteric glands may be also mistaken for enteric fever. But in these disorders the temperature is less elevated than in typhoid fever, and the history of the illness is very different. Their course, also, is very much longer. There is, besides, absence of the rash, of the splenic enlargement (unless, as may happen, there is tubercular disease of the spleen) and of the signs of pulmonary catarrh. Further, in tubercular ulceration the lungs are generally the seat of consolidation and the emaciation is extreme.

Chronic tubercular peritonitis, with its rough harsh skin, its pseudo-fluctuation, and the caseous masses to be felt on palpation of the abdomen, can scarcely be confounded with enteric fever.

Lastly, the distinction between typhoid and typhus fevers is now sufficiently established. In the latter disease the onset is always abrupt, the rash, abundant and quite different in its appearance from the rosy typhoid spots, appears on the fifth day; the face is dusky; drowsiness and stupor are early symptoms; and the end—whether favourable or the reverse—comes in a sudden crisis.

Prognosis.—It has been already said that comparatively few children die from this disease; but small as is the percentage of mortality, it is greater than it need be. This is partly due to the way in which the disease begins, and the mildness of its early symptoms making diagnosis doubtful. It is also owing in part to the character of the early symptoms, and the abuse of domestic remedies. A child is found to be poorly; he vomits and complains of headache. Immediately he is treated to a dose of castor-oil or other aperient; and as the symptoms are not found to be relieved by this measure, the dose is repeated, perhaps several times. There is no doubt that such treatment is excessively injurious; and in hospital practice the cases which terminate fatally generally have a history of active purgation having been adopted before admission.

However severe the symptoms may be, we may look forward hopefully to the issue provided perforation has not occurred. Children respond well to stimulants in typhoid fever; and a patient who is seen stupid and drowsy and profoundly depressed on one visit, may present a very different appearance on the next under the free use of brandy. I think even muscular tremors have not the same unfavourable meaning in the child that they have in the adult. Still, if the tongue quivers when protruded, the lower jaw trembles when the mouth is open, and general tremulousness of movement is pronounced, we have reason to fear the presence of a deep ulcerative lesion in the intestine. Our apprehensions are strengthened if at the same time the belly is much distended, and the temperature remains persistently elevated after the end of the third week. In such a case the danger of perforation is imminent.

If perforation take place, the prognosis is most grave; but even in this strait death is not absolutely certain. If the collapse which follows the extravasation be quickly recovered from, even although considerable tympanitis, pain, and tenderness remain, we may hope that the peritonitis has been localised by intestinal adhesions, and that further improvement may take place.

Treatment.—In every case of typhoid fever, if there is any reason to suppose that the disease has been contracted in the house, the drains should be thoroughly examined at the earliest opportunity, and every care must be taken to prevent the entrance of sewer-gas into the passages. All soil-pipes should be ventilated: waste-pipes should be cut off from direct communication with the sewers; cisterns supplying water for drinking and cooking should be entirely separated from those whose purpose is merely sanitary; and the water itself—unless its purity be above suspicion—should not be drunk without having previously been boiled and filtered.

The treatment of typhoid fever consists mainly in careful and judicious nursing. Sir William Jenner has insisted strongly upon the absolute necessity in this complaint of perfect rest. The child should be confined to bed at once, and if the attack has occurred at a distance from his home, it is better that he should remain where he is, than run the risk of increasing the severity of his illness by the fatigues of a removal. Fatigue not only exhausts nerve-power, which is already reduced by the fever, but it also increases destruction of tissue at the same time that it checks elimination by the excretory organs. The bedroom should be a large one, and the air must be kept as pure as possible by judicious ventilation. Its temperature should not be allowed to rise above 65°. The patient should be lightly covered and not overloaded with bedclothes. There is, however, one precaution which it is expedient to take. As in all cases where the mucous membrane of the bowels is the seat of catarrh, flannel in the shape of a flannel bandage should be applied round the belly so as to avoid the risk of chill. All discharges from the body must be at once disinfected before being removed from the room, and linen, etc., soiled by such discharges must be subjected to the same disinfecting process before being washed. If there be reason to suspect the purity of the water-supply, none should be used for drinking purposes without previous boiling and filtering. This, however, the child may be allowed to drink without stint, provided too large a quantity be not taken at once. A free supply of water assists the depurating action of the skin, kidneys, and lungs; but distention of the stomach by too much fluid is provocative of nausea and flatulence. For this reason effervescing drinks are to be avoided; they are apt to distend the stomach and cause uneasiness.

The question of diet is a very important one. The old plan of "starving the fever" and reducing the patient has been fortunately abandoned, but we must not fly to the opposite extreme and overload the stomach with food in the hope of supporting the strength, however digestible and well selected the food may be. Farinaceous matters, on account of their tendency to ferment and form acid, are better avoided. Fruit for the same reason is out of the question. It is better to restrict the diet to meat broths made fresh in the house, and to milk. The broths may be flavoured with vegetables, but must be carefully strained. The milk should be diluted with an equal quantity of barley-water, so as to split up the curd and prevent its coagulating in the stomach in large lumps. Masses of hard curd are a frequent source of irritation, and may excite restlessness and abdominal pains. They may also, perhaps, increase the diarrhœa. The quantity of food to be given at one time should never be left to the discretion of the attendants. Nourishment should be administered in prescribed doses at regular intervals—the quantity and the length of the intervals to be decided by the age of the patient and the facility with which the meal can be digested. Nausea, restlessness, excitement of pulse, in-

crease of fever, and flushing of face, are signs that the digestive organs are being taxed beyond their powers.

The question of stimulation is closely allied to that of food. Stimulants must not be given too early. They are useful to strengthen the action of the heart and increase nerve-energy, but are seldom required before the end of the second or beginning of the third week of the disease. Even then, they should be only given in severe cases where the heart's action gives signs of failing, and there is marked delirium or great muscular prostration with tremor. Tremor, "out of all proportion to other signs of nervous prostration," is, in the opinion of Sir William Jenner, evidence of deep destruction of the bowel. In these cases alcohol is of the utmost value. The signs connected with the heart which may be taken to indicate the necessity for stimulation are diminution or suppression of the impulse with feebleness of the first sound. The effect of stimulation should be carefully watched. If the fever diminish, the tongue and skin get or remain moist, the pulse and respiration become slower and fuller, and the mind clearer, we may know that we have benefited our patient. If, on the contrary, the temperature rise, the heart's action become feebler and more frequent, the delirium increase, and the child get restless with inability to sleep ; or if he become duller and seem sinking into a comatose state, we may conclude that alcohol is acting injuriously, and that it must be discontinued or given in smaller quantities.

In typhoid fever, as in all other febrile diseases, it is important to watch the temperature and regulate it. If, for instance, with a temperature of 105°, we find restlessness and excitement with wakefulness, the child should be sponged over the whole body with tepid or cold water. This lessens fever, calms irritability, and induces sleep. More than tepid or cold sponging is seldom necessary. If, however, the temperature be not appreciably lowered by the sponging or rise again immediately, the child may be placed gently in a bath containing water at 70°, and be kept immersed for ten, fifteen, or twenty minutes. It is well to continue the bath until distinct shivering has been produced. The child must be then removed, wiped dry, and returned to his bed. A stimulant may be given at this time if thought desirable. The cool bath should not be used unless there is a real necessity for it. Children can bear a continued high temperature better than older persons ; and if there is a daily remission, as occurs in most cases, mere sponging will do all that is required.

Delirium is scarcely sufficiently violent in children to require treatment—at any rate in ordinary cases, and headache is seldom a troublesome symptom. If it should be so, it is usually relieved by cold applications. Sleeplessness may be generally relieved by the tepid sponging above referred to. If necessary, a draught containing bromide of potassium in combination with chloral may be given.

Diarrhœa may sometimes require remedies. In every case where the stools are too frequent and watery we should examine them for curd of milk. If this be present, the amount of milk taken at one time must be reduced. We should also take care that the child does not drink fluid in excess, and if necessary his drink must be given to him in smaller quantities. When drugs are required to arrest the purging, chalk and catechu should be given if the motions are frothy. If they are strongly alkaline, dilute sulphuric acid is most useful. In the later period, when there is ulceration of the bowel, bismuth in large doses is indicated. Hæmorrhage from the bowels is a comparatively rare symptom in the child and seldom requires treatment by drugs. If necessary, however, gallic acid and dilute

sulphuric acid may be administered with small doses of opium. In such a case the child should on no account be allowed to raise himself from the recumbent posture even to relieve the bladder or the bowels. It is well also to give him his food in small quantities and in a concentrated form. Strong beef-essence, well iced, and good meat jelly should be employed; and but little milk should be allowed, for fear of irritating the intestine with lumps of curd.

If perforation and peritonitis occur, opium should be given in small doses, but frequently, so as to produce some of the early physiological effects of the drug, such as drowsiness and tendency to contraction of pupils. In my experience opium is in such cases of small value unless pushed to this extent. The belly should be also smeared with an ointment composed of equal parts of extract of belladonna and glycerine, and be kept covered with hot linseed meal poultices frequently renewed. The food in these cases also must be concentrated and given frequently in small quantities. Brandy and egg will be required to sustain the strength.

During the period of convalescence careful feeding is still necessary, for errors in diet at this time are a frequent cause of relapse in the fever. I have always made it a rule to allow no solid food until ten days have passed after the final fall of temperature. But even then the usual diet of health should be only slowly returned to.

In order to prevent relapses Immerman recommends, in addition to the utmost vigilance with regard to diet, the daily administration of salicylate of soda in full doses; beginning directly the fever subsides, and continuing the use of the drug for ten or twelve days. The after anæmia and weakness must be combated by iron and good food. Change of air to a dry bracing place or to the seaside is very useful.

CHAPTER X.

DIPHTHERIA.

Diphtheria is an acute contagious disease which, on account of its prevalence, its gravity, its consequences, and the frequency with which it is met with in the child, takes a prominent place amongst the disorders of early life. The disease induces great anæmia and prostration, and is characterized anatomically by inflammation of various mucous surfaces and the formation on them of a more or less tough and leathery false membrane. The inflammation often spreads to some distance from its point of origin, but at first is usually confined to a comparatively limited area. The seat varies in different cases; and the symptoms are therefore subject to great variety according to the part in which the chief local expression of the disease occurs.

When the inflammatory process attacks the larynx the malady is called membranous croup, and this was long held to be a distinct affection. Whether all cases of membranous croup are diphtheritic in their nature —whether a false membrane can be developed in the air-passages apart from the diphtheritic poison—is a question upon which pathologists in this country are still divided. That membranous croup arises in many cases from this cause is undeniable. Instances have been met with in which diphtheria has attacked the pharynx in some members of a family and the larynx in others. Thus, Dr. Woodman found membranous laryngitis in two infants, aged respectively eighteen months and two months, while others of the family suffered from false membrane in the mouth and pharynx. Dr. Wilks has seen in different inmates of the same house the disease remain confined to the throat, or spread thence to the larynx, or begin in the larynx; and Trousseau refers to a case reported by Dr. A. Guérard in which a little girl died of laryngeal croup, and other members of the family suffered immediately afterwards from pseudo-membranous pharyngitis. Moreover, it is admitted by the best authorities that the laryngeal false membrane has exactly the same anatomical characters, whether it be due to the spread of a pharyngeal diphtheria or arise primarily as a case of membranous croup.

Advocates of the essential difference between the two forms of illness maintain that the *character* of the two diseases is not the same. Croup, they say, is a sthenic disease, while diphtheria is asthenic. But some cases of croup are accompanied by severe constitutional depression and all the signs of profound general disease; while diphtheria is not invariably accompanied by symptoms of prostration. Indeed, one of the peculiarities of this affection is the occurrence sometimes of marked paralysis after an attack of sore throat so mild as to be almost overlooked.

Secondly, it is pointed out that in diphtheria the glands at the angles of the jaw are invariably enlarged, while in membranous croup they are little if at all affected. But the larynx has little connection with the su-

perficial cervical glands. As Dr. Morell Mackenzie has pointed out, in cancer of the larynx the cervical glands are not enlarged, while if the malignant disease affect the pharynx these glands are always involved.

Thirdly, the contagiousness of diphtheria is insisted upon, while membranous croup is said not to be communicable by one child to another. But the risk of infection is in direct proportion to the amount of exudation, and the readiness with which the membrane can be detached and dispersed. In the glottis the membrane is very firmly adherent; in the pharynx its connections are much looser, and it is much more easily separable from the mucous surfaces. Moreover, as Sir William Jenner has observed, the conditions in which the patient is placed vary greatly in the two cases. A child with diphtheria in its early stage is up and about, kisses his brothers and sisters, and has every opportunity of conveying the disease to them. A patient with membranous croup is kept in bed apart from the other children and carefully tended. Still, there is strong evidence that, in spite of these hindrances to its ready communication, membranous croup may be conveyed from one child to another. Dr. Trend states that he has seen the laryngeal disease in more than one child of a family at the same time. Dr. Wilks believes that he has seen diphtheria begin in the house as a case of supposed membranous croup, and afterwards attack others of the inmates in the form of diphtheritic pharyngitis. Dr. A. Guérard's case, already referred to, is another instance of the contagiousness and interchangeability of the two varieties.

Fourthly, albuminuria, which is common in diphtheria, is said to be rare in membranous croup. But this is not altogether the fact. Moreover, albumen does not always appear in the urine at the beginning of an attack of diphtheria, but may be delayed for several days. Now the duration of fatal cases of croup is often terribly short; so that the patient may die before the albuminuria has had time to occur.

Lastly, paralysis is a not uncommon sequel of diphtheria, while in membranous croup it is very rare. But it must be remembered that true membranous croup is an excessively fatal disease and comparatively few cases recover. Even as a consequence of diphtheria the occurrence of paralysis is variable in different epidemics; and taking the milder cases with the severer, the proportion has been estimated by Dr. Greenfield at no more than one in twelve. In convalescents from membranous croup the proportion who are likely to suffer from paralysis would, therefore, under any circumstances be very small.

From consideration of the above facts and arguments the only conclusion to be drawn is that a large proportion of cases of membranous croup are cases of laryngeal diphtheria. It does not, however, follow that membranous laryngitis is never due to any other cause than the diphtheritic poison. The child's larynx is especially prone to membranous inflammation; and if, as has been positively stated, a true false membrane may be set up by burns, scalds, and other irritants to the air passages, it is possible that the disease may occasionally occur independently of the diphtheritic virus.

Diphtheria is met with both as an epidemic and as an endemic disease, and varies much in character and severity at different times and in different localities. It may attack children who are apparently in robust health, may arise in cachectic subjects, or appear as a sequel of severe general disease. Like typhoid fever the disorder is apt to occur more than once in the same individual, for the protection it affords against a recurrence is by no means complete. Sometimes the second illness may be more severe

than the first, for a child who has passed safely through one attack may succumb to a second.

Causation.—On account of the susceptibility to diphtheria in early life, childhood may be considered to be one of the predisposing causes of the malady. Infants under twelve months of age are not often attacked; but after that age and up to the fifth or sixth year the disease is frequently met with. After the sixth year it again becomes less common, and is comparatively rare in the adult. Besides this natural susceptibility, there is probably in many cases a special susceptibility inherent in the constitution of the patient. Sometimes whole families are cut off during an epidemic of the distemper. Sometimes successive children of the same parents fall victims to the disease at various times and in different places; and in many cases this unfortunate predisposition appears to be a hereditary defect. Besides these general causes, special delicacy of the throat may render the child more sensitive to the diphtheritic poison, inclining him to take the disease where a stronger subject would escape altogether. Also the presence of a catarrhal condition of the fauces at the time of exposure to the unhealthy influence increases the likelihood of infection. The scrofulous constitution has been said to induce a susceptibility to the diphtheritic virus; and there is no doubt that the subjects of this diathesis are, as a rule, keenly sensitive to all forms of zymotic poison.

Cold and moisture appear to have some influence in quickening the activity of the contagious principle, for the disease is common in country districts, especially in damp places, and is more prevalent during the winter months than at any other period of the year.

With regard to the exciting causes: There can be no question as to the highly poisonous nature of the exudation from the affected surfaces, for the discharges have often communicated the disease by coming into contact with a healthy mucous membrane. The virus may, however, be also conveyed by more subtle emanations from the affected person; and it is believed that the contagious principle may be carried to a distance in the clothes of the patient himself after convalescence, or in the dress of a nurse who has not herself suffered from the disorder. Indeed, all the surroundings of the patient appear for some time to be capable of communicating the disease. It is even stated that in certain cases a convalescent may be still the channel through which the diphtheritic virus is conveyed to exceptionally susceptible subjects, although a period of months has elapsed since recovery from the disorder; but in such a case it would be difficult to exclude other and more recent sources of infection.

The poison may be drawn into the lungs with the air or swallowed in contaminated water; but much uncertainty exists with regard to the laws which govern the transmission of the infective matter. Old cesspools and drains appear to preserve the contagium for a long time in a state of active virulence, but there is no proof that the poison can be generated spontaneously from ordinary filth. The distemper may originate in a district under one set of conditions and be distributed under other and different conditions. There is no doubt that insanitary surroundings tend to favour the spread of the disease; still it is probable that other influences also regulate the diffusion of the infection; for when an outbreak occurs in any district, it is not always in the poorest and least cleanly localities—in parts, that is, where the disease would be expected to be most active—that the largest number of cases occurs.

In many outbreaks certain faulty conditions, such as polluted water-supply, long standing accumulation of excrementitious matters, and imper-

fect sewerage and drainage generally, are found to be common to all the dwellings in which the disease appears. These sanitary deficiencies are then held to furnish an explanation of the source of the infection. In other cases no such common conditions can be discovered, and the origin of the outbreak is less easy to account for. This was the case in an epidemic of diphtheria which occurred at King's Lynn, and was reported on by Dr. Airy. Here personal conveyance of the disease was positively excluded in the majority of cases. The milk was not at fault. The water-supply, the system of drainage, and the method of disposal of the excrement were insufficient, either singly or together, to explain the distribution of the infection. It was, however, noticed that excavations had been in progress in the mud of the ancient river-bed and of a creek which had once been a sewer in connection with the town. Dr. Airy suggests that by this means "long-buried germs of some indigenous diphtheria, causing microzymes," may have been disengaged; and that these carried amongst the inhabitants, and aided by season and atmosphere, may have given rise to the outbreak.

Diphtheria is no doubt the consequence of a specific poison, however this may originate. The essence of the disease has been attributed to spherical bacteria (micrococci), which have been discovered swarming in the false membranes and exudations from the inflamed mucous surfaces; but as similar bacteria have been found in the secretions thrown out by ordinary non-specific stomatitis, too much importance must not be attributed to the presence of these organisms. The real nature of the virus has yet to be discovered. The disease with which diphtheria has the closest affinity appears to be scarlatina. Epidemics of the two disorders are frequently seen to prevail in the same neighbourhood at the same time, and it was once supposed that the exciting causes of the two diseases were the same. It is now, however, acknowledged that they have no mutually protective power; and there is no evidence that the contagion of diphtheria has ever given rise to scarlatina.

Morbid Anatomy.—When the pharynx is examined the changes found on the inflamed mucous membrane are as follows: the surface becomes hyperæmic and swollen, and after a few hours is covered with a whitish or yellowish layer which adheres closely to the mucous membrane beneath it, fitting accurately into every depression of the surface. The layer when first formed cannot be removed; but as it increases in extent and thickness, it gradually becomes tougher, and can then be peeled off the surface to which it adheres. Later, it begins to loosen and may separate spontaneously. When uncovered the mucous membrane may be found to be reddened and thickened, and if the inflammation has been severe, raw-looking or even ulcerated.

On examination of the false membrane, it is found to present to the naked eye the appearance of coagulated fibrine; but under the microscope is seen to consist of proliferated epithelial cells which are fused together into a network. These cells are cloudy from a peculiar degeneration of their protoplasm. A vertical section of the layer shows the undermost cells to be much smaller than those at the surface, and in a far less advanced stage of degeneration. Minute extravasations of blood are also scattered through the substance of the layer. If the vertical section be made *in situ* and be carried down through the mucous membrane, it will be seen that the exuded layer is seated directly upon the basement membrane, taking the place of the ordinary epithelial coating. When the morbid process comes to an end, degeneration ceases; a little purulent matter, formed by

unaltered new cells mixed with serum, appears between the mucous surface and the false membrane covering it, and the latter is detached.

In the *larynx* the mucous membrane is inflamed and swollen, and a fibrinous exudation is thrown out between the basement membrane and the epithelial covering. This on examination can be separated into layers consisting, according to Rindfleisch, of alternating strata of corpuscular elements (leucocytes) and of fibrine. The superficial epithelial layer very quickly disappears. The micrococci, which are found in immense numbers in the false membrane, have been already referred to. According to Senator, these organisms are common to all forms of stomatitis, and are probably identical with the spores of the leptothrix buccalis.

The consistence of the false membrane varies in different cases. It is often tough and tenacious, especially in the air-passages; but sometimes is very soft and pultaceous. The latter condition is common when the false membrane occupies the pharynx in cases accompanied by severe constitutional symptoms and great bodily prostration. The more usual seats of the false membrane are the tonsils, uvula, soft palate and back of the pharynx; the nasal passages; the larynx and trachea. Less commonly it is found on the conjunctiva; at the borders of the anus, and in girls of the vagina. Sometimes it appears on wounds of the skin. The mucous membrane is usually, as has been said, congested and swollen. It is very irritable and bleeds easily. Sometimes there is superficial ulceration, and in rare cases the ulceration extends deeply, and sloughing of the tissues may occur. Small ulcerations about the edges of the glottis are especially common in cases where the inflammation occupies the larynx. The cervical glands are swollen from rapid proliferation of small round cells, and the surrounding tissues are infiltrated with serum containing scattered pus-cells.

Besides these local pathological changes, other organs of the body are often affected. Thus:—

The *lungs* may be the seat of lobular pneumonia or collapse; and the air-passages are sometimes lined with false membrane as far as their smaller branches.

The *heart*, although itself showing no signs of disease, may have its right ventricle filled with a colourless ante-mortem clot which extends into the ventricle. It is sometimes stated that the lining membrane may be the seat of endocarditis; but Parrot asserts that he has never met with endocarditis in a case of fatal diphtheria. He believes that the beading elsewhere described, which is almost a natural condition in many young infants, has been mistaken for the result of inflammation. Pericarditis, however, is occasionally present; and in a few instances a granular degeneration of the heart-walls has been observed. This degeneration is considered by Leyden, of Berlin, to be of an inflammatory character. It consists in a multiplication of the intermuscular nuclei which atrophy and form spots of degeneration. At the same time the muscular fibres undergo fatty degeneration. As a consequence of these changes the heart-walls become softer in consistence; extravasations of blood take place into them; and their cavities are dilated.

The *kidneys* may be enlarged and pale, with more or less granular deposit in the renal cells. The cells themselves are often detached so as to block up the tubes. They are mixed with hyaline casts.

Besides the above changes, there may be extravasation of blood into the various organs and beneath the mucous and serous surfaces. This occurs in the malignant form of other varieties of acute specific disease.

On account of the frequent occurrence of paralysis during convalescence

from diphtheria, the nervous system has been carefully examined for signs of degeneration. Charcot and Vulpian were the first to discover indications of pathological change. In the year 1862 these observers detected granular degeneration of nerves and muscles of the soft palate. In the motor nerves of this part the tubules were emptied of their medullary substance, and their neurilemma contained many granular cells. Oertel, in 1871, found many extravasations in the substance of the brain, spinal cord, and spinal nerves in a case where death had occurred from diphtheritic paralysis with general atrophy of muscle. Similar extravasations have been found by Buhl. In addition, this observer noticed the nerves to be thickened at their roots, and their sheaths to be filled with hypertrophied lymphoid cells and nuclei. Déjerine, in five cases of death in children from diphtheritic paralysis, found in each instance changes strictly limited to the nerves supplying the paralysed parts. These changes consisted in a degeneration of the anterior roots similar to that which takes place in the distal end of a nerve after section. He attributes the degeneration to changes in the gray matter of the anterior cornua.

There is no doubt that diphtheria is a specific contagious disease, and that it is, at least finally, a constitutional one; but opinions differ as to whether the malady is constitutional from the first. The more commonly received opinion is, perhaps, that the affection is always a constitutional one, and that the throat lesion is its chief local expression, analogous to the rash of specific fevers. Some pathologists are, however, inclined to believe that the lesion of the mucous membrane is at first a purely local ailment resulting directly from contact with the poison, just as the pustule of small-pox may be excited locally by the process of inoculation. According to this view the constitutional suffering would be of the nature of septicæmia, the blood being directly contaminated by absorption of a specific virus from the diseased spot. The well-known influence of a catarrhal state of the fauces in increasing the susceptibility of the individual to the diptheritic contagion seems to lend support to this theory.

Symptoms.—As in all forms of zymotic disease, the onset of the illness is preceded by a period of incubation. This period may occupy only a few hours or may last for a week or eight days before the symptoms of invasion are noticed.

Cases of diphtheria may be divided, according to the gravity of the symptoms, into the mild, the severe, and the malignant forms.

In the *mild* form of the disease the child is a little feverish, often complains of headache, and is unwilling to swallow solid food. The fever is slight, the temperature often rising to between 101° and 102°, seldom higher. (Thus, in the case of a little girl, aged two years and ten months, temperature: second day, morning, 99.4°; evening, 101.6°. Third day, morning, 99.4°; evening, 101°. After this date the temperature was normal both morning and evening.) In all cases there is some languor and loss of spirits with a certain expression of distress in the face. Even in slight cases a little change is noticed in the quality of the voice, which becomes nasal or throaty. Vomiting is not common in the mild form, although in the severer cases it may be a frequent and distressing symptom. Sometimes the symptoms are even less marked. The child may take his food as usual without any complaint, and only show his indisposition by a certain pallor of face and want of sprightliness in his look.

When the throat is examined, the fauces are found to be red and swollen, but more on one side than on the other; the uvula is distinctly increased in size; and on one or both tonsils a gray or fawn-colored,

tough-looking opaque patch will be seen, usually occupying the anterior face. The patch may be a continuous layer of some consistence, or may be composed of spots of false membrane scattered over the surface. These, however, soon unite so as to form a more coherent coating. In all cases the glands at the angles of the jaw are tender and enlarged; but this symptom is often not marked until the end of the second or the beginning of the third day.

In the mild form the temperature often falls after three or four days. The general symptoms continue trifling; the child takes food with appetite; and unless he attempt to swallow solid food, deglutition is accompanied by little distress. The false membrane may spread a little along the soft palate, but usually remains limited in extent. Very quickly it begins to separate at the edges and then becomes detached. In rare cases, after spontaneous separation of the first patch of membrane a second appears upon the mucous surface. I have known this to happen in one instance. The sore throat may be accompanied by some discharge from the nose. Usually, at the end of a week or ten days the child is convalescent from the throat affection; but it still remains to be seen whether he will escape after ill-consequences.

In the *severe* form the disease may be severe from its intensity or dangerous from its seat. Thus, it may spread widely over the pharynx and be accompanied by signs of serious constitutional suffering; or may attack the larynx and, although limited in extent, produce the gravest consequences from interference with the respiratory process (membranous croup).

Severe pharyngeal diphtheria may begin with the mild general symptoms which are common in the slighter form which has been described; or may be accompanied by much more serious phenomena. Thus, the child complains of difficulty of swallowing and of racking headache; his face is pale and distressed; fever is high; vomiting may occur on any attempt to take food; and the patient may even be convulsed. The false membrane in the throat is thick and generally coherent. It spreads rapidly over the tonsils, the soft palate, and the back of the pharynx; often penetrates into the nasal fossæ, or forms patches on the cheeks, the gums, and the lips. The odor of the breath is soon noticed to be fetid or even gangrenous; and a thin offensive discharge escapes from the nostrils and forms crusts at the openings of the nares.

The submaxillary glands are enlarged and tender; and there is much swelling of the neck. Sometimes hæmorrhages occur from the nose, throat, and gums. The face is pale with a tendency to lividity; the pulse is rapid and feeble; appetite is completely lost; the bowels are generally relaxed with thin offensive stools; and there is great prostration. Sometimes in these cases the false membrane is loose in consistence and may even be pultaceous. It may assume a dirty gray or brownish hue, and is sometimes almost black from admixture with blood.

When the end is favourable this form lasts for ten days or a fortnight. After a time, if no serious complication occurs, the false membrane separates and is not renewed; the swelling subsides; the pulse becomes stronger; the appetite begins to return; and the child enters into convalescence, although for some time he remains anæmic and feeble. Often, however, the patient dies at the end of the week either from exhaustion, from extension of the inflammation to the larynx, or from one of the complications to be afterwards described. The mind is usually clear throughout, although in the worst cases—those in which the disease approaches

most nearly to the malignant type—death may be preceded by delirious wanderings or stupor. In such cases a real septicæmia may occur, the blood being poisoned by the absorption of foul putrescent matters in contact with the tissues of the pharynx. The child often shivers, and his temperature rises to 103°or 104°, often sinking again in rapid daily variations. The pulse is small and feeble ; the eyes sunken and dull-looking ; the complexion of a dirty yellow tint. There is often epistaxis ; the cervical glands swell to a large size ; and the loose areolar tissue of the neck is infiltrated with serum. The prostration is extreme ; apathy is complete ; delirium comes on ; and the child quickly dies.

In severe diphtheria the amount of fever varies. Even in very bad cases it need not be high. Sometimes the temperature is 103° or 104° at the beginning of the illness, and sinks to the normal level or even below it when the more serious symptoms declare themselves. Sometimes after falling it may again become elevated and reach 106° or higher before death. Some inflammatory complication is then probably present.

Albuminuria is a frequent symptom. It occurs in about two-thirds of the cases, but does not necessarily imply gravity in the prognosis. Its amount is usually in proportion to the extent of surface involved. The albuminuria appears to be the consequence of a rapid elimination through the kidneys of poison absorbed from the affected mucous membrane. In severe cases it may be found as early as twenty-hours from the beginning of the illness. This is, however, exceptional. Usually it appears on the third or fourth day, but it may be sometimes delayed as late as the ninth or tenth. Sometimes the urine is smoky. It contains an excess of urea, and hyaline and granular casts may be detected in the deposit. The kidneys are in a state of mild parenchymatous nephritis, but this passes off as convalescence becomes established, and rarely leaves ill consequences behind. It is very rare for uræmic symptoms or dropsy to occur.

When the disease attacks the larynx (laryngeal diphtheria ; membranous croup) the child is at once in serious danger. In the majority of cases the laryngeal disease is due to extension of inflammation from the fauces. Less commonly the inflammation begins in the trachea and spreads thence upwards and downwards. Cases where the disease develops originally in the glottis (the so-called true membranous croup) are very rare. Still rarer are the cases where the false membrane remains limited to the glottis. In my own experience I cannot call to mind a single case of membranous laryngitis in which some evidence of false membrane in other parts was not to be obtained. In most cases there was also exudation in the fauces. In a few the membrane had spread down the trachea and the fauces were free ; but even in these cases patches of exudation were usually found on examination after death at the back of the nares.

The extension to the air-passages often takes place quite suddenly and unexpectedly. The preceding symptoms had been slight, attracting little attention, when suddenly the breathing is noticed to be stridulous. The symptoms of membranous croup then develope themselves with startling rapidity. Usually the sore throat and signs of catarrh continue for several days before any more alarming symptoms are observed. The child is not thought to be ill. He seldom refuses his food ; and although a little languid and unusually anxious for drink, does not appear to be distressed.

When the laryngeal disease begins the breath-sounds lose their ordinary character and become harsh and stridulous. At the same time the cough is hard and harsh and the voice and cry are hoarse. The change in the char-

acter of the breathing may be the earliest of the new symptoms, or may be preceded by the change in the voice and cough.

This stage of the disease may continue for several days; but often after a few hours the breathing becomes greatly oppressed, and attacks of violent dyspnœa throw the patient into the greatest distress. In these attacks, however violent they may be, there is no orthopnœa, for the breathing is not more oppressed when the head is low. As a rule, the child lies back in his cot or in his mother's arms. His face is livid; his mouth is open; his eyes stare wildly, and he looks dreadfully anxious and frightened. The dyspnœa affects both respiratory movements. Each inspiration is prolonged, high-pitched, and metallic; the expirations shorter and harsh; the cough hoarse and whispering. If the chest is uncovered at this time it will be noticed that at each inspiration the lower half of the breast-bone bends inwards so as to leave a deep pit in the epigastrium. At the same time the intercostal spaces deepen and the supra-sternal notch is depressed. The attack of dyspnœa lasts from a few minutes to a quarter of an hour or longer. When it subsides the child's terror disappears; his breathing becomes less noisy and stridulous; his respiratory movements less laborious, and he passes into a state of comparative ease. Still, the breathing is rapid and audible; the nares work violently; some lividity remains in the face, and there is considerable recession of the soft parts of the chest in inspiration. On examination of the chest, the breath-sounds are accompanied by a stridor conducted from the larynx, and this may completely conceal all natural vesicular murmur.

The attacks of dyspnœa return at short intervals, and are easily excited by movement or by anything which irritates or agitates the patient. The cough occurs frequently and is hoarse and whispering. Sometimes the patient expectorates patches or shreds of false membrane; but unless the trachea be opened the child rarely expels enough of the obstructing substance to produce appreciable relief to his symptoms. At each recurrence of the dyspnœa the attack is more severe than before, so that gradually the child passes into a semi-asphyxiated state. He lies back with purple lips and livid face; his pulse is feeble, frequent, and very irregular; his breathing rapid and shallow, although his nares still work; his forehead clammy, and his extremities cold. He often moves his arms restlessly, and his heart's action may become very intermittent, a curious pause taking place between every two or three pulsations. On examination of the chest there is usually good resonance, except perhaps at the extreme base. The breath-sounds are obscured by conducted stridor and may be accompanied by dry rhonchus. If no operative procedure be attempted the drowsiness deepens into stupor, and the child sinks quietly or dies in a last struggle for breath.

If at this stage the trachea be opened, the immediate effect of the operation is most striking. In a favourable case, where the trachea below the opening is not obstructed, the child is at once relieved from almost all his distress. Air again penetrates deeply into the lungs; the lividity disappears; the restlessness subsides; the breathing becomes natural; the nares cease to act, and the look of terror and suffering passes off and may even be succeeded by a smile.

When the disease thus attacks the larynx the duration is usually very short. From the time when the first signs of stridulous breathing are noticed to the end only a few hours may elapse. In other cases the child may live two or three days; but this longer duration is due to slower progress in the earlier part of the illness. When serious dyspnœa super-

venes the child, if not relieved by operation, seldom survives the next twenty-four hours. Sometimes, however, if the false membrane is very limited in extent, recovery may take place. In these cases the symptoms are seldom very severe, and in particular the attacks of dyspnœa, if present at all, are mild and infrequent. The favourable change is marked by a less laboured character of breathing, a brighter look in the face, increased looseness and more natural quality of the cough, and a return of tranquillity to the manner. Still, there is little doubt that many cases of supposed recovery from membranous croup are really cases of stridulous laryngitis, which is a much milder complaint and rarely ends fatally.

In the *malignant* form of the disease the constitutional symptoms are very severe, and may be quite out of proportion to the amount of local lesion. Vomiting is usually frequent. There is often diarrhœa. The child is pale and haggard-looking, and seems stupid and drowsy. His skin is spotted with petechiæ. His pulse is rapid, small, and feeble. His feet and hands are cool and clammy, and even the internal temperature of the body seldom reaches a high elevation. Sometimes, indeed, it is normal or even subnormal. Thus a little boy, aged two years and a half, was admitted into the East London Children's Hospital with wash-leather-like exudation on the fauces, great swelling of the cervical glands, and marked prostration. In this boy the temperature never rose above 98.2°, and a few hours before death was only 97° in the rectum. The child died two days after admission in a convulsive fit.

The false membrane is generally of a dirty-brown colour. Extension of the inflammation takes place rapidly into the nose ; epistaxis often occurs, or there is a flow of thin blood-stained fluid from the nostrils. Sometimes the lachrymal ducts become obstructed ; the eyes then look watery, and false membrane may even appear on the conjunctivæ. The mucous membrane of the fauces may become ulcerated or gangrenous, and the smell from the mouth is very offensive. Hæmorrhages may occur from the gums and throat. The urine is often smoky and almost always albuminous. Delirium comes on followed by stupor, and the child dies exhausted.

Secondary Diphtheria.—Sometimes diphtheria occurs secondarily to some acute disease. Thus it may arise as a complication of typhoid fever, pyæmia, erysipelas, measles, scarlatina, whooping-cough, or other form of acute illness. In these cases the amount of false membrane is usually limited in extent, but the inflammatory process is apt to run on into ulceration or even gangrene. The ulcers are rounded or sinuous, and may penetrate deeply into the tissues. Gangrene is not common. It usually occurs in the tonsils and pillars of the fauces. These parts become gray and exhale a most offensive odour. The sloughs separate after a time and leave grayish, unhealthy-looking pits which in favourable cases may heal, with considerable contraction of tissue in the affected parts.

Complications.—The ordinary course of diphtheria may be interfered with by various complications which delay recovery or unfavourably influence the issue of the illness. The occurrence of albuminuria cannot be looked upon as a complication. This symptom is found in mild as well as in severe cases, and is far more often present than absent. It appears to be the consequence of elimination of the poison by the kidneys, and has probably little influence on the prognosis. The complications which will be considered consist of the formation of false membrane in unusual situations ; the occurrence of inflammation of special organs, such as the lungs, the heart, and the pericardium ; the formation of a thrombus in the heart or large vessels ; and the appearance of paralysis.

Nasal diphtheria has been already referred to as constituting a symptom of the malignant type of the disease. A diphtheritic coryza is, however, sometimes seen as a complication of milder attacks. In these cases a thin discharge flows from the nostril, usually at first on one side only. It produces some excoriation of the margin of the nasal opening as well as of the upper lip, for these parts are often red and raw-looking. No doubt the presence of false membrane in the nasal passages is a sign of the utmost gravity ; but I have known coryza with excoriation of the nostril to occur in cases of a comparatively mild nature without producing an unfavourable influence upon the course of the illness.

Sometimes in epidemics of diphtheria more unusual manifestations of the disease are met with. The false membrane may form upon the conjunctivæ, the external auditory meatus, the outlets of the vagina and rectum, upon the glans penis, and upon any wounds or abraided surfaces present on the skin. Often after tracheotomy the edges of the wound quickly become covered by the diphtheritic exudation. These exceptional seats of the false membrane may be the only local signs of the disease to be discovered, or may be accompanied by the usual affection of the throat. When a wound or abraided surface becomes attacked by the diphtheritic process, its borders become purple-red and swollen, and the surface pours out a profuse, watery, fetid discharge. Soon a pellicle forms on the sore, and from this point the disease may spread over the skin. Thus the discharge irritates the neighbouring cutaneous surface ; little vesicles form, break, and become themselves converted into diphtheritic sores covered by the characteristic false membrane. In this way, according to Trousseau, the diphtheritic process may spread over a large extent of surface ; and the layers of membrane, constantly moistened by the discharge, undergo rapid decomposition, and give out a most offensive gangrenous stench. The general symptoms in such cases are very severe, and the patient usually sinks rapidly from exhaustion.

Inflammatory complications sometimes arise in the course of diphtheria. After the operation of tracheotomy for membranous croup, it is unfortunately far from uncommon to find the temperature rise to 102° or 103°, and to discover, on examination of the chest, all the signs of acute consolidation of the lung. Sometimes, however, the pulmonary lesion is an early complication. In any case it greatly lessens the child's chances of recovery.

Inflammation of the pericardium and endocardium are occasional complications of the illness. Pericarditis occurring alone will probably be overlooked without a careful examination of the precordial region. Endocarditis also may give rise to but few symptoms, and is often only discovered on examination of the body after death. We must, however, be on our guard, and avoid attributing to endocarditis the hæmatomatous beading of the mitral valve described by Parrot. (See page 546.)

When a thrombus forms in the heart, death may occur either suddenly at the moment of formation of the coagulum, or grædually after an interval of much anxiety and suffering. Usually the symptoms appear quite suddenly, and at a time when the child seems to be going on favourably to convalescence, or even after recovery is far advanced. If the formation of the clot does not bring the case to a sudden termination, marked dyspnœa is one of the earliest signs of the accident.

Dyspnœa arising from want of blood in the pulmonary circulation is shown, as Dr. Richardson has pointed out, by symptoms very different in character from those due to an obstructed larynx. In the first case, al-

though the breathing is laboured, the lungs are full of air and may even be distended with it sufficiently to produce in the younger subjects a peculiar prominence in the anterior part of the chest. There are no signs of imperfect aëration of blood, but all the symptoms indicate obstruction to the circulatory current. Thus the lips and cheeks are blue ; the jugular veins distended ; the heart-impulse quick, feeble, and irregular. The body is cold and pale ; it may be marbled, especially at the extremities ; and there is intense anxiety and constant movement. When death occurs, the heart ceases to act before the respiratory movements have come to an end.

On the other hand, when apnœa occurs from laryngeal obstruction the symptoms all point to imperfect aëration of blood. The surface of the body is dusky instead of pale ; the heart-sounds are clear ; the cardiac impulse is feeble but rarely tumultuous ; the lungs are congested but not emphysematous ; there is great recession of the epigastrium and soft parts of the chest at each inspiration ; the muscles are convulsed ; and the breathing stops before the movements of the heart cease.

Sudden death is due in most cases, probably, to the rapid formation of a clot in the right side of the heart. It may be also the consequence of paralysis of the cardiac branches of the par vagum ; but in cases where the sudden end has been attributed to this cause, a granular degeneration of the cardiac muscular fibres with softening of the walls and dilatation of the cavities has been discovered on careful examination. Leyden suggests that the cardiac failure is the result of these changes. According to this observer, dangerous weakness of the heart from this cause is indicated by gallop-rhythm of the heart-sounds with weakness of the impulse and irregular tremulous contractions. Vomiting, due to a reflection of the disturbance to other parts of the pneumogastric nerve, indicates that the danger is pressing. Other observers have noted precordial distress, extreme dyspnœa, smallness and irregularity of the pulse, and attacks of palpitation alternating with slowness of the pulsations. H. Weber has found the pulse fall to twenty-eight or even sixteen beats in the minute.

In a certain proportion of cases of diphtheria convalescence is interrupted by the appearance of paralytic lesions. The frequency with which this complication is found to occur has been variously estimated. Probably it depends in some measure upon the character of the epidemic. The degree, too, to which the nervous system is affected is subject to great variety. In some cases the lesion is so trifling as scarcely to attract attention. In others it amounts to well-defined and general loss of power. Taking mild and severe forms together, the proportion of patients who suffer from the complication is probably one in every ten or twelve cases.

Diphtheritic paralysis is not limited to cases in which the throat affection has been severe. The slighter forms of the distemper are as liable as the more serious forms to be followed by the nerve-lesion. Nor is its occurrence determined by the seat of the diphtheritic manifestation or the presence or absence of albuminuria. It may follow in cases where the false membrane has been limited to the skin, and in cases where albuminuria has not been observed. The period at which the paralysis appears is also subject to variety. From an analysis of sixteen cases Dr. Abercrombie found that the paralytic complication might appear from two to five weeks from the beginning of the illness. Sanné has noticed it as early as the second or third day of the disease, but states that it generally comes on from one to two weeks after the disappearance of the false membrane. According to this observer, when the paralytic symptoms appear early they usually develop gradually and spread slowly from one part to another.

When the onset is retarded, the development of the paralytic phenomena is much more rapid and regular.

The motor lesion may be preceded by increase of languor and irritability of temper. Dr. Hermann Weber has noticed in many cases a marked diminution in the rapidity of the pulse. The paralysis is symmetrical as a rule. Usually it begins either by loss of power in the soft palate and pharynx or, by what is equally common, paralysis of accommodation of the eye. It is noticed that when the child attempts to swallow he coughs violently and fluids return through the nose. His voice has a nasal quality and he snores in his sleep. If the patient is old enough we can ascertain by inspection that he has no power of elevating the uvula, and perhaps, also, that there is more or less anæsthesia of the fauces. If the ocular muscles are affected the child complains that he sees double. Reading is difficult or impossible, and sometimes there is an evident squint. In rare cases there is temporary blindness.

When the pharynx is first affected the paralysis may remain limited to this part. If it be complete, the power of swallowing is lost and food can no longer be propelled down the gullet. The food taken is found to collect in a pouch formed by yielding of the walls of the œsophagus. In such cases nourishment has to be conveyed to the stomach by mechanical means. The use of the stomach-tube is of the greatest service in these cases, both as a method of maintaining nutrition and also as a means of preventing the entrance of food into the glottis. From the pharynx the paralysis may spread to other parts. The tongue and lips may become affected so that the child dribbles and speech is greatly interfered with. Loss of power may also be noticed in the limbs, the neck, and the back. Of the limbs, the legs are affected more commonly than the arms. The paralysis almost invariably takes the form of paraplegia, for even if the weakness is more marked on one side, it will be usually found on examination that the side which appears to be sound has not entirely escaped. The motor paralysis may be accompanied by some disturbance of sensation. In rare cases control over the sphincters is lost. Paralysis of the respiratory muscles sometimes occurs. There is then dyspnœa: mucus collects in the lungs, for there is no power to cough it up; and the child usually dies suffocated. If the diaphragm is paralysed the child has attacks of dyspnœa, coming on at the slightest excitement or when an attempt is made to cough. Death may ensue in such an attack. The most moderate catarrh in such a condition adds an additional element of danger to the case.

Besides these forms of motor lesion, sudden death, attributed to paralysis of the heart, has been already referred to (see page 99).

Diphtheritic paralysis is fatal only in exceptional cases. When death occurs, it is usually the consequence of cardiac thrombosis or syncope; less commonly it is due to impaired nutrition through difficulty of swallowing, or to nervous exhaustion. Recovery is the rule, and the rapidity with which this takes place is very variable. The course is much shorter in cases where the paralysis is limited to the palate. This usually passes off in a fortnight or three weeks. When the loss of power becomes general, a cure is effected with much greater difficulty; but even in these cases it seldom lasts longer than three, or at the most four months. Sometimes the limbs recover their power very rapidly while the pharynx remains obstinately paralyzed for a considerable longer period.

Diagnosis.—When diphtheria gives rise to well-marked symptoms, its detection is easy. The tough-looking gray or fawn-coloured membrane in the throat, the redness and swelling of the fauces, and the enlarged cer-

vical glands are sufficiently characteristic. In tonsillitis the uvula is not swollen, and the whitish exudation occupying the mouths of the crypts, and sometimes spotting the surface of the tonsils, is very different in appearance from the consistent false membrane of diphtheria. It never forms a coherent layer, and never invades the nares or the larynx. Moreover, in quinsy, although the swollen tonsils can be felt externally, the cervical glands are seldom appreciably enlarged. If, in diphtheria, the exudation is soft and pultaceous, instead of being coherent and tough, there is still enlargement of the superficial cervical glands, and the general symptoms indicate profound depression. Any huskiness or weakness of the voice implies extension of the inflammation to the larynx, and points unmistakably to diphtheria. The difficult cases to detect are those in which the throat affection is imperfectly developed, or is slow to appear. At first, nothing may be noticed but redness and swelling of the fauces, with some discomfort in swallowing. In such cases until the false membrane appears, we cannot say that we have not to deal with an ordinary inflammatory sore throat; for although the weakness and pallor of the patient are usually out of proportion to the apparent mildness of the local affection, no positive inference can be drawn from this discrepancy, as some children are more depressed than others by a trifling ailment. If such a condition be met with at a time when diphtheria is known to be prevalent, we should regard the symptoms with much apprehension. Indeed, in any case of sore throat, if enlargement of the glands of the neck can be discovered, we should withhold a positive assurance that the complaint is one of little consequence. Sometimes the appearance of albumen in the urine comes opportunely to clear up a doubtful case. Sometimes after the termination of an ill-defined angina, the occurrence of paralysis throws a new light upon the past indisposition.

Laryngeal diphtheria, or membranous croup, may be confounded with stridulous laryngitis, with abscess of or about the larynx, or with retro-pharyngeal suppuration. The distinctive points between these diseases will be referred to in the chapters treating of these affections. It is possible that a foreign body in the air-passages may be mistaken for croup; but the attack of dyspnœa produced by this means comes on quite suddenly and follows at once upon an attempt to swallow. There is spasmodic cough but no hoarseness; and the first paroxysm of suffocation and cough is usually succeeded by a period of quiet in which, for the time, the breathing is fairly easy and the child seems to be well.

It is very important to be able to discriminate between cases in which tracheotomy may be expected to succeed and those in which no permanent good can be anticipated from the operation. Dr. George Buchanan, of Glasgow, has pointed out that in cases where the air-passages below the point of obstruction are free, and the lungs are in a normal condition, there is great recession of all the soft parts of the chest. At each inspiration the intercostal spaces fall deeply in, and the epigastrium forms a deep hollow. If, on the contrary, the smaller bronchial tubes are full of mucus or diphtheritic exudation, the movements of the chest-wall are impeded, and the chest is puffed out so as to resemble the distended thorax of chronic emphysema.

If the patient be seen for the first time when the paralytic symptoms have declared themselves, the history of the attack will declare the nature of the disease. Even if, as sometimes happens, the throat affection has been too slight to constitute a regular illness, we shall find, probably, that other members of the household have suffered from diphtheria, and that,

in the child himself, any signs of general nerve-lesion have been preceded by a nasal tone of voice, some trouble in swallowing, and the occasional return of fluids through the nose.

According to M. Landrouzy, if a child who is convalescent from diphtheria begins to suffer from attacks of dyspnœa excited by an attempt to cough, or by any small vexation, we should suspect paralysis of the diaphragm in the absence of any more evident explanation of the distressing phenomenon.

Prognosis.—Even in the mildest attack of diphtheria we must be guarded in the expression of our opinion as to the probable issue of the illness. Indeed, it is wiser to express no opinion upon the matter, but to confine ourselves to reporting the daily progress of the case, and speaking cheerfully so long as no symptoms arise indicative of danger. We can never feel certain that the inflammation may not spread to the larynx, or that other ill consequences may not ensue, however favourably the disease may appear to be going on. Caution in prognosis is especially necessary if the epidemic is a severe one, for outbreaks of the distemper vary greatly in the severity of type of the illness, and in some the mortality is much greater than it is in others. The age of the patient is also an important item to take into consideration, for a young child has fewer chances of recovery than an older one.

Different dangers are to be apprehended at different periods of the disease. During the first week we dread lest the inflammation should spread to the larynx, or lest the child should die from septicæmia. We therefore notice carefully the character of the breathing and the quality of the voice. If the breathing become shrill and the movements laboured, or the voice get weak or husky, we can have no doubt that the larynx is becoming involved. So, also, in cases where the false membrane is thick, pulpy, and putrescent the occurrence of shivering or a sudden rise in the temperature, with a dull yellow tint of the face and a rapid feeble pulse, makes us fear that the blood is becoming poisoned by absorption from the affected mucous membrane. Dr. Jacoby has pointed out that in nasal diphtheria septicæmia is especially liable to occur. In this form of the disease, therefore, the regular use of disinfecting injections is imperatively called for.

After the first six or seven days the child is in danger of death from syncope, from clotting of blood in the heart, and from inflammatory complications. At this time we carefully watch the pulse. If this fall notably in frequency and strength, especially if at the same time vomiting occur and be often repeated, the danger is imminent. At this period of the disease hæmorrhages sometimes come on as a result of profound blood contamination and are very exhausting. Other signs of bad augury are: a very feeble frequent pulse, cardiac dyspnœa (see page 98), general swelling of the neck, great prostration, and delirious wanderings. Albuminuria, unless excessive, is not necessarily a grave symptom.

When the diphtheritic exudation invades the trachea the danger is very serious; but if the operation of tracheotomy be performed in time, and a marked retraction of the chest-wall indicates that the smaller tubes are free below the point of obstruction, and that air, if admitted, will be able to penetrate to the alveoli, recovery is far from impossible. After the operation, success depends chiefly upon the child's capability of taking and digesting his food, and upon the lungs remaining free from pneumonia. If there is difficulty in administering nourishment, the child can be still fed through the stomach-tube; but loss of appetite usually implies feeble di-

gestive power, and the prospect is not favourable. If pneumonia occur, the prognosis is gloomy.

After the end of the second or third week nervous symptoms may be expected. In these the prognosis is favourable. It only becomes serious when the lesion is widely diffused, when all the muscles of deglutition are affected so that swallowing becomes impossible, or when the diaphragm and respiratory muscles are attacked. No child, however, should be allowed to die of starvation, for nourishment can always be administered at regular intervals through the stomach-tube passed through the nose.

Treatment.—Diphtheria is an infectious disease, and the ordinary precautions must therefore be taken against its spread. The sick room should be divested of carpets, rugs, curtains, and superfluous furniture; and proper measures should be taken to disinfect all discharges from the patient before removal.

The child must be kept quiet in bed. It is well to place him in a tent bedstead and to envelop him in an atmosphere of steam impregnated with thymol, creasote, or other disinfectant. This may be most conveniently done by the use of the "croup kettle" designed by Mr. R. W. Parker, on the principle of Dr. Lee's "steam draught inhaler." Creasote or carbolic acid may be added to the water in the kettle in the proportion of twenty drops to the pint, or a saturated solution of thymol can be made use of. So many technical matters have to be attended to in the treatment of these cases that whatever be the age of the child the assistance of a skilled nurse is indispensable. Amateur nursing, seldom if ever satisfactory, is here a serious disadvantage to the patient, and introduces into the case an additional element of danger.

The treatment of the disease comprises general and local measures, and these are of about equal importance.

The *general* treatment consists in employing every means to support the strength of the child, so as to enable him to struggle successfully against the exhausting influence of the disorder. The patient should be supplied with food of a nourishing and digestible kind. Strong beef essence, yolk of egg, milk thickened with Chapman's entire wheat flour baked in an oven, pounded underdone meat made fluid with strong meat juice or meat essence, all these are very useful. Alcohol must not be forgotten, and will often have to be given in full doses. Old brandy or whiskey, with or without yolk of egg, should be given at the first sign of feebleness of the pulse. A child five years of age will take with benefit thirty drops of good brandy every two hours. In infants white wine whey given freely is very useful. In giving stimulants we must be guided by the state of the pulse, or in infants by the condition of the fontanelle. As long as the pulse is firm or the fontanelle little depressed, alcohol is not required, when the pulse gets soft and compressible, or the fontanelle sinks, stimulants must be given without delay. It some cases they will be required from the first.

In the selection of medicines preference should be given to such as do not cause depression. In diphtheria there is a tendency to failure of the heart's action; and this tendency is likely to be favoured by the use of depressing remedies, such as the salicylate of soda, which has been sometimes recommended. A simple febrifuge may be given while the temperature is high and the skin dry; but directly the strength shows signs of failing, iron and quinine should be resorted to. The perchloride is perhaps as good a preparation as any other. Ten or fifteen drops of the tincture may be given with one grain of quinine every three hours to a child five years of

age. Much larger doses of the drug are often recommended; but young children vary greatly in their capacity for benefiting by chalybeate remedies, and in weakly subjects the stomach may be readily deranged by an excess of the medicine. Now it is of the first importance to maintain the digestive power, as incomparably the best tonic for a child is nourishing food.

Instead of quinine, chlorate of potash is often conjoined with the iron; but this remedy should be given with caution as it has a depressing effect on some children. It is well to begin the treatment with a mercurial purge, such as gray powder with jalapine, but the aperient need not be afterwards repeated.

In the use of *local remedies* we have to fulfil three indications: to arrest the spread of the false membrane; to promote its removal, and to prevent septicæmia from absorption of putrescent matters in contact with the tissues.

Many measures have been employed to prevent the extension of the local lesion in the throat. At one time strong cauterising agents were resorted to to effect this purpose, such as the solid nitrate of silver, equal parts of strong hydrochloric acid and honey, and the strong solution of perchloride of iron. The *repeated* use of these agents is now almost universally condemned, but one thorough swabbing of the throat is still advocated by some writers. I have occasionally employed equal parts of strong perchloride of iron solution and glycerine, and have thought that used efficiently, once for all, the application has been followed by benefit. Many writers, however, deprecate the use of these powerful agents; and certainly, since I have abandoned their employment, I have not found the disease less tractable or more dangerous to life.

To promote the liquefaction or removal of the false membrane many agents are employed. Rough tearing away of the diphtheritic exudation is injurious as well as useless; but gentle measures to further its destruction are decidedly beneficial. To be of service, however, the application must be used repeatedly, and can be applied with perfect efficiency in the form of a spray from one of Siegel's spray producers. Lime-water, alone or with carbolic acid (twenty drops to the ounce of lime-water), liq. potassæ (twenty drops to the ounce of water), boracic acid (a scruple to the ounce), lactic acid (twenty-six grains to the ounce), benzoate of soda (one scruple to one drachm to the ounce), all these are of service, and the addition of glycerine (half a drachm to the ounce) increases the efficacy of the solutions. Lotions of chlorate of potash (ten grains to the ounce) and of salicylic acid (three or four grains to the ounce) are praised by some, as well as dry insufflations of flour of sulphur, of alum, and of tannin. These latter have, however, the disadvantage that they cannot be employed without distressing the patient. If thought more desirable, any of the above liquid preparations may be used with a brush, but this method of employment is distressing, and except perhaps in the case of infants, presents no special advantage.

The third indication, viz., to destroy the poisonous products of putrefaction so as to prevent absorption and blood contamination, is partly affected by the use of many of the preceding agents. But besides these, special disinfectants may be sprayed into the throat, such as the solution of chlorinated soda or lime diluted with water (half a drachm to the ounce), permanganate of potash (five grains to the ounce), sulphurous acid, pure or diluted with an equal quantity of water, etc. The comfort of the patient is also promoted by the use of the steam kettle, as already recommended, and by warm applications externally to the throat. If the child be old enough, he may be allowed to suck lumps of ice.

In *nasal* diphtheria, where septicæmia is especially to be dreaded, the thorough cleansing of the nasal passages with a mild disinfecting solution should never be omitted. The importance of this measure is insisted upon by Dr. Jacobi, who recommends that the process should be carried out by the fountain syringe wherever practicable. Failing that, an ordinary ear syringe can be made use of. He directs that the injection should be repeated as often as every hour, and that if the obstructed nostrils resist the passage of fluid, the coarser matters must be removed by a probe or forceps. Dr. Jacobi states that these injections, efficiently employed, give great relief to the patient and rapidly reduce the size of the swollen glands. He advises a warm solution of carbolic acid (two to four grains to the ounce), or, if there is no fœtor, of lime-water.

When the disease invades the larynx the danger is at once imminent, and the question of operative interference has to be considered. In cases of laryngeal diphtheria (true membranous croup), tracheotomy is the only hope left to us—the child's last chance for his life. Directly, therefore, we feel sure that the larynx is involved, the operation should be undertaken without unnecessary delay. It must be remembered, however, that dyspnœa alone is not always a sufficient indication for this step. As has been before explained (see p. 99), lividity and laboured breathing are sometimes due to an impediment to the circulation of blood through the lungs. In such a case there is no want of air, and opening the larynx will bring no relief to the child's distress. The signs by which these two very different conditions are indicated have been already enumerated. When, therefore, we notice that the respiratory movements have become laboured, with great recession of the epigastrium and the soft parts of the chest in inspiration; that the breathing is hissing and stridulous, the voice whispering, and the cough husky and stifled, the operation should be no longer postponed. We have nothing to hope for in delay; on the contrary, the earlier the tube is introduced into the trachea, the sooner will the child's suffering be relieved and the better be his prospect of a cure. The success which often attends the operation of tracheotomy in membranous croup is very encouraging, and even in the case of an infant we should not hesitate to have recourse to it. Even at a later stage, when the child seems to be at the last gasp, the operation should still be undertaken, for nothing short of actual death can render it hopeless.

In performing the operation, if the asphyxia is far advanced anæsthetics will be unnecessary. If the lividity is not marked, chloroform should be administered, and if the child be made to inhale it gradually so that he does not breathe in too large a volume at first, the anæsthetic may be given without fear. The details of the operation, as they come under the department of the surgeon, need not be here referred to; more especially as they will be found recorded at length in all works on practical surgery. It may be only remarked that the size of the tube to be employed should be the largest which can be introduced without violence; that it should be as short as is consistent with safety; and that before its introduction the trachea and larynx must be thoroughly cleansed by introducing a feather soaked in a warm solution of carbonate of soda through the opening. The importance of this precaution has been strongly insisted upon by my colleague Mr. Parker in his well-known treatise.

The relief afforded by the operation is usually complete. If the difficulty of breathing still continues, it is a sign that the trachea is obstructed below the opening, and that there is probably extension of the false membrane far down the ramifications of the bronchi.

The after-conduct of these cases is of the utmost importance, as success depends upon judicious nursing and scrupulous attention to small points of treatment. Our object is to furnish a constant supply of properly prepared air to the lungs. The utmost care has therefore to be taken to maintain the inspired air at a suitable temperature and degree of moisture, and to see that the tube is kept in place. Moreover, the strength of the child has to be supported, and the treatment of the constitutional disease to be continued.

The child should remain in his tent bedstead, in a room of the temperature of 70° ; and the croup-kettle must be kept in action on a side table so as to moisten the air he breathes. A disinfectant should be always added to the water in the boiler, as already directed. The kettle must not be placed too near the bed. If the air is kept constantly saturated with vapour, the excess of moisture tends to depress the child. Mr. Parker's rule is a good one, viz., that we should be guided by the amount of tracheal secretion. If this is small, the amount of steam can be increased.

The wind-pipe and tracheotomy tube must be kept patent. Free secretion is to be desired, but this must not be allowed to accumulate so as to interfere with the passage of air. It is important to apply weak alkaline solutions, such as the bicarbonate of soda (ten to twenty grains to the ounce) with a hand spray-producer at short intervals, so that the inhaled air may be saturated with the solvent. The spray at once produces free secretion into the windpipe ; and the repeated use of this agent prevents the mucus from accumulating and becoming inspissated so as to block up the air-passages. It is curious to notice how the dry mucous membrane becomes almost instantly relieved by this means. After a few minutes' use of the spray, a feather soaked in the same solution must be passed into the trachea through the silver tube, so as to clear away loosened membrane and mucus. The introduction of the feather causes spasmodic cough, but this is not to be regretted, as the violent expulsive action usually relieves the patient of large portions of membrane, and greatly aids in clearing the trachea. If signs of obstructed breathing are noticed at any time, we may conclude that either the trachea or the tracheotomy tube is becoming obstructed, or that the latter is displaced. Measures must then be taken at once to remedy the fault.

The inner tube should be removed every hour or two and cleaned with a feather dipped in the warm alkaline solution. The outer tube will require cleaning only once in the twenty-four hours. When it is removed, advantage should be taken of the opportunity to pass the moistened feather upwards into and through the glottis, so as to clear the upper part of the windpipe. At this time, also, the wound can be examined for any unhealthy appearance. As a rule, the outer tube can be easily taken out and replaced, for the tissues around the opening soon become matted together by inflammatory exudation, and the orifice remains patent after the tube is withdrawn. After each cleaning the tube should be replaced by another of different length, so that the child may wear a short and a long tube alternately. If the tube be of silver, it should be examined for black discolourations, as these are due to morbid action at the corresponding part of the wound, and will therefore, as Mr. Parker has pointed out, be often valuable guides in indicating the parts to which our attention should be directed.

After a few days, when fresh membrane has ceased to be formed, we may make trial from time to time of the child's power of breathing through the glottis by closing the external wound with a finger. At first the

breathing is laboured, especially in inspiration, but in most cases the glottis soon becomes accustomed to act again as an air-passage.

While the above treatment is being carried out, the strength of the child must be supported by judicious feeding. Strong meat essence, pounded meat, eggs, milk, strong meat broths thickened with arrowroot or sago, and flavoured if desired with turnip, should be given at regular intervals. Sometimes there is difficulty in persuading the child willingly to take sufficient nourishment; and sometimes the power of swallowing is impaired from paresis of the muscles of the pharynx. Sometimes, also, there appears to be loss of sensibility of the glottis, so that articles of food taken appear at the wound in the air-pipe. If necessary, therefore, food must be conveyed to the stomach by an elastic tube passing through the nose (see Introductory Chapter, page 15). By this means the patient can be fed efficiently every three or four hours. Internal remedies, with the exception of alcohol, are better discontinued at this time. It is wiser to limit ourselves to the local measures which have been described for the relief of the local disease, and to trust to regular feeding and alcohol to support the strength of the patient and enable him to struggle successfully against the constitutional disorder.

The tracheotomy tube should not be allowed to remain in the trachea a day longer than is necessary; for besides that it is not well to allow the glottis to continue a long time inactive, too persistent retention of the tube may be followed by ulceration about the wound, necrosis of the rings of the trachea, and other accidents. In finally closing the wound certain difficulties are sometimes met with. The child having become accustomed to the use of the tube, and having a keen recollection of his sufferings before its insertion, is often nervous and apprehensive of a return of his dyspnœa. This very dread may be sufficient to interfere with the normal action of the laryngeal muscles. Before removing the tube altogether many attempts should be made, by withdrawing it temporarily and closing the opening with a pad of lint, to accustom the child to breathe without its help. He should be also made to articulate under the same conditions (*i.e.*, while the opening is closed), so as to bring the muscles of his larynx again into action.

The accidents which often interfere seriously with the final withdrawal of the tube are: inflammatory hypertrophy of the vocal cords, adhesion between the cords, granulations growing from the tracheal wound or from the posterior wall of the windpipe, paralysis of the posterior crico-arytænoid muscles, spasm of the glottis, cicatricial narrowing of the trachea. Sometimes it is only after much difficulty that the proper function of the disused larynx is restored. Such cases are, however, exceptional. Usually after a few days the child becomes accustomed to do without the help of the tube and all apprehensions of a return of his dyspnœa may be laid aside.

The chief danger and common cause of death after tracheotomy in membranous croup is the occurrence of pneumonia. If this unfortunate complication arise, warm poultices must be kept constantly applied to the chest, and stimulants must be given freely.

If diphtheria of the external wound occur, it is best treated by a careful attention to cleanliness, and by painting the wound with a solution of lactic acid (twenty-four grains to the ounce).

In the paralysis which often follows diphtheria the child should be removed to a bracing sea-side residence, and while there should be regularly shampooed and be given baths of the sea-water. If a dip in the sea is too

vigorous a shock for his weakened frame, the douche may be employed in the house after suitable preparation, as directed elsewhere (see Introductory Chapter, page 17). Quinine, iron, and strychnia are useful in these cases, and the child should pass as much time as possible out of doors. Regular faradisation is of service, especially in cases where the loss of power affects the muscles of the larynx or those employed in respiration. In cases where there is complete paralysis of the muscles of deglutition, and consequent inability to swallow, the child must be fed regularly with the stomach-tube passed through the nose. At the East London Children's Hospital many children have been saved by this means who were quite unable to take nourishment, and who without this help would certainly have died of inanition.

When a thrombus forms in the heart and gives ries to serious dyspnœa, the child should be kept *lying down ;* hot bottles should be applied to his feet and if necessary to his sides ; and diffusible stimulants must be given internally. Dr. Richardson speaks highly of the liq. ammoniæ (P. B.), of which a few drops may be given with five grains of iodide of potassium every alternate hour. If the heart's action appear to be failing, stimulants in large and repeated doses are indicated.

CHAPTER XI.

ERYSIPELAS.

Erysipelas is not often seen in childhood after the age of infancy has passed. For a short time after birth, however, there appears to be a special tendency, under favouring conditions, to suffer from this serious affection ; and in lying-in hospitals the disease is a not unfamiliar one. Amongst well-to-do families erysipelas but rarely attacks the infant, and in children's hospitals, even in those where quite young infants are admitted, it is exceptional to meet with an example of this form of illness.

Causation.—Erysipelas is in all cases a general disease of which the dermatitis and its consequences are merely the local expression. The malady most commonly affects new-born babies at a time when puerperal fever is prevalent, and is most liable to happen during the first six weeks of life. It is then apparently the result of a similar affection to that which attacks the mother; and the illness almost invariably has a fatal issue. According to Trousseau, besides erysipelas, purulent ophthalmia and infective peritonitis are common under the same conditions, and the three diseases must be regarded as various manifestations in different subjects of the same morbific principle.

But besides special puerperal infection, other agencies will act as predisposing causes of the affection. Unhealthy conditions generally will do this ; and the complaint has been known to follow exhausting derangements and diseases, such as chronic digestive troubles and the acute specific fevers. In some cases, however, no such influences can be discovered to have been in operation. Such a case came under my own observation in my student days. A healthy infant of a week old had great difficulty in relieving his bladder, owing to a very narrow preputial orifice. The operation for circumcision was performed (not very wisely) by a young surgeon. Extensive erysipelas followed, starting from the wound, and in a few days resulted in the death of the patient. The child was being suckled by a healthy mother. The parents were of the poorer class, but seemed comfortably circumstanced ; and their residence was clean, and certainly presented no obvious insanitary conditions. Possibly in this and similar cases the erysipelas owed its origin to the use of imperfectly cleansed instruments in the operation.

The exciting cause of the affection is usually traumatic. The erysipelas may follow the operation of vaccination, inflammation set up about the umbilicus, a burn, or the incautious application of a blister. It may develop around an intertrigo or attack a surface excoriated by the irritation of excreta. Some time ago a local outbreak of erysipelas occurring in a particular London district was traced to the use of a violet powder extensively adulterated with white arsenic. Apparently idiopathic cases do, however, sometimes occur. Thus, Mr. Strugnell has reported the case of a male in-

fant, aged eight weeks, in whom a patch of erysipelas appeared on the scalp and thence spread to the face, arms, and trunk. The child had suffered from no bruise or other injury, and nothing objectionable was discovered in the sanitary state of the house in which his parents were living. Other cases of a similar kind are on record.

It seems possible that the milk of a mother who has lately suffered from erysipelas may communicate the disease to her sucking child. Dr. Scholefield has reported a case in which a woman during a sharp attack of erysipelas of the face, neck, and scalp, gave birth to a son. As the labour progressed the erysipelas gradually faded, and when the child was born no trace of redness remained. The mother was warned not to nurse her child; but on the fourth day, as the secretion of milk was copious, she put the infant to the breast. Twelve hours afterwards a red blush appeared on the child's thumb and spread to the arm. This faded and the opposite arm became affected in the same way. Afterwards the same symptom appeared on one of the lower limbs, and in the end a large abscess formed over the sacrum and the child died. The mother had no return of the erysipelas after delivery.

This was not a case of puerperal erysipelas in the mother, for the disease had not only preceded labour but had completely disappeared by the time the child was born. It seems probable that the poison was communicated by the mother to the infant through the milk from her breast. At any rate, it is difficult to say in what other way the infant could have contracted the disease.

Morbid Anatomy.—In the skin the inflamed surface is red, hard, and brawny, with a well-defined margin. The redness disappears on pressure, and the hardness is due to accumulation of serum, lymph, and corpuscles in the substance of the cutis and tissue beneath it. If the œdema be copious, the part is dull red in colour, soft to the touch, and pits on pressure. The area of inflammation rapidly extends to neighbouring parts, and as it spreads the skin first attacked becomes less tense and browner in colour. Sometimes the skin affection disappears from one part of the body and reappears on another without spreading along the surface. Thus, it may attack one limb, then fade in its first situation and break out on the corresponding limb of the opposite half of the body.

As a result of the inflammation, abscesses may form in the subcutaneous tissue; and sometimes sloughing may occur in the skin or areolar tissue. Often vesicles or bullæ form on the inflamed surface, especially in the severe cases where there is subcutaneous sloughing.

In most instances of erysipelas in the infant, adjacent parts share in the inflammation of the skin. Peritonitis is common, even when the dermatitis does not occupy the abdominal parietes. There may be also inflammation of other serous membranes—the pleura, the pericardium, and the cerebral meninges. Sometimes the inflammation spreads from the skin to other parts by direct continuity. Thus, it may pass into the ear by the auditory meatus, into the nose and throat by the mouth, nares, and lachrymal ducts. In other cases, the disease begins in these deeper parts and extends to the skin by the same channels. In addition to the above morbid appearances, evidence of phlebitis, pneumonia, and enteritis is often observed. Lately micrococci, arranged in clusters, have been discovered by Fehleison in the lymphatic vessels of the affected portions of the skin. This observer has even succeeded in artificially cultivating the organisms on gelatine, and in the course of two months reared fourteen generations of micrococci. Some of these cultivated micro-organisms he inoculated into animals and others

into the human subject. In almost all cases a typical erysipelas followed the operation in the person or animal experimented upon.

Symptoms.—The disease presents different characters according to whether it arises as a consequence of puerperal infection or is induced by other causes.

In the first case the general symptoms are usually violent from the first. A patch of bright redness appears on some part of the abdomen, usually about the pubes. The part looks somewhat swollen, feels hard and brawny, and has a well-defined margin. The patch may be of limited extent, but there is high fever, and the infant looks ill, is restless, cries frequently, and is evidently in great pain. By the next day the area of redness has become widened; the fever continues; the fontanelle is depressed, and the patient sleeps little and is very restless and feeble. The erysipelas continues to extend. It passes downwards to the lower limbs and upwards over the trunk; the belly usually becomes fuller and may be tympanitic; vomiting and diarrhœa come on, and a jaundiced hue of the skin may be observed. After a few days, the child falls into a state of collapse and death may be preceded by convulsions and coma. In this form of the disease the duration is sometimes very short. A child who appears to be healthy and vigorous when first attacked rapidly falls into a state of prostration and may die in a few days. The illness may, however, last for a longer time. The colour of the inflamed surface then becomes deeper and more purple, bullæ appear on the surface, abscesses form in the subcutaneous tissue, or gangrenous sloughs may destroy considerable portions of the skin. Infants attacked by the puerperal form of erysipelas are usually under two weeks old, and the illness is almost invariably fatal.

When erysipelas occurs as a result of other causes than puerperal infection the early symptoms are less violent. The local affection generally begins about the genitals, the pubes, the anus, or the lower part of the abdomen, and spreads thence in various directions. When it extends widely, the parts of the skin first affected become paler, but are liable at any time to a return of the redness. The child has a pale pinched face, but may continue to take his food, and his digestion is often fairly good. In other cases, he refuses the bottle or breast, and may be troubled with frequent vomiting or looseness of the bowels. The temperature is high, at night it rises to 103° or 105°, sinking to 101° or 102° in the morning.

Complications often occur in these cases. Abscesses may form in various parts of the body; gangrenous sloughing may attack the skin; pneumonia may occur; or the inflammation may pass directly to the peritoneum through the recently healed umbilicus, or to the larynx and throat. An infant under six months old was brought to St. Thomas' Hospital and admitted, under Mr. Croft, for erysipelas following vaccination. When seen, the whole cervical region and part of the chest were the seat of œdematous erysipelas, and there was great dyspnœa without symptoms of croup. The child was placed in a warm bath and a dose of ipecacuanha wine was given to produce vomiting. These measures relieved the child for a time, but in the evening the dyspnœa returned with such intensity that tracheotomy was performed by the Surgical Registrar. After the operation the infant coughed up small pieces of cartilage—probably from the rings of the trachea. Eventually he recovered.

Whether the disease be idiopathic or arise from traumatic causes its gravity appears to be the same. In the first case the appearance of the special symptoms is often preceded by signs of derangement or sluggish-

ness of the digestive organs. In Mr. Strugnell's case, before referred to, an infant of eight weeks old had been a fairly healthy child, but for ten days or so had been passing very firm, pale, pasty-looking motions. The child was suddenly taken with severe symptoms, and when first seen was lying with his head thrown back and his thumbs twisted inwards upon his palms, but there was no retraction of the abdomen or strabismus. The pupils were equal and acted to light, the pulse was rapid, the temperature was normal. On examination slight œdema of the scalp was noticed on the occipital bone, but there was no redness. On the next day the œdematous part was red. On the third day the cerebral symptoms had subsided; but the erysipelas had spread to the forehead and down the back of the neck. Afterwards it extended over the face, arms, and trunk. A vesicle the size of a filbert and filled with clear serum formed over the left elbow, and another appeared a little later on the thigh. As the disease advanced, the abdomen became distended and tympanitic, and the breathing oppressed. No mischief was discovered in the chest. The child sank and died on the seventh day.

In this case the early cerebral symptoms (retraction of the head and twisting in of the thumbs) were probably symptomatic of the general disease and not of any special intra-cranial complication. They were of short duration and quickly disappeared when the skin affection became marked. The tympanites and embarrassment of breathing were, no doubt, due to the occurrence of peritonitis. Premonitory symptoms, such as were found in the above instance, are not common. Usually the first indication of ill-health is the occurrence of the cutaneous redness and swelling.

In traumatic cases the duration of the disease is often considerable. The illness may last two or three weeks, or even longer. Recovery is not a frequent termination, and usually death is brought about by one of the many complications to which these cases are liable. If none of these occur, the case may end favourably, even although the erysipelas has spread extensively and involved the greater part of the surface of the body. The subsidence of the cutaneous inflammation is followed by desquamation of the epithelium in the portions of skin affected.

Diagnosis.—The nature of the disease can scarcely be misapprehended. A patch on the skin of bright redness, which feels brawny to the touch and is perhaps œdematous, spreads continuously over the surface, and is bounded by a well-defined margin—these local symptoms combined with the severe general disturbance and high fever, make the diagnosis of erysipelas an easy matter.

Prognosis.—When erysipelas occurs in an infant of a week or fortnight old, as a result of puerperal infection, the prognosis is most serious. Very few of these cases recover, although Trousseau has stated that in cases where abscesses have formed extensively, and in these cases only, he has known life to be saved. Consequently he regarded the occurrence of abscesses as by no means an unfavourable symptom.

When the disease arises as a result of other causes the child's prospects are more hopeful, and are brighter in proportion to his age, his general strength, and the healthfulness of his surroundings. Of forty-three cases collected by Dr. Lewis Smith eighteen recovered; but of the cases of recovery in only one was the child younger than three months. If the disease attack an infant during the first two or three weeks after birth, death is almost certain. After the age of six months the proportion of recoveries is greater than that of the deaths.

In all cases the occurrence of a serious complication greatly reduces the

child's chances of escape, and if peritonitis occur, we can have little hope of a favourable issue.

Treatment.—In cases where the disease arises from puerperal infection treatment has been found of little value. Alcoholic stimulation and the administration of ammonia and bark may be useful in supporting the strength, but local treatment of every kind appears to be useless. It would be advisable in these cases to make trial of benzoate of soda—a salt which has been highly praised by Dr. Lehnebach for its value in puerperal fever in the adult. Two or three grains might be given to a child of a week old every four hours, and if the fever were very high, one or two grains of quinine might be added once in the day to a dose of the benzoate.

In cases where no puerperal infection is suspected, the child should be made to take the tincture of perchloride of iron in frequent doses. For an infant of three months old five drops of the remedy may be given in glycerine every four hours. At the same time the strength should be supported by a careful diet. If the child be at the breast, the mother's milk is no doubt the best food he can take. In addition, he may have a teaspoonful of the brandy-and-egg mixture two or three times a day if his fontanelle is greatly depressed. As long, however, as the strength continues good there is no necessity for stimulation. If the patient be hand-fed, care should be taken that his milk is diluted with barley-water or thickened with gelatine; and the stools must be inspected to see that undigested curd is not passing away from the bowels. If this be so, the milk should be diluted with half its bulk of barley-water or aq. calcis; and should be aromatised by the addition of two teaspoonsful of an aromatic water to the bottle. Mellin's food, white wine whey, etc., may also be given.

With regard to local treatment, innumerable applications have been recommended. Most of these are sedative or antiseptic. Thus, the inflamed part may be anointed with an ointment composed of equal parts of extract of belladonna and glycerine, and covered with cotton wool. The application of oil of turpentine has been recommended by Hastreiter. Cavazzani speaks highly of brushing the surface with a lotion composed of one part each of camphor and tannin to eight parts of ether. Painting with tincture of iodine is advocated by some, and with a solution of carbolic acid by others. Heppel states that the spread of the inflammation may be limited by painting the skin at the circumference of the patch, and for a finger's breadth on each side of it, with a ten per cent. solution of carbolic acid. The brush should be used until a distinct staining of the integument has been produced. The plan recommended by Hueter, of injecting subcutaneously around the margin of the patch a three per cent. solution of carbolic acid, is inadmissible in the case of a young child, in whom symptoms of carbolic acid poisoning would be easily produced. Endeavors to limit the spread of the erysipelas, by a line drawn on the skin with nitrate of silver just beyond the margin of the inflamed patch, have been found to be useless. In the child such a proceeding is to be strongly deprecated, as its employment has been sometimes known to lead to the formation of troublesome sores upon the surface.

An important element in the treatment appears to be covering the inflamed surface from the air. Recently, Mr. Barwell, reviving an old method, has found the utmost benefit to result from covering the affected area with a thick coating of common white lead house-paint, renewing the application as often as any crack appears on the surface of the paint. This plan of treatment seems not only to relieve the pain quickly, but also to reduce the temperature and favourably influence the general symptoms.

CHAPTER XII.

WHOOPING-COUGH.

Whooping-cough, or pertussis, is an infectious disorder in which catarrh of the air-passages is combined with nervous symptoms which may assume very serious proportions. The affection occurs in epidemics and may attack the youngest infants: indeed, sometimes it appears immediately after birth. In such young children whooping-cough, even when not of a grave type, may cause serious consequences. It is principally dangerous, however, through its complications. These are numerous, and often appear towards the end of the disease, when the patient's strength is reduced by the length and severity of his illness.

Causation.—The disease usually occurs in epidemics, and appears to be eminently infectious. The channel of infection is the breath and expectoration; and the virus is capable of being conveyed by the atmosphere or even by the clothes. Children of all ages are very susceptible to the infectious principle. The disease is excessively common under two years of age, very common, even, during the first twelve months. Unfortunately, I have kept no systematic record of the many cases of whooping-cough which have passed under my notice, but in eighty-nine cases of which I have preserved notes no less than twenty-four occurred in infants during the first year of life. Even this proportion probably represents imperfectly the frequency of the disease in young babies; for in such subjects the spasmodic stage is often absent. Dr. R. J. Lee is of opinion that infants suffer from pertussis much more frequently than is supposed, and asserts that in a very young child a whoop ought rather to excite surprise than to be looked upon as an ordinary symptom. This is, perhaps, an extreme statement, but there is no doubt that in infants the disease frequently assumes the form of an obstinate pulmonary catarrh with but little laryngeal spasm. After the tenth year the disease becomes very rare; but it may be seen at any time of life, even, as is well known, quite at the close of extreme old age.

Whooping-cough seems to be more common in the spring and autumn than in the other seasons of the year, and the epidemic is often found to precede or to follow quickly upon an epidemic of measles. A patient who has passed through one attack of whooping-cough is in little danger of his illness being repeated, for a second attack in the same subject is rare. The infection, however, lasts for a considerable time after the whoop has ceased to be heard. Dr. Squire is of opinion that at least six weeks should be allowed to elapse before the patient can be trusted to associate with healthy children.

Pathology.—Examination of the body in a fatal case of pertussis reveals nothing to account for the special nervous symptoms which impart its most characteristic feature to the disease. We find signs of catarrh of the air-passages, viz., congestion with hypersecretion of the mucous membrane

within the glottis, of the trachea, and of the bronchi and their ramifications. We also find certain consequences produced by violence of cough and spasm, viz., pulmonary collapse and emphysema. In addition, we usually meet with some other morbid changes due to the complication by means of which the fatal issue has been brought about. Thus, there may be serious congestion and even extravasation of blood into or upon the brain, and sometimes signs of thrombosis of the intracranial sinuses, shown by colourless clots of laminated structure adhering to the walls. The lungs may be the seat of catarrhal pneumonia, and occasionally small extravasations are seen here as in the brain. Moreover, there is almost invariably enlargement of the bronchial glands, and the under surface of the tongue may be ulcerated more or less extensively.

No satisfactory explanation has yet been given of the real nature of the complaint. That the disease is due to inflammation of the pneumogastric nerve has been shown to be erroneous. Pressure upon the same nerve by enlarged glands may be rejected for the same reasons which render this explanation of the phenomena of laryngismus stridulus an insufficient one. In some respects the affection resembles a zymotic disease; in others a neurosis. Some writers consider the complaint a purely catarrhal one; others lay most stress upon the nervous symptoms. That the disease is something more than a mere catarrh is shown by the infectious nature of the secretion thrown off by the mucous membrane. In 1870 Letzerich believed he had discovered a species of fungus in the sputum, and supposed that this was the morbid material which, carried from one person to another, settled upon the mucous membrane of the air-passages, and by its irritation gave rise to the spasmodic symptoms. Other observers, however, have not confirmed this alleged discovery. More lately Dr. Carl Burger, of Bonn, has described a bacillus which he has found in the expectoration of children suffering from whooping-cough, and states that it is peculiar to this complaint.

The neurotic character of pertussis is shown not only by the laryngeal spasm, but by the violent agitation into which the child is thrown during a paroxysm. When he feels the desire to cough becoming irresistible he clutches at his mother's dress or the nearest object capable of giving support, and his whole body is agitated by a convulsive trembling. This agitation is usually attributed to terror, but it is more probably the consequence of a general nervous commotion which, carried to a higher pitch, may become a genuine convulsive seizure. A distinguished physician who was attacked by whooping-cough after middle life, in describing the nervous agitation induced by the spasm, assured me that in the paroxysm he required all his self-control to avoid beating with his feet upon the floor. It seems, therefore, that the neurotic element of the disease is something more than a mere nervous spasm of the larynx and diaphragm. There appears to be a general agitation of the whole nervous system, which may be more or less pronounced according to the severity of the attack and the inherent susceptibility of the child.

Symptoms.—The incubation period of pertussis is difficult to ascertain on account of the uncertainty as to the exact day upon which the disease can be said to begin. It has been estimated at from two to seven days. Other observers are of opinion that it may last a fortnight.

When the disease begins we find the symptoms of catarrh of the air-passages. The eyes are slightly injected, there is snuffling and increased secretion from the nose, and the child soon begins to cough. There is some fever, the temperature usually rising to 100°, and the pulse is

quickened. In a day or two there may be in addition some increased rapidity of breathing. If the catarrh affect the gastric mucous membrane, there is loss of appetite and the child may be languid and mope. The symptoms resemble those of an ordinary catarrh, but their specific character may be sometimes detected by noticing the unusual obstinacy of the cough. It is repeated at very short intervals, and sometimes is almost incessant. This catarrhal stage lasts for a variable time. It may occupy only a few days or may be continued for several weeks. The symptoms usually increase in severity as the days go by. The cough becomes more troublesome, and is worse at night than in the day. If the child is old enough he complains of a harassing tickling in the throat ; and there is often violent sneezing, with the ejection of much ropy mucus from the nose.

After a time a change in the character of the cough shows that the spasmodic stage has begun. The cough occurs in paroxysms, and has such a distinctive character that it at once betrays the nature of the child's complaint. It consists in a number of short hacks, following so rapidly upon one another as to allow of no inspiratory effort. As these continue, the child's face turns from red to purple, and seems to swell and darken at the same time. At length, when the lungs are almost exhausted of their air, and the patient seems upon the very point of suffocation, air is at last drawn in with a long, deep inspiration, accompanied by the characteristic "kink" or whoop. Immediately, however, the cough begins again ; and in this way the long rapid expiratory cough, the signs of imminent asphyxia, and the slower whooping inspiration may be repeated several times before the expulsion of a large quantity of thick tenacious phlegm from the mouth, and perhaps the ejection of food mixed with ropy mucus from the stomach, announces the end of the attack. The child, then, if an infant, sinks back exhausted and perspiring in his mother's arms, and if the cough do not return immediately, usually falls into a heavy sleep. An older child seems a little languid, but if the paroxysm has not been severe, may return quickly to his amusement. If, on the contrary, the spasm has been prolonged, he may seem dull and confused for a time, and may complain of headache.

During the fits of coughing the pulse becomes very rapid, and is almost uncountable. If we listen to the back at this time we hear some slight wheezing in the large air-tubes during the expiratory cough ; but during the long-drawn inspiration any slight vesicular sound which might be heard is covered by the noise of the whoop. In the intervals of the cough auscultation in an uncomplicated case merely reveals a few large bubbles mixed up with dry wheezing sounds scattered about the lungs.

When the paroxysms are violent they are a cause of great distress to the patient. This is well shown by the efforts a young child will make to keep them back. He may be noticed, while on his mother's lap, to hold his breath and sit perfectly still in the hope of repressing the cough. When he feels that the impulse is getting beyond his control his face becomes congested, his brows contract, and sweat breaks out on his forehead ; and as the convulsive expiratory efforts begin, he clutches at his mother's dress and often trembles all over with nervous agitation. During the paroxysm the straining may produce rupture in a child predisposed to hernia ; and hæmorrhage from the intense congestion induced is a common symptom. The bleeding may take place from the eyes, the ears, the nose, the mouth, and sometimes from the lungs. Cracks about the lips and sore places on the gums almost always bleed during the fits of coughing. Epistaxis is

very common. When hæmorrhage occurs from the nose the blood does not always flow forwards through the nostrils; often it passes backwards through the posterior nares into the throat. It may be then swallowed and discharged as black matter by stool, or be vomited after the next attack of cough and cause great alarm. In other cases the blood irritates the glottis and induces a fresh paroxysm. It is then expelled with the cough and is supposed to come from the lungs.

The number of paroxysms that occur in the twenty-four hours varies very much according to the severity of the attack, and partly, too, according to the number of disturbing causes to which the child is exposed. In severe cases, where the slightest emotional or other influence will induce an attack, the number may be considerably diminished by quiet and judicious amusement. The child often coughs more in the night than during the day, for the occurrence of the seizures appears to be favoured by the recumbent position. Between the paroxysms, when the spasm is violent, the child's face may remain permanently congested. The eyes are red and often bloodshot; the eyelids are heavy and swollen; the face and lips are dull red; there is a dusky tint round the mouth and under the eyes, and the veins of the neck are full.

The attacks themselves vary in character. The whoop may be entirely absent throughout the disease. This is said to be common in very young infants. The number of expiratory efforts is very variable. Usually there are only two or three, but they may be much more numerous. As a rule the coughing fits are longer at the beginning of the spasmodic stage, when secretion is thinner and less copious, than at a later period, when it becomes abundant and more tenacious. After the whoop has lasted a fortnight it grows less violent and is less frequently heard. It only occurs with the more violent fits of coughing, and in the milder ones the breath is drawn more quietly and with greater ease. At the end of three weeks or a month it becomes very rare, and the complaint may then be said to have passed into the stage of decline.

The whole time occupied by an attack of whooping-cough varies from a fortnight or even less to two months or longer. The duration is often difficult to ascertain, for after the spasmodic cough has disappeared and the disease has again come to assume an ordinary catarrhal type, trifling accidents, such as a chill or an error in diet, may set up more active symptoms, and the whoop may even return for a time. In this way the complaint may be prolonged for many weeks.

Complications.—There are certain accidents attendant upon the complaint which may be a cause of distress or danger to the patient. Sublingual ulceration is common; hæmorrhage may be copious; the vomiting may greatly interfere with nutrition; bowel complaints may supervene; the nervous symptoms may be exaggerated; and various pulmonary diseases may ensue and, if they do not prove fatal, injuriously affect the future welfare of the child.

The *sublingual ulceration* has been before referred to. It occupies the frænum of the tongue and may extend for some distance on each side of the middle line. The sore may vary from a mere abrasion to a deep fissure with a gray or yellowish surface. It is only seen in cases where the child has cut the lower incisors, and is the direct consequence of the scraping of these teeth against the under surface of the tongue as this organ is protruded and withdrawn during the paroxysms of cough. Blood often exudes from the abraided surface towards the end of a paroxysm. The ulcer is not a constant symptom. It never appears before the spasmodic

stage, but may then be seen as early as the fourth day of the whoop. It is most common in infants who have cut the two central lower incisors and no other teeth. In children who have cut all their teeth the symptom is much less common.

Hæmorrhage must not be looked upon as in every case an untoward accident. When the spasm is violent and the congestion of the head and face extreme, the relief afforded by a discharge of blood from the distended vessels of the nose is no doubt often a salutary incident. If, however, the hæmorrhage occur frequently and be very copious, great weakness may be occasioned; and if the child be already reduced by the violence of the attacks and the deficiency of nourishment occasioned by repeated vomiting, the loss of blood may be an additional reason for anxiety. Rupture of vessels elsewhere than in the nose seldom occurs to any extent. Blood ejected from the mouth during whooping-cough comes almost invariably from this source. Hæmoptysis is rarely seen, for blood coming up from the lungs after an attack is usually swallowed by children, and is seldom, if ever, sufficiently considerable to be a source of danger.

Hæmorrhage may also occur into the subcutaneous connective tissue of the eyelids and that beneath the conjunctiva. The eyes are often blood-shot from small ecchymoses, and occasionally we see little extravasations in the thickened eyelids.

Hæmorrhage from the ears is the consequence of rupture of the tympanic membrane. Several instances of this accident have been recorded. It is occasioned by the blast of air which is forced through the Eustachian tube during the fits of coughing, and a certain amount of blood exudes from the torn surface. In two out of four cases published by Dr. Gibb the rupture occurred in both ears.

In very rare cases hæmorrhage has been noticed in the brain and its membranes, causing death.

Certain *digestive* troubles may arise. Vomiting at the end of a fit of coughing is a familiar symptom. Usually it is of little consequence. If, however, the attacks of cough occur very frequently, and are followed in each case by sickness, the child's nutrition is visibly affected; for almost all the food taken is vomited before there is time for digestion to begin. Even if vomiting is not excessive, there is often considerable interference with nutrition, for the catarrhal condition of the gastric mucous membrane is ill adapted to further healthy digestion. In many cases, no doubt, the tough mucus which coats the wall of the stomach prevents the food from being properly mingled with the digestive juices. It is not uncommon, as M. Rilliet long ago pointed out, for food to be vomited little changed several hours after a meal. On account of the mucous flux in the bowels worms are a frequent complication, and diarrhœa is easily excited. A certain amount of looseness of the bowels is present in a large majority of the cases of pertussis, and considerable quantities of mucus are passed in the stools.

Nervous accidents form a very important class of complications. Sometimes the laryngeal spasm is exaggerated. It is not uncommon to see a child at the end of the long expiratory cough, instead of at once beginning to whoop, remain for some seconds with darkened face, staring eyes, and open mouth, making agitated movements and vainly striving to overcome the spasmodic contraction which is closing the entrance to his lungs. If prolonged the spasm adds greatly to the gravity of the case, and may even determine the fatal issue. This is especially likely to happen if the pertussis is complicated with serious lung mischief. In a case which came

under my own notice—a child of seven years of age, both of whose lungs were the seat of catarrhal pneumonia—the spasms were very violent and prolonged, and in one of them the patient died. In a case recorded by Drs. Meigs and Pepper, whooping-cough complicated a case of laryngismus stridulus, and the child died in a spasm. Sometimes the patient falls into a state of syncope from which he can be roused only with the greatest difficulty.

The semi-asphyxiated state in which the patient is often left after a severe paroxysm of cough may be a cause of general convulsions. Eclamptic attacks, indeed, often complicate pertussis; but although their occurrence should give rise to great anxiety, the seizures are not necessarily fatal. If the convulsion be the consequence merely of deficient aëration of the blood, the return of free respiration removes the danger for a time; but if the same condition be frequently renewed, the child's state is a very anxious one. So, also, convulsions excited by embolisms or congestions of the cerebral vessels, thrombosis of the cranial sinuses, or diffused collapse of the lungs, are very serious. These generally occur late in the disease and are almost invariably fatal. There are two forms of eclampsia liable to happen which are less dangerous. One of these is due to an exaggeration of the nervous excitement which is an ordinary symptom of the disease. In highly sensitive children it is probably not uncommon for convulsions to take place from this cause, especially if the strength has been quickly reduced by copious epistaxis. So, also, the onset of an inflammatory complication is often indicated by a convulsive fit, and these attacks, like the preceding, are often recovered from. If, however, a convulsive fit occur late in the disease, when there is much consolidation of lung, the child seldom recovers. In connection with this subject it is well to remember that convulsions occurring in the course of whooping-cough may be due only indirectly to that disease. The tendency to eclamptic attacks which is common in early life is, no doubt, heightened by the state of nervous excitement in which the system is maintained by the illness. At any rate it is common, especially in rickety children, to find convulsions supervene in the course of whooping-cough upon very slight gastric or intestinal irritation. Convulsions occurring in pertussis without being followed by ill consequences may be, no doubt, often attributed to this cause.

Another important group of complications consists of the pulmonary lesions which may occur in the course of whooping-cough. These, on account of the nature of the complaint and the tender age of the patient, are readily excited, and often bring the illness rapidly to a close. In fact, the liability to these accidents constitutes in most cases the chief danger of the disease.

Collapse of the lung is one of the commonest and most fatal of these complications. In a severe case of whooping-cough in a young child this accident may happen at any time. Indeed, it may be said that at the end of every violent paroxysm of coughing the patient is threatened with collapse of the lung, for all the conditions which conduce to this disaster are present together. Thus the spasmodic cough almost empties the lungs of air; the ropy mucus in the tubes offers an obstacle to its re-entrance; and the state of exhaustion in which the patient is left weakens the force of the inspiratory act. The mechanism of collapse of the lung and the symptoms and signs which result from it are described at length in another place. It will be sufficient here to remark that the occurrence of collapse is often indicated by an attack of convulsions, and if the area of lung affected be

large, sudden death may even ensue. In the less serious cases the child lies back with his head low; his face is pale or slightly livid and covered with a cold sweat; the eyelids and lips are dull red or purple; the nares act, and the respirations are frequent and shallow. There is no fever; often the temperature is lower than natural. On examination of the chest we find a little dulness at one or both bases behind; the breathing is bronchial, and sometimes loose crackling rhonchus may be heard at the lower part of each lung. The whoop generally ceases when collapse occurs, but the fits of coughing continue, although in a modified form, and add greatly to the exhaustion of the patient. These cases almost invariably end in death. The child lies quietly, as if unwilling to stir a muscle. He takes food with difficulty and seems afraid to swallow. If lifted up suddenly he may die from syncope: often the end is preceded by a convulsion.

Bronchitis and catarrhal pneumonia are other common consequences of whooping-cough. The pulmonary catarrh, which is one of the characteristic features of the disease, is easily aggravated, and readily invades the smaller tubes of the lung. In a young child, too, a bronchitis seldom remains a bronchitis, but the inflammation quickly travels to the fine bronchioles and air-vesicles. Thus a catarrhal pneumonia is easily set up. In a severe case of pertussis the breathing becomes more and more oppressed and the face more and more livid as the catarrhal inflammation extends itself; but when the terminal tubes are reached and catarrhal pneumonia begins, the change is at once announced by new symptoms. The whoop ceases; the temperature rises to 102° or 103°; the breathing is quickened and laboured, and the pulse-respiration ratio is perverted; the face is livid; the nares are widely expanded. Although there may be no percussion dulness, a physical examination of the chest reveals some of the signs connected with this dangerous condition. Sometimes a fit of convulsions ushers in the complication. If the pneumonia be extensive the child generally dies. If it be moderate, and the attack of whooping-cough be nearing its close, he may recover, but his life may be said to hang on a thread, for the occurrence of a little collapse, still further reducing the amount of breathing space left to him, may at once determine the fatal issue.

Emphysema of the lung, which often occurs, is a complication of little gravity. It usually occupies the upper lobes and anterior borders of the lungs. It is produced mechanically by forcible distention of the air-vesicles, air being driven from the lower parts of the lungs into the upper portions during the spasmodic cough, or rather during the violent contractions of the diaphragm which immediately precede the cough when the glottis is closed. In the severer cases there is some dilatation of the smaller bronchi as well as of the air-cells. The condition is an acute one, and usually subsides when the disease passes off. In scrofulous children, however, it may remain as a permanent lesion.

Of these complications emphysema is one of early occurrence. Collapse and catarrhal pneumonia occur late in the disease, as a rule, when the child's strength is reduced and his nutrition impaired.

Besides the above accidents others may occur. Laryngitis is seen sometimes, but if not severe adds little or nothing to the danger of the case. Pleurisy and pericarditis are occasionally found, but these do not, like the preceding, follow naturally from the complaint, and are not often met with.

Sequelæ.—When the disease has passed off consequences, local and constitutional, may be left behind. Any diathetic taint, previously dormant, is often roused into activity. Scrofulous children may become subject

to chronic discharges, inflammations, and other signs of that constitutional condition ; syphilis in babies may first manifest itself during or after an attack of whooping-cough ; and acute tuberculosis is a not unfrequent sequel to the disease. Measles and pertussis seem to have a certain affinity in that they both produce an especially injurious effect upon scrofulous children. In such subjects chronic caseous enlargements of the cervical and bronchial glands are common : catarrhal inflammation of the lungs tends to pass into a chronic stage and produce serious mischief, and chronic bronchitis with emphysema may make the child a permanent invalid. Acute tuberculosis, when not the consequence of hereditary diathetic tendency excited by the occurrence of whooping-cough, may be set up as a result of softening of caseous bronchial glands, and this at a considerable interval of time after the primary disease has come to an end.

Besides these constitutional conditions there are other local consequences of whooping-cough which it is important to be aware of.

Laryngismus stridulus is sometimes a relic of the disease, the spasm persisting although the other symptoms have ceased. This is not common, and probably only occurs in the subjects of rickets.

Children who have lately passed through an attack of whooping-cough are often slow to recover their strength and healthy appearance, even although they are innocent of any diathetic taint, and have no chest affection to set up pyrexia and be a cause of weakness. A group of symptoms is often noticed in such subjects which I have elsewhere described under the name of "mucous disease,"[1] and which indicates a marked degree of impairment of nutrition. The child is languid and pale, or has a dingy sallow complexion ; he loses flesh, is easily tired, and sleeps badly at night. There is often some discolouration under the eyes, and the complexion may turn suddenly ghastly white, as if the child were going to faint. Often he does faint ; and he frequently complains of a stitch in the side and is subject to flatulent pains about the belly. The tongue presents a peculiar appearance. It has a glossy slimy look, is often coated with a thin gray fur, and the large papillæ at the sides, although not prominent, are unusually distinct. A curious irritability is a characteristic feature of the disorder. The child is capricious and fretful, and often cries without cause. He quarrels needlessly with his brothers and sisters, and is sometimes quite a torment in the nursery. At night he dreams and often wakes up in violent panic. The "night terrors" of children usually occur in the subjects of this derangement, and sometimes the child gets out of bed and wanders about in his sleep. These symptoms have no regular progression. They are better and worse. Sometimes the child seems almost well ; then, in a day or two, he is as bad as ever. The patients are subject to what are called "bilious attacks." They are seized suddenly with vomiting and purging, which lasts for twenty-four hours or a day or two, and at these times get rid of large quantities of thick mucus both from the stomach and bowels. After this relief they seem better for a time. They are less irritable and languid, their temper improves, and their rest at night is no longer disturbed. After a few days, however, the symptoms return, and continue until they are again relieved in the same way. As a rule, the bowels are rather costive, and an aperient always brings away much mucus with the stools.

These symptoms are due to a continuance of the mucous flux from the

[1] See The Wasting Diseases of Children, 4th ed.

alimentary canal which is always present to a greater or less degree in cases of pertussis. This copious alkaline secretion acts as a ferment and causes an acid change in the more fermentable articles of food. The acid thus generated partially coagulates the mucus, so that this forms a thick coating round the interior of the digestive tube, and also covers the masses of food swallowed. Consequently a proper admixture of food with the gastric juices and other digestive fluids is interfered with, digestion is slow and imperfect, and of the food which is digested only a small part is brought into contact with the absorbent vessels. The child consequently gets thinner and paler. He is uneasy on account of flatulent pains from gases disengaged in the process of fermentation, and irritable on account of the excess of acid with which the system is charged. In bad cases the emaciation may be very great, and although the appetite may be large, the food taken seems to be, and often actually is, nearly useless for purposes of nutrition. Commonly, however, when the derangement is severe the appetite fails, and great difficulty is found in persuading the child to take any nourishment at all. Parasitic worms, which find in the alkaline mucus a congenial nidus for development, frequently complicate this derangement, but it is to the digestive disorder and not to the worms that the symptoms are really due.

Diagnosis.—It is often very difficult to say whether or not a child has got whooping-cough. At the beginning of the catarrhal stage a diagnosis is impossible. At this early period we can only detect the signs of catarrh, and unless the complaint is largely prevalent at the time, or other children in the house are suffering from pertussis, there is absolutely nothing to make us even suspect its existence. Often, towards the end of this stage, the frequency and peculiar violence of the fits of coughing may rouse our suspicions, and if a genuine paroxysm occur, doubt, of course, ceases to be possible. But although fully developed whooping-cough cannot be mistaken, the modified form of cough which is often all that we can detect may be easily misinterpreted. A more or less prolonged cough with a faint whoop from slight laryngeal spasm is not very uncommon in a child suffering from chest complaint, and an abortive pertussis may sometimes give rise to no more characteristic symptoms than these. In making the distinction no arguments drawn from the acuteness of the attack or the early period at which the cough assumed the spasmodic character can be relied upon, for modified pertussis may be as slight and transient as any mere pulmonary catarrh. It is of far greater importance to notice that in a mild form of whooping-cough the general health is good, and that an examination of the chest reveals little deviation from the normal state of things ; while a chest affection sufficiently serious to produce an imitation of whooping-cough will injure the general health and modify the physical signs. It is usually in catarrhal pneumonia that this violent prolonged cough is noticed. In such cases we find the symptoms and physical signs of this disease, and we exclude pertussis by remarking that the cough did not become paroxysmal until the chest disease was well developed. In a case of real pertussis with secondary catarrhal pneumonia, the characteristic cough is very much modified immediately the complication begins. Paroxysms of violent cough with some spasm of the larynx are often noticed in cases of enlargement of the bronchial glands. But here we get other signs of pressure upon the pneumogastric nerve: the breathing is more or less oppressed and the voice is thick and hoarse between the attacks of cough. Besides, the venous radicles of the face, neck, and chest are usually more visible than natural from pressure upon the innominate

vein ; there is no expectoration of ropy mucus ; and the disease is not capable of being communicated to other children.

When convulsions occur in a case of whooping-cough it is very important, with a view to prognosis, to ascertain their mode of origin. If the convulsion is symptomatic of the onset of an inflammatory complication, it is accompanied by a rise of temperature and followed by a diminution in the spasmodic symptoms and a modification of the physical signs in the chest. If it announces the occurrence of collapse of the lung, the characteristic symptoms which mark that lesion will be present.

If the convulsion arises from exaggeration of the nervous disturbance which is one of the peculiarities of the disease, it will have been preceded by signs of unusual agitation in former fits of coughing. Such seizures are only seen in children known to be nervous, sensitive, and impressionable ; they follow immediately upon the cough, and between the attacks no signs of nervous disturbance remain. So also in the case of convulsions arising from partial asphyxia : the nervous attack is excited by extreme violence of spasm, but after the fit has passed off no signs of cerebral lesion are left behind. If, after a fit, there is squinting, drowsiness, stupor, or other sign of nervous disturbance, we may fear that congestion of brain is present or that thrombosis of the cerebral sinuses has occurred, and should watch the case with grave apprehension.

Prognosis.—Whatever be the age of the child, the prognosis is favourable so long as the disease remains uncomplicated ; but if a complication arise the prospect is less hopeful, and in a very young child any addition to the normal course of the complaint is to be regarded with anxiety. Convulsions, bronchitis with collapse, and catarrhal pneumonia are the principal causes of an unfavourable issue to the disease.

In the case of convulsions, if the attack can be connected with nervous agitation or the onset of an inflammatory complication, or if, after the fit, the child seem bright and well, there is still room for favourable anticipation. If, however, the seizure is symptomatic of diffused pulmonary collapse ; if it occur in the course of an extensive pulmonary inflammation ; or if it be followed by drowsiness, squinting, or sign of cerebral lesion, there is little prospect of the child's recovery. Sometimes we can anticipate the occurrence of convulsions. If we find the child to be nervous and impressionable, and we notice that he displays unusual agitation and excitement on the approach of the paroxysm, we may be prepared for an attack. So also if we find that the face becomes very blue during the cough, and that the spasm of the larynx is unusually prolonged, we may fear that an eclamptic attack may ensue. Laryngismus stridulus, as it supplies an additional obstacle to the aëration of the blood and tends to promote collapse of the lung, is an unfavourable sign. If it occur in combination with extensive lung mischief, the prospect is a very hopeless one.

If the pulmonary catarrh becomes aggravated, the presence or absence of rickets is a very important matter. Softening of ribs is a great obstacle to efficient breathing ; and if the presence of thick mucus in the tubes provides an additional impediment to the entrance of air, the occurrence of collapse is imminent. If, with this, the spasms are violent, and the child seem much exhausted at the end of the fit of coughing, collapse of the lung may be considered inevitable. In such a case the prognosis is a very gloomy one.

If the catarrh pass to the small air-tubes and vesicles, and set up catarrhal pneumonia, the state of the child is serious. Still, if the patient be

of healthy constitution and the pertussis of comparatively mild type, he has a chance of recovery. In a rickety child the prospect is very bad. In one of scrofulous constitution, if he do not succumb immediately, there is every likelihood that a chronic consolidation of one or both lungs will be left behind.

Treatment.—The treatment of whooping-cough resolves itself into general measures for preventing complications and furthering the normal working of the animal functions; also, in special treatment for shortening the disease and diminishing violence of spasm.

If possible, the child should be confined to two rooms opening into one another, so that he may inhabit them alternately, and get the benefit of efficient ventilation. Draughts should be avoided, and the temperature be kept as nearly as possible at 65° Fahr. If the rooms have no door of communication, the child should be taken from one to another, wrapped from head to foot in a blanket. Next, quiet and the avoidance of all sources of excitement and irritation should be enforced. If old enough to be amused, quiet games and picture-books may be supplied; and a teachable child is not to be worried with lessons if he is disinclined for them. His dress should be suitable to the season, but bare arms and legs must be forbidden, and the chest should be covered with cotton-wadding if the weather be changeable or cold.

In regulating the diet care should be taken not to overload the stomach. Four small meals are better than three large ones, and attention must be paid to the patient's power of digesting fermentable articles of food. The mucus flux from the stomach and bowels, which is a prominent feature of the complaint, is an active agent in promoting acidity; and starches must be given, therefore, cautiously and in limited quantities. A baby does well upon milk and barley-water (equal parts), and Mellin's food, with a pinch of bicarbonate of soda to each bottle. He may also have the yolk of an egg twice a week, and, if over ten months old, weak veal or chicken broth once in the day. After eighteen months the child may have minced meat, or fish, milk, eggs, and stale bread, but potatoes and farinaceous puddings are to be avoided. Well boiled cauliflower or greens may be given if the patient will take them.

If the natural vomiting does not sufficiently unload the stomach of mucus, nature may be aided by the occasional administration of an emetic. Sulphate of copper, as recommended by Trousseau, is very useful for this purpose, and may be given to a child of one year old in doses of half a grain every ten minutes until sickness is produced. Also, it is well to relieve the bowels by an occasional dose of castor-oil. Looseness of the bowels, such as is common in this complaint, is at once arrested in most cases by a dose of this useful remedy.

Of special drugs for shortening the attack and relieving spasm, so many have been recommended that the mere enumeration of them would occupy many lines; but of really serviceable drugs the number is much more limited. The treatment I have myself found to be most useful, and now invariably adopt, is the following:[1]—Directly any peculiarity in the cough or the occurrence of spasm indicates the nature of the complaint, I at once begin the administration of sulphate of zinc and atropia. From a large experience of this combination I can speak positively as to its power of reducing spasm and shortening the disease. I begin with one-sixth of a grain of sulphate of zinc and half a drop of the solution of atropine (P. B.)

[1] The quantities recommended are suitable to a child twelve months of age.

in water sweetened with glycerine, each morning and evening for two days, and then three times a day. After a week the quantity of zinc is increased to one-fourth, and still later to one-third of a grain. The atropia, however, is given in frequently increasing quantities. Children, although they vary in their insusceptibility to this drug, can all take it in large doses; and in whooping-cough where there is spasm to be overcome, the remedy is of little value unless given in doses sufficiently large to produce some of the physiological effects of the alkaloid. Excluding the belladonna rash, which is too uncertain in its appearance to be trusted, dilatation of the pupil is the earliest symptom that the system is responding to the action of the medicine. This sign is separated by a wide interval from the next earliest symptom—dryness of the throat. To be of service, the remedy should be pushed so as to produce some effect upon the pupil. With this object the dose should be increased every two days by a quarter of a drop of the atropine solution, watching the effect. In this way, with perfect safety, large quantities of the drug may be administered; and so employed, I think no doubt can be entertained as to the value of the treatment and its influence in shortening the course of the spasmodic stage and reducing the violence of the attacks. If the spasm is exceptionally severe and seems to threaten partial asphyxia, it is wise to give in addition a nightly dose of bromide of potassium or ammonium (gr. iij.–iv.). There is one precaution which it is well to adopt during this stage. The paroxysms are often most frequent and severe at night when the child is asleep. The slightest movement of air across the face, such as is produced by a person walking near the cot, will often excite an attack. These night seizures can usually be greatly reduced in number by an expedient suggested, I believe, originally by Dr. Marshall Hall. It consists in throwing a fine muslin curtain over the cot at night-time. The simplest plan is to have a couple of hoops arranged at the ends of the cot, like the "tilts" of a wagon, so as to support the curtain at a sufficient height. This arrangement, which corresponds to the mosquito curtain used in hot climates, does not interfere with a free supply of oxygen, while it effectually stops all wandering currents of air. So protected, a child will often sleep the night through without an attack.

At the end of the spasmodic stage and during the period of decline alum is very beneficial. This remedy, first recommended by Dr. Golding Bird in 1845, has a marked influence in checking too copious secretion and bringing the disease to a favourable termination. Two or three grains of alum may be substituted for the sulphate of zinc in the atropia mixture, and given three times in the day. It is at this time, viz., the end of the spasmodic stage and during the period of decline, that I have found the quinine treatment especially useful. I have little experience of the drug at the beginning of an attack. According to Binz, Jansen, and others, who, following the suggestion of Letzerich, direct their attacks against the organism which has been supposed to cause whooping-cough, quinine given at the beginning of the illness suppresses altogether the spasmodic element, and converts the disease into a severe but manageable bronchitis. They recommend the comparatively tasteless tannate of quinine, given twice a day in doses of a grain and a half for every year of the child's life.

There is no doubt that to be efficient in pertussis quinine should be given in full doses. I have given three times a day two grains of the sulphate of quinine to children between twelve months and two years old towards the end of the spasmodic stage, and have thought that the disease was cut

short by this means. Another combination which acts sometimes at this period of the illness with wonderful promptitude is formed by adding two drops of the tincture of cantharides to five drops each of the tincture of cinchona and paregoric, and giving this dose three times a day. Tonics generally are useful during the stage of decline. The preparations of iron are especially valuable. Thirty drops each of the compound decoction of aloes and iron wine make a good combination; iodide of iron is of service, and the citrate of iron with an alkali may be resorted to. It is a matter of great practical importance in all these cases to avoid the use of syrups in sweetening the mixture for the infant's palate. Glycerine, being non-fermentable, is far safer; or we may use a few drops of chloric ether for this purpose.

Many other drugs are used in the treatment of whooping-cough. The old treatment by dilute hydrocyanic acid and that by dilute nitric acid, each of which has had its day, has now, probably, fallen into complete disuse. Opium, however, in some form has not been completely superseded by belladonna. The preparations of morphia are still relied upon by some practitioners, and the remedy is no doubt a useful one. It should be given in sufficient doses to produce slight drowsiness, and this effect should be maintained for several days. For a child of twelve months a drop of the morphia solution (P. B.) can be given every four hours. There is no doubt that the spasm can be reduced by this means; but the treatment is, in my opinion, inferior to that by atropine, and necessitates very careful watching of the patient lest the narcotic effect of the remedy be carried further than is desired. Chloral may be also employed to reduce spasm in doses of gr. ij. every four or six hours. It is sometimes used in combination with bromide of potassium, and the effect of both drugs appears to be heightened by the association. Croton chloral is a remedy greatly relied upon by some practitioners. The dose is one grain for a child of twelve months, given every four, six, or eight hours in water sweetened with glycerine.

Besides the above methods of treatment the topical action of drugs is largely used in the management of whooping-cough. It is now nearly thirty years since Dr. Eben Watson advocated swabbing the larynx with a solution of nitrate of silver, twenty grains to the ounce. The application was repeated every second day, and the spasm is said to have subsided at the end of the week. This heroic remedy is not now in vogue. Instead, milder applications sprayed into the throat are made use of. A two per cent. solution of salicylic acid used regularly in this manner is said to diminish rapidly the number of paroxysms. Dr. R. J. Lee is a warm advocate of carbolic acid inhalations, and claims for them that they induce a daily decrease in the violence of the cough, and promote the disappearance of the symptoms within a period varying from a fortnight to three weeks. Dr. Lee prefers long-continued inhalations of a diluted vapour, and recommends that the air of the room should be kept saturated with a weak solution of carbolic acid. As this acid does not evaporate when exposed to the air, special means have to be used for converting it into vapour. Dr. Lee's "steam draft inhaler," which moistens the air as well as medicates it, is a useful and simple apparatus. A solution of one part of the acid to thirty of water is to be used for vaporisation, and by this means the child may pass a large part of his time in air kept saturated with a dilute medicated vapour. If carbolic acid be inhaled in the ordinary way from a mouth-piece, the solution should not be stronger than one part in eighty parts of water.

External applications have not been neglected in the treatment of whooping-cough. Many patent remedies, such as Roche's embrocation, which is composed of the oils of cloves and amber with double their quantity of olive-oil, belong to this class. Stimulating liniments are often useful if the catarrh of the chest is severe, and if applied along the sides of the neck, and to the spine as well as to the chest, may help to reduce the spasm. Mustard poultices to the back are favourite remedies with some practitioners, and it is said that if applied along the whole length of the spine for six or eight minutes every night before the child is put to bed a speedy improvement is noticed in the symptoms.

When complications arise in the course of whooping-cough, special measures must be adopted for their relief. If the vomiting of food become excessive, so as to interfere seriously with the child's nutrition, it may be often relieved by emetics of sulphate of copper (half a grain to the teaspoonful) given every day or on alternate days, so as to clear away tenacious mucus from the stomach. Chloral is useful in these cases by its power of diminishing reflex action. Excessive vomiting is usually found in cases where the laryngeal spasm is extreme, and the remedies which are useful in alleviating this symptom have also a beneficial action in checking too forcible contraction of the diaphragm. Looseness of the bowels is usually easily controlled by a dose of castor-oil. In this country diarrhœa seldom becomes troublesome, but in warm climates during the hot season choleraic diarrhœa may supervene. This must be treated according to the rules laid down for the management of that serious condition.

If laryngismus stridulus complicate the paroxysm, bromide of ammonium or potassium (gr. iij.) may be given with atropia two or three times a day ; and the same treatment is useful if unwonted nervous excitement, or signs of cerebral disturbance, indicate the imminence of a convulsive fit. If the spasm be prolonged and seem to threaten suffocation, slipping the child's hands into cold water will often relax the glottis at once.

Convulsions must be treated according to the special condition from which they appear to have arisen. In the more serious form of eclamptic attack, such as that induced by collapse of lung, catarrhal pneumonia, or thrombosis of intracranial sinuses and veins, the treatment must be directed against the complication by which the nervous seizure has been excited. Convulsions set up by pure nervous agitation, or by partial asphyxia from violence of laryngeal spasm, are usually to be controlled by the administration of chloral in the quantities already indicated. If the seizures occur in a rickety child, and appear to be the consequence of digestive disturbance and acidity (a not uncommon case), a dose of ipecacuanha wine, followed by an antacid and aromatic mixture, will usually put an end to them at once.

If the pulmonary catarrh become severe and threaten collapse of the lung, prompt steps must be taken to ward off this dangerous complication. Stimulating applications should be applied to the chest and back ; occasional emetics should be given to aid in the expulsion of mucus ; and the child's strength must be supported by a suitable supply of alcoholic stimulant. In these cases alcohol should be given boldly. A young child in a weakly state from acute disease will respond well to such treatment, and a few timely doses of brandy-and-egg, or other powerful stimulant, will quickly give him renewed strength to struggle against his disease. It may be necessary to give a teaspoonful every hour, or even half hour, until the difficulty is overcome.

If catarrhal pneumonia supervene, the complication must be treated upon the principles laid down in the chapter relating to that subject.

When the disease is at an end, change of air to a dry, bracing spot or to the sea-side is of importance. Remembering the frequency of glandular enlargements and the danger of tuberculosis, we should recommend such measures as are required for restoring impaired nutrition and replacing lost strength. Cod-liver oil is very valuable, alcohol is of service, and iron is usually indicated.

The symptoms described as "mucous disease," which are often seen in children of three or four years of age or upwards after an attack of whooping-cough, are quickly removed by careful regulation of the diet. The child should be fed upon meat, eggs, fish, poultry, and milk; and potatoes, farinaceous puddings, fruit, cakes, sweets—all articles, in fact, capable of affording material for fermentation must be strictly forbidden. A mild aperient, such as the compound liquorice powder, should be given twice a week to ensure the expulsion of excess of mucus from the bowels; and iron with alkalies, or iron wine with compound decoction of aloes (āā ʒ ij. for a child of five years of age), should be given two or three times a day, two hours after meals.

Part 2.

GENERAL DISEASE NOT INFECTIOUS.

CHAPTER I.

RICKETS.

Of all the chronic diseases to which young children are liable, none surpasses in interest and importance the one now to be considered. The frequency with which rickets occurs, the variety of tissues it affects, the influence it exercises upon the course and termination of intercurrent maladies, and the distressing and often fatal consequences which its presence involves render this disease especially deserving of careful study.

Although dissimilar in many respects from the class of so-called diathetic diseases, viz., those which arise as a consequence of a distinct constitutional predisposition, rickets is yet a general affection, for it impairs the nutrition of the whole body. Under its influence growth and development are arrested, dentition is retarded, the bones soften and become deformed, the muscles and ligaments waste, and in fatal cases alterations are often noticed in the brain, liver, spleen, and lymphatic glands. The disease usually begins in infancy. It is rare under the age of six months, for it seems very doubtful if the cases of so-called congenital rickets are true examples of the disease. At the eighth month, however, it begins to be common, and from that age until the eighteenth month may be readily set up under the influence of causes which interfere with digestion and impede the assimilation of food. It is less common for the disease to develop in children who have been in good health up to the age of eighteen months, but it may occur at any time between that age and the seventh year, or even in still older subjects. Although beginning at a very early age, the disease often continues for several years, and may be seen existing in a marked degree in children three or four years old.

Causation.—Rickets is the direct consequence of mal-nutrition in early life. Its causes must therefore be looked for in all the diverse agencies which impair the nutrition of the growing frame. The most important of these are, no doubt, faults of feeding and hygiene. Insufficient or unsuitable food stints the body of necessary nourishment, and an inadequate supply of fresh air renders assimilation defective and weakens digestive power. These two causes are most commonly found united in the poorer quarters of large cities. An infant who lives amongst other children in

one small room, where it breathes a tainted air and derives its only nourishment from the watery breast-milk of a weakly mother, with the addition, perhaps, of a little gruel or sopped bread to quiet it when it cries, can only escape rickets by becoming tubercular. By such means an extreme degree of the malady will probably be produced. But similar agencies, although operating in a milder form, will produce rickets in any condition of life. It is not uncommon to meet with examples of the disease in well-to-do families where the child has been kept in-doors for fear of his catching cold, and has been supplied with farinaceous compounds largely beyond his powers of digestion. Over-feeding with starchy foods is a fruitful cause of rickets. The giving of farinaceous matters in excess, or at a time when the glandular secretions are insufficient for its digestion, is the commonest fault committed in the hand-feeding of infants. Dr. Buchanan Baxter, who tabulated one hundred and twenty consecutive cases of rickets, found that in many of them the disease dated from the time when farinaceous food was first given. It is probable that in these cases the occurrence of mal-nutrition and subsequent rickets is due not so much to the excess of starch as to the absence of the more nutritious food for which the starch has been substituted. Rickety children so fed are often fat, and do not, to the inexperienced eye, convey the impression of being under-nourished. Examination, however, discovers that they are by no means strong in proportion to their size. Although stout they are weak, often excessively feeble ; and it is evident that the plumpness of the child is due to disproportionate development of the subcutaneous fat. This tissue has been enormously over-nourished while the rest of the body has been stinted and starved.

The time of weaning is often a starting-point for rickets, for the breast-milk is usually replaced by some preparation of starch. So also long-continued suckling may induce the disease, for the breast-milk after a time ceases to satisfy the infant's wants, and too little additional nourishment is supplied. Therefore whether the food given be insufficient in amount or indigestible in form the effect is the same : the child is starved and rickets becomes developed.

In cases where the child lives in a good bracing air the effects of an unsuitable dietary are less painfully evident. In dry country places, where the infant spends much of his time out of doors, rickets is a more uncommon disease than it is in localities where the conditions are less favourable to health. Want of sunlight, want of cleanliness, and a combination of cold and damp are other determining causes which are not without their influence in the production of rickets. All these causes must no doubt act with especial energy in the case of infants who are naturally weakly, or whose strength has been already reduced by some exhausting disease. There are, therefore, many conditions which predispose to the complaint. Feebleness of constitution on the part of the parents will, no doubt, have an influence in this respect, for weakly parents are not likely to beget constitutionally healthy children. Moreover, a weakly mother is usually unable to nurse her baby ; and hand-feeding, unless conducted with extreme care and discretion, is often unsatisfactory. A very large proportion of rickety infants are bottle-fed.

Hereditary tendency is considered by some observers to be an element in the etiology of the disease. In the case of so common an affection it must no doubt often happen that the father or mother of the patient has been previously affected in a similar way ; but that a parent who had been rickety in childhood should give birth to a weakly infant, and that this in-

fant, brought up in violation of all the rules of health, should develope rickets, is surely but slender evidence in favour of the hereditary transmission of the disease. Supporters of this theory usually point to the cases of so-called "congenital rickets" as instances of the inherited form of the disease; but, as is hereafter explained, there are reasons for excluding these cases from the class of true rickets.

The relation which exists between rickets and congenital syphilis has within the last few years been brought into great prominence. M. Parrot has laboured to show that rickets is always the consequence of an hereditary syphilitic taint. The arguments of this observer in favour of his view are derived chiefly from morbid anatomy. He points in particular to the anatomical changes observable in the epiphyseal ends of the long bones in the two diseases as evidence of the specific nature of rickets. But the latter is not *only* a disease of the bones; and although the epiphyses in the two cases may present a certain similarity of lesion, there are other alterations of structure in rickets which are different from those of syphilis. Moreover, the general symptoms, especially the peculiar tendency to functional nervous disorders, have no counterpart in the specific disease. Again, rickets is constantly met with in cases where the most careful inquiry and most minute examination fail to detect any history of venereal taint in the parents or sign of it in their offspring. The disease is common in localities where congenital syphilis is rare, and rare in places where the latter is common. It is met with in animals as well as the human subject, and is produced in them by faulty hygiene and bad feeding as it is in the child. But it is needless to multiply arguments against the untenable hypothesis advanced by this distinguished pathologist.

Still, although it cannot be allowed that rickets is caused by syphilis, syphilitic infants may become rickety; and it is probable that a parent weakened by a former syphilis may, without transmitting the taint to his offspring, beget a child of feeble constitution in whom rickets can be easily induced. But in both these cases injudicious feeding and insanitary conditions must come into operation before the disease can occur.

A pronounced tubercular disposition appears to have a protective power against rickets; for although weakly, phthisical parents may give birth to feeble infants who readily fall victims to rickets, it is rare to find the latter disease in a family where other members have died of tubercular meningitis or other form of pure tuberculosis—unless, indeed, the tubercular mischief has occurred secondarily to rickets. The reason of this immunity seems to be that the causes which are capable of setting up rickets will induce tuberculosis in a child predisposed to this form of illness and very quickly bring his life to a close.

How it is that these causes give rise to rickets is still undecided. It has been shown by the experiments of Friedleben that a diet deficient in phosphoric acid and the lime salts is not capable, as was at one time supposed, of inducing rickets; indeed, it seems probable that the essence of the process is not a mere deficiency of lime in the bones, but an irritation of the bone-making tissue. It is asserted by Heitzman that lactic acid exercises an irritating influence upon the osteoplastic tissue, and that it is this influence, combined with a deficiency in lime salts, which induces the disease. There is little doubt that lactic acid is abundantly generated in the deranged digestive organs of rickety children, for this acid has been detected in their urine. If Heitzman's theory be correct, the acid excites irritation in the osteoplastic tissue, and at the same time dissolves and helps to eliminate the calcareous matter deposited in the bones. If, in ad-

dition, the supply of lime salts be actually reduced, rickets is set up with still greater certainty.

Morbid Anatomy.—In looking at a case of well-marked rickets the eye is at once arrested by the enlargement of the epiphyseal ends of the long bones and the deformities of the skeleton which result from softening of the osseous framework. In rickets the bones are affected in three ways. Growth, although not completely arrested, is retarded and rendered irregular; ossification of parts still remaining cartilaginous is interfered with, and bone already ossified is softened. When a longitudinal section is made of one of the long bones the whole structure appears deeply reddened from intense congestion. The epiphysis is very large, and the increase in size is due chiefly to an enormous development of the cartilage, which is preparing for the reception of the calcareous salts. The layer of cartilage into which the new bone is advancing is called *the zone of calcification.* That next in order, in which the corpuscular elements arrange themselves in vertical columns in preparation for the approach of the earthy deposit, is called *the zone of proliferation.* These two zones are greatly thickened and are not separated, as would be the case in the bone of a healthy child, by a well-defined straight line of demarcation. In the rickety epiphysis the new bony tissue, instead of advancing by regular steps into the zone of calcification, no one point being in advance of another, shoots up irregularly, so that lines or little islets of calcification are seen far up in the proliferating zone, while on the other hand specks and streaks of uncalcified cartilage are left far below the line of earthy deposit completely surrounded by bone. Moreover, medullary spaces are formed in unusual places, and appear even in the proliferating zone of cartilage far in advance of the margin of ossification. The cartilage cells become the seat of calcareous impregnation,[1] and are in many cases converted into bone corpuscles. Small isolated masses of lime can also often be seen scattered through the matrix—enough in many cases to give a dotted appearance to a section of the cartilage.

Changes similar to those described in the epiphyses take place at the surface of the shaft of the long bones and in the flat bones. The periosteum becomes excessively thick and very vascular, and is connected so firmly with the bone beneath that it cannot be detached without fragments of the latter being stripped away with it. Its connective-tissue corpuscles undergo rapid proliferation and become transformed directly into bone corpuscles. The calcifying process is irregular here as it is in the epiphyses, so that layers of firm bony tissue are interspersed with others composed of a fibrous matrix containing connective tissue or bone corpuscles and medullary spaces. In the flat bones, especially those of the skull, the irregularity with which calcareous matter is deposited is well seen. The new porous bone occupies chiefly the surface and edges. In the cranial bones a special change is often found. In certain spots the bone becomes excessively thin and transparent (cranio-tabes). This condition is due to deficient deposit of lime salts in the external layers and absorption of the soft tissue in places, here and there, from the pressure of the brain.

Bones in which ossification is thus delayed and perverted are usually soft. The softening is the consequence of the smaller proportion of earthy

[1] It has been doubted whether this change occurs in healthy ossification, for in the normal process the calcification of the intercellular matrix which surrounds the cartilage cells conceals the latter from view. In rickety bone the calcifying granules are deposited first in the cells, so that the changes in them can be distinctly seen.

salts they contain and the larger percentage of organic matter. But the deficiency of lime salts is due not to their removal after deposition, but to the sluggishness with which they are deposited. The corpuscular elements of the periosteum are proliferated in large quantities, and the new matter is but slowly and imperfectly converted into bone. The circumference of the shaft, therefore, consists in great measure of spongy lamellæ which are only partially ossified. All this time in the interior of the bone the normal enlargement of the medullary canal by absorption still continues, so that as long as the rickety process is active the proportion of properly constructed osseous matter containing its due percentage of earthy salts is continually diminishing. Such a bone must necessarily be yielding and subject to ready distortion. This, however, is not the only cause of the bone deformities. According to Strelzoff, the osseous trabeculæ have an abnormal arrangement in rickety bone. They are disposed radially instead of concentrically. He maintains that this irregularity further diminishes their power of resistance to external pressure and is an additional source of weakness.

At the height of the disease the bones, besides being softer, are specifically lighter than natural, and contain an undue proportion of fatty matter. Moreover, the cartilage contains a high percentage of water. The bone on analysis has been shown to consist of 33 to 52 per cent. of earthy salts, instead of 63 to 65 as in health, and its animal matter is said to yield no gelatine on boiling.

When the disease becomes arrested, ossification in the soft, newly formed tissue takes place rapidly. The loose spongy structure closes up and becomes thick and hard, and the whole bone is heavy and dense.

The morbid changes in the osseous system form, no doubt, the most characteristic feature of the rickety state : but rickets is not merely a disease of the bones. In addition, various pathological changes are discovered in the bodies of children who have died while suffering from this affection. In some the liver, spleen, and lymphatic glands are found diseased, the muscular structure is altered in bad cases, the brain may be affected, and the urine almost invariably exhibits pathological characters.

The alterations in the liver, spleen, and lymphatic glands are by no means present in every case, or even in every marked case of the disease. The affected organs are enlarged, tough, and solid to the touch, and heavy out of proportion to their size. The change is usually most marked in the spleen. Dr. Dickinson considers it to be due to no "new growth or infiltrated deposit," but to a hyperplasia of the normal tissue of the organ, and chiefly of the interstitial connective tissue. The fibrous and epithelial elements are hypertrophied, and at the same time their earthy salts are deficient in quantity. In the *liver* the fibroid sheath within the smaller portal canals is twice its natural size, and in the glandular structure the yellowish acini are bounded by a thin pinkish or grayish line. In the *spleen* the interstitial connective tissue may become so hypertrophied that the trabeculæ are as thick as the spaces they enclose. In the meshes the corpuscles are seen by the microscope to be crowded together. The organ is hard and resistant, so that it can be cut with the utmost ease into thin sections. Its surface is deep red or purple in colour, with smooth white spots from enlarged Malpighian corpuscles. Its section is deep red mottled with pale buff colour. But little blood can be squeezed from the cut surface. The *lymphatic glands* are sometimes also enlarged and hard. They are white and opaque on section from accumulation of their cellular contents.

Enlargement of the liver in rickets is not always the consequence of the

pathological condition described. If a rickety child be much wasted from intestinal catarrh or other digestive trouble, the liver may be swollen from fatty infiltration. If he have been subject to repeated pulmonary catarrhs with great interference with the respiratory function, the organ may be enlarged from chronic congestion. So also turgescence of the spleen may be found unaccompanied by any appreciable lesion of the liver or lymphatic glands. In some cases the increase in size of the organ appears to be due, as in the case of the liver, to a chronic congestive process which causes a large development of hyaline fibroid material. In others the spleen seems to be the seat merely of simple hyperplasia and presents the ordinary characters of hypertrophy, such as are seen in some cases of inherited syphilis and in the ague cachexia. This form of enlargement is referred to elsewhere (see page 238).

The muscles have been noticed by Sir William Jenner to be small, pale, flabby, and soft. Their fibres under the microscope are softer and paler than natural, with the striæ very indistinctly marked. The brain is sometimes small and shrunken, so that fluid is thrown out to fill up the space left vacant in the skull cavity. It is also sometimes enlarged, so much so, in some cases, as to cause distention of the cranium. Dr. Hilton Fagge has referred to a case which was taken to be one of advanced hydrocephalus until an examination of the body after death showed that the brain filled up the cranial cavity completely. In such cases the organ, although enlarged, has a healthy appearance and is of natural consistence. The hypertrophy is said to be in the neuroglia without any increase in the nerve-elements.

The urine contains an increased proportion of phosphate of lime, and lactic acid has been found in it by some observers. The secretion is pale in colour and often deposits crystals of oxalate of lime. Often, also, as is so commonly the case in children in whom acid is largely generated from fermentation of food, crystals of uric acid and even considerable quantities of red sand may be passed from the kidneys.

In addition to the above pathological conditions, which may be considered to arise directly from the general disease, there are others which may be looked upon as accidental since they are induced mechanically by the deformities of the thorax resulting from the softening of the ribs. In all cases of distortion of the framework of the chest two pulmonary lesions are invariably present. These are emphysema and collapse. The emphysema is seated at the anterior borders of the lungs, and extends backwards for about three-quarters of an inch from their free margins. Immediately outside this line of dilated lung tissue is a line of collapse which separates it from the healthy pulmonary substance beyond. These lesions occur together and, although not dependent one upon another, are produced by the same mechanical means. During the act of inspiration the softened ribs sink in, and the pressure of the enlarged ends of the ribs compresses the lung tissue with which they are in contact so as to prevent its expansion by the air which inflates the remainder of the lung. While, however, the diameter of the chest is narrowed laterally, its antero-posterior diameter is increased by the protrusion of the sternum. Consequently the alveoli of the anterior borders, immediately behind the breast-bone, are distended by the air which is forced into this part to fill up the resulting space.

Pulmonary collapse is not always limited to the parts of the lung corresponding to the ends of the ribs. There is often to be seen, in addition, a certain amount of atelectasis at the bases of the lungs behind. Collapse

at this part of the lung is due to pulmonary catarrh and plugging of an air-tube with mucus. Its mechanism is described elsewhere (see p. 465).

The enlarged epiphyses of the ribs, besides their effect upon the lung tissue, are also the cause of the patches of circumscribed opacity seen on the visceral surface of the pericardium and on the spleen. That on the pericardium is situated on the left ventricle a little above the apex of the heart. At this point the heart at each beat comes into contact with the nodule of the fifth rib. That on the spleen is produced in the same way by attrition, the organ as it rises and falls in respiration being rubbed against a similar costal projection. In each case the white patch is limited to the fibrous layer.

From a consideration of the morbid changes discovered in the bodies of rickety children, it is evident that the disease is a very special one, involving very wide-spread lesions of structure. Attention has lately been directed to the whole subject of bone changes in the young subject, and it is asserted that many cases in which bone softening has been pronounced are not real examples of rickets, but ought rather to fall under the heading of osteo-malacia; the osseous changes resembling closely those observable in cases of osteo-malacia in the adult. The question is of importance, for the pathology of the two conditions is essentially dissimilar. In osteo-malacia softening is the consequence of a removal of the earthy constituents from perfectly formed bone. In rickets ossification is incomplete, and much new material is thrown out which undergoes very imperfect calcification. The question can only be decided by a careful study of the morbid appearances. In the case of a rickety little girl, aged eighteen months, described by Dr. Rehn of Frankfort, there was marked distortion and softening of many of the long bones, with other signs usually considered characteristic of rickets. The disease, however, was judged to be osteo-malacia on the ground that although softening was a marked feature in the bones, the epiphyseal ends were only moderately swollen, and in the bones of the lower extremities were hardly swollen at all. Moreover, the whole skeleton was excessively thin and the lower extremities were quite straight. There was, however, a considerable formation of soft periosteal deposit; and a rickety element in the case was admitted. It is possible that true osteo-malacia may be grafted on a case of rickets, as is supposed by Dr. Rehn to have happened in the instance referred to, but further observations are to be desired before any definite conclusion in the matter can be arrived at.

Before closing the subject of the pathology of rickets a few words may be said with regard to the cases of so-called "congenital rickets." This term is applied to a condition in which the limbs of a new-born child are found to present peculiar characters. The shafts of the bones are short and thickened, and may be found bent or even broken. At the same time the epiphyses are swollen, soft, and quite cartilaginous. The condition, however, differs materially from true rickets, and has been compared by Eberth to that found in cretinous children. In all recorded cases where the *post-mortem* appearances have been noted the shafts of the bones have been found much ossified and remarkably thick and stunted. This peculiarity gives, of course, a curious shortness to the limbs.[1] The diaphyses, instead of being imperfectly ossified as in rickets, with great porosity of the medullary parts of the bone and thickness of the perios-

[1] In a case described by Dr. Barlow the upper limbs reached only to the umbilicus, and the lower extremities measured no more than five inches in length.

teum, are excessively hard and compact. Fibrous tissue derived from the inferior layers of the periosteum intrudes between the epiphysis and the shaft. The epiphyses, also, are enlarged generally and not only at the line of calcification, as in rickets; and their microscopical characters present sensible differences. In a case recorded by Urtel the cartilage cells in the epiphyses were found lying confusedly together. As they approached the diaphysis they were seen to become flatter, especially in the peripheral portions, and finally passed into the layer of connective tissue which separated the greater part of the epiphysis from the shaft of the bone. The resemblance between these cases and cretinism is displayed not only by the stunting and firm ossification of the diaphyses. There is the same tendency to early union by ossification of the basi-occipital and post-sphenoidal bones. Some specimens of "congenital rickets" preserved in the Museum of the Royal College of Surgeons exhibit this peculiarity, and in others, where the soft parts remain intact, many of the facial characteristics of the cretin are also to be observed.

Symptoms.—As might be expected in a disease which arises as a direct consequence of faulty nutrition, the symptoms proper to rickets are usually preceded by others indicating a general interference with the nutritive processes. Digestive derangements are common, but these comparatively seldom consist in attacks of severe or repeated vomiting or diarrhœa. In most cases the derangement is limited to a lessening of digestive power, so that the motions, without being actually loose, are more frequent than natural. They are large, pasty-looking, and offensive from the quantity of farinaceous and curdy matters which are passing undigested out of the body. At this time the child is often irritable and fretful. His belly may be swollen from flatulent distention, and he frequently cries with pains in the abdomen. For this reason he may be often found asleep in his cot resting on his chest, or supported on his knees and elbows with his head buried in the pillow. The urine is often very acid and causes uneasiness in micturition. If the child perspires copiously the renal secretion may contain considerable quantities of uric acid sand.

Unless by judicious treatment and diet the alimentary canal be restored to a healthy state the child, although often still plump to the eye, becomes pale and flabby. Then, after an interval which varies in duration according to the natural strength of the patient and the more or less wholesomeness of his surroundings, the early symptoms are noticed. The onset of the disease is announced by three special symptoms. The child begins to sweat about the head and neck; he throws off his coverings at night and lies naked in his cot; and begins shortly afterwards to exhibit uneasiness if much danced about in his nurse's arms or handled without the utmost gentleness.

The sweating is profuse and occurs principally during sleep. At night beads of moisture may be seen standing on his brows, and the sweat trickles off his head on to the pillow, which is often saturated by the secretion. If the child fall asleep in the day-time, or even if he exert himself much while awake, the same phenomenon may be noticed. The irritation of this perspiration often gives rise to a crop of miliaria about the neck, behind the ears, and on the forehead. The superficial veins of the temples are full, the jugular veins are unusually visible, and the carotid arteries may be felt to pulsate strongly.

The desire of the child to lie cool at night comes on almost at the same time with the preceding, and may be observed in the coldest weather. It is, indeed, a frequent cause of catarrh in these patients, and I have seen

many cases in which continued looseness of the bowels was apparently maintained by repeated chills so contracted. For the same reason a frequent cough from pulmonary catarrh is a common symptom.

General tenderness usually begins to be noticed at a certain interval after the two other symptoms which have been mentioned. It is shown by unusual sensitiveness to even slight pressure, and appears to be seated in the muscles as well as the bones. The child cries if lifted up at all abruptly or subjected to any jolt or jar, and prefers to lie quietly in his cot or on the lap of his nurse. This symptom seldom occurs until the osseous changes are well marked. It is accompanied by uneasiness or pain about the head, which is indicated by a monotonous movement of the head from side to side upon the pillow. The hair covering the occiput is often worn away by this constant movement, and the bareness of the back of the scalp from this cause is a very characteristic symptom. Tenderness is not always noticed. It is usually confined to cases where the disease is severe. In the mild cases, which are shown merely by a slight enlargement of the wrists and ankles, without any apparent softening of the bones, the symptom is usually absent.

The bone changes consist in an enlargement of the epiphyseal ends of the long bones, in a thickening of the flat bones, and in a general softening of all. The enlargement of the ends of the bones occupies the point of junction of the shaft with the epiphysis. Both extremities of the bone may suffer, but the change is naturally most obvious in the part which is nearest to the surface. The ribs at their sternal ends are usually the first to be affected ; then the bones of the wrists. As a rule, the epiphyseal swelling is more marked in the bones of the upper extremities than it is in those of the lower. The thickening of the flat bones is well seen in the bones of the cranium, and the softening of all the bones is one of the causes of the deformities of the trunk and limbs which are so common in early life. It must not, however, be supposed that every case of rickets ends in softening and distortion. All degrees of severity of the disease may be met with, and in mild cases softening and the consequent deformities of bone are entirely absent. Even in more severe cases we must not expect in every instance to find all the symptoms to be enumerated. In one child the epiphyseal swellings attract most attention ; in another the softening of the bones. In some the chest is excessively distorted and the bones of the limbs are comparatively straight. In others the limbs are greatly twisted while the thorax is but little altered from the normal shape. These differences are said by Baginsky to be determined by the part of the skeleton in which growth happens to be most active at the time of the attack.

In a pronounced case of rickets the effect of the bone lesions is very striking and peculiar :

The *skull* is large with a long antero-posterior diameter, and often, on account of the comparatively small size of the face, looks larger than it really is. The forehead is square from exaggeration of the bosses of the frontal bones, and is sometimes very prominent from the development in the bone of cellular cavities. The fontanelle is large and remains open long after the end of the second year. Sometimes, if the size of the brain is increased, or there is excess of fluid in the skull cavity, the sutures in connection with the fontanelle can be felt to be more or less distinctly gaping. On account of the thickening of the edges of the flat bones the margins of the sutures and fontanelle are elevated, so that the latter feel depressed and the sutures are indicated by furrows. The posterior fon-

tanelle has usually disappeared before the beginning of the illness, but in extreme cases, where the disease began early and the symptoms are pronounced, it may be felt to be still unclosed.

In every case of rickets the condition known as "cranio-tabes" and described by Elsässer should be searched for. It is best detected by pressing gently with the tips of the fingers on the posterior surface of the head. If cranio-tabes be present, spots will be felt where the bone is thin, soft, and elastic, as if at this point it had been converted into tightly stretched parchment. The spots are seldom larger than the diameter of a good-sized pea, and are usually confined to the occipital bone. They are caused by absorption of the imperfectly ossified bone from its compression between the pillow and the brain as the child lies in his cot. They may be met with as soon as the third month of life, and are said to be the earliest sign of the disease.

A rickety child's hair is usually thin, and is often kept moist by the copious perspirations to which the head is subject whenever the patient falls asleep. In most rickety children a systolic murmur of variable intensity can be heard with the stethoscope applied over the fontanelle. According to Senator, the symptom merely shows that an ossified membrane is better fitted than the cranial bones to transmit to the ear sounds generated in the cerebral vessels. There is no doubt that it is rarely heard in children in whom the fontanelle has closed. The murmur is sometimes curiously loud. Not long ago a pallid, flabby little girl, between two and three years old, the subject of rickets, was brought to me from the country on account of a strange noise which was heard at times to proceed from her head. The child had cut all her teeth, but was very weak on her legs. She was subject to attacks of stridulous laryngitis. The fontanelle was not quite closed. Her heart and lungs were healthy. It was said that in this child a noise like "the purring of a kitten," not continuous, but distinctly intermittent, "like a pulsation," could be heard at times. It was loudest at the right side of the head. It was not especially loud after exertion, and was only occasionally audible. It was heard best immediately the child awoke in the morning, and was then distinctly perceptible several yards from her cot. During the child's visit to me no cerebral or other murmur could be heard with the stethoscope. Still, I had no reason to doubt the good faith of the relatives. The mother, who gave me the account, told her tale in a straightforward manner, with the air of one who was eager to receive an explanation of a mystery which had puzzled her and made her anxious.

The chief cause of the smallness of the face is the imperfect development of the jaws. Fleischmann has drawn attention to the angularity, and flatness anteriorly, of the lower jaw. It has lost its normal curve. The incisors are quite in a straight line; then at the situation of the eye-teeth the jaw forms a sharp angle and bends abruptly backwards. This is due to imperfect growth of the middle portion of the jaw. Baginsky describes in addition an occasional want of symmetry between the two halves of the bone, which gives the appearance of one side being higher than the other. The effect of this delayed development of the jaw upon dentition is very important. Rickety children are late in teething. At whatever age before the completion of dentition the disease may begin, directly the cranial or facial bones become affected there is complete arrest in dental development. Thus, if the disease occurs before any teeth have been cut, their appearance may be indefinitely delayed. If several teeth have already pierced the gum the process stops there, and months may elapse before

others are seen. When, however, the teeth do come they are usually cut without much trouble; but they are in most cases of bad quality from imperfect development of the dental enamel, and quickly blacken and decay.

The *chest* is deformed in a very characteristic manner on account of the inability of the softened ribs to resist the pressure of the atmosphere. Under normal conditions, when the ribs rise and the chest expands in the act of inspiration, the solid framework of the thorax is able to withstand the pressure of the expired air, and the chest easily enlarges to allow of inflation of the lungs. Air rushes through the wind-pipe to dilate the pulmonary tissue in proportion as the chest-walls expand. In the rickety chest, on the contrary, the ribs are not firm but yielding. Consequently the framework of the thorax is not rigid enough to resist the pressure of the air from without, and when the effort is made to expand the chest the softened ribs are forced in at the sides—the parts where they are least supported. This sinking in of the ribs throws the sternum forwards. We therefore find the chest grooved laterally and the breast-bone prominent and sharp. The groove is broad and shallow, and reaches from the second or third rib to the hypochondrium. The bottom of the depression is formed by the ribs outside their junction with the cartilages. Therefore along the inner side of the groove the swollen ends of the ribs can be seen, looking like a row of large beads under the skin. The groove is deepest in children who have suffered much from pulmonary catarrh. In such subjects the impediment to the entrance of air, already existing, is increased by the narrowing in the calibre of the smaller tubes induced by the derangement; and the softened ribs receive still less support from the lung tissue beneath them. In a chest so deformed each inspiration increases the depth of the lateral groove, and at the same time produces a deep furrow which passes horizontally across the chest at the level of the epigastrium. This furrowing of the surface has been shown by Sir William Jenner to be due not to the traction of the diaphragm, as was taught by Rokitansky, but like the lateral grooves of the chest to atmospheric pressure. The liver, stomach, and spleen support the parietes under which they lie, and prevent the wall at these points from falling in.

The *spine* is often bent. In an infant the cervical curve is increased so that the head is supported with difficulty and falls backwards upon the shoulders, producing a very characteristic attitude. Also, the weight of the head and shoulders, as the child sits bending forwards, causes a projection backwards of the dorsal and lumbar spines, which is sometimes so sharp as to give the appearance of vertebral caries. The deformity, however, subsides completely when the child is taken up under the arms and the spine is drawn upon by the weight of the limbs and pelvis. If the patient is able to walk, there is an increase in the lumbar and dorsal curves. The curvature may be lateral. If the child is carried habitually on his nurse's left arm, the trunk sways over to the right; if on the right arm, the body leans to the left. In all these cases the deformity is due to weakness of the ligaments and muscles.

The bones forming the *pelvis* may be also deformed, and sometimes, like the chest, are greatly distorted. The shape assumed by this framework is very various, for as it is due in all cases to compression of the yielding bones, it will be determined partly by the age at which the disease begins, and the degree to which ossification has advanced. It is therefore different, according to the usual attitude of the child, and to the circumstance of his being able or not to walk about. Its most ordinary shape is an irregular triangle. Distortion of the pelvis is of great impor-

tance in its influence upon child-bearing in the adult female; but even in early life it may have grave consequences. The operation of lithotomy in the young subject has been attended with serious difficulties, and even been followed by fatal results, on account of this deformity.

In the bones of the *limbs* the articular ends are nodular from enlargement, but the shafts themselves have often an unnatural shape. In the arm the *humerus* is often curved at the insertion of the deltoid muscle by the weight of the forearm and hand when the arm is raised. The *radius* and *ulna* are curved outwards and twisted, for a rickety child often rests his hands on the bed or floor to assist his feeble spine in supporting the weight of his trunk. In the *femur* the head of the bone may be bent at an angle with the shaft. The body of the bone is curved forwards if the child cannot walk; for as he sits on his mother's lap the weight of the leg drags upon the lower part of the thigh. If he can walk, the curve is an exaggeration of the natural curve—forwards and outwards. The *tibia* is curved outwards if the child is unable to walk, so that when the patient is held upright the knees are widely apart. The deformity is due in this case to the position commonly assumed by the infant, who is addicted to sitting cross-legged on his bed, so as to make pressure upon the outside of his ankle. In children who can walk an abrupt curve, having its convexity forwards and outwards, is seen in the lower third of the bone. The lower limbs are not distorted in the infant so frequently as the arms. If the child cannot stand, these extremities, although small and feeble, are often perfectly straight. In cases where the deformity of the long bones is extreme, the shaft is not only bent but broken, for a partial ("green-stick") fracture is generally present. The same thing is often seen in the clavicles which have their normal curves very greatly exaggerated.

Besides the softening and deformity of the bones there is another consequence of the disease which is of great importance. This is the arrest of growth and development of bone which can be noticed in all cases of severe rickets. Rickety children are short for their age, and remain undersized after the disease has passed away. The arrest of growth is most marked in the bones of the jaws, of the lower limbs, and of the pelvis. As it affects the pelvis, this feature is of especial importance on account of its influence upon parturition in after life; for if the capacity of the pelvic framework be not only diminished by distortion, but also relatively small from arrest of development and growth, the difficulties in the way of successful delivery may be insuperable.

The weakness in the lower limbs, which is a marked feature in rickets, is due not alone to feebleness of the muscles combined with the general debility of the child. There is also great weakness and looseness of the ligaments of the joints. This weakness is more pronounced in cases where the disease begins after the end of the second year. In such cases of late rickets softening and deformity of bone are less common features of the disease, while the looseness of the joints from marked relaxation of the ligaments may reach a very high degree. In such cases, too, the disease having begun after the completion of dentition, the teeth are often white and sound.

During the progress of the bone-changes which have been described, the general symptoms continue and become more severe. The head perspirations are profuse; the child can hardly be kept covered in his bed, but whether it be night or day pushes off the bed-clothes and exposes his naked limbs to the air. In bad cases his tenderness and dislike to movement are extreme. So long as he is left alone he is patient and still, but

when approached or noticed he at once becomes fretful and apprehensive of disturbance. He will sit for hours together, heedless of his toys, crouched up in his cot; his legs doubled beneath him, his spine bowed, and his head thrown back; supporting his body upon his hands placed before him on the bed. On account of the softened ribs and his consequent difficulty in expanding the lungs, his breathing is rapid, and his whole attention seems concentrated upon the efficient discharge of this function. His appetite varies. Sometimes it is poor, but more often it is good and may be ravenous. If attention has not been paid to his diet, and the child continues to pass large quantities of pale, putty-like matter, he will usually swallow almost anything that is given to him. Sickness is not common, and severe diarrhœa is only occasionally met with; but moderate attacks of purging are frequently seen, the stools being green, slimy, and offensive.

The belly in rickety children is always large, even in cases where no disease of the liver or spleen can be detected. The swelling is principally due to feebleness of the muscular walls, allowing of accumulation of flatus, and to the shallowness of the pelvis, which throws all the abdominal viscera above the level of the pelvic brim. If the spleen is very large it may cause a special swelling on the left side of the belly, sometimes reaching below the umbilicus. It may be remarked here that in cases where the liver and spleen can be felt below the level of the ribs we must not at once conclude that their size is abnormal. The organs may be merely pushed down by the depression of the diaphragm and diminished capacity of the thorax. Therefore, after ascertaining the position of the lower edge the upper limit of the organs should be estimated by careful percussion. In addition to enlargement of the liver and spleen the superficial lymphatic glands are sometimes swollen, and can be distinctly felt larger than natural in the axillæ and groins.

Rickets is not a cause of pyrexia. If the temperature rise above the normal level a complication may be at once suspected. If fever occur during the stage of improvement it often announces the return of dentition, and shows that a tooth is pressing through the gum. The degree of wasting varies. If the disease be mild the child, although pale, is often exceptionally plump from over-nourishment of the subcutaneous fat; but unless recovery take place shortly the limbs quickly begin to feel soft, and soon the child can be seen to be evidently wasting. The complexion is always pale, the lower eyelid is frequently discoloured, and the borders of the mouth have a bluish tint. If great enlargement of spleen be present the tint of the face becomes peculiarly bloodless and the mucous membranes are very pale. Rickety children are backward in every way, both in mind and body. Their intellect seems to grow as slowly as their bones. On account of their inability to join in ordinary childish games they are much in the society of older persons, and therefore acquire an unchildish way of expressing themselves; but they talk very late and are dull at picking up new words and phrases.

The progress of the disease is slow, and unless the insanitary conditions which have led to it be removed, it goes on from bad to worse. These children often die from some catarrhal complication. A bad diarrhœa is very dangerous on account of their general weakness, and a comparatively mild pulmonary catarrh may prove fatal through the softening of the ribs. Death rarely takes place from the intensity of the general disease. When improvement begins under judicious treatment, the general tenderness is usually the first symptom to subside. The child is less fretful when noticed and takes more interest in what passes around his bed.

At the same time the softening of the bones diminishes, and as the ribs regain their firmness the marked improvement in breathing which results from the greater rigidity of the chest-wall cannot escape notice. Teething also begins again; the wasting ceases; the belly is less distended; the sweats diminish and all the symptoms undergo great improvement. These children often become very sturdy and strong, but usually remain short in stature even when their full growth has been attained.

A form of the disease has been described which has been called "acute rickets." In this variety the articular ends of the long bones undergo rapid enlargement and become tender on pressure. Secondary cylindrical swellings are also seen about the limbs. The temperature is high. It seems probable, from the investigations of Drs. Cheadle and Barlow, that these cases are instances of scurvy grafted on to rickets. They are referred to more fully in the chapter treating of the former disease.

Complications.—It is not often that a case of rickets remains uncomplicated by some intercurrent complaint. The subject of a pronounced form of rickets has but little resisting power, and is readily affected by any kind of injurious influence. But he is in addition peculiarly liable to certain forms of derangement on account of the special tendencies of this phase of mal-nutrition. The sensitiveness to chills manifested by a rickety child has been already remarked upon. This proneness to *catarrh* may be the consequence of the profuse and ready action of the sweat-glands, and it is no doubt encouraged by the child's practice, when his perspirations begin, of throwing off the coverings of his bed. The various forms of catarrh are therefore especially liable to occur, and pulmonary and intestinal catarrhs are the most frequent of these derangements. Few rickety children are without a cough, and this symptom, on account of the unnatural flexibility of their chest-walls, must be always regarded with anxiety. The danger of even a mild pulmonary catarrh in these patients, and the readiness with which this derangement gives rise to collapse of the lung, is referred to elsewhere (see p. 467). To this cause a large proportion of deaths is due. Again, more or less intestinal catarrh is a common derangement in this disease, and after any unusual exposure the looseness of the bowels may pass into a severe attack of purging. Diarrhœa, on account of the great general weakness, is a source of extreme danger, and during the changeable seasons of the year many children are carried off by this complaint.

Another peculiarity of the rickety state is the curious impressibility of the nervous system which manifests itself by the ready occurrence of various forms of spasm. *Reflex convulsions* are common, and *laryngismus stridulus* is practically confined to the subjects of rickets. Catarrh of the larynx is also liable to be accompanied by spasm, and therefore *catarrhal croup* (laryngitis stridulosa), as is elsewhere stated, is a frequent cause of anxiety. These subjects need not be further referred to in this place, as they all receive consideration in special chapters.

One other not uncommon complication is *chronic hydrocephalus*. On account of the small size of the brain in many cases of rickets, fluid is effused into the cranial cavity to fill up the resulting space. The amount of serosity is, however, seldom large and rarely comes to be a source of danger.

An occasional complication, although not a common one, is *acute tuberculosis*. The disease is probably in all cases the result of an acquired tendency due to the presence in the body of a softening cheesy deposit. It certainly is proportionately less frequent in rickety subjects than in children

free from this disorder of nutrition; but it is necessary to be aware that rickets does not exclude tuberculosis.

Diagnosis.—In a mild case of rickets the prominent features are the swelling of the epiphyseal ends of the long bones, the tardy eruption of the teeth, and the backwardness in learning to walk. If we notice the wrists to be large in a young child, we should at once count the number of his teeth and ask if he is able to stand alone. If a child ten months old shows no sign of a tooth, if his wrists are large, and if when held upon his feet his limbs double up helplessly beneath him, there can be little doubt that he is the subject of rickets. Even before the swelling of the articular ends of the bones has come on the onset of the disease may be suspected. Big, fat, flabby infants are generally slightly rickety, and if a child sweats profusely about the head, and is kept covered at night only with great difficulty, we can have little doubt that the characteristic signs of rickets are about to appear. In such a case attention should be at once directed to the child's diet, the regularity with which he is taken out of doors, and the state as to ventilation of his sleeping-room, so that any errors in management may be promptly corrected.

In a marked case of rickets the deformity of the chest, the bending of the bones, the enlargement of the joints and beading of the ribs are sufficiently characteristic. Even the position of the patient as he sits with his legs crossed and his head fallen back between his shoulders, supporting his feeble spine by his hands placed before him on the floor, enables us at once to recognize the case as one of well-defined rickets.

The complete uselessness of the lower limbs in many of these cases is often a serious anxiety even to parents who regard the other symptoms with comparative indifference, for they fear lest the child should be "going to be paralysed." But although the patient has no idea of even placing his feet upon the ground, and cries bitterly when any attempt is made to persuade him to do so, power of movement of the legs is unimpaired. If the skin of the legs be pinched or gently pricked he at once draws his limbs out of the way. Of other local symptoms:—The nature of the antero-posterior spinal curvature is readily shown by lifting the child up under the arms, when the weight of the pelvis and legs at once causes the spinal distortion to disappear. A lateral curvature is distinguished from the effects of pleurisy by noting the presence of signs of rickets and the absence of those of effusion into the chest cavity. The rickety head differs from a skull dilated by excess of fluid by its shape. Instead of being globular it is elongated from before backwards, with a characteristic squareness of the forehead, and moreover this shape of head is associated with other well marked signs of rickets. The fontanelle does not always furnish trustworthy evidence; for although often depressed in rickets and raised in hydrocephalus, these conditions may be reversed. Certainly a depressed fontanelle is compatible with a fairly copious effusion of intra-cranial fluid.

In the present state of our knowledge no differential diagnosis can be made, during life at any rate, between rickets and osteo-malacia. Cases where softening and deformity of bone are present must be assumed to be rickets. Fortunately, for all practical purposes, a distinction in any individual case is unnecessary, as the measures to be adopted for the relief of the patient are the same whatever be the correct pathology of the osseous lesions.

Prognosis.—Rickets is not a fatal disease in itself unless the bony change be far advanced, nor even in such a case does death often ensue except as a

consequence of some catarrhal complication. As a rule, improvement begins directly measures are taken to amend the unwholesome conditions in which the patient is living. The dangers of pulmonary catarrh and atelectasis in a child with great deformity of chest are elsewhere referred to; and the serious consequences which may result from diarrhœa in an infant reduced to a state of serious weakness by chronic mal-nutrition need not be insisted upon. Of the nervous complications, laryngismus stridulus is sometimes a cause of sudden death, but reflex convulsions excited by some trifling irritant rarely have any ill results.

Enlargement of the spleen, liver, and lymphatic glands generally is very rare, but if present should excite great anxiety. It is more common to find enlargement of the spleen alone without any affection of other internal organs. In rickets, as has been said, the spleen is often the seat of simple hyperplasia. This lesion, as it is an additional cause of anæmia, no doubt introduces into the case a further element of danger, but the danger is dependent more upon the intensity of the rickety process than upon the degree of splenic swelling. If the symptoms of rickets are comparatively mild, and due care be taken to shield the child from catarrhal complications, the presence of a big spleen does not indicate the probability of a fatal termination to the illness.

Age has no influence upon the prognosis of rickets, and when the disease occurs as a sequel of inherited syphilis, it presents no special difficulties in its treatment.

With regard to the permanence of the unsightly deformities of bone, it is often astonishing to note the improvement which takes place after recovery from rickets in the deformities which seemed the most unlikely to be reduced. Large joints grow smaller, crooked bones become almost straight, and a distorted chest will recover itself in a surprising manner. In some children, however, improvement goes on farther than it does in others, and therefore, while encouraging the parents to believe that there will be considerable improvement, we must not be too sanguine as to the complete disappearance of all disfigurement.

Treatment —In every case of rickets our first care should be not to give cod-liver oil or tonics, but to inquire into the conditions in which the child is living; to ask about the food he is taking, the quantity allowed for each meal, the frequency with which the meals are repeated, and the degree of cleanliness of the feeding apparatus. We should then turn to the subject of his clothing, the ventilation of his bedroom, and the number of hours he is passing out of doors. The real treatment consists in attention to all these important matters, and not solely in the administration of any particular drug. Medicines are no doubt useful as helps in the treatment, but their importance is trifling as compared with that of a reformation of the unwholesome conditions under which the failure in nutrition has taken place. The reader is referred to the chapter on the treatment of infantile atrophy for general directions with regard to the feeding and management of young children.

Almost all cases of rickets have been preceded by symptoms of digestive derangement or bowel complaint, and unless improvement has already begun we often find signs of looseness or intestinal derangement still persisting. This should at once be remedied. The belly should be kept warm with an ample flannel binder, and the child should take a drop of laudanum to control the undue peristaltic action of the bowels, with a few grains of the bicarbonate of soda to correct acidity, in an aromatic water sweetened with a few drops of spirits of chloroform three times a day. In

many cases there is a special difficulty in digesting starch. In almost all instances we find that this variety of food has been given in great excess. The quantity must be therefore considerably reduced, and that taken should be guarded with malt, as in Mellin's food. Hoff's extract of malt, in doses of two or three teaspoonfuls three times a day, is of great service in these cases. If the child be no longer an infant, the diet should be arranged as directed under the heading of "Chronic Diarrhœa" (see page 640).

Plenty of fresh air should be insisted upon. The child, warmly clad, should be sent out in all suitable weathers, and if care be taken that his feet are well warmed before he leaves the house, there will be little danger of his catching cold. If the patient have reached the age of eight or ten months he should be carefully packed with cushions in a perambulator, and in cold weather should always have a hot bottle to his feet while out of doors. The ventilation of his sleeping-room must be attended to. A small fire in the winter, and a lamp placed in the fender during the summer months, will insure a sufficient circulation of air through the bed-chamber. Both the patient and his immediate surroundings must be kept scrupulously clean. Every morning the whole body should receive a thorough washing with soap and water, and be well sponged in the evening before the child is put into his cot. On account of the copious perspirations his body linen, as well as that belonging to his cot, soon becomes saturated with moisture. His underclothing should therefore be changed as often as is necessary. Every morning, too, his mattress and bed-coverings must be thoroughly exposed to the air. The sheets also should be changed frequently and be carefully aired.

If the above measures are properly attended to improvement will quickly begin. Directly the bowels have been got into a healthy state cod-liver oil should be given. A quantity much less than that usually prescribed is, however, sufficient; for children, infants especially, have comparatively small power of digesting fats. It is best to begin with ten drops of the light brown oil, and during its administration the stools must be carefully watched for any appearance of undigested oil. The quantity can be gradually increased by a few drops at a time as long as none of the oil is seen to pass undigested from the bowels. Iron is also useful. Iron wine (℥ xx.–xl.), the exsiccated sulphate of iron (gr. ij.–iv.), or the tincture of the perchloride (℥ v.–xv.)—all these are useful, and are to be preferred to any of the syrupy preparations. The latter are not fitted for rickety subjects, as the large quantity of sugar they contain encourages fermentation and acidity, and often, indeed, by the disturbance it sets up in the bowels, makes each dose of the medicine decidedly prejudicial to the patient. If quinine be given, the tannate is the most suitable preparation. One or two grains should be suspended in glycerine and given two or three times a day. If there is any tendency to acidity left after rearrangement of the diet, the ammonio-citrate of iron may be given in a draught with a few grains of bicarbonate of soda and one drop of the tincture of nux vomica between meals.

The salts of lime were at one time recommended in the treatment of rickets, as it was supposed that the bone-softening was due to a deficiency of lime in the system. In practice, however, the use of these drugs has not been found of value; indeed, the remedy, for any special benefit it produces, may as well not be given at all.

The copious perspirations from the head and neck are always a source of great anxiety to the mother. They can be controlled by applying belladonna liniment to the parts where secretion is copious before the child

is put to bed. He may also take one drop of liq. atropiæ every night. Directly the tenderness has subsided steady frictions with the hand alone, or with olive-oil, all over the body, especially along the spine, are of great service and do much to strengthen the muscles. The nurse should be directed to rub the child steadily for a quarter of an hour immediately after his bath. In the morning the open hand or a flesh glove may be used ; in the evening it is advisable to employ warm olive-oil for the frictions. As the child improves and his strength begins to return, a cold or tepid saline douche, given as he sits in the warm water of his bath, will be of service.

Care must be taken to prevent the child's getting on his feet before his bones are sufficiently solid to bear his weight. As his strength improves he seizes every opportunity of practising his newly acquired power of standing, and very marked deformities of the tibia may be produced by this means. In such cases support may be given to the limbs by the use of light, padded splints, and if the ligaments of the joints are much relaxed a firmly applied elastic bandage can be made use of.

The treatment of any deformities which may remain after the complete cessation of the disease falls rather under the department of the surgeon. For the treatment of the various complications of rickets the reader is referred to the special chapters treating on these subjects.

CHAPTER II.

AGUE.

Children who live in malarious districts are not exempt from ague; indeed, in early life the system is said to be particularly susceptible to the action of the malarious poison. During infancy and up to the age of five or six years, the fever may assume peculiar characters, and unless detected early, and promptly treated, may even prove fatal. In more advanced childhood the symptoms present little variety from those met with in adult life.

Causation.—Ague is an endemic disease, which is excited by residence in a malarious neighbourhood. An ague-breeding district is usually low-lying, marshy or ill-drained, and has a more or less porous soil, composed largely of rotting vegetable matter. Still, these conditions are not always found united in places where ague abounds. A disintegrated rocky soil, which is very porous, and is saturated with water to within a few inches of the surface, may largely generate the malarious poison, although decaying vegetable matter is entirely absent. A soil thus deleterious is rendered doubly noxious by digging below the surface. Indeed, in some cases a spot previously healthy has been known to become malarious after disturbance of the soil for building or other purposes. Even a malarious district is only poisonous at certain seasons. In temperate climates the spring and autumn are the agueish periods of the year. In the tropics the miasma is evolved in the dry hot season which succeeds to the periodic rains. The malaria is thrown out from the soil, especially at night-time, and rises to a certain distance from the ground. It is always more intense near the surface, being apparently more diluted or rarified as the distance from the earth increases. It may be carried by the wind to a considerable distance from the spot where it has been generated, but appears to be incapable of passing a broad sheet of water, and even a band of trees is found to arrest the progress of the miasma.

Amongst the residents of a malarious neighbourhood the disease is very common. The children living in the district are said rarely to escape; for even if considered healthy they will be found, according to Steiner, to have the spleen enlarged. Even the new-born infants of mothers who suffer from intermittent fever may be found at birth to present the enlarged spleen, the bronzed skin, and all the other signs of a pronounced malarious cachexia. It has even been affirmed that the milk of a cachectic woman is capable of communicating the disease; but this statement requires further proof.

Morbid Anatomy.—When children who have been subject to ague die, the only constant lesion discovered is an enlargement of the spleen. During an acute attack, and for some time afterwards, the organ is engorged with blood so as to be several times its natural size. It afterwards diminishes in bulk; but if the child remain in the malarious district it continues to be harder and larger than natural. The cut surface is then pale

and dryish, with white striæ from thickened trabeculæ, and sometimes it has a gray tint or even a speckled appearance from dark gray spots. The capsule is thickened and often adherent. Besides the spleen, the liver is also congested during an acute attack, and afterwards may remain more or less enlarged.

Symptoms.—In early life ague may occur either in the intermittent or remittent form. Both are common; for although in the adult the remittent form is rarely seen, except in the more serious variety of the disease, which occurs in tropical climates, in the young child a comparatively feeble dose of the poison may produce a profound effect upon the constitution, and excite fever of the remittent type even in a temperate zone. In most cases the fever is quotidian, but it may be tertian and even, although rarely, quartan. The three stages of the attack are usually to be recognised; but they are less perfectly marked than in the adult, and are often characterised by peculiar features not found in after-life.

As often happens in the case of the adult, the attack may not come on for some considerable time after exposure to the malarious influence. Indeed, cases are sometimes met with in which a child, who is free from fever while he lives in the agueish district, only begins to suffer after he is removed to a more healthy situation.

The cold stage may begin with very violent symptoms or may give only trifling indications of its presence. The child may have a severe rigour like an adult, or may be taken suddenly with a convulsive seizure. If the latter the fit is rarely repeated, but is followed almost immediately by heat of skin and all the symptoms of the second stage. In infants neither rigours nor convulsions may be seen. Instead, the baby seems drowsy; frequently yawns; sometimes stretches itself; is peevish and fretful, refusing the bottle; and looks pale and prostrate, with perhaps some lividity of the lips and finger-nails. In rare cases the hands and feet are cold to the touch. This stage is usually short. The temperature rises progressively throughout, and even at the beginning, when the child feels cold or actually shivers, is above the normal level. Towards the end of the stage the mercury may register between 103 and 104 degrees of heat.

The hot stage is usually better marked. In this the skin is distinctly febrile; the child is drowsy and looks ill; if not flushed, the face is pinched and pale; and the head is said to be tender. The tongue is covered with a yellowish fur, and according to Dr. Fruitnight it is not uncommon for the throat to be congested with a whitish deposit on the tonsils. The child is usually thirsty and drinks greedily; he often coughs—indeed, a cough is said by Dr. Fruitnight to be a constant symptom of the attack; the pulse is rapid, feeble, and compressible. Pressure on the liver and spleen elicits signs of discomfort, and both these organs on palpation are found to be enlarged. The child often vomits, sometimes bringing up bile; and the bowels may be relaxed. Occasionally an icteric tinge is noticed on the skin. There is one symptom sometimes met with in a marked case which must not be omitted. This is a general bright redness of the surface. Such a rash, accompanied by a high temperature, and following rapidly upon a rigour or an attack of convulsions, would strongly suggest scarlatina, especially if at the same time some redness of the throat could be detected. Through this stage the temperature continues to rise progressively, and towards the end has reached its maximum, which may be 105° or higher.

The third or sweating stage is very imperfectly developed in the infant. Older children may burst out into a profuse perspiration like the adult. Still, whether the disease end in sweating or not, there is a remarkable

fall of temperature at the end of the hot stage, and the thermometer will often mark 100° or 101° where a very short time before the pyrexia had been as high as 106° or 107°. At the same time that this diminution in the bodily heat is noticed there is usually a profuse secretion from the kidneys, and the child passes a large quantity of limpid urine. According to Dr. Gee's observations, the proportion of urea and chloride of sodium are greatly increased during the hot stage, while the phosphates are diminished. As the temperature falls the amount of urea and of chloride of sodium diminish, while the proportion of phosphates is augmented.

The duration of the attack varies. The hot stage, which lasts the longest, may occupy six or eight hours. After the attack is over, the child, if he is suffering from the intermittent form of the disease, seems quite well until the next attack begins. If the fever is of the remittent type, the patient remains more or less feverish in the interval. He is thirsty, has little appetite, is languid, peevish, and restless ; looks pinched and ill, and usually loses flesh. The wasting is sometimes increased by a troublesome diarrhœa. Often the fever, at first intermittent, may pass into the remittent form ; and then, again, in its progress towards recovery return to the intermittent type. In many cases of the remittent form of the disease the fever runs a less acute course, and the temperature, although persistently elevated, does not reach the high level common in the shorter and sharper attacks. Thus during the paroxysms it may rise no higher than 102° or 103°, and during the remissions may be little over 100°.

In children of feeble constitution, or reduced by chronic disease, the fever may assume very malignant characters. When the attack comes on the patient becomes stupid and drowsy, and then quickly passes into a state of coma from which he never revives. Such cases are never seen in England. Dr. Lewis Smith states that he has twice met with this form of the disease, and that in each instance the attack proved fatal.

Children who live in malarious districts often exhibit signs of ill-health without suffering from actual attacks of fever. Such patients are thin and weakly ; the skin is of a peculiar pale bistre tint ; the mucous membranes are pallid ; the appetite is poor, and the bowels are costive or relaxed. The spleen is permanently enlarged and hard. If the anæmia is extreme, œdema of the legs and ankles may be noticed. Sometimes, however, œdema in these cases is due to disease of the kidneys ; for hæmaturia and albuminuria are said to be not uncommon symptoms in children living in ague-breeding neighbourhoods. Indeed, in countries where malarious fever is prevalent the origin of Bright's disease in the child is frequently attributed to a previous attack of ague. Catarrhal pneumonia is said sometimes to complicate the illness and may even pass into confirmed phthisis.

The more obscure forms of malarious fever, which are not uncommon in the adult, in the child are very rare. Brow ague is unknown. Bohn, however, states that he has met with an intermittent torticollis which he believed to be referable to a miasmatic cause, and Dr. Gibney has described an intermittent spinal paralysis also of malarious origin.

Diagnosis.—When the disease assumes the ordinary form met with in the adult it is easily recognised ; but when, as often happens, especially in infants and the younger children, the stages are imperfectly marked and the symptoms indefinite, there is much difficulty in the diagnosis. If the case occur in an ague-breeding district, sudden illness and prostration with a high temperature should always excite our suspicions, especially if no evident cause, such as vomiting or diarrhœa, exists to explain the alarming

symptoms. Afterwards the sudden fall in the temperature which occurs at the end of the hot stage, and the rapid return of apparent health as the attack passes off—these symptoms, combined with enlargement of the spleen, are very suggestive of malarious origin. When on the next day, or the day after, the same phenomena recur, ending as before in apparent recovery, the nature of the illness can no longer be misapprehended.

Fits of ague sometimes occur in children who are not at the time living in a malarious district. If we were suddenly called to a child of whom we had no previous knowledge, and found him looking ill with a very high temperature and signs of severe general weakness, we should be justified in regarding his condition with grave apprehension; for the fact of his having been lately exposed to the ague poison would probably not be referred to. In such a case, after a careful examination of the patient, we should be able to come to no conclusion, and might probably suspect the onset of one of the exanthemata. It would be only on the next visit, on finding the patient whom we had left in so apparently serious a state looking and feeling well, with a normal temperature, that the nature of the illness would suggest itself to our minds.

If, during the hot stage, the body becomes covered with a bright red rash, this symptom, combined with the high temperature and perhaps slight redness of the throat, may raise strong suspicions of scarlatina. If, however, we are aware that the phenomenon may occur, and find that the rash subsides and the temperature falls completely in the course of a few hours, we should reserve a positive opinion as to the real nature of the eruption. When, later, the same phenomena are exactly reproduced, the nature of the case can be no longer doubtful. Dr. Cheadle has reported two such cases. In one—a child aged two years and nine months—the illness began at 9 A.M. with a sharp rigour. A hot bath which was immediately given brought out a bright red rash all over the body. At the same time the skin was dry and burning, the temperature 102°, and the pulse 110. There was no soreness of the throat. At the end of three hours the rash faded, and the next day the child was playing about as usual. On the following day—the third—an exactly similar attack took place; and later the phenomena were again repeated a third time. Quinine was then given, and the ague fits quickly came to an end. In a case such as the above, if there is no redness of the throat the resemblance to scarlatina is less close. Even if the throat is sore, the peculiar punctiform redness of the soft palate which is so common in scarlatina is wanting; and, moreover, the redness in the fauces is less generally diffused.

When ague assumes the remittent type, as it is apt to do in feeble, badly nourished children, the diagnosis is less obvious. In malarious districts it is well to suspect ague in all cases where pyrexia appears in a young child without evident cause. Still, the sources of error are numerous; for a probable cause of elevation of temperature, such as dentition, may be present in a child who is suffering from a real agueish attack. Perhaps the best rule in doubtful cases is to prescribe quinine. We can do little harm by this practice, and may do great good by putting a stop at once to attacks which in weakly subjects, if not arrested early, may produce very serious consequences.

Prognosis.—If the disease be recognised and treated promptly it can usually be controlled with ease. The fatal cases are those in which the real nature of the illness has been misapprehended and specific treatment consequently withheld. Also, the exceptional cases where the child appears to be overwhelmed by the violence of the malarious poison, and

passes rapidly into a state of coma, are said rarely to end in recovery. But even in these cases, if the cause of the symptoms were recognised in time, it is possible that energetic stimulation and the use of quinine in large doses by enema or hypodermic injection might be successful in averting a fatal issue. It must not be forgotten that in malarious districts the specific fevers, and indeed acute illnesses generally, tend to run a more severe course than in healthier neighbourhoods, and that as a rule epidemics have a high rate of mortality. Children who suffer from the ague cachexia are bad subjects for the eruptive fevers; and in all such cases we should speak with considerable caution as to the patient's chances of recovery.

Treatment.—Directly the existence of ague is recognised in a child specific treatment should be had recourse to without unnecessary delay. Children bear quinine well. A child of twelve months old will take a grain and a half of the sulphate of quinine three times a day, and the fever will quickly yield to this treatment. The best way of administering the remedy is to rub it up with glycerine and give it either in a spoon or in a wineglassful of milk; for milk helps to conceal the bitterness of the drug. The medicine should be continued for a few weeks after the attacks have ceased, but be given in diminished quantity or less frequent doses. At the same time it is desirable to remove the child from the malarious neighbourhood. If this be impossible, it is well to give a dose of quinine twice a week for a considerable time after the subsidence of the seizures.

In cases where the child vomits the quinine, or where from other reasons it is not desired to administer the remedy by the mouth, it may be thrown up the bowel suspended in a small quantity of mucilage, or may be given by hypodermic injection. In the former case the dose must be double that previously recommended for administration by the mouth. If the remedy is administered subcutaneously, Dr. Ranking recommends that the neutral sulphate of quinine be used freshly dissolved in warm water; that the syringe and solution be both warmed before use; and that the injection be made very slowly, distributing the fluid at the same time amongst the interstices of the cellular tissue by the forefinger of the left hand, so that no lump is left to mark the site of the puncture. It is found that warming the solution and the syringe not only lessens the pain of the operation, but also reduces the tendency of the quinine to deposit itself quickly in the cellular tissue. If used cold the quinine is almost always deposited at once in a solid mass before absorption of the solution can take place. This is, however, not injurious, but it retards the beneficial effect of the operation. The quantity of the drug thus administered should be a fifth of that given by the mouth. For an adult the dose is half a grain. Probably one-sixth of a grain would be a suitable quantity for a child of two or three years old. In order to prevent corrosion of the syringe it is advisable directly after the operation to wash the instrument in hot water and dry it carefully, and afterwards to oil the screw well. Instead of the sulphate the kinate of quinine may be used. Mr. H. Collier has recommended this salt as the more suitable on account of its solubility for hypodermic administration.

In some cases, especially in the older children, where there is much acute enlargement of the liver and spleen, quinine seems to be useless. In these cases it is of great importance to reduce the congestion of the liver before beginning the quinine treatment. The child should take at night a dose of gray powder (gr. iv.) with jalapine or compound scammony powder, and the action of the bowels should be kept up for a week or two by doses

of some aperient saline. Sulphate of magnesia is very useful for this purpose, given with dilute sulphuric acid and half a grain of quinine for the dose. The medicine can be made palatable with spirits of chloroform, glycerine, and tincture of orange peel. After the liver has been unloaded, the quinine treatment in full doses can be returned to, or the child can take arsenic (♏ v.–x. of the solution three times a day for a child ten years of age), with or without quinine, directly after meals.

In the more chronic cases, a combination of quinine and arsenic with iron is very useful. It is also of great importance that the child be removed from the malarious district to a bracing seaside air. Moreover, he should be dressed from head to foot in flannel or some woollen material.

CHAPTER III.

ACUTE RHEUMATISM.

Rheumatic inflammation of the fibrous tissues is a common affliction in early life. In childhood, indeed, there appears to be a peculiar tendency to rheumatism; and in young people the disease may assume very special characters. The joints are generally affected, but other fibrous structures suffer as well. More often than in the adult the articular inflammation is absent, and not infrequently it is very partial and takes an insignificant share in the illness.

The great importance of rheumatism in children is due to the inflammation in and around the heart, of which it is so frequently the cause. The large majority of cases of heart disease are the consequence of rheumatic endocarditis occurring in early life. But besides the heart other fibrous structures may be attacked. The pleura may be affected; the meninges of the brain and spinal cord may suffer; and sometimes fibrous tissues in other situations may be implicated, as will be afterwards described.

Acute rheumatism is said to be uncommon under five years of age; but the accuracy of this assertion is open to question. Infants and young children may not suffer from much articular swelling and pain, but it is a common experience to detect a cardiac murmur at the mitral orifice in a young child, and to discover, on inquiry, that the patient had some weeks or months previously been feverish, with a little stiffness and tenderness of one or more joints, symptoms amply sufficient to establish the rheumatic origin of the cardiac disease.

Causation.—The principal cause of rheumatism is exposure to cold, or to cold and damp. In young children and infants a very slight impression of cold may suffice to set up the disease. Thus, I have known a young child exposed to draught from the nursery door, while being dried, after a bath, before the fire, suffer shortly afterwards from stiffness and pain in the knees and endocarditis. Sudden changes of temperature are favourable to the production of rheumatism. In England the disease is much more rife during the spring and the autumn, when the evenings suddenly turn chilly and damp, than in the winter months when the temperature is more uniform.

Many influences favour the action of cold and moisture in producing rheumatism. Family tendency will do this. A large proportion of rheumatic children come of rheumatic parents. Again, previous illness of the same kind predisposes to fresh attacks. When a child has once suffered from rheumatism, he is very likely to suffer from it a second time. The state of the health at the time of the exposure exerts some influence. The existence of catarrh of any mucous membrane renders the patient very sensible to chills, and makes exposure very dangerous to a child of rheu-

matic tendencies. Lastly, scarlatina predisposes with peculiar force to rheumatism or to a disease indistinguishable from it.

Morbid Anatomy. — When a joint becomes the seat of rheumatic inflammation, there is reddening of the synovial membrane lining the joint, the synovial fluid is increased in quantity and often milky, and there is some effusion of fluid into the surrounding tissues. Suppuration in the joint is very rare.

In pericarditis the pericardium is reddened and softened, exudation of lymph occurs on the serous surface, and fluid is effused into the cavity. The serous fluid and the more solid lymph vary greatly in amount, and either may be in excess. The quantity of fluid thrown out is sometimes enormous. It may be clear or opalescent, or tinted red from blood. Sometimes, as in pleurisy, although far less frequently than in that disease, the fluid is purulent. The layer of lymph, also, may reach a great thickness. It may be smooth, or pitted with holes like a honeycomb, or ribbed like the sea-sand. Sometimes the visceral and parietal layers are united by soft thick bands of lymph. If the inflammatory process in the pericardium is severe, the heart substance towards the surface is generally softened to a certain extent and weakened. If much lymph has been thrown out, more or less complete adhesion is likely to take place, after absorption of the fluid, between the opposed surfaces of the serous membrane.

In endocarditis the morbid appearances, when not congenital, are limited almost invariably to the left side of the heart. The valves become thickened and softened, and very soon granular on the surface. The granulations enlarge and develop into the so-called vegetations — outgrowths from the fibrous tissue of the valve which may vary greatly in shape and size. They consist of connective tissue more or less perfectly organised. They are usually limited to the auricular surface of the valve, and are often partially covered by fibrinous deposits. Granulations may also develop on the chordæ tendineæ. The softened tissue of the valve may tear, or the chordæ tendineæ may rupture; and the tension of the valve and the closure of the orifice may be seriously interfered with. After a time the valves may become thickened, contracted, and hardened. Sometimes they adhere to one another or to the wall of the ventricle. In this way, also, the proper closure of the opening may be impossible, and the opening itself may be narrowed and altered in shape.

Ulceration may take place, seriously affecting the valve itself, and tending to produce other grave consequences. It is the washing into the circulation of fibrinous deposits and particles of disintegrated tissue from the ulcerated surface that produces embolism in distant organs—the brain, the kidney, or the spleen.

Symptoms.—The disease begins suddenly. The child, if old enough, complains of cold, and sits over the fire. He is unwilling to move about, sometimes vomits, and may feel some stiffness of the articulations. Soon, pain is complained of in one or more joints, and the child takes to his bed. When the patient comes under observation his temperature is moderately high—102° or 103°. His skin is generally moist with a sour-smelling perspiration, and on inspection we find the affected joints tender, swollen, and suffused with a pink blush. The child is thirsty, has little appetite, and his tongue is furred. The urine is high-coloured and scanty, and is often thick with lithates. The bowels are confined. The patient may wander at night; he sleeps badly on account of the pain; and for these reasons (pain and want of sleep) his face is often haggard-looking, and his expression distressed.

The pain is at first of only moderate severity, but gradually grows worse. As long as the child is quiet and undisturbed he may not make much complaint; but if the limb is touched, or the bed is shaken, he at once shows signs of distress. The degree of pain and the amount of swelling around the joint seem to bear no relation to one another. The articulations affected are usually the larger ones—the hips, the knees, elbows, ankles and wrists. It is exceptional for the small joints of the fingers and toes to be painful and swollen. Usually one or two joints are first attacked; these recover, and others become inflamed. The whole illness may last a variable time, but the duration of the inflammation in each particular joint is comparatively short. It may pass away in a few hours, and rarely lasts longer than a day or two. Sometimes, after leaving a joint and passing to another, the inflammation returns to the joint first affected; and in this way, if the illness be a long one, the same joint may be attacked again and again before the energy of the disease is exhausted. Even when the attack appears to be at an end, a sudden return of the symptoms may distress and disappoint the patient and his friends. Relapses are very common in rheumatic fever, and the symptoms may return, after a more or less complete subsidence, two, three, four, or even five times.

The articular inflammation, although the part of the disease which causes the greatest discomfort to the patient, is yet, as it seldom produces after ill-consequences, of comparatively trifling moment. A far more important feature is the heart affection, which is so common an expression of the malady. Inflammation of the fibrous structures in and around the heart is an essential part of the disease, as it attacks young persons, and must not be regarded as a mere casual complication. In exceptional cases, indeed, a child may have rheumatic fever and the heart may escape; but in rheumatism all the fibrous structures of the body need not be affected at once. The patient may have inflammation of one joint and not of another; the right wrist, for instance, may be affected and the left may escape; one leg may be crippled and the other sound. So the disease may attack the joints and leave the heart alone, as it may attack the heart and spare the joints. The younger the child the more likely is it that the disease will fasten upon the heart to the exclusion of the articulations.

The occurrence of rheumatic inflammation of the heart and pericardium is not at once announced by any striking change in the symptoms, or even in the aspect of the patient. Indeed, it is matter for surprise how complete in most cases is the absence of all external indications that so important an addition has been made to his illness. Often the only sign of implication of these organs is derived from physical examination of the chest.

In rheumatic inflammation of the pericardium there is in ordinary cases neither pain nor tenderness; we notice no special hurry of breathing or of pulse; the heart's action may be irregular, but there are no palpitations; there is little change of colour in the face; and, unless the joint affection be severe, the temperature may be only moderately raised, or may even be normal. In spite, however, of the absence of symptoms, the child looks ill; and while up and about—as he usually is before coming under the notice of the medical attendant, if the articular inflammation is not severe—his countenance wears an expression of distress which quickly attracts the attention of his friends.

A little girl, aged three years and a half, was admitted into the East London Children's Hospital. She had had a slight cough for a fortnight, and was said to have looked ill. On examination, there was found dulness of pyramidal shape in the præcordial region reaching upwards to the

left sterno-chondral clavicular, and to the right as far as one finger's-breadth beyond the right edge of the sternum. The apex-beat of the heart was behind the fifth rib, slightly to the inner side of the nipple line. A faint impulse was felt all over the præcordium. The heart-sounds were muffled, and a soft double friction-sound was heard at the base. The child complained of no pain. There was no affection of the joints. The other organs were healthy and the temperature was normal. A week afterwards it was noted: "The cardiac dulness is as at last report, and there is the same friction to be heard over the præcordial region. Since admission the child has had no symptoms, and the temperature has been generally subnormal. Still the patient looks ill, and there is a distressed expression on the face even during sleep. Is now (3 P.M.) lying asleep on her back, inclining to the left side. Pulse 88, regular; respiration 28, nares not acting. Some slight lividity about the mouth and under the eyes. General pallor of face, with a faint tinge of pink on her cheeks. Lips rather pale. The superficial veins are visible over the sides of the neck and the backs of the hands, although not greatly enlarged." After a few weeks the physical signs of the heart became normal, and the child's health was perfectly restored.

The above illustrates very well the general appearance of a child who is the subject of pericarditis. In the large majority of cases, although he may look ill and be languid, yet if there be no joint affection, he makes no special complaint. An examination of the chest at once reveals the cause of the indisposition.

Still, it is right to say that in exceptional cases much more serious symptoms may be noticed. There may be tumultuous action of the heart, with great dyspnœa or even orthopnœa, and lividity of the face. The countenance may express the utmost anxiety, and the restlessness may be extreme. There is usually, also, some puffiness of the face, and slight but general œdema. The gravity of these cases is probably owing to the participation of the heart substance in the inflammation. Again, in still other cases we find symptoms all pointing to the brain. There is high fever, with headache and delirium (see page 159). Such cases are, however, chiefly interesting from their rarity. They occur very seldom even in hospital practice, and are clinical curiosities which for practical purposes may be put on one side.

The beginning of pericardial inflammation is indicated by a more or less loud rub of friction accompanying the sounds of the heart. The rub is best heard at the base, and is double, the systole and diastole being accompanied by a distinct catch or scrape, which is very superficial, and conveys the impression of being generated at a point nearer to the ear than the sounds of the heart themselves. Even if there be at the same time an endocardial murmur, the friction sound can be in most cases readily separated by the practised ear, through its higher pitch and more superficial character, from the lower pitched and more deeply sounding murmur generated by the inflamed valve. A pericardial friction-sound is not, however, always high pitched, and even its superficial character may not be so decidedly marked as would be expected. In certain cases a loud blowing sound is heard, which is indistinguishable by the ear alone from a similar sound of endocardial origin. Its mechanism must be then decided by other considerations.

At first there is no alteration in the præcordial dulness, but in a day or two, as fluid is poured out from the inflamed serous membrane, the limits of the heart's dulness are extended. At the same time the position

of the apex-beat of the heart is raised, and the cardiac impulse is feebler than before.

A little girl, aged seven years, had a mild attack of rheumatism followed by chorea. Six months afterwards the choreic movements returned, and she was admitted into the East London Children's Hospital. At this time the heart's apex was noted to be beating between the fifth and sixth ribs, one-fourth of an inch outside the nipple line; and a soft systolic murmur was heard at this spot. After being a few days in the hospital, the child's temperature rose from normal to 103.8°, and a double rub was detected over the præcordial region. There was also a patch of pneumonia at the base of the right lung. Some days afterwards effusion was found to have occurred in the pericardium, the limits of the heart's dulness were extended, and the heart's apex was raised to between the fourth and fifth ribs in the nipple line. The double friction was still heard—most distinctly at the level of the third left sterno-chondral articulation.

If much lymph and little fluid be thrown out, the hand placed upon the præcordial region can often detect a distinct fremitus with each beat of the heart. When a considerable quantity of fluid is effused into the pericardium, the resulting area of dulness takes the shape of the containing sac. It becomes triangular or "pyramidal" in form, with the apex directed upwards towards the top of the sternum. A moderate effusion does not prevent the friction-sound from being heard, but the rub becomes less intense and less crisp than before, and the heart-sounds are muffled and distant. In great effusion the chest-wall in the cardiac region may be bulged, and on careful inspection the eye can often detect a distinct undulatory movement with each beat of the heart in the intercostal spaces.

An important distinguishing mark of pericardial friction is, besides its superficial character, the irregularity of distribution of the sound. Endocardial murmurs are carried along with the blood-current. Pericardial frictions may be limited to a small area, or heard equally loudly over the whole præcordial region; in either case they do not follow the rules which regulate the transmission of heart-murmurs. Further, a pericardial rub is intensified by pressure, and is heard better during expiration than when the lungs are expanded. As the fluid and lymph become absorbed, the limits of dulness gradually return to their former dimensions; and the friction after a time becomes fainter and fainter and gradually disappears. If the lymph has been exuded in large quantity, adhesion of the pericardium may take place. Unless there be also adhesion between the pericardium and the adjacent pleura. there are no physical signs by which this condition can be detected. If the pleura and pericardium be adherent, the intercostal space corresponding to the apex of the heart is depressed at each impulse. Adherent pericardium is generally followed by hypertrophy of the heart.

The fluid in pericarditis sometimes becomes purulent. The *suppurative* form of pericarditis is more common in cases where the inflammation has extended to the pericardium from the pleura; although it may no doubt also occur without the pleura having been previously affected. In the cases of this form of pericardial inflammation which have come under my notice, the patients have complained of pains in the chest or epigastrium; the temperature has been high at night (103° to 104°), with a partial morning remission; pericardial friction has disappeared early; absorption of the effusion, if it had begun at all, has been slow and incomplete, and towards the end of the disease slight but general œdema has been

noticed without any albumen being discovered in the urine. These cases almost always end fatally.

When endocarditis occurs, the valvular lesion is indicated at first by no external signs, and can only be discovered by physical examination. With the stethoscope we hear a low-pitched soft murmur at some point of the præcordial surface, indicating, according to its site and rhythm, obstruction or incompetence of one or another of the cardiac valves. The affection of the valve may be accompanied by increased frequency of the pulse and some palpitation ; but while the patient is at rest in bed these symptoms are very exceptional. Tenderness is never present, and it is rare for the child to complain of pain or uneasiness about the chest. The valve affected is most commonly the mitral, although the aortic semilunar valves are sometimes inflamed alone, or in conjunction with it. The lesions are almost invariably limited to the left side of the heart.

Endocarditis may occur without implication of the pericardium, or the two lesions may be combined. In the latter case the endocardial murmur may be completely masked by the external friction-sound, and may only be discovered as the latter subsides. If unaccompanied by inflammation of the pericardium, endocarditis, although a very serious misfortune as regards the future of the patient, adds little, if anything, to the immediate danger.

There is one accident which sometimes occurs as a direct result of endocarditis. The vegetations on the inflamed valve may undergo disintegration, and minute particles swept away into the general circulation may become arrested in the small arteries of a distant organ. Ulcerative endocarditis is not a common disease in children, but it is occasionally met with. This complication gives rise to symptoms which may be mistaken for those of pyæmia or of continued fever, so close sometimes is the resemblance. They are partly constitutional, owing to admixture with the blood of decaying atoms of organic matter from the disintegrating valve; partly local, from embolisms which interfere with the function of special organs. Thus there is high fever with marked remissions ; great weakness and prostration ; a furred dry tongue ; often sickness, and perhaps diarrhœa, thirst, and anorexia. The pulse is small, rapid, and weak ; the breathing hurried ; and the child gradually becomes restless and delirious, or drowsy and comatose. The local symptoms are derived from the organ or organs, whose function is interfered with by arrest of emboli in their minute arteries or capillaries. Thus, embolisms in the skin produce petechiæ from minute extravasations ; in the liver, swelling and perhaps jaundice ; in the kidney, albumen and blood in the water ; in the spleen, swelling and tenderness ; in the brain, paralysis ; or if from small disseminated emboli, headache, delirium, and coma, without special interference with motor function. In all these cases examination of the heart reveals the signs of valvular disease. The cases generally end fatally.

The pleura is often affected in rheumatism, alone or in conjunction with the pericardium. Pleurisy and pericarditis may occur simultaneously, or the inflammation may spread from one membrane to the other. When the two diseases are present together, the inflammatory processes in the two situations may be perfectly independent the one of the other. The effusion in the pleura may be purulent, and that in the pericardium serous; or the pericardium may contain pus, and the pleura pure serum.

A little boy, aged six years, died in the East London Children's Hospital of pleurisy and pericarditis. On examination the right lung was found adherent to the pericardium, and partially to the chest wall. It was

condensed and tough from pressure, and the pleura of that side contained a large quantity of clear fluid. The pericardium was adherent to the heart in places, and in the sac were about two ounces of thick pus. In this case the illness had begun with sickness and pain in the side, followed by cough —symptoms which pointed to pleurisy; and three weeks afterwards, when the child first came under observation, there was slight but distinct contraction of the right side, shown by lowering of the shoulder and angle of the scapula, with distinct curving of the spine—the convexity to the left. These signs, taken in conjunction with the history, seemed to indicate that the pleurisy had dated from the beginning of the illness, and that therefore, if it did not give rise to the pericarditis, was not, at any rate, secondary to it.

Pneumonia is not rare in rheumatic fever, and may occur in conjunction with pleurisy or independently of it. A much rarer lesion is meningitis affecting the membranes at the convexity of the brain and those of the spine. These cases are characterised by high fever, headache, and delirium. Still, we must not suppose that in every instance where such symptoms occur in the course of acute rheumatism they are due to inflammation of the cerebral meninges. Many cases are now on record in which these symptoms have been present, with others—all pointing to the head as the seat of the lesion, and yet on dissection of the dead body no signs of disease have been discovered within the cranium. Dr. Latham has described a case of this kind which occurred in a little scholar at Christ's Hospital. The boy had high fever, headache, delirium, and convulsions; and died in spite of energetic treatment directed against a supposed meningitis. Examination of the body disclosed no disease of the brain or its membranes; instead, there were all the signs of a severe pericarditis—a disease which had not been so much as suspected during life. Trousseau believed this form of "cerebral rheumatism," which leaves no trace of intracranial inflammation behind it, to be a neurosis depending upon some such mysterious modification of nerve-substance as is believed to occur in hysteria and tetanus. The symptoms may, however, be explained more simply by attributing them merely to the effects of hyperpyrexia; and this is the view commonly accepted in the present day. Such a case has never come under my observation; nor have I ever seen a case of rheumatic iritis in the child, nor of peritonitis occurring in the course of acute rheumatism.

Peritonitis may, however, be simulated by rheumatism of the abdominal muscles which sometimes occurs in children. If this be severe, there is tenderness on pressure of the abdominal wall, the child may have an appearance of great distress, and may lie in bed with his knees flexed on his abdomen, as if he were really suffering from inflammation of the peritoneum. The bowels are usually confined. These cases may be readily distinguished by careful examination. The face, although often distressed, has not the haggard look which is so characteristic of peritonitis; there is little or no tension of the abdominal wall; the natural markings are not lost; the tenderness is not extreme; the pulse is soft, compressible, and of moderate quickness, not rapid and hard; and the temperature is normal or only slightly elevated. There is generally great acidity of urine; it is scanty and high-coloured, and its passage may cause some scalding.

Torticollis (stiff-neck) is sometimes a consequence of rheumatism. The disease may affect the muscles, especially the sterno-mastoid; or may attack the fibrous ligaments uniting the vertebræ. The nervous system, too, may suffer. Neuralgia has been noticed in some children; and paralysis

of the muscles of one side of the face may be produced by rheumatic inflammation of the sheath of the facial nerve at its point of exit from the bone. Moreover, there is an evident connection between rheumatism and chorea. This important subject will be considered elsewhere (see Chorea).

A peculiar manifestation of rheumatism is sometimes found in children. This was first noticed by Meynet, and is characterized by swellings varying in number and size which appear in the tendons and their sheaths, and in other fibrous structures which lie close under the skin. Thus they are seen around the patella and the malleoli; on the spinous processes; on the temporal ridge, and on the superior curved line of the occiput. They are very hard; are accompanied by no redness, tenderness, or pain; are sometimes movable; and disappear after a time spontaneously. They are composed of small masses of loose fibrous bundles, and are very vascular.

A little girl, nearly ten years old, was under my care in the East London Children's Hospital for an attack of rheumatic fever complicated with chorea. She had a harsh systolic murmur at the apex of her heart, which evidently dated from a previous attack of endocarditis; but the apex-beat was not displaced, nor were the normal limits of the heart's dulness extended. In this child fibrous nodules were found on the spinous processes of the vertebræ, the prominences of the scapula, the head of the radius, the tendons in front of the right ankle, and the back of the right hand. The nodules varied in size from a split pea to a large marble; they were not tender, and the skin over them was not adherent. While the child remained in the hospital her temperature never at any time rose above 100°. The swellings gradually diminished in size, and by the end of the month had almost completely disappeared.

The duration of the rheumatic attack is much longer in some children than in others. It may be variously estimated according to the method upon which the reckoning is conducted. If we take into account merely the joint affection and the general symptoms, the disease may be considered over in a few days. A child may be taken with high fever, and complain of pain in one or other of his joints, which is found to be red, swollen, and tender. In twenty-four or forty-eight hours the articular inflammation may be at an end and the temperature normal. But it does not follow that the disease is over; and if we at once begin to treat the child as a convalescent, we may find reason to regret our precipitation. Serious inflammation of the pericardium and lining membrane of the heart is quite compatible with a normal temperature; and these internal lesions may be only beginning when the external signs of the disease are on the wane. As it is only in exceptional cases of rheumatic fever that the heart does not suffer, and as the mildest attack of pericarditis is seldom over before a week has gone by, eight or ten days must be considered the earliest period at which convalescence can be said to begin.

In other cases, if there are frequent relapses, the disease may be prolonged for many weeks, the inflammation leaving joints and returning to them with wearisome repetition, and the pericardial inflammation waxing and waning with similar persistency. In this way an attack may be made to last six weeks or two months. It is, however, only right to say that since the introduction of the salicylates these cases are much rarer than they used to be.

Although the joint affection in rheumatism is usually an acute disease, and ceases when the attack is at an end, yet this is not always the case. Children with strong rheumatic tendencies, and who have had several at-

tacks of rheumatic fever, may complain of wandering pains in the back, neck, and loins, and of transient discomfort and stiffness in a joint from time to time, especially in the variable seasons of the year, without having to take to their beds. In such patients there is general impairment of health, appetite is poor, and nutrition is unsatisfactory. The child is often excessively nervous, sleeps badly at night, and is changeable in temper. Dr. West has connected these symptoms with the lithic acid diathesis. There is no doubt that such children are subject to sandy deposits in their urine, and to abundant secretion of urea.

Diagnosis. — When the joint affection is well marked it can scarcely be mistaken. An acute articular inflammation which flies from joint to joint capriciously, is accompanied by redness, swelling, and extreme tenderness, and in a day or a couple of days has passed completely away from the joint first attacked, to run the same rapid course in another— such a disease can only be rheumatism. Real rheumatic joint affections are very transitory. If redness, pain, and swelling persist in a joint supposed to be rheumatic, we may suspect strongly that the true cause of the lesion has yet to be discovered. It is often difficult to decide the nature of the obscure pains and stiffnesses from which some children suffer. The so-called "growing pains" are often rheumatic in their origin ; and if they occur in children of decided rheumatic family tendency, should be regarded with extreme suspicion. A careful examination of the chest will often clear up obscurity, and it is unfortunately too common to find serious valvular or pericardial mischief associated with a very trifling amount of articular or even muscular pain in young subjects. A to-and-fro friction sound over the præcordial region, if decided, is very suspicious in itself of pericardial inflammation. If the child look ill, and especially if there be also increase of the heart's dulness, the evidence in its favour is complete. A faint double rub at the base of the heart is not in itself sufficient to establish this conclusion ; for such a friction may be produced by slight roughness of the pericardial surface, from prominent vessels or other cause, when the membrane is quite free from inflammation.

Dulness of pyramidal shape in the præcordial region, although very suspicious of pericardial effusion, is not conclusive ; such a dulness may be produced by a mass of enlarged glands in the anterior mediastinum. Extension of dulness to the left, beyond the point at which the apex beats, is said to be a positive sign of effusion. The increase in the dull area when the patient is placed in the erect position is often absent ; when present, it is, no doubt, an additional proof of fluid accumulation in the sac of the heart.

When the fluid becomes purulent, as it may do at an early date, the nature of the contents of the sac may be inferred from the variable temperature, the mercury rising every night to 104° or 105°, and sinking in the morning to the normal level, or even below it ; the early subsidence of the friction, although the amount of the effusion remains unchanged ; the stationary character of the dulness, showing want of absorption of the fluid ; and the appearance, after a time, of more or less general œdema without albuminuria.

On account of the frequency with which pericarditis and pleurisy are combined in young children, we should never neglect to make a careful examination of the heart in every case in which we have ascertained the existence of pleural inflammation. Pericarditis, under these circumstances, is not easy to detect, as the dulness in the præcordial region is attributed to the effusion in the chest cavity. Unless, however, the pleural effusion

be very great, the percussion note in the infra-clavicular region is very different from that obtained in the præcordia. If, therefore, we find complete dulness towards the upper part of the sternum, and a fairly resonant or wooden note below the clavicle near the acromial angle, we may strongly suspect accumulation in the pericardial sac. Friction over the heart may then be generally heard on careful auscultation.

A difficulty sometimes arises in these cases from a pleural friction of cardiac rhythm being heard at the limits of the pericardium. This is owing to the action of the heart causing a movement between the adjacent pleural surfaces. In these cases if the child be old enough, or sufficiently amiable, to follow directions, we should listen at the seat of friction while the breath is held after forced expiration, and if the rub cease or be heard only at this spot, it is probably due to the cause referred to. It is not always possible, however, positively to exclude pericarditis.

If we hear a blowing murmur at the apex of the heart, the question of valvular competence has to be considered. All blowing murmurs at the apex must not be taken to indicate regurgitation, nor, indeed, are they a positive sign that the endocardium is inflamed at all. The murmur may be the consequence of regurgitation, of roughness of the valve or cardiac lining, of anæmic dilatation of the ventricle, or of mere abnormal tension of a healthy valve, and there is nothing in the quality of the sound to show to which of these causes it may be properly assigned. If, however, the second sound is evidently intensified over the pulmonary artery; if the murmur is heard at the angle of the scapula; and if, with a full contraction of the left ventricle, the pulse is feeble, small, and irregular, we may confidently pronounce the mitral valve to be insufficient. Still, regurgitation may take place without giving rise to these signs. Therefore, in most cases we must reserve a positive opinion, and wait until sufficient time has elapsed to allow of nutritive changes taking place in the wall of the heart. If there be no displacement of the apex-beat at the end of twelve months, we may be satisfied that the cause of the murmur is not regurgitation.

A recent murmur is very soft in quality and of low pitch. After being in existence for some months it becomes harsher and its pitch rises. If in a case of acute rheumatism we hear a harsh and loud endocardial murmur at the apex, we may be sure, whatever its mechanism, that it is not of recent origin, but is a relic of some former attack.

The diagnosis of ulcerative endocarditis has been already sufficiently explained. If we find that a child, who has lately suffered from an attack of acute rheumatism with endocarditis, remains feverish, with rapid elevations and depressions of temperature, such as are characteristic of suppuration; if he pass quickly into a typhoid state with dry brown tongue, loss of appetite, hurried breathing, and signs of great prostration, we should suspect the presence of this complication; and if we find evidence of embolisms in special organs, our suspicions are sufficiently confirmed.

Prognosis.—The immediate prognosis of acute rheumatism is seldom otherwise than favourable. Even the existence of endocarditis and inflammation of the pericardium cannot often be regarded as giving rise to any fear of immediate danger. Still, it is well not to speak too positively in predicting a favourable issue to the illness. In acute rheumatism—even in the mildest cases—there is a tendency to hyperinosis; and the rapid formation of a clot in the right ventricle of the heart or in the pulmonary artery may be a cause of sudden death. In some instances this distressing accident happens quite unexpectedly in a case which is running a fa-

vourable course, and may even occur at a late period of the disease after convalescence has seemed to be established. Again, in rare cases, pericarditis is a cause of death. When the effused fluid is or becomes purulent, the danger is great; and few such cases recover.

The ultimate consequences of an attack of rheumatic fever may be very serious, for the large majority of cases of heart disease can be referred to this cause. But, as already remarked, the mechanism of heart-murmurs is so various, that the mere existence of a blowing sound at the apex of the heart is no indication in itself that serious consequences are to be apprehended. If the child be seen during an attack, or while the murmur is still recent, it is impossible to speak with certainty as to the gravity to be attached to the phenomenon. If, after a time, we discover signs of dilated hypertrophy of either ventricle, with displacement of the heart's apex, and accentuation of the second sound at the pulmonary cartilage, we may positively assume that serious incompetence exists of the mitral valve.

Endocardial murmurs arising during an attack of rheumatism in children sometimes disappear. It is probable that in all these cases the morbid sound was generated by other mechanism than valvular incompetence, for I have never known the auscultatory sounds to become healthy except in cases where the heart's apex has retained its normal situation.

A little boy, aged eighteen months, with sixteen teeth, was brought to me in November, 1874. A few months previously he had seemed to have pain and stiffness in some of his joints, and had been a little feverish. Since that time he had been subject to palpitations which were sometimes violent. On examination I found a loud basic systolic murmur conducted to the second right cartilage, and at the apex a less loud mitral murmur. The apex-beat was normal. In March, 1875, I saw the child again. The apex-beat was still in normal site. The heart-sounds were a little muffled to the ear, although no murmur could be heard at either the base or the apex; but on this occasion no attempt was made to excite the heart's action. The patient was seen for the third time in March, 1881. He was now nearly eight years old, and of average height for that age. Although rather thin, he was stated to enjoy good health, and never complained of palpitations or of breathlessness. The position of the apex-beat remained unaltered. The first sound was muffled, and after the boy had been made to run round the room, a faint systolic murmur was developed at the apex. It could not be heard at the angle of the scapula.

In this case the basic murmur disappeared, and that at the apex became so indistinct that it could only be detected by exciting the heart's action. Whatever may have been the cause of the abnormal sounds first heard, they were apparently the consequence of rheumatism. Still, it seems certain that there could have been no organic lesion of valve, for in the course of nearly seven years no alteration in the nutrition of the heart had taken place.

Treatment.—A child the subject of acute rheumatism must be kept in bed; the inflamed joints must be wrapped in cotton wool, kept in place by a firmly applied flannel bandage; and the chest should be also enveloped in the same material. A mercurial purge should be given to produce free action of the bowels; and salicylate of soda should be administered without unnecessary delay. Children, as a rule, bear this remedy well. It is exceptional to find any ill effects resulting from its employment. For a child of five years old, ten grains of the salt may be given every two or three hours with tincture of orange peel and glycerine. Within two

or three days, sometimes within a few hours of beginning the treatment, the temperature falls, the pulse becomes less frequent, and the joint symptoms are moderated. The pulse usually loses in strength as well as in frequency; and the depression induced by the action of the drug upon the muscular fibres of the heart is sometimes so great that its administration has to be supplemented by the free use of stimulants. This effect of the remedy is, however, less common in children than it is in the adult, and I have rarely been obliged to discontinue its use for this reason. It sometimes causes distressing vomiting, and occasionally excites epistaxis which may be obstinate. If, on account of any of these accidents the treatment has to be suspended before the disease is completely subdued, the temperature often rises again, and the joint affection may return.

In a small minority of the cases the medicine, although well borne, appears to exercise no influence upon the disease, and even when it lowers the temperature and subdues the joint affection, it seldom prevents the occurrence of cardiac or pleural inflammation. The first signs of pericarditis may be noticed when the patient appears to be under the influence of the remedy; and I cannot say that in any case the course of the pericardial disease has appeared to me to be shortened by the use of the salicylate. Still, if only for its influence in reducing temperature and checking articular inflammation, the drug would be a most valuable one, and we should not be doing our duty to the patient if we neglected to employ it.

In cases where the salicylate cannot be used, we may adopt the alkaline treatment, giving bicarbonate of potash in ten-grain doses every three or four hours. If thought advisable, the bicarbonate may be combined with quinine; or we may prescribe a mixture of quinine with iodide of potassium, as recommended by Dr. Greenhow. The objection to the alkaline plan of treatment is that it encourages the tending to anæmia. It should therefore be supplemented by the early administration of iron when the joint pains have subsided. The method of treatment advocated by Dr. H. Davis, which consists in encircling the affected joint with a thin line of blistering fluid is a painful proceeding and ill-suited to young patients. The best local application is a thick layer of cotton wool, with a firmly applied flannel binder.

If there be much pain in the joints, a small dose of Dover's powder can be given at night (gr. ij.–iij. to a child of four or five years old). Chloral must not be used during the administration of the salicylate, as it also has a depressing effect upon the heart.

Hyperpyrexia is not common in cases of rheumatic fever in children, and, indeed, it is difficult to say what degree of elevation of temperature can in an ordinary case be accounted hyperpyrexia in a child. An injurious amount of fever is usually accompanied by symptoms of mental disturbance such as are characteristic of the so-called "cerebral rheumatism." If these are absent, it is unnecessary to attempt to reduce the temperature by baths; unless, indeed, the pyrexia persist and seem to be injuriously affecting the patient's strength. I have never seen a case of rheumatic fever in a child in which I have felt it necessary to employ cold.

The diet in acute rheumatism must be simple. While the fever persists the child should take nothing but milk and fresh-meat broths, with a little dry toast. When the temperature falls, a more generous diet may be allowed; but for some time attention should be paid to the quantity of fermentable matter, such as starches and sweets, taken by the child. The appearance of lithates in his water is a sure sign that some modification in his diet is required.

Directly the existence of pericarditis is ascertained, a blister should be applied over the præcordial region without loss of time. I prefer the blistering fluid for this purpose as most certain in its action, and use it to quite young children. It is of extreme importance to check the pericardial inflammation early, and there are no means at our command so efficacious for this purpose as a blister. In many cases the effusion begins to disappear as the blister rises. If there be much effusion, and the joint affection have subsided, I am in the habit of giving large doses of the iodide of potassium, alone, or with the tartrate of iron. The iodide is in my opinion of great value in removing serous effusions, if given in full doses. To a child of five or six years of age I give ten grains of the iodide three times a day, and have never seen ill effects follow its employment. On the contrary, its value in causing absorption and restoring the natural state of the membrane has appeared to me to be very decided.

In endocarditis, also, blistering should be employed; and if the temperature has fallen, iron and quinine should be prescribed. The same tonic treatment can be adopted in cases of pericarditis after absorption of the effusion, for the patient is usually left anæmic and weak from the attack, especially if he have been treated with the salicylate of soda. In all cases where the disease has been complicated with endocarditis it is advisable to keep the child in bed as long as possible; and even when he is allowed to get up it is wise to enforce the utmost attainable quiet. In these cases the heart is more likely to recover itself if its action be not excited; and, indeed, judicious care during convalescence may largely influence the future well-being of the patient. Complete rest moderates the heart's action, and allows time for the healthy removal of inflammatory products from the valves. If such products become organized, they contract the tissues and cause puckering of the valves, with all the evils which the resulting hindrance to the circulation must inevitably entail.

If suppuration in the pericardium is suspected, the sac should be carefully punctured with a hypodermic syringe in the fourth or fifth interspace, near the left edge of the sternum, to make sure that the fluid is purulent. If it prove to be so, the question of evacuating the contents of the pericardium must be considered. Professor Rosenstein has reported an interesting case, in a boy of ten years of age, in whom recovery took place after the sac had been emptied. The pericardium was opened by incision in the fourth space, near the sternum, and after the pus had escaped, two drainage-tubes were passed into the wound, and antiseptic dressings were employed. This form of pericarditis is so fatal that the operation should be decided upon if the state of the patient offer the slightest prospect of its success.

Muscular rheumatism, whether it affects the abdominal wall or the muscles of the neck, must be treated with stimulating applications and with warmth. A good mercurial purge to relieve the bowels is useful.

In cases of chronic joint pains affecting children who are old sufferers from rheumatism, it will be often necessary to change the conditions under which the patient has been living. Removal to a warm dry air will often do wonders. Great attention should be paid to the action of the skin and kidneys. Five or six grains of bicarbonate of potash, with an equal quantity of citrate of iron, given three times a day, will be found of service. Fermentable matters and acid-making articles of diet should be taken with moderation.

CHAPTER IV.

SPONTANEOUS GANGRENE.

Amongst the non-infectious general diseases may be included the curious condition in which apparently spontaneous gangrene becomes developed in various parts of the body. The lesions are often symmetrical, but are not so in every case. Sometimes the lower limbs are the parts affected; but portions of the face and trunk may be also attacked. Children, the subjects of this tendency, are not always cachectic or otherwise enfeebled; although in many cases the gangrenous process occurs in convalescents from acute or depressing disease. After measles a special disposition to gangrene is occasionally discovered. The same tendency is displayed, but less frequently, after other acute specific diseases, as scarlatina, variola, varicella, and enteric fever; and insanitary conditions generally, combined with poor food, have been cited as predisposing causes of the gangrenous lesions. It is said to be more common in cold than in warm weather; and some observers are disposed to look upon a low temperature of the air as one of the causes of the mischief.

In the case where the disease appears in a well-nourished child who has not previously been subject to any enfeebling influence, the etiology of the lesion is obscure. Raynaud, who was the first to describe a "symmetrical gangrene of the extremities," attributes the affection to a spasm of the arterioles, followed by a migration of blood-corpuscles and transudation into the skin. He states that he has noticed, with the ophthalmoscope, spasm of the arterioles of the fundus occuli in these cases. The disease is sometimes associated with intermittent hæmaturia; and Dr. Gee has reported the case of a little girl, aged five years, in whom gangrene of the vulva was combined with embolism of the kidney and the brain. Still, in many cases no lesion of the viscera or arterial system is discoverable on the closest investigation; and no evidence has yet been brought forward pointing to any centric or nervous defect capable of exciting mortification of the tissues, although the symmetrical distribution of the lesions is suggestive in many cases of some such mode of origin. Dr. Nedopil, in explaining the mechanism by which spontaneous gangrene is produced, assumes the existence of a functional nervous derangement. This writer agrees with Raynaud in ascribing the arrest of circulation to a spasm of the walls of the arterioles in the part affected. He supposes that owing to irritation of sensory and centripetal nerves the reflex centre of the vaso-constrictors which control the circulation at the extremities of the limbs is excited. If the spasm be prolonged and be sufficiently intense to close the arterial channels, gangrene of the part may be induced.

Children of all ages may suffer from the disease. It may occur immediately after birth, or may appear in later childhood. It is not always fatal; but if the gangrene is extensive and penetrates deeply through the skin, it seldom terminates otherwise than unfavourably.

Gangrene as it affects the mouth and the lung is described elsewhere. In the present chapter gangrene of the skin and underlying tissues will alone be considered.

Morbid Anatomy.—Gangrene may affect the healthy skin or may attack a blistered surface. In the first case the skin becomes dark blue in colour, and then almost black. Its consistence varies. Sometimes it is hardened and feels dry like parchment; in others it is softer and moist. At the margins of the gangrenous patch the skin is reddened and inflamed. Instead of blackened patches the gangrene may assume the form of ulcers limited in extent. These ulcers are circular in shape, with abrupt, clean-cut edges, and their depressed floor is formed of a gray or blackish slough. They may penetrate completely through the skin.

When gangrene attacks a blistered surface the lesion is usually more superficial than in the former case. It appears in the form of a lightish gray slough, marbled here and there with a violet tint.

Sometimes the gangrene penetrates completely through the skin and subcutaneous tissues. It may then be found in two forms: a moist and a dry variety. In the moist form the gangrenous patch is black, softened, and infiltrated with a dirty, reddish fluid. Its odour is excessively offensive, and the tissues affected appear to be completely converted into a putrescent pulp. Often it begins as a small pimple, which changes into a bleb containing thin purulent matter. As the process continues, more and more skin becomes involved, and a considerable extent of surface may be red, œdematous, and boggy to the touch. The centre is usually purple. On this surface blebs form and burst, leaving spots of gangrene. The sloughs unite, and if the patient survive may become limited. The gangrenous part is then thrown off, leaving the under muscles exposed.

When the gangrene assumes the dry form its anatomical characters are similar to those of senile gangrene. MM. Rilliet and Barthez describe a case in which the skin of one leg was completely mortified. On the toes it was shrivelled and blackish. Elsewhere it was transparent, hard, reddish, and elastic like a piece of parchment. The dried skin was so transparent that the injected venous radicles could be seen ramifying on the under surface, and it had a curious resemblance to the rind of bacon.

In some cases ante-mortem clots have been found in the arteries leading to the affected part; but in not a few cases no embolus is to be found in the femoral or other arteries of the diseased limb.

A common seat for this spontaneous gangrene is the vulva in the female child. Here the gangrene usually begins on the labia, and may spread thence to the interior of the vulva, to the anus and the sacrum. The affected parts are dry and blackish-brown, and may slough off, leaving the muscles exposed. In male infants the scrotum is sometimes attacked. Often the patches of gangrene are not limited to one region or to one limb, but occur in scattered spots of various sizes situated on the legs, the arms, the buttocks, or other parts of the body. The lesions are then often symmetrical, attacking corresponding parts of the surface on the two sides.

Symptoms.—Children the subjects of this tendency to spontaneous mortification are liable to attacks of what has been called "local asphyxia." Some part of the body—usually a finger, a toe, or the whole of a hand, a foot, or even a limb—becomes excessively painful, and is noticed to be purple in colour. It feels cold to the touch. The tint may deepen to a dull leaden hue. After three or four hours, during which the greatest anxiety has been excited, the pain subsides; the colour of the part grows

lighter and then becomes normal, and the natural warmth returns to the skin. These attacks are sometimes accompanied by severe abdominal pain. Occasionally, too, they are followed by hæmaturia of a distinctly intermittent character, the water being normal at some times, red with blood at others. The attacks of local asphyxia do not always subside harmlessly. In some cases the symptoms grow slowly worse, and the affected part becomes gangrenous.

Gangrene occurs in two principal forms: disseminated and more or less symmetrical gangrene, and gangrene limited to the extremities, the vulva, or the scrotum.

In the *disseminated* variety the disease begins in scattered nodules or patches. The child for some days appears to be unusually drowsy, and then, if old enough to speak, complains of pain in some part of the body—the thighs, legs, buttocks, or arms—and livid patches make their appearance, which grow rapidly darker in colour. The patches are hard and tough to the touch, and seem to be tender, for pressure elicits signs of suffering. If the patches are few and small, the general health may be little affected; but if they are large or numerous, there may be vomiting, headache, and general malaise.

Dr. Southey has reported the case of a little girl, two and half years of age, who had a feverish attack accompanied by purpuric spots on the limbs. She soon recovered, but some months afterwards had a second attack which lasted three days. About a fortnight later the child complained of headache, and said she had hurt her legs. The pain was increased by friction of the limbs. In rubbing them it was noticed that the skin on the backs of the calves was livid. Soon afterwards the child vomited, complained of headache, and was feverish. Towards the evening the patches were seen to have extended up and down the calves and to be darker in colour. A similar appearance was noticed at the backs of the arms, and on the following morning the buttocks had become livid.

When admitted into the hospital on the second day the child was moribund. The pulse at the wrist was feeble and somewhat wiry, but could still be counted. The tibial pulse could not be detected. The patches of lividity felt hard and tough. The lungs and heart appeared to be quite healthy. Brandy and milk were given, and two doses of nitro-glycerine, but all were vomited. Intelligence was preserved until evening. Convulsions then occurred, and were frequently repeated until the child's death at 11 P.M. The illness altogether lasted only thirty-two hours. A *post-mortem* examination of the body discovered no coarse lesion of the viscera, nor could any embolus be detected in the femoral or other arteries of the left lower limb, which was the only one examined.

Mr. Astley Bloxam has kindly communicated to me the particulars of a case of spontaneous gangrene which was under his care in the Charing Cross Hospital. The child—a little girl of ten months old—had been ailing for eight weeks. A small pimple then appeared on the region of the inferior angle of the scapula. The next day a head formed on the pimple, and became filled with purulent fluid. When the child was admitted a day or two afterwards (on August 19th) she was seen to be pale and thin, and was said to be wasting. The whole of the scapular region on the right side was œdematous, red, boggy, and hot. In the centre was a purpuric patch an inch and a half long by three-quarters of an inch broad, the borders of which were quite purple. On palpation the patch gave a boggy sensation to the finger, as if from fluid underneath the skin. The temperature on the first evening was 101.8°.

On August 20th the patch had slightly enlarged. Temperature : in the morning, 100.6° ; in the evening, 101.2°. Pulse, 96 ; respirations, 60.

On August 21st the patch was much larger, measuring three and three-quarter inches long by two and one-half inches broad. Some bullæ had appeared on the surface, and one of these had burst, leaving a small slough. There was no tenderness at the gangrenous part ; indeed the opposite appeared to be the case, and the part seemed to be unusually devoid of sensibility. Temperature : in the morning, 98°; in the evening, 99.6°. Pulse, 120 ; respirations, 60. An ammonia and bark mixture was ordered, and in the evening the part was well painted with strong nitric acid. The application caused no pain. Thirty drops of brandy were ordered every three hours.

After this the slough did not further increase. On the contrary, it began to separate, and the surrounding œdema to subside. There was a little diarrhœa. On August 24th part of the slough came away and exposed the muscles. The child became very fretful and weak, and died rather suddenly on August 29th.

When the gangrene attacks the *extremities*, it may be seen in the fingers and toes, or may spread to the hands and feet, or even higher up in the limb. Children so affected are usually pale, under-nourished, and cachectic in appearance. After a few days of more or less irritability, loss of appetite, headache, sleepiness, and general malaise, the patient begins to complain of severe pains in the toes, which may extend for some distance up the legs. At the same time the ends of the toes are noticed to be dull red or purple, and their sensibility is found to be blunted. The pains continue. There may be some fever at night, and in the morning the lividity of the ends of the toes is seen to have extended to the circumference of the nail. At this point the symptoms may subside, the pains becoming moderate, and the lividity fading and disappearing ; or, on the contrary, the disease may go on to complete sphacelus, and extend to the whole of the foot or even of the limb. Thus, François records the case of a child, three years of age, in whom the gangrene involved the whole of the foot and lower part of the leg.

This form of gangrene may be dry or moist. If the former, it assumes the characters of senile gangrene, becoming separated by a line of demarcation, and subsequently detached. Raynaud reports the case of a little girl, aged eight years, of good constitution and healthy appearance, who began to complain of severe pains in the feet and lower halves of the legs. At the same time the ends of the toes were noticed to be blue. The pains increased and the child was a little feverish. The fourth toe on each foot became slate-coloured, and the other toes showed spots of livid red. The mortified parts were insensible to the touch, but the pains continued and were worse at night. The appetite remained good, and there was no diarrhœa. After a few days the pains ceased, and the gangrenous patches became limited by a well-defined line. In about a fortnight the toes desquamated. Dry brown scabs became detached, and left the skin beneath them tinted of a pale violet colour. On the fourth toe of the right foot, the one which had exhibited the largest patch of gangrene, a black crust was thrown off, and a suppurating surface was left which quickly healed.

A very similar case has been published by Dr. Southey. In this the spots of gangrene were accompanied by subcutaneous mottlings of the trunk and limbs. These mottlings developed into a raised rash like erythema tuberculatum. The eruption at first itched, then became tender and painful, but eventually subsided, leaving merely a discolouration of the

skin. Recovery in such cases is sometimes followed by an attack of paroxysmal hæmaturia, in which large quantities of crystals of oxalate of lime are passed with the urine.

In the moist gangrene of the extremities the affected part—which is commonly the end of a finger or toe—is swollen, and the epidermis is raised up by red serous effusion. As the destruction of the tissues of the part proceeds, the articulation may be laid open. Sometimes moist gangrene of the extremities is combined with disseminated spots of a kind similar to those previously described. Thus, MM. Rilliet and Barthez refer to the case of a little girl, aged four years, who was under the care of Legendre. In this child moist gangrene attacked the ungual phalanges of the right thumb and middle finger—in the latter laying open the second articulation—and the ungual phalanx of the left forefinger. Moreover, gangrenous blebs filled with bloody serum formed at the back of the shoulder, in the lower part of the dorsal region, and in other parts of the body. At last a double pneumonia declared itself, and the child died on the ninth day from the beginning of the illness.

When the gangrenous process attacks the vulva, the lesion is usually seen in a cachectic or weakly child, who has lately passed through an exhausting illness. Severe measles occurring in a scrofulous subject is sometimes followed by this dangerous sequela. As in gangrene of other parts the earliest symptoms are usually loss of appetite, headache, and nausea. Then the child complains of severe burning pains in the genitals; and a light red circumscribed patch is seen on one of the labia, often on its internal aspect. Around it the tissues are dense and swollen for some distance. The patient cries frequently with the pain, and seems to suffer great distress in passing her water. After a day or two ashy gray spots appear. These are circumscribed and limited by a light red ring. Soon their colour changes to a dark brown or black, and the gangrene spreads to the upper part of the vulva, the perinæum, and the anus. Often there is a purulent, offensive discharge from the diseased surface. The general symptoms also become more pronounced. The pulse is small and rapid; the features are pinched, and the face is very pale. The child lies moaning in her bed, and complains of pains not only in the diseased parts, but also in the limbs and body. Sometimes a watery diarrhœa comes on, and in that case the child soon dies exhausted. If by energetic treatment the gangrenous process can be arrested before it is too late, the sloughs separate, the swelling and darkness subside, and a granulating surface is left which quickly heals.

The gangrenous patch is sometimes single and of limited extent. Often the case is first seen when the separation has partially occurred, and a sloughy-looking ulcer is found on one of the labia. Still, however small the local lesion may be, the general symptoms are severe, and on account of the exhausted state of the patient the danger is very great. At the beginning of the disease a slight febrile movement is sometimes noticed, and the temperature may reach 100° or 101°; but the pyrexia usually quickly subsides, and the temperature for the remainder of the illness is below the level of health. Death in cases of gangrene may occur from exhaustion. Sometimes it is ushered in by a series of convulsive attacks. In Dr. Gee's case of gangrenous ulcer of the vulva an extensive embolism was found in the cerebral arteries.

Diagnosis.—The diagnosis of spontaneous gangrene in the child presents little difficulty. The only case in which a mistake is likely to be made is that in which the disease attacks the extremities of the fingers or

toes. In that case the pricking pain, combined with the livid hue of the skin, is suggestive of chilblains; and, indeed, according to Raynaud, cases of this variety of gangrene have been often confounded at the beginning with this common and insignificant disease. In most cases of gangrene, however, the pains are far more severe, the occurrence of the local symptoms is more abrupt, and several fingers and toes are attacked simultaneously. Moreover, the gangrenous lesion is often found at a season when the common chilblain is not usually suffered from.

Prognosis.—In every case of gangrene, whatever part of the surface be attacked, the prognosis is most unfavourable. The patient, indeed, does not always die, but instances of recovery are rare. If the patient be a newborn infant, or a child of weakly constitution, he may be considered to have still fewer chances of passing safely through so formidable an illness. The most favourable cases are those in which the gangrene is of the dry variety and remains limited to a finger or toe. If the gangrenous process appears successively in several parts of the body, little hope of recovery can be entertained.

Treatment.—In all cases where a cachectic child is attacked with gangrene, every effort should be made to support the strength of the patient, and improve the state of his nutrition. He should be supplied with as much nourishing food as he can digest. Meat—pounded if necessary, and strained through a fine sieve—eggs, milk, well cooked vegetables, and a judicious quantity of farinaceous matter must form his diet. Stimulants are always required, and the child may take half an ounce of port wine, or the St. Raphael tannin wine, diluted with an equal proportion of water, after each quantity of food.

If the patient be an infant at the breast, we should inquire if the supply of milk is adequate to his necessities. If the breast milk is poor and insufficient, additional food must be given as directed elsewhere (see page 603). White wine whey is very suitable in these cases. Tonics are always required. Quinine can be given in full doses (two grains for a child of three years old, three times a day), or the ammonia and bark mixture can be ordered. Mr. Cripps speaks highly of opium given frequently in small doses.

In cases of disseminated moist gangrene the heat of the part should be maintained by hot applications; and directly a slough is noticed on the surface its further extension should be prevented by the free application of a powerful escharotic. Strong nitric acid should be applied once thoroughly, and the part must be then kept covered with hot poultices. When the slough separates, the resulting sore or sores can be dressed with a carbolic-acid lotion (five drops to the ounce of water), or a solution of boracic acid (twenty grains to the ounce). In all cases of gangrene of the vulva this method of treatment is useful; and the local measures employed in the treatment of gangrenous stomatitis are equally serviceable when the vulva is the part affected. Parrot advocates the use of powder of iodoform, especially in cases of gangrene of the vulva. The ulcers must be first carefully cleaned. Then they must be completely filled with the powder, no part of the raw surface being left uncovered. If the ulcer is very moist, it ought to be dressed twice a day. This method of treatment is painless, and is said to arrest the progress of the ulcer in three or four days. At the same time the surrounding œdema rapidly diminishes.

When the gangrene is limited to the extremities, the affected part should be wrapped in cotton wool, and gentle frictions with a piece of flannel moistened with eau-de-Cologne are recommended by Raynaud. This

author disapproves of the use of energetic local stimulants, and states that he has seen very disastrous results follow quickly upon undue local irritation. Directly a line of demarcation forms, hot dry applications, such as bags of heated bran or sand, should be kept applied to the seat of the lesion, so as to preserve the dryness of the tissues and hasten the separation of the sphacelated part. In extensive gangrene amputation has been sometimes performed, but without saving the life of the patient. Indeed MM. Rilliet and Barthez are of opinion that the removal of the diseased member only hastens the fatal termination.

Part 3.

THE DIATHETIC DISEASES.

CHAPTER I.

SCROFULA.

The scrofulous diathesis is one of the most common of the morbid types of constitution which we meet with in the child. It is found in all ranks of life, and in almost all parts of the world. It is, however, especially frequent in the temperate zones, being far less common in very cold or in tropical climates. This vice of constitution is often hereditary, and is then handed down with singular persistence from generation to generation. Sometimes, indeed, it is seen to pass over certain members of a family, but even those who escape may not transmit complete immunity to their offspring.

A child who has the misfortune to be born with this unhappy predisposition is liable to very widespread evidences of the constitutional fault with which he is burdened. His skin, his mucous membranes, his bones, joints, organs of special sense, lungs and lymphatic system are all exceptionally sensitive to the ordinary causes of disturbance, and may all or any of them become the seat of obstinate derangement or even of incurable disease. These manifestations of the constitutional tendency usually take place early, so that scrofula is especially a disease of childhood. Infants, indeed, are in great measure exempt from its attacks; but after the third year it begins to be common, and from that age until the fourteenth or fifteenth year the diathesis is most active. At puberty its energy sensibly abates, and strumous disorders are less and less frequently met with as the individual advances towards middle life.

Causation.—One of the most important of the causes of scrofula is hereditary influence. When the parents are actually suffering from the cachexia, or have suffered from it, the child is hardly likely to escape a share in the constitutional predisposition; but when no such manifestation of the tendency has been seen in the father or mother, there is a hope that by careful management and attention to the laws of health the same freedom may be extended to their offspring. But besides actual scrofulous disease, other debilitating influences in the parents may determine the strumous constitution in their children. Thus, the cancerous and tubercular ca-

chexiæ will do this. Syphilis in the third generation is apt to manifest itself by scrofulous disorders; and age in the father, or imperfect nutrition in the mother during her period of gestation, are also held to be determining causes of a congenital tendency to strumous complaints. Whether mere nearness of relationship on the part of the parents will exercise the same influence is a question which has been often debated, and many writers hold that it can do so. I do not think, however, there is any satisfactory proof that such a result can follow in cases where there is not already a tendency to scrofula in the family.

Besides being hereditary, the diathesis, it is commonly held, may be acquired under conditions favourable to its development. It is true that we frequently see patients who exhibit all the signs of a scrofulous lesion without any discoverable family history of scrofulous disease; but it is often difficult to trace out hereditary taints, especially when the transmitted tendency has been mild in its manifestations, or has skipped over one or two generations. It is more probable that in such cases latent scrofula is developed by debilitating influences in children, who, under more favourable circumstances, would have escaped altogether.

The causes which are thus capable of developing the cachexia in children whose constitutional tendency is comparatively feeble, are all the various agents which impair the nutrition of the body by weakening digestion, checking assimilation, and interfering with the escape of waste matters from the system. Repeated exposure to cold and damp; an habitual coarse and indigestible diet; absence of fresh air, and confinement to close, ill-ventilated rooms; deprivation of sunlight and want of exercise —the continued operation of these causes, if it cannot set up the disease where no predisposition exists, has at any rate a powerful influence in exciting the cachexia in children who have been born the subjects of the diathesis. Even grown up persons exposed to such unhealthy conditions are often found to become scrofulous. Therefore causes which are capable of reawakening the cachexia in the adult, after the age most prone to it has passed by, must act with still greater energy in the child. Certain fevers have the power of developing or re-instating the disease in suitable subjects. Measles and whooping-cough have a wonderful influence in this respect. Unmodified small-pox used frequently to be followed by obstinate scrofulous disorders; and scarlatina can count the same complaints amongst its sequelæ. Where the predisposition is strong, it is probable that any disease of a lowering tendency may suffice to develop it.

Scrofula, like other complaints, has been said to have been communicated by vaccination; but that the disease possesses any specific morbid matter which is capable of being conveyed from one child to another by inoculation is a doctrine which has now been proved to be destitute of any foundation.

Morbid Anatomy.—The structural lesions induced by the scrofulous diathesis consist in various chronic inflammations with their consequences. These have nothing special in their anatomical characters to distinguish them from the same lesions occurring in non-scrofulous children. They need not, therefore, be further referred to in this place.

The affection of the lymphatic glands, which is so characteristic a part of the disease, differs from the ordinary hyperplasia induced in a healthy child by neighbouring inflammation in the fact that the swelling does not subside when the irritant which has given rise to it has passed away, but continues as a chronic condition. In the case of a healthy child the gland becomes more vascular, and swells up by an increase in its corpuscular elements.

These rapidly increase, multiply, and enlarge, and acquire many nuclei which fill their interior. This is the first step. In the second, one of two things may take place. If the irritation subsides and cell-production is checked before the nutrition of the gland is interfered with, a fatty degeneration takes place in the new cells which reduces them to a milky fluid. They are then absorbed and the gland resumes its former size. If, on the contrary, the irritation persist, the proliferation of cells continues; they crowd together, destroying the reticulum and the capillary network of the gland, arrest nutrition by their pressure, and lead to rapid disintegration and suppuration. This, then, is an active process conducted rapidly. In the scrofulous child the course is much more protracted. The glands are apt to take on a chronic inflammatory process. They increase slowly in size, and remain a long time as indolent lumps, apparently incapable of further change; or, if the swelling have been originally acute, no diminution in size takes place when the inflammatory process is at an end. In either case the gland is filled with proliferating cells, which by their pressure hinder nutrition, and induce an imperfect fatty degeneration, so that the gland is converted either wholly or in part into a mass of cheesy matter.

Glands so affected have a spongy feel, unless there is much hypertrophy of the connective tissue, in which case they become hard. Their section is pale red, passing into a dirty white or yellowish colour. After a time the whole gland becomes thick, tough, anæmic-looking, and dry, and is then quickly converted into an opaque, yellow, caseous mass. Disease in the glands is unequally distributed. Some are unaltered, and even of those affected there is great variety in the degree to which the process extends, for some remain small while others enlarge considerably. After remaining for a long time inactive one of two changes may take place. Either the gland softens, sets up inflammation around, and evacuates its contents; or the fluid part of the gland is absorbed, and the gland dwindles into a fibrous mass, or is hardened by the deposition of earthy salts. The cervical glands often suppurate; the bronchial glands occasionally do so, but in the mesenteric glands such a termination is very rare.

Softening and suppuration constitute a chief danger of caseous glands. In the glands of the neck this is of less moment than in those of the closed cavities, for their contents are discharged externally, and are thus removed from the body. Even in these cases secondary consequences may ensue. The existence of a chronic discharging sore, such as often results from the suppuration of these glands, is very apt to induce amyloid degeneration of the liver, kidney, and spleen. Therefore these organs are frequently diseased in scrofulous children. Besides, there is always danger that softening cheesy matter may give rise to an explosion of acute tuberculosis; and many scrofulous children fall victims to this fatal disorder. In the case of the bronchial and mesenteric glands softening and suppuration are still more serious, on account of the effect upon neighbouring organs. This subject will be referred to afterwards.

Symptoms.—In a well-marked example of the scrofulous diathesis the constitutional tendency often expresses itself in an unmistakable manner in the build and general appearance of the child. He is stout and heavy, and looks as a rule older than his age. The subcutaneous fat is usually over-developed, and in places remarkably so. His face is broad and fat, with a thick upper lip, and a wide nose. The limbs are stout, with thick ends to the bones, and the abdomen is inclined to be large. But although the adipose tissue is relatively increased, there is a want of firmness about the child's flesh, and his limbs feel soft and flabby. Such children are not

necessarily ill-favoured. The general want of delicacy and refinement in the features is often redeemed by the large size and dreamy expression of the eye, by the high colour in the cheeks, and by the redness and fulness of the lips.

Such characteristics are, however, seen only in pronounced cases of the diathesis, and even then are not always to be found. All the tendencies of the scrofulous constitution may be active in a child without his presenting any such peculiarities of face or figure. Indeed, in many strumous cases the child is seen to have a spare frame, with delicate features and a thin transparent skin—a type which conforms more to the tubercular variety of constitution to be afterwards described. But whether he be stout and coarsely built, or thin and delicately framed, there is one indication of the diathetic state which is seldom absent in a strumous subject. This is the singular activity of all the epithelial structures. The hair is soft, thick, and luxuriant; the eyelashes and eyebrows are well marked; and in many cases there is a remarkable development of fine down covering the ears, cheeks, shoulders, and spine. The skin, moreover, is apt to be rough and scaly, and the nails grow fast. This peculiarity marks one of the essential features of the scrofulous diathesis, viz.: a tendency to rapid proliferation of all the epithelial and cellular elements of the body.

It has been said that the scrofulous diathesis is not in itself a disease. It is a tendency to disease—a tendency to derangements of structure or of function which finds expression under suitable conditions in a variety of lesions. All these bear a common character, and vary in gravity according to the tissue or organ affected. The lesions are inflammatory in their nature, and are characterized by rapid cell-growth and rapid decay of the newly formed elements. They are not distinguished by any special anatomical characters which stamp them at once as of scrofulous origin. In appearance they do not differ from similar derangements occurring in children of a healthy habit of body. Their constitutional origin is shown by their tedious course, for if not stopped at once they soon pass into a chronic state; by their sluggish response to treatment; and by their proneness to relapse when apparently cured. The disturbance originates under the influence of some trifling and temporarily exciting cause; and the length of its course is often dependent upon the hygienic conditions surrounding the child at the time of the attack. If these are satisfactory, the derangement may be quickly recovered from, although it readily recurs when a similar cause is again in operation. If they are unsatisfactory, as is usually the case amongst the poor, the derangement becomes a chronic disorder, and increases in severity and obstinacy as the days go by.

The parts which are prone to suffer in this diathesis are: the mucous membranes, the skin, the bones and joints, the organs of special sense, and above all the lymphatic glands. In whatever tissue the lesion is seated, the neighbouring lymphatic glands are liable to suffer; and this is a fact so generally recognized that amongst the public the term "scrofula" is understood to mean simply a chronic enlargement, with tendency to suppuration, of the glands.

The mucous membranes in all strumous children are especially sensitive and subject to catarrh. Gastric and intestinal catarrhs are very common; and we find besides, coryza, ophthalmia, catarrhs of the throat, ear, and air-passages, and in girls of the vulva. All these, beginning as catarrhs, pass quickly into chronic inflammations very difficult of cure.

The affections of the gastric and intestinal mucous membranes will be considered in another place. They do not differ from the same derange-

ments as they occur in healthy subjects except in the fact—and it is a very important one—that in scrofulous children such catarrhs are always accompanied by fever. This is seldom the case with healthy children. If pyrexia be present with a simple gastric catarrh, it affords a strong presumption that the patient is of a scrofulous constitution. Catarrhs of the intestine in these children often set up ulceration of the mucous membrane. This is an obstinate lesion and may lead to serious consequences (see Ulceration of the Bowels).

Catarrhs of the nasal passages leading to ozæna, and even destruction of bone, may be seen. Obstinate discharge from the nose in a baby is generally of syphilitic origin ; in a child of two and a half years and upwards it is much more commonly due to the scrofulous cachexia. It is very obstinate, gives rise to a distressing and perhaps unavoidable habit of snuffling, imparts a nasal character to the voice, and leads to cracking and excoriation of the upper lip.

The eyelids and eyes may be affected with tinea tarsi, pustular ophthalmia, and keratitis, with intense lachrymation and photophobia.

Pharyngeal catarrh is a very common affection. It is also a very important one, for it is accompanied by some enlargement of the tonsils, and considerable swelling and thickening of the posterior nares and back of the fauces. Consequently there is occlusion of the Eustachian tubes and deafness. On inspecting the back of the fauces in such cases we find the mucous membrane of a deep red colour. It is swollen and velvety, and is covered with a thick muco-purulent secretion. The closure of the Eustachian tube is not due to enlargement of the tonsils, but to the swelling of the mucous membrane. Children so affected present a peculiar appearance. They have a vacant look, hold their mouths half open, and, hearing but imperfectly what is said to them, hesitate and are confused when spoken to. They are not really wanting in intelligence, but on account of their deafness appear to be so. On examination of the ear the tympanum is seen to be drawn in, but it retains its translucency, and there is no tinnitus.

Otorrhœa is very often met with in scrofulous children from catarrhal inflammation of the meatus. The inflammation may spread to the inner ear, in which case perforation of the membrane always takes place. Severe primary otitis may also occur as a result of cold or injury, or as a sequence of scarlatina, measles, and small-pox.

Pulmonary catarrhs in strumous subjects may become chronic and give rise to winter cough, with emphysema of the lungs and persistent hypersecretion ; or the catarrh may spread to the air-cells, inducing chronic catarrhal pneumonia with all its possible consequences.

Various skin affections occur in subjects of this diathesis, and are generally the earliest manifestation of the constitutional tendency. Acute eczemas are common, and slight depressing causes may give rise to an outbreak of impetiginous or ecthymatous pustules. Little scratches are apt to run into festering sores which may be slow to heal. Occasionally we find rupia, pemphigus, or lupus, but these are rare in childhood. A not uncommon form of affection of the skin is seen in babies and children under two years of age. This begins as a small lump—hard, painless, and of the size of a pea or a small nut. It is seated in the subcutaneous tissue, and the skin over it is at first freely movable and is natural in colour. Gradually an adhesion forms between the little mass and the integument. The skin gets red, and after a variable time gives way, and the cheesy contents of the abscess are evacuated wholly or in part. After discharging

for a longer or shorter period, the sore heals; its hard base becomes absorbed; and a deep cicatrix is left at the site of the abscess. Several of these abscesses are usually seen at the same time in various stages of progress. They are seated on the arms, legs, or abdominal wall, and run a protracted course, passing very slowly through their several stages. They seldom occur except in children of pronounced strumous tendencies. When seated on parts where the skin is in close contact with the bone, as on the fingers, periostitis may be set up with exfoliation of bone; but elsewhere they have no injurious local consequences.

Disease of the bones and joints is a very common consequence of the scrofulous diathesis. These affections enter more particularly into the department of the surgeon. Still, there is one form of bone disease which is brought so frequently under the notice of the physician that it may be properly considered in connection with this subject. This is caries of the bodies of the vertebræ, in its early stage, before it has led to curvature of the spine. The reason why we so often see such cases is that the pain, which is one of the earliest symptoms of the malady, may, by its seat and by the cramp-like character it sometimes assumes, give little indication of its being generated in the spine. Like the pain of pleurisy, the pain of vertebral caries is often referred to a region far distant from the seat of the disease. When the atlas and axis are affected, the pain is referred to the occipital region. In the case of the lower cervical vertebræ, it is felt in the shoulders, down the arms, or even in the upper part of the breastbone. If the caries occupy the dorsal spine, the only discomfort complained of may be in the sides of the thorax, the middle line of the chest in front, or the epigastrium. In disease of the lumbar vertebræ the pain is reflected to the pelvis, or to the lower limbs as far as the knees, or even to the feet. But wherever the pain is felt, and whatever may be its degree of severity, its cause may usually be distinguished by noting the increase to the child's discomfort when he moves about, and the relief he experiences when he lies down. Sometimes, however, slow cautious movement may be made without uneasiness; for if the spine be braced up and steadied by the surrounding muscles, the patient may be able to move carefully about without communicating any jar to the vertebral segments. But movement when the child is taken at a disadvantage, with the spinal muscles relaxed, is always distressing, and therefore it is important to inquire as to the effect of coughing, sneezing, riding in a carriage, or making a false step in walking.

Besides pain, another important indication is obtained by noticing the degree of mobility retained by the spinal segments. The child holds his back stiffly, and avoids all movements which necessitate bending of the spine. Thus, when laid down on his back and told to get up, he does so by turning slowly upon his hands and knees, keeping his back straight, and then getting carefully on to his feet. If required to pick up a small article from the floor, he turns sideways to the object and lowers and raises himself by bending and straightening his knees, keeping the spine straight and almost erect. Movements such as these are of great value, and in doubtful cases the child should be put through a series of exercises, so as to test thoroughly the mobility of his vertebral column. He should be required to turn round quickly as he walks, to climb a chair, or to touch his toes with outstretched fingers while his knees are straight.

Another important symptom is the attitude assumed by the patient when at rest. If there be much disease of the bones, the child will endeavour to relieve the spine by supporting his head or diverting the weight

of the body from his back to his arms. Thus the favourite attitude of a child whese cervical vertebræ are affected is to sit with his elbows on the table supporting his head with his hands. In other cases of the disease the weight of the body is transmitted through the arms. Mr. Howard Marsh, who has devoted much attention to this subject, describes two characteristic attitudes assumed by a child the subject of caries of the dorsal and lumbar spines. In one of these he places the palms of his hands on a chair, and leans over forwards with his arms straight and shoulders raised. By this means weight is taken off the spine and transmitted through the arms. Another position is equally characteristic. The child rests his weight on one toe, with the heel slightly raised and the knee flexed, and placing his hand on the middle of the thigh, leans over, so as to convey weight from the shoulder down the arm to the limb.

Attention to the above points will give very valuable information. Other symptoms are less trustworthy. Thus tenderness on pressure over the spines of the diseased vertebræ is sometimes present; but it is not characteristic of caries. Striking with the knuckles down the centre of the back is a very fallacious test. In cases of undoubted caries there may be no response; and a child may shrink when the spine is tapped even though the bones are sound. In the same way the application of a hot sponge to the spine as a test of tenderness is unsatisfactory, and in the case of a child little information is to be gained by this means.

Whenever spinal caries is suspected we should never forget to look for iliac or psoas abscess; for in cases where the ulceration is limited to the surface of the bodies of the vertebræ, an abscess may form before any curvature can be detected in the spine.

Caseation of Glands.—One of the most familiar consequences of the scrofulous diathesis is a chronic enlargement of the lymphatic glands. In all young subjects these glands are liable to enlarge upon slight irritation; but in a healthy constitution the swelling subsides when the cause which gave rise to it has passed away. In the child of scrofulous tendencies the cause exciting the morbid process may be so feeble and transient as to escape notice. But, the unhealthy action once set up runs a protracted course, and the enlargement continues until some further change takes place which causes it to disappear. The steps by which the affected gland becomes converted into a cheesy mass have already been described. The process is a purely local one, and does not necessarily produce any ill effect upon the patient. It is evidence, no doubt, of a constitutional tendency, and as such may excite apprehensions of other and more formidable manifestations of the diathetic state. Of itself, however, unless the swollen glands be so situated as to press injuriously upon parts in the neighbourhood, or to threaten by setting up inflammation around to injure a vital organ, it is seldom attended with danger.

The glands most commonly affected are the cervical, the bronchial, and the mesenteric.

Chronic enlargement of the cervical glands is excessively common, on account of the many scrofulous lesions to which the head and face are liable. But these lesions do not all act with equal energy in promoting the glandular swelling. Inflammation of the pharyngeal mucous membrane is found to produce this result far more frequently and readily than an irritant occupying any other part of the head and face. A skin affection may exist for a long time without causing enlargement of the glands, but a pharyngitis causes them to enlarge very quickly. Chronic glandular swellings are seen as round or oval masses, firm to the touch, and usually

freely movable. The skin over them retains its normal colour and is not adherent. They are generally to be seen behind the ear, beneath the lower jaw, and sometimes extending down the neck to the collar bone. The masses may be formed of single glands; but more often several of these unite and are bound together by thickened and condensed cellular tissue. Such swellings may reach the size of a small apple. Usually, after a time, tenderness begins to be noticed; the skin becomes adherent and red; fluctuation is felt; and eventually the abscess bursts and discharges its contents externally. Scrofulous abscesses are slow to heal. Often a discharging cavity is left from which a thin pus escapes; or the opening enlarges, and we see a sluggish ulcer with thickened undermined edges. In bad cases several of these may be seen at the same time at each side of the neck.

Enlarged cervical glands do not always suppurate. Sometimes, after remaining a variable time as a chain of indolent swellings, they begin gradually to diminish in size and return slowly to their normal dimensions.

Caseation of the bronchial glands is little less common than the same condition in those of the neck. The effect, however, of such disease is very different. Swelling of the superficial glands of the neck, although unsightly enough, is yet in itself a complaint of comparatively little moment. But when the glands of the mediastinum become enlarged, the consequences may be serious. The glands are seated at the bifurcation of the trachea, behind the upper bone of the sternum, and a little below it. They also accompany the bronchi into the interior of the lung. When swollen, they must therefore encroach upon neighbouring parts, and may produce considerable disturbance by pressing upon the blood-vessels, the air-passages, and the nerves of the chest.

Before describing the symptoms produced by this means, it may be remarked that enlargement of the bronchial glands does not necessarily imply the existence of chronic lung disease. A child is not to be considered consumptive because his mediastinal glands are bigger than they ought to be. The term "bronchial phthisis," which has been applied to this condition, is very misleading, and was given at a time when all chronic changes in the glands were attributed to tubercle. Scrofulous children, who are so prone to suffer from pulmonary catarrh, will generally be found, on careful examination, to have some swellings of the glands behind the sternum; but if no dulness or bronchial breathing can be detected over either lung, we have no reason to infer the existence of pulmonary disease. Like the same affection in the neck, caseation of the glands below the trachea is often a purely local process, induced in a scrofulous child by some passing irritation. It is more serious than a similar condition in other parts only because the glands are shut up in a closed cavity, in the immediate neighbourhood of large vessels and vital organs, which may be affected injuriously by their pressure, or by pathological changes occurring in them.

It is possible that the bronchial glands may be, as most authorities hold, occasionally the seat of tubercle, although arguments in favour of this view, drawn exclusively from morbid anatomy, are of only secondary value. But there is little doubt that the ordinary form of glandular enlargement is due to a very different cause. It is true that children who suffer from this form of scrofula are frequently feverish, and that they are often thin and under-nourished; but these phenomena are not necessarily the result of tubercle. It will be generally found that the pyrexia is not a constant feature in the case. It occurs now and again, the child's tem-

perature in the interval being normal, and lasts on each occasion for a week or ten days. While the feverishness continues, the child is languid and mopes, eats little or nothing, and is generally troubled with cough. The explanation is that a child suffering from this cachexia is excessively sensitive to changes of temperature and readily takes cold. While the catarrh lasts he is feverish; and as all the mucous membranes are equally sensitive, the stomach sympathizes in the general derangement. For the time, then, nutrition is in abeyance, and he loses flesh. Even when the attack is at an end, and appetite returns, the stomach does not all at once recover its power. The patient's digestion continues weak and cannot fully satisfy the requirements of his system, so that he regains flesh but slowly. If the catarrhs recur at short intervals, the child is kept thin and weak; but he is not therefore tubercular, and if he die, he dies usually from a simple bronchitis or pneumonia, and not from any tubercular complaint. But such children, if in a position to receive all the care they require, seldom do die. In my experience such a termination is rare in cases where the lungs are unaffected. When due precautions are taken, they often become fat and strong, and the signs of glandular enlargement disappear.

In many cases the disease in the glands is associated with pulmonary phthisis; but this is more often than not of the non-tubercular variety. When death takes place in such cases it results from the lung disease, and the glandular swelling contributes little, if at all, to the fatal issue. Death, however, does sometimes occur as a consequence of the scrofulous swelling. The mass may cause such disturbance by pressure upon neighbouring parts that inflammation and ulceration are set up, and the child sinks from exhaustion. Thus the œsophagus or an air-tube may be perforated, as in a case published by Dr. Gee, without any softening having occurred in the gland. In other cases the gland softens and becomes converted into a mass of pus. Here there is hectic fever, general and persistent wasting, and loss of strength. Eventually the abscess discharges itself into the pleural cavity, into a bronchus, or into a large vessel, causing fatal hæmorrhage. A common termination when softening takes place in the gland is by acute tuberculosis. This, however, may occur in the case of any other softening cheesy mass wherever situated. It is no proof that the gland was originally the seat of tubercle.

The special symptoms produced by enlargement of the mediastinal glands are the consequence of pressure—the glands by their unwonted size encroaching upon the parts around.

Pressure upon the superior vena cava, or either innominate vein, interferes with the return of blood to the heart. There is a certain degree of lividity of the face, the skin around the mouth has a bluish tint, and the lips look puffy and dark. The superficial veins also are unusually visible in the temples, the neck, and over the front of the chest and shoulders. A small amount of pressure is sufficient in children to cause dilatation of the venous radicles of the chest, and the symptom is one of the earliest indications that the bronchial glands are larger than they ought to be. If there be great obstruction to the return of blood from the head, œdema of the face and puffiness of the eyelids may be seen; and this, when one innominate vein only is pressed upon, is limited to one side of the face. On account of the congestion of the venous system, epistaxis is common, and hæmorrhage may even occur from the lungs. But hæmoptysis in children is difficult to detect, for blood coming up from the air-tubes is almost invariably swallowed, while a discharge of blood from the mouth is

usually the consequence of epistaxis, the blood escaping backwards into the throat from the posterior nares.

Pressure on the nerves of the chest causes hoarseness of the voice and paroxysmal cough which may be mistaken for whooping-cough. It occurs in violent fits, and sometimes ends in a crowing inspiration. It is, however, seldom followed by vomiting. When the pressure affects also the lower end of the trachea at its bifurcation there may be, in addition, attacks of dyspnœa. These are the ordinary "asthmatic attacks" of young children. Sometimes laryngeal spasm is induced, and long-continued spasm may so interfere with the entrance of air into the lungs that the antero-posterior diameter of the chest becomes diminished, the weight of the atmosphere forcing the sternum backwards below the level of the ribs. All these pressure symptoms become greatly aggravated by an attack of pulmonary catarrh. In ordinary cases severe symptoms are only seen when the child catches cold. If this happen, the condition of the patient becomes alarming. His face is livid; his dyspnœa distressing; his voice hoarse; his cough violent and spasmodic. Even then the attack is often not continuous. It occurs in sudden seizures which come on once, or more often, in the day, or only at night. The attacks last a variable time and create much alarm. In most instances their violence abates after a few days, and in the course of a week or so the child seems restored to his ordinary health, although he is left languid and more feeble than before his illness. In other cases the symptoms increase in severity instead of diminishing. The child starts up suddenly in his bed with staring eyes and a dusky, frightened face; his respiratory muscles work violently, and his agitation and distress are painful to see. After several repetitions of these attacks death may take place either suddenly, or after a fit of convulsions.

The physical signs afforded by examination of the chest are of importance. In marked cases we find dulness on the first bone of the sternum, which may extend for some distance on each side and below. Sometimes it is found to reach as far downwards as the base of the heart. I have never succeeded in detecting any dulness in the back between the scapulæ. Indeed, the results of percussion even in front are often misleading. There may be very considerable and extensive disease in the glands, and unless the mass is in actual contact with the wall of the chest no dulness may be discovered at the spot. The signs afforded by the stethoscope are much more trustworthy. Pressure upon the lower part of the trachea produces a respiratory stridor which is sometimes so loud as to be heard at a distance from the chest. It is generally intermittent. In either bronchus marked pressure may interfere with the entrance of air into the corresponding lung, and lead to a certain amount of collapse at the base. Pressure such as this, however, is exceptional, and is only seen in cases where the enlargement is great. The most common auscultatory sign connected with the breathing is produced by conduction, the glands forming an artificial medium of communication by which sound is conveyed from the air-tubes to the chest wall. This gives to the breathing a loud blowing character which is very characteristic. It is less high pitched and metallic than the ordinary blowing and cavernous breathing heard in cases of pulmonary consolidation and excavation; and is most marked at the apices of the lung, especially at the supra-spinous fossæ. Sometimes it is heard loudly over the whole of one or both sides of the chest. Opening the mouth generally modifies considerably the intensity of this blowing quality, and may even make it cease altogether.

Pressure upon the descending vena cava or the left innominate vein

gives rise to a hum, and on the pulmonary artery to a systolic murmur heard best at the second left interspace. But long before the ordinary signs of pressure on the vessels can be detected, we can induce pressure on the vein if the bronchial glands are enlarged. This sign is one of the earliest indications of disease in these glands.[1] Thus, if the child be directed to bend his head backwards upon his shoulders so that his face is turned upwards to the ceiling above him, a venous hum, which varies in intensity according to the size and position of the swollen glands, may be heard with the stethoscope placed upon the upper bone of the sternum. As the chin is slowly depressed again the hum becomes less distinctly audible, and ceases shortly before the head reaches its ordinary position. The explanation of this phenomenon appears to be that the retraction of the head tilts forward the lower end of the trachea. This carries with it the glands lying in its bifurcation, and the left innominate vein is compressed where it passes behind the first bone of the sternum. I believe this explanation to be the correct one, for in cases of merely flat chest, where there is no reason to suspect enlargement of the glands, the experiment fails. Nor, again, can the hum be produced in a healthy child by the thymus gland. This gland lies in front of the vein immediately behind the sternum. Enlarged bronchial glands lie behind the vessels in the bifurcation of the trachea. A swelling in front of the vessels does not appear to be able to set up pressure upon the vein when the head is bent backwards in the position described. Again, in order that the experiment should succeed, the lower end of the trachea must not be fixed, and the glands lying below its bifurcation must be movable, otherwise no hum is heard when the head is retracted. Thus a child was admitted into the East London Children's Hospital for lymphadenoma. There was dulness at the upper part of the sternum, and downwards as far as the base of the heart. In this case, to my great surprise, no venous hum could be heard. The child died, and on examination of the body, yellow, flattened, cheesy masses were found adherent to the inner side of the sternum, and others, very large and immovable, were seen filling up the interval between the bifurcations of the trachea. The lower end of the air-tube was held firmly down by the mass, consequently pressure could not be brought to bear upon the vein by bending of the head, as the glands, being fixed, could not be brought forwards against the vessel. The experiment may sometimes fail even in cases where the lower end of the trachea with its caseous glands is free to move, for the relative position of the glands and the vein may not correspond; but as a rule it will succeed, and a venous hum, so induced, is, I believe, a certain sign that the glands of the mediastinum are not healthy.

The mesenteric glands are, perhaps, less commonly affected than those of the neck or the chest; but disease in them is far from rare, although it cannot always be detected during life. The affected glands may be separate, or they may unite as in other situations into masses bound together by thickened cellular tissue. In this way a mass the size of an apple, and more or less movable may be felt on manipulation of the abdomen.

The old name for disease of the mesenteric glands was *tabes mesenterica*, and very serious consequences were described as resulting from the glandular enlargement. It is now known that these symptoms are due, not to the mesenteric swellings, but to the lesion of which they are the consequence; and that the caseous glands form a part—and often only a very

[1] See a paper by the writer, "On the Early Diagnosis of Enlarged Bronchial Glands." Lancet, August 14, 1875.

insignificant part—of the disease from which the patient is suffering. Like the lymphatic glands in other situations, those of the mesentery swell up as a result of irritation or inflammation in the parts from which the lymphatic vessels passing through them take their origin. In strumous subjects they have the same proneness as the others to become caseous. Of themselves they form a strong argument against the tubercular theory of scrofulous glandular enlargement; for caseation of the mesenteric glands, unless their size be such that they press upon neighbouring parts, is in itself a by no means serious matter. In ordinary cases, where there is no accompanying lesion of the bowels, the child's nutrition is good; his spirits and appetite are satisfactory; his temperature is normal; and except, perhaps, for some slight pallor of face, he may show no sign of ill-health. In most cases, however, swelling of the glands, if at all considerable, is combined with scrofulous ulceration of the bowels; but even here the consequences are not always as serious as might be expected. Much depends upon whether or not the ulceration of the intestine is accompanied by a catarrhal condition of the mucous membrane. If this be present, there is diarrhœa with marked disturbance of nutrition. The child grows thinner, paler, and weaker; his expression is distressed; he sleeps badly at night, often asking for drink, and is disturbed by wandering abdominal pains. The temperature may rise slightly in the evening, but there is seldom marked pyrexia.

If there be no intestinal catarrh, the bowels may be confined, and the effect upon the child's general health is much less pronounced. He still looks ill, is troubled by flatulent pains, and is pale and weakly; but nutrition may be fairly performed, and the child may even appear stout, although to the touch his limbs feel soft and flabby (see Ulceration of Bowels).

When caseation of the glands is associated with tubercular peritonitis —and it is to this combination that all old descriptions of tabes mesenterica apply—the symptoms are those of the peritoneal disease, and the case is a very serious one.

Scrofulous mesenteric glands are not always easy to detect. The belly is so often distended in children, with flatulent accumulations, that it may be difficult to force the parietes sufficiently inwards to reach the swollen bodies. Moreover, a certain tension of the abdominal wall, more or less voluntary, may still further increase the difficulty. The enlarged glands lie about the middle of the abdomen, in front of the spine. If the mass be a large one, pressing the abdominal wall directly inwards will usually detect the swelling at once. In cases where the increase in size of the glands is inconsiderable, it is better to make pressure laterally, bringing the hands together from the sides towards the centre, so as to catch the little mass between the fingers.

If the glands are large enough to press upon the parts around, there may be œdema of the legs and scrotum from pressure upon the vena cava. This, however, is exceptional. A very small amount of pressure will be sufficient to cause dilatation of the superficial veins of the abdominal wall; and most cases of enlarged mesenteric glands are accompanied by this phenomenon. Cramps in the legs are said to be sometimes caused by pressure upon the nerves of the abdomen; and ascites may be the consequence of pressure upon the portal vein by the glands occupying the hepatic notch.

The usual termination of scrofulous glands in the abdomen is that by shrinking and petrifaction. They rarely soften, although cases are re-

corded in which suppurating glands have become adherent to a coil of intestine and have discharged their contents into the bowel.

From the preceding description it will be seen that the phenomena produced by the development of the scrofulous cachexia are very numerous. The manifestations of the diathesis must therefore vary greatly in different cases, the constitutional tendency expressing itself now in one way, now in another ; for in addition to the general predisposition, the child seems also to inherit a special weakness of particular tissues. Thus, in one family we see child after child suffer from scrofulous inflammation of the eye ; in another there is equal susceptibility of the pharyngeal or the nasal mucous membranes ; in a third we detect a special proneness to disease of the bones or of the joints. All these disorders are apt to run a tedious course and to resist treatment with singular obstinacy. They can only be attacked successfully by using means which improve nutrition, and weaken the morbid tendency on which the lesion depends. Until this be done mere local applications will be of small value.

Diagnosis.—It has been said that scrofulous lesions have no special characters which indicate their constitutional origin. Their real nature must therefore be inferred from their lingering course, their tendency to recur, the frequent absence of any discoverable local cause to account for them, and the coexistence of other disorders of a like nature, especially of glandular enlargements.

The subcutaneous abscesses may be, and often are, mistaken for syphilitic gummata. They must be distinguished by the history of the case, noting the complete absence from it of any syphilitic symptoms.

The diagnosis of the early stage of spinal caries has been already indicated in the description of that disease. Remembering how the pain radiates in this affection to distant parts, we should always look with suspicion upon pain in the chest or stomach in a child of scrofulous tendencies until the spine has been tested for the effect of sudden jars or shocks, and the child's attitudes as he walks or plays have been inquired into. Persistent pain in the occipital region, if combined with any stiffness in the neck or any altered manner of holding the head, is always suspicious of caries of the cervical vertebræ. Pain in the chest or stomach, unaffected by food but increased by movement and relieved by lying down, is highly suggestive of dorsal caries. In all cases where spinal disease is suspected the child should be made to raise himself from a recumbent position, to pick up a small object from the floor, or to climb on to a chair or table, and his manner of performing these acts should be carefully observed, noting the degree of movability of the spine, and whether any part of it is held rigid.

In the case of enlarged glands we may consider that a gland has become cheesy if it have enlarged without evident cause, and if it persist for a long time as a painless indolent tumour showing no tendency to subside.

Caseation of the bronchial glands may be detected in their early stage by the experiment of listening over the upper bone of the sternum while the child's head is retracted, as already described. Dulness at the upper part of the sternum, if combined with any sign of pressure, is very suspicious, especially if there be fulness of the superficial veins of the neck, side of the head, and temples. Spasmodic breathing and paroxysmal cough are also characteristic symptoms—the more so if they are combined with any altered quality of voice. In all cases where children have attacks of so-called "asthma," attention should be always directed to the bronchial glands (see page 182).

In the case of the mesenteric glands the only satisfactory proof of their enlargement is holding them between the fingers. Even in these cases, however, we have to satisfy ourselves that the substance is really a gland, and not a cheesy mass attached to the omentum, or a lump of hardened fæces. Cheesy omental masses are much more superficial, and consequently more easily felt than enlarged glands. They are also more freely movable. In feeling for mesenteric glands the fingers have to be pressed down firmly towards the spine, and the glands, if enlarged, can be detected as slightly movable lumps with ill-defined margin.

The sensation conveyed to the fingers by fæcal masses is very different to that furnished by enlarged glands. Fæcal accumulations can be readily studied in cases of typhoid fever where there is no diarrhœa, and the child is taking milk. Here we find elongated masses of moderate size lying with their long axes in the direction of the bowel, and situated at some point in the course of the colon. They are never very deeply placed, and can be always readily reached by slight depression of the abdominal wall. By firm pressure they can be indented by the finger. If any doubt is felt in such a case, the effect of a copious enema should be tried. Fæcal masses are readily removed by this means; while lumps due to any other cause are only made more evident by the injection; for this by removing gaseous distention and fæcal matters, renders a full exploration of the abdominal cavity more easy than before.

Prognosis.—It is the exception for scrofulous children to die from the direct effects of the disease. In fatal cases death usually results from acute tuberculosis; the outbreak of the tubercular malady being determined by some mysterious process of infection through softening cheesy matter or slowly ulcerating bone. Again, children the subjects of this diathesis are more sensitive to the ordinary causes of disease. They catch cold very readily, and therefore are apt to suffer from various chest affections. These, besides their own special dangers, may lead to evil consequences by causing enlargement and caseation of the bronchial glands. Pneumonia, again, has a risk of its own in its propensity to undergo only partial absorption, and so to induce chronic changes in the lung.

Scrofulous children are singularly susceptible to the influence of contagion. Few such children exposed to the infective principle of zymotic disease will be found to escape, unless protected by a previous attack. Such diseases, too, have a special power of intensifying the diathetic taint. They leave the child not only depressed by his late illness, but also more exposed than before to suffer from the consequences of his constitutional weakness.

Enlarged bronchial glands, if sufficiently advanced to cause serious pressure upon parts around, must always occasion anxiety. If there be lividity of face or attacks of dyspnœa, a very guarded prognosis should be given. Still, when placed under favourable conditions such children often do well.

Enlarged mesenteric glands, if unaccompanied by ulceration of bowels or signs of tubercular peritonitis, are in themselves of little importance. If signs of intestinal ulceration be present, the case is more serious, and the prognosis depends upon the amount of diarrhœa, the presence of disease in other organs, and the effect of the lesion upon the nutrition of the patient. This subject is considered in another place (see page 665).

Amyloid disease of organs set up by chronic suppuration is of moment, as tending to induce anæmia and lower the strength. Still, in childhood, if the primary suppuration be arrested and the scrofulous disease removed, the amyloid degeneration often undergoes a surprising improvement (see "Amyloid Liver").

Treatment.—The constitutional tendency to scrofulous lesions is best attacked by measures which encourage and maintain healthy nutrition. The causes which excite the dormant cachexia have been stated to be exposure to cold and damp, insufficient and unsuitable food, impure air, and want of exercise. It is therefore evident that a careful regulation of the diet, combined with warm clothing and daily exercise in the open air, must be the first measures to be adopted.

With regard to food, the child should be fed liberally; meat, fresh eggs, and milk should enter largely into his diet, and his stomach should not be overloaded with puddings and starchy matters to the exclusion of more strictly nourishing articles of food. Fresh vegetables are a valuable addition to his dietary, but potatos must be given with caution, although they are not to be entirely excluded. If the appetite be poor, a small amount of stimulant is often of service, and the child should be allowed a good wineglassful of sound claret diluted with an equal quantity of water to his dinner. It is needless to say that cakes and sweetmeats between meals must be strictly forbidden. In the case of infants born of scrofulous parents, a healthy wet-nurse should be provided if the mother be unable to suckle her child. If this be impossible, the utmost vigilance must be exercised in the feeding and general management of the baby. Directions are given elsewhere for the healthy rearing of infants, and the reader is referred to the chapter on "Infantile Atrophy" for fuller information upon this important subject.

Climate is a matter of great moment for children who are, or are likely to be, the subjects of scrofula. A bracing air is indispensable to the successful treatment of these cases. Residence in low-lying clay soils does much to encourage the predisposition, while sandy or gravelly places, with a dry air, are of the greatest benefit in increasing the vigour of the constitution. On account of the tendency to catarrhs in this diathesis, a dry air is of especial importance; and a place which is sufficiently warm during the winter months to allow of the patient passing a large part of his time out of doors is of the utmost service. Large towns, with their smoke and vitiated air, are bad residences for scrofulous children. When compelled to live in cities, care should be taken that the child is warmly clothed and sent out as much as possible for exercise in the large open spaces with which most towns are now provided. For children of both sexes healthy out-of-door games should be encouraged; and they should be early trained in suitable gymnastic exercises, such as develop the muscles and expand the chest.

The skin should be kept perfectly clean by a daily bath, but cold douches are often too depressing for such subjects, unless employed according to the plan recommended for delicate children (see Introduction). The bowels must be attended to, and habits should be inculcated of regularity in the use of the close-stool. When aperients are required drastic purgatives should be avoided. It is better to employ mildly acting drugs, such as the compound liquorice powder, or to combine an aperient with a tonic, as in giving the infusion of senna with the infusion of gentian or orange-peel.

In treating children in whom the cachexia has become developed, the above matters must be carefully attended to. Great stress should be laid upon the value of a suitable climate in aiding the child's recovery of health. If possible, the patient should be sent to winter in a dry air sheltered from cold winds. There, dressed from head to foot in warm, woollen clothing, he should spend the greater part of his time out of doors. Cod-liver oil is

usually prescribed indiscriminately in these cases, and while some children appear to be greatly benefited by the prescription, others seem almost insensible to its effects. It may be laid down as a rule that the stout scrofulous children are not the best subjects for cod-liver oil. It is the spare framed child with an active, nervous system who derives most benefit from the use of the drug. The oil should be given in doses of one teaspoonful two or three times a day, and its use must be continued for months together. If the child appear to be nauseated by this constant dosing, the oil may be remitted for a few days at a time, but must be shortly resumed. On the Continent much value is attached to acorn coffee, made by roasting together a mixture of acorns and coffee beans and grinding them in the usual manner. This coffee is generally given as an adjunct to the oil. It is especially recommended in cases where there exists a chronic catarrh of the bowels. Cold bathing, when employed with proper precautions to induce a healthy reaction, is of vast importance in the treatment of many cases of scrofula. These precautions are described elsewhere (see Introduction). Cold douching is most useful in the case of stout children—those who derive little benefit from cod-liver oil.

For enlarged scrofulous glands, besides the above general treatment, iodine combined with iron is very useful. I am in the habit of prescribing iodide of potassium with the tartrate of iron and glycerine, as in the following mixture:

℞. Potas. iodidi ..... ʒij.
Ferri tartarati ..... ʒj.
Glycerini ..... ʒss.
Aquam ad ..... ℥iv.
M. Ft. Mistura. An eighth part to be taken three times in the day.

The iodide should be given in fair doses. The above is suitable to a child of five years of age, and is better than the ordinary syrup of the iodide of iron, the sugar of which is so frequently found to disagree. Some practitioners prefer the common tincture of iodide, given in doses of three or four drops freely diluted with water.

Violent attacks of dyspnœa from pressure of enlarged glands upon the nerves of the chest are best treated at the time by strong counter-irritants. After the attack has subsided gentler counter irritation may be continued. I have thought benefit has been derived from the careful and continued use of the iodine liniment to the front of the chest.

Enlarged cervical glands are sometimes reduced by rubbing into them twice a day the cadmium ointment of the British Pharmacopœia diluted with an equal quantity of lard. The oleate of mercury salve is also of service. This application should be used of the strength of five per cent. It must be smeared on the part, not rubbed in. It can be used twice a day for the first five days; then at night only, and afterwards every other day. When the gland suppurates it should be opened with as little delay as possible, in order to avoid unnecessary scarring of the skin. It is important, however, to anticipate the suppurative process, if possible, and avoid the dangers of a chronic discharging sore. Therefore if the measures adopted to cause absorption are seen to exert little influence upon the size of the swelling, it is advisable to call in the aid of the surgeon. Dr. Clifford Allbutt strongly advocates free incision and enucleation of the caseous matter; and Mr. Teale states that he has successfully treated many such cases by scooping out the cheesy contents of the gland, merely leaving the sound portions with the enclosing capsule.

If softening has taken place and the abscess formed continues to discharge and often reinflames, the nightly administration of a powder containing one grain of hydrargyrum cum creta to eight grains of peroxide of iron is often attended with surprising benefit. This powder should not be given longer than for a week at a time. The sulphide of calcium in doses of one-fifth of a grain, given every two or three hours, is also recommended. This, however, is a very uncertain remedy. Sometimes it succeeds, but more often it fails completely. The chloride of calcium in doses of five grains every four hours is sometimes successful. An important point in the treatment of enlarged cervical glands is warmth. During the whole time that local applications are being used the swellings should be carefully protected from the cold. A good plan is to cover them with a thick pad of cotton-wool.

Lugol [1] has spoken highly of iodine in all forms of scrofulous lesions. He used the drug as a salve to the swellings, as a lotion to the ulcers, as an injection to the sinuses and fistulous sores, and as a bath for the cure of the affections of the skin and subcutaneous tissues. Iodine tinctures and ointments are still favourite applications to all glandular enlargements. They should be used, however, with caution. I have seen serious sloughing set up in a child's neck by the too energetic inunction of an iodine ointment into the skin over a caseous gland.

Chronic discharges from the various mucous surfaces are best treated with astringent injections. Otorrhœa from catarrh of the auditory meatus, if limited to the part outside the tympanum, is readily cured by the following lotion:

℞. Boracis ..... gr. x.
Zinci sulphatis ..... gr. viij.
Glycerini ..... ℥ j.
Aquam ad ..... ℥ j.
Misce.

In using this application the passage must be first thoroughly cleansed by injection with warm water, and then half a drachm of the lotion must be poured into the ear and allowed to remain. This can be done two or three times a day. It is important to cure a discharge from the ear as quickly as possible. The old notion that otorrhœa in children should not be checked too quickly is one which if acted upon may have serious consequences.

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[1] The strength recommended by Lugol for his salve was:

℞. Iodinii ..... gr. vj.–x.
Potas. iodidi ..... ʒij.–iv.
Adipis ..... ℥ j.
Misce.

For his lotion or injection:

℞. Iodinii ..... gr. j.–ij.
Potas. iodidi ..... gr. ij.–iv.
Aq. destillatæ ..... ℥ viij.
Misce.

For his bath, for the use of a child:

℞. Iodinii ..... ʒij.
Potas. iodidi ..... ʒiv.
Aq. destillatæ ..... q.s.

Dissolve completely and add to three gallons of water of the temperature of 98° F. in a wooden vessel. This same solution he recommends as a fomentation to scrofulous lesions and sores.

CHAPTER II.

ACUTE TUBERCULOSIS.

Acute tuberculosis is an acute febrile general disease which arises, in most cases, as a consequence of special hereditary predisposition. The disease expresses itself anatomically by the formation of the miliary nodule known as the gray granulation in the various organs of the body. This nodule is in great part an out-growth from the lymphatic system, and may be found wherever lymphatic or adenoid tissue normally exists. Acute tuberculosis is not to be confounded with pulmonary phthisis. Indeed, the two affections are essentially distinct, for ulceration of the lung, although occasionally present, is by no means a necessary part of the tubercular process.

In the young subject acute tuberculosis frequently assumes a form which is rare in the adult. In childhood the disease not uncommonly presents itself as a primary febrile affection, giving rise to but few symptoms, and those the manifestation merely of the general distress without any sign pointing to local mischief. It is often not until a few days before the close of the illness that any symptoms are discovered to draw attention to any particular organ. This is the primary form of the disease, which has much the character of an acute specific fever.

In other cases, almost at the same time with the beginning of the general symptoms, others, more or less severe, are noticed, showing that some particular organ is especially fastened upon by the tubercular process. This form is not uncommon in cases of tubercular meningitis.

A third form resembles that which is often met with in the adult where the disease arises as a secondary affection in the course of some other illness, and in such a case brings the life of the child quickly to an end. This form is seen when tuberculosis supervenes upon empyema, pneumonic phthisis, etc.

Acute tuberculosis attacks children of all ages, and may be seen in very young infants. When it occurs at this early age the anatomical feature of the disease is always very widely distributed. On the other hand, the older the child the more likely is it that the formation of the gray granulation will be limited to special cavities of the body.

The word "tubercle" has been and is still employed in so vague a sense by various authors that it has almost ceased to convey any definite meaning. It may be well, therefore, to state that in the following pages the word is in every case used to signify the miliary nodule called "gray granulation" in the adult, but which in the child very quickly becomes yellow and opaque.

Causation.—Hereditary predisposition plays a very important part in the etiology of tuberculosis. In a large proportion of cases a distinct family tendency to the formation of tubercle can be discovered. The tendency is not, however, always exhibited in the parents. These are often, to

all appearances, of sound constitution. It may be necessary to push our inquiries farther back and ask as to the health of the grandparents and of collateral branches of the family. In a child with this unfortunate predisposition, any cause which impairs the nutrition of the body may excite the manifestations of the tubercular tendency. Therefore lowering complaints and insanitary conditions generally are justly regarded as important agents in the production of tuberculosis.

There are certain acute specific maladies with which the tubercular formation is very apt to be associated. Whooping-cough and measles may be said to number tuberculosis amongst their sequelæ, so common is it to find children convalescent from these complaints, who are placed under unfavourable conditions for complete recovery, fall victims to the disease. Typhoid fever is sometimes followed by it. Children who suffer from malformation of the heart with narrowing of the pulmonary artery are also very liable to become tubercular. They do not, however, often suffer from acute tuberculosis. In them the disease is more apt to assume primarily the form of chronic tubercular phthisis, even if the distribution of tubercle become afterwards generalised. When the predisposition is strong, any cause which gives a shock to the system, such as a fall, a blow, or other similar accident, may be sufficient to excite the outbreak of the disease.

In addition to the cases where tuberculosis is excited in the bodies of persons predisposed to the affection by febrile disturbances or unwholesome conditions of life, there are other instances where the disease appears to be set up by a local infective process. It has been well established by numerous experimenters that the inoculation of tuberculous matter into the bodies of healthy animals will produce general tuberculosis; and it is held by Koch and his followers that the infecting agent in such cases is the minute organism known as the "tubercle bacillus." Until lately it was believed that the inoculation into a healthy animal of non-tuberculous or putrid matters would give rise to the formation in the system of a body indistinguishable by the microscope from the gray granulation. But recent investigations have made it evident that some fallacy must have been present in the experiments which appeared to establish this result; for a repetition of the experiments by competent observers have shown that no ill consequences of any kind may follow the introduction of such matters under the skin. Still, arguments drawn from experiments upon animals, especially upon the rodentia, which are usually selected for these investigations, are not perhaps strictly applicable to the human subject. In man the presence of softening cheesy matter in any part of the body may set up an infective process which is indicated by fever, wasting, and symptoms of general distress, and eventually by signs indicating implication of special organs. After death a general distribution of small nodules which have all the characters of the gray granulation is found in various organs. In children a chronic empyema often induces such a condition, and the child usually dies with the symptoms of tubercular meningitis. Acute tuberculosis may be also set up by other forms of cheesy degeneration. Softening caseous glands and cheesy pneumonia are common exciting causes of the disease; indeed, the scrofulous habit of body appears in itself to be a favouring influence, and the tissues of such subjects furnish a congenial soil in which the growth of the tubercular bodies can be readily excited. The share taken by the tubercle bacillus in the production of tuberculosis—whether it is the sole medium by which the infection is conveyed, as is maintained by some, or is merely a casual

addition to the septic agent, as is believed by others—is still at the present moment a matter of warm debate.

Morbid Anatomy.—The distribution of the gray granulation is very frequently general in the child. In the infant it is almost always so: in older children it may be limited to one or more cavities of the body. MM. Rilliet and Barthez have commented upon the curious fact that while in the adult, according to Louis' canon, if tubercle exist anywhere in the body it will be found also in the lungs, in the child the lungs sometimes escape altogether although every other part of the body is attacked. When found in one cavity of the body alone, the part affected is usually the skull or the abdomen.

The gray granulation is a firm, gray, translucent, projecting nodule which varies in size from a fine pin's head, or even a smaller object, to a millet seed. In children the colour very quickly changes to yellow and the translucence disappears, so that whatever organ is examined gray and yellow nodules (the latter usually predominating) are found mixed together. The growth occurs, according to Rindfleisch, as the result of a specific irritation of the endothelia of the lymphatics, the serous membranes, and the blood-vessels, especially the former; and the nodules are found to follow the ramifications of the finer arteries because the lymphatics run chiefly in the adventitia of the blood-vessels. On careful examination the miliary bodies can be seen growing upon the fine vessels, involving the whole calibre of the channel in the smallest arteries, and in those a degree larger forming protuberances on one side. Rindfleisch describes the granule as a product of inflammation, and states that it consists in an increasing accumulation of leucocytes in the connective tissue of the part irritated. Of these white cells a portion take on an epithelioid character. These grow to three or five times the size of a white blood corpuscle and are called tubercle cells. Others develop into the irregular branching bodies called "giant-cells." The giant-cells are not, however, as was at one time supposed, peculiar to tubercle. Schüppel believes that they arise within a blood-vessel from the accumulation and adhesion of tenacious masses of molecular matter. When they have reached a size which causes distention of the vessel, nuclei begin to appear. According to this observer, the epithelioid cells are derived from processes of the giant-cells. They lie around the latter and constitute the greater part of the nodule. According to most observers, a section of the tubercles, after they have been some time in existence, shows a delicate reticulum, the meshes of which contain the cells. This, however, is denied by others.

In proportion as the tubercular body enlarges by accumulation of cells the central part is found to degenerate, and when examined at this stage (*i.e.*, after degeneration has begun) it will be seen to consist in great measure of small, shrivelled, and granular cells.

The presence of the gray granulation in any tissue is usually quickly followed by inflammation in the neighbourhood of the growths. In the case of a serous membrane, such as the meninges of the brain or the peritoneum, lymph is quickly thrown out, and, if time be allowed, becomes caseous. In the lungs an early consequence is bronchitis and catarrhal pneumonia. In these organs the granules very quickly become yellow and caseous, and every stage of degeneration of the nodules is usually to be discovered. Dr. Wilson Fox has described in the lungs of children dead from tuberculosis: gray translucent granulations; opaque white granules—soft, but of varying firmness and resistance; the same, but caseous in the centre; yellow granulations, very soft and easily crushed; cheesy

granules—dry, opaque, and friable, with or without a surrounding zone of gray transparent matter; groups of the latter forming little masses the size of a pea, bean, or even walnut; indurated pigmented granules, single or in groups; and, lastly, tracts of variable size and irregular outline, granular on the surface, passing insensibly into the so-called "gray infiltration." Sometimes, also, he noticed little cavities from softening of the tubercular masses. There were, in addition, signs of secondary catarrhal pneumonia and its consequences.

Ulceration of lung and the formation of cavities is not a common consequence in early life of acute pulmonary tuberculosis. In infants in whom the disease runs a rapid course this lesion is very exceptional. It is, however, sometimes met with. Thus, in an infant, aged eight months, with four teeth, who died in the East London Children's Hospital of acute general tuberculosis with secondary broncho-pneumonia and meningitis, tubercles, gray and yellow, were found after death occupying all the cavities in the body. They were discovered at the base of the brain, on the peritoneum, in the substance of the liver, spleen, and kidneys. The lungs were completely stuffed with them, and in the lower lobe of the left lung a small cavity had formed of the size of a hazel-nut. Such a condition is, however, not common. Even in older children, although the duration of the illness is longer, breaking up of the lungs, as a consequence of acute tuberculosis, is comparatively rarely seen.

In the *intestines* the gray and yellow granulations are seated especially in the smaller bowel, and involve principally the ilium and the part of the cæcum in the neighbourhood of the valve. The nodules lie in the submucous tissue, and in the acute form of the disease do not, as a rule, give rise to ulceration. In the *liver* the tubercles are developed on the smallest ramifications of the hepatic artery. They may be seen under the serous coat, and are also found in the interlobular spaces and in the interior of the lobules. They are usually few in number. In addition to being the seat of tubercle, the organ is often found to present other pathological characters not especially distinctive of the tubercular disease. Thus, it may be enlarged from a simple hypertrophy or from fatty infiltration, and is sometimes the seat of a cirrhotic change. In the latter case it may give rise to ascites.

The *spleen* is one of the organs most commonly attacked by tubercle. Gray and yellow granulations and large cheesy masses may be found, so that the size of the organ is considerably increased. In the *kidneys* miliary nodules may be thinly scattered through the parenchyma. The little masses are developed, as elsewhere, in the sheath of the smallest arteries. Sometimes more extensive disease is met with, and large masses of cheesy matter are formed which soften and give rise to tuberculous ulcers. These may penetrate deeply into the renal tissue. According to Rindfleisch the disease begins in the papillary portion of the gland, spreading from the mucous lining of the calices. In extreme cases the kidney is converted into a thick-walled sac, with hemispherical protrusions, each of which corresponds to a Malpighian pyramid. The *bladder* is sometimes involved, although comparatively rarely in early life. Miliary nodules appear in the submucous tissue and soften, giving rise to circular ulcers the edges of which are found on examination to be infiltrated with closely packed gray and yellow granulations.

In addition to the lesions which have been mentioned, the bronchial and mesenteric glands are always enlarged and cheesy. Sometimes they are softened.

How far the cheesy matter, which is often found in large quantities in the more prolonged cases of pulmonary tuberculosis, is to be regarded as tubercular is a question upon which opposite opinions are held. Virchow and his followers look upon all such caseous matter as the consequence of catarrhal pneumonia; and there is no doubt that the miliary nodule is primarily an extra-alveolar growth, while the caseous masses, such as are found in cheesy pneumonia, take their origin from a proliferation of the epithelial elements in the air-cells. Before the giant-cell was known to be a constituent of other than strictly tubercular structures, the presence of this cell was held to be confirmatory of the tubercular nature of the pathological product. Now the presence of the bacillus is considered by many to point to the same conclusion. But is the question one which can be determined solely upon anatomical grounds? The clinical history of the disease is surely a not unimportant element in the solution. It is generally admitted that the closest examination discovers in the gray granulation no peculiarity of structure which can be relied upon to separate the nodule from other bodies having a like appearance, and under the microscope all cheesy matter has very similar characters. The case is one in which the clinical features of the malady should have an exceptional value in determining the nature of the pathological product; for if two diseases are found to differ widely in the mode of origin of the attack, in the nature of the symptoms, and in the course of the illness, we may hesitate to admit identity of nature, however close may be the resemblance in the anatomical conditions.

Symptoms.—Primary tuberculosis in the child commonly assumes the form of an acute general disease. It excites moderate pyrexia and marked interference with nutrition, and from the indefinite character of the earlier symptoms and the absence of any manifestation of local distress, often presents great difficulty in the diagnosis. Sooner or later signs are discovered pointing to disease of special organs: cerebral symptoms arise, or there are indications of pulmonary mischief. Tubercular meningitis and cerebral tubercle are described at length in special chapters. The present description is confined to cases where the disease is general, and where the local symptoms are limited to the lungs and other organs not elsewhere referred to.

Children who fall victims to acute tuberculosis, although often of delicate appearance, are not necessarily thin and feeble-looking. In many cases the nutrition of the patient is very good, and the child is considered to be in every way a healthy subject until the disease appears. It is not at all uncommon, especially in cases where the chief violence of the malady is expended upon the cerebral meninges, to find that up to the time of his illness the child had never suffered from a day's indisposition. In other cases the patient has been noticed to be sensitive to chills and prone to attacks of indigestion. These latter children are often of frail appearance and have the "tubercular aspect." Their skin is thin and transparent, their hair fine and silky, their features regular and delicate, their bones small, and their shoulders narrow and sloping.

Acute tuberculosis may begin gradually or suddenly. In exceptional cases the disease has an abrupt beginning. There is high fever, headache, epistaxis, relaxed or confined bowels, and the child is very restless and stupid. But this mode of beginning is very rare. In the large majority of instances the onset is so insidious that there is a difficulty in fixing upon a date for the beginning of the attack. The earlier symptoms, as has been said, are so slight and vague, and the child passes so gradually from health

to sickness, that the mother is usually quite unable to determine when she first noticed any signs of indisposition. She will say that for some weeks the child had seemed to be less brisk and lively than was his wont; that he would often lie about instead of playing; and that his appetite had seemed to fail; but that no special importance was attached to these symptoms until something more definite was noticed which excited alarm. The first influence of the disease is upon general nutrition. The child begins to look pale, with a curious transparent pallor. His conjunctivæ have a bluish tint, and the lower eyelid is discoloured. He loses his sprightliness and gets dull and moping; his appetite is poor, and he falls off in his flesh. A certain amount of fever usually accompanies this condition. In the evening the cheeks may be brightly flushed, and the hands and feet feel hot to the touch. At this time a thermometer in the axilla marks between 100° and 101°. The patient is thirsty, and often asks for water in the night. In the morning the temperature is normal; but the child when he leaves his bed generally looks pale and distressed. The anxious expression of the face in these cases is indeed commonly a noteworthy phenomenon; and if combined with mildness of the general symptoms, and complete absence of all signs of local discomfort, is an indication of illness of very serious moment. In some cases there are repeated attacks of chilliness followed by heat; and these may have a periodicity which suggests suspicions that the child is suffering from ague. The chilliness, however, seldom amounts to shivering, and sweating is scanty or absent. Loss of flesh is never very long in showing itself. The wasting is often very gradual, unless some relaxation of the bowels is present, and in the majority of cases is intermittent. In hospital patients, under the unaccustomed influence of good food and nursing, it is not uncommon for a child to regain some of the flesh he had lost, although all the time the fever continues and the general disease is pursuing its regular track. Even in children who are living in better circumstances the progress of the illness is often very unequal—the child seeming to be alternately better and worse, and the temperature fluctuating curiously from day to day. Sometimes, indeed, the pyrexia is found entirely to subside, and for a few days the improvement may be such that recovery is confidently anticipated. The intermission is usually, however, of short duration, and the patient relapses into his former state. At this time a common symptom is œdema of the legs and sometimes of the face, and the urine may contain a trace of albumen. In young babies the only symptoms of the disease for a considerable time may be slight fever, pallor, some loss of flesh, an inelastic state of the skin, and a little œdema of the extremities.

For the first few weeks the above general symptoms are all that can be discovered; and the most careful examination detects no cause to which the evidently serious condition of the child can be referred. He is thin, pale, weakly, and listless; but his tongue is clean, and although feverish and restless at night, he sleeps fairly well, is not light-headed, and in the daytime makes no complaint. His abdomen is normal, rather flattened than distended; there is no enlargement of the liver or spleen—at least during the first few weeks of the illness; and pressure of the belly elicits no sign of tenderness. In some cases a few rosy spots, rather more red than the typhoid spot, and of a larger size, are noticed on the abdomen and chest. The skin generally is dry and harsh.

After a time local symptoms arise. These often point to cerebral irritation. An attack of convulsions occurs, followed by squinting; the pupils are dilated; there is drowsiness and rigidity of joints; and the child dies

with all the symptoms of tubercular meningitis. It other instances the cranial cavity escapes, and symptoms are noticed showing implication of the lungs.

The first local sign of acute pulmonary tuberculosis is cough. This is short and hacking, and in the earlier period not very frequent. It may be accompanied by some hurry of breathing; but the respirations are not always increased in rapidity, and even at an advanced stage of the disease, if there be only a moderate amount of catarrh, may be little, if at all more rapid than in health. The cough at this time is not accompanied by any abnormality of physical signs. Repeated examination of the chest discovers no dulness on percussion; and an occasional click of rhonchus or a sibilant wheeze may be the only phenomenon present. In some cases the child dies without any fresh symptoms; but usually a secondary bronchitis develops after a time. The breathing then becomes rapid, the face is haggard and livid, and the nares dilate in inspiration. The pulse is small and rapid, and there may be some slight perversion of the pulse-respiration ratio; but this never occurs to the degree noticed in cases of broncho-pneumonia. The temperature rises, and may reach 103° in the evening, sinking to 100° in the morning. With the stethoscope we now find the breath-sounds covered by a crisp, bubbling rhonchus, which occupies the whole extent of both inspiration and expiration. If the breathing can be heard through the rhonchus, it is not bronchial although the expiration is perhaps prolonged. There is no dulness if collapse be absent; but sometimes local collapse of small extent occurs at the apex; and we may find a little local dulness at the supra-spinous fossa, or above the clavicle, with faint bronchial breathing. There is nowhere any increased resonance of voice or cough.

The above signs may persist without alteration to the close. Often, however, the inflammation passes into catarrhal pneumonia. Patches of dulness are then discovered at the apex or elsewhere. At these spots the breathing is blowing or tubular; the rhonchus becomes crisper, finer, and more crepitating in character; and the vocal resonance may be intensely bronchophonic. The patches of consolidation, as in cases of the non-tubercular inflammation, may coalesce until large areas of tissue are solidified.

The occurrence of broncho-pneumonia is also indicated by increased severity of the previous symptoms. The lividity deepens; the breathing becomes laboured; the soft parts of the chest and epigastrium sink in at each inspiration; the nails become purple, and the superficial veins of the extremities are fuller than in health. The temperature also rises to a higher level, and may reach 104° or 105° in the evening. When these symptoms are noticed the illness is very near its close; indeed, the child seldom survives longer than a day or two. Death may be preceded by a fit of convulsions, due either to meningitis or asphyxia.

A little girl, aged ten, with a consumptive family history, was a patient in the East London Children's Hospital. The child was said to have suffered when quite young from measles, whooping-cough, and scarlatina, but had recovered perfectly from each, although the latter had been followed by dropsy. She had also had an attack of ague when between two and three years of age. Still, the child had been in fair health until six weeks before admission. Her illness had begun suddenly, but the symptoms at first were not marked. She had seemed generally poorly, but did not lose flesh to any considerable extent; nor was she troubled with cough for the first three weeks. When the cough began it was short and dry, but not

distressing. Three days before admission it had become loose, and the child had expectorated some yellow phlegm. After the cough began she was noticed to waste and to be feverish, sweating much at night. For a week her feet had been a little swollen.

On admission the child's expression was anxious. There was some lividity of the face, and in the evening her cheeks flushed brightly. Her tongue was clean and her bowels regular. Temperature at 7 P. M., 100.4°. On examination of the chest the percussion-note was slightly high-pitched above the clavicles, but elsewhere was normal. Everywhere about the chest the breath-sounds were concealed by a metallic bubbling rhonchus. This was coarser behind than in front, and occupied the whole extent of both inspiration and expiration. The vocal resonance was normal. A rhonchal fremitus could be felt everywhere about the chest.

After admission the physical signs persisted with little alteration. The dulness disappeared from the apices and none could be detected elsewhere. The pulse was very rapid, 150–168; respirations, 60–68; temperature each evening, 101°–102.4°. After a few days the lividity deepened; the child became very restless, and she died on the ninth day—the fifty-first day of her illness.

On examination of the body gray or yellow miliary nodules were found in the liver, spleen, and kidneys. Gray granulations were also seen under the serous coat of the small intestine, and were numerous on the pia mater. The lungs were stuffed with tubercle throughout, and the nodules formed projections on the surface underneath the pleura. The nodules varied in size, the largest not exceeding a hemp-seed in diameter. The lung tissue between them was of a deep red colour and tore readily. It, however, floated in water. The mediastinal glands were enlarged and cheesy, and one or two were softened.

Besides the parts which have been mentioned, tuberculosis sometimes involves the urinary apparatus. The kidneys indeed are often affected, and the consequent congestion is no doubt a cause of the slight albuminuria which is a common symptom of the affection. But besides the kidneys, tuberculosis may occur in the bladder. This lesion is more common in the adult than in younger subjects, but is met with from time to time in the older children. As it gives rise to many of the symptoms of vesical calculus this form of tuberculosis must not be passed over without a word of mention.

The presence of miliary tubercles in the bladder sets up a cystitis, and gives rise to symptoms which are attributed almost invariably to stone. There is great irritability of the bladder and increased frequency of micturition; and according to Guébeard, these symptoms are more marked at night than during the day. At the end of the flow of urine some pus may be passed, or a drop of blood may appear at the extremity of the urethral canal. There may be pain, which is referred to the region of the bladder, and the passage of urine is often accompanied by uneasiness. Sometimes micturition is only effected by straining, during which the rectum may prolapse. The urine may be normal, but often is cloudy and thick. It may contain a trace of albumen. The temperature and general symptoms of tuberculosis are present in these cases. Exploration of the bladder with a sound discovers no calculus; but digital examination by Volkmann's method (*i.e.*, passing a finger into the rectum and palpating with the other hand above the pubes) sometimes detects a tubercular nodule at the fundus of the bladder.

In the stomach, intestine, liver, and spleen the development of tubercle

rarely gives rise to sufficient local symptoms to furnish grounds for diagnosis. In the stomach the lesion may excite digestive trouble; but even this is an uncommon consequence of the disease, and when present is significant merely of catarrh of the mucous membrane. Bignon, indeed, has reported a case in which a child died after vomiting a large quantity of blood, and on examination of the body an ulcer was found at the larger curvature surrounded by tuberculous nodules. This case is, however, a very exceptional one. In the intestine the lesion seems to excite no symptoms whatever. The spleen, if thronged with masses of tubercle, may be enlarged; but the liver is rarely increased in size from this cause. It is, however, sometimes the seat of fatty infiltration.

The duration of acute tuberculosis in the child is seldom prolonged. In infants it may last six weeks or two months; in older children somewhat longer. The length of the illness principally depends upon the duration of the early stage, for when local symptoms occur showing implication of special organs, the disease usually runs rapidly to its close.

Diagnosis.—The disease with which acute tuberculosis is most apt to be confounded is typhoid fever. This is especially the case when the tubercular affection begins abruptly with high fever, headache, and bleeding from the nose. A diagnosis is then impossible at the first; indeed it is often only by the after-course of the illness, and the prolongation of the pyrexia beyond the time when in typhoid fever a fall of temperature may be looked for, that suspicions are excited of the real nature of the disease. The diagnosis between an ordinary case of acute tuberculosis and typhoid fever is given elsewhere (see page 83).

Sometimes cases of acute gastric catarrh may present considerable resemblance to acute tuberculosis in its early stage. Not long ago I was consulted about a boy, seven or eight years of age, who had at one time suffered to my own knowledge from slight consolidation of the right apex, the consequence of an attack of catarrhal pneumonia. The boy was of scrofulous type, thin and pale. He was said to have been losing flesh for some time and to have had a poor appetite. For more than a week his appetite had been exceptionally bad; his temperature had been raised, and he had had a hacking cough. I saw the boy at 5 P.M., with Dr. J. N. Miller, whose patient he was. The boy's temperature was then 100.2°. He was pale with no flush on his cheeks; and his face was bright and lively without any sign of distress. His chest was everywhere perfectly normal, except for a little dry rhonchus about the back. His belly was not distended. There was no enlargement of the liver or spleen, and no swollen mesenteric glands could be felt. He had no sore throat. The tongue was furred, and the breath had a faint unpleasant smell. There was no albumen in the water, nor any trace of œdema of the legs. The spirits of the child were said to be remarkably good; and I was told that that morning he had been seen attempting the acrobatic feat of standing on his head. This latter fact, joined with the bright expression of the boy's face, the signs of gastric derangement, and the absence of all evidence of pulmonary mischief, appeared to me to afford sufficient ground for excluding tuberculosis. I accordingly expressed an opinion that the boy was suffering merely from a subacute attack of gastric catarrh. Shortly afterwards I heard that the febrile symptoms quickly disappeared.

According to my experience, children suffering from the development of tubercle are invariably dull and spiritless, and usually show signs of distress in the face. If a boy jumps about and plays boisterously, as if he

were well, acute tuberculosis may be excluded with a high degree of probability.

The detection of acute tuberculosis depends in a great measure upon the absence of symptoms capable of explaining differently the serious condition of the patient. If a child is brought with a history of fever and wasting of some weeks' duration, if he looks ill, with a distressed haggard face, and if a careful examination of the whole body discovers no disease of organs, the state of the child is evidently not to be attributed to any local cause. In such a case the diagnosis will lie between typhoid fever and tuberculosis, and if from the duration of the illness, or for reasons given elsewhere (see page 83), typhoid fever can be excluded, we shall be reduced to tuberculosis as the only other probable explanation of the child's state. In a badly fed infant who has been irregularly feverish from teething, and whose nutrition has been some time defective, the history of wasting and pyrexia may raise suspicions of tuberculosis. But in such a case the child will not look haggard and pinched like one suffering from that disease ; the irregular and often greatly elevated temperature of dentition is unlike the moderate pyrexia of the tubercular affection, and will be sufficiently explained by inspection of the gums. Moreover, the history of the illness, which will almost certainly include several attacks of diarrhœa or sickness, and the account of the child's diet will furnish an amply sufficient explanation of his continued indisposition. In an infant acute tuberculosis is almost always accompanied by œdema of the legs. At this period of life the combination of wasting, moderate pyrexia, and œdema of the lower limbs is a very suspicious one.

Even when the case is first seen in its later stage, after signs of local disease have become evident, the diagnosis is not always easy. The physical signs of tuberculous bronchitis have no special character distinctive of their specific origin, and they must be read in the light afforded by the history and course of the illness in order that they may be rightly interpreted. In tuberculous bronchitis the temperature is higher than is found in an uncomplicated case of the catarrhal disease. In simple capillary bronchitis the pulmonary affection is seldom accompanied by marked pyrexia, and the mercury rarely rises higher than 101° in the evening. In tuberculous bronchitis, on the other hand, a temperature of 104° is not uncommon. The chief point, however, is the occurrence of the bronchial disorder in a child worn and weakened by illness of undefined character and accompanied by fever and wasting. If this illness have succeeded after a variable interval to an attack of whooping-cough or measles, the fact alone should raise a suspicion of the tuberculous nature of the pulmonary complaint. So, also, if broncho-pneumonia supervene, with spots of local consolidation, the history of previous ill health is essential to a right understanding of the nature of the child's complaint. In either case the onset of symptoms pointing to intracranial mischief is of the utmost value in confirming our suspicions ; and if convulsions occur, followed by squinting, ptosis, unequal pupils, and rigidity of the joints, the tuberculous nature of the disease may be considered to be established (see also page 440).

In tuberculosis of the bladder the child's distress is usually attributed to the presence of a vesical calculus. There is, however, one diagnostic point of considerable importance. The irritation excited in children by a stone in the bladder is rarely a cause of noticeable pyrexia, while, when the symptoms are due to vesical tuberculosis, the evening temperature may reach 102° or higher. Moreover, digital examination after the manner re-

commended by Volkmann, already referred to, will sometimes detect a tuberculous nodule in the fundus of the bladder.

Prognosis.—The prospects of a child in whom acute tuberculosis has revealed itself unmistakably are very desperate. In the earlier stage of the disease, while any uncertainty exists as to the nature of the illness, we can still hope; but when a secondary bronchitis or catarrhal pneumonia arises, or signs of intracranial mischief are noticed, death may be considered certain. Attacks of gastric catarrh in children with tuberculous and scrofulous tendencies are almost invariably accompanied by fever. If the attack is protracted or rapidly recurs, an intermittent pyrexia may continue for some weeks, and on recovery the child may be thought to have passed through an attack of tuberculosis. Probably most instances of alleged recovery from acute tuberculosis are cases of this kind.

Treatment.—When a case of acute tuberculosis has occurred amongst the younger members of a family very special measures should be taken to preserve the health of those who remain. They should sleep in well ventilated rooms, be warmly clothed, and be taken out of doors regularly for exercise. Such children should, if possible, live much in the country on a sandy or gravelly soil, and should avoid the vitiated air of towns. Their diet should be plain, and excess of sweets and fermentable matter should be forbidden. Children with tubercular tendencies should not be taught too early. It is wise to postpone regular education until they reach their sixth or seventh year; and every care should be taken that their sensitive brains are not overtasked. The mother, if herself of frail constitution, should be forbidden to suckle her infant, and a healthy wet nurse should be provided. Any signs of indigestion in such subjects should be promptly treated, and the utmost vigilance should be exercised to maintain the nutritive processes of the body at a healthy standard.

All catarrhs, however mild they may be, should at once receive attention, and the parents should be warned of the danger of treating the child as if he were well before all signs of his temporary ailment have disappeared. Acute diseases, especially the exanthemata, have peculiar dangers for these children; and during the period of convalescence the patients should be put into the most favourable conditions for insuring complete recovery. A good sea air should be always advised in these cases as soon as the child is well enough to be moved from his home.

When the disease declares itself no drugs appear to have any value in arresting its course, and very little in retarding the fatal issue. Something may be done by treating symptoms and putting a stop to enfeebling complications. Thus the looseness of the bowels, which is often an early symptom of the disease, may be usually controlled by a powder containing three or four grains of rhubarb with double the quantity of aromatic chalk powder every night; and twice a day a draught containing dilute sulphuric acid (℥ iij.–v.), with tinct. opii (℥ j.–ij.), and a few drops of glycerine in a teaspoonful of water. Sometimes the carbonate of bismuth in full doses (gr. x.–xx.) may be substituted with advantage for the rhubarb in the powder. If in spite of these remedies the looseness still continues, gallic acid (gr. ij.–v.) can be given with laudanum.

It is very difficult to reduce the pyrexia in acute tuberculosis. Large doses of quinine have no more than a temporary effect, and often appear to be quite useless; salicylic acid and its compounds have little beneficial influence; and the hypophosphites have not in my hands been followed by satisfactory results. The hypophosphite of lime, however, although it

does not reduce the heat, is useful in alleviating the various forms of catarrh so common in tuberculous children, and often has a sensible influence in improving the appetite, and sometimes, temporarily, the strength.

Inflammatory chest affections must be treated upon ordinary principles. As the strength of the child declines, stimulants will be required, and the brandy-and-egg mixture must be resorted to. The diet should be such as is recommended for other febrile diseases.

CHAPTER III.

INFANTILE SYPHILIS.

Syphilis in the infant is generally the consequence of an inherited taint. It then presents a combination of the so-called secondary and tertiary stages of the disease. Sometimes, however, it is acquired, and there is then a primary lesion as in the adult. In this latter case the symptoms resemble more those of constitutional syphilis acquired after puberty. Still, the progress of the disease is not entirely uninfluenced by the tender age of the patient, for in after-childhood we can often discover many symptoms which are common to the inherited form of the malady.

Causation.—The congenital taint may be derived from either the father or the mother; and the severity of the transmitted disease is in direct proportion to the shortness of the time which has elapsed since the appearance of constitutional symptoms in the parent.

The disease may originate with the father. In this case much discussion has arisen as to the mode in which the mother becomes affected, or as to whether she becomes affected at all. In cases where there is no evidence of direct contagion, it has been held by some observers that the mother may be infected by tainted spermatic fluid, although no primary lesion is produced. Others believe that the infection only takes place at the time when conception occurs; others, again, deny that even in this case can infection be conveyed; while a fourth class insists that when the mother becomes herself syphilitic the virus is introduced only indirectly, being absorbed into her system from the tainted embryo. This discussion has, no doubt, great scientific interest, but is of little practical value. Of far greater importance is it to remember that a man may beget a syphilitic child long after constitutional symptoms have ceased to appear in his own person. From the researches of Dr. Kassowitz it appears that when left untreated, a series of years—six, eight, ten, or even more—may elapse before a man is relieved from the obligation of transmitting the taint to his offspring. When mercurial treatment is adopted, the remedy destroys for a time the power of the virus, and the parent is then capable of begetting a healthy child. But this immunity from transmitting the disease is not permanent. In some cases the influence of treatment becomes exhausted after a longer or shorter time, and the poison recovers something of its former virulence.

With regard to the escape of a mother who has borne a syphilitic child, it seems certain that the escape must be incomplete, for she acquires a strange immunity from further infection. Long ago Colles laid it down as a canon that "a new-born child affected with inherited syphilis, even although it may have symptoms in the mouth, never causes ulceration of the breast which it sucks, if it be the mother who suckles it, although continuing capable of infecting a strange nurse." This law holds good as completely now as when Colles wrote in 1837; and it is difficult to understand

how the mother can be proof against the poison unless she be herself the subject of the disease.

Still, there is no question of the apparent immunity of many women the mothers of syphilitic children. Dr. Kassowitz has brought forward instances to prove that the most careful examination, combined with watching extending over many years, may fail to detect signs of syphilis in women who have borne diseased children. It certainly does appear possible that, as Mr. Hutchinson believes, a woman may have a form of disease too feeble to give rise to external manifestations, but strong enough to protect her from further contamination. Mr. Berkeley Hill insists that in all these cases the escape of the mother is not real. He believes, too, that in most cases she has contracted syphilis in the usual manner by direct contagion, but that the primary sore has escaped notice through examination having been delayed too long after the date of infection.

The mother alone may be diseased, the father being healthy. In this case if the mother have contracted the disease shortly before conception, and exhibit the secondary rash during her period of gestation, the child probably never escapes. If four or more years have elapsed since her infection at the time when she becomes pregnant, she may have lost her power of transmitting the disease and the child may be spared.

If the mother be actually pregnant when the virus first enters her system, she may or may not communicate it to her offspring. Much depends upon the period of gestation at which infection took place. The more advanced the disease in the mother before her confinement, the more likely is the infant to inherit the taint; and if a secondary rash have appeared upon the mother's body before the end of her pregnancy, the child usually suffers severely from the transmitted disease. In the initial stage of the malady the power of the mother to impart the taint is less certain; and it is improbable that the fœtus can be infected if the parent have not herself suffered from constitutional symptoms. Therefore, if she only contract the disease towards the close of her pregnancy, the infant has a fair chance of escape. There is no evidence to show that the disease contracted by the mother after the eighth month of her pregnancy can be communicated to the fœtus in her womb.

The influence of mercurial treatment in destroying the transmissive power is very decided. If a woman who has borne a dead or diseased child be properly treated before or during her next pregnancy, the infant borne after treatment will be either perfectly healthy or will suffer very slightly from the inherited taint. Still, as in the case of syphilis in the father, the counteracting power of the remedy is apt to be diminished by time.

When a healthy infant acquires the disease after birth, it is usually during lactation, the nipple of the mother or nurse having become infected by the mouth of another child who suffers from the disease. It is doubtful if the milk alone of a syphilitic woman is capable of communicating the complaint. Again, accidental contact with specific purulent discharges, whether from a primary sore or a secondary lesion, may impart the disease. In either case the sore produced in the child is a primary one. Another method by which the syphilitic poison may be conveyed to a healthy child is by vaccination. The possibility of such communication was long denied; but many well-authenticated cases in which this deplorable accident has occurred have now been published, and the evidence in its favour is complete.

Morbid Anatomy.—Infantile syphilis, like the other diathetic diseases

of childhood, may affect the tissues very widely. The pathological characters may be divided into three classes, according as to whether the part affected is a mucous membrane, a solid organ, or a part of the bony frame-work.

The *mucous membrane* may be the seat of catarrh, of mucous patches, or of ulcers. All these may be seen on the inside of the cheeks and lips, the fauces, and sometimes the small intestine; also upon the larynx, the trachea, and even the bronchi.

The inside of the mouth is a common seat for erosions and mucous patches. They do not spread down the gullet, according to Dr. John Mackenzie; nor are they to be seen on the posterior wall of the pharynx. In rare instances syphilitic ulceration is found in the small intestine. I once saw a little boy—four years of age—the subject of obstinate diarrhœa, in whom the evacuations had all the characters usually found in cases of ulceration of the bowels. His father had had syphilis, and his mother in her next confinement gave birth to a distinctly syphilitic child, and had afterwards several miscarriages. The case resisted all ordinary remedies, but was eventually cured by the continued application of a mercurial ointment to the abdomen.

Mucous patches and ulcers may be seen on the glottis and epiglottis. The vocal cords may be destroyed by ulceration or may be the seat of warty growths. A case is elsewhere related (see page 417) in which obstruction of the larynx by warty growths occurred in a child who had a past syphilitic history, but in whom no other constitutional lesion could be discovered. Sometimes great thickening is noticed in the mucous membrane of the glottis. Thus, in a case reported by Eröss—a syphilitic child aged three and a half years—a laryngoscopic examination showed that the epiglottis was thickened to three or four times its natural size; the ary-epiglottidean cords were thickened and pale red; the left vocal cord was more than twice as thick as the right, and bulged out at its edge towards its fellow. The symptoms were aphonia, and frequent convulsive fits of coughing with suffocative attacks. The child was treated with mercurial inunctions, and was well in two months and a half. According to Dr. T. Barlow, the larynx, even after recovery, is left very sensitive and susceptible to fresh catarrh. The mucous membrane of the trachea and bronchi may be affected in a similar way. There may be catarrh, or mucous patches, or shallow ulcers; but these lesions are less common here than at the upper part of the respiratory passage. In rare cases the ulceration may be extensive. Thus, Woronichin found in a child of fourteen months old ulceration of the lower part of the trachea, and a similar lesion of the right bronchus which extended as far downwards as the next division of the air-tube.

In *solid organs* syphilitic lesions assume the form of fibroid growths, which may be either diffused or circumscribed. Whatever organ be affected, the nature of the lesion is the same. There is hyperplasia of the connective tissue of the part. This grows, thickens, and finally contracts, so that the proper parenchyma of the organ is obliterated and replaced by a solid fibroid material. When the lesion is circumscribed it is called "gumma." This has essentially the same structure as the diffused form, but tends to soften in the centre by a process of fatty degeneration.

Diffused fibroid change is seen in the lungs, liver, spleen, and pancreas. Gummata have been found in the same organs; also in the heart and subcutaneous tissue. Occasionally they are found also in the tongue and soft palate, but not in infants. This is a later symptom and seldom occurs before the end of the sixth year.

In a lung the seat of diffused fibroid change, the part is solid and gray in colour, with a smooth shining section traversed by fine fibrous lines. It is very dense and tough. Under the microscope the alveolar walls are seen to be infiltrated with round cells, spindle cells, and fibrous tissue. The round and spindle cells develop into fibrous tissue, which thickens the septa and compresses the alveoli. There is also free production of new vessels, so that the new growth is very vascular. The area of lung thus affected varies. Usually the disease extends over a part of a lobe, or even a whole lobe. Besides the diffused form, gummata are seen sometimes in the lungs. These are rounded well-defined masses, few in number, usually of the size of a nut, and yellowish-white or gray in colour. They are firm at the circumference, but get softer in the centre, and the interior may be reduced by fatty degeneration to a puriform matter. Microscopic examination shows the alveolar walls to be infiltrated at the circumference of the tumour with nucleated cells, while nearer the centre round or oval cells are seen in a finely reticulated tissue. These two forms of the same lesion are seldom seen, except in dead-born or very young infants.

The liver may be affected, and, according to Dr. Parrot, is most frequently found diseased in infants who die six weeks after birth. The organ is enlarged and hardened, and may be the seat of a sclerosis, diffused, as in the lungs, or, more rarely, of the circumscribed form. According tc Gübler, who first drew attention to this condition, the organ in the diffused fibroid change is hypertrophied, globular, hard, and elastic, and its edges are rounder than in health. It creaks on section, and the cut surface is pinkish-white or yellow, and shows layers of small, white, opaque grains on a yellowish uniform ground. The capillary vessels are obliterated, and the calibre of the larger vessels is increased. These changes are due to the development of new fibro-plastic tissue which compresses the hepatic cells, obliterates the vessels, and checks or prevents secretion of bile. Gummata may be combined with the preceding, and are seen as circumscribed nodules embedded in healthy tissue. The masses are bright yellow, and present under the microscope the usual round or oval cells. There is commonly more or less softening in the centre, while at the circumference the normal hepatic cells, between which the infiltration is advancing, become hypertrophied.

The spleen is often enlarged, and, according to Dr. Gee, if the enlargement is great the child will probably die. Dr. Gee considers the degree of enlargement to be an index of the severity of the cachexia. If the child improves the size of the spleen does not diminish as the other symptoms disappear, but continues unaltered—often for years. In the spleen, as in the other solid organs, the disease consists principally of a diffused interstitial hyperplasia.

The heart and lungs may be also affected. Gummata have been found in the former organ, and Dr. Coupland has described a specimen in which the muscular walls were thickened and hardened, and showed under the microscope an almost universal infiltration of small round cells amongst the muscular fibres. In the same case the kidneys, although normal to the eye, were seen to be undergoing similar changes, and their substance was unnaturally firm.

The thymus gland is seldom diseased. Sometimes collections of matter are found scattered through its interior, but it is not clear that these are the consequence of the syphilitic taint.

The suprarenal bodies are said by Virchow to be frequently the seat of a fatty degeneration. Hüber has described a condition in which these

bodies are large, grayish on the outside, translucent, and thick, with numerous white, irregular spots dispersed through their substance.

The *bones* are often the seat of profound structural disease. Our knowledge of the bone disease which occurs as a consequence of inherited syphilis is only of recent origin. Dr. G. Wegner was the first to describe these lesions, and attribute them to their true cause, in 1870. More recently Drs. Parrot and Cornil have laboured at the same subject. Dr. Taylor, of New York, who has collected many cases of his own and analysed those of others, gives a graphic account of these affections in his well-known volume.

Disease of the osseous system is a far from uncommon lesion. According to Dr. Abelin, of Stockholm, it is found in ten per cent. of the cases. The bones especially affected are the long bones of the limbs; next come the bones of the skull, the ribs, the scapulæ, and the iliac bones. In the long bones there are two chief varieties. One begins with the periosteum —periosteogenesis: the other is not connected with the periosteum, but is confined to the ossifying line of the diaphysis—osteochondritis.

Periosteogenesis begins as a periostitis. Parrot divides it into two forms: the osteoid and the spongioid or rachitic. The former may occur from the earliest period of life; the latter is rarely seen in infants of less than six months old.

In the osteoid form we find one or more layers of a new growth which is composed of interlacing trabeculæ lying perpendicularly to the axis of the shaft. The periosteum is thickened and adherent to the growth, and the latter has a chalky appearance from copious infiltration with calcareous salts. Consequently it is whiter and more friable than the bone beneath, and the line of junction is well defined. The osteoid material is found on the shafts of the long bones and on the cranial bones. In the latter situation it may reach an inch or more in thickness. By the microscope we find differences in structure from true bone. There are no bone corpuscles regularly disposed round the Haversian canals; instead, corpuscles —three-sided or polygonal, resembling the stellate corpuscles of connective tissue—anastomose by their processes with the cells of the periosteum, with corpuscles in the medullary spaces, and with one another.

In the spongioid form, which is not seen in children under six months of age, a new fibroid tissue, pearly gray or yellowish in colour, is formed between the periosteum and the bone. It is more vascular than normal osseous tissue.

The osteoid and spongy growths are often combined. If the new material consist of several layers, some may be more trabecular, others more spongy in structure—the chalky layer being nearer the bone, the fibroid immediately beneath the periosteum. While this process is going on around it, the shaft of the bone may be unaltered. This is usually the case in very young babies. In older children the calcareous matter of the shaft may become absorbed, and the tissue be separated into layers by the formation of furrows filled with medulla. The bone as a consequence becomes light, porous, and brittle. The ends of the bones are thickened, partly by the periosteogenetic growth, partly by granulations thrown out from the spongioid tissue of the shaft.

Osteochondritis appears to consist in a suppurative ostitis affecting the epiphyseal end of the bone. The layer of cartilage preparing for ossification becomes thickened to three or four times its natural width, and gets transparent and soft. This increase in width is due to excessive proliferation of the cartilage cells, which assume much the shape and size of the

round granulation cells of syphilitic gummata. At the same time the intercellular substance is diminished. The cartilage which is actually undergoing ossification is thickened, and shows on section a broad wavy line. By the microscope the osteoblasts are found to be replaced more or less completely by small granulation cells or spindle-shaped elements. After a time destructive changes set in in the bony tissue. Dr. Parrot describes a "gelatiniform softening," in which the bone is replaced by a soft, rather transparent material of a yellowish or brownish colour. After death, when the bone is dry, a cavity is left. The cancellous structure is also infiltrated with purulent watery fluid, so that the lamellæ disappear and leave a fibro-vascular network filled with the same fluid. According to Wegner, a characteristic feature of this osseous disease is the protrusion of bundles of fibrous tissue along the course of the blood-vessels. These bundles pass through the cartilage, the calcifying layer, and the processes of spongy bone, and penetrate deeply into the cancellous tissue of the shaft.

As a consequence of this lesion the epiphyses with the ossifying layer may separate from the shaft of the bone. Suppuration is then set up, an abscess forms, and the pus escapes into the surrounding tissue by penetrating the periosteum. The joint itself is not involved as a rule; but Dr. Lees has reported a case in which the left elbow-joint and both knee-joints became filled with pus.

Periosteogenesis is more common than osteochondritis. It attacks particularly the humerus and the tibia; and gives rise to symptoms, recognised during life, which will be afterwards described.

An osseous lesion, due probably to changes similar in character to those described above, and called dactylitis, may attack the bones of the hands and feet. Dr. Taylor, of New York, has contributed much to our knowledge of this affection. According to this author, the disease begins either in the fibrous tissue surrounding a joint or in the periosteum. In the first form slight enlargement is seen of one or more toes or fingers—either of the whole length, as occurs in the toes, or of one or more phalanges, as is seen in the case of the fingers. The process is slow and is accompanied by little or no pain, although the swelling interferes with the play of the joint. The second form is most frequently seen in the fingers. One or more of the phalanges becomes evenly rounded or fusiform. When the first phalanx is attacked, it usually assumes the shape of an acorn. The metacarpal and metatarsal bones may be also affected in the same way. In all cases, as a rule, the tendency is to resolution. Still, sometimes, if the enlargement is great, the part is exposed to accidental injury. The skin then becomes swollen, red, and tense; ulcerates or is incised, and discharges a soft, cheesy detritus mixed with pus. Limited necrosis may follow and lead to shortening of the finger. Dactylitis is usually seen in very young children, but it may be a later symptom. The number of fingers affected varies. Dr. Taylor mentions a case in which all the phalanges of both hands were involved.

The bones of the skull may be affected by the two forms of disease which attack the long bones. Gelatiniform softening is comparatively rare, but is sometimes found in very young infants. It begins beneath the pericranium but does not penetrate deeply into the bone, so that it rarely reaches the dura mater. After death the bone has a worm-eaten appearance. This form cannot be diagnosed during life. The osteoid growths are only found in older children. At first they always occupy the same situation, viz., the frontal and parietal bones surrounding the anterior fon-

tanelle. Sometimes they are also seen in the temporal bones, but are never found, unless the disease be exceptionally severe, in the orbital plates or the occipital bone. As they grow they produce a very characteristic deformity of the skull. The fontanelle comes to be surrounded by four elevations, which are separated by two furrows intersecting one another in the form of a cross—the one transverse, the other antero-posterior. These osteophytes are usually spongy and porous, but they may become hard and smooth like normal bone tissue. They sometimes reach an inch and a quarter in thickness.

In addition to the above purely syphilitic changes, local thinning of the bone, called *cranio-tabes*, is often found. This condition, which is a thinning or even perforation in certain spots of the cranial bones, was until lately considered to be exclusively a symptom of rickets. It is due to direct pressure upon the bones of the skull by the brain within and the pillow without, and is found especially in the occipital bone. It may be present in rickets where no trace of syphilis can be discovered, but is most common in cases where there is a distinct syphilitic taint.[1]

It is difficult to say with certainty at what age a child becomes liable to syphilitic disease of bone. Gelatiniform softening and osteochondritis generally occur early, beginning before the sixth month, and it is probable that they may even be present in intra-uterine life. Dr. Taylor has most frequently seen osteochondritis about six weeks after birth. The changes in the cranial bones seem to be later symptoms, and to occur most commonly after the second year. In some cases reported by Drs. Barlow and Lees the ages of the children were between two and three years. Bone changes usually occur in the most severe cases, although it is said that they are sometimes the only symptom of the disease. If the patient recovers, all traces of the morbid growth may disappear, but it is not rare to find curvatures or twists left as evidence of the cachexia which has passed away.

Symptoms.—The first manifestation of the constitutional taint may occur early or late, according to the degree to which the system is affected by the virus. When the syphilitic poison is very active, the disease may first show itself during intra-uterine life. The fœtus then dies and is born dead before the proper time. Syphilis is thus a common cause of miscarriage; and in all cases where premature labour is found to have occurred repeatedly, we should not fail to make inquiry as to the previous health of the parents. If examination of the aborted fœtus be made, the bones and internal organs exhibit signs of being profoundly affected by the syphilitic poison.

In a less active state of the virus the child, although diseased, may be born alive. He is then much emaciated and looks shrivelled. His body is covered with an eruption of pemphigus which extends even to the palms of the hands and soles of the feet. He snuffles and has a hoarse cry. If, as generally happens, the internal organs are extensively diseased, the child dies. If no disease of the internal organs be present, the child may linger for a longer time, but he generally dies in the end. It is only in very rare cases that he struggles on and eventually recovers.

Usually when a syphilitic child is born alive, he has at first a healthy

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[1] Out of one hundred cases of cranio-tabes collected by Drs. Barlow and Lees, in forty-seven there was satisfactory proof of syphilis, in forty there was more or less evidence of the disease, only in twelve was there no indication of syphilis to be detected.

appearance. After a time—often between two and six weeks, rarely after three months—the first signs of the disease appear. Before this, however, the child in many cases has an unhealthy look, although it is difficult to say in what this unhealthiness consists. There is often great restlessness; and the infant may sleep badly at night, sometimes breaking out into paroxysms of violent crying, which are a source of great perplexity and distress to his attendants. It seems probable that this symptom is due to nocturnal pains in the bones, such as often affect adults before the outbreak of constitutional symptoms. The sleeplessness soon ceases under the influence of specific treatment. Sometimes the outbreak of the general symptoms is determined by a febrile disease, such as vaccination or one of the exanthemata. Thus, it is not very rare to see the rash of measles subside leaving the syphilitic eruption in its place.

Snuffling is one of the earliest symptoms. It should always be inquired for, as while the child is breathing through the mouth it is not noticed, and the mother attributing the symptom to a cold may not think it deserving of mention. The snuffling is most evident when the child takes the breast, and his manner of doing so is very characteristic. Each breath is drawn with difficulty through the nostrils, and if the obstruction is great respiration has to be suspended while the babe sucks. Consequently, he can only draw the milk by short snatches. After every two or three mouthfuls he is forced to desist, and can be seen lying with the nipple in his half open mouth so as to renew his supply of air before he begins again. A discharge from the nostrils soon appears. This is at first watery, but soon becomes thicker and forms crusts which block up the nasal openings. Little ulcerations and cracks are generally seen about the nostrils and upper lip, due either to mucous patches or to scalding by the irritating secretion from the nose. In bad cases ulceration of the Schneiderian membrane may take place, and the septum is sometimes perforated. Occasionally, necrosis of the nasal bones follows, and fragments of the bones may be found in the dried discharge. The bones may be also loosened so that the bridge of the nose is flattened and sinks down.

Another early symptom is the rash. This appears, as a rule, shortly after the beginning of the coryza. It is seen as flattened, slightly elevated spots, of a rusty red or coppery colour, scattered over the perinæum, upon the genitals, and around the anus. Sometimes it begins as a uniform, dingy red blush covering the belly, the perinæum, and the buttocks. It soon assumes the tint of the lean of ham; its edge is distinctly circumscribed, and at the circumference isolated spots are seen of the same colour. The eruption is not confined to the lower part of the body. It is often seen in the folds of the joints, particularly of the armpits, along the sides of the neck, and over the chin. Other varieties of eruption are also seen. Ecthymatous and tubercular spots are not uncommon, and mucous patches and ulcerations are constantly present on the skin. The ecthymatous pustules are met with in the more weakly children. They are generally covered with a thick scab, under which the skin may ulcerate into deep, sharply cut sores. Mucous patches lie at the outlets of the various passages opening on to the surface of the body, and in other places where the skin is especially delicate and moist. Thus they are seen around the anus, and in a girl round the vulva; also about the commissures of the lips, and between the fingers and toes. They are round or oval patches, slightly elevated. The surface is of a grayish colour and is moistened by constant secretion. On a mucous membrane they quickly become converted into shallow ulcers. Ulcerations and cracks invade the angles of the mouth and alæ of the nose. They are

linear and leave behind them linear cicatrices when they heal. The skin itself of a syphilitic child presents a very characteristic appearance. In severe cases it is dry, inelastic, and wrinkled in loose folds. The complexion is yellowish, and has been compared to weak café-au-lait. This tint is unequally distributed, being most marked on the prominent parts, as the nose, cheeks, forehead and chin. The general colour of the skin may be muddy; but in children who survive it generally becomes singularly bloodless, and remains pale long after other symptoms have disappeared.

The hair and eyebrows sometimes fall out. The nails may also be affected. Inflammation and suppuration occur in the matrix, so that the nutrition of the nail becomes impaired and the nail gets dry and is cast off.

The cry of the infant is a noticeable symptom. It is hoarse and high-pitched from laryngeal catarrh or extension of the mucous patches to the larynx. Occasionally the hoarseness is accompanied by attacks of laryngismus stridulus. In almost every case the ossification of the cranial bones is delayed and the fontanelle is widely open; but the growth and development of the teeth are not interfered with, for the teeth are cut early, as a rule, and with little inconvenience to the child. Cranio-tabes is present in the large majority of cases, and the posterior cervical glands are often enlarged.

The bone disease presents many very characteristic symptoms. The long bones should be examined for signs of enlargement, especially the humerus, the femur and tibia. If we place the finger and thumb on the anterior and posterior aspect of the humerus at the upper part, and carry the hand downwards along the shaft, we shall often notice that the bone becomes thickened at the lower end, and that the thickening is greatest at the point of junction of the shaft with the epiphysis. In the tibia the thickening can be often detected on the inner surface, in the femur on the outer and inner aspects of the shaft. Besides these, there may be beading of the ribs and thickening of the radius and ulna above the wrist. The osteophytes on the cranial bones have already been described.

When suppuration takes place outside the joint, especially if there be fracture of the neck of the bone, we find peculiar symptoms. The child appears as if paralyzed. His arms lie pronated by the sides of his body; his legs are stretched out straight in the cot; and when the patient is lifted up, they hang loose, like the legs of a doll, swaying from side to side. Crepitation can sometimes be detected between the shaft and the separated epiphysis; and if an abscess forms, the joint, which had been tender before, becomes bent and stiff and exquisitely painful. Parrot has called this condition "syphilitic pseudo-paralysis."

A form of real paralysis has been occasionally seen affecting the branches of the brachial plexus, and causing more or less complete loss of power in the arms. In two cases, described by Dr. Henoch, voluntary movement was almost completely lost in the upper extremities, the flexor muscles of the fingers alone retaining a slight trace of contractility. There were other signs of syphilis, and the paralysis disappeared under the influence of mercury. In some cases a peculiar twisting of the head backwards has been noticed when the child is placed in a sitting position.

The degree to which the child is affected in cases of inherited syphilis varies—partly according to the virulence of the poison, and partly, also, according to the general strength of the infant. In rare cases, where twins are born of parents suffering from this disease, the two children may be affected very unequally. An instance of this came under my own notice.

The children were three months old. One was much emaciated, with a shrivelled, parchment-like skin, covered with pemphigus. She snuffled and cried hoarsely. The other was a healthy-looking child, fat and strong, with a good complexion. She snuffled and showed on her buttocks signs of recent eruption ; but was never thought sufficiently ill to require medical advice.

In practice we see every degree of intensity of the syphilitic cachexia. In one case, like the healthier twin just mentioned, the infant may be plump and strong-looking, with few symptoms and those trifling in character. In another the child is wizened and wasted, with a wrinkled, inelastic, blotchy skin. He is peevish and restless, crying hoarsely and whimpering almost constantly. He is always hungry, for the state of his mouth and nasal passages offers a continual impediment to his drawing sufficient nourishment from the breast. He gets weaker and weaker—partly from disease, partly from want of food. Vomiting and diarrhœa perhaps come on, and his miserable little life soon draws to a close.

When the infant survives, he may seem quite to throw off all traces of his illness, and grows up a strong healthy child. But usually, when the symptoms have been severe, more or less permanent impression is produced upon the system. The body may be stunted in growth ; the complexion earthy or unhealthy-looking ; the hair thin and brittle. The brain may be also more or less affected, and epilepsy, deficient memory, loss of perceptive power, and even gradually advancing imbecility are enumerated as consequences of the disease.

Relapses.—In rare cases the symptoms of inherited syphilis are said to be delayed until the seventh, ninth, tenth years, or even later. Most of these cases are no doubt instances of relapse of the disease, the symptoms which occurred during infancy having been slight and transient. The relapse shows itself in coppery eruptions on the skin with discharges from the nose, ears, etc. The skin often ulcerates, and the nasal bones may be destroyed by gummy ostitis so that the bridge of the nose is depressed. The spongy bones and hard palate may ulcerate away, and the velum and pillars of the fauces may be destroyed so as to throw the nose and mouth into one cavity. The eyes may be affected with interstitial keratitis ; the permanent incisor teeth may be notched and dwarfed ; and deafness may occur. Deafness is the consequence, as a rule, of some morbid condition of the auditory nerve. It is seldom accompanied by any disease of the outer or middle ear, for there is tinnitus, and the patient cannot hear a tuning-fork placed on the head. It is most common between the fifth and fifteenth years, and can seldom be improved by treatment.

Epilepsy has been mentioned as sometimes occurring in syphilitic children. It is usually one of the later symptoms, and may exist, as was seen in one of Dr. Hughlings Jackson's cases, without any sign of organic disease being detected in the brain after death. Syphilitic children sometimes die from a basic meningitis with symptoms similar to those produced by the tubercular form of the disease. They may also succumb to a cerebral hæmorrhage. Dr. Barlow has described a diffused thickening with opacity of the arterial coats in the brain as sometimes occurring in cases of inherited syphilis. This may lead to thrombosis of vessels or rupture of the artery with fatal hæmorrhage.

Lastly, in many children who have suffered from the hereditary form of the disease we may find amyloid degeneration of internal organs, especially of the liver, the spleen, and the kidneys.

Diagnosis.—When the symptoms are well marked the nature of the

disease can scarcely be mistaken. The little, old-looking face, with its dusky complexion, its fissured lips and crusted nostrils; the snuffling and hoarse cry; the wasted body; the wrinkled and inelastic skin; the ham-like redness of the buttocks and perinæum— all these symptoms are sufficiently characteristic. Doubt is only permissible when the symptoms are few and indistinct, when nutrition is unaffected and the child has the appearance of fair health. In such cases there is general pallor of the skin and careful examination may detect a few coppery spots upon the body; the spleen may be big, and we may, perhaps, discover some enlargement of the lower end of the humerus or shaft of the tibia. Chronic coryza is sometimes the only sign of the disease. Persistent snuffling in babies is commonly of syphilitic origin. If it be combined with pallor of the skin, specific treatment should always be adopted, especially if a history of previous miscarriages can be obtained from the mother.

In older children the signs of past disease are: Flattened bridge of the nose from long-continued swelling of the nasal mucous membrane when the bones are soft; marking of the skin by little pits or cicatrices from former ulceration, especially when these are seated about the angles of the mouth; protuberance in the middle line of the forehead between the frontal eminences from specific disease of the frontal bone; enlarged spleen and marked pallor of the skin. If the permanent teeth have appeared the incisors should always be examined for signs of the characteristic malformations.

In cases where there is enlargement of the ends of the long bones, the diagnosis from rickets has to be made. As compared with inherited syphilis rickets is a late disease. It rarely begins before the ninth month. The lesions of syphilis are seen early, almost always before the sixth month. Again, the bone disease in syphilis is usually evidence of a profound cachectic state. It is, therefore, in most cases accompanied by other and unmistakable symptoms of the disease. Moreover, it is very partial, seldom affects the ribs, and is not symmetrical. In rickets it is always symmetrical and general and the ribs are the earliest of the bones to be affected. In syphilis separation of the end of the bone and suppuration around the joint are not uncommon. In rickets these lesions are never seen. Again, the preliminary symptoms of rickets are very characteristic, and are quite wanting in an uncomplicated case of inherited syphilis. If, in any case, we find that the bone lesions are symmetrical and involve the ends of all the long bones, if there is an absence of the signs of inherited syphilis but a history of the symptoms characteristic of the early stage of rickets, and if we find that the child's dentition is backward, and that at ten months old he is showing no disposition to "feel his feet"—we shall have little difficulty in reaching the conclusion that the case is one of rickets. Still, a mild form of rickets is sometimes engrafted upon a syphilitic constitution. Here we shall find symmetrical and general enlargement of the joints and beading of the ribs combined with some of the symptoms of present or past syphilitic disease.

Dactylitis occurring in syphilitic children must be distinguished from the necrosis which sometimes attacks strumous subjects. In syphilis the diseased bone is evenly enlarged, and no inflammation in the integuments occurs unless the size of the lump exposes it to accidental injury. In the fibrous form, also, the swelling is indolent and painless, and although not quite symmetrical, as in the osseous variety, is distinguished by its little tendency to end in suppuration and abscess. In strumous necrosis the bone is enlarged unevenly and generally forms a lump on one side. This

lump gets bigger, then softens and suppurates, adhesions take place with the integument, and finally the abscess opens and discharges cheesy pus. On exploring the abscess bare bone is found at the bottom of the cavity. In all these cases careful inquiry should be made for history or sign of syphilis in the patient or other children of the family.

Prognosis.—The prognosis is serious in proportion to the intensity of the cachexia. The general condition is, therefore, of greater importance in counting the chances of a child's recovery than the severity of any particular symptom. The degree of intensity of the cachexia may be estimated by the date of appearance of the first symptoms of the disease, and by the extent to which nutrition is interfered with. If the symptoms appear during the first fortnight and the child progressively wastes, death may be anticipated with certainty. All intercurrent derangements which interfere with digestion and assimilation of food sensibly increase the gravity of the case. Thus, vomiting and diarrhœa, which rapidly reduce the strength of even a healthy child, must be looked upon as very serious complications.

Disease of the internal organs or of the bones, as they indicate profound contamination of the system, make the case a very anxious one. Moreover, the interference with function which results from the visceral disease is another reason for forming a very unfavourable opinion as to the result of the illness.

There is one special symptom which must not be overlooked in forming a prognosis. This is the condition of the nasal passages. When these passages are occluded from swelling and incrustation the child is forced to breathe through the mouth. Consequently, he can take but little nourishment, for while he sucks he cannot breathe, and while he breathes he cannot suck. The amount of food he takes is, therefore, very inadequate to the wants of his system, and he is in danger of actual starvation.

If the disease first appears several months after birth, and if the child continues plump, and does not sensibly emaciate, the prognosis is favourable even although particular symptoms may be severe.

In cases of relapse, or of so-called delayed syphilis, when symptoms appear after the seventh year, much depends upon the early recognition of the nature of the malady. Syphilitic lesions urgently require specific treatment, and the so-called tertiary forms of the disease cannot be neglected without serious consequences. Therefore, to look upon such lesions as scrofulous in their nature, to be treated with cod-liver oil and tonics, is to commit an error which may be a very fatal one to the patient.

Treatment.—In every case where a woman gives birth to a syphilitic child the nature of the illness should be explained to the father, so that by suitable treatment of one or both parents their future children may be enabled to escape the disease. Treatment begun during pregnancy is often successful in preventing the taint from being transmitted to the fœtus; but it should be begun early and, if it can be borne for so long a time, should be continued for fully three months.

In the child it is important to attack the cachexia at the earliest possible moment. Therefore, if previous children have been syphilitic, and the parent in the interval have undergone no treatment, it is well to place the new-born child at once under the influence of remedies, even although he may have a healthy appearance and present no symptoms of the disease. Mercury is indispensable to the successful treatment of infantile syphilis. It may be either given internally or applied externally. In bad cases it is well to combine internal administration with external application, so as

to bring the system as quickly as possible under the influence of the drug.

The infant may be given one grain of gray powder twice a day, either alone or combined with a grain of carbonate of potash or a few grains of prepared chalk to prevent irritation of the alimentary canal. After a week the dose can be increased by a quarter of a grain every three or four days until two or three grains are taken twice a day. If the powders produce irritation of the stomach, they can be omitted for a day or two until the irritation has subsided. If they still disagree, it is better to change the preparation of mercury. In this case perchloride of mercury in doses of twenty or thirty drops of the ordinary Pharmacopœia solution (gr. $\frac{1}{32}$ to gr. $\frac{1}{48}$) can be given in a teaspoonful of water sweetened with glycerine two or three times a day. Children take this salt very well, and it will often agree when the gray powder excites irritation and vomiting. Calomel in doses of one-twelfth of a grain is sometimes preferred, but it is a more irritating preparation than the other.

Externally, mercury can be employed in the form of the ordinary mercurial ointment. The most convenient method of using this salve is to smear it inside the flannel band which covers the infant's belly. When this is done great cleanliness must be observed. The whole body must be washed well with soap and water every night so that all old ointment is removed before a fresh application is made. Another way of using mercury externally is in the form of mercurial baths. Thirty to ninety grains of the perchloride may be dissolved in two gallons of warm water. It is better to begin with the smaller quantity and gradually to increase the strength of the solution. The baths, besides their effect upon the general system, have a very beneficial local influence upon the cutaneous lesions. When the cachexia is very severe, it is well to combine external with internal treatment; and in cases where there is great irritability of the stomach or bowels, we may be forced to depend exclusively upon the cutaneous absorption of the remedy.

If a mother who is giving suck to her diseased infant be herself undergoing treatment, it may be unnecessary in addition to give mercury to the child. Doubts have been entertained as to whether mercury is really secreted by the breast. Cullerier has tested the milk of mercurialised mothers without finding evidence of the drug in the secretion. Still, it seems certain that an appreciable amount of the remedy must reach the child by this means, for in mild cases very rapid improvement is noticed in his symptoms while he remains at the breast. In cases of severity I am disinclined to trust to the child's getting a sufficiency of the drug by this channel, and prefer to supplement the treatment by the direct application of mercurial ointment to the abdomen.

While specific treatment is being adopted, we must do our best to improve the general nutrition of the infant. The milk in syphilitic mothers is too often poor and watery, and ill-adapted for the supply of sufficient nourishment to their offspring. Therefore if the child wastes, especially if, by frequently requiring the breast and crying peevishly after his meal, he seem to be ill-satisfied by the milk he has swallowed, it is well to give alternate meals of cow's milk diluted with an equal quantity of barley-water, and containing a small quantity of some malted food, such as Mellin's Food for Infants. If the child have a difficulty in sucking, on account of the condition of his nasal passages, this food must be given with a syringe. If a feeding-bottle be used, care must be taken that no other child be allowed to suck at the mouth-piece used for the diseased infant,

and the nurse should be cautioned not to put the teat into her own mouth. In connection with this subject it may be well to remark that it is a duty in all these cases to warn the nurses and servants in immediate attendance upon the child of the danger of infection from mucous patches and other discharging sores upon the patient's body. They should be directed to observe great cleanliness; to avoid wiping their hands upon any cloth or towel used for the infant; and if they have a finger wounded by any accidental cut or abrasion, on no account to handle the child unless the part is properly protected.

The infant must be kept perfectly clean. His whole body should be bathed with warm water twice a day; and if mercurial inunctions are being employed, soap should be used for the evening bath. Care must be taken to dry the child thoroughly after each washing. Fresh air is of the utmost importance, and if the patient be strong enough and the weather dry, he can be taken out every day warmly dressed into the air.

Vomiting is best treated by suspending the mercurial for a few days. If the symptom continue and there be a sour smell from the breath, the diet must be altered, as recommended in such cases (see Infantile Atrophy). If looseness of the bowels occur and be not arrested by stopping the medicine, an alkali with tincture of catechu will usually check the derangement at once. Diarrhœa is seldom obstinate in these cases if the diet be regulated and the child's body be sufficiently protected from the cold.

It is important to attend to the condition of the nostrils. All hard crusts must be removed by bathing with warm water after softening with cold cream. An ointment of the red oxide of mercury may then be employed to the inside of the nostrils. Mucous patches must be well touched with the solid nitrate of silver, and if large ecthymatous crusts have formed on the body, they must be removed by poulticing. The uncovered ulcer can then be treated with the red mercurial ointment.

Internal treatment must not be continued long after the symptoms of the disease cease to be noticed. On account of the profound anæmia often induced by the long-continued administration of mercurials it is wise to change the treatment as soon as the skin has recovered its healthy appearance, and the other specific symptoms have subsided. Cod-liver oil and iron can then be given. In addition, every care must be taken to promote healthy nutrition by judicious regulation of the diet, and vigilant attention to all the minor agencies which exert so material an influence upon the well-being of the infant.

Part 4.

DISEASE OF THE DUCTLESS GLANDS AND BLOOD.

CHAPTER I.

LEUCOCYTHEMIA.

Leucocythemia (leukhæmia), although a rare disease in childhood, is occasionally seen in the young subject, and therefore may be shortly described. The disease is characterised by great excess of the leucocytes of the blood, enlargement of the spleen, sometimes of the lymphatic glands, and a morbid state of the bone medulla. Two cases have come under my notice, both in children under three years old. In each of these the malady assumed a febrile form, and was accompanied by enlargement of the spleen without any apparent affection of the lymphatic glands. In lymphadenoma, which is described elsewhere, an increase in the number of the white corpuscles is exceptional. Sometimes, however, in that disease excessive overgrowth of lymphatic elements is combined with multiplication of the colourless blood-cells. These cases present a great resemblance to the lymphatic form of leucocythemia, and, indeed, anatomically appear to be almost indistinguishable from it. In the present chapter the splenic form of leucocythemia will alone be described.

Causation.—The etiology of leucocythemia is not clear. Out of 150 cases analysed by Dr. Gowers in one-fourth there was a history either of ague or of habitation in an ague district. Of my own two cases, one had lived at Malta; the other was a resident of London, but had lived in a street in which the roadway had been broken up for repairing and relaying drains; and for two or three months the upturned soil, saturated with coal-gas and other unhealthy effluvia had remained heaped up by the side of the foot-pavement. The disease appeared shortly before the close of these operations, and I cannot but think that the illness took its rise in the offensive emanations to which the child had been constantly exposed.

Morbid Anatomy.—The spleen is enlarged and may reach a great size. This increase is due to an overgrowth of the splenic pulp, the leucocytes and the fibrous stroma being equally increased. The organ, although enlarged, retains its normal proportions, so that its shape is not changed. Its density is increased and its colour is paler than natural. On the surface it is smooth unless local peritonitis have occurred, in which case particles of

lymph may adhere to the capsule. From this cause it may contract adhesions to parts in its neighbourhood. Its section is smooth and of a brownish-yellow colour mottled with paler streaks from thickened trabeculæ, and but little blood escapes from it on pressure. The Malpighian bodies are not very prominent, and may be seen under the microscope to be the seat of fatty or lardaceous degeneration.

The liver is often enlarged from congestion, and may be fatty. The kidneys, too, are often the seat of fatty degeneration. Hæmorrhagic extravasations are common, and may be seen in the skin, the heart, the lungs, the brain, and the retina, and fluid effusions may be found in the serous cavities.

In some cases the lymphatic glands undergo slight enlargement, but the increase in size is rarely universal as it is in lymphadenoma. On examination they appear to be normal in structure without any hyperplasia of the reticulum, and suppuration or caseation rarely occurs. As in lymphadenoma, adenoid growths may be also found in the tonsils, the follicles of the tongue, the glands of the stomach and intestines, and in other situations. The capillaries in various parts are distended with collections of leucocytes. The marrow of the bones is more fluid than natural, is grayish in colour, and shows an accumulation of white and red corpuscles. The blood itself is much altered. It is pale in colour, coagulates loosely, and shows an enormous excess of white corpuscles, together with a diminution in the number of the coloured cells. Consequently the relative proportions, instead of being one white to four hundred and fifty red, as in health, may fall to one to twenty, one to ten, one to five, or even to an actual equality of number. The white cells may also present peculiar characters. They are sometimes seen of two quite different forms; the one double the size of the other and full of small fat granules. According to Mosler, this larger form is evidence of morbid change in the bone medulla. After death thick creamy-looking clots may be found in the cavities of the heart, the terminal branches of the pulmonary artery, and the systemic vessels.

Symptoms.—The illness begins insidiously. Sometimes at first the general health alone seems to be impaired; sometimes even from the beginning the belly is noticed to be large. The child loses his sprightliness and begins to look pale and to droop. His appetite fails and he slowly wastes. There is almost always more or less fever, but this is at first slight and occurs irregularly. Afterwards it becomes more continuous and the temperature rises to a higher level.

Enlargement of the spleen, although not always noticed at an early period of the disease, is usually to be detected on careful examination. The limits of the organ should be always estimated by percussion as well as palpation. The degree of enlargement varies. In neither of my cases did the lower edge reach more than three fingers' breadths below the ribs, and there did not seem to be any great upward extension. In many cases, however, the increase in size is much greater. Some enlargement of the liver may also be noticed.

When the disease is fully developed, the child is pale and weakly looking. His complexion is very white round the mouth and eyes, and at the sides of the nose; but often there is a flush on the cheeks, which at times is noticed suddenly to disappear, leaving the face ghastly pale from the contrast. Often, especially when the disease is advanced, there is a peculiar sallow, half-jaundiced tint of the skin. This has been attributed to the anæmia, the altered blood being unable to destroy the bile pigment

absorbed into it from the intestine. The belly is usually swollen from flatulent accumulation, as well as from enlargement of the liver and spleen. No tenderness is noticed on pressure of the abdomen, but if the bone medulla is diseased, pains in the limbs may be complained of in walking. There is no loss of elasticity of the skin. The tongue is furred and the bowels are often capricious. Sometimes the stools are loose and slimy; at other times there is constipation. The child may cough, and his breathing may be short; but unless a complication be present, examination of the chest discovers merely a little large-bubbling rhonchus at the bases of the lungs. The pulse is quickened, especially at night. It is usually over 100, sometimes considerably so. In one of my cases—a little boy aged two years and a quarter—the urine was high-coloured and offensive, and contained bile, but no albumen. There was some difficulty in holding it at night.

The temperature rises in the evening to between 102° and 103°, sinking to 99° in the morning. The fever, however, is very irregular, and on some days is much higher than it is on others. The skin may be moist at night, and sometimes there is copious perspiration. An examination of the blood discovers a great excess in the number of the white corpuscles.

As the disease goes on the child remains very fretful and pining. He sleeps badly at night and continues to lose flesh. His expression is very distressed, and his face is white and haggard. He is thirsty, but cares little for food. Often hæmorrhages come on, and these effusions form a very characteristic symptom. The nose may bleed, or blood may be discharged by the mouth or by stool. Although usually a late symptom, hæmorrhage is not always delayed until near the close of the illness. Epistaxis is sometimes noticed quite early in the disease.

Enlargement of lymphatic glands may occur, but this is rarely considerable in a case of pure splenic leucocythemia, and pressure signs from this cause are rarely noticed. Towards the end of the disease œdema and dropsical effusions are common. There may be ascites or hydrothorax or œdema of the lung, and the lower limbs may swell and pit on pressure.

The fever usually perseveres to the end, and the child grows thinner and weaker. Various complications occur before the close, especially croupous pneumonia and pleurisy. Death is often preceded by an attack of convulsions, due, probably, to obstruction of the cerebral capillaries by masses of leucocytes, as described by Bastian.

Diagnosis.—The symptoms of leucocythemia are sufficiently characteristic of the disease. Irregular pyrexia and general impairment of nutrition, combined with a distressed, pallid face, a sallow complexion, a swollen abdomen, an enlarged spleen and liver, and the occurrence of epistaxis or melæna, point very distinctly to leucocythemia; and the diagnosis is at once confirmed by a microscopical examination of the blood.

When seen for the first time, the case often presents some resemblance to enteric fever; and a hæmorrhage occurring from the bowels might appear to confirm this view of the illness. But the history, which usually indicates disease of considerable standing, the complete absence of rosy spots, the enlargement of the liver as well as of the spleen, the peculiar sallow tint of the skin—these symptoms are very unlike typhoid fever; and if at a late stage œdema of the lower limbs occurs, the presence of a symptom so uncommon in enteric fever should make us at least doubt the correctness of this diagnosis. An examination of the blood showing a large excess of leucocytes is of course conclusive.

Leucocythemia may be diagnosed with certainty if, with an enlarged spleen, the proportion of colourless corpuscles is greater than one to twenty. In a doubtful case, therefore, it is well to count the corpuscles with the hæmacytometer. If the proportion of leucocytes is less than one to twenty, the case may still be one of leucocythemia in process of development; and as Dr. Gowers has pointed out, to exclude this disease it will be necessary to make repeated examination of the blood, and satisfy ourselves that the proportion is not increasing.

In cases where the lymphatic glands undergo hyperplasia, the disease is distinguished from lymphadenoma by noticing that the lymphatic enlargement is only moderate, and occurs as a late complication. Also that the excess of white corpuscles in the blood is very pronounced. In lymphadenoma this increase is either absent or is comparatively insignificant. Composite cases are, however, occasionally met with, and may be a source of perplexity.

Prognosis.—The disease invariably terminates fatally; and the more nearly the number of the white corpuscles in the blood approaches to an equality with that of the red, the greater the prospect of an early termination to the illness. Hæmorrhage, unless it be from the nose, is a very grave symptom.

Treatment.—No treatment has yet been discovered which is capable of arresting the progress of the disease. Arsenic, which is of great value in cases of lymphadenoma, has no influence in leucocythemia, and quinine, iron, and tonics generally have proved to be quite useless. Cod-liver oil may, however, be given, and is said to be sometimes of temporary benefit. In an early stage of the illness faradisation of the splenic region for fifteen minutes twice a day is said to diminish the proportion of white corpuscles in the blood. In a case reported by Mosler this application, combined with the internal administration of piperine, oil of eucalyptus, and hydrochlorate of quinine, reduced the size of the liver and spleen and greatly improved the condition of the blood. Dr. G. V. Poore finds the size of the spleen to be diminished temporarily after faradisation, but states that the therapeutic benefit derived from the application is very transient. Many times a spleen which was felt to be smaller and softer immediately after galvanism was found after only a few hours to have recovered its former size and again become tense and hard. Dr. Poore states that the leucocytes in the blood are increased in number directly after the application. Injection of various substances into the spleen has been attempted, but the results have not been encouraging. A case is reported in which a grain and a half of salicylic acid was injected into the organ, and the patient died six hours afterwards.

Excision of the spleen has been tried, but has invariably led to such effusion of blood that the death of the patient has very quickly followed. All we can do is to treat distressing symptoms as they arise, and to supply the patient with such nutritious food as his stomach can digest. Quiet is very important when the anæmia is great. Looseness of the bowels must be treated with small doses of rhubarb and the aromatic chalk powder, or with dilute sulphuric acid; œdema with digitalis and diuretics; hæmorrhage with the ordinary styptics. If the pain is complained of over the spleen, it is best relieved by counter-irritation and anodyne applications, such as smearing the surface with equal parts of the extract of belladonna and glycerine, covering the side afterwards with cotton-wool.

CHAPTER II.

LYMPHADENOMA.

Lymphadenoma (adænia, lymphatic anæmia, Hodgkin's disease) is one of the less common diseases of early life, but it occurs sufficiently often to render the affection a not unfamiliar one in Children's Hospitals. Lymphadenoma consists in a hyperplasia of lymphatic tissue in various parts of the body, even in situations where such structures do not normally exist in any great quantity. The lymphatic glands are chiefly involved, but the spleen, liver, and kidneys may be greatly enlarged and altered in structure. If the enlargement be limited to a few glands or organs, the disorder may have the characters of a local complaint. Usually, however, the affection spreads very extensively and exhibits all the phenomena of a general disease, being attended with fever, wasting, great and increasing pallor, and marked weakness. In the end it is almost invariably fatal.

Causation.—The causes of lymphadenoma are obscure. Diathetic tendencies have been supposed to give rise to the disease, and there is no doubt that in some cases pulmonary consumption or syphilis has been noted in the parents. In other cases, however, the family history has been good. Acute disease in the child himself has sometimes appeared to be the starting-point for a slow deterioration of health which has eventually developed into undoubted lymphadenoma. So also the occurrence of the illness has been attributed to bad or insufficient food or insanitary conditions generally. In some cases, however, no sufficient cause has been discovered to account for the failure of health. The disease, like tuberculosis, with which it presents certain affinities, may develop without apparent reason in a child whose health had previously given no cause for anxiety.

In not a few cases some local derangement or injury has appeared to be the exciting cause of the enlargement of the lymphatic glands. Thus a decayed tooth, a patch of eczema, an otorrhœa—all these have been known to be quickly followed by a swelling of the glands in the neighbourhood of the irritant. In scrofulous subjects a persistent caseous enlargement of glands from this cause is not uncommon. In lymphadenoma, however, the morbid changes do not remain limited to the neighbourhood of the irritant. Others more distant from the seat of irritation take on the same unhealthy action, and thus the disease spreads widely so as to involve adenoid tissue in all parts of the body.

The age of the children affected is usually four or five years and upwards. I have, however, seen a well-marked case in an infant eight months old, who had begun to suffer at the age of three and a half months.

Morbid Anatomy.—After death in a case of lymphadenoma we usually find great enlargement of the lymphatic glands, and often of the spleen, the liver, and the kidneys. In addition there is commonly overgrowth of

the more minute collections of adenoid tissue in various parts of the body, as in the tonsils, the pharynx, the gullet, the stomach and intestines, etc. Of these the more considerable enlargements are often limited to a comparatively few organs and structures, but microscopical examination discovers very wide-spread changes in parts which present little or no apparent alteration to the unassisted sight.

The lymphatic glands are greatly enlarged, and the enlargement may be in two forms—a hard and a soft swelling. This difference appears to depend less upon the nature of the growth than upon the rapidity of its progress, for the two varieties may be found combined in the same subject.

The size of the swollen glands commonly varies from a hazel-nut to a hen's egg, but in exceptional cases the growth may reach still more considerable dimensions. The first glands to be affected are usually those in the neck. Then follow in order of frequency the axillary, inguinal, retro-peritoneal, bronchial, mediastinal, and mesenteric. But besides enlargement of glands, circumscribed growths may be developed in spots where, although adenoid tissue exists normally in small quantity, it is not collected into glandular masses. By this means the various groups of enlarged glands may be found connected together by chains of newly developed lymphatic nodules.

When a group of glands takes on the morbid process, the individual bodies at first remain distinct and are movable. As the disease progresses they cease to be movable, and eventually become welded together into a solid mass. The process of union consists in a disappearance of the capsule, which becomes pierced and ultimately almost destroyed as the new lymphatic tissue accumulates. On examining such a mass the outline of diseased glands can be recognized here and there by a thin fibrous capsule, but the confluence is for the most part complete, and no intervening infiltration can be discovered. On the surface the mass is often very irregular and nodulated, and may be mottled with white or yellow patches, but caseation is seldom seen. If the mass be superficial it may be adherent to the skin. In rare cases it suppurates. The greater or less hardness of the enlarged gland is determined, as has been already said, by its rapidity of development. If it grows very quickly the gland is soft. On section of such a gland the substance appears often to be almost diffluent. If firmer, it yields a creamy juice when scraped. If very firm the hardness is found to be due to hyperplasia of the fibrous stroma, dense bands of fibrous tissue running in various directions through the mass.

Under the microscope the morbid change in the glands is seen to consist in an enormous increase in the lymph corpuscles. These accumulate, and by their pressure may perforate the capsule and even split up the septa and cause them to disappear. In the softer growths the diseased process is chiefly of this kind. In the firmer glands there is an increase in the fibrous stroma, which becomes greatly thickened. The hypertrophy may even obliterate the meshes of the reticulum and convert the organ into a mass of fibrous tissue.

The *spleen* commonly suffers, especially if the disease begins in the lymphatic glands of the neck. The organ becomes greatly enlarged. Its normal lymphatic tissue takes on a rapid growth, and shows the same tendency to fibrosis that is noticed in the glands. Externally the organ is of a dull reddish colour with paler patches, and yellow spots from the size of a mustard-seed upwards are often seen scattered over the surface. To the touch it is usually dense and firm. On section whitish or yellow nod-

ules are discovered on a dark-red ground. The nodules are more or less closely aggregated so as to form masses of varying size and shape. The new material appears to originate in the Malpighian follicles and the peri-arterial sheaths of lymphoid tissue. It is composed of lymphoid cells and large quantities of imperfect fibrous tissue. The fibrous stroma is often thickened, and may show bands of fibrous tissue without definite arrangement, or running loosely parallel so as to form oval loculi by their divergencies. In a late stage the bands are sometimes pigmented at their edges. Under the microscope these bands appear to be formed by rapid induration of a lymphatic tissue growing around the vessels.

In the *liver* the new growth usually appears in the form of small, irregular, infiltrating masses which may project as irregular prominent patches on the surface. The structure of these growths is similar to that of the new material in other parts, but in this organ there appears to be a greater tendency to caseation. The lymphatic new growth occupies the interlobular spaces. In a case reported by Dr. Greenfield it seemed to start in the portal canals as small masses which extended around and into the lobules, the liver-cells becoming degenerated and shrivelled.

When the *kidneys* are affected the organs are enlarged and often irregular in shape. Their colour is light yellow or even dull white, and ecchymoses may be scattered over the surface. Sometimes signs of more profuse hæmorrhage are found, and large purple blotches are seen through the capsule on the pale surface of the gland. On section the cortical substance is more or less swelled, and is of a yellowish-white colour mottled with points and patches of red. By the microscope an excess of adenoid tissue is seen between the tubules, sometimes separating them widely. The growth is collected in large quantities around the glomeruli, and in some cases the new tissue appears to pass along the vessels into the interior of the Malpighian capsule. In both liver and kidneys it is common to find blood-vessels blocked by masses of colourless corpuscles.

The new growths developed in places where adenoid tissue exists normally in minute quantity are usually rather soft and elastic. They are of a pinkish colour and very vascular. Such local developments of lymphatic tissue may be seen in the tonsils, at the back of the pharynx, and in the gullet, stomach, and intestines, originating in the follicular glands. All these often undergo ulceration. Growths have also been found in the testicles, peritoneum, omentum, pleura, and in the lungs. In the latter situation they often break down and form cavities.

When the *blood* is examined microscopically the red corpuscles are seen to be very pale in colour, but they usually form rouleaux in the ordinary manner. Amongst them are corpuscles of much smaller diameter. The red corpuscles are considerably reduced in quantity, but there is seldom any material addition to the number of white corpuscles: indeed, in many cases, like the red cells they are diminished in number. Sometimes, however, the leucocytes may appear to be slightly more numerous than in the healthy subject; but even if the spleen be greatly enlarged, no increase sufficient to constitute leucæmia is observed in cases of true lymphadenoma, and the white cells never present the altered characters which are noticed in the former disease. As a rule, a greater excess of white corpuscles is seen in cases where the lymphatic growth is of the soft variety than where it is hard and chiefly fibrous. Forms of mixed disease are also sometimes met with in which there is increase in quantity of the splenic pulp. The affection has then some of the characters of leucocythemia.

Symptoms.—The symptoms of lymphadenoma may be divided into

those proper to the illness, which may be called the regular symptoms, and those which are irregular and accidental, being the consequence of the pressure set up by the growths upon the parts around.

The *regular* symptoms consist of the general constitutional disturbance excited by the disease, the changes in the state of the blood, and the presence of enlarged lymphatic glands.

The general constitutional symptoms may precede or follow signs of enlargement of glands. They consist of a febrile movement more or less high, with gradually increasing wasting, pallor, and loss of strength.

A little boy, aged three years, was under the care of my former colleague, Dr. Mitchell Bruce, in the East London Children's Hospital. The child had been ill and languid for three months before admission, gradually wasting and suffering from occasional attacks of diarrhœa. When brought to the hospital he was weakly, with a pale complexion and haggard, anxious look. His face often flushed up suddenly; his skin generally was harsh and dry. At first no special disease of organs could be discovered. The spleen could be felt projecting about half an inch below the ribs, the liver was normal in size, and no enlargement of the lymphatic glands was noticed. The boy coughed occasionally, but the physical signs about his chest were normal. His temperature on the first evening was 101.4°, and continued to stand at much the same level for some time. It sometimes sank to 99° and at other times rose suddenly for a few hours to 104°, but it usually varied between 100° and 101°. The boy continued in much the same state, being usually apathetic and dull, although he brightened up a little at times and would play listlessly with his toys. The course of the illness was very variable, and the child seemed much worse at some times than at others. Once or twice he seemed decidedly better and regained a few ounces of his weight, then he relapsed and wasted, rapidly losing a pound and a half in a week. Often he was drowsy, and his appetite was always poor.

As time went on the liver and spleen became moderately swollen, signs of enlargement of the bronchial glands were noticed, and deep pressure in the abdomen discovered some enlargement of the mesenteric glands.

The bowels remained more or less loose. The boy grew slowly weaker, and died after a residence of four months and a half in the hospital. There was never any œdema of the limbs, and the glands in the neck were not affected.

On examination of the body after death, large yellow, cheesy-looking masses were found adherent to the under surface of the breast-bone, and the anterior mediastinum was filled with a large mass of agglutinated glands. A similar mass was found in the abdomen in front of the spine just below the diaphragm and surrounding the head of the pancreas. The liver was large, soft, and flabby to the touch. Its section showed a half translucent appearance, and on close inspection this was found to be due to a multitude of closely set little masses, the size of a pin's head or less, some clear and transparent, others more yellow. The spleen also was large, and its section showed the appearance usually noticed in this disease and which has been already described. Both lungs were found on section to be pervaded with small masses of new adenoid growth.

In this case the general symptoms preceded the signs of local mischief. Often, however, especially if the illness begins, as it commonly does, with enlargement of the cervical glands, the affection has at first the characters of a local disease. But sooner or later, as the lymphatic tissue becomes

more and more involved, the patient begins to suffer from irregular fever and grows very decidedly anæmic.

The glandular swellings in the neck usually form an irregular nodular mass which may extend from one side to the other, passing underneath the chin, or may be limited principally to one side. At first the individual glands can be made out, and the masses are movable. Afterwards the glands become more welded together and the masses are fixed. The swellings are painless, and unless of very rapid growth are dense and firm to the touch. In some cases a mass of enlarged glands will become very soft and suppurate, forming an abscess which discharges and heals up in the ordinary manner. Besides the neck, enlarged glands may be felt in the axillæ and groins. In the armpits the size of the growths may interfere with the movements of the arms. Examination of the chest and belly often discovers a similar change in the glands lying in the anterior mediastinum and abdomen. The enlargement of the liver and spleen is usually moderate, although sometimes—especially in the case of the latter organ—it may be very considerable.

While the disease is limited to swelling of a few glands in the neck, the child, although pale, may be active and cheerful, apparently suffering in no way except from the local inconvenience. When, however, the glands grow rapidly, or the disease spreads from the neck to other parts of the body, constitutional symptoms begin to be noticed. Fever is almost invariably present, although in the earlier stage it is slight and intermittent. In the cachectic stage the temperature often rises to a high level, and for a few days together may range between 103° and 105°, sometimes even passing the higher limit. Sweating is not common ; indeed, in most cases the skin is excessively harsh and dry. The digestive organs almost invariably suffer. The tongue is covered with a white fur, and the papillæ are prominent and red. Ulcerative stomatitis may be present on the inner side of the cheek. The appetite is poor and indigestion and vomiting may be complained of. The bowels are sometimes costive, but often they are loose, and the dejections may be preceded by griping pains in the belly. The looseness is due in many cases to small ulcerations of the ileum. There is then usually abdominal swelling, increased tension of the parieties, and tenderness on pressure. More or less cough is a common symptom, and an examination of the chest often discovers signs of consolidation and softening. These lesions commonly result from growths in the lung which soften and break down into cavities.

Great apathy and dulness of mind are in many cases associated with the cachectic stage of the disease. The child may be found to sleep almost constantly, his senses seem dulled, and his wants are so little pressing that he asks for nothing and makes no complaint. Indeed, sometimes it is most difficult to get him to speak at all. The urinary function is rarely interfered with, but sometimes blood is passed with the urine. In a case reported by Dr. Goodhart—a little girl aged ten months—the child's water towards the end of the disease became red with blood.

The anæmia is usually extreme. The whole surface of the body is excessively pale, and the mucous membranes are singularly bloodless. Purpuric spots may be found on the body, face, and limbs, and sometimes larger dark purplish blotches are seen from more extended extravasation. Flushing of the face is a common symptom, and a redness of the cheeks at this time forms a curious contrast with the dead whiteness persisting round the mouth and eyes. A microscopic examination of the blood shows the diminution in the number of the red corpuscles which has been already

referred to. The white corpuscles are rarely in notable excess. As a consequence of the anæmia œdema may occur in the limbs, and there may be ascites. Pressure of the enlarged glands upon the venous trunks may also aid in the production of serous effusion.

A good example of the more common form of the disease, where the general constitutional disturbance occurs subsequently to the primary glandular enlargement, was seen in the case of a little boy, aged thirteen years, who was under the care of my colleague, Dr. Donkin, in the East London Children's Hospital. The boy came of a healthy family and had himself been strong and healthy until the age of eight years, when he was laid up for three months in consequence of a fall on his head and spine. In this illness the lad could not rest on his back or side, but was obliged to lie on his face. Although he began to walk again in two months' time, and was convalescent at the end of the third month, he never recovered his strength completely. Twelve months after his illness he was again laid up with pains in the chest and swelling of the face and arms. The swelling soon subsided, but the boy remained weak and complaining and was often under medical treatment.

On admission the patient complained of lumps in his neck which he stated were of three years' duration. For three months he had been losing flesh and his belly had been growing larger. His skin, he said, had been dry for some time. His legs had never swelled, but he had noticed a swelling of his scrotum for three or four days. He was subject to cramp-like pains about the umbilicus which were often severe, and the belly at these times was tender. He had had a cough for a month without expectoration, and his bowels had been relaxed for a week.

On examination the boy was found to be very thin, and his skin was dry, rough, and furfuraceous, especially about the belly. The cervical and submaxillary glands were enlarged on both sides so as to form a collar round the neck. The axillary and inguinal glands were normal. No enlargement of the liver or spleen was noticed. The abdomen was distended, with fulness of the superficial veins. There was some tenderness on pressure below the umbilicus, and the tension of the parieties was increased. No growth could be felt in the belly, and there was at first no ascites. There was some œdema of the scrotum, but none of the arms or legs. The tongue was red and rather raw-looking, and some superficial ulceration was noticed at the angles of the mouth and inside the left cheek. The bowels were relaxed, the stools being loose and lightish yellow in colour. There were signs of consolidation of the right lung. The urine was pale, slightly alkaline, but contained no albumen. An examination of the blood showed the absence of any excess of white corpuscles.

After admission the boy remained in a very apathetic state, and whether up or in bed seemed to be always drowsy. He would be found asleep with his head on his arms or curled up on a sofa. His face was habitually very pale, but at times it would flush up irregularly. He coughed occasionally, and expectorated tenacious mucus. His temperature was always high, rising at night to 103° or 104°. He continued to waste and grow weaker. Death was hastened by a severe attack of vomiting which produced great prostration, and he died soon afterwards.

After death the cervical, bronchial, retro-peritoneal, and mesenteric glands were found to be enormously enlarged, forming agglomerated masses in which, however, individual glands could still be made out. The enlarged glands were very tough. On section, the larger number were of yellowish tint and seemed fibrous, but a few were grayish and translucent.

Some contained caseous matter. New growths very similar in appearance were found in the pleura and peritoneum. There were some ulcers in the ilium and cæcum. The follicles of the tongue were swollen. Both tonsils were large and ulcerated. Small ulcers were found on the anterior wall of the trachea ; and on the posterior surface of the epiglottis were yellowish infiltrations of a roundish shape. All the mucous membrane in this neighbourhood was highly injected. Both lungs were the seat of consolidation which had broken down into cavities. The spleen was large, soft, and congested. The Malpighian tufts were not visible. The kidneys and liver were normal. The marrow of the right femur was mottled, red, and gray.

The *irregular* or *accidental* symptoms arise from pressure set up by enlarged glands or organs upon adjacent parts. Thus the swollen glands in the neck may press upon the jugular veins, and by impeding the escape of blood from the interior of the skull, cause heaviness, drowsiness, œdema of the head and neck, and epistaxis. They may also hamper the movements of the lower jaw, press the larynx and trachea to one side, and cause dyspnœa by their interference with the air-passages. Sometimes they obstruct the channel of the gullet so that food passes with difficulty or swallowing becomes actually impossible. Enlargement of the bronchial glands may produce dyspnœa, spasmodic cough, and all the symptoms which have been enumerated elsewhere as the consequence of pressure within the chest (see page 181). Growths of the mesenteric glands may set up ascites and jaundice by their pressure on the bile-ducts or portal vein, and œdema of the scrotum and lower limbs by their interference with the return of blood through the inferior vena cava.

Paralysis has been occasionally noticed. Thus Dr. Goodhart has reported the case of a little boy, aged six, who was admitted a patient under Dr. Pavy, in Guy's Hospital, for complete paraplegia, with incontinence of urine and deficiency of sensation below the umbilicus. After death a lymphomatous growth was found in the thorax, which had entered the spinal canal in the dorsal region by passing through the intervertebral foramina. Here it had lined the laminæ of the vertebræ from the axis to the eighth cervical segment. In addition it had formed a mass which at one point completely filled the canal, compressed the cord, and had formed adhesions with the cord and the dura mater. Below this point the subarachnoid tissue was distended with fluid.

In a case which was under my own care in the East London Children's Hospital—a boy ten years old, who suffered from an enormous mass of enlarged cervical glands on the right side of the neck, besides lesser enlargement of the mesenteric and inguinal glands—for some weeks before the child's death ptosis was noticed of the right eyelid, and on examination it was found that the pupil of that eye was somewhat dilated, and that there was paralysis of the internal rectus. At times, too, the boy complained of severe neuralgic pains in the right eyeball. After death, inspection of the body showed a mass the size of a walnut, which lay in the middle cerebral fossa, and was adherent to the dura mater covering the cavernous sinus. The mass had a prolongation which passed through the foramen lacerum medium and joined the general glandular mass in the neck. Its pressure upon the right third nerve had caused some atrophy of the nerve—for it was appreciably thinner than that on the left side—and had, no doubt, given rise to the paralytic symptoms which had been noticed during life.

The duration of a case of lymphadenoma is very variable. When the illness begins as a local disease, the course is usually very slow at the first,

and it may be years before the general glandular system becomes affected. When, however, the cachectic stage begins, the course is more acute. Still, the progress of the malady is always variable, and growth is more rapid at some times than at others. In the child the general disease rarely lasts longer than six or eight months. Death may result from asthenia or from some complication, as pneumonia, pleurisy, vomiting, or diarrhœa. It may be preceded by convulsions. Sometimes the end is hastened by the injurious effects of mechanical pressure upon the air-passages, the gullet, or the large veins of the abdomen.

Diagnosis.—In the diagnosis of a case of lymphadenoma we have to search for evidence of general affection of the glandular system. So long as the disease remains limited to a few glands of the neck the nature of the swelling is not always easy to ascertain ; but even at this time it may be sometimes distinguished by the elasticity of the growth, for, according to Birch-Hirschfeld, even in the harder variety of lymphadenoma there is a certain elasticity as compared with the dense, boardlike hardness of the cheesy gland. Moreover, there is no inflammation set up round the mass, and caseous degeneration and softening are very rare. In a group of scrofulous glands some usually soften early and form an abscess. In such a case, too, the general signs of scrofula may be noticed.

Sarcomatous glands present a greater likeness to lymphadenoma ; but when extension takes place in the former disease the tissues involved are not especially the lymphatic tissues ; indeed, the disease tends to spread rather to organs than to glands.

In the cachectic stage lymphadenoma is usually easy of recognition. The irregular fever, the extreme pallor, the great drowsiness and unwillingness to speak, the general implication of lymphatic glands in all parts of the body, the character of the blood, which shows diminution in the number of red corpuscles with no or only slight increase in the proportion of leucocytes. These symptoms are sufficiently characteristic.

Prognosis.—Although some cases of recovery from this disease have been recorded, the illness is so generally fatal that little hope of a favourable issue can be entertained. In the cachectic stage speedy death may be anticipated. In the earlier period a prolonged course may be hoped for, especially if the enlargement is slow ; but it is unwise to speak too favourably even of this prospect, for the disease may at any time suddenly assume an acuter character, and variations in the rapidity of its progress are not uncommon. Examination of the blood may be of some service in estimating the probabilities of a lengthened course. If the number of red corpuscles is greatly reduced, the child's prospects are very unfavourable.

Treatment.—In every case the child should be put into as good sanitary conditions as possible, and every effort should be made to improve the general health. Cod-liver oil, iron, quinine, and tonics generally are useful in this respect, but none of these remedies have the power of delaying materially the progress of the disease after the affection of the lymphatic glands has become general. Arsenic, however, is highly spoken of for its value, even in this stage of the disease. The dose should be a large one ; and it must be remembered that most children have a special tolerance for this drug, being often able to take it in larger quantities than can be readily borne by the adult. For a child of eight years old ten drops of Fowler's solution may be given three times a day, freely diluted, directly after food, and every few days the dose can be increased by two drops. The effect of the medicine is to increase the softness and mobility of the glands. Soon pain begins to be complained of in the swellings, and this

is quickly followed by an arrest in their growth, or even an appreciable diminution in their size. Iron may be given with the arsenic if thought desirable, and the combination is preferred by some. Phosphorus has been also recommended as useful in promoting reduction in size of the glands ; but this drug appears to be decidedly inferior to arsenic. Iodide of potassium has been found quite useless as an absorbent in this disease.

If the patient come under observation when the glandular swelling is limited to the neck, and the general system appears to be unaffected, we may begin the treatment with greater hopes of success. Early extirpation of the growths is often advocated, and the operation is said to have been followed in some cases by complete recovery. Even if this happy result be not attained, we may expect that in a suitable case the progress of the disease will be sensibly checked by the operation. We can, however, only anticipate good results when the glandular enlargement is limited strictly to one group of glands, the spleen is unaffected, and the proportion of red corpuscles in the blood is not greatly reduced. Dr. Gowers recommends that in every case the actual proportion of red corpuscles be estimated by the hæmacytometer, and states that if the proportion of coloured cells be less than sixty per cent. of the normal average, the idea of operating should be abandoned. On the other hand, a slight increase in the quantity of white corpuscles is not to be considered prejudicial to the success of the operation. After removal of the swollen glands the child should be sent to a bracing seaside air, and arsenic with quinine or iron should be given in full doses.

According to some writers, friction of the growing glands with the hand alone or with some simple salve has been found useful, and compression and blistering have been also recommended. Injections into the glands of various substances, such as iodine, carbolic acid, etc., is not a safe method of treatment. In one case in which I injected tinct. iodi into a large lymphomatous swelling the operation was followed in a few days by a rapid and permanent increase in the size of the tumour.

CHAPTER III.

ANÆMIA.

Deterioration in the quality of the blood, combined often with deficiency in its quantity, is a common result in infancy and childhood of any condition which causes a temporary failure in the nutritive processes. In the child anæmia is commonly symptomatic of some discoverable ill; for the obscurer form, called idiopathic or pernicious anæmia in the adult, is but rarely met with in early life.

The reason of the exceptional frequency of impoverishment of the blood in childhood is not difficult of explanation. From the researches of Denis, Poggiale, Wiskemann, and others, it appears that in infancy although the quantity of blood is greater than it is in maturer life, in proportion to the entire weight of the body, this blood is of lower specific gravity, and contains more white corpuscles, but less fibrine and soluble albumen, a smaller proportion of salts, and a considerably smaller quantity of hæmoglobin.[1] With this comparatively dilute blood the growing child has to undertake a larger work than is required from the adult. He has to supply material for growth and development instead of merely maintaining the necessary nutrition of tissues and organs already matured. The heart and lungs are forced to greater efforts to answer the demands made upon them: the first to drive a sufficient quantity of blood along the relatively wider arterial channels; the second to aërate the larger proportion of blood carried to them by the more capacious pulmonary artery. The lungs eliminate carbonic acid in far higher proportion than is the case in older persons. The amount of urea, too, excreted by the kidneys is relatively much greater than it is in the adult. The work required from the different secretory and excretory organs whose united labours go to build up the growing frame may be judged from the fact that within twelve months of its birth the body has increased to three times its original weight. As Dr. Jacoby has observed, the "organs are in constant exertion, or rather overexertion, and all this at the expense of a blood which contains less solid constituents than the blood of the old. Thus the natural oligæmia of the child is in constant danger of increasing from normal physiological processes. The slightest mishap reduces the equilibrium between the capital and the labour to be performed, and the chances for the diminution in the amount of blood in possession of the child are very frequent indeed."

Although the blood of the child is thus relatively poor as compared with that of the adult, a constant inflow of nutrient material enables it to preserve a healthy standard and carry on its functions with success. The

[1] Hæmoglobin is the chief constituent of the red corpuscles. In the newly born infant its amount is relatively larger than it is in the adult, reaching the high ration of 22.2 per cent. of the whole solid constituents (at adult age it is only 13.99 per cent.). This high percentage rapidly diminishes until it reaches the lowest point at the age of six months. It then slowly rises again.

amount of food consumed by the growing child is far greater proportionately than that required by the fully developed man. According to Dr. Edward Smith, the infant as compared with the adult consumes three times as much carbon and six times as much nitrogen for every pound of his weight. If now, from any cause, either from deficiency in the supply of food, or derangement of the machinery by which food is elaborated and prepared for its purpose of nourishing and renewing the tissues, the inflow fails, the standard of the blood at once sinks below the average of health, and a state of anæmia or oligæmia (poorness of blood) is induced.

The constituents of the blood which are of the greatest importance in nutrition are the albuminoid compounds of the plasma and the red blood corpuscles. The albuminoid compounds constitute the material out of which the tissues are nourished; the hæmoglobin of the red corpuscles carries the oxygen, without which the chemical changes necessary for nutrition are impossible. In anæmia the blood is impoverished in its albuminous constituents, especially in its hæmoglobin. Therefore, as the amount of iron is in direct proportion to the amount of hæmoglobin, a diminution in the latter means a deficiency in the former; and as the chief office of the hæmoglobin is that of conveying oxygen to the tissues, the blood in anæmia is no longer able efficiently to perform its respiratory and nutritive functions.

Causation.—In early life any cause which interferes with the orderly renewal of the normal constituents of the blood leads to anæmia. In the infant—a being who is dependent for health upon a full daily supply of food—not only serious disease but even the most simple acute derangement will leave the blood in a state of temporary oligæmia. This is usually rapidly recovered from, for in the healthy child convalescence is short, and the nutritive functions quickly resume their course when the obstacle to their proper exercise has disappeared. By anæmia, however, is usually meant a more prolonged poorness of the blood—a condition in which the symptoms of general debility are allied with others indicating an imperfect performance of the bodily functions.

The causes of such a condition may be divided into two classes, according as to whether they interfere with the continued renovation of the blood or abnormally increase its consumption.

In the first class are included all the various conditions which hinder the introduction and elaboration of nutritive material. Thus, actual deficiency of food, such as arises from extreme poverty or wilful neglect; an unsuitable diet, the stomach being loaded with food which, from its nature or form, is beyond the child's power of digestion; functional derangements of the gastro-intestinal canal, owing to which an otherwise suitable food is rendered temporarily inappropriate—these causes may prevail at all periods of childhood, but are especially frequent during the period of infancy; and the anæmia and wasting which are so common in hand-fed babies can usually be referred to the action of these agencies. To them must be added the influence of imperfect ventilation. Oxygen is as essential to healthy tissue change as are the elements of food themselves, and in its absence the chemical changes necessary for the renewal and development of the tissues are impossible. Consequently infants confined to close, ill-ventilated rooms are pale and flabby, however carefully their dietary may be adjusted.

The above causes are also powerful to impede nutrition and promote the impoverishment of the blood after the period of infancy has gone by. The influence of digestive derangements, combined or not with want of

fresh air and exercise, is one of the commonest causes of anæmia in later childhood. The causes which induce impoverishment of the blood are no doubt often complex; but of such as act alone imperfect digestion from catarrh of the stomach is perhaps to be blamed more often than any other injurious condition. These attacks tend to be repeated, and, as is elsewhere explained, recurring gastric catarrh may induce a degree of pallor and wasting which excites the greatest alarm in the minds of the parents, and often requires very careful treatment for its prevention and cure (see Gastric Catarrh).

Again, the diathetic diseases—tuberculosis, scrofula, and syphilis—often induce a degree of anæmia, even before any local manifestations of the constitutional disposition are discoverable. In syphilis, also, the disease, after apparent recovery, is apt to leave behind it a state of profound anæmia, which in many cases is to be attributed, not to the malady, but to the medication to which the patient has been subjected; for a prolonged course of mercury is an unfailing cause of impoverishment of the blood. In rickets, the beginning of the disease is announced, and its progress accompanied, by a marked degree of anæmia, which indicates the unfitness of the blood in such a case to fulfil all the requirements of healthy nutrition. Of other special general diseases which may lead to diminution in the amount of hæmoglobin and so set up anæmia may be mentioned rheumatism, scurvy, and the cachectic condition induced by malaria.

Disease of special organs concerned in sanguification—the spleen, the lymphatic system, etc.—is, of course, followed by great alteration in the quality of the blood. In extensive amyloid degeneration of these organs, the marked pallor of the patient is one of the most striking symptoms of the disease; and in lymphadenoma the patient is peculiarly pale and bloodless.

The causes which increase the consumption of the blood are: Profuse hæmorrhages, as in melæna neonatorum, hæmophilia and hæmorrhagic purpura; severe diarrhœa; chronic purulent discharges, as in cases of chronic empyema with a fistulous opening in the chest-wall; cirrhosis of lung with dilatation of bronchi; albuminuria; onanism; etc. In this class, too, must be included rapid growth, which is a very frequent source of languor and anæmia. It must be remembered, however, that at the age when growth is apt to be most rapid the child is often exposed to other influences which may also tend to set up impoverishment of the blood, such as confinement to close rooms and want of exercise.

Idiopathic anæmia (which is sometimes seen in young people) may result from bad and insufficient food or other depressing cause acting upon the general system; sometimes it is the consequence of mental shock, as in the case of a boy who was under the care of Sir William Gull, in Guy's Hospital. The lad began to suffer shortly after being attacked by a number of sheep in a field.

Morbid Anatomy.—In anæmia the blood may be merely deficient in amount (oligæmia), but it is usually found that there is also a deficiency in the hæmoglobin (aglobulosis). It is not often that actual diminution in the number of the red corpuscles occurs in ordinary symptomatic anæmia unless, indeed, the impoverishment result from severe hæmorrhage; but these bodies are said to be considerably reduced in size, and in certain forms of anæmia it is common to find many corpuscles with a diameter greatly below the average. The blood is paler than natural, for in consequence of the decrease in the hæmoglobin it is deficient in iron. Its specific gravity is also lower, and it coagulates slowly into a loose clot.

As a result of the imperfect nutrition of the tissues which is the consequence of the deteriorated quality of the circulating fluid, a degree of fatty degeneration may be found in the heart, the liver, the kidneys, and even in the walls of the blood-vessels; also in the voluntary muscles, and the glands of the stomach and intestines.

In idiopathic anæmia fatty degeneration of organs is also commonly observed. There are, moreover, ecchymoses of serous membranes, the retina, etc. The blood is not only diminished in quantity, but the red blood corpuscles are also greatly reduced in number, being, according to M. Lépine, one-fourth, one-sixth, or even one-tenth of their normal proportions. The white corpuscles are not more numerous than natural, at least they are not increased to anything like the degree observed in leukhæmia. In some cases of pernicious anæmia minute red corpuscles have been noticed measuring only one-fourth of their natural size, and wanting the characteristic bi-conate shape. These bodies, however, appear not to be present in every case.

Symptoms.—Poorness of the blood implies an imperfect state of the general nutrition. This is especially the case in young subjects whose blood, as has been already explained, can only carry on its functions efficiently on the condition that it is continually reinforced by a regular inflow of properly elaborated nutritive material. Consequently, in addition to a general pallor, the muscles of such subjects are small and flabby, their strength is reduced, and their spirits may perhaps be depressed. Languor and indisposition to exercise are not, however, constant symptoms of anæmia in childhood. Boys suffer in this respect much less than girls, and when free from actual pain or discomfort such patients are often lively, and join with as much alacrity in boisterous games as if they were perfectly well. Indeed, this cheerfulness and activity may in some cases be an important aid to diagnosis (see Tuberculosis).

The tint of the skin may be a clear, transparent whiteness. Often, however, it is dull and pasty; or may have a faint greenish cast similar to the hue of chlorosis, and the lower eyelid may be livid and purplish. The mucous membranes are also pallid. Coldness of the extremities is a familiar feature of this condition. In anæmic little girls we are often told that the feet and legs are never warm, and the hands feel cold and clammy to the touch. Slight œdema is often met with. It may affect the lower eyelid, but less commonly than in the adult. Usually it is noticed in the feet and ankles, and if the anæmia be great, may involve also the hands and arms. In rare cases there may be moderate ascites.

Breathlessness and palpitation on slight exertion sufficiently pronounced to cause distress are not common symptoms of anæmia in the child, but they are sometimes present. The appetite is often poor, discomfort may be complained of after food, and the bowels are usually confined. As this condition of the blood is in many cases a consequence of gastric derangement, all the symptoms which are elsewhere enumerated under the heading of gastric catarrh are often to be noticed. Flatulence, especially, is a common phenomenon, and faintness or actual syncope may occur from pressure upwards against the heart of a suddenly distended colon. The temperature is seldom elevated in an uncomplicated case of simple anæmia. Pyrexia may, however, be present as a consequence of the cause to which the impoverishment of the blood is owing, or to some accidental complication, such as teething, catarrh, etc.

Children, the subjects of anæmia, are usually very nervous and excitable, and on examination of the chest we often find the heart acting violently,

can notice a strong pulsation in the neck, and with the hand placed upon the præcordial region can feel a well-marked systolic thrill. As the violence of the cardiac action subsides the thrill ceases, and the carotid pulsations diminish or disappear. The sounds may then be heard to be ill-accentuated, or perhaps murmurish. Although anæmic cardiac murmurs are said to be uncommon in young subjects, it is not rare in cases of pronounced anæmia to detect a murmur which ceases to be heard as the patient improves. The murmur may be at the apex of the heart and is—sometimes at least—accompanied by displacement of the apex-beat upwards and to the left, as if from dilatation of the left ventricle. Basic murmurs are, however, the more common phenomena. At the base of the heart the least pressure upon the pulmonary artery from enlarged bronchial glands will give rise to a loud systolic murmur in that vessel. In many cases we can hear a venous hum in the jugular vein in the neck, sometimes, also, in the left innominate vein, behind the upper part of the sternum.

Bleeding from the nose and gums is not rare in anæmic children ; and in hospital patients petechiæ are common in the skin as the result of flea-bites. From this cause the bodies of poor children are often speckled all over with little extravasations of blood.

Pain across the forehead, or sometimes at the back of the head, is often complained of. In infants more serious symptoms may be met with as a consequence of anæmia of the brain. The child lies with a pale shrunken face, eyelids only partially closed, and fontanelle depressed. His extremities feel cold, and a thermometer in the rectum registers a temperature below the normal level. Soon the infant sinks into a state of semi-stupor, and unless aroused by energetic stimulation will probably die. Impoverishment of blood and prostration so profound are apt to be complicated by thrombosis of the cerebral sinuses or collapse of the lung.

The duration of a case of ordinary simple anæmia varies according to the measures which may be taken to remove the cause or causes which are impeding the supply of nutritive material to the blood. If the cause can be removed, and the child be afterwards fed with judgment and placed under good sanitary conditions, recovery usually follows very quickly.

In *idiopathic anæmia* all the preceding symptoms may be noted. In this form of the disease the anæmia is more profound. The skin is of the colour of ivory and the mucous membranes seem perfectly bloodless. Optic neuritis may occur with hæmorrhage into the retina. Epistaxis is common, and vomiting may be frequent and distressing. The child becomes excessively feeble, and has irregular attacks of pyrexia in which the temperature rises to 103° or 104°. Towards the end of the disease, however, elevation of temperature ceases to be noticed ; indeed, the bodily heat usually falls to a subnormal level. The blood has the characters already described.

Diagnosis.—In every case of anæmia it is important with regard to prognosis and treatment that we should exclude serious organic and diathetic disease. The diagnosis of the many conditions which induce impoverishment of the blood is treated of under their several headings. It may be only stated generally that if the cause lie elsewhere than in some obvious derangement of the digestion, we should institute very searching inquiry into the family and special history of the patient, particularly with regard to diathetic tendencies, and should make careful examination of the various organs.

Idiopathic anæmia may be distinguished by the profound deterioration of the blood without increase in the white corpuscles ; the absence of discoverable cause for the pallor and weakness ; and the attacks of irregular

pyrexia. Leucocythemia is characterised by increase in the proportion of white corpuscles, and by enlargement of the spleen or lymphatic glands.

Prognosis.—In anæmia the prognosis depends very much upon the primary disease, if any such can be discovered. If the poorness of blood be the sequel of some previous acute illness, or other cause which has ceased to prevail, the patient usually responds well to treatment and quickly recovers under ordinary restorative measures. In cases of idiopathic anæmia, when the prostration is great, the pallor extreme, and the temperature high, the child's prospects are very unfavourable.

Treatment.—Anæmia must be treated according to the cause which has produced it. Impaired nutrition and a pallid face form in themselves no necessary indication for the employment of chalybeate remedies. The commonest cause of anæmia in the child, as has already been stated, is gastro-intestinal derangement. In such a case iron has no power to improve the condition of the blood until the hindrance to digestion has been removed. In anæmic infants the dietary must be reconstructed upon the principles recommended elsewhere (see Infantile Atrophy). In older children if, as often happens, the patient be suffering from repeated attacks of gastric catarrh more or less severe, the digestive disturbance must receive careful treatment, and measures must be adopted to lessen the child's susceptibility to changes of temperature and to protect his sensitive body from the cold (see Gastric Catarrh). In all cases plenty of fresh air should be prescribed. The parents should be warned of the necessity of thorough ventilation of nurseries and sleeping-rooms, and the child must be sent out as much as possible into the open air. It is important, however, not to force the patient to take exercise when his feeble powers will not admit of his deriving benefit from muscular activity. If his weakness be great, the child should go out only in a carriage; and when in-doors care should be taken that his wearied muscles are allowed a sufficiency of needful rest. As he mends, however, he should be urged more and more to exert himself, and in severe cases a desire for exercise is a valuable sign of improvement.

The child must take plenty of nitrogenous food, and if, as sometimes happens, the appetite is poor, with a special dislike to meat, his fancies must be consulted in every way possible. Often a child will eat a small bird, as a lark or a snipe, when he turns with disgust from beef and mutton. Pounded underdone meat spread upon bread and butter will often be taken, or the meat may be diffused through a meat jelly. Eggs, milk, and fish are all of service, and a moderate quantity of farinaceous food may be allowed; but the child must be prevented from taking starchy matters to the exclusion of more nutritious articles of diet. When the appetite is poor, it may be often improved by taking three times a day a drop or two drops of the dilute hydrocyanic acid (P. B.) with five grains of bicarbonate of soda in infusion of orange peel. The draught can be sweetened with spirits of chloroform, and should be taken an hour before meals.

Iron is only to be resorted to as an addition to the more general measures for restoring nutrition and improving digestive power, and it must not be given until the disorder of the gastric functions has been attended to. Iron acts far more energetically when it is combined with aperients. Often, indeed, until the bowels have been well relieved by appropriate purgation the remedy seems to be perfectly inert. Not seldom, after giving an iron mixture perseveringly for a length of time without any sign of improvement, I have noticed an immediate alteration for the better when

the chalybeate has been exchanged for a morning and evening dose of the compound senna mixture of the British Pharmacopœia. The form in which the iron is given is of little importance. The dose should always be as large a one as the child can bear without discomfort; and if the digestion be in good order, the acid preparations are to be preferred as a rule to the alkaline salts. Still, if there be any remains of catarrh of the stomach, the ammonio-citrate should be given with an alkali. Most children bear the sulphate of iron well. For a child of six years old, five grains of the dried salt may be given in a teaspoonful of glycerine three times a day directly after food. This dose may seem rather a large one, but it is rare to find any signs of irritation produced by the medicine, and the tonic effect upon the system is usually rapid and decided. The perchloride is also a good form for administration of the remedy. Twenty to thirty drops, well diluted with water and sweetened with glycerine, may be taken after each meal. These preparations are far more useful than the various iron syrups which are commonly preferred. I have seen many a case of anæmia arising from gastric catarrh prolonged by the use of these syrups, which promote acidity and flatulence and encourage the excessive secretion of mucus.

In some children almost all forms of iron seem to act as direct irritants to the stomach, inducing indigestion and peevishness of temper and causing wakefulness at night. In these cases the dialysed iron is the best form in which the remedy can be administered. Pure chalybeate waters are also of service if the child can be induced to take them. Their value is, no doubt, enhanced by the fresh country air and exercise by which the change to a chalybeate spring is usually accompanied.

Under the use of iron the red corpuscles increase in size and the proportion of hæmoglobin is therefore largely augmented. The improvement is announced by a healthier tint in the complexion, an improvement in the appetite, and, if the child had been previously listless and dull, by greater freedom and sprightliness in his movements.

Arsenic is another remedy of great value in improving the condition of the blood. Children bear arsenic well. The drug, unless given in very large quantities, is rarely a cause of gastric irritation. In fact, as is well known, arsenic in small doses is a valuable sedative to the digestive organs and often arrests vomiting. As a tonic the remedy should be given to a child of six years old in the dose of three or four minims of Fowler's solution directly after food. When the digestion is greatly impaired by repeated attacks of gastric catarrh the effect of this medication is often very striking. The arsenic may be usefully combined with a drop or two of the tincture of nux vomica. Another remedy from which good results have been obtained is phosphorus. This powerful drug may be safely given to a child of six years old in doses of $\frac{1}{120}$ to $\frac{1}{100}$ of a grain. I have, however, no personal experience of its value.

Cod-liver oil is of service as an additional food, and in combination with iron wine is a favourite remedy in all forms of anæmia in young subjects. The alcohol of the vinum ferri is no doubt a valuable therapeutic agent. Alcoholic stimulants taken with food help to promote digestion, and in many pallid, weakly children have great virtue in aiding the return to health. Sound claret, or the St. Raphael tannin wine, diluted with an equal proportion of water, is usually taken readily by the child, and is a sensible help to other treatment.

Cold-water packing is said to be useful in improving the condition of the blood. Drs. M. P. Jacoby and V. White have reported a series of

cases in which anæmia was treated by the regular application of the cold pack followed by massage. The patient was enveloped in a cold wet sheet, this was covered by a drier sheet, and over all six blankets were laid and carefully tucked in. After the lapse of an hour the coverings were removed and the skin and muscles were vigorously shampooed. This plan of treatment was combined with rest and careful feeding, and was attended by very good results. It might be employed with advantage in the case of weakly, pallid children in whom anorexia is a marked feature, for one of its most pronounced effects was found to be an immediate improvement in the appetite. The induction of sleepiness by the pack and massage is usually an indication that the patient is benefiting by the treatment.

CHAPTER IV.

ENLARGEMENT OF THE SPLEEN.

Enlargement of the spleen is common in early life, and is found in the course of a variety of diseases. The symptom is alluded to incidentally in the descriptions of the various forms of illness in which the phenomenon occurs; but the subject is of sufficient importance in a clinical point of view to deserve a special chapter for its consideration.

A splenic tumour may be of acute or chronic growth. Acute enlargement is seen in typhoid fever and ague, sometimes in acute tuberculosis, and, it is said, in cerebro-spinal fever; also the enlarged spleen found in cases of leucocythemia may be included in this class, for in early life leukhæmia often runs an acute course. Rapid increase in size of the organ is also occasionally met with as a result of splenic embolism in the course of ulcerative endocarditis.

Chronic enlargement of the spleen may be the consequence, and sometimes the only manifestation, of the cachectic condition induced by malarious poison. It occurs in some cases of amyloid degeneration, although a spleen so affected is not always increased in size. It is a common symptom of lymphadenoma, is not unfrequently a consequence of atrophic cirrhosis of the liver, and may be met with in cases of old-standing disease of the heart. Lastly, it may be due to a simple hyperplasia. Hypertrophy of the spleen may occur in rickets and syphilis, especially the latter; but is also found in cases where syphilis may be positively excluded, and in cases, too, where there is no reason to suspect any malarious origin of the swelling.

In the child a spleen is not necessarily diseased because its lower edge is within reach of the finger. The healthy organ is sometimes pushed down, so as to be felt. This displacement may occur in cases of copious effusion into the left pleura, and is common in rickets where there is much retraction of the ribs.

In determining the existence of enlargement of the spleen it is not sufficient merely to ascertain the position of the lower edge; for considerable swelling of the organ may be present although its inferior border does not project below the margin of the ribs. In the child the spleen often extends backwards and upwards as well as downwards, and may reach posteriorly to the spinal column. By percussion in such cases we can often detect dulness in the axilla reaching upwards as far as the fourth or fifth rib, and in the back extending as far upwards as the inferior angle of the scapula. In all cases where a splenic tumour is suspected the size of the organ should be estimated by percussion as well as palpation. When the lower part of the organ projects below the ribs into the abdomen it is easily felt by laying the hand flat upon the belly and pressing gently with the finger tips. That the swelling thus discovered is due to increase in size of the spleen is indicated by the superficial position of the tumour, by the comparative thinness

of its inner border, and by the notch which can often be distinctly perceived by the finger.

An enlarged spleen is usually firm and resisting to the touch, especially if the enlargement is a chronic process. In typhoid fever, however, the substance of the swollen organ is unusually soft, and on this account can sometimes be only felt by a practised finger. In acute forms of swelling the increase in size is accompanied by some tenderness on pressure. In chronic enlargements there may be also tenderness, but this is commonly due in such cases to the presence of local peritonitis.

In the present chapter it will be unnecessary to refer again to all the forms of splenic tumour met with in the child. It will be sufficient to consider the chronic enlargement which occurs as a consequence of a simple hyperplasia of the organ.

Simple Hyperplasia of the spleen is a not uncommon condition in infancy and early childhood. Often the patient may bear traces of inherited syphilis or show some symptoms of rickets; but this is not always the case, and sometimes no sign of diathetic disease or constitutional weakness is anywhere to be detected. When the enlargement is thus present in a child of apparently healthy constitution its etiology is difficult to establish. In some of the cases which have come under my notice the enlargement has been preceded by gastro-intestinal derangement. In others the child has been subject to frequent attacks of pulmonary catarrh. Sometimes the splenic tumour was first discovered shortly after an attack of measles; but it is difficult to admit a connection between these derangements and the splenic hyperplasia.

Morbid Anatomy.—When enlarged from simple hypertrophy the spleen retains its normal shape. It is firm and smooth; its capsule is thickened; and a section shows a pale red or reddish purple surface, with the Malpighian bodies more or less distinctly visible.

Symptoms.—The existence of enlargement of the spleen is at once indicated by the complexion of the child. The whole body—both skin and mucous membranes—is pale and bloodless; but the tint of the face is characteristic. It has something of the colour of ivory or wax, with the addition of a faint olive cast which is not found in either of these substances. Often we notice a curious transparency, especially about the mouth and eyelids. The belly is large and the spleen can be readily felt as a smooth, firm mass. If the increase in size is great, the tumour projects diagonally across the abdomen, and presents on its inner surface the abrupt edge broken towards the middle by the notch. Usually the organ projects upwards and to the back as well as downwards, and its limits in these directions can be estimated by percussion. Sometimes it is freely movable by the hands, and it always descends when a deep breath is taken, rising again in expiration.

Although pale and bloodless the child has often a considerable amount of flesh, and is greatly wasted only in exceptional cases. He is, however, weak and languid. The bowels are often irritable, and in children of three or four years old the appetite is capricious and perhaps perverted, so that the patient shows a curious tendency to eat cinders, chalk, slate-pencil, and other gritty or even disgusting substances. Œdema of the lower limbs and eyelids is sometimes noticed, and petechiæ and bruise-like patches may be present in the skin. There is also a marked tendency to epistaxis.

On examination of the blood the red corpuscles form rouleaux in the usual manner; but tested by the hæmacytometer their number is found

to be reduced considerably below the normal average, and the white cells are often appreciably increased, although seldom to the degree observed in cases of leucocythemia. Sometimes both red and white corpuscles are irregular in shape.

A little boy, aged one year and seven months, was said to have been born strong and healthy. He was the youngest of four, his elders being all strong and well. He did not snuffle after birth, nor were any spots noticed at that time on the buttocks. Until the age of ten months the child excited no anxiety, but he then began to get pale and to lose flesh. He had been lately very restless at night.

On examination the infant was seen to be very anæmic over the whole body, and his complexion was of a dull yellowish-white, especially on the cheeks. He was thin although not emaciated, and his expression showed no sign of distress. The child was the subject of slight rickets, he had only two teeth, his chest was a little flattened laterally, and there was insignificant enlargement of the epiphyses of the long bones. His legs were small, and he had never been able to walk. The fontanelle was about half an inch in diameter. The frontal bone was rather prominent on each side of the middle line, and there was some inconsiderable thickening of the parietal bones. Cranio-tabes was well marked.

The belly was very full and prominent, especially on the left side. As the child lay on his back, the lower border of the spleen was found to reach to the left crest of the ilium, and the inner margin passed obliquely downwards from beneath the ribs to within two fingers'-breadth of the right anterior superior spine of the ilium. The notch was felt just above the umbilicus. The organ was freely movable, descending appreciably in inspiration, and it could be pushed upwards until its lower border was on a level with the navel. Its substance was firm and hard, and its surface smooth. The upper border, estimated by percussion, rose to within two fingers'-breadth of the inferior angle of the left scapula. The edge of the liver was one inch below the costal margin. A small nodule could be felt on each side behind the ramus of the lower jaw; otherwise there was no enlargement of the lymphatic glands. A little blue mark, like a bruise, was noticed on the forehead, and there was another on the back, but there were no petechiæ present on the skin. There was no œdema of the legs. The child's appetite was good, and he was not suffering from digestive disturbance. An examination of the blood showed no excess of white corpuscles.

Children in whom great enlargement of the spleen exists are very subject to gastro-intestinal troubles, and in consequence of their weakness are frequent sufferers from every form of catarrhal derangement. In fact, they usually die from a severe diarrhœa or an attack of bronchitis or catarrhal pneumonia. If they escape these accidents recovery is not impossible. We sometimes find the spleen gradually diminish in size and eventually return to its normal dimensions.

A little boy, aged twelve months, with no teeth, was brought to me, as he was said to be weakly. The child had been reared by hand, and was subject to attacks of sickness. A short time previously, during a visit to the seaside, he had been jaundiced. There was some slight enlargement of the ends of the bones and his fontanelle was large. The child could not stand, but liked to be danced about and played with. His complexion was excessively pale, with a faint olive cast. The abdomen was full, and the spleen, which was large and hard, reached to the level of the navel. The child was put upon a nutritious diet, and was ordered cod-liver oil

and plenty of fresh air. In five months' time he had cut ten teeth, and although still pale, had a better complexion. Seven months afterwards (twelve from his first visit) he had sixteen teeth and could run about well. His spleen was now greatly reduced in size, being just perceptible below the ribs. His complexion was good and he seemed perfectly well.

In this case no special medication was attempted with the object of reducing the size of the spleen. The general weakly state was improved by fresh air and a suitable dietary, and cod-liver oil was given on account of the signs of incipient rickets. Moreover, further intestinal catarrhs were prevented by a carefully applied abdominal bandage. The hope that under these altered conditions the size of the spleen would diminish as the general health improved was perfectly justified by the event.

Diagnosis.—There is little difficulty about the diagnosis of these cases. The complexion of the child is very characteristic. Indeed, in a young child extreme anæmia should always direct attention to the spleen. When a hard lump is discovered in the left side of the abdomen, it is easy to ascertain if the swelling is due to splenic enlargement. The superficial position of the tumour; its passing upwards beneath the ribs; its less rounded inner edge, with a perceptible notch; the free mobility of the mass, which can be pressed upwards by the fingers, and may be seen to move in correspondence with respiration, descending when a deep breath is drawn, and rising again with the diaphragm as the lungs contract—all these signs leave little doubt of the nature of the enlargement. That the tumefaction is a simple hypertrophy, and is not due to lymphadenoma or leucocythemia, is inferred from the absence of lymphatic enlargements in the former case, and in the latter from the small increase in number of the white corpuscles of the blood.

Prognosis.—The prospects of the child in simple hyperplasia of the spleen depend in a great measure upon the care bestowed upon him, and the watchfulness with which he is guarded from intercurrent ailments. The prognosis is therefore much more favourable in the case of children of well-to-do parents than in those belonging to the class by which our hospitals are supplied. If the patient show marked signs of rickets or syphilis, a cure can hardly be anticipated; but if the signs of rickets are only moderately developed, or the syphilitic origin of the enlargement is merely a matter of suspicion, the child, under favourable conditions, has a fair chance of recovery. Any considerable excess of white corpuscles in the blood must greatly diminish our hopes of a successful termination to the case.

Treatment.—In the treatment of cases of simple hypertrophy of the spleen we must not allow our attention to be directed too exclusively to the swollen organ, to the neglect of the general health. Much injury is often done in these cases by long courses of mercury or iodide of potassium, and the energetic application of mercurial ointments to the left hypochondrium.

Our first care should be to attend to any gastro-intestinal derangement which may be interfering with the patient's nutrition. Vomiting must be stopped, looseness of the bowels must be arrested, and the diet must be arranged so as to supply the most ample nourishment with the least tax upon the digestive powers. Most of the patients are weakly children under two years of age. They must therefore be dieted upon the principles recommended in the chapter on Infantile Atrophy. Milk, yolk of egg, Mellin's food, Chapman's baked flour, broths, thin bread and butter, and, if the child is eighteen months old, raw or underdone mutton, pounded

in a mortar and strained through a fine sieve, should be given. Watchfulness must be exercised that the size and frequency of the meals are duly proportioned to the digestive capabilities of the patient; and in the case of milk, in particular, it is important, by careful inspection of the stools, to satisfy ourselves that curd is not passing away in large quantities by the bowels. If this be the case, milk should not be given pure as a drink, but be always mixed with barley-water or other thickening material, so as to aid its digestion by insuring a fine division of the curd. Three or four grains of pepsine, given just before the three principal meals, will be of great assistance in these cases.

Having attended to the diet, attention should next be directed to the clothing of the child. These patients, especially if they show any signs of rickets, are very sensitive to changes of temperature, and it is of extreme importance that they should be thoroughly protected from chills. The belly should be covered with a broad flannel belt. This must be applied carefully, so as to cover the whole of the abdomen, from the hips to the waist, and should fit closely to the skin. In cold or changeable weather the child's legs and thighs should be protected by long woollen stockings, and all his underclothing should be of flannel or wool. So protected, the patient must be taken out of doors as much as possible, and in suitable weather should pass the greater part of the day out of the house. Before he leaves home, his feet should be examined to see that they are perfectly warm; and in cold weather it is best to pack the child in a perambulator, so that his back and sides may be properly supported. His feet can then rest upon a hot-water bottle. If the patient be sent to a good seaside air, the effect of these measures is often very marked.

For medicine, unless there are positive signs of syphilis, mercurials and other lowering drugs should not be employed. The best treatment consists in the use of iron in full doses and cod-liver oil; but this treatment must not be begun until the bowels have been put into a healthy state by appropriate remedies. For a child of eighteen months of age two or three grains of the exsiccated sulphate of iron may be given in glycerine; or ten drops of the tincture of perchloride of iron may be administered, freely diluted with water and sweetened with glycerine, three times a day after meals. Quinine is also of service, and may be given in conjunction with the iron. The value of alcohol must not be forgotten. A teaspoonful of the St. Raphael tannin wine, given two or three times a day, diluted with an equal quantity of water, is an important addition to the treatment.

I have employed frictions with mercurial salves to the splenic region, and seen them used by others, but have never noticed any special benefit from this proceeding. As a rule, it has seemed to me that the anæmia has been intensified by this means, and that the size of the spleen has increased rather than diminished under the use of the drug. Unless the employment of the remedy is distinctly indicated by clear evidence of the presence of syphilis in the child, this method of treatment seems likely to be attended with a bad rather than a good result.

CHAPTER V.

HÆMOPHILIA.

Hæmophilia is a congenital tendency to bleeding which manifests itself shortly after birth and lasts the life of the patient. The hæmorrhage occurs either spontaneously or upon slight provocation, and can only be arrested with great difficulty. The subjects of the disease also exhibit a curious tendency to obstinate swellings of the joints, which are often spoken of as "rheumatism." A temporary disposition to hæmorrhages, such as is sometimes left after certain diseases, does not constitute hæmophilia. The true disease dates from birth, or appears shortly after it; is always seen in childhood, and persists, as a rule, to the very end of life.

Causation.—Hæmophilia, if not invariably hereditary, shows a singular tendency to hereditary transmission. The proclivity manifests itself more frequently in the male than in the female offspring; but the females, if themselves exempt from this peculiarity, are still capable of transmitting the disease to their children. It is, indeed, a curious fact that the transmission of the tendency to the child is seen more commonly in cases where the patient, whether male or female, although sprung from a family of bleeders, is individually free from the hæmorrhagic disposition. It is rare to find a father transmit the disease to his child if he is himself a sufferer. In the majority of cases the unfortunate inheritance is derived from the mother, who has probably escaped.

In a family subject to this tendency all the male children may prove bleeders. Sometimes, however, one or more escape. Dr. Wickham Legg is of opinion that when transmission is only partial the first-born are more exempt than the others. The disease is found in all countries and all conditions of life. The Hebrew race is said to be peculiarly liable to it.

Morbid Anatomy.—In cases of death from hæmophilia little is found to explain the nature of the disease. The body is usually blanched from loss of blood, but the organs, especially the heart and large vessels, present no appearance of disease. No change is discovered in the blood, and the vessels seldom present any alterations recognisable by the microscope. In some cases, indeed, a partial fatty degeneration of the lining membrane of the arteries has been observed; but this is probably the consequence of the anæmia. Petechiæ in the skin, and bruise-like patches from subcutaneous extravasation, may be found; and sometimes large collections of blood have been met with. Sir W. Jenner has reported the case of a boy, aged thirteen years, in whom an enormous extravasation of blood was discovered beneath the fascia of the right thigh. The swelling of the joints appears to be due to extravasation of blood into the articulations. In a case reported by M. Poncet, on opening the knee-joint, which had been obstinately swollen and painful during life, all the tissues of the articulation were found to be stained with blood. At the circumference the tissues were chocolate-coloured; the articular surfaces were red and impreg-

nated with blood; and the cartilages were the seat of advanced lesions such as have been described by Charcot as characteristic of chronic rheumatism. Microscopic examination revealed in the substance of the tissues yellow granules, irregular or rounded, and of variable size, pigment granules, and fat granules. Other joints in the same subject showed similar lesions.

Symptoms.—There is nothing in the look of the child at birth to indicate any peculiarity of constitution. Nor in after years, unless the individual be actually suffering from loss of blood or disease of the joints, is there anything in his appearance to distinguish him from another without the same tendency to bleed. The child may be fair or dark, tall or short, of robust frame or of slender build. As a rule, he looks healthy, and his intellectual capacity is above the average.

It is rarely before the end of the first twelve months of life that any sign is noticed of the hæmorrhagic disposition. Bleeding seldom occurs at the time of separation of the umbilical cord, or during the operation of vaccination; and it is not until the infant is able to crawl or walk, and thus becomes exposed to injuries from falls or other violence, that his constitutional peculiarity can be recognised. Sometimes, however, evidence of the disease is postponed until later. Bleeding may not be noticed until the second crop of teeth begins to make its appearance at about the sixth year. It has even been known to come on for the first time at a later period; but is rarely delayed till after puberty.

The propensity to bleed varies greatly in its intensity in different subjects. In the lowest degree it may show itself merely in the shape of ecchymoses in the skin. In a higher grade the patient may complain of spontaneous hæmorrhage from the mucous membranes. In its most pronounced form a tendency to every kind of bleeding is observed. The mucous membranes may pour out blood without obvious cause; slight injuries may give rise to copious extravasation into the tissues; petechiæ may appear in the skin; and obstinate and painful swellings may attack the joints.

The hæmorrhage usually occurs at a time when the patient appears to be in unusually good health, for it is at these times that there is a plethora of the smaller vessels. The bleeding may be preceded by signs of excitement or irritability of temper, and it is said that there is sharpening of the senses of hearing and of sight. Epileptiform convulsions have been noticed in one case by Boier.

If the bleeding be spontaneous, it occurs in the child usually from the nose; but may be also noticed from the inside of the cheeks and lips, and from the gums, especially during dentition. In less common cases blood is also poured out from the mucous membrane of the stomach and bowels, and may be vomited up or discharged by stool. As a rule, the younger the child the more likely is the hæmorrhage to come from the nose or mouth. It is only towards puberty that hæmatemesis or melæna becomes common. Renal hæmorrhage is rare. Once started, the loss of blood may be continuous and copious, so as to be arrested with the greatest difficulty; or may cease for a time and then return. Sometimes hæmorrhage from one source is quickly followed by a similar effusion from another, until the patient dies worn out by the constant discharge. When bleeding from one source alone ends in death, the hæmorrhage occurs usually from the nose.

In addition to the spontaneous hæmorrhages, slight wounds or blows may produce a copious effusion. Little cuts or scratches bleed obstinately; slight blows upon the body may be a cause of serious extravasation; and

in certain subjects even the rising of a blister may fill the bleb with blood instead of serum. In such patients the extraction of a tooth, the application of a leech, or the prick of a pin may induce bleeding which for a long time resists the most powerful styptics, and may even destroy the life of the patient in spite of the most energetic measures for its suppression.

The tendency to bleed, even in the case of the same child, is subject to curious variation. A slight injury which at one time gives rise to excessive hæmorrhage, at another is followed by no ill consequences; and a child in whom repeated hæmorrhages from the nose or mouth are a source of anxiety may bear the removal of a tooth without unusual bleeding following the operation. Thus Dr. Wickham Legg has reported the case of a boy, aged eight years, who was subject to frequent hæmorrhages from the nose and gums. This child could bear the extraction of a tooth or a cut on the finger without much loss of blood.

In all cases the source of the bleeding is capillary. The hæmorrhage occurs as a constant oozing, which may last for hours, days, or weeks; and it is astonishing to note the enormous quantity of blood which may be thus poured out by the most trifling wound. In the case of traumatic bleeding the hæmorrhage usually begins some hours after the infliction of the injury. It often does not cease until the patient becomes faint, and even then is liable to renewal when consciousness returns. By this means the child may be reduced to a state of profound anæmia, and only slowly regains his colour and strength.

The petechiæ and subcutaneous hæmorrhages which occur in hæmophilia are very similar to those noticed in cases of purpura. They are common on the buttocks and limbs of infant bleeders, but the face usually escapes. Trifling blows may produce copious effusions. In some cases the blood infiltrates extensively through the areolar tissue of a limb, and death may even ensue from this inward bleeding. In other cases circumscribed collections of blood may be noticed, forming tumours of various sizes.

One of the most curious features of the disease in its higher grade is the joint affection to which these patients are so subject. The articulations attacked are usually the larger ones, and in the majority of cases it is the knee which suffers; but the ankles and hips, the shoulders and elbows are liable to be affected. The joint becomes swollen and tender, and the swelling usually increases until the ends of the bones can no longer be felt. It is accompanied by pain which is increased by movement, and there is a rise of temperature. Sometimes fluctuation may be detected. The swelling is said to be due, in some cases, to a simple effusion into the joint; but it is more commonly the consequence of articular hæmorrhage. It may occur either spontaneously or as the result of a trifling injury. The symptom persists for a variable time, and it may be months before the joint returns to its ordinary dimensions. Several joints may be attacked in succession, or the joint affection may alternate with some form of visible hæmorrhage. Blood tumours sometimes rise on the sides of a diseased joint. Thus M. Poncet has recorded the case of a boy, aged sixteen, whose right knee had been painful, stiff, and swollen for two years. Some time previously a small swelling had formed on the inner side of the knee. This had turned black, and then had burst, giving rise to obstinate hæmorrhage. The boy was very subject to profuse bleedings from the nose, and eventually died in consequence of repeated hæmorrhage from wounds made by the application of the actual cautery to the diseased joint.

In addition to the articular affection, pains may be complained of in the limbs about the joints, although unaccompanied by swelling. These

may be so severe as to interfere with exercise. The subjects of hæmophilia also suffer much from cold, and the hæmorrhage may be determined by exposure to weather.

It might, perhaps, be expected that the existence of the constitutional tendency would influence unfavourably the course of the exanthemata and other intercurrent diseases to which childhood is liable ; but this does not appear to be the case. Measles, scarlet fever, and whooping-cough are said to run their normal course in such subjects without manifesting exceptionally unfavourable symptoms ; and although the patients are prone to chest affections, such as pleurisy and pneumonia, these diseases are not attended with special dangers. There is no peculiar liability to phthisis ; but sloughing and gangrene are said to be not uncommon accidents in the course of wounds and traumatic injuries generally.

Diagnosis.—In pronounced cases the detection of the hæmorrhagic tendency is a matter of little difficulty. The history of repeated bleedings, the habitual appearance of bruises upon slight injury, and the affection of the joints, furnish sufficient evidence of the existence of this constitutional peculiarity. In cases where the tendency is present in a less degree the diagnosis is not so easy. Repeated epistaxis is often seen in children whose health in other respects is perfectly satisfactory ; and the occurrence of spontaneous hæmorrhage from this source is therefore of no value in establishing the existence of hæmophilia. Again, profuse and even fatal bleeding from the stomach and bowels may be met with in new-born infants. The cause of hæmorrhage in the newly-born is often obscure ; and in the absence of any evident reason for its occurrence some observers have attributed it to a special hæmorrhagic tendency existing in the infant. This may be so ; but the cases differ from hæmophilia in the fact that where life is preserved no special proneness to bleeding is manifested in after years (see page 655). So, also, in hæmorrhagic purpura profuse bleeding may occur from all the mucous surfaces and into the tissues ; but the disposition to bleed is here, also, a temporary infirmity which passes off and is completely recovered from.

In all cases of true hæmophilia careful inquiry will discover the existence of a hereditary tendency, especially on the side of the mother, and also in most cases a disposition on the part of the child himself to bleed profusely upon slight provocation.

The nature of the joint affection can only be discovered by establishing the existence of the hæmorrhagic tendency ; for there is nothing in the character of the joint symptoms to distinguish the swelling from that produced by other causes.

Prognosis.—Hæmophilia is a disease which is accompanied by serious danger to life. The exhaustion produced by repeated hæmorrhages is so great that comparatively few of the patients reach adult years. Out of one hundred and fifty-two boys, the subjects of the hæmorrhagic disposition, Grandidier found that only nineteen attained the age of twenty-one, and that more than half of the number died before completing their seventh year. Death usually occurs from hæmorrhage, but some kinds of bleeding appear to be more unfavourable than others. Thus hæmorrhage after extraction of a tooth is found to be especially dangerous ; obstinate epistaxis is also to be viewed with grave apprehension ; indeed, to these two varieties of bleeding a large proportion of the deaths may be attributed.

Children are said rarely to die from a first bleeding, and one profuse gush which causes fainting is thought to be more favourable than a slower and persistent oozing. Still, in any case we should speak very cautiously

of the future, whether immediate or remote ; for if the tendency be pronounced, the boy's chances of growing into manhood are not promising.

Treatment.—In cases of hæmophilia great care should be taken to protect the child from all forms of injury. Vaccination has been seldom followed by dangerous bleeding ; but the operation should be performed, as Dr. Wickham Legg suggests, rather by scarification than by puncture. Surgical operations, even of the simplest kind, should be undertaken only as a last resource, and the extraction of a tooth should be expressly forbidden.

Constipation is likely to be particularly injurious to the subjects of hæmophilia. Therefore it is very important to see that the bowels are properly relieved. The child should take a dose of gray powder with jalapine every two or three weeks, followed by a saline ; and the latter, in the shape of Dinneford's magnesia or the granular citrate of magnesia, may be given regularly every week. The dietary should include a good proportion of vegetables ; and the white meats and fish are preferable to too much beef and mutton. In case any of the premonitory symptoms of hæmorrhage are observed, all meats should be at once forbidden, and a mercurial purge be administered, followed by a saline. Regular exercise should be enforced ; but boisterous games, such as cricket, foot-ball, etc., can only be indulged in at a great risk.

When bleeding occurs, the treatment will depend upon the source of the hæmorrhage. If this be at the surface, so that pressure can be brought to bear upon the part, as in the case of a cut or other injury, the application of a graduated compress, after careful cleaning of the wound, should be had recourse to. The local use of perchloride of iron, nitrate of silver, and other styptics, and of ice, is also recommended. In cases of spontaneous hæmorrhage astringents applied locally are our chief resource. In epistaxis the nasal passages must be first cleared out by injections of ice-cold water. Afterwards the solution of perchloride of iron (of the strength of one drachm of the strong solution to an ounce of water) should be injected or sprayed into the nostrils. If this method fail, the anterior and posterior nares must be plugged. If the hæmorrhage occur from the socket of a tooth, crystals of the perchloride of iron applied locally will sometimes arrest it ; or the alveolus may be packed with a graduated compress soaked in the iron solution. Bleeding from the bowels usually comes from the lower part of the rectum, and can often be staunched by injections of the iron solution (one or two drachms to the ounce). Bleeding from the gums is usually stopped by washes of tannin, alum, or rhatany ; and the child should be prevented if possible from encouraging the bleeding by sucking his gums. Iron and other styptics given internally seem to be of small value ; but ergot is stated to have proved of service.

The subjects of this tendency should be warmly dressed and carefully protected from the cold. If possible their residence should be elsewhere than in cold, damp situations. The joint affection must be treated by perfect rest, and cold or warm applications as are most agreeable to the patient. At a late stage blisters to the joint are said to be useful, but counter-irritation with the actual cautery is to be avoided.

CHAPTER VI.

PURPURA.

Purpura is a diseased condition in which extravasations of blood take place into the skin and the substance of the viscera, and blood may be poured out from many mucous surfaces and into the serous cavities. When the extravasation takes place into the skin it is called *purpura simplex;* when the hæmorrhage is more general the disease goes by the name of *purpura hæmorrhagica.* Many acute forms of illness, febrile and other, are accompanied by the ready escape of blood from the vessels. In the malignant forms of scarlatina, measles, small-pox, typhus fever, and diphtheria purpuric spots and hæmorrhages are seldom absent; and the same symptom is found in scurvy, and is occasionally met with in cases of Bright's disease, cirrhosis of the liver, leucocythemia, and valvular lesions of the heart. Strictly speaking, however, the term *purpura* is applied to a temporary hæmorrhagic tendency unconnected with any of the acute specific diseases, and in which no morbid condition of organs, other than that due to the extravasation and its consequences, can be discovered.

Causation.—Purpura is common in children, and appears in many cases to be a consequence of insanitary conditions and insufficient food. Still, that the disease may arise from other causes is shown by the well-nourished state and robust appearance of many of the subjects of this disorder. The hæmorrhagic tendency is sometimes seen to come on quite suddenly without apparent cause in one member of a healthy family, the others who appear to be living in precisely the same conditions escaping altogether. Thus, a robust little boy, aged six years, one of eight healthy children and born of healthy parents without any history of hæmorrhagic tendency, had himself been strong and well all his life with the exception of attacks of measles and whooping-cough during his second year. The boy suddenly began to bleed from the eyes, the nose, and the mouth, and soon developed all the symptoms of severe hæmorrhagic purpura. In cases such as this the occurrence of the disease can never be traced to error in diet or insufficiency of vegetable food or milk. Sometimes purpura may come on as a sequel of an exhausting disease, such as scarlatina and typhoid fever, and I have known it to occur after a severe attack of croupous pneumonia. It is said, too, to be occasionally induced by the administration of iodide of potassium in weakly subjects, especially in those labouring under valvular disease of the heart. In many cases, however, no antecedent condition of any kind can be discovered capable of explaining the sudden propensity to bleed.

Morbid Anatomy.—In the skin the hæmorrhage occurs in the rete mucosum and the papillary layer of the cutis, and also into the subcutaneous tissue. The submucous tissue is also often the seat of extravasation, and sometimes much blood is poured out from the surface of the mucous membrane. In this way, after death purple spots and extravasations of

various sizes may be discovered beneath the mucous membrane of the mouth, gullet, stomach, and intestine both small and large. So also the serous surfaces and subserous tissues may suffer in the same way, and more or less copious extravasation may be found in the serous cavities—the pleura, the peritoneum, and the pericardium. The substance of organs is not unfrequently the seat of hæmorrhage, and clots may form in the lungs, the heart, the kidneys, etc. Fatal apoplexy may also result from this cause.

Pure purpura does not lead to disease of internal organs. If the anæmia be extreme, fatty degeneration of the muscular fibres of the heart and a similar condition of other viscera may be found; but this is a consequence of the impoverished state of the blood induced by repeated hæmorrhages, and is only a secondary consequence of the hæmorrhagic tendency. Amyloid and other degenerations found in the liver and elsewhere must be looked upon as a result with the purpura of a common cause. When bleeding is profuse and repeated the blood undergoes the changes incident to an advanced stage of anæmia, the amount of hæmoglobin is lessened, and the red corpuscles are diminished in number as well as reduced in size. Unless the blood be impoverished by hæmorrhages, no morbid change in the fluid can be detected.

With regard to the pathology of the disease, the fault has been supposed to lie in some alteration of nutrition in the coats of the capillaries and smaller blood-vessels, so that they rupture readily under the pressure of the blood. This explanation may be a sufficient one when the purpura occurs in a cachectic subject, but it cannot apply to the sudden tendency to hæmorrhages often manifested by a child whose health had been previously satisfactory. Henoch suggests that in these cases the cause of the effusion may be a vaso-motor neurosis which gives rise to stasis in the blood, rupture of the wall of the capillaries, or migration of the blood globules from paralytic dilatation of the smallest vessels.

Symptoms.—The spots may appear quite suddenly without previous signs of ill-health. Often, however, they are preceded by more or less aching of the limbs, slight feverishness, thirst, and symptoms of indigestion. The child has no appetite and is unwilling to exert himself, crying if obliged to walk, and complaining constantly of feeling tired. In some cases the appearance of the purpuric rash follows an attack of vomiting and diarrhœa. The spots are circular and of a brick-red or deep purple colour. They are not elevated above the surface, and pressure does not cause them to disappear. In size they vary from a pin's head to the diameter of half an inch or more, and their outline is distinctly defined. They may be so closely set as to be confluent. This is especially common about the instep and ankles. Often they are accompanied by marks like bruises due to extravasation into the subcutaneous tissue. These are bluish discolourations without defined margin, and may be accompanied by some swelling. They appear to be sometimes the consequence of insignificant injuries, for a gentle pinch or feeble blow will produce them. The purpuric spots come out in successive crops, and each, after going through the ordinary changes of colour peculiar to such hæmorrhages, disappears in the course of a few days. At times the skin will be found to be nearly clear; then another crop is discovered and the surface is thickly studded with them as before. They are usually most numerous on the limbs, but are found besides on the trunk, and sometimes, although rarely, on the face. Mixed up with the true purpuric spots may be wheals of urticaria, little patches of erythema papulatum or erythema

nodosum, and occasionally blebs arise filled with bloody serum. Inspection of the mouth will also often discover minute hæmorrhagic extravasations into the mucous membrane of the lips and cheeks.

In the more acute form of the disease, when the general health has been previously satisfactory, the purpuric spots may be accompanied by œdematous swelling. The limbs then feel unusually firm and full and pit on pressure. Unless hæmorrhage occurs from the urinary passages there is no albuminuria.

A healthy little girl, aged five years, began to lose her appetite and complain of pains in the legs and knees. She was unwilling to take exercise, and after walking for a short distance would say that her legs ached and ask to be carried up-stairs. These symptoms continued for two or three weeks without improvement. The child then became slightly feverish, her knees swelled, and purpuric spots appeared on the lower part of the body and on the legs. When seen on the sixth day the child looked well in the face and seemed cheerful. The spots were numerous on the lower limbs and varied from a pea to a fourpenny bit in size. They were brick-red in colour with a well-defined outline, and did not disappear on pressure with the finger. In addition to these spots there were larger patches, like bruises, of a greenish or yellowish colour. Both legs were uniformly swollen and felt very firm. They pitted distinctly on firm pressure. The knees were not swollen or tender at this time, but were said to have been very tender and painful. The skin covering the popliteal spaces was much ecchymosed. There had been no bleeding from the nose or other mucous tract. The heart-sounds were healthy. There was no albumen in the urine.

The pains in the limbs usually continue after the spots have appeared, but subside in a few days. A return of the pain is sometimes found to precede the eruption of each successive crop of spots. The number of the crops varies. Sometimes there is only one. Usually, however, they are more numerous. Exercise seems to encourage the hæmorrhages, and rest is therefore an important element in the treatment. In the simple form the disease is usually at an end in from one to three weeks.

In simple purpura the extravasations are limited to the skin, but in the more severe form, called *hæmorrhagic purpura*, effusions of blood are noticed from other parts. The nose bleeds, and the hæmorrhage may be so copious that it has to be arrested by mechanical means. Blood may be also discharged from the eyelids, the gums, the ears, the lungs, the stomach, the bowels, and the kidneys. Hæmaturia is a common consequence of hæmorrhagic purpura, and the amount of blood may be so copious from this source that the urine passed is of a deep red colour. The renal hæmorrhage often occurs in one gush and then ceases entirely for a time, so that two successive discharges from the bladder may be of quite different characters—the first blood red, the second perfectly limpid and normal in appearance. Still, even if there be no naked-eye signs of blood in the water, the microscope will sometimes detect red corpuscles in the deposit. Hæmorrhage from the bowels is seen as black clots at the bottom of the chamber-pan. It is rarely copious. Its appearance may be preceded by severe abdominal pain, which ceases when the blood is discharged from the bowels. Sometimes colicky pain occurs without being followed by intestinal hæmorrhage.

When pains in the joints are complained of, there may be some tenderness and considerable swelling. This symptom is often spoken of as "rheumatism," and the disease is then called *purpura rheumatica*. It

seems probable, however, that sometimes, at any rate, the lesion is due not to rheumatic inflammation but to hæmorrhage into or around the joint. If it arise from this cause the articular affection is more chronic than a rheumatic joint lesion, and remains confined to the part first attacked. There is no necessary discolouration of the skin.

During the progress of the complaint the general symptoms are often indefinite. The appetite may be good or more or less impaired. A certain amount of thirst is usually to be noticed. The liver may become much swollen from congestion, and the bowels are often confined. Usually, until the loss of blood has produced anæmia, the child complains only of aching and feeling tired. The temperature is often normal, but sometimes there is irregular pyrexia. The febrile heat does not, however, appear to bear any relation to the hæmorrhage. I have not found it to precede or follow in any regular manner the flow of blood.

A robust little boy, six years of age, was in his usual health when he suddenly began to bleed from the eyes, nose, and mouth. During the next month he continued to bleed every morning from the gums, and on three separate occasions had copious attacks of hæmorrhage from the eyes and nose. An accidental cut on the finger also bled profusely for two hours. During all this month the boy was very thirsty, drinking any fluid he could get, even dirty water.

On admission into the East London Children's Hospital the child seemed to be well nourished and had a healthy appearance, with a fair amount of colour in his face. His gums were not spongy. His face, body, and limbs were thickly covered with purpuric spots of a brownish-red colour, which did not fade on pressure. There were in addition large bruises on the right arm, the trunk, and the left thigh. There was no enlargement of the liver or spleen. The urine had a density of 1.029. It was clear, without sediment, and contained no albumen. The heart beat in the fifth interspace in the nipple line. At the apex the sounds were healthy but muffled, and a loud anæmic murmur was heard at the base.

While in the hospital the patient had frequent hæmorrhages from the nose, the mouth, the bowels, the kidneys, and into the skin. On one occasion he repeatedly retched and vomited large black clots of blood. He also complained much of abdominal pain, and passed large quantities of black blood from the bowels. This may, of course, have been blood poured out by the nasal fossæ and swallowed ; but the hæmorrhage was at any rate copious, and caused a marked blanching of the skin and much feebleness and languor. The boy's temperature varied considerably during his illness. He had irregular attacks of fever during which the temperature would rise to 101° or even higher, but the pyrexia did not always precede the gush of blood. If, however, there was fever when the hæmorrhage occurred, the first effect of the flow was to reduce the bodily heat to a subnormal level.

The boy was treated first with iron, which seemed to have no effect upon the hæmorrhages ; then with aperients, which produced at first a marked improvement ; later with iron and arsenic combined, under which he became rapidly convalescent.

When anæmia occurs, the ordinary signs of debility are noticed. The child is pallid and feeble. He is restless and complains of headache, and his pulse is frequent and irritable. A systolic murmur can usually be detected at the base of the heart, and a loud venous hum is not uncommonly heard at the upper part of the sternum.

There may be some œdema of the ankles, and even of the limbs and

face. In very severe forms of the disease the child may die from syncope or exhaustion, and sometimes death occurs in an attack of convulsions. Convulsions are due in rare cases to hæmorrhage into the cranial cavity. Mr. Hallowes has reported the case of a boy between three and four years old, who had lived in a good air and been well fed. This lad, after being languid for one day, developed bruise-like patches on different parts of the body, and died on the third day after a convulsive attack followed by rigidity. At the autopsy extensive hæmorrhage was found to have occurred into both ventricles with laceration of the brain substance. No ruptured vessel could be found.

Convulsions in purpura are not always the consequence of cerebral hæmorrhage. A little girl three months old was under my care in the East London Children's Hospital for vomiting and diarrhœa. After these derangements had ceased a purpuric eruption developed on the body, and in a few days the child had an attack of convulsions and died. Here the brain was found to be unusually anæmic, and there were no signs of intracranial extravasation. These are, however, exceptional cases. In the child a fatal termination to the illness is rare. Usually after a longer or shorter period the hæmorrhages cease, and the patient regains his colour and strength.

The course of the disease is almost always irregular. The successive crops occur at uncertain intervals, and often the disease is thought to be cured when a sudden return of the extravasations shows us that the hæmorrhagic tendency is not yet overcome.

Diagnosis.—Hæmorrhagic purpura cannot be confounded with a malignant form of exanthema, for the high fever and profound general suffering manifested in such dangerous cases are not present in the milder complaint.

In scurvy there is always a history of privation or injudicious feeding; the special symptoms follow upon a period of ill-health; general tenderness is a prominent feature; and there is marked feebleness from the very first. In all these points the affection differs from purpura. Moreover, the treatment of the two diseases is different, and measures which are found to have an immediate influence upon the scorbutic condition are powerless to check the hæmorrhagic tendency in purpura.

In hæmophilia, which is characterised by similar symptoms to those of purpura, the disease is a constitutional one and is almost always hereditary; the family tendency is well recognised, and the hæmorrhage is usually first manifested as a consequence of a cut or injury. Moreover, the disposition to bleed is a chronic and permanent state, and is not a more or less acute condition which can be made to cease by appropriate remedies.

Prognosis.—In simple uncomplicated purpura the prognosis is always favourable. In hæmorrhagic purpura the disease is more serious; but if the child be submitted early to treatment the illness rarely has a fatal issue.

Treatment.—In all cases of purpura the child should be confined to his bed, as rest is of extreme importance in preventing repeated relapses of the disease. The two forms of purpura, viz., that which comes on quite suddenly in healthy children and that which attacks feeble or cachectic subjects, require a different method of treatment. In the first the old plan of energetic purgation is peculiarly valuable. Often in such cases a course of iron or other tonic is followed by no benefit whatever, while a few doses of some drastic aperient cause a prompt and final disappearance

of all hæmorrhagic symptoms. This treatment is equally useful whether the complaint be of the simple or hæmorrhagic variety, and may be employed without fear even in cases where great anæmia has been induced by the loss of blood. If the liver is found to be swollen from congestion, as sometimes happens, its size is quickly reduced by the purging. It is in these cases, perhaps, that the value of aperients is most strikingly illustrated; but all cases of the acute variety of the complaint seem to be benefited by this method of treatment. The best form in which the aperient can be prescribed is a combination of the oil of turpentine with castor-oil. For a child six years old, two drachms of each may be given made into an emulsion with mucilage of tragacanth and flavoured with syrup of lemons and peppermint water. This draught should be taken before breakfast every morning, or on alternate mornings, according to the effect produced. If the hæmorrhage is not arrested in the course of a few days, iron and arsenic should be given in addition after each meal. A child of this age will take without inconvenience fifteen drops of the tincture of perchloride of iron and three or four of Fowler's solution, freely diluted, three times a day. Other treatment is also recommended. Werlhof, who first described the disease, relied upon quinine and dilute sulphuric acid. Ergot is preferred by some, especially in cases where the hæmorrhages are copious; but this drug should be always given by the mouth and never hypodermically by the injection of a solution of ergotin, as obstinate bleeding has been known to result from the puncture of the needle.

Special hæmorrhages must be treated by special means: epistaxis by the injection of iced water, or by the use of a spray of perchloride of iron. In using the spray the nasal passages must be first cleared out completely of clot by the injection of water. Afterwards two drachms of the strong perchloride of iron solution diluted with water to two ounces must be sprayed into the nostrils. Hæmorrhage from the gums may be usually arrested by an alum gargle or the infusion of rhatany; intestinal hæmorrhage by iced-water injections and the application of an ice-bag to the abdomen. In hæmaturia gallic acid should be given.

When the patient becomes anæmic, stimulants (port wine or the St. Raphael tannin wine) must be given, and the child should take plenty of nutritious food.

In the cachectic form of purpura aperients are less suitable. In these cases stimulants are required from the first, and the child should take food in small quantities at a time so as not to overtask his feeble digestive powers. Iron wine may be given with arsenic, and cod-liver oil is useful. As a special styptic turpentine in ten-minim doses is of service, taken every three or four hours, or an equal quantity of the liquid extract of ergot may be administered several times in the day.

CHAPTER VII.

SCURVY.

Scurvy is a disease which is now rarely seen in its most pronounced form even in the adult, unless under circumstances of exceptional hardship and privation. As one of the diseases to which young children are liable it has been, until recent times, completely ignored. Lately, however, owing to the observations of Drs. Cheadle, Gee, T. Barlow, and others, a form of the malady has been recognised as an occasional consequence in infants of bad feeding and injudicious management. In such subjects the disease is commonly grafted upon rickets; and there can be little doubt that it is this conjunction of the two maladies which constitutes the state described by Fürst and others under the name of *acute rickets*.

Causation.—A scorbutic taint which reveals itself by the milder phenomena of scurvy appears to be less uncommon than was at one time supposed amongst the out-patients of large hospitals. Dr. Eade, of Norwich, and Dr. Ralfe, of the London Hospital, have both met with such cases amongst their patients; and Surgeon-General Moore has remarked upon the frequency with which similar symptoms can be detected amongst the inhabitants of certain districts in India. In all such cases bad or insufficient food is no doubt the cause of the impoverished state of the system, especially the want of fresh meat, fresh milk, potatoes, and vegetables generally. In young children the causes appear to be very similar to those which have the power of setting up rickets, although they are not identical with them. If an infant be fed with excess of starchy food and supplied with sweetened preserved milk instead of the fresh milk of the cow; if he be dirty and neglected as to his person, and breathe habitually a close, foul air, the conditions are just those which are capable of setting up the scorbutic state. An infant so brought up quickly begins to show signs of rickets, and may perhaps be found all at once to develop the symptoms of scurvy. That every badly fed child does not manifest similar phenomena is probably owing to the fact that many articles of diet are anti-scorbutic, although not anti-rachitic; indeed some, while they preserve from scurvy, may actually aid in the production of rickets. Scurvy differs from rickets in not being a disease of general malnutrition. In the former the affection is due merely to the absence from the blood of some constituent whose presence is essential to health. In the latter the whole system suffers, and the condition is one of general impairment of nutrition from deficiency of wholesome food. Consequently as long as the indispensable element is supplied to the blood the patient does not become scorbutic, however well the diet may be adapted to favour the occurrence of rickets. Thus a child fed largely upon potatoes may very probably grow rickety, but he will certainly escape scurvy. Again, in England fresh fruit, being cheap, is largely consumed by the children of the poor. Even babies in arms are allowed to nibble at an apple or a plum

as soon as they are able to hold an object in their hands. During the summer months they get strawberries and gooseberries; in the autumn apples, pears, and plums; and in the winter and spring oranges. By such means a scorbutic tendency is no doubt counteracted, but general nutrition is little improved; indeed, it is not improbable that on account of the indigestion and acidity which such indulgences must necessarily excite at this early age the occurrence of rickets is actually promoted.

The outbreak of scurvy often appears to be determined by some influence which causes a temporary depression in the child's strength. Children who inherit a diathetic tendency are probably more prone than constitutionally healthy subjects to suffer readily from the want of milk and fresh and wholesome food. In many cases, however, it is noticed that the patient is enabled to resist for a long time the influence of a distinctly injurious dietary; and it is only when the nutritive processes are brought to a sudden standstill by an attack of gastro-intestinal catarrh that scorbutic symptoms begin to be observed.

Scurvy is not confined to the subjects of rickets, but most scorbutic children are found to be suffering from that disease. This is not to be wondered at, for the age at which rickets is most liable to occur is also that at which scurvy is chiefly found to prevail. The two affections are also, as has been said, induced by causes very similar in kind; and the general impairment of nutrition of which rickets is the consequence no doubt renders the patient especially sensitive to the effects of a scurvy diet. In most of the recorded cases of scurvy in the young subject the patients have been under eighteen months old.

Morbid Anatomy.—One of the most characteristic morbid changes induced by the disease is a copious extravasation of blood into the tissues of the limbs, especially of the thighs. The muscles themselves are usually pale, but the tissues between them may be infiltrated with serum more or less blood-stained. Sometimes blood is extravasated into the substance of the muscles, but without any evident laceration of the fibres. The chief seat of the extravasation is between the periosteum and the bone. In many cases the investing membrane is found to be separated widely from the shaft of the bone, retaining its attachment merely at the epiphyses. It is, moreover, greatly thickened and deeply injected. Between it and the bone lies a large, loosely adherent blood-clot in which the bone is embedded. When the clot is cleared away the bone is found to be perfectly smooth, although bare of periosteum. Another common feature is a separation of the epiphyseal ends of the long bones. This separation is not at the line of union of the epiphysis, but in the shaft of the bone just below the point of junction. The osseous structure at the seat of fracture can be noticed to be particularly loose and spongy. It is important to remark that in all these cases where separation of periosteum has occurred no sign of caries or exfoliation of the bone is to be discovered. Nor does the extravasation of blood ever appear to end in suppuration. The shaft of the bone is curiously fragile and thinned. This atrophy is well seen in some cases in the ribs, which may appear to be reduced to the two bony plates by almost complete loss of their cancellous structure. Extravasation of blood never seems to take place into the articulations, as is seen in hæmophilia; for all the joints and tissues immediately connected with them are found to be healthy.

The above changes in the bones and periosteum are common to all fatal cases of scurvy in the child. Mr. T. Smith's case exhibited at the Patho-

logical Society of London in 1875–76, under the provisional name of "hæmorrhagic periostitis," showed the above changes in both lower limbs. The parts principally involved were the thigh bones, but the bones of the legs were affected, although to a less extent. In Dr. T. Barlow's beautiful preparations shown at the Royal Medical and Chirurgical Society in 1883, the same characters were observed. The effused blood has usually been found of a deep marone colour and coagulated. Of other organs the abdominal viscera are generally healthy in these cases. The same thing may be said of the chest; but once or twice Dr. Barlow has found some effusion in the cavity of the pleura, and in Mr. T. Smith's case there was a small hæmorrhage in the lung. Often no sponginess or inflammation of the gums is to be seen, but little hæmorrhages have been noticed at the point of the gum in the situation of the up-coming teeth. Other small extravasations may be present in the skin in various parts of the body. They may occur around the ribs, and may be discovered in the intestines and kidney.

The above morbid characters can leave little doubt that these cases are rightly classed under the head of scurvy. It has been objected to this view that although the symptoms observed during the life of the child do not, as a rule, point to any very marked deterioration in the quality of the blood, the lesions noted after death are the later manifestations of the disease, such, indeed, as occur in the adult only as a consequence of profound constitutional cachexia. Thus sub-periosteal hæmorrhage, which is a late symptom in the adult, is produced early in the child; and the affection of the gums, which is usually regarded as one of the earliest and most characteristic symptoms of scurvy, may be absent in the young subject altogether. To this it may be replied that cachexia is produced very rapidly in the infant by acute disease, and that in some cases of scurvy in the child an extreme degree of anæmia and debility has been reached. But granting that in many cases serious lesions have been discovered where the general symptoms have been comparatively mild, this is not to be wondered at, considering the age and peculiarities of the patient. In a blood disease such as scurvy it might almost be anticipated that the tissues chiefly affected would be those in which growth and development are making most active progress. At the age at which young infants are usually found to suffer no tissues or organs are undergoing more rapid changes than the long bones, especially those of the lower limbs; and it is exactly in these situations that the more pronounced lesions are observed. On the other hand, in the maxillary bones ossification and development are practically at a standstill; for the child being (as he almost always is) the subject of rickets, the jaws have ceased for the time to increase in size, and the evolution of the teeth is completely arrested.

The cause of the deterioration of the blood in scurvy appears to be, not the mere absence of potash salts, as Dr. Garrod believed, but rather, as Dr. Buzzard supposes, the absence of these salts in combination with organic acids. Dr. Ralfe has still further developed the latter hypothesis. This observer is of opinion that the primary change depends on a general want of normal proportion between "the various acids, inorganic as well as organic, and bases found in the blood, by which the neutral salts, such as the chlorides, are either increased relatively at the expense of the alkaline salts" or these latter are absolutely decreased. He concludes that there is a diminution in the alkalinity of the blood, and that this produces dissolution of the blood-corpuscles and fatty degeneration of the muscles and of the secreting cells of the liver and kidneys.

Symptoms.—Children in whom the symptoms of scurvy are noticed

are often large, flabby infants between twelve and eighteen months old. They usually show the milder phenomena of rickets, such as profuse sweating about the head, lateness of dentition, enlargement of the ends of the long bones, and beading of the ribs. In such subjects the course of the scorbutic disease is as follows: The patient shows signs of unusual and extreme tenderness. He dreads being handled, cries if put upon his feet, and if he had been able to walk, is quite taken off his legs. Next he begins to suffer from pains which seem to be constant. The child lies moaning in his cot, and screams if touched or even approached. Very soon swelling is noticed of a limb, usually a thigh—one or both. The affected part is enlarged by a cylindrical swelling which although not actually brawny to the touch is yet firmer than natural. In many cases it is distinctly œdematous, but it may not pit under the finger, although it often gives the sensation of containing infiltrated serosity. In the lower limb the swelling usually occupies the whole length of the thigh and often of the leg. There is no perceptible fluctuation, and no enlarged veins can be seen, but the tint of the skin is often livid or faintly lead-coloured, and in a case recorded by Fürst its tint was red and glistening. There is no effusion into the joints, but these are usually swollen from enlargement of the articular ends of the bones. The upper limbs are less affected than the lower. The forearm just above the wrist is here the part in which swelling is most commonly noticed. In such a case if the swelling is not extensive, it is difficult to distinguish it from the ordinary epiphyseal enlargement so commonly present in the rickety child. But besides the parts which have been mentioned, swellings from local periosteal extravasation may be found at the upper part of the humerus and on the shoulder-blades, and sometimes similar extravasations are noticed in the skin and subcutaneous tissue. Petechiæ, bruise-like patches, and even small blood-tumours may be met with. There appears also to be the same tendency to the formation of ulcerating sores on the cutaneous surface which has been remarked in cases of scurvy affecting the adult. In one of Dr. Cheadle's cases—a little boy aged sixteen months—there were two unhealthy looking sores seated the one on the right wrist, the other on the fore-finger.

At first, when the swellings begin, the child keeps his limbs flexed, but later a new phenomenon is noticed. The patient ceases to flex his legs, and allows them to remain stretched out straight in the bed, as if he had lost all power of movement. It will now be noticed on examination that a soft crepitus can be detected in the neighbourhood of the joints from separation of the epiphyseal ends of the bones, and the wrist may drop from fracture of the carpal end of the radius. At this stage the joints can be examined without the child appearing to suffer pain from the movement of the articulations.

In many of the cases in which the symptoms are well marked, sponginess of the gums and other minor manifestations of the scorbutic taint are entirely absent. Sometimes, however, the gums are red and soft and gelatinous-looking, and may be so swollen as actually to protrude between the patient's lips. They bleed at the least touch. The swelling may extend to the mucous membrane of the palate, and this may be so spongy as almost to touch the dorsum of the tongue when the mouth is open. Dr. Cheadle has reported some cases in which the affection of the gums was unaccompanied by signs of deep-seated extravasation in the limbs, but the two conditions may be present together. The child appears at this time to be the subject of marked cachexia. He is sallow and very emaciated.

his temperature is often raised, reaching to 101° or 102° in the evening; his appetite is poor, and his bowels may be relaxed. Often profuse perspirations are noticed. If the mucous membrane of the mouth or gums is affected, the breath has a most offensive odour. The weakness is usually very great. The child ceases to be able to support himself in a sitting posture, and when placed in that position falls on to his side at once if left alone. The urine may contain albumen and sometimes is reddened with blood. The abdominal organs seem to be healthy, and no enlargement can be detected of the liver or spleen. There may be cough, but the physical signs of the chest are usually normal, or consist merely in a few large bubbles heard here and there about the back. In one of Dr. Gee's cases—a child aged one year—a curious recession of the chest was noticed. At each inspiration the whole of the front sank inwards, the ribs bending on each side at a point much outside the costochondral articulation, and the breast-bone receding instead of protruding as in rickets. Dyspnoea is not, however, mentioned in other recorded cases of the disease in early life.

As the illness progresses it is often found that the swelling first noticed begins after a time somewhat to subside, and another limb becomes affected in a similar way. Thus, in Fürst's case the earlier swellings appeared in the left femur and the tibiæ of both limbs. Next, enlargement was noticed in the right forearm, and afterwards in the left forearm and the right arm. At the time when these secondary swellings appeared the parts first affected began to recover, and the fever abated. Even after apparently complete recovery the disease is still liable to recur, under the influence, probably, of the same causes which provoked the original attack. Thus, in Mr. Thomas Smith's case the child was said to have suffered eleven months previously from like symptoms which had lasted over a period of two months.

Fever is not always present in cases of scurvy in the child. Sometimes, as has been stated, the thermometer marks an elevation of 101°, 102°, or ever higher, but the disease may run its course without the occurrence of pyrexia. Still, if the hæmorrhagic effusion is great and the tension of the periosteum correspondingly severe, a certain amount of fever is usually to be noticed.

When the patients recover, as they will usually do if suitable treatment is adopted in time, the temperature falls, the tenderness subsides, the swellings disappear, the appetite improves, and the strength and colour return. A degree of thickening is left at first around the bone at the site of the swelling, but this after a time is no longer to be detected. Even the separated epiphyses will, under favourable conditions, become again consolidated with the shaft of the bone.

Diagnosis.—In all cases where a young child presents symptoms of rickets, and it is discovered that his feeding and management have been such as to favour the special deterioration of the blood which gives rise to scurvy, the symptoms of that disease should be looked for. These always supervene upon a state of ill-health, and never occur, as is the case with purpura, in a child whose condition is not in other respects unsatisfactory. Exaggerated tenderness, even in a case of rickets, is a suspicious symptom. In rickets tenderness is confined to cases where the bone-changes and general features of the disease are pronounced. If the symptom is noticed in a child who, although showing signs of rickets, is evidently suffering from the disease only in a mild form, it points very decidedly to scurvy.

When the swellings occur in the limbs the great enlargement without

fluctuation, or redness, or local heat of skin, is unlike ordinary periostitis, and, indeed, this disease is not a recognized complication of rickets. If, then, the patient be suffering from rickets, the probability of the additional phenomena being due to the supervention of scurvy should be considered.

In many cases, especially if separation of the epiphyseal ends of the bone has occurred, with the symptoms of pseudo-paralysis, the difficulty is to exclude syphilis; and if, as may happen, there is a history of miscarriages on the part of the mother, or of doubtful symptoms in the child himself shortly after birth, it may be impossible to exclude a syphilitic taint. Still, the diagnosis of scurvy may often be ventured upon. Syphilitic pseudo-paralysis is usually accompanied by enlargement of the spleen and all the signs of a profound syphilitic cachexia. The child is greatly wasted. He is hoarse and snuffles, the cranial bones have the characteristic thickening, and the skin has the peculiar dry, parchment-like appearance so common in the inherited disease. In scurvy the patients are not as a rule greatly emaciated. Often their general nutrition is fair; and the special characteristics of syphilis are absent. If the gums are spongy or signs of hæmorrhage can be noticed in the skin or elsewhere, the evidence is strongly in favour of scurvy.

Prognosis.—If the child be seen in time and measures are at once taken to improve the quality of his food and supply the lacking constituents to his blood, recovery may usually be counted upon. When children die in this disease they die from exhaustion. Much will therefore depend upon those who are entrusted with the care of the child, for scurvy is one of the maladies of which the treatment consists almost entirely in vigilant and judicious nursing.

Treatment.—In all cases of infantile scurvy it will be found that the child has been deprived of fresh milk and fed upon Swiss milk and other kinds of tinned food, which are deficient in the material necessary for maintaining all the constituents of the blood at a normal standard. An immediate change must therefore be made in his diet. He should be given fresh cow's milk, diluted, if necessary, with barley-water or thickened with a proportion of potato-gruel. If he be twelve months old raw mutton pounded in a mortar and strained through a fine sieve, may be given every other day alternating with raw meat-juice,[1] or if the meat be not well digested, meat-juice can be given every day. If the child refuse this food the juice may be sweetened with sugar, or what is much better with turnip or carrot. Orange-juice is well taken as a rule, even by young babies, and is a valuable anti-scorbutic. If the patient be in a very exhausted state, twenty or thirty drops of brandy can be given every three or four hours; or he may have one or two teaspoonfuls of burgundy or the St. Raphael Tannin wine, diluted with an equal proportion of water. At the same time care should be taken to furnish a proper supply of fresh air. If the weather be suitable the child may be taken out frequently lying at full length in a little carriage. If he be confined to the house, open windows should be insisted upon, every precaution being taken to keep the cot out of the line of direct draught. The best medicine is cod-liver oil. This may be given with a few drops of the tincture of perchloride of iron, or in a draught composed of three of four grains of the citrate of iron and quinine dissolved in a teaspoonful of lemon-juice, and sweetened with spirits of

[1] To make raw meat juice: Put two ounces of lean raw mutton very finely minced into an earthen vessel and pour upon the meat enough cold water to cover it. Stand inside the fender before the fire for two hours, then strain through a sieve.

chloroform. An occasional powder of rhubarb and aromatic chalk can be given if there is an unhealthy state of the bowels.

When the gums are spongy and bleeding, they may be painted several times a day with a solution of glycerine of tannin and glycerine of carbolic acid, fifteen minims of each to the ounce. This application was used by Dr. Cheadle in his cases with the best results. For the swellings of the limbs Dr. Barlow recommends surrounding them with wet compresses thoroughly wrung out, and covered with dry cloths closely applied. An operation seems to be unnecessary, although Mr. Herbert Page has reported a case in which he made an incision through the periosteum and turned out the extravasated clots without ill consequences. Still, it seems probable, from the results in other cases, that eventual absorption of the blood will take place if the child be put under favourable conditions for recovery. If separation of the epiphyses has occurred, the limb must be kept perfectly quiet in splints.

Part 5.

DISEASES OF THE NERVOUS SYSTEM.

CHAPTER I.

GENERAL CONSIDERATIONS.

The diseases of the Nervous System in childhood present many difficulties. In early life the excitability of the reflex centres is normally in excess; and can even be heightened by causes which rapidly modify the general nutrition of the body. Consequently slight irritants may give rise to symptoms of tumult in the nervous system which are out of all proportion to the apparently trifling character of the lesion which has produced them. On account of this excessive irritability of the nervous system many pathological states in the child express themselves by convulsive movements which in the adult are accompanied by much less striking symptoms. In the young subject signs of nervous disturbance may arise quite independently of actual disease in the nervous centres; and the apparent violence of the commotion is not influenced by the seat of the irritant, and bears no proportion to the severity of the lesion of which it is the expression. Indeed, the same violent spasmodic movements may be the consequence of lesions so various in situation and in gravity, that in a case where such symptoms are noticed it is often by no means easy to discover the position of the irritant or to say at first whether or not the nervous centres are free from disease.

In children investigation of disease of the cerebro-spinal system is carried on by means exactly the same as are employed in the case of the adult. As, however, the young child cannot describe his sensations we have to trust much to objective symptoms, and are dependent upon the memory and observation of others for important information as to peculiarities of manner and changes in temper and disposition.

Of the symptoms to which cerebral disease gives rise some are peculiar to a centric lesion, while others are present in every case of nervous disturbance, however it may have originated. In every variety of acute illness in the young child the impressionable nervous system shows signs of distress. This is well seen in a case of acute indigestion. The skin becomes burning hot; the child is restless, cries and talks wildly; he twitches and starts in his uneasy sleep and, if an infant, may be violently

convulsed. These symptoms indicate nervous disturbance but are not distinctive of cerebral lesion. So, again, a child may scream out with pain, and frequently carry his hand to his forehead or ear, without his headache being necessarily a sign of disease of the brain.

There are other symptoms which are more directly indicative of cerebral origin ; but which may still be present without owing their rise to any discoverable lesion of the nervous centres. Thus, *squinting* is a sign which should always be viewed with great suspicion. It is frequently present in convulsions, whatever their cause, and may even continue after the nervous seizure is at an end without being necessarily a sign of anything more serious than derangement of function. Sometimes the defect becomes a permanent one, and yet after death from some accidental cause a *post-mortem* examination of the body discovers no lesion within the skull. Strabismus is not therefore necessarily a grave symptom. Still, it is so frequently a consequence of serious disease of the brain and membranes that its persistence after a convulsive attack should always give rise to uneasiness. An external squint, when it occurs without having been preceded by spasmodic movements, is often a sign of pressure upon the corresponding crus cerebri, and may be an early symptom of cerebral tumour. Strabismus may, however, occur as a consequence of hypermetropia ; and an intermittent squint is not unfrequently a symptom of chronic digestive derangement. Therefore, in all cases, careful search should be made for further evidence. In the case of cerebral tumour external squint is usually associated with ptosis and dilated pupils ; headache and vomiting will probably have been complained of ; there may be tremors or spasmodic movements in other muscles ; the sight is often impaired, and an ophthalmoscopic examination may reveal the presence of optic neuritis.

Nystagmus, or small consensual oscillations of the eyeballs, very often indicates the presence of cerebral disease. It is common in the second and third stages of tubercular meningitis, and is then accompanied by severe and obvious symptoms of intra-cranial mischief. It is not unfrequently seen in chronic hydrocephalus and even in simple œdema of the brain, and is sometimes present as a consequence of cerebral atrophy. In cases of tumour of the brain nystagmus often precedes paralysis of the ocular muscles as an early symptom of a growth within the skull. Nystagmus is not, however, always a consequence of cerebral mischief. If it occurs in an infant in whom no other sign of nervous disturbance has been noticed it should suggest a congenital cataract ; for this lesion if left untreated is apt to induce oscillatory movements of the eyeball from alternate contractions of the recti and oblique muscles of the eye. Even in older children the symptom may be due to a congenital cataract which has been overlooked. In rare cases nystagmus is the consequence of a local chorea.

The condition of the *pupils* should be always noted. During sleep in a healthy child the pupils are contracted but they dilate when the child wakes up. They are contracted in the early stage of meningitis, either the simple or tubercular form, and are also small if opium has been administered in too large quantities. In the later stage of meningitis and in many forms of cerebral disease the pupils are large and equal. If they are sluggish and contract imperfectly or not at all under the influence of light, the sign is a very grave one. If they are unequal on the two sides, the eyes themselves being perfectly free from disease, we can have little hope of the patient's recovery.

Impairment or loss of sight is another symptom of importance. In

tumour of the brain it occurs early, and if combined with headache and vomiting is very characteristic of a cerebral growth. It is often observed in meningitis and in thrombosis of the cerebral sinuses. In these cases optic neuritis may perhaps be discovered by the ophthalmoscope.

Delirium in the young baby is indicated by sudden screams, staring of the eyes, and a frightened look. In the older child by restlessness and random talking, as it is in the adult. The symptom is comparatively rarely the consequence of cerebral disease, although it may occur in cases of tubercular meningitis. As a rule, delirium in the child is evidence either of digestive derangement, of the febrile state, or of some altered condition of the blood such as obtains in the acute specific fevers. In exceptional cases a transient delirium may be due to mere weakness, and may be seen on the subsidence of pyrexia at the end of an attack of acute febrile disease. In such a case it disappears at once when the child is spoken to and he answers perfectly rationally. Early and pronounced delirium, accompanied by a high temperature, is very commonly induced by croupous pneumonia; and in any illness beginning with such symptoms it is to this disease that our thoughts would naturally turn.

Drowsiness, with dilated pupils, passing into *stupor*, is often a sign of intra-cranial mischief. After a fit of convulsions from reflex irritation, the child may be drowsy for an hour or two; but unless congestion of the brain have supervened and effusion of fluid have taken place into the skull cavity, it is a symptom which in such a case soon passes away. If the fits are frequently repeated, and in the intervals the child is heavy and stupid, with large sluggish pupils; if he takes no notice of familiar faces; and especially if the temperature is high, and there are signs of headache, the case is probably one of meningitis.

It must, however, be borne in mind that drowsiness approaching even to stupor may be present without being due to a cerebral lesion. Certain cases of pneumonia in the child are accompanied by stupor without the temperature being extraordinarily elevated, and may give rise to strong suspicions of cerebral disease. In such cases there is often little to attract attention to the chest, and all the symptoms point to the brain as the part affected. So, also, at the beginning of certain fevers, in uræmia, and even in some cases of severe gastric disturbance there may be great drowsiness and stupor, although there is no lesion of the brain.

Loss of consciousness is not easy to detect in infants. The popular test is the capability of recognising a familiar face. If the baby no longer "takes notice," he is thought to be unconscious. But it must be remembered that impairment of sight is an early symptom of tumour of the brain, and may be present in other forms of cerebral disease. A child, therefore, may cease to recognise objects and faces because his sight and not his intelligence is defective. In all cases of unconsciousness or supposed unconsciousness it is important to notice if the child still takes liquid food. An infant, if his stupor is profound, or if he is suffering pain in the head or elsewhere, refuses his food; while, if he is only stupid and drowsy, without being completely comatose, and is in no pain, he will often take his bottle with avidity. In cerebral hæmorrhage and serous effusion a child sucks well from the bottle. When he is tortured with earache or abdominal colic, he refuses all food while the pain lasts; and a child suffering from meningitis can only be fed with great difficulty.

Changes of temper should be always inquired for. At the beginning of many cerebral diseases the child often seems unaccountably wayward and capricious. He is fretful without cause, or spiteful, or sullen and morose.

These symptoms are not, however, confined to cases of brain affection. The same change is often noticed in chronic abdominal derangements, and may be a symptom of epilepsy.

Tremors, *spasms*, and *paralysis* are symptoms which derive their value from the connection in which they are found.

Tremors are sometimes a result of mere weakness, as when they occur in the late period of typhoid fever. In such a case they are general, and the condition of the patient is one of extreme debility. When they result from cerebral disease they are often confined to one limb or to a group of muscles. In such a case, if they are repeated, and occur always in the same part, they should excite suspicions of tubercle of the brain. If rhythmical, they would suggest disseminated sclerosis, although this is a rare disease in childhood.

Spasms or *convulsive movements*, both clonic (intermittent contractions) and tonic (persistent contractions) may be general or limited, like the tremors to one side of the body, to a group of muscles, or even to a single muscle. As a result of cerebral disease they are often so limited. Thus, if a child be subject to epileptiform convulsions which affect exclusively one-half of the body, some lesion (often a mass of cheesy matter) may be suspected in the opposite hemisphere of the brain. Still, a general convulsion, as has already been remarked at the beginning of this chapter, is not necessarily a sign of disease of the brain; for in certain subjects a very trifling and passing irritant is able to induce it. This subject is treated of at length in a separate chapter (see Convulsions).

Paralysis is commonly a consequence of disease of the brain or spinal cord; but even this symptom may be sometimes referred to a less serious origin. Thus a temporary loss of power may follow a severe and prolonged attack of convulsions, and is then attributed to exhaustion of nerve-force as a consequence of the seizure. This form of paralysis soon passes off. If it persist for a week or longer, it is probable that a lesion of the brain has actually occurred. Again, facial paralysis may be the result of causes acting upon the facial nerve after its point of exit from the temporal bone. An infant may be born paralysed on one side of his face from pressure of the forceps upon the trunk of the nerve; and in older children rheumatic inflammation of the nerve-sheath from a chill may be followed by the same deformity.

Even paralysis due to cerebral or spinal disease is not always permanent. When the patient survives, power in the affected limbs is often recovered more or less completely. Thus, paralysis due to myelitis affecting the anterior cornua of the spinal cord (infantile spinal paralysis), at first very extensive, may be found in a few days or weeks to have limited itself to one limb, or even to a single muscle. Again, a paralysis from cerebral hæmorrhage is often recovered from if the child survive; and the mysterious form of paralysis which sometimes follows an attack of diphtheria generally passes off completely after a time. The loss of power is often very partial, and affects special muscles. In cases of cerebral tumour it may be limited to the muscles of the eye or face.

The various forms of paralysis in children which result from clot, embolism, or other shock to the brain, are usually accompanied by aphasia. With regard to this symptom it may be noted that loss of speech is of less value in early life, as indicating the seat of the lesion, than it is held to be in the adult. Indeed, in the young subject aphasia may be present although the brain itself is free from disease. It must be remembered that in a child of five or six years old the power of talking is a comparatively recent ac-

complishment, and that the utterance of any but the most simple phrase requires a distinct intellectual effort. In many weakened states of the body—whether produced by general disease or special injury to the cerebrum—the necessary effort cannot be made. Consequently, any shock to the system will in many children take away for a considerable time the faculty of articulate speech.

Rigidity may be noticed in the affected parts. If the paralysis be permanent, rigidity and contraction may eventually ensue. Rigidity, however, is often a merely temporary phenomenon which affects various joints and comes and goes irregularly. This is often seen in cases of tubercular meningitis. Other forms of rigidity of the joints are seen in children. Tonic contractions may occur in the extremities from reflex disturbance of the nervous system (see page 274); the limbs may be the seat of spastic rigidity from disease of the spinal cord; and in girls of ten or twelve years old the so-called hysterical contractions of the joints are by no means rare.

A common form of rigidity is that which affects the muscles of the nucha and causes retraction of the head upon the shoulders. This symptom is a common one in cases of cerebral disease, and is a certain sign of intra-cranial lesion. Mere stiffness of the neck is not here referred to. This may be due to many causes, such as cervical caries, rheumatism, etc. In the retraction of the head so often induced by brain affection the head is drawn backwards upon the shoulders by rigidly contracted muscles at the back of the neck. This condition may be associated with rigidity of limbs, epileptiform fits, and hydrocephalus. It is often due to basic meningitis, and may be the consequencee of mere distention of the lateral ventricles with fluid. It is a grave symptom, although not necessarily a fatal one. Sometimes it is intermittent.[1]

Besides the symptoms connected especially with the brain, others derived from disturbance of distant organs may furnish signs not to be neglected of a cerebral origin. So great is the sympathy between the various organs of the body in early life that disease in the central nervous system is invariably associated with more or less general disorder of function.

Vomiting is rarely absent in cases of cerebral disease. It happens not only after meals, but at other times; and when retching occurs on an empty stomach, or is excited by merely raising the child up from his bed, it is a very characteristic symptom. *Constipation*, also, if obstinate, is a sign not without importance; and if associated with vomiting, and occurring in a child in whom gradual failure of health has been noticed, is very suspicious of tubercular meningitis. Even the amount of *tension* of the abdominal wall is a matter not to be disregarded. In tubercular meningitis the softness and loss of elasticity of the parietes is sufficiently obvious to the touch, and at the same time the wall is depressed and retracted in a manner peculiar to this disease.

The state of the *breathing* must be noticed. In many forms of brain lesion the respirations become very irregular, and this alteration of rhythm may be sometimes a very important sign. In tubercular meningitis, especially, great irregularity of breathing, with frequent sighs and occasional long pauses during which the chest-walls are not seen to move, is a valuable

[1] It is important not to confound the involuntary contraction of the head from rigidly contracted muscles with the voluntary bending back of the head which is seen in infants who are suffering from the pressure of an abscess upon the larynx. Such cases are accompanied by lividity of the face and urgent dyspnœa; and a swelling can often be felt at the back of the pharynx.

aid to diagnosis when the nature of the disease is doubtful. There is a peculiar form of breathing, called from the writers who have drawn attention to it the "Cheyne-Stokes" type, which, although not peculiar to cerebral disease, is yet often noticed in such affections. It consists of a series of inspirations gradually increasing in depth and strength, and then as gradually diminishing, until the movement of the chest-wall is hardly perceptible. There are many theories as to the pathology of this peculiar respiration. In most of them a supposed diminution in the excitability of the respiratory centre is a prominent feature. This type of breathing is often associated with headache and delirium, and may be found in disorders of the heart and kidneys as well as of the brain. Still, when it is found, whatever be the disease, some nervous complication is usually present.

Information can also be derived from the state of the *circulation*. In the earlier period of meningitis the pulse often falls in frequency and at the same time becomes intermittent. If a child with a temperature of 102° have a pulse of 70°, especially if its rhythm be irregular, we should suspect the presence of tubercular meningitis. It must not be forgotten, however, that a slow pulse is not uncommon in children during convalescence from acute disease, and that this slow pulse may be irregular or even completely intermit at times, especially during sleep. We must not, therefore, attach too great importance to this symptom alone, unless the temperature be elevated, and the child's state be one to excite anxiety.

Again, a remarkable modification in the vascularity of the skin is often seen in cases of tubercular meningitis. The child often flushes up suddenly, and slight pressure upon the skin, especially that of the face, the abdomen, and the front of the thighs, produces a bright redness which remains for many minutes. This cerebral flush (called by Trousseau, who first drew attention to it, *tache cérébrale*), although perhaps more vivid and persistent in this disease, is yet not peculiar to tubercular meningitis. It may be often produced by gentle pressure in sensitive children, especially if they are the subjects of pyrexia.

In all cases of paralysis in the child a careful examination should be made of the heart. Children, like their elders, are subject to embolisms, and if sudden hemiplegia occur in a child who suffers from valvular disease of the heart, we have reason to attribute the paralysis to this cause.

Lastly, the state of the urine must not be forgotten. Coma and convulsions from Bright's disease are not uncommon in children. If, in such a case, œdema, however slight, be discovered, and an examination of the water reveals the presence of albumen, we can have little hesitation in attributing the nervous symptoms to a toxic cause.

To make a complete examination of a young child in whom we suspect the existence of a cerebral lesion, all these points should be taken into consideration. In addition, it is important to study the face and expression of the patient, for by this means we may often exclude serious disease. A teething child who has just had a fit seldom looks ill—that is to say, his face has not the weary, haggard look which severe acute disease imprints upon it from the first. If the child's face looks pinched and distressed we may be sure, however apparently trifling the symptoms may be, that the case is a serious one.

In connection with this subject of nervous symptoms in children it is important to remember that in them—even in children three and four years old—we must be prepared occasionally to find the peculiar functional disorders of the nervous system which in the adult are called hys-

teria. These disorders are found both amongst boys and girls, and have no necessary relation to puberty or the establishment of the catamenial function. Sensitive children, if frightened by the shock of a fall or other nervous impression, may be seized with convulsions of hysterical type and have various modifications of sensibility of the skin, combined, perhaps, with impairment or disorder of motor power. Aphonia, blindness, deafness, anæsthesia, analgesia, hyperæsthesia, rigidities, and paralyses may be all met with from this cause. It is possible that in some of these cases the child is addicted to excessive masturbation, and some instances have been published in which there can be little doubt that debility and exhaustion of nerve-power induced by this means were the cause of the nervous disturbance. Often, however, there is no reason to suspect any such agency. The patient is a strong, healthy-looking child with firm muscles and well-developed limbs. In not a few such cases the derangement can be referred to a fright or other shock to the nervous system.

Cases illustrating these various conditions are published from time to time in the medical journals, and all busy practitioners must occasionally meet with them. They are usually readily cured by the application of a moderate galvanic current.

The diagnosis is not difficult. The derangement being purely functional, no nutritive changes can be detected. Thus the paraplegic child has full, firm limbs with no sign of muscular wasting. In the child who professes that he cannot see, and gropes his way like a blind person, the retina shows no change to the ophthalmoscope, the cornea is bright, and the pupils contract normally. Moreover, in almost all instances we may suspect the nature of the case, partly from the character of the symptoms themselves, partly from the general appearance of the child, and partly from the absence of other signs of serious organic disease.

CHAPTER II.

LARYNGISMUS STRIDULUS.

LARYNGISMUS STRIDULUS (child-crowing, spasm of the glottis, internal convulsion) is very common in England. The complaint is a form of convulsive seizure which is limited to the muscles of respiration. Sometimes it affects exclusively the muscles of the glottis; in other cases it may implicate also the diaphragm and other muscles concerned in breathing. The disorder must not be confounded with laryngitis stridulosa, in which there is inflammation of the glottis with spasm superadded. Laryngismus, as it affects the vocal cords, is a pure spasm, arising, as other spasmodic attacks are so apt to do in the child, from reflex irritation.

Causation.—The complaint may be met with under two different conditions: In new-born infants in whom no other deviation from health can be observed, and in rickety children between the ages of six or eight months and two years.

The spasm appears to be predisposed to by foul air and hot, ill-ventilated rooms. It is a remarkable and suggestive fact that the disorder is essentially a winter complaint, being prevalent when windows and doors are kept closed for the sake of warmth. It is rarely seen in summer, when every window is open to admit the air. Still, the derangement may occur without our being able to attribute it to any impurity in the air. In these cases it may be due to some special irritability of the reflex centres peculiar to the individual infant.

Few writers now hold the opinion that laryngismus is the result of pressure upon the vagus or its branches by an enlarged thymus gland. Were this so, cases of laryngeal spasm would surely be much more numerous than they actually are. Moreover, M. Hérard has reported that in six children who had died from this complaint, the size of the gland presented such striking variations that it was impossible to connect it with the production of the laryngismus from which they had suffered. It is equally improbable that pressure of any other kind set up on the pneumogastric or its recurrent branch can produce the disorder. The effects of such pressure in the case of enlarged bronchial glands are well known. Hoarseness of the voice and violent paroxysmal cough are early symptoms, and if spasm is induced it occurs, usually, at a late period, when the existence of the disease is beyond a doubt. Spasm occurring alone without warning, and as suddenly subsiding without other symptoms being noticed, is not a characteristic of enlarged bronchial glands.

The association of laryngismus with rickets is indisputable. It was first pointed out by Elsässer, and was dwelt upon by Sir William Jenner in his lectures on rickets in 1860, and more lately by Drs. Gee and Henoch. For many years I have paid attention to this matter, and can call to mind but few cases of laryngismus occurring after the age of six months in which the child was not rickety in some degree. It is important to remember, in in-

vestigating this point, that the patients do not always show a marked degree of rickets. They may do so; but as often, perhaps, as not, the child is fat, although pale and flabby—a big child, although a weak one. This connection with rickets—a disease in which the irritability of the nervous centres is known to be exalted—is a strong argument in favour of the reflex origin of the spasm. It also serves to explain the cases where many children of a family have suffered in turn from the complaint; for when a first child is rickety the others who are brought up under similar conditions usually become so too. Moreover, the tendency to laryngismus is often combined with a tendency to tonic and clonic spasm. In the same family one child may suffer from spasm of the glottis, another from general convulsions; or in the same child attacks of laryngismus may alternate with general eclamptic seizures, or may even be complicated by them. That the latter disturbance is often a pure neurosis is universally conceded; it seems, therefore, needlessly creating a difficulty to search for a different explanation for the former. Still, many other conditions have been said to be capable of causing the complaint. Various lesions of structure connected with the cerebro-spinal system have been discovered in children dying in a spasm, and in all of these cases a connection has been supposed to exist between the symptoms observed during life and the morbid appearances found in the dissecting-room. Thus the laryngeal trouble has been referred to chronic hydrocephalus, to exostosis in the skull cavity, or to actual pressure of the pillow upon a softened occiput. It seems highly probable that in all these cases the special pathological condition has been a pure coincidence, or at any rate has had only an indirect influence in inducing the nervous commotion. That no evident tissue change is needed to excite a perfect and even fatal spasm is proved by the numerous cases on record in which, after death in laryngismus from apnœa, no lesion of the cerebro-spinal system or of the glottis could be detected. It is equally certain that under ordinary circumstances intracranial inflammations and effusions do not produce spasm of the glottis, and there is no evidence that pressure upon the substance of the brain or spinal cord will have any such effect.

The exciting cause of the seizure is usually some peripheral irritant, as in the case of reflex convulsions. There may be disorder of the digestion or other irritation of the stomach or bowels, or a swollen, tense gum. The child may have been exposed to a sudden chill, and according to Henoch cold and catarrh of the air-passages are the most frequent source of this form of reflex irritation. In the few cases which have come under my notice of laryngismus attacking a child some time after birth where symptoms of rickets were completely absent, the spasms appeared to be due to slight laryngeal catarrh occurring in a nervous, sensitive child. I was asked some time ago to see a healthy baby, seven months old, who had cut two teeth and was cutting his upper incisors. The little boy was peculiarly precocious, and had the bright, intelligent face of one twice his age. There was no enlargement of the ends of the bones or other sign of rickets. The child was brought up at the breast, and his general health was good although his bowels were habitually costive. Some days before my visit the child had caught cold and had begun to cough. His voice also had been husky. Since that time he had alarmed his parents by occasionally making a noise in his throat "like the crowing of a cock." He did not suffer from dyspnœa, nor was there any lividity of the face. The sound was evidently due to a slight spasm of the larynx, which passed off almost immediately and seemed to cause little inconvenience to the infant himself.

The child's bowels were attended to and he was given half a grain of chloral twice a day. The symptom then soon subsided.

In cases where there is great irritability of the nervous system cough or even swallowing may induce a paroxysm. Anything which frightens or irritates the patient may produce the same result. Thus in a young child who is subject to the attacks a fit of crying may bring on a seizure. Sometimes, again, the complaint is a relic of pertussis, the spasm remaining although the other symptoms of the disease have passed away.

Symptoms.—We may often notice in rickety babies an occasional crow or croak in their breathing which seems to cause them little or no inconvenience. In some children this symptom may continue for weeks and then disappear without being followed by anything more serious. In others, after it has continued for some time the child is suddenly seized with a decided attack of laryngismus stridulus.

In a pronounced form of the seizure the child becomes all at once quite stiff and lies with his head back, his face congested and livid, his eyes staring, and his expression haggard and frightened. After a few seconds the spasm relaxes, the breath is drawn in with a crowing or hissing sound, and the attack is at an end. The child then looks pale and seems languid ; often he goes to sleep.

In the more severe cases the spasm is repeated several times at short intervals. Still, actual closure of the glottis is seldom prolonged beyond a few seconds. There is no pyrexia. At the end of an attack the child often vomits, and sometimes he has a good fit of crying.

The above is the simplest form of the complaint—that in which the spasm is limited to the muscles of the glottis. Even in these cases, however, signs of tonic spasms in voluntary muscles are often to be detected. The fingers are forcibly clenched upon the thumbs, and the toes are flexed under the feet. This tendency to carpo-pedal spasms may continue between the attacks and even for some little time after the seizures have ceased to appear. The number of the spasms and the frequency with which they are repeated vary considerably in different cases. Generally the attacks are not very frequent at first, and sometimes after occurring several times they cease to appear. But if the child be the subject of marked rickets he seldom escapes so easily. The seizures, having once begun, sooner or later return. In the beginning they may be seen at comparatively rare intervals, and perhaps only after waking from sleep, or when the child is irritated or frightened ; but in bad cases they may recur so frequently that the patient is in constant peril. Dr. Roberton has referred to a case in which the spasms were not absent for more than ten minutes, day or night, for ten months. Sometimes they cease completely for a time, but return at the end of some weeks, or even months, when a sufficiently powerful exciting cause is again in operation.

As an illustration of the length of time during which these attacks often continue, I may instance a little rickety boy, aged twenty months, who was an in-patient under my care in the East London Children's Hospital. Nine months before the child had had an attack of whooping-cough. After the cough had subsided the laryngeal spasms still continued, and were often repeated eight or nine times in the twenty-four hours. He had been treated as an out-patient three months before admission with much benefit, for the paroxysms had been greatly reduced in number, although they returned on the slightest provocation. If by any chance he coughed he always had an attack immediately. During the first few days after admission the child had three paroxysms daily. In these attacks,

which came on quite suddenly, his lips turned blue, his breathing was excessively difficult, his inspirations were croupy, and his whole body was agitated, although there was no general convulsion. Then the spasm abruptly relaxed and he heaved a deep sigh. After the seizure he was always very pale, but the breathing was natural and there was no hoarseness. The child had all the signs of well-marked rickets. He had only six teeth; the joints were large; the fontanelle was open; the ribs were very soft and the lower part of the thoracic wall receded deeply at each breath. The spleen was enlarged, reaching nearly to the level of the navel. There were no signs of swelling of the bronchial glands. The child's bowels were loose and his motions very offensive. There was no fever. In this patient the spasmodic attacks were cured almost immediately by bathing him three times a day in cold water.

A more complicated form of the complaint is that in which the spasm is not limited to the glottis, but involves also the diaphragm and other respiratory muscles. These cases assume much more the characters of general convulsions, for there is often more or less tonic spasm of the limbs, and consciousness may even be interfered with. Thus the child lies backwards with dusky face, half-opened eyelids, and upturned eyes; breathing is laboured and inspiration difficult and crowing; the diaphragm acts irregularly; and there are often convulsive contractions of the muscles, causing profound recession of the lower ribs and soft parts of the chest. Sometimes for a few seconds the glottis is completely closed; the face then becomes lead-coloured, and the limbs are agitated by convulsive movements. According to Rilliet and Barthez, the pulse is small, frequent, and irregular, and the heart's action also irregular and tumultuous. If the child be markedly rickety a general eclamptic attack may supervene, or there may be tonic contractions of all the voluntary muscles, the body becoming stiff, the limbs contracted, and the fingers and toes forcibly flexed.

In new-born infants, on account of the feebleness of the child—for it is in weakly or prematurely born infants only, as far as I have noticed, that laryngismus occurs so soon after birth—the symptoms are quieter. In the cases I have seen crowing-breathing was absent. The lips were noticed to turn blue and the face to become livid; the baby stretched himself out stiffly and remained for a few seconds perfectly motionless, with flexed fingers and toes. There was complete immobility of the respiratory muscles, and he seemed as if dead. Then he drew a deep sigh and the attack was over. In these cases the spasm appears to be seated in the diaphragm and external muscles of respiration, leaving the glottis unaffected; for no symptom is noticed of narrowing of the rima. Obstruction to breathing seems to be complete. The seizure is short and rarely lasts longer than five or at the most ten seconds.

In an uncomplicated case of laryngismus stridulus, *i.e.*, in a case where the complaint consists of pure muscular spasm, there is no fever. Sometimes, however, laryngismus complicates an attack of pneumonia. The temperature is then high. These cases are very serious and usually end fatally.

Even in an uncomplicated case death may ensue. If this happen during a paroxysm, the face assumes an expression of the utmost terror; the eyes are widely open and suffused. the pupils are dilated, and the eyeballs seem to project; the complexion grows more and more dusky, sweat breaks out on the forehead, and the pulse grows feeble and small. Inspiratory efforts are at first violent, then cease; the heart stops, and the child falls

back dead. Death may be preceded by general convulsions. This is the result of asphyxia from too long-continued spasm of the inspiratory muscles. According to Dr. J. Solis Cohen, incarceration of the epiglottis is apt to occur in the more violent paroxysms, and may produce death by suffocation. The epiglottis is drawn forcibly down by the spasmodic action of the ary-epiglottidean muscles, and its free edge is caught between the posterior face of the larynx and the wall of the pharynx, so as to cover the glottis like a lid and completely occlude it. In such cases it can be felt by the finger passed deeply into the child's throat. Sometimes death takes place still more suddenly, and the end then resembles an attack of fatal syncope. The dusky face assumes a ghastly pallid hue, the muscles generally relax, and the patient is found to be dead.

In other instances, where the seizures have been violent and persistent, especially if they have been complicated by general convulsions, the child may die more slowly. In most of these cases extensive collapse takes place in the lungs. The spasmodic symptoms subside but the child's face continues dusky. His lips are blue, his nostrils work, he lies very quietly breathing with rapid, shallow inspirations which expand the chest very imperfectly ; he gets more and more livid, and after some hours dies quietly or in a final convulsion.

Sudden death from asphyxia may take place early, even it is said in the first attack. The slower death from collapse of the lung is seldom seen except in severe cases where the child is exhausted by repeated and violent paroxysms, or where the complaint has been complicated by general convulsions. In rickety children who are left untreated for that disease the spasms continue as long as the faulty nutrition to which the disorder is due remains unremedied. The seizures may therefore go on for months, or even years, when the parents are ignorant or careless, and the child is injudiciously reared. In ordinary cases the patient is treated early and soon recovers. Children after the second year rarely suffer from the complaint. I have, however, met with it once in a rickety little girl of four and a half years old.

Diagnosis.—In new-born babies laryngismus, especially if it be of that variety which is manifested by spasm of the diaphragm and intercostal muscles without closure of the glottis, may be mistaken for infantile tetanus. We may distinguish the two diseases by remarking that in laryngismus the temperature is normal, and that between the attacks the muscles are perfectly relaxed. This complete relaxation of the muscles is the most trustworthy distinguishing mark, for the temperature in very young children may be raised by many trifling and temporary conditions. Sometimes, however, there may be a more serious complication that gives rise to pyrexia. Thus I once saw an infant of two weeks old who suffered from these attacks, and in whom there was pyrexia dependent upon pericarditis with copious effusion into the sac of the heart.

In older children the case may be mistaken for laryngitis stridulosa. Here, too, the absence of fever is a very important distinction, if the disease is quite uncomplicated. But children while cutting their teeth are subject to frequent elevations of temperature from the natural process of dentition ; and this in the subjects of rickets, who cut their teeth late, may be delayed far beyond the end of the second year. We should then be careful to satisfy ourselves that the gums are not swollen, and that there is no stomatitis or other complication capable of giving rise to fever. Moreover, the history and course of the two diseases are different. In laryngismus the spasm comes on quite suddenly, lasts a few seconds or a

minute or two, and then subsides. Laryngitis is preceded by cough and hoarseness; the attacks of dyspnœa are much more prolonged, and even in the intervals the breathing is more or less oppressed, the voice hoarse, and the cough loud and clanging. Again, stridulous laryngitis is an acute disease, while laryngismus stridulus is apt to take on a very acute course. In laryngismus there are often tonic spasms or carpopedal contractions, and the disorder is often complicated by general convulsions. In laryngitis convulsions are rare and tonic contractions are very rarely seen. Lastly, laryngitis stridulosa, as a rule, attacks children after the age at which they are most susceptible to laryngismus, and is not common in infants under two years old.

Prognosis.—In new-born infants the prospect is very serious, for the attacks at this early age are very apt to end fatally. Persistent lividity of the face or other sign of collapse of the lung is a symptom of very dangerous import.

In older children, if the spasm remains limited to the respiratory muscles, the prognosis is less serious than in cases where the convulsions, at first local, afterwards become general. The percentage of mortality has been put very high by some writers; but statistics gathered from published cases alone are apt to be misleading, as only the worst cases are likely to be placed on record. The prognosis depends in great measure upon the strength of the child and the degree of rickets which may be present. If there be much softening of the ribs and consequent interference with respiration, there is great danger of pulmonary collapse taking place, and the case is a very serious one. If, under these circumstances general convulsions ensue, the child's life is in very imminent danger. Even in the slightest cases we should speak guardedly of the patient's chances of recovery.

Treatment.—If the child be seen during an attack, attempts should be made to excite vomiting by passing the finger into the fauces. Afterwards a sponge wrung out of hot water may be applied to the throat under the chin. According to M. Charon, who first proposed the remedy, the inhalation of ammonia is almost invariably successful in arresting an attack. This physician advises all mothers whose children are subject to spasm of the glottis to carry a small bottle of ammonia—ordinary "smelling salts"—about with them. He relates the case of a lady whose child was always rapidly relieved by this means. Unfortunately one day the child was seized with an attack at a time when the remedy was not at hand, and while the mother was hurriedly searching for it the child fell back dead.

If the suffocative spasm be very intense, it is well to thrust the finger deeply into the child's throat, so that the epiglottis, if incarcerated, as described by Dr. Cohen, may be released. The seizure, however, in most cases, is over so quickly that there is little time to adopt measures for abridging it. But we can at any rate take steps to prevent a return of the paroxysms. For this object cold water bathing is indisputably the most important and most immediately successful. The child should be placed naked in an empty bath or large basin, and be then rapidly sponged all over the body with cold water. In winter he may be made to sit in hot water during the process. The bath should be given three times a day. Very few cases of laryngismus will be found to resist this treatment. I have used it in obstinate cases, and to children suffering from rickets, with the most satisfactory results. Next to cold bathing fresh air is of the greatest service. The child, warmly dressed, should be taken regularly

out of doors, and even in cold weather should spend many hours in the open air.

While these measures are being carried out, search must be made for any source of irritation which may serve as an exciting cause of the spasms. Tense swollen gums should be lanced, the dietary must be reconstructed upon sound principles, and the condition of the digestive canal must be attended to. In many of these cases the bowels are loose with relaxed slimy motions. If this be so, a dose of rhubarb should be given, and the child should take for a few days five or six grains of bicarbonate of soda dissolved in an aromatic water sweetened with glycerine. Of special drugs musk and belladonna are the most useful. The former can be given to a child of twelve months old in doses of one-third of a grain every six hours, and will be found to have a powerful influence in checking the tendency to spasm. Belladonna to be of service must be given in sufficient doses. A baby of twelve months old will take well fifteen drops three times in the day. Mr. Stewart of Barnsley, speaks highly of chloral in the treatment of spasm of the glottis, and recommends two and a half grains to be given to a child of twelve months old three times a day.

In new-born babies, for whom cold sponging is inadmissible, musk is a very important remedy. One-fourth of a grain can be given three times a day, suspended in mucilage. It can be combined with ten drops of tincture of belladonna if thought desirable.

If the child is markedly rickety, iron and cod-liver oil should be given as soon as the state of his digestive organs is sufficiently improved to make the use of the tonic desirable. Iron wine is, perhaps, the best form in which that drug can be administered, for the alcohol it contains is an addition of great value to weakly children. Great care must be taken in these cases that the child is not overfed with farinaceous foods which contribute little to his general nutrition while they overload him with unhealthy fat. They are also very apt to turn acid in the stomach and favour catarrhal derangements. No mention has been made of bromide of potassium, for in this complaint I hold the drug to be of very inferior value, and place it far below musk in its powers as an antispasmodic.

CHAPTER III.

TONIC CONTRACTION OF THE EXTREMITIES.

Tonic contraction of the extremities, or *tetany*, is sometimes met with in young children, most commonly in the subjects of reflex convulsions or laryngismus stridulus. The contraction occupies the muscles of the limbs, especially those of the hands and feet, and may be continuous, remittent, or intermittent.

Causation.—Tonic contraction appears to be one of the many forms of reflex disturbance to which rickety and excitable children are so peculiarly prone. The disorder rarely attacks a sturdy subject. It is most commonly met with in young patients whose nutrition is imperfect either from injudicious management or natural delicacy of constitution, and appears to be predisposed to or excited by digestive derangements and other forms of irritation. Thus a little girl of five years old, who had recovered under my own observation from tubercular peritonitis, but had remained very delicate and liable to gastric and intestinal troubles, one day swallowed a part of an orange. She was seized shortly afterwards with severe pains in the belly, and passed a few loose, unhealthy motions. At the same time the fingers became firmly clenched, with the thumbs inverted and the wrists flexed. In this state she remained for forty-eight hours, in spite of active treatment by injections and laxatives. At the end of this time a large enema brought away a mass of orange pulp. The child was at once relieved, and the rigid contractions of the muscles ceased from that moment. Similar instances have been recorded in which a constipated state of the bowels has been a cause of the phenomenon, and other sources of disturbance and excitement, such as pleurisy, pneumonia, diarrhœa, intestinal worms, the irritation of uric acid calculi, and teething have been quoted as exciting causes of this painful affection. The age at which children are most liable to be attacked is between the first and third year. The disorder is said sometimes to affect young girls shortly before puberty, and in such cases is attributed on the continent of Europe, where tetany seems to be more common than in this country, to the influence of cold and damp.

Symptoms.—A child who has been for some time in a weakly state, and is, perhaps, in the majority of cases, the subject of mild rickets, all at once cries with pain in the extremities, and it is noticed that these parts are contracted. Often the contraction is found to succeed to a fit of convulsions or an attack of laryngeal spasm ; but it persists after these are at an end. The muscular spasm may affect both hands and feet, or be noticed first in the fingers, and spread thence to the hand and wrist, the ankle and the toes. When fully developed the hand is found to be flexed at the wrist, and the thumb to be firmly inverted into the palm. The fingers may be rigidly clenched upon the thumb, or slightly separated and perfectly straight except for some slight flexing of the last joint. The ankles are often extended and the toes firmly flexed. In a few cases redness and swelling in the neighbourhood of the joints have been noticed. The con-

traction in most cases seems to be painful. Infants cry repeatedly, and older children complain of pains shooting along the course of the nerves. The muscles are in a state of rigid contraction. In pronounced cases, not only can the muscles of the leg, such as the gastrocnemii and peroneii, and of the forearm be felt to be firm, but the act of manipulating them increases their tendency to become rigid. Pressure may even induce tonic contractions in muscles otherwise free from rigidity, such as the pectorals, the muscles of the neck, and those of the abdomen. In a severe case recorded by Dr. Cheadle—in a boy two years old—even the muscles of the face were in a state of abnormal excitability, for irritation of the skin just in front of the left parotid region caused twitching of the orbicularis palpebrarum, the levator alæ nasi, and the levator anguli oris. The same phenomenon was also seen, although to a less degree, on the right side of the face. There was, in addition, some difficulty in swallowing, especially when liquids were taken.

When the attacks follow a convulsive seizure they may be accompanied by a temporary paralysis, such as is a not uncommon consequence of eclampsia (see page 280). Sometimes the contractions are more extensive. Thus the muscles of the trunk are occasionally affected. Rilliet refers to the case of a delicate little girl, aged twelve years, in whom the tonic rigidity of the extremities was accompanied by opisthotonos with extreme retraction of the head, and at times intermittent contractions limited to the back were noticed, closely resembling tetanus in character; but the jaws were not affected, as they invariably are in that disease. The disorder lasted for a month. In other cases, according to the same authority, the spasms may be more limited and affect the hip or one side of the neck. The disease appears to be more severe upon the continent of Europe than it is in England. In the milder form common in this country the contractions are invariably bilateral, and affect the corresponding muscles of the two sides. As long as they continue, walking is impossible, and the child can hold nothing in his hand. In the slighter forms the contractions are remittent, and occasionally cease completely. In severe cases little variation is seen in the rigidity, and it persists during sleep. Even complete anæsthesia from chloroform produces no relaxation of the tonic spasm. Sensation is unaffected; reflex excitability is normal; the temperature is natural or even below the level of health and the child's intelligence remains perfect. In Dr. Cheadle's case the muscles responded well to both the continued and interrupted current. The tonic contractions are rarely the only nervous symptoms present. Often they alternate with other forms of nervous spasm. The child may be subject to laryngismus stridulus, or may be readily thrown into convulsions by any passing irritation. In many cases, as has been said, the contractions succeed to some such form of nervous seizure, and sometimes an intermittent squint is noticed.

In most cases, in addition, symptoms of intestinal or other derangement are present. Diarrhœa is one of the commonest of those symptoms; and, indeed, the nervous disorder has been known to disappear as the condition of the bowels improved. The duration of tetany is very variable. It may last a few days or persist for weeks. It usually becomes intermittent before it finally disappears. After ceasing for a time it not unfrequently returns.

Diagnosis.—This form of nervous spasm is readily recognised. Tonic contractions occur in a child whose nutrition is impaired either from injudicious management, from gastro-intestinal derangement, or from the recent presence of acute disease. Often he is the subject of rickets, and has already shown a tendency to other forms of nervous derangement. Tetany

is bilateral and symmetrical. It occasions no elevation of temperature and is accompanied by no clouding of the intellect. These qualities, combined with the tendency to nervous spasm, and the evident connection of the attack with some form of peripheral irritation, will serve to exclude cerebral disease. In the severe form, which is accompanied by opisthotonos and tetanoid spasms, the history of the attack, the normal temperature, and the entire absence of stiffness of the jaws will be sufficient to exclude tetanus.

Prognosis.—Tetany is merely a symptom which has no gravity whatever; and the prospects of the patient's recovery of health depend upon causes quite independent of the nervous spasm. As the children in whom tetany occurs are often the subjects of a chronic intestinal derangement, and are in many cases distressed by frequent attacks of laryngismus stridulus, they may possibly succumb; but in estimating the patient's chances of recovery the tonic rigidity of the extremities may be quite excluded from our calculations.

Treatment.—Our first care in the treatment of this complaint must be to attend to any disordered condition which may be present interfering with nutrition, and acting as an irritant to the nervous system. Gastro-intestinal derangements must be checked; constipated bowels must be relieved; the diet must be regulated to suit the needs of the system (see Infantile Atrophy, Chronic Diarrhœa, etc.); and if rickets be present, measures must be taken at once to arrest its progress. In all cases, indeed, the general treatment recommended for laryngismus stridulus and rickets, viz., fresh air, good food, cleanliness, and the administration of iron wine and cod-liver oil, is of equal service in this disorder. Frictions and warm baths seem also to have a beneficial influence.

In obstinate cases special steps are required to relieve the tonic rigidity. This form of spasm will often refuse to yield to measures which have the power of readily controlling the nervous disorders with which tetany is allied. Chloroform puts an immediate stop to an eclamptic seizure, but has no power of relaxing the rigidly contracted muscles of tetany; and chloral which is so valuable in arresting the spasm in laryngismus stridulus is given in this neurosis without any beneficial result. Bromide of potassium and musk appear to be equally useless. In Dr. Cheadle's case, before referred to, chloroform, chloral, and bromide of potassium were given without any success; but the contractions yielded after the treatment had been changed to Calabar bean with cod-liver oil and iron wine. One thirty-sixth of a grain of the bean was given three times a day. The dose was gradually increased to one-eighth before any effect was produced. A notable diminution in the stiffness was then observed. Afterwards the dose was increased to one-fifth, later to one-fourth, and lastly to one-third of a grain three times a day. The boy was well seven weeks after beginning to take the remedy.

Although the bean appears in this case to have had a decided influence over the spasm, it must be noted that the child began at the same time to take iron wine and cod-liver oil; and that although the principal improvement occurred after the dose had been pushed to one-sixth of a grain, it followed two days after the important addition of pounded raw meat had been made to the child's diet. The Calabar bean, no doubt, deserves a more extended trial in these cases of tonic rigidity. Still, in the interesting case referred to it is doubtful what degree of improvement can be correctly attributed to this remedy; for the alcohol, the cod-liver oil, and the improved diet must have taken a sensible share in bringing about the child's recovery of health.

CHAPTER IV.

CONVULSIONS.

The commotion in the nervous system which goes by the name of eclampsia, or a fit of convulsions, is a common phenomenon in infancy, and is sometimes seen in early childhood. The seizure depends upon an exalted excitability of the reflex centres seated in the pons and medulla oblongata, but is seldom attended by changes in those parts capable of being detected on examination of the dead body. The disturbance is essentially a symptom, and may be produced by a variety of causes. Irrespective, then, of the immediate danger to life, the phenomenon may be of serious moment or of trifling consequence according to the cause which has induced it. It is, therefore, of great importance to ascertain its mode of origin, for only by this means can we speak with any certainty as regards the influence which the attack is likely to have upon the future well-being of the child.

It is during the first two years of life that the tendency to this form of nervous derangement is most active. At this period of childhood the nervous system of the infant, although immature, is undergoing rapid development, and the reflex centres respond briskly to every form of peripheral irritation. The tendency to eclampsia is not, however, confined to this age. Convulsions may even affect the infant in the womb. Early death of the fœtus and premature labour can be sometimes attributed to this cause, and it is to this accident that some varieties of congenital deformity have been referred—those which are characterised by permanent contraction of special muscles. After birth the proneness to convulsions may continue for a longer or shorter time, according to the natural sensitivencss of the nervous system to external impressions. It is therefore much more persistent in some children than in others, and may endure in exceptional cases to the ninth or tenth year.

Causation.—There are certain conditions which predispose a child to convulsions. Thus the liability to eclamptic seizures sometimes runs in families, so that all the children born of certain parents are found to suffer from these attacks. In other cases the tendency is confined to certain individuals of the family, or even to one sex. Thus all the boys may have convulsions while the girls escape. Again, in rickets there is a special convulsive tendency which is very remarkable, and a large number of the cases of reflex convulsions are found to occur in children with this constitutional condition. When the predisposition exists very slight causes—causes often so trifling as to escape recognition—may induce the attacks.

Within certain limits the state of a child's nutrition does not appear to affect his susceptibility to convulsive seizures. A strong child and a weak one may be equally prone to suffer from this nervous disturbance. When, however, an infant is greatly reduced by long-continued interference with nutrition, a remarkable difference is noticed in his sensibility to nervous impressions. Not only is there no exaltation of reflex function, but the

normal excitability of the reflex centres is diminished or annulled. Therefore in a child so enfeebled convulsions are seldom of reflex origin, but usually indicate grave cerebral disease.

The exciting causes of the nervous commotion are very various :

True reflex convulsions arise from peripheral irritation. Injuries to the skin from pricks, burns, and wounds ; irritation of the alimentary canal from indigestible food, hard fæcal masses, or parasitic worms ; of the gums from inflammation and swelling during the cutting of a tooth ; of the ear from collections of wax, the presence of a foreign body in the auditory meatus, or inflammation of the tympanic cavity ; retention of urine ; sudden chilling of the surface from exposure ; violent emotions, such as terror—all these causes may set up convulsions in certain subjects.

Irritation affecting the mucous membrane of the stomach and intestine, and according to some authors irritation within the ear, seem to be the most common exciting causes of reflex convulsions. In hand-fed babies indigestion is a familiar occurrence, and the disturbance set up by a mass of undissolved curd or other irritant may speedily culminate in an attack of eclampsia. Again, otitis is a more common disease of infancy than is usually supposed. It is often a direct consequence of dental irritation, and occurs with such frequency as to constitute one of the more common complications of dentition. According to Dr. Woakes the inflamed and swollen gum is a source from which irritation is conveyed to the otic ganglion, and thence is deflected to the vessel supplying the tympanic membrane. Acute congestion of the membrane thus occasioned is a source of extreme pain ; and if the irritation persist, suppuration in the tympanic cavity may follow. Inflammatory tension of the gum alone may set up the eclamptic attack ; and the secondary disturbance in the ear is a fruitful source of such seizures.

Eclamptic attacks are common in the child at the onset of acute illness, and correspond to the rigor which usually introduces the febrile movement in older persons. These seizures must not be attributed directly to the pyrexia, for it is improbable that the mere elevation of temperature is sufficient to produce them. The more severe the attack and the younger and more impressible the patient, the more likely are convulsions to be seen. These attacks are seldom dangerous, but the eclamptic fits which occur at a later stage of the same diseases arise from a different cause and have a far graver meaning.

Another class consists of the convulsions which are induced by imperfect aëration of blood. These constitute the less serious attacks which sometimes arise in the course of pertussis after a prolonged paroxysm of cough, and often precede death in cases of extensive collapse of the lung.

Congestion of the brain is often quoted as one of the causes of convulsions, and no doubt fatal fits of eclampsia are frequently associated with a hyperæmic state of the cerebral vessels. The chief factor in such cases, both of the congestion and the fits, may, as Dr. Bastian has suggested, be minute embolisms or thromboses in the small arteries and capillaries of the brain. In the fatal convulsions which sometimes abruptly terminate an attack of whooping-cough congestion of the brain is generally present, and is often dependent in such cases upon thrombosis of the cranial sinuses.

An exactly opposite state of the cerebral vessels may induce the same symptom. The anæmia of brain which results from profuse hæmorrhage or exhausting discharges, such as an attack of acute diarrhœa, is often indicated by a convulsive seizure. It is, however, worthy of note that an equal degree of prostration slowly established by a chronic intestinal de-

rangement is not followed by the same consequences, the excitability of the nervous centres being then diminished instead of exalted.

Lastly, toxic causes may induce convulsive seizures. Uræmic convulsions belong to this class, and also the eclamptic attacks which are common in children who live in malarious districts. Lead in the system may produce the same result. Infants seem to be very susceptible to the influence of lead given medicinally. I have long ceased to make use of this remedy in the treatment of the diarrhœas of young children, as I have several times seen convulsions follow its employment, and the attack has appeared to me in some cases to be directly excited by the use of this agent.

Convulsions arising from cerebral disease have been omitted from the above classification, as partaking more of the nature of epileptic attacks than of true eclampsia. Reference must, however, be frequently made to them in discussing the subject of convulsive seizures, for it is of the utmost importance in every case where a child is taken with a fit to be able to exclude centric causes from consideration.

Symptoms.—The convulsive seizures may come on suddenly or be preceded by symptoms of nervous excitability which are more or less obvious. Such phenomena are often called by nurses "inward fits." They are not invariably followed by a convulsion. Indeed, as a rule perhaps, they pass off after a time, especially if they are the consequence of digestive trouble, and the infant's placidity of manner returns. In other cases they become more and more pronounced, and culminate in an attack of eclamptic spasms. Thus the child is unusually disturbed in his sleep. He often starts and twitches. His eyelids may only partially close, and he wakes easily, starting up at the slightest touch. When awake he is restless and fretful. His senses seem unusually acute, so that loud noises frighten him. He changes colour frequently. His face has a curious expression, the eyeballs are often directed upwards, and his thumbs may be twisted inwards across the palms. After these symptoms have continued for a variable time—often for several days—the child is all at once noticed to be unusually quiet. He stares with a peculiar fixed look, and his attention cannot be diverted to his toys. Then, suddenly, the fit begins. The child gets quite stiff, his head is retracted, his arms and legs are rigidly extended, his eyes are turned upwards, and he ceases entirely to breathe. In a few seconds the tonic rigidity is replaced by clonic spasms. The face becomes intensely congested, the eyelids are widely open, and the eyeballs are drawn upwards and to one side, and are twitched rapidly in different directions. The muscles of the face work, the tongue may be seized and bitten by the teeth, and froth, perhaps tinged with blood, may appear upon the lips. The muscles of the limbs are thrown into the same spasmodic action, and more or less pronounced twitching affects the arms and legs, sometimes even down to the fingers and toes. Consciousness is completely lost. The skin is often covered with a profuse sweat, and in many cases the sphincters are relaxed, so that there is involuntary passage of urine and fæces. During the clonic spasms the breathing is not suspended, but there are jerking movements of the respiratory muscles. After some time the spasms become less violent. The face then changes from dusky red to a deathly pallor, the muscles relax, the child often gives a long sigh, and the attack is at an end.

The spasmodic movements are usually general and involve both sides of the body, although one side is often more actively convulsed than the other. Sometimes they are partial, and may be limited to one or both limbs on one side of the body, to the two arms, or even to one side of the

face. The eyes are almost always involved in the convulsion. The fit lasts for a time varying from a few minutes to several hours. In the longer fits there are intervals of more or less complete remission, and sometimes the so-called fit consists of a series of eclamptic seizures with short intervals of quiet. In rare cases death takes place in the fit from asphyxia. As a rule, the child sleeps after the seizure has come to a close, and may wake to all appearance quite well. When the fit is repeated several times the child is drowsy for a time between the attacks, but the sleepiness passes off in a few hours. As long as any signs of abnormal excitability of the nervous system continue, and symptoms characteristic of the condition described as "inward fits" remain, we may anticipate a renewal of the convulsive seizures. It is not until all restlessness, startings, twitchings, etc., have disappeared that our apprehensions can be laid aside.

Some loss of motor power may be noticed after the fit is at an end. In cases of pure eclampsia this is a very temporary phenomenon, and only occurs when the seizures have been very violent and protracted. It is probably due to exhaustion of nervous power and disappears completely after a day or two. Any signs of permanent interference with nerve-force, such as local muscular weakness, contractions, or choreic movements, are usually taken to indicate some organic central cause for the convulsion. It is possible, however, that these symptoms may be the consequence of the seizure; for severe cerebral congestion induced by intense and protracted eclampsia may give rise to hæmorrhage into the brain or arachnoid. Certainly I have known cases of convulsions occurring in children as a result of some temporary irritant to be followed by paralysis with contraction of muscle, and have thought that in such cases the cerebral lesion might have been secondary to the eclamptic attack. There seems little reason to doubt that sometimes congestion of brain, with serous effusion sufficient in quantity to flatten the convolutions, may result from an eclamptic attack, and give rise to squinting, drowsiness, and death.

A rickety little girl, aged twelve months, who had cut only two teeth, was quite well until January 7th, when she was weaned. She then became very fretful and vomited her food. At the same time an eruption of small red spots appeared on her arms and face. On January 9th the child had two fits, in which she "went stiff and worked her arms about." On January 11th she had a third fit and then began to squint.

When I saw the child, on January 17th, she was lying with her eyes closed; the right eye was turned inwards with convergent squint; the pupils were equally dilated, and acted well with light; there was no discharge from either ear; the face was pale, but flushed upon pressure of the skin; there was no paralysis or contraction; the thumbs were not twisted inwards, nor were the toes flexed. When the abdomen was compressed the child made uneasy movements. She was evidently not unconscious, but seemed drowsy. The heart and lungs were healthy. The child was preparing to cut the upper incisors, and the gums were very full and tense. Pulse, 160, regular; respiration, of Cheyne-Stokes type, 40; temperature, 99°.

The patient was ordered a mercurial purge, and bromide of potassium was given; but the drowsiness deepened into stupor, and she died on January 19th. Her temperature rose every night to 101°. Half an hour before death it was 99.4°.

On examination of the body the dura mater was noticed to be very tense, and the brain bulged through slits in the membrane. There was great venous congestion of the pia mater, and the convolutions were flat-

tened. On removing the brain about two ounces of sanguinolent fluid were left at the base of the skull, and on section much fluid escaped from the lateral ventricles. Nothing but congestion of the brain was noticed. There was no loss of consistence; the membranes were not thickened, nor had they lost their pearly appearance; there was no lymph effused, and no gray granulations could be detected. There was a mass of enlarged glands at the bifurcation of the trachea. The lungs and heart were healthy. Unfortunately the cranial sinuses were not opened.

In this case it seems clear that the post-mortem appearances were secondary to the convulsions. The nervous symptoms themselves seem to have been the consequence of reflex irritation from the state of the gums, combined with irritation of the stomach from unsuitable food, both occurring in a child of rickety constitution. The red spots spoken of were strophulous, resulting from the indigestion.

Sometimes loss of speech and even imbecility have been known to follow upon an attack of convulsions. In such cases, no doubt, some profound cerebral lesion has induced the fit or been caused by it.

Diagnosis.—In every case of convulsions we should examine the patient very carefully for signs of disease of the brain or its membranes, more especially as the first question usually asked by the parents after their first excitement and alarm have subsided relates to the possibility of any affection of the brain. In infants of twelve months old or under, if the child be fat and robust, the fit is in all probability reflex; if he be under-nourished, weakly, and wasted, *i.e.*, in that condition where all reflex excitability is practically in abeyance, the convulsion is no doubt the consequence of an intracranial lesion. In a weakly wasted infant by far the most common cause of a convulsive seizure is general tuberculosis with secondary tubercular meningitis.

The character of the fit itself will give some indication valuable in diagnosis. Cerebral convulsions are often partial. Therefore, if the spasms are limited to one side of the body or one limb, we should search carefully for signs of cerebral disease. Paralysis of the face remaining after the end of an attack is indicative of a cerebral lesion. Thus, drawing of the mouth to one side, ptosis, or inequality of pupils are symptoms never seen in true uncomplicated eclampsia. A squint persisting after the convulsion has passed off must be regarded with anxiety; for although not necessarily a grave symptom, it is often indicative of a serious lesion; and if accompanied by signs of heaviness, or tendency to stupor, must be looked upon as an unfavourable omen. Again, convulsions, general or partial, without loss of consciousness, should lead us to suspect disease of the brain. Another important symptom is the condition of the child after the attack. In true eclampsia consciousness is recovered quickly after the seizure; and if any drowsiness remain, it is over in a few hours. Signs of persistent stupor or dulness of the senses would point to a cerebral lesion. Mere temporary loss of power in a limb is no proof of centric origin; but if the paralysis continue longer than a few hours or a day or two, especially if contraction of muscle occur, we may conclude that some centric lesion, either primary or secondary, is present. Even if unmistakable evidence of a cerebral lesion is seen when the convulsion is at an end, it does not follow that the lesion was the cause of the fit. One consequence of eclamptic seizures is congestion of the brain; and if the nervous attack be prolonged, serous effusions, and perhaps minute capillary hæmorrhages, may occur and lead to alarming consequences. A case in which death took place from this cause has already been narrated.

It has been said that convulsions taking place at the end of the exanthemata and other febrile diseases are commonly attributed to cerebral congestion, although it seems probable from the observations of Dr. Bastian that embolic plugging of minute cerebral arteries takes a large share in their production. These attacks never come on except at an advanced period of the illness, when the state of the patient is evidently very serious; and they quickly put an end to his sufferings. It is right here to mention that a fit may be the first sign of secondary tuberculosis. Tubercular meningitis, when it occurs in the course of an acute illness, has its own early symptoms masked by those proper to the primary disease, and only reveals its presence by the more violent phenomena which are characteristic of the third stage of the intracranial lesion. Appearing in this form —as a part of a general formation of the gray granulation all over the body—tubercular meningitis is not uncommon in babies of only a few months old. If, then, in a child of any age suffering from an acute inflammatory disease, such as an attack of acute catarrhal pneumonia, convulsions come on, we should strongly suspect tuberculosis; and if the fit is followed by squinting and irregularity of pupils, with or without rigidity of joints, we can speak confidently of the existence of tubercular inflammation in the skull cavity.

In cases where no serious cerebral lesion is suspected, it is important to distinguish an eclamptic attack from an epileptic seizure. At the time this is impossible, for the state of the patient requires all our attention, and if only to quiet the alarm of the relatives, it is urgent that something should be done. When, however, the subsidence of the spasms gives us leisure to make inquiries, we should try to discover some source of irritation to which the convulsion may be attributed. We should look for signs of rickets—the condition which especially predisposes to eclamptic seizures—and inquire for any convulsive tendency in the family.

The age is of importance. Up to the time of completion of the first dentition the disturbance is probably not epileptic; and if the gums are tense or hot, or the child has lately swallowed some unsuitable food, we may feel satisfied that the case is one of pure eclampsia. Again, high fever is not a characteristic of epilepsy; therefore, if there be pyrexia, the fit is probably reflex, or is a nervous disturbance announcing the onset of one of the exanthemata or of an acute disease. But irrespective of these considerations, under the age of two years epilepsy is rare, while reflex convulsions and the other forms of pure eclampsia are very common.

In older children it is more difficult, often it is quite impossible, to exclude epilepsy. If, however, the fit is a prolonged one, and lasts for an hour or more without intermission, we may conclude that the attack is eclamptic, for the duration of an epileptic seizure rarely exceeds ten minutes, or at the most a quarter of an hour. When the urine can be obtained it should be always examined for albumen, as uræmic convulsions in children are not uncommon. For the same reason the whole body should be carefully inspected for signs of peeling of the skin, as uræmic convulsions towards the end of the desquamative stage of scarlatina are far from rare. The attack of scarlatina is sometimes so mild as to be overlooked by inattentive or unobservant parents; and even if it be known to have occurred, the past illness may be looked upon as immaterial to the present disturbance, and may not be referred to. In all cases we must remember that after the age of three, or at the most four years, eclamptic attacks from reflex irritation are rare. Convulsions occurring in a child of this age, if

not due to epilepsy or cerebral disease, are generally either uræmic or are premonitory of some acute febrile disease.

As long as any cause can be discovered for the attack the fit is probably eclamptic. It is the convulsion occurring without evident reason that is so suspicious of true epilepsy; and if a child of four or five years old, or upwards, be visited while in apparent health by such a seizure, we are justified in fearing the beginning of epilepsy. It must be remembered, however, that convulsive seizures, at first eclamptic, may pass into true epilepsy. There is no doubt that this does happen in cases where there is a strong neurotic inheritance. Where there is no such predisposition I believe that epilepsy only follows in cases where the eclamptic attack has induced a secondary cerebral lesion. In such a case, although the first attack, or series of attacks, may have occurred as a result of some appreciable cause, the after convulsions may arise without anything being discovered to serve as an explanation of the morbid phenomenon.

Prognosis.—Eclampsia is a symptom which may be serious or not according to circumstances. In estimating the importance of the symptom we must consider the age of the child, the nature and severity of the attack, and the probable cause which has induced it. Infants of a few weeks old often die even from purely reflex convulsions if the seizures are violent. Older children have a better chance of recovery. After the first few weeks of life much depends upon the cause of the attack. Purely reflex fits and the initial convulsions of acute disease rarely end otherwise than favourably. Again, the convulsions which arise from imperfect aëration of the blood, such as may occur in pertussis, are often recovered from; but when the cause is collapse of the lung they are generally fatal. In pertussis, however, convulsions may be of several kinds, of which some are more serious than others. Those due to cerebral congestion and thrombosis are invariably fatal. Eclampsia arising from congestion and anæmia of the brain are especially serious, because they usually take place when the patient is already in a state of great exhaustion. When convulsions occur towards the close of the eruptive stage of measles or scarlatina, they must be looked upon as a very dangerous symptom. Uræmic fits often pass away without producing serious consequences. Whatever be the cause of the attack, sterforous breathing, great lividity of the face with blueness of the nails, or a very rapid pulse should excite the gravest apprehensions. As a rule, the prospect becomes more unfavourable in proportion to the rapid succession of the eclamptic seizures and the severity of the attacks. The occurrence of a large flow of urine, according to M. Simon, is a sign of good omen, indicating that the convulsive movements are about to cease.

In convulsions from cerebral disease it need not be said that prognosis is most unfavourable; and if the fits are followed by stupor, squinting, or irregularity and sluggishness of the pupils, we can have little hope of the patient's recovery.

The influence which the attack is likely to have upon future brain-development is a point of importance, and much anxiety is usually manifested on the subject by the child's relatives. In the commonest case, that in which a rickety child has a fit as a result of some trifling irritant, I believe the attack to be usually unimportant; and familiar as is the experience, have rarely known the patient to suffer from any after ill-consequences. So in the case of the other forms of purely reflex convulsions, the eclamptic seizure is due to some temporary condition, or set of conditions, which may pass off, if the child survives, leaving the brain unharmed. If,

however, the patient belong to a family in which nervous disorders are common, convulsive seizures assume greater significance. If the attacks are often repeated, the prospect as regards the mental development of the child is unfavourable, for such cases may end in epilepsy or even idiocy. In all cases, too, where the convulsions are connected, either as cause or effect, with some intracranial lesion, and where they are followed by signs, more than merely temporary, of muscular weakness, there is no doubt that for the time the brain is injured by the illness. In cases of recovery especial care would then have to be exercised in the child's education so as not to put too great a strain upon his faculties.

Treatment.—When called to a case of convulsions the practitioner should lose no time in questioning the attendants, but should at once have the child placed in a warm bath of the temperature of 90° Fah., and apply sponges dipped in cold water to his head. This is the time-honoured remedy: it is certainly an innocent one: it may tend to quiet the nervous system, and it is one the efficacy of which is so generally recognised amongst the public, that it would be unwise to court unfavourable criticism by neglecting to employ it. The bath must not be continued too long. In ordinary cases the child should be allowed to remain in it for ten or twenty minutes, according to his age. If, however, the patient be an infant who has lately been reduced by an exhausting diarrhœa, he should not be allowed to remain more than two or three minutes in the warm water, and cold applications to the head may be dispensed with. If the convulsions have ceased when the case is first seen, the bath need not be used; but we should not omit to have the child completely undressed, and then to see that he is placed, lightly covered, in a large cot, and that the room in which he lies is well ventilated and not too light. Care should be taken to unload the bowels by a large enema of soap and water; and if the child be noticed to retch, his stomach may be relieved by a teaspoonful of ipecacuanha wine. In the case of a teething infant opinions differ as to the propriety of lancing the gums. There is no doubt that this operation is a useless one if employed with any hope of hastening the evolution of the teeth; but if the object be to relieve pain and tension, I consider the practice judicious, and never hesitate in such circumstances to have recourse to it. If it be desirable to remove all sources of irritation, surely such a source of irritation as a swollen and inflamed gum should not be disregarded. Lastly, if it can be discovered that the child has had pain in the ear, or if the tympanic membrane can be seen to be red, the ear should be fomented with hot water; and if thought desirable a leech may be applied within the concha, the meatus being first plugged with cotton wool.

If in spite of these measures the convulsions return, or signs are noticed of continued irritability of the nervous system, it is best to administer a dose of chloral. Two grains can be given to a child between six and twelve months old; and if the patient be unable to swallow, half as much again may be administered by the rectum, dissolved in a few teaspoonfuls of water. If necessary the dose can be repeated several times a day. Bromide of ammonium, and belladonna, are also largely employed in these cases. The former may be given in three or four grain doses every two hours to a child between six and twelve months old; the second in ten, fifteen, or twenty drop doses two or three times a day. In the convulsions of pertussis, where the spasm of the glottis is extreme, treatment by bromide of ammonium or potassium and belladonna is especially indicated. The bromides are well borne by quite young children, and we should not

fear ill consequences from what may seem a very large dose. Chloroform also is often employed, but is decidedly inferior to chloral and much more troublesome.

Nitrite of amyl is a very useful agent in arresting convulsions, and may be employed without fear of danger even in young infants. The remedy may be administered by the mouth or by inhalation. In the case of an infant of six to nine months old, one-fourth of a drop of the nitrite may be given in mucilage and glycerine three or four times a day; and if the child be actually convulsed the inhalation of a drop on a morsel of lint will usually put a speedy end to the spasmodic movements. Even in cases where the convulsive seizures are due to cerebral disease the symptom may be controlled by the same means Dr. A. E. Bridger has reported some cases in which this plan of treatment was followed by the utmost benefit as far as the muscular spasms were concerned; for although the nitrite cannot of course exercise any remedial influence upon the centric disease, it is of no small advantage to be able to control a symptom which of all others is distressing to those to whom the patient is dear. Dr. Bridger found that it was necessary to increase the dose every twenty-four hours by about one-third.

If the child have been lately the subject of exhausting discharges, warmth should be employed, and stimulants such as the brandy-and-egg mixture of the British Pharmacopœia must be given energetically.

If the convulsive attacks are followed by symptoms indicative of intracranial mischief, such as stupor, squinting, ptosis, etc., the child should be kept quiet and an ice-bag be applied to his head. In such cases the treatment must be conducted according to the conditions from which the convulsion is supposed to have arisen.

When the convulsions have ceased, and signs of irritability of the nervous system are no longer to be observed, we must take steps to improve the general condition of the patient. His bowels should be attended to, and his diet carefully regulated. If rickets be present, it must be treated according to the directions laid down for the management of these cases. Most children in whom the convulsive tendency exists are benefited by iron wine and cod-liver oil, for their nutrition is usually at fault, and both the alcohol and the iron contained in the wine are beneficial, while the oil is of the utmost value in supplying nutritive deficiencies. Fresh air, too, is of extreme importance, and the child should be warmly dressed and taken regularly out of doors.

CHAPTER V.

EPILEPSY.

Epilepsy, a disease which may vary in severity from the most transient unconsciousness to violent convulsions and profound coma, is not uncommon in children. It has been estimated that nearly one-third of the cases met with in the adult have begun under the age of ten years. The malady is one of peculiar importance in early life, on account of its tendency to influence injuriously the development of the brain.

Causation.—In a large proportion of cases of epilepsy there is a hereditary neurotic tendency. We often find a family history of epilepsy, of insanity, or of some form of nervous derangement. If this is the case on the side of both parents the child's prospect is a sad one, and in such families every child may be afflicted with some form of neurotic disturbance. Habitual intemperance in alcohol on the part of the father or mother is said to have a determining influence in the causation of epilepsy in the child. Lancereaux insists upon the importance of this cause, and states that a tendency to convulsions in their offspring is a common consequence of alcoholism in the parents.

Cachectic conditions resulting from imperfect nutrition or disease, such as anæmia, chlorosis, and scrofula, have been said to favour the development of epilepsy; but I can find no sufficient foundation for this statement. Rickets contributes largely to the occurrence of eclamptic attacks in infancy, but it does not, according to my experience, especially predispose to epilepsy unless there be strong hereditary neurotic tendency; for when the disease passes off, as it will do readily if the causes exciting it be removed, the proneness to convulsive seizures also subsides.

Amongst the exciting causes of epilepsy violent emotions, such as terror and fright, take a prominent place. Injuries, such as blows or falls upon the head, are answerable for many of the cases. It is also common to find the paroxysms attributed in the first place to eclamptic attacks occurring during childhood. It seems probable that in many cases of infantile convulsions some change takes place in the brain during the course of the fit, which afterwards induces a return of the seizures without discoverable cause.

A bright, healthy little boy, aged eleven months, in whose family I could discover no neurotic history with the exception that his father and one of his uncles had had fits in infancy, was taken ill on August 31, 1870. Some pustules appeared on his legs and he was feverish. On the next morning he was seized with a convulsive fit which lasted with occasional intermissions for several hours and left him paralysed on the right side. During the next three days he remained in a drowsy state and was feverish at night. I saw him for the first time on September 4th. The child, a healthy-looking boy, had but three teeth. Still, although backward in this respect for his age, he showed no other sign of rickets. He was lying with

closed eyes on his mother's lap. His pupils were equal and acted well with light; his pulse 146, was regular in rhythm but not in force; his breathing was irregular and interspersed with sighs, although without long pauses; the temperature in the rectum was 101.6°. Both legs were covered from the knee to the ankle with an erysipelatous blush. Power over them was, however, being restored, for the child moved the right arm readily and the leg a little. At first they had been completely paralysed. His lungs and heart were healthy. The child seemed stupid but was not unconscious, for he watched a light passed before his eyes, and during examination of his chest cried and twisted himself about. When the teat of his feeding-bottle was given to him, he seized it eagerly and put it into his mouth. There was no paralysis of the face.

The convulsions in this case had been evidently an initial symptom of the erysipelatous inflammation, and must have led to a small extravasation or other structural lesion in the brain; for although the child quickly recovered the use of his limbs, he became subject from that time to frequent slight fits, which were no doubt of an epileptic nature. They came on every two or three weeks without discoverable cause and lasted for one or two minutes. The boy was said to become suddenly very quiet; then, in a moment, his cheeks flushed, his lips became purple, his eyes, although not exactly fixed, had an unnatural look, and he lost consciousness completely. He did not twitch. When the fit came on he never fell, for his nurse seeing his sudden quiet and anticipating what was to follow always took him up in her arms. In spite of treatment these attacks became confirmed, and in 1882—the boy being then twelve years of age—were still going on. Occasionally he had a more perfect seizure, but usually the attacks were of the character which has been described.

The above illustration I believe to be typical of a class, and am strongly of opinion that the origin of many cases of epilepsy in the child can be referred to a similar accident. In other cases where there is a strong neurotic predisposition, and the gray matter of the brain is in a highly explosive state, it is possible that eclamptic attacks originally induced by some trifling irritant may become perpetuated as epileptic seizures without discoverable cause. Where no such predisposition exists, and no lesion is present in the brain, I know of no proof that convulsive seizures can be so perpetuated.

Pathology.—No anatomical characters have been discovered by which the occurrence of epileptic attacks can be explained, and hence the nature of the disease is still a matter of speculation and doubt. The seizures have been attributed to both anæmia and congestion of the brain, the seat of the faulty action has been referred to the medulla oblongata and the upper part of the spinal cord, to the ganglia at the base of the brain, and to the cerebral convolutions. We have learned by experiment that lesions of the convolutions will induce muscular spasm, and that irritation of the cortex in the motor region will have the same effect. Nothnagel, too, has pointed out on the floor of the fourth ventricle a limited area, which he calls the "convulsion centre," on irritation of which all the voluntary muscles of the body are thrown into tonic and clonic spasms. Any or all of these parts may then be concerned in the production of an epileptic seizure. It can hardly be doubted that sometimes the convolutions may be the seat of the nervous discharge, for in a certain proportion of cases where at the beginning of the fit the patient is conscious of his condition, the discharge occurs in a centre of special sense; also in cases where the aura is intellectual the hemispheres are probably at fault.

When the attack is distinctly reflex, the medulla oblongata and pons may contain the seat of diseased action; and the fact that in all cases there is more violence of spasm on one side of the body than on the other seems to point to some controlling influence of the corpus striatum.

The loss of consciousness has been explained to be the consequence of anæmia due to spasm of the cerebral arteries and capillaries, and caused by an extension of the discharge to the vaso-motor centre. According to another theory, consciousness is arrested as the result of an influence which radiates from the part affected to the sensorium. The after-symptoms have been ascribed to carbonic acid poisoning from partial asphyxia, and this was long held to be a sufficient explanation, although lately doubts have been expressed as to its correctness. At present, however, no explanation has passed out of the region of hypothesis, and although different theories may have different degrees of plausibility, none can be said to rest upon any very solid foundation.

Symptoms.—The symptoms of epilepsy are very various. Although the convulsive movements are the part of the seizure which most forcibly attracts the attention, they are not essential to the nature of the disorder. The most characteristic feature is the loss of consciousness, and this, although often transient, is very rarely completely absent. A severe fit of epilepsy is much the same in the child that it is in the adult, and it will be unnecessary to describe minutely the characters of a seizure with which everyone must be familiar. The main features of the attack are similar to those already described as characteristic of eclampsia. It is preceded by a prodromal period of variable duration, in which some change is noted in the character, manner, or expression of the patient. The convulsion itself seldom lasts longer than a few minutes. It is followed by a stage of coma, which is usually more protracted, but sooner or later the child recovers consciousness, although he may remain more or less stupid for some hours. Often recovery is marked by a profuse discharge of limpid urine. In many cases the onset of the fit is announced in the child, as it is in the adult, by an "aura." In others the first symptom is vertigo, or a sudden flushing or pallor, or a twitching of some particular muscle. Whatever this initial symptom may be, it is usually repeated before each attack.

The more severe seizures (epilepsia gravior or haut mal) seldom appear in all their gravity when the child first becomes subject to the disease. They are usually preceded for months or years by a milder form of the affliction (epilepsia mitior, petit mal, or epileptic vertigo) which presents itself in very many different forms.

In all varieties of epileptic vertigo, loss or clouding of the consciousness, which may be momentary, is the main feature, and is sometimes the only symptom. Thus, a child while engaged at his lessons or his play stops all at once in what he is doing and rests for a time perfectly quiet with dilated pupils and a strange fixed gaze; then after a few seconds he recovers himself and continues his occupation. Instead of being perfectly still, he may mutter some incoherent words or may perform some curious or unexpected act. Sometimes his face may lose its colour, or a twitching may be noticed in one cheek, lip, or eyelid, or his head may be drawn to one side. In any case, when consciousness returns the child is quite ignorant of what has passed, and immediately continues the action in which he was engaged. In other instances he merely seems for the time to be puzzled and confused, and does not recognise his friends. In other cases, again, an ordinary peaceful and affectionate boy will suddenly do

some savage or spiteful act which is strangely foreign to his real disposition, and which afterwards he is quite ignorant of having perpetrated.

A little boy, aged twelve years, well nourished and healthy looking, had always been well until September, 1877, when he had an attack of pertussis. During this time he noticed that objects "looked small" to him for a moment. On recovery from the whooping-cough he returned to his day-school, and one evening, when doing his lessons, he seemed all at once to be "puzzled and confused, and did not know his father." Since then he had had some well-marked epileptic fits.

The boy was brought to me in May, 1878. He then complained of slight but constant shooting pain in his right temple. I was told that he seldom had a genuine epileptic fit, but that he was very subject to attacks of mental aberration in which he did strangely spiteful things. The attacks were said to last from a few seconds to ten minutes and to end in a stupor of about a minute's duration. On recovery he was always quite ignorant that anything extraordinary had occurred. While standing before me the boy had an epileptic seizure. He turned his face away over his left shoulder, remained for about thirty seconds perfectly motionless, and then fell backwards into his mother's arms. His face continued perfectly placid and did not change colour. The eyes were closed, and when the lid was raised were seen to be turned upwards and to the right. There was a faint twitch noticed twice in the fingers of the right hand. The pulse was full and regular. After being in his mother's arms for about sixty seconds, he suddenly changed his position; and then in another minute sat up, looked about him, and seemed quite recovered.

Attacks of epileptic vertigo may come on suddenly, or may be preceded by certain premonitory warnings, which soon come to be recognised by the friends as likely to be followed by a seizure. The warning may be a headache, a pain in the body or a limb, an attack of sickness, the contraction or spasm of a muscle, or some curious change in the habits or disposition of the patient. It may precede the attack by several hours or a day or two. Sometimes it occurs without being followed by a fit. Epileptic vertigo often in time develops into the more pronounced form of the disease. Usually, as in the case above narrated, rare attacks of genuine epilepsy are separated by long intervals, during which the patient is afflicted by repeated seizures of the disease in a milder form. Often the severer fits occur only at night and may be thus overlooked for a time. Epileptic vertigo always recurs much more frequently than the genuine epileptic seizures, and the patient may suffer from many such attacks in the course of a single day.

Between the attacks, whether of the graver or lighter form of the disease, the child may seem perfectly well both in mind and body. He may be animated, intelligent, active, and seem in no way harmed by his affliction. In other cases, especially if the attacks have dated from infancy, there is manifest interference with mental development, and the child may either have the manner and intelligence of one much younger than his age, or be dull and stupid even to idiocy. In the case already referred to—the little boy in whom the attacks began at the age of eleven months—when four years old he was intellectually on a level with a child of half his years. He sat on the floor and played with his toys with the manner of a baby, and had only learned to feed himself during the previous six months. Although he understood all that was said to him, he could only say a few words, and could not pronounce the letters s, l, n, or m. At the age of five years he began to have daily lessons from a governess, who re-

ported him as "not difficult to teach." At twelve years of age the fits still continued, although they were, as a rule, mild and infrequent, and occurred at intervals of six weeks, two months, or longer. His father stated at this time, in answer to a letter making inquiry as to the boy's progress, that his mental power was below the average, and that the lad was far behind other boys of his age.

The severe convulsions which occur at comparatively long intervals seem to have a less disastrous influence upon mental development than the milder epileptiform seizures which occur more frequently. Also, as has been before remarked, the age at which the seizures begin is a very important matter. If the child has been subject to them from before the completion of the first year of life, his mental development is almost certain to be injuriously affected.

Sometimes choreic movements occur in epileptic children, for there appears to be an association between the two diseases. A choreic child may develop epilepsy; and a child subject to epileptic fits may become choreic. Dr. Gowers has published some interesting cases illustrating this connection.

Diagnosis.—An eclamptic attack in infancy and early childhood presents exactly the same characters as a fit of genuine epilepsy, therefore it is very important to decide in every instance to which class of convulsive disease the attack is to be referred. This question has already been discussed elsewhere (see page 282).

Epileptic vertigo, when it takes the form of loss of consciousness without muscular spasm, is liable to be mistaken for an attack of syncope, especially in those cases where there is great pallor of the face. The seizures, indeed, are constantly spoken of by the parents as fainting fits, and we must be on our guard against this interpretation of the phenomenon. But syncope, although not uncommon in young people, is seldom seen except as a consequence of weakness, prolonged and exhausting disease, or flatulent accumulation occurring in an anæmic child. Epileptic children are often robust and generally appear to be well nourished. Again, slight twitching of muscle, combined with complete loss of consciousness, would point to epilepsy. In syncope there are no twitchings, and if any muscular movement occur insensibility is not complete. Lastly, an epileptic attack is sudden, and when the child recovers he is ignorant of what has passed; syncope is preceded by a very distinct sense of "faintness," and after the attack is at an end the patient is quite aware that he has been unconscious.

Cases of cerebral disease with partial convulsions may be mistaken for this disorder, but in such cases there is a history differing widely from that of epilepsy, and other symptoms of cerebral disease are present. Besides, in the attack we do not find the peculiar interference with respiration which is so characteristic of an epileptic seizure.

Even in the case of children it is necessary to be on our guard against the hysterical simulation of epileptic seizures both on the part of boys and girls. These false attacks can be usually recognized without difficulty. A boy, eleven years of age, was admitted into the East London Children's Hospital under the care of my colleague, Dr. Donkin, with a history of fits which were supposed to be epileptic. There was no neurotic tendency in the family, and the patient had always been healthy until the beginning of July, when he was noticed to look pale. He was said to have been exposed shortly before to a hot sun, and also to have received a heavy blow on the head of which for some time he seemed to feel the effects. On July 13th

he had a fit in the night, which was supposed to be a faint. During the next fortnight he suffered frequently from the attacks, often passing through as many as eight or nine in the day. The description given was that he felt giddy, fancied he saw "things going round him," made a clutch at some imaginary object, and then with a cry fell backwards. He was said to foam at the mouth, but not to bite his tongue although he clenched his teeth firmly ; to make convulsive movements with his arms as if fighting ; and sometimes to lie motionless with closed eyes. The mother thought he lost consciousness. The fit sometimes lasted half an hour. It was not followed by stupor, but the boy remained for some time oppressed and weary, and stammered when he attempted to talk.

The first day he passed in the hospital he had eight attacks. In these he struck out with his arms, dashing his hands against the bars of his bed, but always striking with the fleshy part of the fist, never with the knuckles. He also kicked out with his feet as if keeping off some enemy. He threw back his head, and his face was much flushed by his exertions. It never became blue, nor was there any arrest of respirations. The eyelids were closed and he resisted opening them. When the conjunctiva was touched he winked. The pupils were not dilated. He did not injure his tongue even if he caught it between his teeth, and all his movements had a certain voluntary character. There was no stage of tonic contraction. After the fit was over he lay down with closed eyes as if to sleep.

On the second day a sharp galvanic current was applied to the boy's spine. After this experience he had no more attacks of convulsion.

Epileptic fits which occur in the night only are often overlooked. In such cases the fact that a child suddenly begins to wet his bed at night is suspicious, and if a neurotic tendency exist in the family, the symptom should lead us to make further inquiries.

Prognosis.—Cases where the attacks are well developed and occur infrequently are more hopeful than the modified seizures which continually return. Certainly they are more amenable to treatment. The age at which the affliction first manifests itself has less influence on the curability of the disorder than it is said to have at a later period of life. On account of the difficulty in following out these cases (for if no immediate improvement is noticed the patient is very apt to be lost sight of), my experience in this matter is too limited to enable me to speak positively ; but I am inclined to believe that the appearance of the disease during the first two years of life is of less favourable import than when it begins later. There is no doubt that at this age its influence upon the mental development of the patient is more hurtful, especially as such early appearance implies in many cases a strong neurotic predisposition.

The earlier treatment is begun after the onset of the disease the more favourable is the prognosis ; for while the affliction is still recent, we may have hopes of putting an end to the attacks. In confirmed cases, especially if there is strong hereditary tendency, the child's prospect is but a gloomy one.

Treatment.—It is so seldom possible to discover and remove the cause of epileptic seizures that little hope of curing the patient by this means can be entertained. It is not, however, the less desirable to relieve the child of all irritants, and to shield him from all influences which experience has shown to be injurious. Worms should be inquired for ; the state of the bowels should be regulated ; evil habits, if indulged in, should be controlled ; and the child's whole mode of life should be arranged according to the laws of health. All sources of excitement, whether in games, chil-

drens' parties, or public amusements, should be strictly forbidden; and although monotony of life is to be carefully avoided, pastimes which do not over-excite the brain are to be preferred. The influence of quiet and of healthy recreation upon the disease is often seen in hospital patients. A child who has been admitted with a history of severe epileptic seizures, occurring daily for months, may pass several weeks in the wards and be eventually dismissed without any symptom of his disease having been detected. Careful gymnastic exercise is of value in promoting healthy change of tissue, but care should be taken to stop short of actual fatigue. With the same object pursuits which occupy the mind while they give employment to the hands should be encouraged, such as gardening and carpentering. A useful plan is to send the child, under proper supervision, to a farm-house, where the tending and feeding of animals, and all the pursuits incidental to healthy country life, will be found of infinite service to him. At the same time the patient should be kept under strict control; any taste he may have for music, drawing, etc., should be cultivated; and without fatiguing the mind by mental labour, much valuable instruction may be conveyed by conversation and the reading to him of suitable books. Dr. West recommends simple chants, such as are easily acquired, as a useful means of improving imperfect articulation, and suggests drilling to the accompaniment of music as valuable in correcting slovenliness of gait and aiding the child to regulate voluntary movement.

The question of food is a very important one, as the frequency of recurrence of the attacks may be determined to some extent by the judgment with which his diet is selected. It is a generally recognised fact that an abundant meat diet is injurious to epileptics, for the brain-tissue which it helps to build up is of a more highly irritable composition than if a less stimulating dietary were enjoined. Butcher's meat must be taken sparingly, and the food should consist principally of milk, vegetables, poultry, game, and white fish.

The drugs which I have found the most useful and which I believe to have a decided influence in checking the number and diminishing the severity of the attacks are strychnia, belladonna, and the bromides[1] of ammonium and potassium. For a child five years of age I begin with two drops of liq. strychniæ (P. B.) and twenty drops of tinct. belladonnæ twice a day, and give at night half a drachm of bromide of potassium with camphor-water sweetened with simple syrup. This treatment should be continued for months together, increasing the dose of the strychnia solution by one drop and of the belladonna tincture by three drops every two weeks. In this way large doses of the drugs may be administered without danger. A little boy, four years of age, under my care took for a long time seventeen drops of the strychnia solution (or about one-seventh of a grain of the alkaloid) twice a day with great benefit. Another child—a little girl nine years of age—by gradual addition to the strength of her medicine, reached one-fourth of a grain of strychnia twice in the day. An important part of the treatment consists in the administration of a weekly or bi-weekly aperient, for it is essential that the bowels be regularly relieved. Accumulation of fæcal matter is a powerful excitant of convulsive seizures in a child of epileptic tendencies. Moreover, the continued use of the bromide

[1] In all cases where the bromide salts are being taken, however small the dose, the practitioner must be prepared for the occurrence of the bromide rash. Some children have a curious sensitiveness to these salts. A few small doses of bromide of potassium will produce in such subjects an abundant eruption which, if their idiosyncrasy is not recognised, may excite considerable perplexity.

salts tends in many children to produce constipation which may assume an obstinate character. In such cases it is useful to combine the strychnia mixture with one or two drachms of infusion of senna, so as to maintain a continued gentle action upon the bowels. The addition of chloral to the bromide is said to increase the efficacy of this treatment, and it has been stated that used in this combination a smaller proportion of the bromide is required to produce an equal effect.

Besides the above remedies, other drugs have been employed in the treatment of this disease, such as the bromide and other salts of arsenic; the sulphate, bromide, and oxide of zinc; the oxide and nitrate of silver; and ergot of rye. Very good results are sometimes obtained from the use of borax. This salt may be given in doses of one grain for each year of the child's life. Borax is best administered directly after food, for if given on an empty stomach it may excite vomiting. There is one disadvantage connected with the use of the remedy. In certain subjects the drug has a tendency to cause psoriasis which may prove obstinate.

The attack may be sometimes arrested by the inhalation of chloroform. Any sudden shock is occasionally useful to attain the same object, such as applying ammonia to the nose or pouring cold water upon the head. Dr. Creighton Browne advocates the inhalation of nitrite of amyl.

CHAPTER VI.

MEGRIM.

Megrim, or migraine, is a functional nervous disorder which gives rise to severe headache and other nervous phenomena, and often to nausea and bilious vomiting. The derangement is a not uncommon one in childhood, especially amongst growing boys. Treatment is of peculiar importance at this age, for if the complaint be allowed to continue and the attacks become frequent, the patient may be almost entirely incapacitated from pursuing his studies, and his education may suffer greatly in consequence.

Causation.—In many cases megrim appears to be hereditary. We often find on inquiry that one or the other parent suffers or has suffered from the derangement, or that there is a tendency in the family to some form of nervous disease. Sometimes, however, this is not the case. The disorder then appears to be acquired. In excitable children it may be induced by continued mental effort in crowded, ill-ventilated school-rooms, and the common practice of pressing forward the education at a very early age no doubt helps to engender the disposition to suffer from this complaint.

Anæmia and debility, from which children often suffer soon after the second crop of teeth begin to make their appearance, probably also aid in the production of megrim, and an exhausting illness, such as typhoid fever, sometimes seems to predispose towards it. One of the most powerful of the exciting causes appears to be confinement in-doors combined with overfeeding in a weakly child. The complaint is much more common amongst the children of well-to-do parents than amongst the children of the poor, who pass so much of their time playing in the streets.

Megrim is not seen in early childhood. It rarely begins to show itself before the beginning of the second dentition, at about the sixth year. I have, however, known it to occur in a little boy five years old.

Pathology.—The view formerly held that the head symptoms were the consequence of gastric disturbance is now practically abandoned. Dr. Latham refers the source of the affection to the sympathetic nervous system. He believes that if by anxiety, fatigue, or other depressing cause, the regulating influence of the cerebro-spinal system of nerves is impaired, the sympathetic system, no longer controlled, runs riot, causing contraction of the vessels and consequent anæmia of the brain. It is to this anæmia that he attributes the disorders of sensation which precede the cephalalgia. Afterwards the excitement of the sympathetic subsides and is followed by exhaustion, and the vessels becoming dilated produce the headache.

Dr. Edward Living differs from this view. This authority ascribes all the phenomena to the irregular accumulation and discharge of nerve-force. He believes that a "nerve-storm traverses more or less of the sensory

tract from the optic thalami to the ganglia of the vagus, or else radiates in the same tract from a focus in the neighbourhood of the quadrigeminal bodies."

Symptoms.—The chief symptom of megrim is headache. Sometimes it appears to be the sole source of discomfort, but it is often preceded by a general feeling of illness and certain disorders of sensation. In many cases we are told that the child wakes up with a severe headache, and that this continues for several hours, during which he lies groaning and incapable of any exertion either of mind or body. The pain in young subjects is more often bilateral than it is in older persons, and is comparatively seldom limited to one spot or one side of the head. It may extend across the forehead or over the top of the head or the occiput. It is of a very severe throbbing character, and is increased by light, by noise, or by movement. The child feels and looks excessively depressed. His face is pale and haggard. He cannot eat, and usually prefers to lie quietly on a sofa in a darkened room. His head is often hot, but his feet and hands feel cold to the touch, and he complains of feeling chilly and may shiver. The pulse is small and weak and may fall to 60 or 70. In exceptional cases the child feels sick and may vomit.

The headache does not always occur in the early morning. Sometimes the patient wakes up in his usual health, and it is not until several hours afterwards that the pain begins. The cephalalgia is then often preceded by curious disorders of vision. Some children will say that objects look small to them, others that everything appears to be larger than natural. Sometimes stationary objects seem to be in movement, or there is partial insensibility of the retina, so that the patient cannot see the whole of an object at once. Thus in looking at his mother's face he may see only the right or the left side, not the whole. In addition to the sight, other senses may be affected. There may be noises in the head or impairment of hearing, or the taste or smell may be deficient. The child complains of unpleasant odours, or if offered milk remarks upon the peculiarity of its flavour.

These earlier symptoms usually subside when the pain comes on. The headache lasts a variable time, from three or four to eight or ten hours, and then gradually subsides. As his suffering becomes relieved the child usually falls asleep and wakes well, but wearied and weak. The frequency with which the attacks come on varies in different subjects. Often they are periodical and return with remarkable regularity every week or fortnight. Sometimes a child after one attack has no return of the complaint for months. If boys at school suffer, the attacks are often very frequent.

Some time ago I saw a school-boy, twelve or thirteen years of age, who was subject to daily headaches to such a degree as to be almost incapacitated from pursuing his education. The pain began in the morning on rising from bed and lasted all day, only subsiding towards the evening. It pervaded the whole of the head, and although not at first very severe, was made worse by exercise, by head-work, and by a bright light. It was not attended by sickness. If, as sometimes happened, the boy awoke free from pain, the cephalalgia came on in the middle of the day, and in this case did not subside as usual in the evening. The boy was subject about once a month to bilious headaches, but these he described as different to his ordinary pain. In the latter, objects always looked large to him.

There was no doubt about the truth of the boy's statements. They were corroborated by his mother, who assured me that the severity of

her son's suffering during his attacks was perfectly visible in his face. The boy himself was fond of his studies and seemed very anxious to be cured. He first took ten-grain guarana powders, but without relief. He was then ordered to take twice a day a dose of liq. strychniæ (℥ iij.) and liquid extract of ergot (℥ x.), and in a few days the headaches had entirely ceased.

In some cases, in addition to the cephalalgia pains apparently of a neuralgic character are complained of in the limbs.

A well-grown boy, nine years old, was sent to me from the Isle of Wight by Dr. Gibson, with the history that for six months he had been suffering from frequent attacks of pain in the head and often in the legs. The boy used frequently to cry with pain which attacked him at night in the right hip and knee. He was noticed to drag the affected leg slightly in walking, and seemed to have a difficulty in placing the foot fairly by the side of the other. It was thought, too, that the leg was a little shortened. His temperature at that time was between 99° and 100°. The pain was not, however, confined to that limb. Sometimes it shifted to the other extremity, and sometimes was complained of in the back and shoulder. The temperature for a month was about 100°, but the boy seemed well except for the pains, and strongly objected to any restriction in his diet.

When the patient came under my own notice he was in good condition and had a healthy appearance. The lungs and heart were normal, and the organs generally gave no sign of disease. The urine was acid, of specific gravity 1.014, and contained no albumen. No petechiæ or signs of bruising were seen about the body. There was no swelling of any of the joints, nor any excess of fluid in the knees. The attacks of pain were said to come on at variable intervals. Often he woke in the morning with a severe frontal headache, but sometimes the cephalalgia came on during the day. It always lasted many hours. He rarely vomited. When the pain first began in the course of the day, he was noticed for some time beforehand to look white, with eyes "drawn," and his sight would be affected. He would see only half an object, or objects would look unnaturally small to him. In the limbs the pains were chiefly at this time behind the knees, but sometimes they affected the thighs and calves of the legs. They were increased by exercise, and he could not walk long without fatigue. His appetite was good and his bowels were regular. The boy was ordered to take two minims of liq. strychniæ and fifteen of the liquid extract of ergot three times a day, and the nurse was directed to employ vigorous frictions to his limbs before he went to bed. Under this treatment the distressing symptoms began to moderate, and as long as the boy remained in London—a period of several weeks—he had no return of the headache or pains in the limbs. Before his return home he was said to have greatly improved in his power of walking.

Diagnosis.—Periodical attacks of headache, preceded by disorder of sight—these attacks lasting several hours and passing off completely, leaving the child well until the next recurrence—may almost always be ascribed to megrim. Children comparatively rarely suffer from dyspeptic headaches, although sometimes during attacks of acid indigestion in young subjects dull pain in the temples and soreness of the eyeballs may be complained of. These attacks are, however, very different from megrim. The pain is much less intense and is preceded by symptoms of gastric derangement; the tongue is foul; the bowels are confined; the patient looks heavy, and his complexion is usually sallow. In megrim the pain is intense and throbbing, the face is white, and vomiting, if it occur, is a late symp-

tom, coming on towards the end of the attack. The attacks, too, often occur in the night, so that the patient, when he wakes up, finds the headache fully developed, although he had retired to rest in perfect health.

Children who are much exposed to vitiated air, especially to air made unwholesome by gas-jets, often suffer from headaches, but in these cases the pain can be traced to the evident cause of the attack. Again, hypermetropia is a not uncommon cause of cephalalgia in young people. This form of headache is not noticed until the education of the child is entered upon and he begins to pursue regular studies. He is then forced for some hours together to exert the full focussing power of his eyes in order to remedy his natural defect, and the consequent strain upon his muscles of accommodation gives rise to a frontal headache which is often very distressing. But this headache always comes on at about the same time in the day, and is evidently connected with the act of reading. It ceases at once directly the hypermetropia is remedied by the use of suitable glasses.

In headache due to cerebral disease, such as tumour of the brain, there are usually other symptoms connected with the brain which continue between the attacks of paroxysmal suffering. Squint, or nystagmus, is often an early symptom, and persistent lesions of special sense soon begin to be observed. These are not limited to the seizures, but continue after the headache has subsided.

Treatment.—During the actual attack the child should be allowed to lie quietly in a room shaded from a too bright light. If he be chilly a thin coverlet may be thrown over him, and if his feet feel cold they should be warmed by a hot-water bottle. The best remedy at this stage is the guarana powder, which is to be given in a dose of ten grains (to a child of ten years old) in a little sweetened water. This remedy is said to succeed best in cases where there are very distinct premonitory symptoms, especially disorders of vision, but even in these cases the administration of the powder is often followed by no relief. Other remedies which sometimes have the effect of cutting short an attack are the bromide of potassium (gr. x.–xx) with sal volatile, chloride of ammonium (gr. x.–xv.) with spirits of chloroform, and compound tincture of lavender. Various antispasmodics, as valerian, assafœtida, tincture of henbane, and the fetid spirits of ammonia, have also been recommended. In many cases—in most, perhaps, occurring in young subjects—the attack is very decidedly shortened by a dose (℥ xv.–xx.) of the liquid extract of ergot given with spirits of chloroform in camphor-water.

If sickness occur and prove obstinate, it may be often arrested by a saline effervescing draught containing a couple of drops of dilute hydrocyanic acid (P. B.).

After the attack is at an end the child should, if possible, avoid close rooms and headwork, and should be made to spend as much of his time as possible in the open air. In the case of school-boys, however, it is important that their education should be proceeded with, and we must endeavour to arrest the tendency to the attacks without any intermission of study. Few cases will be found to resist the combination of strychnia and extract of ergot already referred to in the treatment of the two cases which have been narrated. I was led to employ these remedies in this complaint from noticing their useful effects in some cases of epilepsy, and since beginning to treat megrim in the young subject by this method I have met with very few obstinate cases. Often from the time of beginning to take the

medicine the attacks have ceased altogether. I usually order two or three drops of the strychnia solution (P. B.) and ten or fifteen of the liquid extract of ergot with spirits of chloroform to be taken three times a day. I believe the combination of the two drugs to be more efficacious than either given alone, but in some cases strychnia given with iron has been found of value.

The child's bowels must be kept regular with some mild aperient, such as the compound liquorice powder, and the diet should be regulated, taking care that he does not take an excess of sweets or fruit.

CHAPTER VII.

CHOREA.

Chorea is essentially a disease of the second dentition ; for although it is occasionally met with in children under five years of age, and sometimes even in adults, yet an enormous majority of the cases are found between the ages of five and fifteen years.

Causation.—Children who are likely to be attacked by this complaint are those in whose family there is a tendency to neurotic disease, and who, perhaps as a consequence of this tendency, are born delicate and sensitive, with a highly impressionable nervous system. Perhaps the mother may herself in childhood have been afflicted in the same way. Girls are much more prone to it than boys, and a child who has once passed through an attack is very likely to suffer from it a second time.

The outbreak of the disorder may be determined by an attack of rheumatism, or by some shock to the nervous system, as a fright, or by any cause which reduces the strength more or less suddenly and sets up anæmia or some cachectic condition. There is an indisputable connection between rheumatism and chorea. It is common to find a family history of rheumatic attacks. Often the patient has herself suffered from it, either in its acute or subacute form. Out of forty-two cases (nine boys and thirty-three girls) of whom I have notes, I find distinct history of rheumatic attacks in sixteen. Others came of rheumatic families, although it could not be discovered that they had suffered from the disease themselves. There was a heart-murmur in twenty-seven, and in many cases the rheumatic disease had left evident traces of its passage in a harsh cardiac murmur with some hypertrophy of the heart. Still, there is no doubt that we find many cases of chorea in which no history of rheumatism can be discovered, and many rheumatic children never have chorea. Rheumatism alone will not set up the complaint, for a peculiar instability of the nervous system is no doubt essential to the production of the disorder. Rilliet states that in Geneva, where rheumatism was a common disease, chorea was almost unknown, and according to the investigations of Dr. Weir Mitchell, it appears that amongst negro children, in whom rheumatism is not uncommon, chorea is very rarely seen.

Dr. Anstie was of opinion that the hereditary rheumatic tendency was associated with a hereditary tendency to neurotic diseases of various kinds, and especially to chorea. In support of this view he instanced the case of nine families with decided rheumatic history. In each of these several of the children had suffered from rheumatism, to his own personal knowledge. In all of them, also, there was a strong neurotic inheritance, which showed itself in many cases in the form of chorea. The striking fact consisted in this, that although many children suffered from rheumatism and many from chorea, it was not the victims of rheumatism who were especially prone to chorea. As often as not those children who had

suffered from rheumatism escaped the neurosis, while others who had never had rheumatism fell victims to chorea.

Other conditions appear to influence the incidence of the disease. The rarity of chorea amongst the little negroes seems to show that the degree of cerebral development may constitute an important element in the tendency to the disorder; for the brain in the black race is no doubt less perfectly developed than it is in whites. Again, monotony of life and absence of mental excitement must tend to impart immunity from chorea, for Dr. Weir Mitchell's researches show that the disease is far less common in rural districts than it is in towns, and in small towns than in large cities.

In a suitable subject any irritant may set up the complaint. Worms in the intestinal canal, and, of course, the practice of masturbation, have been cited as frequent causes of this as of all other nervous disorders. Still, I cannot but think that the influence of the two causes just mentioned, of masturbation especially, in provoking nervous derangements in the child has been greatly exaggerated. Chorea is sometimes associated with grave diseases of the nervous centres. It has been seen in connection with cerebral tubercle, cerebral hypertrophy, and softening of the brain; and Dr. Jacoby has reported a case in which violent choreic movements were induced by meningitis involving the membranes of the cervical part of the spinal cord.

Pathology.—The pathology of chorea is still a matter of debate. In some fatal cases obstructions have been discovered in the minute arteries ramifying in the corpus striatum and its vicinity, with little points of softening and congestion resulting from them. Hence Dr. Kirke's view, since supported by the authority of Dr. Hughlings Jackson, that chorea is a consequence of minute emboli swept out of the heart and arrested in the small arteries of this part of the brain. This theory, if correct, would only explain the cases which have been preceded by rheumatism, and would throw no light on the many cases where the heart is to all appearance healthy.

Dr. Dickinson has proposed another explanation. He believes that the faulty part of the brain is not limited to so small an area. In his opinion the disease depends upon a wide-spread hyperæmia of the nervous centres "not due to any mechanical mischance, but produced by causes mainly of two kinds—one being the rheumatic condition, the other comprising various forms of irritation, mental and reflex, belonging especially to the nervous system." Dr. Dickinson has found, as the result of post-mortem examinations of fatal cases, that all the small arteries both of the brain and spinal cord have a general tendency to dilatation. As a consequence, exudations and sometimes minute hæmorrhages occur in the tissues immediately surrounding the dilated vessels—shown by the presence of blood-crystals and patches of sclerosis. He has noticed these changes to be most advanced in the corpora striata, the vicinity of the trunks of the middle cerebral arteries, and in the posterior and lateral parts of the spinal cord —principally at the upper part; and states that they are equally distributed on the two sides. This theory has the advantage that it explains the wasting of muscles, rigidity of limbs, and occasional permanent paralyses which sometimes follow an attack of chorea.

In opposition to the above theories based upon morbid anatomy, Dr. Sturges has advanced an ingenious explanation of the phenomena attendant upon chorea, founded upon intimate acquaintance with the peculiarities of childhood. Dr. Sturges regards chorea as a purely functional complaint, arising, in the majority of cases, from some strong nervous impression.

Starting from the fact that in every child placed in an embarrassing position emotional restlessness (or temporary chorea) is produced, he argues that exaggerated limb-movement is the natural expression in young subjects of emotional states; that disordered movement is increased by the attention being diverted, as it is by some strong emotional shock; that the consciousness of this partial loss of control deepens the mental impression and intensifies and extends its consequences; and, lastly, that want of success in directing movement impairs the child's confidence and entails further failure. The little treatise is well worthy of perusal, for although it may not offer a full explanation of all the phenomena connected with the disorder, no one can refuse admiration to the ingenuity of its reasoning and the graces of its style.

Dr. Haydon, of Dublin, has started another theory. Like Dr. Sturges he refuses to accept any special organic lesion as the exciting cause of the complaint. He believes that the attack begins with a vaso-motor paresis, the consequence of a profound emotional impression, and that the essential symptoms are due to defective polarity or dynamic instability of the motor-nerve tracts, both intracranial and spinal. This hypothesis would explain the post-mortem appearances noted by Dr. Dickinson, and would account for the phenomena common in the graver cases of the disorder.

Symptoms.—The phenomena of chorea consist in an inability to guide and control the muscles, so that while there is excess of motion there is absence of ordered movement. The infirmity begins gradually in most cases. At first the child is noticed to be stupid over her lessons; she shows less than her usual alacrity at her games, and is emotional, nervous, and altogether strange in manner. Soon she begins to fidget, scraping her feet as she sits on a chair, or restlessly moving one of her hands about her dress. Then she is found to drop articles from her hand, and to stumble awkwardly as she walks. These symptoms are always at first attributed to carelessness, and the child is admonished and reproved; but after a time, usually from some eccentricity of movement or facial contortion, it dawns upon the parents that the child's control over her muscles is impaired, and the matter is referred to the medical attendant.

In exceptional cases the symptoms do not come on in this insidious way, but begin with some suddenness as a consequence of fright or other shock to the nervous system. But however the disorder may have begun, when fully developed the symptoms are the same. The power of the will to control muscular action appears to be completely lost, and we find spontaneous spasmodic movement, inco-ordination of voluntary movement, and a certain degree of muscular weakness.

In a marked case nearly all the voluntary muscles of the body seem to take their share in this disorder of movement. The child is never quiet. First one group of muscles, then another, contract in a jerky spasmodic manner which is very characteristic. Volition is evidently not concerned in their production. They occur not only without the influence of the will, but in spite of it. The face is curiously worked, as if the muscles were attempting, but unsuccessfully, to simulate all the passions of the mind. The eyebrows are suddenly bent into a frown; but it is not anger. The mouth expands abruptly into a smile; but conveys no impression of mirth. The eyelids are opened widely; then quickly squeezed together; the eyes are rolled upwards, downwards, and from side to side; the cheeks twitch, and the angles of the mouth are contorted with strange grimaces. The head is jerked backwards and forwards, and then pulled suddenly down to one side. The arm may be thrown abruptly forwards

by a peculiar movement of the shoulder; the hand and wrist are violently pronated, then as suddenly supinated, and the fingers work convulsively. Sometimes, by a strong effort of the will, the hand may be kept quiet for a few seconds, but soon, with a convulsive jerk, it is thrown again into motion. The lower limbs, although less violently affected, are not inactive. They are thrown one over the other, or are suddenly drawn up and again extended.

Sometimes the muscles of the trunk may be affected, and spasmodic contractions of the respiratory muscles may take place; or the patient may be suddenly jerked upwards from the bed, or even thrown out of it upon the floor. In the worst cases the child has a wild, frightened look, or sometimes a half-dazed expression; speech may be impossible, and even memory may appear to be almost lost.

In the milder cases an effort to execute a voluntary act increases the contractions; and even the exertion of standing makes control of the muscles more difficult. The more completely the child is at rest, the quieter she becomes. The movements are also increased by mental emotion and nervousness, so that the child is always at her worst when observed; and no doubt, as Dr. Sturges suggests, the consciousness of failure increases her helplessness. During the height of the complaint the ungovernable eccentricity of movement makes the commonest actions difficult or impossible; for an attempt to direct any special group of muscles is immediately frustrated by violent contractions of antagonistic groups, so that the patient does anything but what she wishes. The child can only speak indistinctly; she cannot button or tie her clothes, or perform any act in which accurate co-ordination of movement is required. For this reason it is often quite impossible for her to feed herself, as she can no longer guide the spoon or fork to her lips. Even when fed by the nurse, mastication may be difficult from irregular movements of the tongue; and sometimes the contractions of the gullet are interfered with in the process of swallowing. In bad cases natural sleep is almost impossible. Even in a milder form of the complaint the child finds a difficulty in going to sleep; but when she does at last sleep the movements cease.

Sometimes sensory disturbances can be noticed. Painful spots may be found in the course of the nerve-trunks in the affected parts; there may be tenderness on pressure over the spinous processes of the vertebræ; or the child may complain of hyperæsthesia or anæsthesia of the skin. Occasionally sight is impaired.

The choreic movements are not always general; sometimes they are limited to one-half of the body (hemichorea). In these cases either side may be attacked; but even in hemichorea, according to Dr. Broadbent, muscles bilaterally associated in their action are affected to some extent on the two sides. When the disorder is unilateral, the muscular weakness, which is seldom completely absent, is more easy to recognise, as we have in the sound side a standard of comparison. When sensation is impaired in hemichorea, it is impaired on the same side of the body as that on which the muscles are affected. This fact is relied upon by Dr. Broadbent as a proof that the seat of the disease is not in the cord; for if it were so, sensation would be impaired on the side opposite to the affected muscles.

The constant movement seems to cause wonderfully little muscular fatigue. In ordinary cases, if the movements are not exceptionally violent the general health is but little affected. The child may complain of giddiness and headache, but appetite is usually good, and the digestive functions are well performed, although the bowels may be costive. In bad

cases appetite is often capricious and digestion impaired, and partly for this reason, partly from the difficulty in feeding the patient and the want of sleep, nutrition may suffer and the child become pale and thin.

The urine has always a high specific gravity at the height of the disease, and contains abundant urea and phosphates.

The mental condition may vary, according to the severity of the disorder, from mere depression or irritability to taciturnity, obstinacy, violence of disposition, or even furious delirium. In the milder cases intelligence does not appear to be enfeebled, and although the patient often has a silly vacant expression, this is no more than can be accounted for by the child's own feeling of helplessness, and her consciousness that her contortions and grimaces may be the subject of ridicule.

The temperature in chorea is normal unless the complaint be complicated with a rheumatic attack, or be symptomatic of organic disease of the nervous centres.

Weakness of the muscles has already been referred to as an essential symptom of the disorder, but as a rule it is insignificant, and may not be noticed without special inquiry. Sometimes, however, the muscular weakness assumes great prominence, and may even throw all the other symptoms into the shade. Thus a form of the disease is sometimes met with in which a paralysis or paresis of one or more limbs is the only symptom complained of. For instance, a little girl is said to have gradually lost the use of her arm. The hand hangs down and is evidently very weak. The patient may perhaps by a great effort of will be able to raise it, but when she tries to grasp with the fingers the pressure is very feeble. The leg of the same side is sound, and there is no paralysis of the face or tongue. Sometimes the other arm is also weak, although to a less degree. In other cases the paralysis involves the leg as well as the arm of one side, but the face and tongue always escape. In all these cases, although to a casual glance there may appear to be no movement at all, careful inspection will usually discover occasional slight twitches—faint clonic spasms—in the affected limb or on the sound side. Sometimes this is all that can be noticed, and the muscular power returns after a time without the occurrence of any confirmed disorder of movement. In other cases the clonic spasms become more and more marked as the paresis improves, so that when the power of the affected limb is almost restored the motor disorder is at its height.

There is another form of muscular weakness which occurs later, and sometimes remains as a permanent condition after the disease has passed off. It affects the muscles which have been previously implicated, and is probably due to degenerative changes in the spinal cord. The muscles remain weak and become wasted, and perhaps contracted.

The state of the heart in chorea is very interesting. In a large proportion of cases, at least of those occurring in young children, a mitral murmur becomes developed in the course of the illness. This murmur may disappear as the symptoms of motor disorder decline, or may remain as a permanent condition. The temporary murmurs are often very variable in intensity; coming and going; heard with some beats of the heart and not with others. These are probably due to some irregular action of the papillary muscles of the heart, the consequence of clonic spasm similar to that which takes place in the voluntary muscles of the body. Temporary murmurs, when not thus interrupted, may be the result of anæmia—a condition in which the blood is watery and the tissues of the heart relaxed, so that the left ventricle is dilated and the mitral orifice is insufficiently

closed by its valve. In these cases there is often a basic pulmonary murmur. We cannot say positively that a murmur has disappeared until we have examined the chest after exertion as well as when the heart is quiet. It is important, therefore, before pronouncing an opinion, to excite the heart's action by making the child run round the room. If the heart-sounds after this exercise still remain clear, we can say decidedly that the murmur has gone. Temporary murmurs are much more common in girls than in boys.

Permanent murmurs are in all cases, probably, the result of endocarditis, which may be due to coincident rheumatism, or may arise in the course of the illness without rheumatic taint.

The choreic disorder runs a chronic course, but in the large majority of cases ends in complete recovery. Its progress is, however, often unequal, and the child may be better and worse again several times before control over muscular movement is completely restored. After all involuntary spasm has subsided, a certain abruptness of executing voluntary acts may continue for a time before all traces of the disorder pass away. Relapses after an interval of months or years are very common.

The duration of chorea varies greatly. If left to itself it lasts from one to two months, seldom longer, although cases are recorded in which muscular disturbance has continued through life. As a rule, the disease can be greatly influenced by treatment. When the complaint passes off, recovery in most cases is complete. Sometimes, however, the mind remains more or less enfeebled; the patient becomes slovenly, careless, and dirty in her habits, and may even drift into a state of permanent weakness of mind. In other cases the contrary happens, and the intellect seems brightened by the attack. Sometimes, although fortunately very rarely, some of the affected muscles undergo atrophy and contraction.

Death from the disease is very uncommon in children, but it sometimes occurs from the violence of the disease, the patient being worn out by want of sleep, insufficient nourishment, and muscular exhaustion. Death is usually preceded by delirium and coma. In the bad cases the chafing of the skin produced by constant friction becomes a source of great discomfort, and may induce an attack of fatal erysipelas.

Diagnosis.—In a well-marked case of chorea the absence of monotony and rhythm in the movements, their abruptness and variety, their complete independence of the will, and their occurrence in spite of all efforts to restrain them, make mistake impossible. The cases which begin with paresis, and in which the muscular movement is a subordinate and insignificant feature, are less immediately recognisable. In such cases careful observation is often required to ascertain the existence of muscular spasm. According to Dr. Gowers, whenever a child of the choreic age suffers from gradual loss of power in the arm, and presents no weakness of face, tongue, or leg, the disease is invariably chorea. If the nature of the complaint be suspected, we must look for confirmatory evidence, and slight occasional spasm will be usually detected in the weak arm or in the sound one.

Prognosis.—The immediate prognosis is almost always favourable, and very severe cases in children under twelve years of age seldom do otherwise than well. The worst cases are seen in girls who have menstruated, and it must be remembered that the catamenia sometimes appears at a very early age.

The influence of the disease upon a child's future life has also to be considered. If the patient have strong neurotic tendencies derived from

inheritance, we may feel less sanguine than we otherwise should be as to the after-effects of the illness. In such cases much will depend upon the moral influences which may be brought to bear upon the child. The form of the complaint in which muscular weakness is the prominent and early symptom, seldom passes into very severe general chorea, but it often proves an obstinate ailment and difficult of cure.

Treatment.—Chorea is a disease which is decidedly influenced by treatment in the wider sense of the word, as distinguished from mere drug-giving. Our first care should be to see that the muscles are spared all unnecessary exertion; and that the child is kept as quiet as possible in bed. We should then attend to all the bodily functions—see that the bowels are regularly relieved; that any worms present in them are removed; that the skin and kidneys act well; that the diet is regulated with a proper proportion of animal and vegetable substances; and that the child does not take too much farinaceous matter or sweets. In most cases the subjects of chorea are anæmic and weak, with flabby muscles; not unfrequently the skin is dry and acts imperfectly. To restore the skin to its natural condition the body should be oiled all over at night, and in the morning the child should be thoroughly washed with soap and hot water. After a few days the normal softness and suppleness of the skin will be restored. A cold douche may be then added to the treatment. If the child be not weakly, the douche may be given after her ordinary bath as she sits in the warm water. In the case of a weakly child it is better to separate the ordinary washing from the invigorating douche. The patient may take her usual bath in the evening, and in the morning the douche may be given as the child sits in hot water, after complete preparation of the skin by vigorous shampooing (see Introduction). In this process the shampooing, besides preparing the skin to resist the shock of the cold water, seems to have a directly beneficial effect upon the muscles.

Moral treatment is of the utmost importance. The child is, as a rule, weakened and demoralised by the new conditions in which she finds herself, and much may be done by kindness, firmness, and vigilant attention to her wants to restore the balance of her mind. At first she should be amused as much as possible, and endeavours should be made to anticipate her wishes, so that she may be spared the constant sense of failure. When the symptoms begin to improve, the child may be allowed to leave her bed; and games which involve rhythmical movement, such as the skipping-rope, should be encouraged. Benedikt recommends a weak constant current along the spine. The child should stand up during the application, and the current should be just strong enough to be distinctly felt.

With regard to drugs, the whole pharmacopœia has been ransacked for remedies for this complaint. The disorder has been attacked with anti-rheumatic remedies, on account of its connection with rheumatism; with iron, cod-liver oil, and tonics generally, on account of the weakness and pallor with which it is usually associated; with phosphorus and other nervine tonics and stimulants, to strengthen the nervous system; and with the whole long list of antispasmodics, sedatives, and narcotics, to reduce nervous excitement. Where there is great anæmia iron is very useful, and should be always given. In these cases, too, alcohol is of great service, and the child should take a wine-glassful of sound claret, diluted with an equal quantity of water, with her dinner. Of all the drugs which have been recommended as specifics in this complaint the only one from which I have ever seen any decided benefit has been arsenic, and with this only

in large doses. Children bear arsenic well. I have been in the habit of prescribing for a child of five or six years of age ten drops of Fowler's solution of arsenic, directly after meals, three times a day. In this dose it is rarely found to disagree. If the child complain of discomfort at the epigastrium, and vomit a short time after taking the remedy—and these are the only unpleasant symptoms I have known the medicine to produce—it can be given for a time twice a day or in smaller doses. In every case the dose should be as large a one as can be borne without discomfort, and given thus immediate benefit will usually ensue. In cases where arsenic is ill borne by the stomach, or where it has been given without producing benefit, the drug may be administered hypodermically. Dr. W. A. Hammond, of New York, speaks in high praise of this manner of treating the disease, and states that thus administered the remedy can be tolerated by the system in doses considerably larger than if it were given by the mouth. Dr. Hammond directs that the injection should be made slowly at a spot where the skin is loose, such as the front of the forearm; that care should be taken to conduct the fluid into the subcutaneous tissue and not into the skin or underlying muscles; and that Fowler's solution should be used diluted with an equal proportion of glycerine. The injection should be made once in the twenty-four hours, beginning with ten or twelve drops of the solution, and increasing the quantity by one drop each day.

Almost every writer on this subject has his favourite remedy. Trousseau advocates the claims of morphia and strychnia; Sir Thomas Watson speaks in high praise of turpentine. Sulphate of zinc is said to be a specific by some; others prefer bromide of potassium or chloral. Without going through the list of drugs specially recommended, it may be sufficient to say that it is now generally held that the bromides are most useful in cases where the movements are violent and exhausting, especially if there be any reason to suspect ovarian excitement; that zinc should be preferred for florid children and the more acute cases, iron for the pallid subjects weakened by chronic illness, and that arsenic given by the mouth effects its most rapid cures in the simpler forms of the disease where the muscular disturbance is not extreme. In cases of acute chorea dependent upon meningitis or medullary congestion or inflammation, and accompanied by a high temperature, Dr. Jacoby recommends the liquid extract of ergot, given in half-drachm doses to a child five years of age, three or four times a day, and continued for many weeks in succession.

In very bad cases, where the movements are violent and incessant, where the child cannot sleep, and takes food with the utmost difficulty, the best plan is to put the patient under chloroform at stated intervals and feed her through an elastic catheter passed down the gullet. In such cases a sufficient quantity of stimulant should be supplied with each meal. At night-time, in order to insure sleep, a full dose of morphia should be given hypodermically. Much benefit is sometimes derived from Jaccould's plan of spraying with ether the whole length of the spine twice a day. Dr. Anstie records the case of a boy, aged six years, who had been reduced by the violence of the disease into an almost hopeless condition. At length the ether spray was begun. The boy at once began to improve, and in a fortnight the disease was at an end.

Obstinate cases of chorea may be sometimes cured by the plan originated by Dr. Weir Mitchell and ably practised by Dr. Playfair in cases of aggravated hysteria in women. The plan consists in vigorous shampooing or "massage" of the muscles, so as to excite excessive muscular waste, and

in supplying the waste so induced by regular and excessive feeding. The shampooing must be carried out energetically. It consists in kneading the muscles and making passive movements of the joints. This should be done several times daily for half an hour on each occasion. At the same time the patient is fed with large quantities of milk, meat, eggs, and other nourishing food. By this means all the more violent movements are quickly controlled, the extremities become warm, the child sleeps soundly and rapidly puts on flesh.

In every case where the movements are violent care should be taken that the patient receives no injury from knocking or bruising or chafing the skin. The sides of the cot should be padded ; and the child should be confined to the bed by a folded sheet passed over the chest and tied underneath the cot.

When the disease has passed off, means must be taken to discipline the mind by a judicious system of education, both moral and intellectual, and the child should be encouraged to take part in active games and out-of-door exercises. A change to the sea-side is often useful to complete the cure.

CHAPTER VIII.

IDIOPATHIC TETANUS.

Tetanus or lock-jaw, as it attacks new-born children, is a disease of which in England we know little by actual experience. A few cases are, however, seen from time to time, and it is not unlikely that but for the tender age of the infant attacked, and the rapidity with which the disease hurries to a close, more examples of the malady might come under observation. Certainly, at the east end of London, in the Irish quarters, where squalor and poverty are often extreme, it is strangely common to hear of several infants of a family having died a few days after birth from "convulsions." Such cases have probably come under the notice of no more experienced observer than an ordinary midwife, and it is quite possible that many cases of infantile tetanus may thus escape recognition.

The disease consists in an intense irritability of the spinal cord and the motor nerves which proceed from it, throwing the whole body into violent tonic spasms. Infantile tetanus runs a very acute course and generally ends in death. It is common in the West Indian islands, in South America, and in the southern portion of the United States. In these warm climates it attacks by preference the new-born children of the negro population. It is also occasionally found in more temperate zones. The island of St. Kilda in the Hebrides has long been notorious for its enormous infant mortality from this cause, and sometimes in other parts of Europe the disease occurs sporadically or even in occasional epidemics.

Causation.—Much speculation has been bestowed upon the etiology of the disease as it occurs in new-born infants, and many theories have been devised to account for it. The fact that the symptoms appear within a few days of birth seems to point to some traumatic cause for the illness, and suspicion naturally fell at once upon the remnant of the newly divided umbilical cord. Hence the disease has been ascribed to phlebitis of the umbilical veins. The explanation has, however, been proved to be erroneous. Dr. Mildner, of Prague, has collected forty-six cases of inflammation of the umbilical vessels which ended fatally. In only five of these did convulsions form part of the symptoms, and in no instance did the convulsions bear any resemblance to those characteristic of tetanus. Again, phlebitis of the umbilical veins, although an occasional accompaniment of infantile tetanus, is more often absent than present. Inflammation, then, cannot be a cause of the disease, but still it does not follow that tetanus is independent of the condition of the cord. Even in the adult inflammation of a wound is not essential to the production of traumatic lockjaw, for the malady has been known to occur in cases where the wound had undergone healthy cicatrisation.

Mechanical causes for the disease, such as blows or accidental injuries. and the use of too hot water for the bath, have been suggested by some authors. An eminent American writer has attributed the disorder to press-

ure on the medulla oblongata and its nerves, through displacement occurring either during labour, or after birth from the child being allowed to lie for days together with the back of his head upon a pillow.

Although the disease may arise from these or other traumatic causes, it seems likely that an explanation of the phenomena is to be found in general rather than in local agencies. The influence of sudden changes of temperature in producing tetanus hardly admits of doubt. In all countries where the complaint is prevalent there are rapid alternations of temperature, the heat of the day passing suddenly into the cool of the evening. On this account interruption to the functions of the skin has been suggested as the immediate cause of the disease. In the same way chilling of the surface by exposure to cold and wet has been said to be capable of exciting the tetanic convulsion. Of all causes, however, to which the disease has been attributed foul air generated by filth and imperfect ventilation is, perhaps, one of the best established. The often quoted case of the Dublin Lying-in-Asylum seems to prove this conclusively. Before 1772 nearly one in every six of the children born alive in the asylum died, and the cause of death was almost invariably tetanus. In that year Dr. Joseph Clarke introduced a complete system of ventilation into the hospital. The consequence was that the mortality immediately fell to one in nineteen. Later, the proportion of deaths was still further reduced to one in fifty-eight, and of those who died little more than a ninth died from this disease.

In St. Kilda the high rate of mortality may with much probability be attributed to a similar absence of fresh air and cleanliness in their homes. That some cause is there in existence which does not obtain in the neighbouring islands is evident, for children born of natives of St. Kilda out of the island escape the disease, and hence the occurrence of the affection cannot be attributed to intermarriage or any hereditary influence.

Dr. Holland in his "Summary of the Diseases of the Icelanders," records the frequency of trismus nascentium in the island of Heimaey, one of a group situated on the southern coast of Iceland. He states that almost every infant born on the island died of this disease, and that consequently the population was supported almost entirely by immigration from the mainland. It appears that there was no vegetable food upon the island, and that the natives lived principally upon sea-birds which they salted and barrelled. Dr. Holland attributes the disease to irritation of the bowels excited by the practice of feeding the infants shortly after birth upon a strong and oily animal food. He fortifies his opinion by the fact that at St. Kilda, where the diet and mode of life of the natives resembled those prevailing at Heimaey, the disease was equally prevalent and equally fatal.

Tetanus is occasionally seen in older children, as a consequence of some cut, or bruise, or other injury, as is the case in the adult. Sometimes it is idiopathic, and is then probably rheumatic in its nature.

Morbid Anatomy.—Extreme injection of the small vessels of the spinal cord and its membranes, with extravasation of blood into the cellular tissue around the theca, and also into the cavity of the spinal arachnoid, has usually been described as a common consequence of infantile tetanus. In a case which died in the East London Children's Hospital, under the care of my colleague, Mr. Parker, there was a striking absence of congestion of the cord and its membranes. On opening the spinal canal the loose connective tissue around the cord was found to be ecchymosed in patches from the middle to the lower end of the dorsal portion of the cord. On opening the spinal dura mater, the pia mater did not present any unusual appearance. It did not appear abnormally congested. The cord itself

was firm to the touch. On cutting into it, the gray matter was clearly mapped out by its pink colour when compared with the white substance. There were no extravasations into its substance at any point.

In some cases in adults Rokitansky and Demme have observed a development of connective tissue in the spinal cord.

Symptoms.—The disease generally begins on the third, fourth, or fifth day after birth. It is rarely delayed longer than the tenth. The first symptom mentioned by the mother is usually that the child cannot take the breast, or that if he attempt to do so he quickly abandons the nipple. Sometimes the milk is noticed to run out of his mouth, as if he had a difficulty in swallowing it. Soon the jaws become stiff and the face has a rigid, pinched look. The spasms extend from the muscles of the jaw to the neck, the back, and finally the limbs, so that in a short time a general muscular rigidity is observed, which comes on in paroxysms, lasts for a variable time, and then remits to return after a short interval. The infant may utter a pitiful whimper when the paroxysm begins, but at once the muscles become stiff and hard, the eyes are tightly closed, the jaws are set, with the mouth a little open, the head is drawn backwards, the hands are clenched, and the feet are flexed upon the ankles. Sometimes there is opisthotonos. If the paroxysm is short respiration may be suspended and the face become dusky, but in the longer attacks breathing generally continues. Each attack lasts from a few seconds to half a minute, and the intervals between them may be a few minutes or longer. In the interval the spasm does not completely relax, there is some lividity of the face, the head often remains more or less retracted, the hands continue clenched and the thumbs are twisted inwards. At this time a touch will frequently excite the recurrence of the paroxysm. If milk is put into the mouth the child may be unable to swallow it, or if he attempt to do so the effort may bring on a return of the spasms. The want of nourishment and the exhaustion induced by the convulsions cause rapid emaciation. In most cases the interval between the attacks becomes shorter and shorter, and the child sinks exhausted, or dies asphyxiated from spasm of the muscles of respiration. From the very beginning of the attack the child ceases entirely to cry. Occasionally he may whimper faintly, but a loud cry is never heard. The temperature usually varies from 99.5° to 101° or 102°. It may fall below the normal level before death, or may rise to 104° or 105°. In a case recorded by Ingersley the temperature in some of the attacks reached 107°. In this case albumen and casts were found in the urine, and the kidneys, after death, showed marks of acute nephritis, with extravasations of blood.

Death usually occurs at the end of a day or two. The infant seldom recovers if the paroxysms have appeared before the third day after birth. If the child live six days after the appearance of the first symptoms, the case may terminate favourably.

In Mr. Parker's case, before referred to, the arms were noticed to be stiff immediately after birth, and they could not be flexed. For a day or two the child sucked without difficulty, then the milk was observed to run out of his mouth. On the fifth day, soon after the navel-string fell off, he began to have slight spasms. If the nipple was put into his mouth the spasms were immediately excited. On admission on the fifth day the cranial bones presented no abnormality. The child lay with the eyelids screwed up. His mouth was not quite closed, but any attempt to open it wider brought on a tetanic spasm. There was no risus sardonicus. When stripped, the child's body was seen to be covered with hæmorrhagic flea-

bites. The umbilicus was slightly red and inflamed, but there was no discharge from it. There were no marks of violence, nor any sores of any kind about the body. The limbs were rigid and outstretched, the legs rather less so than the arms; the hands were clenched. The abdominal and thoracic walls were also rigid during the spasm, but they partially relaxed after the spasm had passed off. The limbs never quite relaxed during the intervals. The spasms were of short duration (a quarter to half a minute), and affected the whole body at once. They recurred very rapidly, and the slightest touch sufficed to bring them on. Respiration was quite arrested during the paroxysm. There was no opisthotonos. The temperature, taken in the rectum, was 103.8°.

The case was treated with the calabar bean extract, of which one-sixth of a grain was given every half hour by the mouth; but as the infant was unable to swallow, probably very little of the remedy was really introduced into the system. Still, possibly some was absorbed, for after several doses the child opened his eyes and was able to swallow milk. He was then placed in a warm bath and the bean extract was given every two hours. The infant had some spasms during the bath, and a few others shortly afterwards, but in the course of an hour they ceased entirely and the child seemed to be going on well, when suddenly a violent paroxysm came on and he died asphyxiated. The temperature varied, after the first, between 100.8° and 102.4°. The child lived only about sixteen hours after his admission into the hospital.

In fatal cases the duration of the illness is usually short. Sometimes the infant dies in a few hours, and in the majority of cases all is over before the end of the second day. More rarely the child makes a better struggle for life, and only succumbs on the eighth or ninth day. When the disease takes a mild form from the beginning it may terminate favourably after a more or less serious illness of two or three weeks.

When tetanus attacks children after the age of infancy, the symptoms are similar to those which are seen in the adult. They are well illustrated by the following case of idiopathic tetanus which was under my care in the East London Children's Hospital.

A boy, aged ten years, complained one day on returning from school of chilliness, and shivered. For the next three days he seemed poorly and complained constantly of feeling cold. On the fourth day, in the evening, his neck became stiff, and the stiffness extended to between the shoulders so that he held his head backwards. On the following day (the fifth) he began to "get straight" from the hips upwards, and the stiffness soon extended to the feet. Although very ill, he would sit up in a chair during the day, and on one occasion, on being raised to his feet at his own request, he became perfectly stiff so that his mother could not bend him or replace him in his chair. After about a minute the rigidity subsided and he resumed his seat. He complained of no pain except from his tongue, which he often bit in these attacks. After this the stiffness returned whenever he moved. His mind was quite clear, but except for asking for what he wanted he did not talk. The bowels were much confined.

The boy was admitted into the hospital on November 12th, two weeks after his complaint of chilliness. It was noted that he had no marks of external injury. His face was drawn from contraction of the muscles, and there was risus sardonicus. Occasionally his body became quite stiff, his arms and legs rigid and extended, the abdominal muscles hard and the muscles of the nucha contracted. There was no opisthotonos. These attacks generally came on at night. On the night of November 14th he had

nine of the spasms, on the 15th, ten. He often bit his tongue. During the first few days his pulse was 80; temperature, 99–101°; respiration, 20–24. The lungs and heart were healthy.

On the 16th, at 6 P.M., he began to take calabar bean extract, one-sixth of a grain every half hour. This reduced his pulse in a few hours to 54. On the 17th it was noticed: "Abdominal muscles feel hard, and there is much rigidity of the back of the neck. No stiffness of joints of arms or legs. Can only partially open mouth, when he does so the muscles under the chin become very stiff, but are painless. Keeps his eyes closed although light is not distressing to them. Cheeks and eyelids rather red. His face has a peculiar drawn expression; nostrils widely open. Tongue sore from biting. Has no difficulty in swallowing. When asleep, the muscles are much less rigid than when he is awake, unless during the actual spasm. Temperature at 9 A.M., 98.2°; pulse, 72, small and compressible, regular in force but not in rhythm; respiration, 22."

During the whole of the 17th the boy had only one paroxysm. In the course of the following night he had three attacks. At 10 P.M. on this night (the 17th), his pulse being only 48, the medicine was ordered to be given every hour instead of half hour. After this the spasms became fewer and less severe and the rigidity of the muscles gradually relaxed. The spasms still continued to occur at times during sleep, but they usually subsided at once when the child was roused. The bean extract was stopped on the 25th. His improvement continued and the patient was pronounced convalescent on December 12th. The last muscles to become completely relaxed were those of the abdominal wall.

Diagnosis.—Infantile tetanus is a disease which it is not easy to mistake. Violent paroxysms of tonic rigidity in which the jaws are set, the chest is fixed, the muscles generally are stiff and hard, and the face becomes dusky and drawn—these seizures occurring without twitching or sign of clonic spasm, and followed by intervals of only partial relaxation, are very characteristic.

In older children it is important to distinguish between tetanus and the symptoms of strychnia poisoning. According to Sir Robert Christison, tetanus does not kill so quickly as a poisonous dose of strychnia. Moreover, in tetanus the symptoms become developed gradually; in strychnia poisoning the convulsions very rapidly become general, and a perfect fit is developed in an hour, or even more quickly still. If strychnia have been given in carefully graduated doses, the distinction is less easy, but even in these cases there are very decided differences. Tetanus begins gradually and always runs a continuous course. Sir B. Brodie declared that he had never known a case of tetanus to begin, then subside, and then begin again in twenty-four hours. This continuity of symptoms would be difficult to simulate even by the most carefully graduated doses of the poison. Again, in strychnia poisoning the upper extremities are affected early; in tetanus they are implicated late, and the fingers last of all. The facies, too, of tetanus is very peculiar. The forehead is wrinkled perpendicularly and transversely, the eyebrows being drawn towards one another in a very remarkable manner. The eyes are not fully opened; there is a "peering look" which is very characteristic, and after a time the eyeball becomes painfully sunken from tetanic contraction of its muscles. In strychnia poisoning the eyelids are widely opened and the eyeballs protrude.

Prognosis.—So few children recover from this disease that the prognosis is always very unfavourable. Dr. Lewis Smith has collected forty cases, of which thirty-two died and eight recovered. This is a large pro-

portion of recoveries, but statistics gathered from published cases alone probably represent but feebly the fatal nature of the illness; for in so mortal a disease it is likely that many more successes than failures would be placed upon record. Early occurrence of the symptoms after birth, great violence of the spasms, shortness of the period of remission, and a very high temperature should excite the gravest apprehensions. The most favourable cases are those in which the disease appears after the first week has passed. The symptoms are then as a rule less severe, and sometimes deglutition is unaffected. The ability or inability of the child to swallow is an important element in the case. If he still continue capable of swallowing milk from a spoon, we are justified in entertaining some hope of ultimate recovery.

In an older child the prospect is more favourable if the disease be idiopathic than if it follow upon an injury; but in any case we cannot look forward without serious anxiety to the termination of his illness.

Treatment.—In every case of infantile tetanus our first care should be to remove all sources of irritation, whether internal or external. The infant must be kept quiet in a room carefully darkened, and the bowels should be relieved by a good dose of castor-oil, or if he cannot swallow, by a copious enema. Next, the rapid emaciation must be counteracted by regular feeding. The great obstacle to efficient nutrition is the spasm of the muscles of deglutition which makes swallowing so often impossible. Infants cannot be nourished per rectum. It is therefore advisable to put the child under chloroform at regular intervals and administer his mother's milk, if it can be obtained, or if not, asses' milk, cow's milk and barley-water (equal parts), or other suitable food, through an elastic catheter passed down the gullet. In this way three or four ounces of food can be administered every three hours; and with each quantity it is advisable to mix fifteen or twenty drops of sound brandy.

The third indication is to control the spasms. For this purpose some form of sedative must be resorted to. Opium, alone or combined with anti-spasmodics such as sulphate of zinc or assafœtida, Indian hemp, and belladonna or its alkaloid have been all employed. Whatever form be used, it should be given with the food through the catheter or hypodermically in frequent small doses. Chloroform checks the paroxysms for a time, but they return when the effects of the anæsthetic have passed away. Good results have been obtained from the extract of calabar bean. In Mr. Parker's case, previously narrated, even the small quantity of the remedy absorbed seemed certainly to prolong the intervals of remission, although the seizures when they occurred were not diminished in severity. The drug should be administered hypodermically if the child cannot swallow. The dose should be one-twelfth of a grain by the mouth, or one-twentieth by subcutaneous injection, every hour or two hours, watching the effect. It is advisable to produce some decided effect upon the heart and lungs, reducing the rapidity of the pulse and the breathing, if any good result is to be hoped for.

Of all the drugs which have been recommended for this disease the most favourable results appear to have been obtained from chloral. Dr. Widerhofen claims six recoveries in twelve patients by the use of this agent, but the only case referred to in the short extract from his lecture which appeared in the *Lancet*, was not of a very severe character, as the symptoms came on late and deglutition was not interfered with. In a case which was under my care in the East London Children's Hospital this remedy was employed, and although the baby died the effect of the drug

upon the spasms was decidedly encouraging. The difficulty appears to be to regulate the dose accurately so as to dominate the seizures without producing too serious a depression. For the notes of the case I am indebted to Mr. J. Scott Battams the Resident Medical Officer, who watched the child with great attention.

A little boy, four days old, of healthy Irish parentage, was admitted October 18, 1881. The father and mother with three other children besides the patient occupied one room, which was said to be clean and large. The bed in which the child lay with his mother was placed in a strong draught, of which the woman had constantly complained. The child was born to all appearance healthy, and took the breast well until the day before admission, when he was noticed for the first time to be unable to suck. That night the infant slept badly, crying and drawing up his legs. The cry was, however, strong even on the morning of admission.

When first seen (October 18th, noon) the baby was dirty but seemed well nourished; navel apparently healthy; cranial bones normal. Every five minutes spasms occurred of moderate severity; they did not arrest the breathing. In the spasms the legs were drawn up rigidly, the forearms were flexed, the fingers were stretched out and widely separated, the lips pouted a little and there was risus sardonicus, the jaw was fixed and the head was slightly retracted. An attempt to open the eyes or mouth aggravated the spasms. At this time the person who brought the child refused to leave him without the consent of the mother. At 6 P.M., however, he was brought back and admitted. He had taken no food since 11 P.M. of the previous evening. The spasms had continued all the afternoon and were more severe than at first. The bowels were relieved by enema of a large quantity of curd, and the child was put into bed with an ice-bag to the spine. Between 7 P.M. and midnight three enemata of milk, containing, respectively, four grains, six grains, and six grains of chloral, were administered. After three hours the ice-bag was removed. At midnight the child was no better. As he remained unable to swallow, he was put under chloroform, and three ounces of his mother's milk with four grains of chloral were injected through a catheter passed into the stomach. This was repeated at 4.30 A.M., after which the catheter was passed without difficulty and without chloroform, and between two and three ounces of his mother's milk with ten drops of brandy were given every two or three hours. During this time the convulsions had varied in intensity as well as in number. They were manifestly influenced by the chloral, so that from 5 A.M. (19th) until 10 A.M. he slept quietly.

At 10 A.M. (October 19th) the limbs were quite relaxed, and the child's face was somewhat dusky. Very little air seemed to be entering the lungs. On passing the catheter into the stomach very little spasm was excited.

At 2 P.M. Mr. Battams was sent for, as the infant was thought to be dead. On making artificial respiratory movements the child gave a gasp. From this time until 5 P.M. he continued to breathe eight times per minute. The conjunctivæ were insensible, the surface was cold, but there was less cyanosis. Some brandy was administered. At 10 P.M. his condition remained unaltered, except that the respirations were now reduced to four per minute. No more spasms had occurred.

On October 20th, at 2.30 A.M., the child was again thought to be dead, but artificial respiration revived him for a time; he, however, finally sank about 3 A.M.

The temperature was 98° on admission (October 18th), 99° at 9 P.M. On the 19th it was 100.6° at midnight, 99.8° at 2.15 P.M., 94.8° at 5.30

P.M., 95.8° at 7.30 P.M., and 96° at 10.30 P.M. No post-mortem examination was allowed.

In this case the remedy was, no doubt, administered too energetically. It would have been better, after the first dose or two of the chloral, to have given the drug in smaller quantities, even if it had to be repeated more frequently. Had this been done, the result might have been different. I have been unable to find any rule by which the administration of the remedy may be regulated. Whether it be advisable to proceed to actual narcotism, or whether it is preferable to stop short of that point, must be a matter for individual experience to acquire, and in this country such experience is difficult or impossible to obtain. Widerhofen directs gr. j.–ij. by the mouth, or gr. ij.–iv. by the rectum, to be given "at the time of each onset of convulsion." This direction is too vague to be useful as a guide in practice, and can scarcely be intended to apply to a case such as the present, where the intervals of remission were so brief.

Tobacco and woorara have also been recommended, but must be very dangerous drugs to use at so early an age, even when, as in this disease, there is such a remarkable tolerance of sedatives. External applications are sometimes employed. Warm baths and cold packing have both their advocates. In Mr. Parker's case the warm bath seemed to have a decidedly unfavourable effect upon the infant.

CHAPTER IX.

CONGESTION OF THE BRAIN.

Congestion of the brain is a term which is often used very loosely, and is probably applied to various forms of illness. Writers who have dealt with the subject of disease in early life differ curiously in the importance they attach to the subject of cerebral hyperæmia, some attributing to it most of the convulsive diseases to which young children are liable; others, as Valleix, asserting that this pathological condition is almost unknown in infancy.

The view formerly held that the quantity of blood circulating within the cranium is constant and cannot be influenced by altered conditions of the body generally, has now been proved to be erroneous. The researches of Robin and of His have shown that surrounding the cerebral blood-vessels are lymphatic sheaths which communicate with the lymphatics of the pia mater, and are several times the size of the blood-vessels they enclose. These lymphatic canals contain a fluid which increases or diminishes in quantity according to the varying distention of the blood-vessels, and must therefore allow of great variety in the amount of fluid circulating within the cranial cavity. There is no doubt, therefore, that hyperæmia of the blood-vessels can take place; but it does not follow because evidences of this congestion are discovered in the dead body that it was the cause of the symptoms from which the patient had suffered. It is common in cases of death from convulsions to find engorgement of the vessels of the brain and membranes, but this engorgement is probably as often a consequence of the convulsion as a cause of it. Still, every physician practising amongst children must now and again meet with cases in which he finds a group of symptoms suggestive of some temporary increase of pressure upon the brain. These symptoms either pass off after a time and the child recovers, or they increase, the patient dies, and on examination of the skull cavity nothing but a hyperæmic state of the cerebral vessels with an effusion of serum is seen to account for the illness. These symptoms are therefore supposed to indicate congestion of the brain; but there is probably some deeper and less obvious cause of the impairment of function, for although this pathological condition may be invariably present, it cannot be held to furnish a full and satisfactory explanation of the phenomena.

Causation.—Cerebral congestion may occur in two forms: An active hyperæmia from increased flow of blood into the brain, and a passive hyperæmia from obstruction to the return of blood from the interior of the skull. Many different causes have been enumerated as giving rise to the condition, but it is difficult to accept all of them as determining agents in the production of cerebral congestion. Dentition is usually said to be a cause of vascular engorgement, because the teething process is often accompanied by convulsive seizures; but in these cases, if cerebral hyperæ-

mia occur, it is as likely that the convulsive seizures are the cause of the congestion as that the congestion determines the fits. The intense congestion of the face, and the swelling of the veins of the neck, which are always present in a convulsive fit, show that there is impediment to the return of blood from the head ; at the same time the heart's action is excited, and blood is being propelled rapidly into the cranium. There must be therefore great engorgement of the vessels in this region, and if the fits are frequently repeated and the child remains for hours, as often happens, in a more or less convulsed state, the engorged vessels must relieve themselves by effusion of serum, and perhaps by minute hæmorrhages. Pressure upon the brain set up by this means is sufficient to account for the stupor, squinting, etc., which are often found to follow a convulsive seizure ; but the effusions are in all probability like the venous congestion itself, a consequence rather than a cause of the nervous commotion.

Even in cases where the cerebral congestion has preceded the convulsion, it seems probable that something besides mere distention of vessels, unless this be extreme, is necessary to give rise to the eclamptic seizure. Some time ago I was asked to see a little child, aged six months, who had impetigo of the head. The cervical glands of both sides were enlarged and had set up considerable pressure upon the veins of the neck —enough, indeed, to induce great œdema of the head and face. In this case, where there must have been serious impediment to the return of blood from the brain, there were no signs of nervous disturbance. So in cases of enlarged bronchial glands with pressure upon the vascular trunks in the chest, œdema of the head and neck is sometimes produced, and some heaviness may be complained of ; but convulsions are not a symptom of the disease.

It appears probable that in many cases, in addition to the engorged state of the blood-vessels, small embolisms or thromboses in the minute arteries and capillaries of the brain may be agents in the production of nervous symptoms. Dr. Bastian found this condition of the brain in persons who had died whilst suffering from delirium and coma in the course of acute specific diseases, and has recorded his belief that minute and widespread congestions are often a consequence of these obstructions. There is no reason to suppose that young children differ in this respect from older persons ; and probably the convulsive seizures which often occur towards the close of measles, scarlatina, and other infectious fevers, may owe their origin not to the accompanying congestion, but to minute plugging of the cerebral capillaries. Such vascular obliterations, if widely distributed, must produce, as Dr. Bastian remarks, "total disturbance in the incidence of blood-pressure, and in the conditions of nutritive supply in the convolutional gray matter of the brain."

Besides the eruptive fevers and convulsive attacks, exposure to extreme heat and cold, or direct violence applied to the head, may be, directly or indirectly, determining causes of acute hyperæmia of the brain. A passive congestion may be induced in the child during a difficult labour ; it is sometimes the consequence of energetic expiratory effort in whooping-cough ; it may be set up by diseases of the heart and lungs, or by other causes which interfere with the return of blood from the head ; and it may be induced by the pressure of intracranial growths upon the cerebral sinuses and veins.

Morbid Anatomy.—A congested brain has a swollen appearance. The dura mater is tightly stretched, and if slits are inadvertently made in the membrane in the process of removal of the calvarium, the organ bulges

through the artificial opening. The convolutions look broad. They are flattened by pressure against the bones of the skull, and their sulci are narrowed. The veins of the pia mater are engorged, tortuous, or even varicose; and the small vessels are filled to their minute ramifications. The cranial sinuses are distended with thick, dark, partially coagulated blood, and the choroid plexuses are also congested. The gray matter of the brain is also darker than natural, and its section shows fine dots from the injected vessels. The white substance also contains numerous red points, and sometimes the cerebral tissue is œdematous, with excess of fluid in the ventricles. In cases where the congestion has existed for some time, little masses of blood pigment may be found lying outside the vessels within the lymphatic sheath. These are described by Bastian as molecular grains of a dark olive or amber colour.

Symptoms.—Signs of general irritability of the nervous system, such as heat of head, fretfulness, dislike to light and noise, disturbed sleep, startings and twitchings, have been said to constitute an early stage of cerebral congestion. Such symptoms in impressionable infants frequently accompany digestive disturbance and teething, but are more probably due to reflex irritation of the nervous centres than to engorgement of the cerebral capillaries and veins. They are often, perhaps, accompanied by increased activity of the cerebral circulation, but are not necessarily induced by it. The so-called "irritative stage" of cerebral congestion, then appears to me to be one which cannot be clinically recognised, at least I know of no evidence to show that the symptoms said to be characteristic of this stage have any necessary relation to an engorged state of the cerebral circulation.

The common form in which congestion of the brain is met with in practice is that in which an infant who has been taken with violent convulsions from teething, or other form of reflex irritation, is left drowsy and stupid after the fits have subsided. Instead of clearing quickly away the heaviness continues. The child lies with his head retracted on his shoulders, sometimes he vomits, and he may even squint. In these cases congestion with effusion of serosity into the lateral ventricles, and perhaps the substance of the brain, appears to be an important agent in the production of the symptoms. In cases of death we find excess of fluid in the ventricles; the volume of the brain, is increased, the convolutions are flattened, and the vessels of the brain and the pia mater are engorged with blood. Such a case has already been narrated in the chapter on convulsions. Another, which seems to have been of a similar kind, although it ended differently, is the following:

A little boy, seven months old, a strong, healthy-looking child, who was being brought up at the breast, and had cut four of his teeth, was suddenly attacked with vomiting and purging. The symptoms appear to have been severe, for after a few hours the child fell into a lethargic state in which he lay for four days. At the end of this time he had a fit which lasted six hours. For the next ten days he was drowsy and half stupefied. His bowels were confined and once or twice he vomited.

When I saw the child, on April 8th, he was lying in his mother's arms with his eyes half closed. His face was very pale, the pupils were equal, dilated, and immovable; there was no squint; the fontanelle was very elevated and tense; the head was retracted and the muscles at the back of the neck felt rigid. The temperature in the rectum was 99°, the pulse and respiration could not be counted for irregularity. The lungs and heart

were healthy. The child took the breast well, and sucked vigorously but by snatches.

He remained in this state, vomiting occasionally, until April 12th, when the sickness ceased and the patient seemed very much better. When seen on the 15th he appeared to be quite sensible. The pupils were dilated and acted imperfectly with light, *i.e.*, when the eyelids were suddenly opened the pupils could not be seen to contract. The fontanelle was now rather depressed. Pulse, 168, very weak but regular. Skin cool. Head not retracted. After this the child soon became quite well, except that for some time afterwards he had a peculiar stare, the eyes being directed downwards, so as to show a rim of white above the cornea.

It is difficult to say to what these symptoms were due if congestion of the brain and effusion of fluid induced by the convulsion were not the cause of them. The normal temperature seemed to exclude any inflammatory condition; while the somnolence, the immobility of pupils, the swollen and tense state of the fontanelle, and the retracted head pointed to some increase of pressure within the skull cavity. If we assume, on the strength of Dr. Bastian's observations, that the congestion is the consequence of wide-spread minute emboli obstructing the circulation through the brain, the frequent occurrence of symptoms such as the above is less difficult to account for.

Cases have been recorded and attributed to cerebral congestion in which loss of consciousness, with pyrexia, squinting, and general paralysis occurred, and passed off completely after a few days or hours. It is difficult to understand how a simple local congestion alone can give rise to elevation of temperature even in a young child. Such cases are obscure, and no sufficient explanation of them has yet been arrived at.

Many cases of so-called congestion of the brain are probably the consequence of thrombosis of the cerebral sinuses. Dr. Lewis Smith has shown this to be sometimes the case in pertussis; and convulsions due to other causes may be accompanied by similar obstructions to the venous passages within the skull. Exact observations upon this point are to be desired; but it is probable that increased knowledge will in course of time greatly diminish the importance of mere fulness of cerebral veins as an agent in the production of nervous disturbance.

Diagnosis.—When we see a child who is suffering from symptoms indicative of oppression of the brain, such as drowsiness, immobility of pupils, an elevated tense fontanelle, and a retracted head, we have to distinguish the case from one of meningitis or other serious cerebral disease. The history is here of the utmost importance. If the symptoms began with a convulsive attack preceded merely by signs of irritability of the nervous system, such as usually usher in a fit of eclampsia; if the child be the subject of rickets, and if some cause such as swollen inflamed gums, otalgia, or digestive derangement, can be discovered to account for the nervous seizure, we may consider the symptoms to be due to filling of the cerebral vessels and effusion of serum into the cranial cavity. If the temperature be low, it is a confirmation of this diagnosis. Often, however, in these cases the heat of the body is increased as a consequence of the cause which has provoked the convulsion. Therefore a high temperature is not necessarily to be interpreted as casting any doubt upon the accuracy of this opinion. In simple meningitis, which begins with violent convulsions followed by drowsiness and stupor, there is often a history of chronic otorrhœa; and in most cases the convulsion has been preceded by signs of pain in the head. But besides the history, the symptoms in the two

diseases differ in important particulars. In meningitis the child is at once seen to be seriously ill. He refuses his food, and is restless; he contracts his brows, raises his hand to his head, rolls his head from side to side, and, although heavy and stupid, manifests every sign of suffering. The temperature is high, but the pulse is comparatively slow (70–80). The fits continually recur, leaving the child more and more stupid and comatose. The pupils become unequal, rigidity of the joints comes on, and the child dies.

In cases of congestion and effusion upon the brain the child, although heavy and stupid, is quiet and shows no distress. Usually he takes his bottle well, and this is an important sign. The fits are rarely repeated after the drowsiness has become marked. The pupils, although sluggish, are not unequal in size; and although the head may be retracted there is no rigidity of the joints.

Tubercular meningitis sometimes, although rarely, begins with a convulsion; but unless the cerebral symptoms occur as a terminal phase of acute general tuberculosis, the disease afterwards runs its normal course, which is very unlike that of cerebral congestion. It must be remembered, however, that a primary tubercular meningitis is a rarity under the age of two years, while the cases of cerebral congestion we have been considering are almost limited to the first two years of life. The difference of age is therefore an important element in the diagnosis. Still, apart from other considerations, congestion of the brain may be usually recognised by remarking that although drowsy and stupid the child is not actually unconscious; that he continues to take his bottle well; that his pupils are never unequal; that there is no rigidity of joints, and that loss of power, although it may occur as a consequence of violent convulsions, passes off in a few hours unless there be some cause for it more serious than mere exhaustion of nervous force. The occurrence of squint lasting more than a few hours is very suspicious of a small hæmorrhage. It occurred, however, in the case narrated in another chapter (see Convulsions), without anything being discovered in the brain beyond congestion of vessels and effusion of serum.

Prognosis.—There is always reason for great anxiety when a young child shows signs of abnormal heaviness and drowsiness. The mistake must not, however, be made of attributing to centric disease natural sleepiness due to disturbed rest from digestive derangement. It happened to me once to be summoned some distance into the country to see a child of a few weeks old who was said to have congestion of the brain because it was always falling asleep. I found that the child's bowels were disordered, and that it was evidently tortured by frequent griping pains. Every few minutes it drew its legs up, bent itself backwards, and uttered a feeble cry. After some seconds its features relaxed, its eyes closed, and it seemed to sleep, but almost immediately afterwards it was aroused by a fresh attack of pain. This state of things had continued for forty-eight hours. During all that time the child had been prevented from obtaining natural sleep owing to the abdominal pains which roused it almost as soon as its eyes were closed. After a good dose of castor-oil, which relieved its bowels of the irritating matter, the child enjoyed a refreshing sleep and awoke quite well.

The majority of cases of stupor following convulsions recover; but we should be careful not to commit ourselves to a too hopeful prognosis unless improvement begin early and go on apace. As long as the child continues to take his food well the prognosis is favourable. If he refuse

his food, if the drowsiness deepen, the pupils become unequal, or squinting occur, the child will probably die.

When drowsiness is noticed in children as a result of impediment to the return of blood from the head, the prognosis is determined by the nature and severity of the disease which has given rise to the passive congestion.

Treatment.—When called to a child who has been left heavy and stupid by an attack of convulsions, and we have reason to fear an effusion of fluid into the skull cavity, our first care should be to clear out the alimentary canal by a dose of calomel and jalapine. We should afterwards keep up a free action of the bowels by frequent doses of any suitable saline aperient. The child should be kept perfectly quiet in a large well ventilated room carefully shaded from a too strong light. If he be at the breast, no other food should be allowed. If he be brought up by hand, milk and barley water should be given, and but little farinaceous food. If the gums are tense and swollen, they may be lanced ; but unless actual irritation arise from this cause the operation is better avoided. If thought desirable cold may be applied to the head. In some cases counter-irritation with mustard poultices to the chest and spine has seemed to be of service.

In passive congestion the treatment is that of the disease which has given rise to the hyperæmia.

CHAPTER X.

CEREBRAL HÆMORRHAGE.

Rupture of vessels and effusion of blood into the brain is in the child a comparatively rare accident. In new-born babies, however, extravasation into the arachnoid sac (meningeal hæmorrhage) is not uncommon if the labour has been difficult and slow. Indeed, Cruveilhier has stated that amongst still-born children one-third of the deaths may be attributed to this cause. Under three years of age it is rare to meet with any other form of intracranial hæmorrhage than that into the arachnoid, or the meshes of the pia mater, although Billiard found a clot in the left corpus striatum in an infant only three days old, and Bérard found a similar lesion in a child of eight months. But after the third year a true cerebral hæmorrhage is more likely to occur, and sometimes it produces much the same symptoms as are found in the adult to accompany a clot in the brain.

Causation.—When meningeal hæmorrhage occurs during birth it is in cases where the head of the fœtus is locked in the brim of the pelvis, and the bones of the skull are forced to overlap from the pressure brought to bear upon them. If it occur after the birth of the child it is usually a secondary affection, and may be induced by any cause which is capable of giving rise to severe and long-continued congestion of the brain. Thus it may be found in cases of thrombosis of the cranial sinuses; it may be induced by tumours of the brain pressing upon the torcular Herophili and the veins of Galen; it may be a consequence of convulsions or whooping-cough, and it is said to be often found in cases of death from infantile tetanus. It appears to be predisposed to by conditions which lead to debility and cachexia, such as bad feeding and acute exhausting disease.

The same agencies which induce cerebral hæmorrhage in infants may cause extravasations of blood into the skull cavity of older children. In these subjects the hæmorrhage may take place into the meninges, the ventricles, or the substance of the brain. In hæmorrhagic purpura the meninges of the brain, like other parts of the body, are occasionally the seat of extravasations of blood. In many cases, especially when the effusion occurs between the dura mater and the skull, the hæmorrhage may be attributed to a traumatic cause. Children, too, like adults, may die from that comparatively rare accident—rupture of an aneurism on the brain. Cerebral aneurism occurs in early life much more frequently than the ordinary forms of aneurism. Out of seventy-nine cases collected by Dr. Peacock no less than four were found in children between the ages of thirteen and fifteen years, and a boy, twelve years of age, recently died of this disease in the Victoria Park Hospital, under the care of one of my colleagues. Still, liable as children are to cerebral disease, hæmorrhage into or on the brain is not common in young subjects, so far at least as can be judged from the results of post-mortem examinations.

Morbid Anatomy.—In young subjects hæmorrhage is in general capil-

lary. Rupture occurs in small vessels and the effusion of blood is gradual. In the meninges of the brain the extravasation usually takes place in the arachnoid sac; but it may be also formed between the dura mater and the bone, in the meshes of the pia mater, and in the lateral ventricles. In the arachnoid sac the blood is either liquid, of the consistence of syrup, or is separated into a solid and a liquid portion. On opening the cranium the dura mater is of a deep violet colour from the presence of the dark clot beneath it. On examination this clot is seen to be spread over the surface of the brain. It usually occupies the situation of the posterior lobes and the cerebellum, and may even reach as far as the vertebral canal. It is thickest in the centre unless a part of it covers the fissure between the hemispheres, in which case it is usually thickest at this spot, as it here dips down towards the fornix. Towards the circumference it thins off, and is usually continued for some distance as a false membrane which results from absorption of the colouring matter of the effused blood. This false membrane near the clot is readily distinguishable, but it fades gradually towards the edges and is lost on the surface of the arachnoid. The clot generally adheres slightly to the parietal layer of the arachnoid, although it may be readily separated, and the membrane beneath it has a perfectly normal appearance. The visceral layer of the arachnoid, however, is often thickened and opaque. The clot and resulting false membrane are in rare cases stratified—an appearance probably produced by successive additions to the original extravasation. Sometimes we find more than one clot, the effusion having taken place at various points. The thickness may be from a few lines to an inch or more.

A certain amount of fluid, more or less coloured, bathes the surface of the clot; and if the child live long enough the liquid may become enclosed in a species of cyst formed by more or less complete adhesion of the edges of the false membrane to the surface of the arachnoid covering. Sometimes the cyst is loculated, and the contents may increase in quantity by subsequent secretion. In a case reported by MM. Rilliet and Barthez a double cyst was found, each chamber containing more than half a litre of fluid. When the collection of fluid is thus considerable, it presses outwards the fontanelle and the bones of the skull so as to form a real hydrocephalus.

It is rare to find hæmorrhage in the ventricles; but it may occur either in the walls of the lateral ventricles or into their cavities. Hæmorrhage into the substance of the brain is also an uncommon lesion, although it may occur in infants and children of any age. It is seldom copious. Usually when it takes place it is in the course of some other form of illness, and perhaps on this account often escapes recognition during life. The blood is seen in minute points scattered about the cerebral tissue, or may be found collected in little cavities in the brain-substance. These two forms are about equally common. The larger collections of blood vary in size from a pea to a walnut. Around them the brain-tissue is normal, or tinted with rose colour, or slightly softened. The hæmorrhages may be found at any part of the brain-substance, but are much less common in the cerebellum than in the cerebrum. Besides hæmorrhages we often find in these cases much congestion of the brain; and there may be also other lesions, such as meningitis and even tubercles of the brain, as in a case to be afterwards referred to.

Cases of aneurism of a cerebral artery in young subjects are almost invariably associated with endocarditis, and it is generally held that the arterial dilatation is the consequence of embolism. It is probable, also, that

cerebral hæmorrhage in the child is more often the result of aneurism than is commonly supposed, for this may be easily overlooked. As Sir William Gull has observed, "when death takes place from changes around the aneurism, as by pressure or softening, the sac itself may present such appearances that unless a minute dissection be made of it, its true nature may not be discovered." The mechanism by which the aneurismal dilatation is produced is doubtful. Dr. Ogle attributed it to the impaction of the fibrinous clot, and supposed that this afterwards softened and involved the coat of the vessel in the process. Dr. Goodhart has suggested that in many cases the clot is given off from a valve the seat of ulcerative endocarditis, that this poisons the part where it lodges and "leads to acute softening of the arterial wall by inoculating it with its own inflammatory action." This explanation is not, however, of universal applicability.

Symptoms.—The symptoms of *meningeal hæmorrhage* are unfortunately far from being characteristic of the lesion to which they are owing. This form of intracranial hæmorrhage, indeed, may give rise to no symptoms at all. According to M. Parrot, in infants reduced by long-continued bad feeding to a cachectic state meningeal hæmorrhage is not unfrequently found, although during life nothing unusual in the condition of the child had been noticed to excite a suspicion of this serious complication. On the other hand, in new-born babies extravasation of blood into the arachnoid sac may be accompanied by violent convulsions and end in death within a few hours. Such a case is recorded by Valleix. A well-developed, healthy-looking male infant received a violent bruise on the shoulder two days after birth. He seemed to be going on favourably when, on the sixth day, he was seized with strong convulsions, which were repeated with violence, and in three hours the child was dead. On examination of the body a large clot was found in the arachnoid sac ; the veins of the pia mater were swollen with blood ; the substance of the brain was injected ; and the superior longitudinal sinus was filled with a whitish, semi-transparent, gelatinous thrombus. In this case the convulsions must not be attributed entirely to the hæmorrhage. No doubt the thrombosis had a great share in the production of the symptoms, and it was apparently the cause of the extravasation. Convulsions are, however, a common consequence of arachnoid hæmorrhage and repeatedly recur.

Legendre has described a febrile form of meningeal hæmorrhage in which the disease begins with vomiting and pyrexia. Convulsive seizures soon come on, limited at first to the ocular muscles and giving rise to a slight squint. The child sucks well, probably from thirst, and his bowels are in a normal state. Soon contractions are noticed of the fingers and toes, and general convulsions follow, both tonic and clonic, during which consciousness is lost and the face becomes of a dusky red tint. For a time the convulsions are comparatively infrequent, and in the intervals the child is heavy and drowsy. After a few days the heaviness deepens into stupor, the intervals between the fits become shorter and shorter, and towards the end of the illness the infant is almost constantly convulsed. The fever persists throughout, and death is often hastened by an intercurrent inflammatory complication of the lungs.

The above is generally accepted as representing the ordinary course of an attack of meningeal hæmorrhage in the young child ; but if it induces us to look for elevation of temperature as an essential part of the illness it is certainly misleading. Statements with regard to temperature, made in days before the thermometer came into use as an aid to clinical investigation, should be accepted with caution. Moreover, in each of the two

illustrations appended by the author to his description of the disease, a double catarrhal pneumonia was found to occupy the lungs; and this complication would amply explain any elevation of temperature which might have been noticed during life. In cases of intracranial hæmorrhage unaccompanied by an inflammatory condition of other organs the temperature, as is shown by a case narrated later, is not raised above the normal level.

The chief difficulty in assigning to this form of hæmorrhage its distinctive symptoms arises from the fact that it is rare to find a case in which the hæmorrhage was not secondary to, or complicated by, some other malady. Even in instances where no morbid condition of other organs is to be discovered it is an open question whether the convulsions which are invariably present in such cases give rise to the hæmorrhage or the hæmorrhage to the convulsions. It is worthy of remark that paralysis is seldom a consequence of meningeal hæmorrhage. The symptoms, indeed, are very much those of meningitis affecting the convexity of the brain, with the important exception that in cases of hæmorrhage there is no pyrexia. They also differ from them in the fact that there are no signs of headache, and that at first the stupor is not profound. Infants with extravasation of blood into the meninges, according to the testimony of all published cases, take the bottle well for a time. This is no doubt owing to thirst rather than to any appetite for food. Still, the fact remains that while in arachnoid hæmorrhage the child takes food with avidity, in simple meningitis of the convexity of the brain he makes little attempt to suck, and generally refuses the bottle altogether.

Hæmorrhage into the meninges or on to the surface of the brain is not confined to infants. A little girl, aged eight years, was a patient in the Victoria Park Chest Hospital, for heart disease and dropsy. The heart was enlarged in all directions; præsystolic and systolic murmurs were heard at the apex; there was much œdema of the lower extremities, and the urine contained one-third of albumen. The child was kept in bed and made considerable progress for about a fortnight, when some thrombosis was noticed in the basilic and internal saphena veins of the left side. About a week afterwards she cried out one morning after breakfast with pain in her head, and shortly afterwards became convulsed. Twitchings were noticed in the muscles of the lower part of the face on the left side, involving the lips, the angle of the mouth, and the left side of the neck. The face was turned to the left. There were also convulsive movements of the left arm, more particularly of the forearm, wrist, and hand. There were no movements of the leg on that side. The girl died in the course of the evening after a series of these convulsive movements. The temperature was normal throughout.

On opening the superior longitudinal sinus, after death, the channel was found to contain a decolourised adherent clot which reached from nearly the anterior extremity to the posterior third. Opening into the sinus was a vein which ran from the right cerebral hemisphere. This was also filled with a clot, but less decolourised than the first, and the surface of the brain in its neighbourhood was the seat of a circumscribed hæmorrhage. The clot was bounded posteriorly by the fissure of Rolando, and extended anteriorly over the posterior part of the superior frontal convolution on the right side. These correspond very nearly to the areas described by Ferrier, as connected with the movements of the lips, tongue, and mouth; also that for the movements of the arm and leg. There were no convulsive movements of the left leg, but this was the seat of so

much œdema that the child's own voluntary power over it had been very small.

This case, for the notes of which I am indebted to Dr. Lawrence Humphry, the resident physician, bears a very close resemblance to Valleix' case before referred to, although occurring in a much older child. It will be remarked that the temperature during the convulsive seizures was not elevated.

When the extravasation of blood takes place into the *substance of the brain* the first symptom is usually an attack of convulsions. Afterwards the phenomena may resemble those peculiar to an apoplectic seizure in the adult. It is probable that this form of hæmorrhage is less uncommon than might be inferred from examinations in the dead-house; for if the amount of blood effused be moderate, the child may recover with a more or less extensive paralysis. In primary hæmorrhages I believe this is not unfrequently the case. In hospital practice we not unfrequently see children who, as a consequence of a fall or some injury to the head, are seized with headache and convulsions, and are then found to be paralysed in one half of the body. The leg often recovers after a few weeks, but the arm may remain more or less permanently disabled with contraction of the fingers. This was the case with a little girl, six years of age, who was lately a patient in the East London Children's Hospital. In addition the child was aphasic, and could not be persuaded to speak during her stay in the hospital. Otherwise her general health seemed fairly good, and she did not complain of headache. The case unfortunately could not be followed out, as after a few weeks the child was removed by her friends; but I have little hesitation in ascribing her symptoms to a small clot in the brain.

Often the cerebral hæmorrhage is only one of several lesions occupying the cranial cavity. It is then difficult to assign to each its due share in the production of the symptoms.

A little girl, aged fifteen months, with ten teeth, was brought to the hospital on July 13th. According to the mother's account the child, although hand-fed, had walked at the age of ten months, and had always been regarded as healthy until the previous March, when she had had a fall down a flight of stairs. The child was not stunned by the accident, but vomited and "was ill" for a few days. She then began to lose flesh and ceased to run about, always crying to be nursed. On June 4th, she had a violent convulsive seizure which began with hiccough. The spasms were limited to the left side, and lasted nine hours. When they ceased the left arm and leg were noticed to be powerless, and the face was drawn to the right side. The paralysis passed off in about a fortnight, but the child remained weakly. She began to have a discharge from the left ear and the nostrils. She seemed to suffer much from pain in the head; often vomited; and the bowels were somewhat loose. On two occasions she had general convulsions of an hour's duration. She took liquid food well.

Towards the end of June the child became much worse. She began to cough; her breathing was rapid; she sighed a great deal; seemed very drowsy, and at times would scream out suddenly as if in pain.

On admission into the hospital (on July 13th) the temperature was 101°; pulse, 160; respirations, 88. The patient was fretful and screamed almost incessantly until 11 P.M., when she had an attack of general convulsions. At this time her temperature was 104°. On the following morning she was found very pale; the fontanelle was depressed; the eyes were turned constantly to the right; the pupils were unequal and insensible to

light, the left being the larger of the two. Both arms were convulsed, and the right leg and left hand were rigid; there was no paralysis of the face. The hands, feet, and nose felt cold, although the temperature in the rectum was 102.4°. The pulse was very small, 170. The abdomen was soft and not retracted. Pressure on the skin produced little flush. On examination of the back dulness was noted on both sides with abundant crepitating râles. After this the child remained insensible and died at 6 P.M.

On examination of the body much yellow lymph was found covering the right middle lobe of the cerebrum. There was an old clot, the size of a hen's egg, occupying the right corpus striatum and the superjacent part of the right hemisphere. Scattered caseous nodules, the size of a large pea, were seen in the right hemisphere, and the choroid plexus; and some gray granulations were discovered on the vertex of the brain along the course of the vessels, and a larger number at the base. The lungs were the seat of catarrhal pneumonia. The liver, spleen, and kidneys contained small yellow nodules; and the bronchial and mesenteric glands were enlarged and caseous.

In this case there can be little doubt that the convulsions and hemiplegia noted on June 4th resulted from the apoplectic clot. The after-symptoms were, no doubt, the consequence of the meningitis and general tuberculosis. The case is interesting as showing that a copious extravasation is not necessarily fatal; for it is reasonable to suppose that had the clot been the sole lesion present the child would not have died.

Cerebral hæmorrhage in the child is not, however, always accompanied by symptoms so characteristic. Violent convulsions and sudden death may be produced by a clot in the substance of the brain; or a child may be seized with repeated vomiting; may then be taken with convulsions; and afterwards fall into a state of unconsciousness with dilated pupils, rapid feeble pulse, and cool skin, and die in the course of a few hours. These were the symptoms noticed in the case of a boy who died in the Victoria Park Hospital from rupture of a cerebral aneurism. The notes of the case were kindly furnished to me by Dr. Humphry, the resident physician.

A scrofulous-looking boy, aged twelve years, was admitted into the hospital under the care of my colleague, Dr. Birkett, on March 15th. He had had scarlatina four years before, followed by dropsy, and there was besides a doubtful history of rheumatic fever at about the same time. For two years the patient had complained of shortness of breath, which had lately been getting more distressing. When admitted, a loud mitral murmur was detected, with considerable hypertrophy of the heart.

On March 19th the boy vomited a great deal, and complained of headache. On the morning of March 20th he seemed very sleepy, but made no complaint. At 11.30 A.M. the resident physician was summoned to his bedside, as the boy was said to have had a fit. The patient had vomited, and appeared to be very drowsy, but he answered questions. The pupils were equal and rather contracted; the conjunctivæ were sensitive, and there was no squint or other sign of paralysis. Shortly afterwards he had several quasi-fits in which he became flushed. His eyes rolled from side to side, and the conjunctivæ were not sensitive. He passed water in the bed. The pupils were equal. Temperature, 97.6°; pulse, 84, and regular. After this the coma became more and more profound, and the boy died at 4 P.M.

On examination of the body the veins over both hemispheres were much congested, especially on the right side. The pia mater over the whole surface was suffused. The left hemisphere was larger than the right, and the convolutions were flattened. At the base of the brain all the

loose tissue of the arachnoid was filled with dark clotted blood, which had spread along the Sylvian fissure on to both surfaces of the cerebellum and downwards along the cord. Both laferal ventricles were completely filled with a large clot, as also were the third and fourth ventricles. From the ventricles the blood seemed to have spread by the transverse fissure to the outer portion of the brain, and not through the "iter." The source of the hæmorrhage was a small aneurism, of the size of a small pea, seated on the Sylvian artery about one inch from its beginning. The coats of the aneurism were very atheromatous and brittle. The rupture was extensive along the top of the aneurism, and the blood had burst into the top of the anterior horn of the left lateral ventricle. Elsewhere the coats of the vessels showed no sign of disease. The mitral valve was much beaded, and the pericardium was universally adherent.

Judging from the variety of symptoms found as a result of cerebral hæmorrhage in the child we can only conclude that there are none which can be considered characteristic of this lesion. Symptoms of irritation of the brain coming on suddenly, and followed after a few hours by symptoms of compression, are not peculiar to hæmorrhagic effusion within the skull; and yet, as a rule, we find nothing more distinctive than these. Still, the very fact of profound depression following rapidly upon symptoms of violent irritation in a non-pyretic patient may give rise to suspicions of cerebral hæmorrhage, especially in children over four or five years of age.

Diagnosis.—On account of the indefinite character of the symptoms, hæmorrhage into the brain or meninges in childhood is very difficult to detect. The difficulty is increased by the lesion being so often a secondary one, occurring in infants and young children who are already suffering from other complaints. It must be confessed that in such cases intra-cranial hæmorrhage is very likely to be overlooked. Even when the hæmorrhage is primary it is difficult to lay down rules for the detection of the lesion.

If a young child, whose water has been examined and found to be healthy, be seized with repeated convulsions, in the intervals of which, although drowsy and stupid, his temperature is normal, and he swallows liquid food with appetite, we may hesitate between congestion of the brain with effusion of fluid and intra-cranial hæmorrhage. If, now, we notice that after the stupor has become marked the convulsions continue, and especially if any contractions and rigidity, more than merely temporary, are noticed in the hands and feet, the temperature remaining low, we are justified in suspecting a hæmorrhage.

When hemiplegia follows an attack of convulsions, the paralysis is not necessarily a symptom of hæmorrhage, for the same phenomena (convulsions and paralysis) are occasionally seen in cases of tumour of the brain. In the latter disease, however, we can usually obtain a history of severe and paroxysmal headache; there is often paralysis of ocular muscles, indicating implication of cerebral nerves; and an examination of the eye will generally detect the presence of optic neuritis. Contractions and rigidity of the fingers and toes, wrists or ankles, may occur in either case. If, after recovery of consciousness the hemiplegia persist, but the child remain free from headache, if the retinæ are normal and the general health seem fairly good, a cerebral growth may be excluded.

A diagnosis between hæmorrhage into the meninges and that into the substance of the brain is probably impossible from the symptoms alone, although if paralysis occur this symptom is not in favour of meningeal extravasation. The age, however, is here of importance. Under the

third year hæmorrhage rarely takes place into the cerebral tissue. In nine cases of intracranial hæmorrhage occurring in infants aged three years and under, observed by M. Legendre, in no case was the hæmorrhage other than meningeal. After that age hæmorrhage more commonly takes place into the brain-substance, as it does in the adult.

Prognosis.—In all cases of cerebral hæmorrhage the prognosis is very serious; and it is especially so if the patient in whom the extravasation occur be the subject of diathetic disease, or be weakened by recent acute illness. The occurrence of paralysis is not in itself a necessarily unfavourable sign. Of greater importance is the degree of heaviness remaining after the convulsions have ceased, or the frequency of return of the spasmodic movements themselves. As long as the child continues to take liquid food we may hope for improvement. If he refuse his bottle, or cease to drink when the feeding-cup is held to his lips, the sign is a very unfavourable one. The condition of the pupils should be always noticed. If they are dilated and insensible to light the prognosis is bad; if they are unequal in size death may be considered certain.

Treatment.—Cases of intracranial hæmorrhage require much the same treatment as has been already recommended for congestion of the brain. If the child be strong an ice-bag should be applied to his head, and the bowels should be freely acted upon by a dose of calomel and jalap. If the heart's action be violent, and the arteries of the neck are seen to pulsate strongly, digitalis may be given to control the energy of the cardiac contractions. Three drops of the tincture of digitalis, or twenty of the infusion, may be given every two or three hours to a child of twelve months of age. The patient should lie with his head raised; and if the feet are cold, a hot bottle can be placed at the bottom of the cot. If the pulse flag or the fontanelle become depressed, stimulants should be given in such quantities as may seem desirable.

The food should consist of milk, freely diluted with barley water, or of whey and barley water. It is better in these cases to feed the child with a spoon, or at any rate to give him fluid only in small quantities at a time, so as not to increase the strain upon the vessels by a rapid introduction of large quantities of liquid into the circulation.

In the after-paralysis little can be done. Our efforts must be restricted to ordinary measures for improving the general health and promoting nutrition.

CHAPTER XI.

CEREBRAL TUMOUR.

Children, like adults, are subject to morbid formations in the brain which may give rise to a variety of symptoms according to the situation of the growth. In the case of a child, however, "tumour" of the brain usually means "tubercle" of the brain, for it is only in exceptional cases that any other form of cerebral growth is to be found. Still, in rare instances cancerous, glyomatous, and syphilitic nodules are developed in this region, and occasionally we meet with the cysticercus cellulosa or the hydatid cyst.

Morbid Anatomy.—Tubercle of the brain is said to be rare under the age of two years; but I think the occurrence of the disease in infants is more common than has been supposed. It is seldom seen in the cranium without other organs being similarly affected, although in exceptional cases it may be a solitary instance of tubercular formation in the body. The seat is most frequently in the cerebellum, but it is also common in the hemispheres of the brain. Next in order of frequency, according to Andral, come the pons, the medulla oblongata, the peduncles of the cerebrum and cerebellum, the optic thalamus, and the corpus striatum. In number there may be one or more, and in size they may be small or large. Usually the more numerous masses are of small dimensions. Single tumours may be as small as a pea or as big as an egg, or even of still larger size; but they are most commonly met with about equal in volume to a filbert or small marble. The masses are almost always surrounded by a fibrous covering which separates them from the brain-substance around. In exceptional cases, however, *i.e.*, where death has taken place while the tumour is still growing, the limits of the mass are not thus circumscribed, but its substance passes insensibly into the adjacent cerebral tissue. When the tumour ceases to extend itself, an areola of connective tissue and vessels forms at its circumference, and develops into a fibrous envelope which varies in thickness according to the age of the growth.

On section the tumours are yellowish white, or have a faint greenish tint, and are found to consist of cheesy matter. Their consistence is more or less firm, but the centre is usually softer than the circumference, and may be converted entirely into a creamy pulp so as to give the appearance, with the firm envelope, of a little bag of pus. Tuberculous matter found in the brain is seldom seen in any other shape than that of yellow caseous matter. Lebert and Rokitansky, however, agree that in exceptional cases it may begin as the gray granulation; but it seldom remains long in this stage and very quickly becomes cheesy and yellow. Around the mass the brain-substance may be natural, or congested, or more or less softened by œdema. Often the collections of tubercle spring from the pia mater, and are attached to it by a fibrous stalk continuous with the

envelope, and filled like it with tuberculous or cheesy matter. Tuberculous meningitis is often present, and is the direct cause of death. If the mass be on the surface of the cerebellum, and so placed as to press on the straight sinus or the vena magna Galeni, it may be a cause of chronic hydrocephalus. It is not often that a cretaceous change takes place in cheesy matter situated in or upon the brain, for the irritation set up is usually so injurious that death takes place before this transformation has had time to occur. Still, it is sometimes met with.

Cancer of the brain is rare. When it occurs it is usually secondary to a similar growth in the eye ; or, as recorded by Steiner, may advance inwards from the skull. When thus secondary, it may appear in several centres. The size of the mass varies from a pea to an orange. These so-called cancerous growths have usually the characters of sarcoma.

Gliomatous tumours of the brain are solitary growths which increase slowly in size, so that they may be long in producing appreciable effects. They often reach considerable dimensions, and occupy by preference one or other of the posterior cerebral lobes. Their borders are not well defined, and their substance passes gradually into the brain-tissue around. Their consistence is usually firm, and they are rather more vascular than the cerebral substance in which they are embedded.

Cysticerci, the second stage of the tænia solium, when they occur in the brain, are usually numerous. They are generally found in the gray substance or at the surface. They are especially partial to the pia mater, and are usually more or less embedded in the gray matter of the convolutions. They vary in size from a pea upwards. Occasionally they die and become changed into a thick "mortar-like" substance containing hooklets.

Hydatids, the second stage of the tænia echinococcus, usually exist, several together, enclosed in an outer sac. The most frequent situation is the centre of the white matter in one of the hemispheres, and the cyst may grow to a large size. The hydatid, although rare at all ages, is not proportionately less common in children than in adults. In twenty-four cases of hydatids of the brain, collected by Dr. Bastian, in which the age was stated, three occurred in children under the age of ten years.

Symptoms.—Tumours of the brain, if they grow slowly, if they are situated at a distance from the base of the brain and the large ganglia, and if they merely displace the brain filaments without destroying them, may produce absolutely no symptoms at all. This fact, which has been ascribed to a supposed faculty of accommodating itself to pressure residing in the brain, is better explained by Niemeyer to be due to the atrophy of cerebral substance which takes place in the neighbourhood of slowly growing tumours, allowing of increase in size of the growth without interference with cerebral function. Sometimes the symptoms are so trifling as to be overshadowed by others arising from disease or disturbance of a different part of the body. Again, after being a long time latent, the growth may give rise to obstinate headache, to a slight squint, or some other form of muscular spasm ; and for weeks or months this may be the only symptom to be detected. In cases where the morbid growth consists of cheesy matter other symptoms may arise not due directly to the cerebral tumour. Thus the patient often dies of a tubercular meningitis, the symptoms of which may quite conceal any special phenomena resulting from the tumour of the brain.

There are no symptoms peculiar to an intracranial growth, for all are the consequence of local destruction of substance, of pressure on the tissue around, and of interference with its vascular supply. A distinctive char-

acter is, however, given to the disease by its course, the sequence of its phenomena, and the predominance of some symptoms over others.

There are certain general symptoms which are found in most cases of cerebral tumour. Headache is usually early to occur, and may remain for a long time the sole morbid phenomenon. Often slight at first, it becomes gradually more intense, and may assume a violent paroxysmal character which is infinitely distressing. Infants show this by contracting the brows, throwing up the hand to the head, rolling the head from side to side, and occasionally breaking out into piercing cries. An older child will place his hand upon the site of the pain if asked to do so. He avoids the light; shudders at a loud noise; and often buries his face in the pillow of his bed, or covers his head with the bedclothes. The attacks of headache are generally accompanied by vomiting, and often by dizziness.

Sooner or later convulsions, tonic or clonic, may supervene. These are sometimes complete and bilateral, and resemble attacks of epilepsy. Sometimes they are partial, and are confined to the face, the eyes, or one limb. The convulsions may be preceded by tremours or twitchings without loss of consciousness, and it may happen that these latter are present without being followed by more decided seizures. If attacks of such motor disturbance, of whatever degree, are noticed from time to time in the same part, or persist in it, the symptom is a very suspicious one. Convulsions are said to be more common when the growth is situated in the posterior lobes of the brain, and to be less frequent when the anterior lobes are affected. If the seizures are epileptiform in character, the tumour is probably in or near the cortical substance of the cerebrum.

The convulsions may be followed by temporary paralysis in the affected muscles, and in some cases a permanent paralysis may be observed. This more commonly affects muscles supplied by cerebral nerves than is the case in other diseases of the brain. The external rectus may be affected (sixth nerve), producing convergent squint; there may be ptosis, dilatation of pupil, and external strabismus from paralysis of the third nerve; the facial muscles may be paralysed; and there may be impairment of deglutition or articulation. Sometimes hemiplegia is produced. The cerebral nerves are affected on the same side as the growth: the spinal nerves on the opposite side. If, however, there be several tumours present in the brain, nerves of both sides may be involved, and we may find hemiplegia combined with variously distributed paralyses on both sides of the face. Generally the paralysis is developed slowly, and is preceded by pain in the muscles about to be affected. When it occurs suddenly after a convulsive seizure, the case is often mistaken for one of cerebral hæmorrhage. Contractions often occur in the paralysed muscles, and may follow the paralysis very rapidly.

There is usually loss of special sense. Deafness may occur, and impairment of vision is a frequent symptom. Amaurosis is said to be most common when the growth occupies the anterior lobes; in which case the straight sinus is compressed and the escape of blood obstructed from the veins of the eye. Impairment of vision is not, however, confined to these cases. It is often seen when the tumour is seated in the posterior lobes or in the cerebellum. The disturbance of sight is then attributed to compression of the vena magna Galeni; and the interference with the circulation induces at the same time a copious effusion into the lateral ventricles.

Ophthalmoscopic examination of the eye almost always shows important changes which affect the retina of both eyes. We find that the disk

is swollen and blurred at the margins, with tortuosity of the central vein. If the child live long enough the optic nerve may atrophy.

Unless chronic meningitis become developed, or there are numerous tumours in the cerebral substance of both hemispheres, intelligence is but little affected. Still the child generally shows some change in character. He is fretful and perverse, or morose in temper, and gives much trouble in the nursery and school-room.

In slowly growing tumours the development of the symptoms is very gradual. These are the cases which are comparatively easy to recognise. We find a history of headache, of tremors, or convulsive attacks, followed at a longer or shorter interval by paralysis more or less complete, involving often special senses, and implicating the cerebral nerves as well as those of the spine.

A good illustration of the symptoms is seen in the following case :

A little boy, aged five years and a half, who had had a slight convergent squint since the age of two years, but had otherwise enjoyed perfect health, began to suffer in the month of June from peculiar symptoms of illness. A short time previously he had had a severe fall upon his head. The accident shook him for a time, but its effects appeared to pass off completely. Early in June, however, the boy began to complain of headache, which came on in severe paroxysms, so that he cried out with the pain. Almost at the same time his limbs began to get weak. His arms trembled when he took anything up in his hands, and he tottered as he walked. Very soon afterwards his sight began to fail, and he used to vomit, especially at night ; but his other senses seemed perfect, and his intelligence was unimpaired. After a time the severity of the headache diminished, but the other symptoms were intensified, so that by November, when he was admitted into the East London Children's Hospital, he was almost blind and had quite lost the power of walking.

On admission (November 16th) the muscles were well nourished and seemed firm, but any voluntary movement excited a kind of spasm, during which both arms were drawn up, seemed to get rigid, and were agitated by a peculiar trembling which lasted for one or two minutes. The legs also appeared very weak. When placed upon his feet he could not stand without support, and when he tried to do so a tremor was noticed in the legs like that which affected the arms. There was no paralysis of the face, and the tongue was protruded in the middle line. He had only partial control over his sphincters, for when he felt the desire to evacuate the bowels or the bladder, he usually passed his water or motions in the bed before there was time for any one to come to his assistance. He was quite blind, and an ophthalmoscopic examination showed the presence of optic neuritis. His other senses were perfect, and his intelligence was quite equal to that of other children of his age. His temperature at 9 A.M. was 102° ; pulse, 138.

For some days after admission the boy continued in much the same state. The temperature remained between 100° and 101°, rather higher at night than in the morning. The tremors persisted, and the weakness became more and more marked. In about ten days, however, some rigidity of the left arm was noted. The elbow became slightly stiff, and he kept his left hand tightly clenched over the inverted thumb. He used only the right hand voluntarily, although if made to hold anything in the left he could do so.

On November 28th control over the sphincters was quite lost, and he passed his water in the bed. The bowels were usually costive. There was

rigidity and tremor of both arms, the head was retracted, and the back was kept rigidly extended. Still, intelligence remained unimpaired. Sometimes the boy answered questions in a sleepy tone, but he perfectly understood all that was said to him. He made no complaints. Temperature at 9 A.M., 104.6° ; pulse, 144. At 6 P.M., temperature, 104.4° ; pulse, 148.

On November 29th he became very drowsy and would answer no questions. Both arms were rigid and flexed, with the thumbs twisted inwards. The legs also had become stiff and the toes extended. The back was rigid with inclination to opisthotonus. He could swallow, but apparently with difficulty. The respiration was jerking, and appeared to be chiefly diaphragmatic. The abdomen was rather retracted. The eyeballs twitched. The child was alternately flushed and pale, with profuse perspiration. He had several convulsive attacks during which the left corner of his mouth was drawn up. Temperature at 9 A.M., 108°. The boy had no more fits after 2 P.M., but lay unconscious with his eyes fixed and turned to the right. There was oscillation of the eyeballs, and the pupils were dilated and immovable. He winked when the right eye was touched, but the left conjunctiva was insensible. The joints were rigid and flexed. The belly was retracted. The pulse was excessively rapid and very irregular in force and rhythm. Respiration 36, with occasional deep sighs. The child died the same night in convulsions. The temperature shortly before death was 108.8°.

On examination of the body the brain weighed fifty ounces. The convolutions were flattened, especially over the right hemisphere. On removing a thin layer of brain-substance at the posterior part of this hemisphere a large cavity was found of between two and three inches in diameter. This was empty and was lined by a species of false membrane. The brain-substance composing its roof seemed rather firmer than natural, and was from one-sixth to one-fourth of an inch in thickness. The floor of the cavity was formed by a firm lobulated tumour as large as a good-sized orange. This reached to the base of the skull, where it was firmly attached to the dura mater. It lay external to the pons, occupying the posterior part of the middle lobe and the adjacent part of the posterior lobe. Its boundaries were not distinctly defined, for it passed insensibly into the cerebral substance around. On section the mass showed a uniform surface of a yellowish-white colour. It was generally very firm to the touch, but spots were found here and there where the substance was softer, as if from fatty degeneration. Some of these softened spots had become hollowed out into cavities of about the size of a marble, with irregular walls. On microscopical examination the tumour was found to consist of small round cells, with many spindle-shaped cells and a fibrous matrix. There were also many fat globules. The lateral ventricles contained about eight ounces of fluid. The crura cerebri were softened, flattened, and rather twisted. The corpora quadrigemina also softened. Optic nerves small and soft. There was no appearance of recent meningitis.

This case illustrates fairly well the course of the disease. The severe paroxysms of headache with which the illness began, the vomiting, the affection of sight, the gradually increasing paralysis, and the muscular contractions and spasms which succeeded, together with the chronic progress of the case, all pointed to compression of the cerebral substance. It is probable that the effusion into the ventricles was a late symptom, only occurring when the retraction of the head and dorsal rigidity became marked. The accumulation of fluid compressed the cerebral substance, and was a cause of the drowsiness and stupor which marked the last hours of the

boy's illness. The complete clearness of mind which continued until a late period in the course of the disease is worthy of note in the case of so large a growth. A curious point in the case is the continuous elevation of temperature; for pyrexia is not a usual symptom in gliomatous tumours of the brain until quite the close of the illness, unless the growth be complicated with meningitis, and in this case no recent signs of inflammation could be discovered. On account of this pyrexia the tumour was thought to be a tubercular one, although no evidence of tubercle could be obtained during life by examination of the other organs of the body.

In the case of children it is exceptional to find any other variety of tumour than the tubercular form. This, in the majority of cases, becomes sooner or later complicated with tubercular meningitis, the symptoms of which will then mix with and obscure the more special phenomena connected with the cerebral growth. Anomalous cases of tubercular meningitis are often, as Dr. Hennis Green pointed out in his admirable paper, instances of this combination.

A little girl, twelve months old, was noticed towards the beginning of March to squint outwards with the left eye, and shortly afterwards the eyelid of that side began to droop. Much about the same time she suffered from sickness, and was restless and agitated, often screaming out as if in pain. The face used to flush, often on one side only. She took her bottle well. The bowels were confined. At the beginning of April the restlessness from which she had suffered increased, and she cried greatly, rolling her head from side to side on the pillow. She then had a fit in which both arms and legs were rigid and convulsed; her head was retracted and her back arched. After this she did not completely recover consciousness, and, either from dulness of intelligence or from impaired vision, ceased to recognise her mother. She still, however, took her bottle well when the teat was put into her mouth.

When seen, on April 23d, the child lay in her cot apparently unconscious. The head was retracted and the back rigid; the arms were stiff and semiflexed, with the thumbs inverted; the big toes on each side were rigid and extended; but while the left lower limb lay stiff and straight the right was slightly flexed, and the leg from the knee downwards was in constant movement, alternately flexed and extended. There was ptosis of the left eye, but no squint. The pupils were unequal and insensible to light, the left the more dilated. The breathing was irregular, with sighs and pauses. Temperature at 6 P.M., 99°. The child took her bottle well, but lay as if unconscious, although the pupils contracted when the conjunctivæ were touched. After this the rigidity continued with occasional remissions, and an external squint became again developed in the left eye. The temperature varied between 99° and 100.5°.

At the beginning of May the patient began to cough, and a pneumonic consolidation was discovered in the right lung. After this she became rapidly worse; the coma became deeper; the temperature rose to 103°; and she died on May 11th.

On examination of the body there was found a consolidation breaking down in the right lung with many gray granulations. The convolutions of the brain were flattened and congested. Its substance was excessively soft, so that the brain did not preserve its shape when removed. The lateral ventricles contained eight ounces of clear fluid. Attached to the under surface of the left crus cerebri was a nodulated tumour of the size of a walnut, feeling soft to the touch like a bag of pus. It was irregular on the surface, and was attached to the crus by a slender stalk of soft, yellow

cheesy matter, and covered with pia mater. No gray granulations could be detected about the membranes, but the dura mater was reddened and thickened.

In this case the occurrence of signs of paralysis of the left third nerve (ptosis and external strabismus), accompanied by headache and vomiting, pointed to localised pressure, such as that of a growth; and as this nerve and no other was affected at the first, the position of the growth in or upon the left crus cerebri (which is pierced by the oculo-motor nerve) could be positively indicated. The other symptoms—convulsions, rigidity, and stupor—which followed after an interval are such as are common in cases of cerebral tubercle, and almost invariably attend the close of the illness. In fact, such symptoms, preceded during several months by headache, vomiting, and paralysis of a cerebral nerve on one side, are very characteristic of tubercle of the brain. The disease might, indeed, be often divided into two stages—an early chronic stage, in which headache, vomiting, optic neuritis, tremors and convulsive movements, and more or less marked muscular weakness succeed one another irregularly and at various intervals of time, and into an acute second stage, in which convulsions, paralysis, rigidity of limbs, retraction of head, and stupor usher in the end of the illness. We must not, however, always expect to meet with a division of the disease into two well-defined stages. Sometimes the earlier course of the malady is accompanied by few symptoms, and these, on account of the tender age of the child and the character of the symptoms themselves, may have little importance attached to them.

Thus a little girl, aged six months, had vomited more or less since birth, and was said to moan frequently and "fret" as if in pain. She had wasted considerably but had never had convulsions. The family history was a healthy one.

In so young a child vomiting, pain, and restlessness, combined with loss of flesh, are familiar symptoms, and do not point in any way to intracranial disease. But on examining the baby carefully it was noticed that when the child cried the mouth was drawn up to the left side, and that the left eyebrow contracted better than the right. When the face was at rest the right eye was more open than the left, and the nasal line skirting the angle of the mouth was less deep on the right side of the face. The pupils were equal and there was no squint.

In a few days other symptoms began to be observed. The head became retracted, there were tremulous movements in the right arm, the child seemed heavy and stupid, and often appeared to be quite unconscious. Rigidity of the limbs then came on, the drowsiness deepened into coma, and the child died. After death patches of meningitis were found at the base of the brain. A small cheesy mass, the size of a cherry-stone, was imbedded in the substance of the pons—the left posterior half—and a second, pedunculated, growth of the size of a marble was attached to the upper part of the medulla oblongata and lay underneath the right crus cerebri. There was a considerable amount of fluid in the ventricles, and a mass of caseous glands in various stages of softening lay about the roots of the lungs.

Sometimes the disease begins with extensive paralysis. This was the case with a little girl, aged four years, in whom the first symptoms noticed were left hemiplegia and vomiting four or five months before her death. In other cases the onset of the illness may be indicated by a muscular tremor or a convulsive attack. In the majority of instances, however, severe headache precedes the other symptoms.

On account of the frequency with which tubercle occupies the cerebellum in children it is important to be aware of the phenomena which usually accompany a growth situated in this region of the brain. The characteristic group of symptoms consists of vomiting, occipital headache, amaurosis, and a staggering gait.

The vomiting is especially obstinate. It is a frequent accompaniment of all cerebral tumours, but when combined with occipital pain is very suggestive of a cerebellar growth. The headache is the consequence of pressure upon and stretching of the tentorium. It affects the occiput especially, and may radiate to the back of the neck. If, as sometimes happens, it is accompanied by rigidity of the muscles of the nucha, we find a curious resemblance to cervical caries which may be a source of perplexity. Amaurosis from optic neuritis is a common symptom of this as well as of all other forms of intracranial tumours, but growths in the cerebellum are especially apt to press upon the venous channels in the neighbourhood and impede the escape of blood from the retina. Staggering gait is the most characteristic symptom of cerebellar tumour, and when combined with the preceding is sufficient to establish a diagnosis. Dr. Bastian compares the walk of such patients to that of one who paces the deck in a rough sea. In the case of a child it looks as if the patient were only now learning to walk, and if combined, as it often is, with a certain stiff way of carrying the head, the effect in the elder children is very curious. After a time the weakness extends to the limbs, which then become unable to support the trunk. Tonic contractions, too, may affect the muscles of the back and limbs as well as those of the nucha, and are sometimes very severe. Tonic rigidity is much more common than clonic convulsions when the tumour affects this region of the brain. Dr. Stephen Mackenzie lays it down as a general rule that "tonic contraction is a product of cerebellar, clonic of cerebral disease." These contractions, like the paresis, affect the muscles of the trunk before those of the limbs.

The pons and medulla oblongata are also frequently visited by tuberculous formations. In the former situation the growth may produce neuralgia, anæsthesia, or paralysis of the fifth nerve, difficulty of deglutition, and disturbance of the function of the bladder. If the growth occupy the anterior lateral half, the third and fourth nerves may be paralysed. If it lie in the posterior lateral half, there may be paralysis of the fifth and facial nerves, and in either case there may be hemiplegia of the opposite half of the body.

In the medulla oblongata the growth may produce wide-spread mischief. Extensive paralysis is common ; there may be difficulty of deglutition and articulation and incontinence or retention of urine from paralysis of the bladder. Convulsions are common in these cases.

Tuberculous tumours, when they occur in infants, are almost invariably a part of a general formation of tubercle in the body. They are very apt to be complicated with catarrhal pneumonia excited by the presence of the gray granulation in the lungs, and in a large proportion of these cases, as has been said, the illness closes with all the signs of the third stage of tubercular meningitis. In older children the formation of tubercle may not be general. Still, we often find evidence of scrofulous consolidation of lung, or caseous bronchial glands, and in such cases the cerebral mass might, perhaps, be more strictly described as scrofulous cheesy matter than true tubercle. In exceptional cases no other sign of disease is to be found in any part of the body.

Diagnosis.—The existence of a tumour of the brain can only be ascer-

tained by careful attention to the course of the illness and the characteristic grouping of symptoms to which it gives rise. If the combination of headache, vomiting, and double optic neuritis be discovered, it is highly probable that a cerebral growth is present; but in infants, although the existence of headache and vomiting is easy to ascertain, an ophthalmoscopic examination of the eyes is often a far from easy matter, and even the question of impairment of sight may be a difficult one to decide. It is probable that many instances of supposed dulness of mind at this early age are really instances not of imbecility, but of blindness. The child ceases to recognise familiar faces because he has ceased to see them. In such cases the test of a bright light passed before the eyes is a very valuable one; for if the eyes follow the light the infant is evidently not unconscious, and the retina is usually still capable of appreciating a luminous jet, although its sensitiveness to ordinary objects is impaired. If then, in an infant who is subject to headache and vomiting, we can ascertain in addition that the sight has failed, we have gone far to establish the existence of tumour. If now a local paralysis arise, or tremors or convulsive spasms are noted in special muscles, we may feel satisfied that our diagnosis is a correct one.

If a young child is seen first towards the close of the disease when the symptoms have become complicated with those of basilar meningitis, we must inquire carefully as to the previous course of the illness and the progression of the symptoms. If we find a history of chronic disease in which headache, sickness, and local paralysis, such as squinting, ptosis, or distortion of the face, have occurred some months previously; if any loss of power observed has been persistent; and especially if we can discover that the child is the subject of optic neuritis, or that his sight has been failing, we may give a positive opinion that a tumour is present in the brain. Even the anomalous course of a tubercular meningitis is suspicious of a cerebral growth, and the sudden appearance of symptoms characteristic of the third stage of this disease (convulsions, stupor, squinting, unequal pupils, paralysis, or rigidity of joints), preceded by signs of chronic nervous disturbance, are very suggestive of tubercle of the brain.

In older children the combination of headache, vomiting, and optic neuritis is very significant if Bright's disease can be excluded. Severe headache alone is of no value, for migraine is a not uncommon complaint in young persons. The disease does not, however, always begin with pain in the head. When this symptom is absent, tremors or muscular spasms occurring repeatedly in the same limb or the same region of the body are suspicious. If after a time they become more severe and general, and are complicated with other signs of nervous disturbance, such as paralysis, especially of a cerebral nerve, and impairment of sight, the disease is in all probability tumour of the brain.

The actual position of the new formation can seldom be more than suspected. In the case of a cerebellar growth, the symptoms to which this gives rise have been already described. When the tumour occupies the base of the brain, paralysis of some special cerebral nerves may reveal the seat of pressure. In other parts of the brain the symptoms are so often contradictory, and are so liable to be altered and confused by disturbing causes, that the situation of the tumour can seldom be predicted with anything approaching to certainty.

If epileptiform attacks form part of the symptoms, these are distinguished from genuine epilepsy by remarking that between the attacks the patient is not well, but still continues to exhibit signs of cerebral irritation.

With regard to the nature of the growth : A tumour of the brain is in childhood so generally tubercular that we may conclude it to be so unless there be signs to make us suspect the contrary. If, however, the child be well nourished and of sturdy build, if there be no history of phthisis in the family, and if the other organs appear to be healthy, we should hesitate to class the growth as a tubercular one. Children with tubercle of the brain are not necessarily wasted, nor have they always a tubercular or phthisical history ; but they are usually pale and flabby, and generally show in their physical conformation signs of diathetic influence. No argument can be founded upon the age of the child, for although the disease is said to be rare under the age of two years, I cannot agree with this statement. Indeed, in the preceding pages I have referred to two cases—one a little girl of twelve months and another aged six months, both patients of my own in the East London Children's Hospital—in each of whom tubercular masses were found after death connected with the brain.

Prognosis.—The disease is so fatal a one that when we are satisfied of the existence of a tumour of the brain, we can have little expectation of the child's recovery. In very rare cases shrinking and calcification of a tuberculous tumour have been known to occur ; but if the growth has produced symptoms of pressure and irritation, little hope can be entertained of a favourable ending to the illness. Even in cases where the symptoms, although distinct, are of a mild character, we must not allow ourselves to anticipate necessarily a lengthened course to the disease, for however chronic may have been the earlier symptoms, the disease may at any time take on a more acute course and run rapidly to a close.

Treatment.—In the treatment of these cases we must attend to the constitutional condition of the child and correct any derangement which may be present to interfere with the nutritive processes. We must remedy any digestive disturbance and regulate the bowels. By improving the general health of the patient we may perhaps help to arrest the extension of the mass, and may possibly promote the calcification of the tumour. The child should live, if possible, in a dry bracing air ; should be warmly clothed, judiciously fed, properly exercised, and be treated generally according to the rules laid down for the management of the scrofulous diathesis. Cod-liver oil and iodide of iron are useful aids to this treatment. If any history of syphilis can be obtained, mercurial treatment must be adopted without loss of time, and a long course of perchloride of mercury should be entered upon. Distressing symptoms must be treated as they arise. Vomiting can be often allayed by keeping the child perfectly quiet in a recumbent position, and by applying an ice-bag to the head. Cold applications will also relieve the headache when this becomes severe, and a good aperient of calomel and jalap is useful. If necessary, morphia can be given with the same object.

CHAPTER XII.

CHRONIC HYDROCEPHALUS.

Hydrocephalus is a name given to serous effusions into the cavity of the skull, wherever situated. The effusion may be acute or chronic. Acute hydrocephalus is generally the consequence of tubercular inflammation of the meninges of the brain, and the name is practically synonymous with tubercular meningitis—a disease which is discussed in a separate chapter. It is not, however, very uncommon in cases of death from severe and protracted convulsions, occurring without discoverable organic lesion of the nervous centres, to find collections of serosity in the cerebral ventricles and at the base of the brain. This effusion is accompanied by turgescence of the veins of the pia mater—itself probably a consequence of the convulsive seizures—and may be looked upon as a result of the venous congestion. This may be considered an instance of the non-tubercular form of acute hydrocephalus. Such a case is narrated in the chapter on "Convulsions."

Chronic hydrocephalus is called either internal or external, according to the situation of the fluid. In the internal form the fluid is contained in the cerebral ventricles ; in the external variety it collects in the arachnoid cavity. The disease may be congenital, or may be developed at some period after birth. Hence there are two chief divisions of chronic hydrocephalus into the congenital and acquired variety. The congenital form is usually an internal hydrocephalus, for the fluid is for the most part in the ventricles. In the acquired variety it may be either internal or external, or the fluid may collect in both situations.

Causation.—It is difficult to say what may be the causes of congenital hydrocephalus, although these are probably more than merely temporary agencies ; for a woman who has once given birth to a hydrocephalic infant may do so again in future pregnancies. The tendency appears to be often hereditary, and it has been attributed with a doubtful amount of probability to drunkenness and other constitutional vices on the part of the parents. According to Dr. B. Rennert, of Frankfort, the children of workers in lead who have themselves suffered from chronic lead-poisoning are very apt to develope chronic hydrocephalus. Sometimes it is associated with malformation of the brain, for if there is congenital atrophy of any part of the organ fluid is thrown out to fill up the resulting space. This has been called "hydrocephalus a vacuo." Rokitansky attributes the large majority of cases of the congenital form of the malady to inflammation of the arachnoid lining of the ventricles occurring during fœtal life or attacking the infant shortly after birth.

Acquired hydrocephalus usually occurs before the end of the third year. It may be induced by any cause which interferes with the cerebral circulation, such as tumours pressing upon the venæ Galeni or straight sinus, and so impeding the escape of blood from the ventricles. Serious

pressure upon the veins of the neck by enlarged glands may produce the same result. So also the intracranial effusion may be a part of general dropsy dependent upon disease of the heart.

Another group of causes are those which modify the quality of the blood. Thus it may occur as a consequence of anæmia, rickets, and other diseases which are accompanied by impoverishment of the blood, and as a sequel of exhausting acute illness. In Bright's disease hydrocephalus may be a part of the general dropsy induced by the state of the kidney. The fluid in acquired hydrocephalus is usually in the ventricles. In the rare cases where it is found external to the brain it is sometimes a consequence of meningeal hæmorrhage. In the chapter on this subject it was stated that an arachnoid clot becomes after a time, if the child survive, converted into a cyst by the adhesion of the edges of the layer of fibrine—left after absorption of the colouring matter of the blood—to the serous membrane. This false membrane, according to Legendre, Rilliet, and others, is formed, as above described, directly out of the blood-clot. Virchow, on the contrary, is of opinion that it results from an inflammation of the internal surface of the dura mater, and that the exuded lymph arising from this process becomes vascularised and forms a pseudo-serous membrane which is the wall of the cyst.

The cyst may be simple or loculated, and its contents consist of reddish serum with small clots and flocculent matters. Often the cyst is double, each half corresponding to one of the hemispheres of the brain. Its walls become thin and transparent, and have a serous appearance. Usually arborescent vessels may be seen to ramify on the surface. The fluid contents become increased in quantity after a time, and may vary from a few spoonfuls to half a pint or more.

Morbid Anatomy.—When the hydrocephalus is congenital and the fluid accumulates in the ventricles of the brain, it tends to press outwards the walls of those chambers. As a consequence the brain-substance is thinned; the convolutions are flattened, and, as the pressure is equal in all directions, the corpora striata and optic thalami are flattened, separated, and pressed aside; the septum lucidum is softened, stretched, and often torn; the ventricles communicate freely through the dilated foramen of Monro, and the corpora quadrigemina, the cerebellum, and the pons are flattened and compressed. The membrane lining the ventricles is often found thickened and softened, and may be roughened or even distinctly granular. In some cases the foramen of Majendie is closed. If the effusion is large the walls of the skull also feel the effects of pressure. The head becomes distended; the frontal bone is pushed forwards; the roofs of the orbits are depressed so as to flatten the sockets of the eyeballs, and the occipital bone and the squamous portion of the temporal bone are made almost horizontal. The sutures are widened and the enlarged fontanelles communicate by the sagittal suture. The shape of the head is often not quite symmetrical, neither is it globular. The curve is much greater at the sides, and the skull is rather flattened at the vertex. Ossification in the cranial bones is delayed, and is said to be often aided by the conjunction of small islets of bone formed in the membranous interspaces. At a later stage the bones become very thick and the skull is remarkably spherical in shape.

If no great quantity of fluid is present the size of the head is not increased, but this is comparatively seldom the case; usually the skull is distended as described. The fluid is clear or slightly turbid, and varies in quantity from a few ounces to several pounds. It is of higher specific

gravity than the cerebro-spinal fluid; is alkaline in reaction, and contains a very feeble proportion of albumen, besides chloride of sodium and urea.

Various abnormalities of the cerebrum may be present from arrests of development, and sometimes traces of old disease can be discovered, such as patches of sclerosis resulting from past hæmorrhage or inflammation. The cerebral substance generally may be of normal consistence, or anæmic, or œdematous. Congenital hydrocephalus is often combined with other arrests of development, such as cardiac malformations, spina bifida, hare-lip, etc.

In acquired hydrocephalus the changes above described stop short of the extreme degree often reached when the disease is congenital. The ventricles are still dilated, but to a less extent. They contain several ounces of fluid (six, eight, ten, or twelve), usually limpid and clear. The ependyma of the ventricles is thickened and often dotted over with fine nodules, especially upon the optic thalami, the fornix, and the stria cornea. The choroid plexus is congested, and the brain-substance may be denser or tougher than natural.

If the fluid is in the arachnoid space it is spread more or less over the surface of the brain. The brain is often œdematous, and its consistence is reduced. In extreme cases it may be converted into a white pulp (hydrocephalic softening).

Symptoms.—Many cases of congenital hydrocephalus which reach the full period of gestation die during delivery or shortly afterwards. Others survive for a variable period, but they die in the majority of cases before the end of the second year. In rarer instances the patient may live for five or ten years, or longer, and it is said may even reach extreme old age.

At birth the size of the head is not always remarkable. The appearance of the new-born infant may be natural, and no cranial enlargement may be observed until after the lapse of some weeks. Most cases of hydrocephalus present both physical and mental peculiarities. The head of the child becomes very large, but his general development is strikingly backward. The increase in size of the skull is gradual and progressive, and in some cases the volume of the head becomes enormous. The peculiar shape of the skull and the strange contrast between the dimensions of the cranium and the little pinched and pointed face beneath it is very striking and characteristic. In a well-marked case the large globular head, greatly expanded at the sides and flattened at the crown, combined with the small face, if represented merely in outline upon paper, would give the impression of a large oriental turban placed upon the head of a child of ordinary size. The skin over the cranium is thin and seems stretched; the veins are full; the hair is scattered and meagre. On placing the hand upon the head the large fontanelles, the widely opened sutures, and the thin, yielding bones convey almost the impression of a tense bag of fluid. Often fluctuation can be detected, and the soft parts may have a slight pulsation, rhythmical with the breathing, falling in during inspiration and dilating again as the breath is expired. The face is thin, the cheeks are often hollow, and the chin is small and pointed. The eyeballs are forced forwards by the flattening of the roofs of their sockets, and at the same time the eyebrows and eyelids are drawn upwards by the tension of the skin. Consequently the eyes look prominent. They appear also to be directed downwards, for there is a rim of white above the cornea from uncovering of the sclerotic, while the lower half of the pupil is covered by the lower eyelid. This large head is necessarily a heavy one, so that the child has a difficulty in supporting it. As the general nutrition

is imperfect, and the muscular development of the patient far below a normal standard, the difficulty is often great. The child may endeavour to support the head with his hand, but often he has to abandon the attempt to keep himself upright, and is forced to rest his head on a pillow or on his mother's lap. The weight of the head is one reason why these children are slow in learning to walk. Another cause is the imperfect state of nutrition of the body generally. Although the child as a rule takes food greedily and appears to digest it, he does not thrive. His head gets bigger and bigger, but the muscles of the trunk and limbs remain feeble, flabby, and thin, and seem to derive no benefit from his copious meals.

The intelligence of hydrocephalic patients varies greatly in different cases. Sometimes it appears to be unaffected, and mental development continues in normal progression. As a rule, however, the child is backward. He is slow to take notice, apathetic, and dull at an age when other infants can be easily amused. The time for walking arrives, but he makes no effort to "feel his feet," and if held upon the ground allows his limbs to double up helplessly underneath his body. When at last he learns to walk his gait is tottering and uncertain. This backwardness in locomotion appears to be partially due in many cases to want of intelligence, but the general muscular weakness and the weight of the head contribute, no doubt, greatly to the deficiency.

It is very difficult to ascertain the degree of keenness of the senses in infants. Hydrocephalic babies are often thought to be deaf, but this is probably due in many cases to want of attention. The sight is often impaired, and—as in many other cerebral diseases of infants—the child may not take notice of faces and objects because he sees them indistinctly. Dr. Clifford Allbutt believes ischæmia papillæ to be the earliest change, but states that soon the disks and retinas become wholly disorganised and the optic nerve is atrophied from pressure. The ophthalmoscope shows the disks atrophied, their outlines blurred or lost, the vessels distorted or closed, and the retina maculated with patches and streaks of a brownish or whitish colour from old hæmorrhages, exudations, and fatty degenerations. Nystagmus is a common symptom in these cases, and there is often a convergent squint.

Nervous symptoms are seldom absent. The patient may be distressed by attacks of laryngismus stridulus, and Dr. West has observed spasmodic dyspnœa. Convulsions are not rare, and sometimes recur at short intervals. So also partial paralyses, contractions, and automatic movements may be features of the disease. There may be also diminished sensibility of the skin, and occasionally the opposite condition—hyperæsthesia—has been noticed. These children appear to suffer from frequent cephalalgia. The pressing of the head into the pillow and the frequent rolling of the head from side to side as the infant lies in his cot are almost invariably symptoms of uneasiness within the skull, and these are seldom absent in hydrocephalic cases. Sometimes the head is retracted.

As an example of an ordinary case of chronic hydrocephalus I may instance a little girl, aged two years and a half, who was admitted under my care into the East London Children's Hospital. The child was of small size except her head, and weighed eighteen pounds six ounces. The head had been noticed to be big from the age of three months, and had been constantly growing larger. The patient had been subject to convulsions ever since birth. She could not stand or support her head. The skull at the level of the bosses of the temporal bones measured twenty-two inches in circumference. The fontanelles were very large and tense, and

the sutures were widely open. There was slight retraction of the head, with some rigidity of the muscles at the back of the neck. The wrists and elbows of both upper extremities were kept constantly flexed, and the thumbs were inverted. There were no actual convulsions, but the child often twitched all over. She was very dull and stupid, but could be made to look round by calling to her. She was not blind ; but there was nystagmus, and squint was often noticed. Her temperature was normal.

The duration of the disease varies. Many patients die during the first year of life, and comparatively few survive to the second. Still death does not always take place so early. Sometimes a sudden arrest occurs in the disease. The head then ceases to enlarge, ossification goes on slowly, and general nutrition improves. In these cases it is often long before bony union is completed in the skull. In the case of Cardinal, recorded by Dr. Bright, who lived with an enormous skull to the age of thirty years, ossification was not completed until two years before the patient died.

In acquired hydrocephalus the symptoms are much the same as those described in the congenital form, so long as the effusion occurs before consolidation of the skull is completed. If, however, it takes place after the fontanelle is closed, the symptoms are obscure, for there are no external signs of distention. The child generally becomes dull and heavy. There is headache, vertigo, and often an apparent difficulty in supporting the head, so that the patient lies about and seems to dislike movement. If made to walk, he totters and steps cautiously. Twitching or convulsive movements may come on, the pupils get sluggish and dilated, and the pulse slow. Then the stupor deepens into coma and the child dies.

In rare cases the symptoms may be relieved by spontaneous evacuation of the fluid. Mr. L. W. Sedgwick has recorded such a case. A little boy, two years of age, two of whose brothers had died of the disease, and who had always himself had a large head, began to be listless and dull. He often complained of headache and wanted to lie down. He slept badly at night and often woke up with a scream. After a time his head was noticed to be growing larger ; the fontanelle became very wide ; the pupils were dilated and sluggish, and there was some insensibility to external impressions. The respirations, too, became slower and the breathing was oppressed. While in this state, the case appearing every day to be more hopeless, a sudden change was noticed for the better. The patient became brighter ; his drowsiness cleared off ; his pupils began again to respond to light ; and he ceased to complain of his head. This improvement coincided with a copious flow of watery fluid from the nose ; and after a large quantity of fluid had thus escaped all the unfavourable symptoms disappeared. Twelve months afterwards they returned, and increased to a degree that seemed to render the child's recovery out of the question; but again they were relieved in a precisely similar manner. A case of the same kind is recorded by Mr. Barron in which a large quantity of watery fluid mixed with blood was discharged from the nose and mouth. In this instance the patient died, and on examination of the skull, a narrow passage was found conducting from the cranium to the nose through the ethmoid bone.

Although the disease may become arrested, and in children who survive the accumulation of fluid always becomes stationary after a time, the usual termination is in death. Such children, with their weakly frames and feeble resisting power, fall easy victims to any intercurrent disease ; and, as a rule, succumb to an attack of bronchitis, pneumonia, or severe intestinal catarrh, even if they do not die from actual interference with cerebral function.

Diagnosis.—Mere enlargement of the head is no proof in itself of the existence of hydrocephalus unless other symptoms of fluid are present. In rickets the head is often large, and sometimes this increase in size is due to actual hypertrophy of the brain. In syphilis it may be also large from extreme thickening of the cranial bones. In both of these cases, however, a certain excess of fluid may be effused, although the quantity may be insufficient to produce any ill effects from pressure. Still, unless actual intra-cranial dropsy be present, we never see the peculiar globular shape of the skull which is met with in chronic hydrocephalus. The characteristic features of this condition have already been sufficiently described.

In cases of acquired hydrocephalus, when the collection of fluid takes place after closure of the fontanelle, diagnosis is very difficult. The condition is usually dependent upon a tumour of the brain compressing the veins of Galen. It may be suspected when symptoms of gradually increasing pressure upon the brain are noticed, and absence of the more special phenomena peculiar to the inflammatory forms of cerebral disease throws us back upon this as the most likely cause of the symptoms. The seat of the fluid effusion is often difficult to ascertain with any precision, but it must be remembered that internal or ventricular hydrocephalus is more common than the external variety. Mr. Prescott Hewitt states that the flattening of the orbital plates, which forces forwards the eyeballs, occurs only in the internal form. If, then, in any case the eyeballs are prominent, and we see the lower half of the pupil covered by the lower eyelid, while a rim of white is seen above the cornea, we may conclude that the dropsy is ventricular.

Prognosis.—So few children, comparatively, survive the second year that the prognosis in intracranial dropsy is always very serious. Congenital cases mostly die, and in no instance can we give a favourable opinion unless evidences of arrest of the disease have become unmistakable. Certainly in no case can we venture to hope for so favourable a termination as a spontaneous evacuation of the fluid. Even if the disease become arrested, the patient remains in most cases with a large unsightly head and a more or less blunted intelligence. Convulsions, twitchings, retraction of the head, and other signs of cerebral irritation are unfavourable symptoms. So, also, are continued wasting and looseness of the bowels. If the patient is weak, any intercurrent disease generally proves fatal.

Treatment.—Cases of chronic hydrocephalus are the despair of the physician. He can do little more than attend to the general health of the child, regulate his bowels, and exercise a judicious supervision over his dietary. As regards arresting the disease, or causing absorption of fluid already accumulated, treatment appears to be of slight value. I have thought that the persevering employment of perchloride of mercury has been of service, for I have found arrest of the disease to occur in one or two instances while the drug was being given, but the same treatment has failed in so many other cases that the more favourable result was in all probability a mere coincidence. I have never seen special benefit derived from diuretics or tonics, blisters, strapping, or artificial evacuation of the fluid. I have several times punctured the fontanelle half an inch to one side of the median line, and after withdrawing a quantity of fluid have strapped up the head tightly with carefully applied strips of adhesive plaster. But although the patient appeared uninjured by the operation the fluid always quickly re-accumulated. If the skull is enlarging rapidly, I believe the strapping treatment to be decidedly injurious.

CHAPTER XIII.

OTITIS AND ITS CONSEQUENCES.

(Purulent Meningitis; Thrombosis of the Cerebral Sinuses; Encephalitis.)

Otitis in the child is a common disease, and may lead to very serious consequences on account of the facility with which inflammation can extend from the tympanic cavity to the interior of the skull. During the first few years of life the mastoid process is in a rudimentary state. In the young child, therefore, the mastoid cells are limited to the horizontal portion which lies behind the tympanic cavity, and above and slightly posterior to the auditory meatus. It is only at a later period that they extend downwards and backwards to form the hollow of the mastoid process. These cells communicate with the tympanum, and share in any catarrhal process of which that cavity may be the seat. The tympanum itself is separated from the interior of the skull by a thin layer of bone, which is often a mere translucent shell. This, according to Toynbee, may even be deficient in places, so that the mucous lining of the tympanum is sometimes here and there in actual contact with the dura mater covering the temporal bone. It is then easy to understand how, without any disorganisation of the bony layer itself, inflammation may extend from the tympanic cavity to the interior of the cranium, and give rise to serious disease of the brain and its membranes.

The inflammation may spread from the ear to the skull-cavity through either the roof of the tympanum or that of the mastoid cells. It may also pass through the upper wall of the external auditory canal, or be conveyed inwards by means of the internal auditory meatus, which is lined by a prolongation of the brain membranes. The petrous bone may or may not participate in the disease. Sometimes it becomes carious. In other cases serious disease of the brain and its membranes may be set up, although the bony layer separating the ear cavities from the interior of the cranium seems in no way affected by the inflammation around it.

Causation.—In childhood there appears to be a special tendency to catarrh of the mucous membrane lining the middle ear. Von Tröltsch has commented upon the frequency with which in young persons this condition is discovered after death, without any symptom of the derangement having been observed during the life of the patient. The tendency is heightened by the scrofulous diathesis, and in the subjects of this constitutional state the catarrh has a special proneness to become a serious suppuration. Diseases which have an influence in provoking the manifestations of the scrofulous cachexia are very apt to be followed by suppurative otitis, as scarlatina, measles, and small-pox. Besides these causes, cold or slight injuries to the ear may set up the same condition, and sometimes the tympanum becomes affected as a consequence of similar disease in parts around. Thus inflammation may spread to the middle ear from

the external auditory meatus or from the pharynx. Dr. Knapp, of New York, states that in the majority of cases the occurrence of suppurative catarrh of the middle ear is due to cold, which affects first the naso-pharyngeal cavity, and then spreads up the Eustachian tube. In 8.78 per cent. of his cases he attributes the immediate cause of the otitis to sea bathing ; in 7.74 per cent. to scarlatina. The extension of the inflammation further inwards to the skull-cavity may be determined by any agency capable of setting up acute inflammation in the ear. Cold is a frequent cause of this disaster, and blows upon the head may produce the same result. It is an occasional complication of dentition (see page 560).

Morbid Anatomy.—When the mucous membrane lining the tympanum becomes acutely inflamed, it is of a deep red colour, and its vessels are full and distended. In the chronic stage the mucous membrane becomes thickened and pours out a copious purulent secretion which usually perforates the tympanic membrane and issues from the external meatus as a yellowish-white discharge. A chronic otitis may continue for months, or even years, without producing much inconvenience. But sometimes the inflammation extends to the bony wall, which becomes carious and softened ; or the inflammation suddenly assumes an acute character. In either case violent symptoms may be all at once noticed from implication of the brain and its membranes. The consequences of spreading of the inflammation to the skull cavity are the occurrence of purulent meningitis, and of encephalitis with abscess of the brain.

In purulent meningitis there may be inflammation and thickening of the dura mater (pachymeningitis), and this membrane may be separated from the petrous bone. Often suppuration takes place between it and the bone ; the membrane is perforated, and pus is effused into the cavity of the arachnoid. If disease of the petrous bone is one of the consequences of the otitis, thrombosis of the cerebral sinuses may occur, and pyæmia may be produced. In all cases where the dura mater is inflamed, phlebitis and thrombosis of the cranial sinuses are frequent consequences. The coagulation of the blood and arrest of the circulation in the venous channels is due to narrowing of the calibre of the sinus either by pressure upon it of inflammatory products or by thickening of its walls owing to inflammatory infiltrations and abscesses. As a rule the lining membrane of the sinus is smooth, but it sometimes becomes roughened and dull-looking. The clot which forms the thrombus is fibrinous, and contains but few red blood corpuscles. It is therefore whitish-yellow in colour, or slightly gelatinous-looking, from the number of white corpuscles. It may lie free in the sinus or form loose adhesions to the walls. These decolourised clots are sometimes very extensive, and may reach from the lateral sinus downwards to the vena cava. If the child live long enough, the thrombus may soften in the centre, and the disintegrated fibrine may present a pus-like appearance to the eye.

The pia mater is almost always affected. Its vessels become dilated and filled with blood ; small patches of ecchymosis are scattered about ; and a yellowish or greenish exudation is poured into the subarachnoid tissue. This exudation may be solid like an ordinary false membrane, but is often distinctly purulent. It varies greatly in amount. The cortex of the brain, as might be expected from the intimate connection which exists between its vessels and those of the investing pia mater, usually shares in the inflammatory condition, and becomes injected and softened.

Encephalitis usually occurs in patches. The vessels are dilated and congested ; there is effusion into the tissue around them which becomes

swollen, red, and soft (acute red softening), and can be washed away by a stream of water. Surrounding the inflamed patch the cerebral tissue is congested and œdematous, and of a yellowish colour. As the process goes on the colour of the diseased spot changes from red to greenish; its substance gets softer and softer, and the central part breaks down into a yellow or green purulent matter. The wall of the abscess thus formed consists of brain-substance more or less softened. The seat of the abscess in cases of otitis is in the adjacent part of the middle or posterior lobe of the cerebrum, or in the cerebellum. As a consequence of the abscess and inflammation of the brain-substance at the spot, there is enlargement of the affected part of the brain, its convolutions are flattened, and its sulci partly obliterated.

To produce these secondary results in the skull cavity it is not necessary that caries of the petrous bone should occur. In many cases the bone itself is found intact, the dura mater even may have the appearance of health, and a layer of healthy-looking cerebral substance may separate the abscess from the surface of the brain.

Symptoms.—Acute otitis may be present without any symptoms indicating the existence of the inflammation. Usually, however, as the purulent secretion accumulates in the cavity of the tympanum, especially if the tympanic membrane shares in the inflammation, there is severe pain in the ear and side of the head, and pressure on or around the ear increases the suffering. In babies earache is a common affliction, and may even be a cause of convulsions. The child cries incessantly with a peculiar shrill scream, and refuses to be comforted. He burrows his head in his pillow, or rests it against his mother's shoulder, often lifts his hand to his head, and refuses the bottle or the breast. If the pain cease or subside for a time, he falls asleep, but usually wakes up again after a short interval screaming loudly, and continues to cry again incessantly as before. After some hours of this agony the tympanic membrane gives way, a discharge of pus issues from the meatus, and the cry at once ceases. Examination of the ear in these cases seldom affords much information, although the passage sometimes looks red and inflamed.

When a chronic otitis exists, there is a more or less copious purulent discharge from the ear, the tympanic membrane is destroyed, and the sense of hearing is blunted. So long as no more pus is formed than can pass readily away, no other ill effects are observed, and the absence of the tympanic membrane usually allows of free escape of the matter exuded. Sometimes, however, an accumulation of pus takes place in the mastoid cells, and ill consequences follow. The chief danger in these cases is the occurrence of a fresh acute attack. The otorrhœa then ceases at once, there is an intense pain in the ear and side of the head, and often meningitis with all its serious consequences ensues. It must be remembered, however, that as otitis may exist without giving rise to symptoms, meningitis occurring as a result of inflammation of the tympanum is not always preceded by otorrhœa. Sometimes the symptoms of meningitis precede the otorrhœa, and sometimes the otitis is latent throughout.

In an ordinary case of extension of the inflammation to the meninges the sequence of symptoms is as follows: A little child of a few years old has a discharge of purulent matter from the ear. This may have followed an attack of severe earache, or may have begun without pain and continued without discomfort, although the hearing on that side has been noticed to be dull. The otorrhœa continues for several months. Occasionally the child is feverish and complains of acute pain in the affected ear and side

of the head. At the same time the discharge from the meatus ceases to flow. After some hours, however, the pain subsides and the running reappears. At length the patient is seized with high fever, and has an attack of violent convulsions. After several repetitions of the fits, in the intervals of which he seems drowsy and stupid, he sinks into a state of coma and dies within the week. This is called the convulsive form—long standing otorrhœa; then, suddenly, fever, convulsions, coma, death. It is the shape the disease takes in babies and children under two years of age.

The fever is high. The temperature rises to between 104° and 105°, and undergoes at first little remission in the mornings. The pulse almost always intermits more or less completely, and very often falls in frequency, sinking to 75 or 80. This, however, is a very variable symptom, and sometimes the pulse remains quick throughout. Pain in the affected side of the head is seldom absent. The youngest children, in the intervals of convulsions, may be noticed to moan and put their hands to their heads. Respirations are quickened and may be perfectly regular, although sometimes we notice sighing respirations, and the breathing towards the end may assume the Cheyne-Stokes type. The pupils are generally contracted at first, and become dilated later. They are often unequal in size. There may be squinting of one or both eyes, and sometimes we note a paralysis of the face on the affected side.

The convulsions are violent, and, for the most part, bilateral. In the intervals consciousness is not completely restored, the child is heavy and stupefied, taking little notice of persons and things around, although his attention can be usually attracted by calling him loudly by name. He is very restless, and often keeps one or more of his limbs in constant movement. Rigidity of the joints may be present, and if there is any accompanying spinal meningitis, the head is firmly retracted on the shoulders with rigidity of the muscles of the nucha. The abdomen is seldom markedly retracted as in tubercular meningitis, and the characteristic doughy feel of the abdominal wall is also usually absent. The child refuses his bottle, and often can scarcely be made to swallow liquid from a spoon. The disease runs its course rapidly. After a day or two the convulsions become less frequent. The child lies plunged in a deep stupor, and after remaining comatose for a variable time, dies without any return of consciousness. Sometimes convulsions immediately precede death.

In certain cases the disease may run an even shorter course, and death take place with startling rapidity.

A little boy, aged twelve months, strong-looking and well nourished, was seized with vomiting at 1 A.M. on February 16th, and continued to vomit at intervals for twelve hours. He then had several fits, and at 3 P.M. was brought to the East London Children's Hospital. He was seen by Mr. Scott Battams, the house surgeon, who noted that all the limbs were convulsed and the pupils were dilated. When the fits ceased the child still continued insensible; there was nystagmus; the pupils were equal and dilated, and acted well with light; the conjunctivæ were insensitive; there was no squint; the cerebral flush was fairly marked; the limbs were flaccid.

At 8 P.M. the child was still insensible. He had had no more fits; pulse, 150, with occasional intermissions; respirations, 40; temperature, 103°; pupils equal, and still acted with light.

All through the night the child remained insensible. There was no vomiting, and the convulsions were not repeated. No twitching was noticed, and the head was not retracted. He died at 8 A.M. Before death the temperature was 104°.

On examination of the brain, the whole convexity was found coated with yellow lymph which had extended to the under surface of the frontal lobes, and had glued the anterior and middle lobes to one another. There was no flattening of the convolutions; no excess of fluid in the ventricles; no exudation in the optic space; and no inflammation of the membranes at the base of the brain. No gray granulations could be seen; the brain was firm, and seemed perfectly healthy; the cerebral sinuses contained semifluid dark blood.

In this case there was slight discharge from the ears, but without offensive smell. It is doubtful if this had any part in producing the meningitis, for the dura mater covering the petrous bones had a healthy appearance. Nothing in the history of the child could be discovered to account for the illness, for although he had had a cough for a fortnight, and had whooped during the last two days, this could not be looked upon as a determining cause of the inflammation. It may be remarked that the symptoms above described resemble exactly those often present in cases of meningeal hæmorrhage in the young child, with the exception that in this case the temperature was elevated. A raised temperature, present in meningitis and absent in hæmorrhage, appears to be the single important symptom by which the two diseases may be distinguished.

Above the age of two years it is usual for the meningitis to assume a different shape. Convulsions are a less prominent symptom; instead we find a more or less violent delirium. Hence Rilliet—to whose labours all descriptions of meningitis in the child are so much indebted—has called it the "phrenitic" form. It is of longer duration than the convulsive variety, and resembles more meningitis as that disease occurs in the adult. The child complains of severe headache, is agitated and restless, and very rapidly becomes delirious. The delirium is noisy. The child raves about the pain in his head. His eyes are red and wild-looking, his pupils contracted and often unequal in size. The pulse is quick and irregular, and may be completely intermittent. His temperature is high, marking 104° or 105°, as in the preceding variety; and his breathing is rapid, although usually regular. After some days the delirium becomes less violent. The child has intervals of quiet in which he appears to be unconscious. He lies with his eyelids half open and his eyes turned upwards, moaning occasionally; the muscles of his face twitch; there is trismus or grinding of teeth; and his head is often retracted upon his shoulders. As the disease progresses the coma becomes more constant, but at first a touch may excite violent delirious struggles, for there seems to be general hyperæsthesia making the slightest pressure painful. The pupils dilate, and are insensible to light; there is often oscillation of the globe of the eye and squinting. The pulse becomes very frequent, and the respirations are of the Cheyne-Stokes type. There may be rigidity of the joints. The coma continues profound, and the patient gradually sinks and dies. Usually there is profuse sweating before death, although the temperature continues high; and the disease may terminate in a fit of convulsions.

Sometimes the temperature falls considerably before death. At other times it rises rapidly to 108°, or even higher. The duration of the phrenitic form of the disease varies; its course may be rapid like that of the convulsive variety, but sometimes it is prolonged to three, four, or more weeks. In these slower cases the illness often assumes a subacute type, with only slight elevations of temperature; but at any time the heat of the body may undergo a sudden and apparently causeless increase.

In many cases inflammation of the dura mater is accompanied by thrombosis of the cerebral sinuses. The symptoms, however, of this condition are masked by those of the accompanying meningitis; and its existence, therefore, can seldom be more than suspected. According to Gerhardt, we may sometimes detect on the affected side comparative emptiness of the jugular vein, which is no longer filled with blood from the obstructed sinus; but this is a symptom the existence of which it must be difficult to ascertain. In ordinary cases the occurrence of shivering, or great variations in the temperature, with signs of metastatic deposits in the lungs (sudden dyspnœa, cough, and perhaps scattered zones of crepitation about the chest or back) would point to the probable occurrence of cerebral phlebitis.

When meningitis occurs as a consequence of other causes than otitis, the symptoms are as described, with the addition, in most cases, of a preliminary stage in which the child complains, if old enough, of headache, gradually increasing in intensity. He is feverish, vomits, is very restless, and his ideas are confused. The course of the disease is therefore rather longer than in the form described above.

Inflammation of the brain (encephalitis) is more frequently than the preceding a consequence of otitis. Indeed, it has been estimated that fully half of the cases of abscess of the brain are due to inflammation originating in the middle or internal ear. The inflammation is limited to certain spots, being usually confined to the cerebrum in the immediate neighbourhood of the petrous bone. Sometimes, however, it is found in children, as it is commonly in the adult, in the cerebellum.

The symptoms are often obscured by meningitis, which may exist at the same time; and there may be thrombosis of the cranial sinuses.

The disease begins with pain in the head, which is indicated in the young child by repeated screaming and frequent movement of the hand to the head. The child seems drowsy, and behaves as if only half awake. He takes food unwillingly or refuses it altogether. The bowels are generally confined, and there is usually vomiting. The temperature seldom rises above 102°. The pulse is generally slow (70 to 80), and the pupils are contracted. The drowsiness soon deepens into stupor, and there is rigidity of the joints, usually limited to one side, with perhaps paresis or paralysis of the limbs. Much depends upon the seat of the abscess, and whether it affects the centres of special sense or interferes with the conduction of motor influences. Thus there may be incomplete hemiplegia from compression of the fibres of the internal capsule; paralysis of the third nerve from pressure on the cerebral peduncle; or paralysis of the facial nerve. The loss of power is almost invariably limited to one side of the body. Convulsions may occur; there are frequent twitchings of the facial muscles, and the child grinds his teeth and makes movements with his mouth as if chewing. The stupor is not constant. At first the child can be roused by being spoken to loudly; and occasionally the mind becomes clearer after a time. The child will often begin again to answer questions, and may even recognise his friends. The respirations are quickened and very irregular; the pulse, after the first few days, increases in rapidity, and often becomes intermittent. In acute cases the stupor soon becomes more profound, and deepens into a coma in which the child dies. Convulsions, if previously present, may cease when the patient becomes comatose, or may return before death. The temperature remains moderately elevated throughout, or falls notably before the fatal termination, or rises to a high level during the last few hours of life.

A rickety little boy, aged two years, was admitted into the East London Children's Hospital with the symptoms of severe pulmonary catarrh. For some months the child had been subject to otorrhœa, but there was no history of earache. He went on well at first; the cough improved and his chest seemed greatly relieved, when, on December 7th, his temperature rose to 102°, and there was a copious discharge of pus from the left ear. The discharge continued through the week, but the child seemed to suffer little inconvenience from the state of his ear. He was lively, took his food with appetite, and his temperature, which for a few days had been high, again sank to 99°.

On December 13th a change was noticed. The child screamed frequently and seemed indifferent to his food. His temperature that evening was only 99°. On the morning of the 14th the temperature was still 99°, but the pulse, which had been always considerably over 100, was found to have fallen to 80. The child was drowsy and could not be thoroughly roused. He lay on his right side with a puffy-looking flushed face, grinding his teeth and making other movements with his jaws. The pupils were equal, slightly contracted, and sluggish; occasionally there was a slight squint. Some rigidity was noticed of the right knee and elbow joints. The child took no notice of questions and refused food. At 6 P.M. the temperature was 100°; pulse, 96; respirations, 34; and in the evening the stupor deepened into coma.

For the next forty-eight hours the child's state continued much the same. He was completely insensible, and squinted outwards with the right eye. During this time his temperature was 101°–101.4°; pulse, 120–130; respiration, 21–48, and very irregular. The abdomen was slightly retracted; the bowels were confined, and he vomited once.

On December 16th the bowels had been moved by aperients, and there was some approach to consciousness. The child resisted the feeding cup, and in the evening seemed to recognise the nurse. He was heard to say "no" repeatedly when offered drink. He could move both his legs. The temperature was 100°–101°.

On December 17th the stupor was even less, although the patient remained very drowsy; he turned his head when called loudly by name, and answered when asked to drink. There was no flushing of the face, nor any redness when pressure was made on the skin. Temperature, 100°–101.6°; pulse, 156; respirations, 38. On the 18th the child had two fits. These were followed by no rigidity of the joints; but the patient lay in a semi-comatose condition, although it was still possible to rouse him by loud calling. From that time he gradually sank, and died on the afternoon of the following day. The temperature shortly before death was 101°. On examination of the body, the petrous part of the temporal bone was found denuded of dura mater at one spot, and the membrane around was much inflamed. An abscess was discovered in the adjacent cerebellum filled with offensive pus, and there was excess of fluid in the lateral ventricles.

The course of encephalitis is usually rapid. It may last only five or six days, or may be prolonged to two or three weeks. Sometimes after a time the acute symptoms disappear, consciousness is recovered, and the child's health may appear to be restored. It is even said that such children may grow up to adult age, the abscess having become encysted and ceasing to be a source of irritation.

Diagnosis.—Otitis should be suspected in all cases where a young child cries incessantly without any symptoms being detected—such as drawing up of the legs, tension of the abdominal wall, unhealthy evacuations, etc.—

to draw attention to the belly. Abdominal pain is intermittent, and the cries cease when the uneasiness subsides. Earache is constant, and until relief is obtained by the discharge of pus from the meatus the child cries with a persistence which is very characteristic.

When purulent meningitis occurs, the onset of violent convulsions, with high fever, following upon sudden cessation of discharge from the ear, are very suspicious ; and when we remark that in the intervals of the fits the child remains drowsy and stupid, refuses food, and takes no notice of accustomed faces ; that he is restless, contracts his brows, and constantly moves his hand to his head, we can speak with some confidence as to the nature of the case. In reflex convulsions the mind is clear between the attacks. Drowsiness or stupor with recurring convulsive movements is very characteristic of a cerebral origin. An alteration in the pulse adds a new and important feature to the case. A pulse of 80 in a young child is a slow pulse. If the child be feverish, the contrast between the bodily heat and the comparative infrequency of the arterial pulsations is still more striking. Therefore if to the preceding symptoms we add a slow and perhaps intermitting pulse, our suspicions are sufficiently confirmed.

Fevers or inflammatory diseases in the young child may begin with the combination of pyrexia and convulsions. In the case of the exanthemata we should find some of the early symptoms of the eruptive fever ; and the convulsive movements themselves are few and not violent. There is little restlessness, and between the attacks the child takes notice and recognises his friends. In the case of malignant scarlatina, beginning with convulsions and delirium, there is little headache, and the eruption appears within twenty-four hours of the first symptoms of the fever.

Pneumonia in the child not unfrequently begins with convulsions, and there is high pyrexia ; but the absence of stupor and of headache, the action of the nares, the greater rapidity of the breathing, and the perverted pulse-respiration ratio would serve to exclude meningitis although a physical examination of the chest might reveal no signs of disease. In the so-called "cerebral pneumonia," where there is delirium and headache, with stupor and high fever, the nature of the disease may be often detected early by an examination of the chest. Sometimes, however, physical signs are slow to appear, and in such a case we must wait before pronouncing an opinion. Usually the head symptoms of cerebral pneumonia are not violent, but assume more the characters of tubercular meningitis than of the simple form of the disease. The distinction between these two varieties of meningitis will be considered elsewhere (see Tubercular Meningitis).

From uræmia and the various forms of cranial disease unaccompanied by pyrexia, the high temperature which is one of the characteristic features of simple meningitis will form a sufficient distinguishing mark.

In the case of encephalitis, drowsiness with convulsions or rigidity of joints, or both, followed by coma and hemiplegia—the symptoms occurring in a child the subject of chronic otorrhœa, or following upon an attack of severe earache,—sufficiently reveal the nature of the disease. When there is no paralysis it is difficult, perhaps impossible, to distinguish inflammation of the substance of the brain from inflammation merely of its membranes, and a certain amount of meningitis usually accompanies the encephalitis.

Thrombosis of the cerebral sinuses can seldom be more than suspected. If the dura mater be inflamed, it is reasonable to suppose that the sinuses at the seat of disease are also implicated. If in a case where the cerebral symptoms have evidently followed upon a long standing otorrhœa we can

detect deficient filling of the jugular vein on the affected side, or can discern signs of pyæmia—rigors, or rapid variations of temperature, with evidence of metastatic deposits in the lungs or other organs—we may conclude that thrombosis in the sinuses has probably occurred.

Prognosis.—Otitis can usually be cured by suitable treatment, and if, while the discharge continues, proper measures be taken to prevent the collection of purulent matter in the tympanic cavity or mastoid cells, there is no reason to apprehend any ill results from the state of the ear.

If extension of the inflammation take place to the skull cavity, the worst consequences may be anticipated. The patient does not, indeed, always die, but the proportion of recoveries is very small. In encephalitis it is common for the stupor to clear away more or less completely for a time, and therefore false hopes should not be raised by the patient's apparent amendment; and the friends should be warned that such signs of improvement are seldom to be trusted.

Treatment.—When otitis occurs, it is important to remove pus early from the interior of the tympanum. This is done by inflating the Eustachian tube by means of Politzer's bag. The operation is easily performed upon children, as it is not necessary that they should swallow. All that is required is to send a forcible blast of air through their closed nostrils. If the purulent contents are not removed by this means the tympanum must be punctured. When a discharge appears from the meatus, the passage should be syringed several times daily with warm water. If any uneasiness appears to be felt in the ear, counter-irritation with tincture of iodine may be employed behind the pinna.

A chronic otorrhœa should be stopped as quickly as possible. Any mild astringent injection may be employed; but care should be taken thoroughly to cleanse out the passage with warm water before using the astringent lotion. In obstinate cases the use, several times daily, of an application composed of sulphate of zinc and borax, ten grains of each, and one drachm of glycerine, to the ounce of water, will often arrest the discharge very quickly. Glycerine of tannin diluted in the proportion of one drachm to the ounce of water, used frequently, is often of service. Sometimes the injection, once daily, of a solution of nitrate of silver (gr. x. to the oz.) will hasten the cure. In cases of long-standing otorrhœa, when the membrane of the tympanum is destroyed, the child should wear small pledglets of cotton wool in the ear, except in very warm weather, as a fresh catarrh is easily excited by cold and damp.

When meningitis occurs, the room should be kept in a half light; free ventilation and perfect quiet should be insisted upon; and the thermometer must be watched that the temperature of the room does not rise above 60°. The feet must be kept warm and the head cool. It is advisable to remove the hair, and keep the shaven scalp constantly covered with an ice-bag. The bowels must be opened freely by aperients, such as calomel and jalap. Opinions differ as to the value of morphia in these cases. Morphia, even if it produces no impression upon the inflammation itself, can scarcely be injurious. Its use has at any rate this advantage, that when the child is kept under its influence the more violent symptoms are moderated, and much pain is saved to the friends by the apparent relief thus extended to the patient's sufferings. Counter-irritation, although often advocated, is of little value; and the old plan of leeching behind the ears has never seemed to me to be followed by any improvement. Our great trust should be placed in the constant application of cold to the head, in perfect quiet, and in free purgation. Encephalitis is to be treated on similar principles.

CHAPTER XIV.

TUBERCULAR MENINGITIS.

A BASIC meningitis induced by tuberculosis of the pia mater is undeniably the commonest form of intra-cranial disease to be met with in the child. The symptoms to which this variety of meningitis gives rise are sufficiently characteristic to merit a separate description; for the seat of the inflammation, the insidious beginning of the illness, and its well-defined course are very different from what we find in simple inflammation of the meninges, and make the affection for all practical purposes a different disease.

Infants and children of all ages are subject to tubercular meningitis. It is little less common in infants than it is in older children; but in the former the disease invariably occurs in the course of an attack of general tuberculosis. It is then called "secondary," for its symptoms, being preceded by others arising from inflammatory affections of various organs also dependent upon the diathetic state, are completely masked in their earlier stages, and only reveal themselves as the more violent phenomena which mark the closing period of the illness. After the age of infancy the disease usually assumes the primary form, for although other organs may be the seat of tubercle, the symptoms first noticed are those arising from the brain, and these retain their prominence throughout the course of the attack.

Causation.—As a form of acute tuberculosis, tubercular meningitis is dependent upon the same predisposing causes as those which give rise to the diathetic condition. It is worthy of remark that in families in which the tubercular diathesis exists, not only the tendency to tubercular formation is handed down, but often, also, a proneness to the particular shape the disease is to assume. This is especially the case with regard to the meningeal form of the malady. It is not uncommon to hear of several children of the same family being carried off by tubercular meningitis; and in doubtful cases the fact that a previous child has fallen a victim to the intra-cranial inflammation becomes an important aid in arriving at a decision.

Although children who become the subjects of this disease are often weakly and delicate-looking, with a marked tubercular family history, this is not always the case. It is not uncommon to see the disease break out in children who are stout and vigorous, and who certainly differ widely in aspect from the delicately formed and frail-looking type which is considered characteristic of the tubercular diathesis. It is possible that infection of the system by softening cheesy matter may induce the disorder in a child free from any constitutional tendency to this form of illness; but in most cases, however unlikely a subject the child may appear to be, careful inquiry will discover evidences of "consumptive" tendency in collateral branches of the family, if not in the direct line from which the child has

descended. The disease is common in all ranks of life; but as poverty (which too often implies reckless indifference to insanitary agencies, or helpless submission to them, even more, perhaps, than actual privation of food) may help to determine the outbreak, the affection is especially common amongst the poor.

Of the exciting causes, possibly any injury or shock to the head, such as blows or exposure, may help to induce the illness. Over-excitement of the mind, whether from study or amusement, may not improbably have the same effect. It has been denied that pressing sensitive children forwards in their learning can act injuriously in this direction. I am, however, strongly of opinion that such heedless expedition is very hurtful to the child, and has often determined the occurrence of the meningeal inflammation in subjects predisposed to tubercle.

Morbid Anatomy.—The starting-point of the disease is the development on the pia mater of numerous gray granulations as a result of the constitutional state. These gray nodules are found especially on that part of the membrane which covers the base of the cerebrum. On the pia mater of the cerebellum and convexity of the brain they are much less numerous, and indeed appear often to be quite absent from these situations. On careful inspection the gray or yellow nodules may be noticed following the course of the vessels, especially of their smaller branches. They chiefly congregate in and about the Sylvian fissure, and may be often seen also in the chiasma of the optic nerve. If very numerous, they may be found sprinkled about like a fine glistening dust in these regions and along the sides of the hemispheres. The larger granules may be as big as a pin's head or even a hempseed. By the microscope the small nodular bodies are observed to lie upon the vessels within the perivascular canals, and to adhere closely to their coats. On the larger branches they form projections on one side of the artery. On the smaller, they may completely embrace the vessel. In either case—and this is an essential particular—they project inwards as well as outwards, so as to narrow the channel of the tube; and they may even perforate the delicate coats and protrude into the interior of the vessel. The granulations are formed by excessive proliferation of nuclei from the epithelial lining of the perivascular canals; and the obstruction to the vascular channels which results from this excessive accumulation causes thrombosis within the small vessels, great impediment to the circulation, severe congestion, and extensive collateral fluxions.

As the meningeal tuberculosis is usually merely a part of a general distribution of "tubercle" over the body, the gray granulation is found also in other organs and serous membranes, and has been noticed by Cohnheim on the vascular tunic of the retina.

The vessels of the pia mater are engorged, and the membrane is cloudy and often adheres closely to the surface of the brain, so that when torn away it brings with it small particles of the cerebral substance. More or less copious yellowish or greenish jelly-like exudation is found in the meshes of the subarachnoid tissue, often running in streaks along the course of the vessels. It is usually confined to the base of the brain.

An almost invariable feature in these cases is the ventricular effusion. This is so constant a phenomenon that it used to be looked upon as constituting the essence of the disease (hence the name of "acute hydrocephalus," by which the affection was formerly distinguished). The quantity is often very considerable. It may distend the ventricles, flatten the convolutions, and even cause rupture of the septum lucidum. In appearance

it is clear, or turbid with suspended flocculent particles, or tinged with blood. The cerebral substance around the ventricles is softened. The softening is attributed by some writers to the effects of mere imbibition and maceration. Others ascribe it to inflammation. Dr. Bastian is inclined to the opinion that it is often the result of degenerative changes set up by the anasarcous condition of the central brain tissue; and that both the ventricular effusion and the softening result from the pressure of the blood in the overloaded veins and capillaries, and in some cases, perhaps, from actual thrombosis in the veins of Galen.

Besides this softening of the central parts of the brain, the cortical substance is inflamed as well as the pia mater which invests it, and sometimes spots of softening with capillary hæmorrhages have been seen in the substance of the corpora striata and the optic thalami. As a rule the brain substance is pale and bloodless, and the greater the ventricular effusion the whiter and softer the cerebral tissue becomes.

The above morbid appearances are singularly constant in cases of tubercular meningitis. The granulations, the exuded lymph, the vascular engorgement, the superficial encephalitis, the ventricular effusion, and the white softening of the ventricular walls are almost invariably to be discovered when death has occurred from this disease. In addition, signs of more or less general tuberculosis are also present. These in infants are usually well marked, and almost all the other organs and serous membranes may be sprinkled over with the gray granulation. In older children, however, the meningitis occurs before nutrition has been appreciably impaired, and is perhaps itself the earliest indication of the diathesis. In such cases the other organs may be healthy, and the granulations scattered over the pia mater may be the only morbid formation to be discovered in the body. Usually, however, signs of the cachexia are perceptible in other organs, and sometimes the granulations are so equally and generally distributed that we cannot but wonder at the little interference the constitutional and local states had exercised upon the general health of the patient.

Symptoms.—The onset of the illness is almost always preceded by a prodromal period of variable duration. This is to be expected in every malady where disease of special organs is dependent upon a general diathetic state. In all forms of tubercular disease it is a rule which is rarely infringed that local symptoms are preceded by phenomena indicating the general disorder of nutrition induced by the constitutional cachexia.

The premonitory symptoms vary in severity, partly according to the age of the child, partly according to the previous state of his health, and partly according to the intensity of the diathetic influence to which he is subject. In young babies, in whom the disease invariably occurs at the end of an attack of general tuberculosis, the head symptoms are preceded by others indicative of the disease from which he has been suffering. In older children, especially in those in whom the diathetic tendency is comparatively feeble, the prodromal period may be short and the symptoms trifling. Therefore in different cases we may find marked variety in the duration and severity of the symptoms which immediately precede the outbreak of the disease.

Two forms of tubercular meningitis, a primary and a secondary form, will be described.

In *primary tubercular meningitis* the prodromal period is often short, and its symptoms, on account of their indefinite character, may excite little attention. The child is thought not to look well, but he makes no complaint for he suffers no pain. He generally becomes thinner and paler,

and his appetite is capricious. The loss of flesh is, however, seldom considerable, and may be only recognised by the use of the weighing scales, for no diminution in bulk may be visible to the eye. He is usually listless and unwilling to exert himself; sits and lies about instead of joining in the sports of his companions, and if urged to take part in their games, objects that he is tired. He is often drowsy, and may be noticed to stop in the middle of some childish employment and fall asleep on the floor of the room. A change in character is frequently noticed; and this is a symptom so common that it should be always inquired for. The change is usually indicated by an increase in his emotional sensibility. If reproved, he shows exaggerated distress; his endearments exhibit an unaccustomed warmth; he readily takes offence, and cries without apparent reason, or sits moody and silent in a corner of the room. A certain sluggishness of mind is also apparent. An ordinarily bright child becomes stupid over his lessons; he seems drowsy and incapable of fixing his mind upon his task. There may be headache, and he may say that the room seems turning round. Sometimes there is confusion of sight. The bowels may be irregular and costive. The temperature during this period is often slightly elevated, and the child looks flushed at night and has hot dry hands. In one case which came under my own notice the evening temperature for the five nights immediately preceding the outbreak was 100.4°, 98.4°, 98°, 99.6°, and 97.6°

The special symptoms of the disease are usually divided into three stages; and when the affection is a primary one this arrangement is justified by clinical observation. There is a stage of invasion, in which the indefinite symptoms of the prodromal period are suddenly broken in upon by the first indications of local mischief; a stage of irritation, in which there is exalted nervous activity; and, finally, a third stage, which is marked by diminution of nervous power and abolition of the functions of life.

The first symptoms of the stage of invasion are in the large majority of cases vomiting and headache, and the bowels which were before costive become obstinately constipated. The vomiting is often repeated and distressing, and occurs without any reference to taking food. It is, indeed, characteristic of a cerebral origin that retching and vomiting occur in the intervals of the meals—towards the end of digestion when the stomach is nearly empty. The heaving is often excited by raising the child up into a sitting position. The matters ejected consist of food and bilious or watery fluid. The headache is generally severe. It is referred to the front or top of the head, and seems to occur in paroxysms so that the patient screams out with pain. The cephalalgia is increased by movement or by a bright light, and is accompanied by dizziness so that the child staggers in his walk. The expression is distressed, and may be irritable or spiteful. The tongue may be clean, but is often thickly furred; the thirst is often great, and appetite is completely lost. The child takes early to his bed, from which he never again rises. The abdomen is of normal fulness to the eye, but its parietes have a peculiar, soft, doughy feel, which is very characteristic, and are easily compressible. Often there is marked loss of elasticity of the skin. The pulse is generally rapid and regular at this time, but may be slow, and sometimes a fall in the rapidity of the pulse is the earliest symptom noticed. Thus, in the child whose case has been referred to, a fall in the pulse from 100 to 74 occurred on the evening preceding the actual outbreak. The temperature is moderately elevated (100° to 101°). The breathing is generally irregular, and may be unequal and sighing from the first. This is a symptom of great

importance. The child takes several quick breaths in rapid succession. Then the respiratory movements cease, and during some seconds the chest is motionless. The patient then heaves a deep sigh and pauses again, or his breathing returns for a few minutes to the natural rhythm. Signs of great irritability of the nervous system are rare at this early period of the illness, although in exceptional cases the disease may be ushered in by a convulsive seizure. Still, there are sufficient indications of nervous agitation. The senses are excessively acute, the pupils are contracted, and light is painful to the eyes; the child is distressed by loud noises; and hyperæsthesia of the skin may be present so that a touch is painful. During this stage the urine is scanty and may contain excess of phosphates.

Of these symptoms the most important are the combination of headache, vomiting, and confined bowels, with irregular breathing. Even if the latter be absent, the occurrence of vomiting and obstinate constipation with headache in a child who for some weeks has shown signs of failing nutrition is always to be regarded with anxiety.

In the second stage—the stage of irritation—the symptoms become more aggravated. The headache increases in severity, and the child often becomes delirious. He lies in his bed with his eyes closed—often squeezed together, and his eyebrows contracted—making chewing movements with his jaws or grinding his teeth loudly. Sometimes he screams out as if in pain. If called, the child usually opens his eyes, but he answers questions unwillingly or stares at the speaker angrily and makes no attempt to reply. Whether from headache or irritability, the eyebrows often have a scowl which gives a peculiarly forbidding expression to the face of the patient.

The pulse generally falls in frequency at this stage and becomes intermittent. It varies in rapidity from 60 to 80, and the finger pressing the artery finds the rhythm of the pulsations interrupted at irregular intervals by the complete omission of one beat. It is important in examining the pulse in these cases to seize an opportunity when the child is lying quietly and has not recently made a movement; for a pulse which is slow and irregular during repose may become quick and regular for a time upon the slightest change of position. The temperature is generally lower by a degree than in the first stage, and may rise no higher than 99°. The respirations continue irregular as before, and often at this time assume the Cheyne-Stokes type. The pupils now become dilated and are often sluggish. Sometimes there is a slight squint, but this is seldom more than a passing deviation. Examination by the ophthalmoscope, if it can be managed, shows a congested state of the retinal vessels and disk, and sometimes small bodies like gray granulations can be seen projecting from the sides of the small retinal arteries. Towards the end of this stage the vomiting usually ceases, but the constipation continues, and the child shows no desire even for liquids. There is often retention of urine, and the motions are passed in the bed after an aperient. The pulse generally quickens again, and the temperature rises. The abdomen usually becomes markedly retracted, but still remains soft, doughy, and compressible. Besides, a singular tendency to flushing of the skin is noticed. The cheeks suddenly become red, then the flush dies away leaving them apparently whiter than before. Slight pressure on the skin, especially of the face, abdomen, and front of the thighs, produces a bright redness—the "cerebral flush" of Trousseau, which remains visible for a considerable time.

The principal symptoms of this stage are the fall in the pulse and temperature, the apathy and drowsiness of the child, the violent headache, the irregularity of breathing, the excavation of the abdomen, the dilatation of

the pupils, and the passing strabismus. The cerebral flush, unless very vivid, is an uncertain symptom, for it is often well marked in cases where there is no reason to suspect tubercular inflammation of the cerebral meninges.

In the third stage the temperature gradually rises again, and towards the end may attain a high elevation. The pulse also increases in rapidity and becomes regular, but the irregularity of breathing continues. The most prominent symptoms of this stage are the increasing coma and the occurrence of convulsions and paralysis. The child, who before could be roused by loud calling, now makes no sign of response, or if for a moment he raises the lids, he closes his eyes again almost immediately. The aspect of the child at this period is often very characteristic; for if, as often happens, the disease have been preceded by few signs of ill-health, and the patient have retained his plumpness, he presents to the uneducated eye the appearance of a healthy child in quiet slumber. His cheeks are brightly flushed, his countenance perfectly placid, his features rounded as in health; but it will be noticed that the eyelids close imperfectly, and that the respirations are very irregular and disturbed by deep sighs and long pauses. On raising the eyelids with the finger the pupils are seen to be widely dilated, they act sluggishly or not at all, and are often unequal in size. There may be nystagmus or a distinct squint.

When the coma becomes complete, the flush usually subsides and the face becomes very pale. The insensibility is not, however, always profound. Often it varies in degree, and the child may seem to wake up for a time and look round with some intelligence in his glance. Still, it is difficult to say whether at these times he is always conscious. In some cases the stupor clears off completely for some hours, and the child may sit up, apparently infinitely improved, and again show some interest in his toys. These cases are very distressing in their effect upon the relatives, who had given up the child as hopeless, but now conclude that all danger has passed. Unfortunately, if the eyes be examined, it will be found that the pupils continue sluggish, dilated, and unequal in size; the squint, if it had been present, still persists, and little hope can be entertained that the improvement will be lasting. After a short interval, to the infinite grief of the friends, the coma returns as profoundly as before, and then continues until the close.

Increase in the coma is usually associated with effusion into the ventricles. If ossification of the cranial bones is still incomplete, the fontanelle, when the effusion occurs, generally becomes elevated and tense. Still, it is important to be aware that a large effusion in the ventricles is quite compatible with a level or even a depressed fontanelle.

Convulsive movements generally come on early in this stage. They are often partial, and may be confined to twitchings on one side of the face or in one arm. Often, however, they are general and more severe. Between the seizures the joints are often stiff, and paralysis is more or less distinctly marked. Squinting of one or both eyes is seldom absent, and there is frequently ptosis, but general paralysis of the face is rarely seen.

Loss of power in the limbs usually assumes the form of hemiplegia. The arm is sometimes affected alone, but the paralysis is said never to be confined to one leg. At the end of this stage, when the coma is complete, the head often becomes retracted upon the shoulders, and the tonic rigidity may affect the whole spine; the joints are stiff; there is more or less complete paralysis of one side; the pupils are dilated and unequal; there is squint of one or both eyes; the eyeballs often oscillate; and tremors and twitchings may be noticed in the muscles of the face and limbs.

Before death the pulse usually becomes very rapid; the constipation is replaced by diarrhœa; aphthæ appear upon the mouth; the retracted abdomen swells out again with gaseous distention; ophthalmia may occur, and the cornea often ulcerates; there is generally profuse sweating, and acute œdema occurs in the lungs. On the last day the temperature may fall to a subnormal level or may rise very high, and sometimes it reaches a surprising elevation. Thus, in a little girl, five years of age, the temperature on the morning before her death was 97.6°; but from that point it rose progressively through the day and night, until at 7.45 A.M. on the following morning, the time at which she died, it was 110°, and two hours after her death had only sunk to 107°.

The average duration of the illness, counting from the first day of vomiting, is twelve days. It may, however, run a shorter course, and sometimes comes to an end on the sixth or seventh day. In other cases it lasts over a longer period, but is seldom prolonged beyond the end of the third week.

The sequence of the phenomena, as given in the preceding description, is that ordinarily met with in cases of the primary form of the disease, but there are occasional variations in the symptoms which it is important to be aware of. Thus, in exceptional cases the illness begins with diarrhœa, and I have known the looseness to persist, with occasional intermissions, throughout the course of the attack, although no ulceration was present in the bowels. Vomiting, also, may be a far from prominent symptom. Sometimes it is quite absent; at other times the child vomits once or twice, and not afterwards. Again, the pulse may be slow from the beginning, or, on the contrary, may be rapid at the onset and never afterwards fall in frequency. Still, as a general rule, repeated observations will usually detect a slow pulse at some period of the illness, even if it only last a few hours. It is always important in ascertaining the state of the pulse to do so at a time when the child is perfectly motionless. The headache, too, varies greatly in severity. It may be excessively severe or comparatively slight. The intolerance of light is also a variable symptom. Sometimes it is extreme. In other cases the child can bear the light without apparent discomfort. Lastly, the temperature is not always high. It may be little raised above the normal level, and in most cases the pyrexia lessens at the beginning of the second stage. Indeed, at this period the reduction in the fever, together with the diminished fretfulness of the patient as he becomes more stupid and drowsy, may excite in the minds of the friends false hopes of improvement. It is generally the case that the fever is higher in the third stage than at an earlier period. If it rise to a high level in this stage it is a sign of approaching death.

In *secondary tubercular meningitis* the earlier symptoms of the special lesion are masked by the more general phenomena indicative of the suffering of the whole system from the tubercular cachexia. This form of the disease is the shape the affection invariably takes in infants, and it is not uncommon in older children. In these cases nutrition is always greatly interfered with. The child is thin, weakly, and miserable-looking. He is more or less feverish, although, unless catarrhal pneumonia be present, the temperature rarely exceeds 101°; has no appetite; often vomits; and appears to be gradually wasting away. Suddenly he is seized with a fit of convulsions. This is followed by partial paralysis which involves some of the cerebral nerves, notably the occulo-motor; dilated, sluggish, and often unequal pupils; rigidity of joints, and stupor. In this state he lingers a few days; the convulsions are repeated; the pulse is small and rapid;

the breathing is irregular; the abdomen is retracted, and the child dies without any return of consciousness. After death the gray granulation is discovered widely distributed throughout the internal organs, and the lungs as well as the cerebral meninges are usually the seat of inflammation.

The convulsions are often very partial in these cases, and may consist merely of tonic spasms affecting one or more limbs, with squint or conjugated deviation of the eyes. Sometimes, also, there are slight clonic spasms or faint tremors, unilateral or limited to one limb. The outbreak of the head symptoms is often preceded by sighing or irregular breathing, flattened abdominal parietes, and slight twitches in the limbs; but the slow intermittent pulse, which is such a valuable sign in the diagnosis of the primary form, is usually absent. Often, before the actual onset nothing at all is noticed to give rise to suspicions of intracranial mischief, although our knowledge that in every case of acute general tuberculosis affecting a very young child such symptoms are likely to occur should lead us to watch for them very narrowly.

In infants the affection, when secondary, almost invariably assumes this form, and death usually follows within a few days of the occurrence of the head symptoms. In older children the course of the secondary form is somewhat longer, and, indeed, the symptoms in some cases may approach nearly to the type observed when the disease is primary. Still, there are in most cases many differences. Delirium alternating with stupor, without convulsions, squinting, or other form of paralysis, may be the only sign that the meninges are affected. Sometimes there is repeated vomiting, with some wandering of mind and intellectual sluggishness, so that the child seems not to understand questions addressed to him, and when told to put out his tongue makes no effort to obey. The disease may even reach its termination without any more positive signs of intracranial lesion being noticed. Indeed, in these cases the variations in the symptoms are infinite; but if the existence of general tuberculosis has been ascertained, we shall be at no loss to explain the meaning of any new symptoms which may arise from the head at this late period of the illness.

Many anomalous cases of secondary tubercular meningitis occur in children suffering from cerebral tubercle. This is a chronic disease which continues often for months, and is accompanied by more or less severe symptoms pointing to the brain. Fever is usually present, and sickness and headache, which are characteristic symptoms at the onset of the meningitis, are also common in the brain tumour. Consequently the recurrence of these familiar phenomena is often attributed to the growth, and is seldom interpreted as indicating a new phase of the illness. In such cases the early period of the meningitis passes unnoticed, and the complication is seldom recognised before the more violent symptoms which are characteristic of its third stage are actually present.

Diagnosis.—It is not always easy at the beginning of an attack of tubercular meningitis to speak positively as to the nature of the illness. The first symptoms are often mild and apparently trifling, and if, misapprehending their importance, we make light of what eventually proves to be a fatal disease, the mistake is one which will be certainly remembered to our disadvantage.[1] Vomiting and constipation, especially if conjoined with

[1] It is well in all cases, even of apparently trifling febrile derangement occurring in children of known tubercular tendencies, to warn the parents that although the case appears to be at present one of trifling importance, even such casual disturbances are found occasionally to arouse the dormant tendency to mischief and to be followed by very serious consequences.

headache, form a very suspicious combination, and if these occur in a delicate child or succeed to a period, however short, of general failure of health, we should view them with serious apprehension. If our suspicions are well founded, symptoms soon appear to give them confirmation. The pulse becomes slow and intermittent, the breathing is irregular, the child gets stupid and drowsy, the pupils dilate and are sluggish, and there may be a slight squint. When this stage of the disease is reached, there is little room for hesitation. It is principally in cases where the illness varies from the normal type that the beginning of the disease gives rise to uncertainty. Vomiting may be absent. Instead of constipation there may be looseness of the bowels. But still, if the child is feverish, complains of headache, and has a pinched, distressed expression—if with even trifling symptoms he looks really ill, we should never speak slightingly of his condition.

Tubercular meningitis almost invariably begins insidiously, and the symptoms have a regular progression. It is seldom ushered in by a convulsive fit, and if such a seizure occur at the beginning, it is rarely repeated. Slighter signs of nervous disturbance may, however, be generally discovered by careful observation and inquiry. The child will be found to have lately changed in character. From an even-tempered placable boy, he has become suddenly irritable and spiteful ; if naturally headstrong and independent, he turns strangely timid and affectionate, and is moved to tears by a kind word. Often he grows curiously silent and unwilling to play or even to speak. Again, he may be noticed to frown often and avoid the light. He flushes frequently, sighs deeply, and complains of headache and giddiness. All these small details assume great value if combined with feverishness, vomiting, and a look of care. Drowsiness is an early symptom, and when succeeding to the above is very suspicious. At the same time the breathing generally becomes unequal, with long pauses and deep sighs, and this, itself an important symptom, becomes of double value when associated with others pointing in the same direction. If now the pulse falls in frequency and is intermittent, without improvement in other symptoms, the evidence it supplies may be considered conclusive.

The early period of tubercular meningitis may be mistaken for any of the other lesions or derangements which are accompanied by loss of flesh, vomiting, headache, and signs of nervous excitement.

The condition called spurious hydrocephalus, which sometimes occurs in exhausted infants as a result of anæmia of the brain, with sluggish cerebral circulation, and is sometimes a sign of thrombosis of the cranial sinuses, is usually readily distinguished by the history of severe vomiting or diarrhœa, the evident exhaustion of the child, the depressed fontanelle, and the normal or even subnormal temperature. This condition is seldom seen after the first year of life, and therefore is more likely to be mistaken for a general tuberculosis with secondary meningitis than for the primary form of the disease. Sometimes older children after an attack of serious acute disease may be left in a state of profound malnutrition, in which all food excites vomiting, and the stomach seems incapable of retaining or digesting even the simplest articles of diet. The child is restless and fretful, and complains of headache. His skin ceases entirely to act, is dry and rough, and the hardened epithelial scales can be brushed off as a fine dust. His lips are dry and cracked, his bowels confined, and his urine scanty and high coloured. After a time the child becomes drowsy and sinks into a stupor in which he dies. In these cases the brain and the internal organs

generally are bloodless and wasted. A distinction from meningitis may usually be made by the low temperature, which even in the rectum is often no higher than 97°; the history of the case, the absence of retraction of the belly, and the course of the illness, which has not the regular progression peculiar to the tubercular disease.

An acute catarrhal condition of the stomach in a scrofulous child sometimes presents symptoms—feverishness, vomiting, headache, and constipation—which may be mistaken for the onset of tubercular meningitis, more especially as, when convalescence begins, the pulse often gets slow and intermittent. But in all derangements, as distinguished from grave diseases, there is an important distinguishing mark, viz., that the patient does not look seriously ill. If he be not profoundly depressed by the severity of the symptoms, or harassed with pain, his face is placid and shows no signs of distress. Moreover, his breathing is regular, and his abdomen normal in appearance and not retracted. If, later, the pulse becomes slow and intermittent, the slackening coincides with an improvement in the symptoms and not with an unfavourable change in the condition of the patient.

Still, even a child suffering from tubercular meningitis has not always a haggard, careworn look. Some time ago I saw, with Dr. Miller, of Blackheath, a little boy, four years old, who had been noticed to be getting thin and pale for six weeks. He was often found asleep on the floor in the middle of his play. He flushed up at times and was very fretful, crying without cause.

On November 18th he began to vomit, and the sickness continued all through the week. It occurred usually about an hour after food, and seemed generally to be induced by movement. The bowels were confined, but acted readily after aperients. The temperature at night was about 100°.

When I saw the child, on November 25th, he was lying in bed, with a slight flush on his cheeks. His pulse was at first 100, and regular; afterwards 80, and slightly intermittent; respirations, 26, and somewhat irregular, for the child occasionally heaved a deep sigh, although his breathing was never quite arrested. Temperature (at 3 P.M.) 98.4°; eyes bright; no squint; pupils normal, and acted perfectly; no photophobia; no cerebral flush; consciousness perfect, and the boy answered questions readily. He said that his head sometimes ached at the back. Tongue furred, white; motions, after aperients, of normal appearance and contained no mucus or worms. The belly was deeply hollowed, and the parietes were soft, doughy, and compressible; the liver and spleen were of normal size, and the physical signs of his heart and lungs were healthy. There was no albumen in his urine.

In this case which was seen on the seventh day of the disease, the general mildness of the symptoms, especially the slightness of the headache and the complete clearness of mind of the child at so long a period after the beginning of his illness, seemed to tell against tubercular meningitis; but the history of the case, the pulse, the sighing breathing, the deeply excavated abdomen, the absence of sufficient signs of digestive derangement to account for his state, and the want of elevation in the temperature, which excluded a continued fever—all these symptoms taken together pointed very strongly in favour of the tubercular disease; indeed in a few days the child became comatose, and he died shortly afterwards.

"Cerebral pneumonia" may be accompanied by symptoms which resemble tubercular meningitis; and as the physical signs of the chest may

be normal on the first examination, it is often difficult at once to distinguish the real nature of the disease. There is often delirium and stupor; vertigo may be a prominent symptom; and the pulse, although rapid, is intermittent. In such a case the history, the absence of prodromata, the perverted pulse-respiration ratio, the greater elevation of temperature, and the early occurrence of the head symptoms are not in favour of tubercular meningitis; but until signs of consolidation are discovered we cannot venture positively to exclude meningeal tubercle.

In special cerebral disease the course is usually very different from that of tubercular meningitis, as the illness almost invariably begins with violent nervous symptoms. The phrenitic form of simple meningitis of the convexity approaches most nearly to tubercular basic meningitis in its attendant phenomena; but here the early symptoms are far more severe than in an ordinary case of the tubercular variety. The disease breaks out suddenly with violent headache, almost immediately followed by loud, often furious delirium; the temperature is very high from the first; stupor quickly supervenes, and the whole course of the disease is rapid.

In the secondary form of the tubercular disease the earliest sign of the occurrence of the cerebral complication is usually vomiting, and this symptom should never be disregarded. Often, however, the intra-cranial inflammation may first reveal itself by a fit of convulsions or a squint. In a child who, after a period of wasting and general illness, has an attack of catarrhal pneumonia in which he is suddenly taken with a convulsive seizure, the presence of a secondary tubercular meningitis may be more than suspected.

A basic meningitis is sometimes seen in infants as a consequence of inherited syphilis. The symptoms are identical with those of the tubercular form; but the nature of the illness may be sometimes inferred from the appearance of the child and the presence of other signs of the congenital malady.

Cases are sometimes seen in which a child dies with all the signs of a tubercular meningitis, although after death no appearance of intracranial inflammation or exudation can be discovered, nor can the closest examination detect any gray granulations either in the skull cavity or at any other part of the body. Such cases occur now and then in most children's hospitals. I have seen one or two; and as far as I know the form of tubercular meningitis thus simulated is always the secondary form; *i.e.*, the cerebral symptoms do not arise suddenly in an apparently healthy child, but come on towards the close of a more or less prolonged febrile attack.

Prognosis.—Tubercular inflammation of the cerebral meninges is so mortal a disease that when the nature of the case is established beyond a doubt, a fatal termination is inevitable. The disease is said to have been sometimes arrested before the second stage had been reached. In such a case it is reasonable to doubt the accuracy of the diagnosis. Probably many of the cases in which recovery from a basic meningitis has been recorded have been instances of the syphilitic form of the intracranial inflammation, which is much more amenable to treatment.

Treatment.—The disease is so fatal when once established that special precautions should be taken in every case where we have ascertained the existence of the tubercular diathesis to prevent the development of the cachexia, and ward off all influences tending to promote irritation and congestion of the brain. For the general means to be adopted to strengthen the constitution and weaken the diathetic tendency the reader is referred to the chapter on tuberculosis. With regard to special measures, we

should be careful to forbid the more exciting amusements and too boisterous games. The mind of the child should not be overtaxed with protracted study, and care should be taken that his intervals of relaxation are frequent and regular.

When the disease is actually established, we can have little hope that any treatment we can adopt will succeed in checking the course of the illness. The violent measures which it was at one time thought necessary to employ in cases of tubercular meningitis have been found to be not only useless but actually hurtful. Few judicious practitioners would now think of applying leeches, of blistering the skin, of running a seton into the neck, or of rubbing tartar emetic ointment into the shaven scalp. If the case be seen early, perfect quiet in a room carefully shaded from the light should be enforced ; ice-bags should be applied to the head, and the feet should be kept warm. The bowels must be relieved by a dose of calomel and jalapine, or compound scammony powder, and in the hope that the disease may have a syphilitic origin, the perchloride of mercury, in doses of fifteen to thirty drops, can be given two or three times a day. The child should be supplied with liquid food in sufficient quantities ; and if he refuse to swallow, he must be fed through an elastic catheter passed down the gullet. Stimulants must be given as seems necessary.

CHAPTER XV.

PARALYSIS OF THE PORTIO DURA.

Facial paralysis from affection of the portio dura of the seventh nerve may be a mild or severe complaint according to the cause on which the paralysis depends. It is common enough in children, and in them is frequently a sign of severe and perhaps incurable disease.

It will be remembered that the facial nerve rises in the floor of the fourth ventricle from a nucleus common to it and the sixth nerve. Thence it passes outwards with the auditory nerve, enters the internal auditory meatus, and is conveyed by the Fallopian aqueduct to its foramen of exit from the skull. It is important to bear in mind the principal branches given off by the nerve in the Fallopian canal, as the seat of the lesion is determined by the extent and distribution of the paralysis. Shortly after entering the aqueduct, the facial nerve is joined by the large superficial petrosal branch of the Vidian nerve. It is by this channel that it conveys nervous influence to the velum ; for the Vidian nerve is united with Meckel's ganglion, from which branches descend to supply the muscles of the uvula and soft palate. Soon afterwards it is joined by the small superficial petrosal branch from the tympanic nerve ; and a little farther on it gives off the chorda tympani, which joins the gustatory branch of the fifth nerve, and is distributed to the tongue.[1]

Causation.—The function of the facial nerve may be interfered with by a lesion at any part of its course, from its origin in the floor of the fourth ventricle to its periphery. The cause of the paralysis may therefore lie inside the skull cavity, in the Fallopian aqueduct, or outside the temporal bone.

Inside the skull the nerve may be injured by extravasation of blood or be compressed by tumours, inflammatory thickenings of the dura mater, and by exudations. In the Fallopian canal the nerve may be damaged by fracture at the base of the skull, or be destroyed by caries of the petrous bone. After leaving the temporal bone the nerve may be injured by the forceps during delivery ; or by blows upon the face ; or by inflammation set up in its sheath by extension from neighbouring parts, as in parotiditis ; or by an impression of cold, causing rheumatic inflammation of the sheath of the nerve.

The two chief causes which give rise to this condition in children are, no doubt, carious disease of the petrous bone, and exposure of the face to a current of cold air. Of these the first is a very serious disease, the second a comparatively trifling one.

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[1] According to some anatomists the chorda tympani is derived from the nerve of Weisberg, and not from the facial. It is intimately connected with the lingual branch of the fifth ; and the sense of taste in the anterior two-thirds of the tongue is dependent entirely upon the chorda tympani, the lingual presiding over general sensibility only.

Caries of the petrous part of the temporal bone is a common consequence of neglected otitis in the child. According to Von Tröltsch, it is far from uncommon to find the mastoid cells, with the tympanic cavity, and the Eustachian tube the seat of suppurative catarrh in a child who had lived and died without the disease having been suspected. This condition may exist without external discharge, without pain, or any symptom by which its presence may be revealed (see Otitis).

In children under three years of age facial paralysis is not rare. At this time of life it is due almost invariably to otitis and caries of bone, with suppuration in the sheath of the nerve. Older children may suffer from paralysis arising from the same cause, but in them there is increasing probability that the loss of power is the consequence of a chill.

Symptoms.—The first symptom usually noticed by the mother is that the child's mouth is drawn to one side when he laughs, or cries. On careful inspection it will be found that the absence of movement involves the whole side of the face. While the features are at rest, the eye on the affected side is incompletely closed; the nostril is flattened; the cheek may hang a little, although this is not easy to detect in babies; and the angle of the mouth is slightly lowered. It is when the child cries that the great difference between the two sides is seen. Then, on the healthy side the eyebrow contracts; the forehead wrinkles; the eye closes; the ala of the nose and the mouth are drawn upwards; and the middle line of the lips is pulled far out of the centre of the face. On the affected side, on the contrary, the muscles are motionless; the eye is open; and the skin remains smooth. If the nerve is affected in the Fallopian canal, the paralysis affects the soft palate. On looking into the throat, it will be seen that on the side of the lesion the arch of the palate is flattened, and that the uvula is curved to the sound side; for the motor fibres which pass through the large superficial petrosal nerve and the Vidian nerve to Meckel's ganglion, from which the palatine branches proceed, contract the azygos uvulæ only on the sound side. For the same reason children may complain that their mouth is dry and their taste impaired—the chorda tympani, which erects the papillæ of the tongue and promotes secretion of saliva, no longer conveying the nervous influence. Sensibility is not affected, but babies often seem to have a difficulty in swallowing their food; and if there should be loss of power on one side of the soft palate, some of the milk may be occasionally returned through the nose. An older child complains of great inconvenience from food collecting between the gums and the cheek, through the action of the buccinator being paralysed. He can no longer whistle, and even his speech may be impaired. The half-open eye is apt to become inflamed from exposure; and there may be a flow of tears over the cheek as a consequence, according to Duchenne, of paralysis of the tensor tarsi muscle, which no longer retains the puncta in its normal position.

The symptoms which are produced by a lesion affecting the facial nerve in the Fallopian aqueduct are well seen in the following case:

A little girl, aged sixteen months, was admitted into the East London Children's Hospital on March 24th. The mother stated that the child had been always healthy until two weeks previously, when she had begun to be feverish and to be irritable and thirsty. For the same time she had been losing flesh and had had some cough. The day before, while sitting up in her mother's arms, the child had suddenly fallen backwards in a fainting condition, and had seemed to lose consciousness. It was then noticed that her face was drawn to the right. On admission there was found complete

paralysis of the left side of the face, and the left eye closed incompletely. The uvula was small and showed no distortion. A discharge escaped from the left ear, but the mother could not say how long this had been going on. On examination of the chest there was impaired resonance at each apex, and the breathing was high-pitched and bronchial, with a large bubbling rhonchus. Over both sides of the chest dry and moist râles were heard. During the first fortnight of the child's residence in the hospital her temperature varied between 99° and 100°. She took her food fairly well, but seemed to swallow with difficulty, and occasionally fluids returned through the nose. The paralysis of the face continued, and the left eye became red and congested. The otorrhœa improved ; but the child's temperature became higher, and rose to 104.5° in the evening. Then the left cornea sloughed, and the patient died suddenly on April 19th.

After death both lungs were found studded over with small cheesy masses. On examination of the left ear the tympanic membrane was destroyed ; the ossicles were carious and broken down ; the tympanum and mastoid cells were filled with pus ; the wall of the tympanum was carious, and a probe could be passed though it in the direction of the Fallopian canal. There was no inflammation of the brain or its membranes. The cranial sinuses were not examined.

The occurrence of the paralysis is not always attended with symptoms of shock, as in the above instance. Usually it is only discovered accidentally by noticing a deviation in the child's face when it cries. The sloughing of the cornea in the case narrated was due to implication of the sensory branch of the fifth nerve.

In the parts supplied by the paralysed facial nerve the loss of power is usually complete ; and if the lesion affect the nerve after its passage through the internal auditory meatus—that is to say, if the facial nerve and no other be implicated, the motion of the tongue is unimpaired, the muscles of mastication act well, and there is no loss of power in the levator palpebræ or the muscles of the eyeball. In all but the mildest forms the paralysed muscles soon lose their irritability, and cease to respond to the electric current.

When the paralysis is due to caries of the petrous bone there is usually discharge from the meatus of a very offensive kind, and more or less impairment of hearing. When the cause of the loss of power is inside the skull cavity, we get signs indicating the involvement of other nerves. There is squinting, or deafness, or anæsthesia, and hemiplegia may be present. Occasionally it happens that paralysis of the sensory branch of the fifth nerve accompanies the facial paralysis. If this nerve be affected at a point anterior to the Gasserian ganglion, where it lies on the petrous part of the temporal bone, there result loss of sensibility of that side of the face, of the conjunctiva, and of the anterior portion of the tongue, also, inflammation of the conjunctiva, and ulceration of the cornea. If the nerve be affected at a point posterior to the Gasserian ganglion, inflammation and ulceration of the cornea do not follow, although the sensibility of the face is still affected. If the portia dura be diseased at its origin in the nucleus common to it and the sixth nerve, internal strabismus from paralysis of the external rectus muscle of the eyeball will accompany the facial palsy.

Diagnosis and Prognosis.—If the paralysis is noticed directly after birth in a child who has been delivered with instruments, the cause of the infirmity is evident and the prognosis most favourable. In older babies and young children it is very important to discover the seat of the lesion. If it is due to caries of bone, and the nerve is consequently affected in the Fal-

lopian canal, there is an offensive discharge from the auditory meatus, and the sense of hearing is more or less blunted. Perhaps, also, we can detect a certain degree of flattening of the palatal arch on the affected side, with a little twisting of the uvula, but this sign in children whose uvula is small is often absent. The existence of impairment or perversion of the sense of taste is also impossible to ascertain in young children. In them old standing otorrhoea, or even a recent offensive discharge from the meatus, combined with facial paralysis, affords suspicion of the strongest kind that the facial nerve is affected in the Fallopian aqueduct. The prognosis in these cases is very unfavourable. In fact, death usually occurs sooner or later from extension of the inflammation to the dura mater and the brain. The form of facial palsy which is found in children under the age of three years is commonly due to this cause. In an older child, if the paralysis has not been preceded by any impairment of the sense of hearing, or by otorrhœa ; if his sense of taste is natural, his mouth perfectly moist, and his uvula straight, we may conclude that the nerve is affected in the third part of its course. If, as usually happens in such cases, there is history of exposure to cold or of some slight injury to the face, the prognosis is favourable although recovery may take some time.

Treatment.—Facial palsy from pressure of the forceps during delivery soon disappears, and little treatment is required beyond frequent frictions to the face. Paralysis from cold should be treated by steady frictions with stimulating liniments, and the affected side of the face should be wrapped up in cotton wool. Electricity is useful. Dr. Duchenne's plan was to employ first the constant current with frequent intermissions, and as the irritability of the muscles returned, to make the intermissions less frequent and the sittings shorter. He never used faradism until several weeks had elapsed after the beginning of the paralysis, although at the later stage he allowed its value. Under the use of these measures the tonicity of the muscles returns, and the face regains its symmetry some weeks before voluntary power is restored.

Besides electricity and passive exercise, Dr. W. A. Hammond recommends the early employment of strychnia in sufficient doses to bring the patient under the full influence of the drug. He also insists upon the importance of supporting the affected side of the face by means of a little hook placed in the angle of the mouth and fastened to the ear. But mechanical supports of this kind, which depend for their usefulness upon the intelligent co-operation of the patient, are not well suited to young children.

In cases where the palsy is due to disease of bone, little can be done in the way of treatment. Our efforts must be then directed entirely to the cure of the otitis.

CHAPTER XVI.

ACUTE INFANTILE SPINAL PARALYSIS.

Acute infantile spinal paralysis, or acute anterior polio-myelitis, is not, as was formerly supposed, a disease peculiar to childhood. It is now known to occur also in adults, although in them much more rarely than in younger persons. This lesion constitutes the ordinary form of paralytic affection to which children are liable. It nearly always begins in babyhood—during the time of the first dentition—but often lasts long after the first teeth have been completed, and indeed may render the child a cripple for life.

The disease is never a fatal one in itself, but if death occur from other causes in a child so paralysed, no naked-eye changes in the spinal cord can be discovered. Consequently the nature of the lesion was long doubtful, and has only recently been elucidated. Now, however, owing to the researches of MM. Charcot, Joffroy, Roger, Damaschino, and others, the loss of power has been shown to be due primarily to an inflammation affecting the gray matter of the anterior cornua of the spinal cord, causing atrophy and disappearance of the large multipolar ganglion cells in that situation. The reader may be reminded that these large ganglion cells are believed to be centres of reflex action and transmitters of impulses received through the spinal tracts. They therefore influence the movements of muscle. Besides this, they are probably trophic centres and regulate the nutrition of tissues. Consequently the disappearance of these cells is followed by impairment or even abolition of reflex and voluntary action in the parts with which they are in communication, and also by impaired nutrition in muscles, tendons, bones, and joints.

Causation.—As the disease is mainly limited to the period of the first dentition, cutting of the teeth has been supposed to be a cause of the myelitis; but if this be the case it is probably so only indirectly. An infant feverish from teething is in a high state of nervous irritability. His digestion is impaired, and his pyrexia renders him exceptionally sensitive to chill and other causes of inflammatory and catarrhal disorder. For this reason pulmonary and intestinal derangements are common at this period of life. But these ailments cannot be said strictly to be caused by dentition, except in the sense that the process of teething, by making the child feverish, heightens his susceptibility to ordinary injurious influences. So, also, in the case of this disease, an infant, when feverish, is more likely to be affected by causes which produce the myelitis than he would be at another time when his temperature is normal, his digestion good, and his nervous system undisturbed. What these causes may be is doubtful. The inflammation is often attributed to chills, and there is no doubt that the season of the year has a distinct influence in inducing the attacks. Drs. Wharton Sinkler, of Philadelphia, and Barlow, of Manchester, have made inquiries into this matter. Out of one hundred and forty-nine cases collected by the former physician no less then seventy-seven occurred in the months of July and August. In Dr. Barlow's one hundred and eleven cases forty-eight occurred during the same months. Now July and August, although

the hottest months in the year, are also those in which alternations of temperature are most rapid and unexpected, and in which, therefore, sudden chills are very likely to be incurred. If the child at the time of the change is depressed and exhausted by previous intense heat—as he is apt to be in a tropical climate—the sudden lowering of the temperature is the more likely to produce an injurious effect. The disease sometimes occurs after typhoid fever: Dr. Buzzard has known it to come on after measles; and the paralytic attack appeared in a patient of my own—a little girl of two and a half years old—during convalescence from an obstinate chronic diarrhœa. Both sexes appear to be subject to it in an equal degree; and, apparently, robust health is no protection from its attacks, for it as often affects a constitutionally healthy child as a cachectic and weakly one.

Morbid Anatomy.—The lesion is limited to the spinal cord, the brain being unaffected. An inflammatory process attacks the anterior cornua and produces certain changes in the gray matter itself, in the roots of the nerves which take their origin in this situation, and in the muscles, tendons, bones, and joints to which they are distributed.

In the gray matter the changes are not appreciable by the naked eye, except that in old standing cases a certain diminution in bulk, with increased consistence of the affected parts, can be sometimes detected. By careful microscopic examination, however, the changes can be distinctly recognised.

The inflammatory process is diffused through the gray matter forming the anterior horns; but is more intense at certain points, notably the cervical and lumbar enlargements. As a consequence, areas of softening can be seen, more or less sharply defined, seated towards the front of one or both cornua. In these areas the tissue is soft and friable, the blood-vessels are fuller than natural, and numerous granulation cells are seen with an increase in the amount of connective tissue. The most striking change consists, however, in the fact that the large ganglion cells have almost completely disappeared, and the few which are left are greatly atrophied and degenerated. The nerve fibres and axis cylinders are also destroyed, and the anterior roots are degenerated and wasted. As a consequence of these changes the anterior horns look small and shrunken at the spots where these diseased foci are situated. Although the diseased process is thus concentrated in certain patches, the gray substance generally is not completely healthy. Throughout the whole dorsal portion of the cord the gray matter is often more or less affected. Granulation cells may be seen to be scattered through the tissue; the nuclei are multiplied; the blood-vessels are dilated and ganglion cells here and there have disappeared.

The above changes constitute the first stage—that of active inflammation. As the acute process subsides improvement takes place in parts where the gray matter has not undergone entire destruction. But in other regions, where the disintegrating process has been complete, further changes ensue. These consist in a more extreme wasting and shrinking of the anterior horns, so that the diminution in bulk becomes visible to the naked eye. The disease is most marked in the cervical and lumbar enlargements. In the affected areas there is complete destruction of all nerve fibres and ganglion cells. Even if a few are left, they are degenerated and shrivelled. The area becomes filled with a fine fibroid connective tissue, rich in nuclei, and the blood-vessels are hypertrophied. Even the anterior white columns become more or less degenerated. Their neuroglia is thickened, their nerve fibres are atrophied, and the development of the columns is retarded, so that they look small and narrow. This is, however, probably a secondary affection, and is not necessary for

the complete development of the symptoms. Stated briefly, the lesion which constitutes infantile paralysis may be said to be an acute myelitis of the anterior gray cornua, leading to circumscribed patches of sclerosis with complete destruction of the large ganglion cells and other nerve elements.

The changes which have been described supply an explanation of the peculiar phenomena observed in the disease. The striking limitation of the paralysis to certain muscles, or groups of muscles, and the complete immunity of others, is due to the concentration of the lesion into certain circumscribed areas; while the early resolution of the inflammation in the larger portion of the tissue attacked accounts for the disappearance of the first severe symptoms, and the restitution of power in many of the muscles primarily affected.

The paralysed muscles also undergo atrophy and degeneration. They become at first paler and softer, then grayish or reddish yellow, with bands of connective tissue, and yellow lines or streaks of fatty tissue. The microscope shows at different stages the fibres wasted, and their striation indistinct, with hyperplasia of the cells of the sarcolemma; then the fibres cloudy with numerous fat molecules; finally, almost complete absence of muscular fibre. The normal structure is often replaced by an increased formation of connective tissue, so that what was once a muscle becomes a mere fibrous bundle; in other cases we find substitution of the normal muscular substance by adipose tissue, and by this means the original volume of the muscle may be actually increased.

Fatty degeneration is not an invariable consequence of the muscular paralysis. Even when it occurs, it is often not universal, and proceeds much faster in some bundles of fibres than in others.

The bones as well as the muscles become wasted. Their development and growth are retarded, and their density diminished.

Symptoms.—The attack is sudden, and the paralysis reaches its height at once, both in distribution and degree. In many cases the child exhibits no symptoms of illness. He goes to bed to all appearance perfectly well. In the morning one or more of his limbs is found to hang loosely and to be motionless, otherwise he shows no sign of ill health. In quite young babies, who cannot walk, the loss of power may remain unnoticed for several days. In a second class of cases the symptoms are a little more marked. A child who has been put to bed in his usual health is seized in the night with fever. He cries and is very restless. In the morning more or less extensive paralysis is discovered. In a third class of cases the child is feverish and poorly for several days before the paralysis occurs, sometimes he is delirious, or he may have an attack of convulsions followed by stupor. In all cases, probably even in those where the symptoms are the least accentuated, there is some preliminary fever, but this may last only a few hours, and is often unnoticed by the attendants.

The paralysis is complete. It may be widely distributed, or may be limited to one muscle or a group of muscles. It may affect all four limbs; it may attack only the lower extremities; it may assume the hemiplegic form and fix upon the arm and leg of one side; or, again, it may settle upon one limb only—in such a case the right foot is said to be the part most frequently selected. In this form of paralysis the face[1] and parts sup-

[1] With regard to the absence of paralysis of the face it is right to say that Dr. Buzzard has recorded a case which appears to be one of undoubted infantile paralysis in which facial paralysis was noted. Dr. Buzzard attributes this exceptional phenomenon to an extension upwards of the inflammatory process into the medulla oblongata. He

plied by cerebral nerves are never affected, the intelligence, after the first onset, is never impaired, and control over the rectum and bladder, at any rate after the first few days, is never lost. Sensibility in the paralysed parts remains in every way normal; there is no pain anywhere; no rash upon the skin; no tendency to the formation of sores or sloughs upon parts exposed to pressure; no rigidity of the joints. The affected limb is perfectly flaccid and painless, but also perfectly motionless. In some rare cases the onset of the disease has been said to be attended by pains in the back and limbs, and by hyperæsthesia of the skin; but these phenomena are not directly the consequence of the spinal lesion, and form no necessary part of the group of symptoms which are held to be characteristic of infantile paralysis.

The flaccidity of the paralysed muscles is accompanied by a loss of reflex phenomena and a diminution or complete disappearance of the normal contractility. This takes place early in certain muscles, so that in the course of a few days they may be found to respond faintly or not at all to faradic stimulation. While, however, the muscles have ceased to react to the strong faradic current, they will still respond to slow interruptions of the constant current. When contractions are obtained by this means in a muscle which has lost all faradic contractility the phenomenon is called "reaction of degeneration." It implies that the muscle for the time is physiologically cut off from the influence of the spinal cord. Besides this, early signs are noticed that the nutrition of the limb is no longer efficiently maintained. The part is cold and often looks purple; the pulse is smaller; the fat becomes absorbed; the muscles waste; the ligaments of the joints are relaxed and there is even a slackening of growth in the bone. These trophic changes are usually marked, and generally continue after apparent restoration of power in the affected limb.

The paralysis is at first complete and much more extensive than it afterwards becomes. After some weeks, or perhaps months, a partial recovery takes place in the muscles whose faradic contractility had not been entirely destroyed. Sometimes this restitution of motor power is perfect, and, except for the impaired nutrition in the affected limb, the child may seem to be well. More usually, however, certain muscles, or groups of muscles, still continue disabled; and when the paralysis has thus limited itself, the parts which remain crippled are in most cases permanently useless.

When the paralysis is at first extensive, there appears to be no definite rule as to the parts which are afterwards to recover their power. If an arm and a leg are both affected, the one limb does not necessarily recover sooner or more completely than the other. The only indication is the persistence of contractility in the palsied muscles. Each muscle should be carefully tested by the faradic current, and in those whose contractility is not destroyed we may hope for eventual recovery. Cases have been recorded—notably by Dr. Kennedy—in which the limbs recovered early and completely without the disease leaving any trace of its passage; but it has been doubted if in such instances the lesion is the same as in those where recovery is slow and more or less imperfect.

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believes that facial paralysis occurs so seldom because the acute affection invading the bulb is not likely to spare the nuclei of nerves essential to life, for if it attacked the nuclei of the vagus sudden death would be the consequence. He suggests that cases of sudden or rapid death in young children may be sometimes due to the disease striking the medulla oblongata with the same suddenness with which it usually attacks the anterior gray matter of the spinal cord.

In course of time changes take place in the muscles which remain permanently paralysed after the general restoration of power. This stage of the disease is called the period of atrophy; for the affected muscles waste, and at the same time the slackening of growth in the bone becomes a noticeable feature in the case. This arrest of development in the affected limb has been already referred to. It is a variable phenomenon and is not always present. When it occurs, it does not appear to be proportioned to the severity of the disease as to muscular wasting and paralysis; but may be present in a mild case, and absent, or nearly so, in a severe one. According to Volkmann, it has been seen in cases of the most transient infantile paralysis where the muscles quickly recovered their power, and atrophy of special muscles was not noticed. As the growth and development of the unaffected limbs proceed in the normal manner, the difference between the two sides is often very evident.

The wasting of the muscles permanently paralysed sometimes begins early, and, according to Duchenne, may be evident at the end of a month. As a rule the permanent paralysis is not widely diffused. It is not common to find a whole limb shrunken and useless, although even this misfortune may occur. Usually it is a group of muscles, or even a single one, which is thus disabled; and in practice certain parts more than others are found to undergo the atrophic change. In the leg the common extensor of the toes, the peronei longus and brevis, the tibialis anticus, and sometimes the gastrocnemius may become atrophied; in the thigh, parts of the triceps extensor; of the muscles attached to the upper extremity, the deltoid, the serratus magnus, and some of the muscles of the forearm.

One of the most important and characteristic results of the disease consists in the *paralytic contractions* which almost invariably occur when muscles are permanently disabled, and constitute various kinds of deformity. They are especially common in the feet, and are the principal cause of the different forms of clubfoot which develope in the child after birth. The contractions occur not in the paralysed muscles, as a rule, but in those which still retain their contractile power. They begin early, and tend to increase as time goes on. This contraction of unaffected muscles, or of muscles only partially affected, was attributed formerly to the influence of the so-called "muscular tonus." It was supposed that a constant stimulus proceeded from the spinal cord, and kept all healthy muscles in a state of persistent slight contraction. In the normal condition, it was said, opposite muscles neutralise each other; but if the muscles become paralysed on one side, so that the contracting power on that side is abolished, the limb is drawn to the affected side by the action of the "tonus" in the unaffected muscles. This theory was combated by Werner, who maintained that the contraction could be explained without recourse to the imaginary tonus. He asserted that when one set of muscles is paralysed, there is no deformity until the opposite set of muscles is put into action. The limb is then drawn to that side and cannot be replaced by the paralysed antagonistic muscles. It therefore remains in its new position until replaced, or until it falls back again by its own weight. Consequently, it must happen that the limb is often and long in one position, for the muscles once contracted remain so because the antagonistic muscles can no longer act. After a time they lose the power to relax, and a permanent contraction becomes gradually established.

But even this theory does not account for the whole of the facts, for, as was pointed out by C. Hüter, it is not always the muscles anatomically opposed to the paralysed groups which undergo contraction; and indeed

the deviation sometimes occurs in the direction of the paralysed side. The real cause of the deformities of the foot appears from the researches of Hüter, Volkmann, and others, to be only partially the unopposed action of healthy muscles and inability to antagonise their contractions. Far more important agents are the weight of the affected part itself and the greater pressure thrown upon it when in use. For instance, the commonest deformity of the foot is the talipes equino-varus; but this is exactly the position in which the foot will fall when the ankle-joint is not acted upon by its muscles. If a child be made to sit upon the edge of a table, with his legs hanging down, the foot instantly falls into the equino-varus position. In paralysis of the limb, if the child has not walked, this is the form the deformity invariably takes. The foot assumes this position, and the shortened muscles in time become permanently contracted. The arrest of growth in the bone, which is generally present, promotes the formation of this deformity, for the affected leg being shorter than the other, the child has to point the toes in order to reach the floor. If the paralysis occur in a child who has already learned to walk, the flat foot (talipes valgus) is the usual form of distortion, and is, according to Volkmann, irrespective of the actual muscles paralysed. When the patient brings his weight to bear through the leg upon the sole placed flat on the ground, the foot, being no longer braced up by the paralysed muscles, curves outwards until checked by the ligaments. By repetition of this action the ligaments stretch, and the bones on the compressed side are interfered with in their growth. The talipes valgus thus formed is less perfect than the same deformity produced by over-exercise and fatigue in a child with unparalysed muscles, for during rest the foot is brought again by gravitation into the equino-varus position. The shortened muscles are therefore again drawn out, and their contraction is less complete, so that the joint is comparatively loose.

When the muscles of the thigh are permanently weakened, there is no contraction about the knee unless the child attempt to aid himself by the use of crutches. Children in whom there is partial paralysis of the quadriceps femoris walk, says Volkmann, exactly like a person who wears an artificial leg. To get such a leg to support the weight of the body without bending the knee, the weight must be thrown in front of and not behind the joint. Every time that the body rests upon the weakened limb, the weight is thrown forwards, so that the knee is in a state of complete extension, and the posterior ligaments are put upon the stretch. These after a time relax, and the knee is over-extended so as to produce a genu recurvatum.

In the arm, the elbow-joint is little affected. It remains quite free, and no contractions occur unless the arm is kept permanently in the bent position, as when worn constantly in a sling. When the paralysis is so marked that the hand is useless, the power of supination of the arm is soon lost, for the child, having no occasion for the movement, soon ceases to employ it. The wrist becomes slightly flexed, and the fingers, completely clenched upon the palm, undergo contraction in that position. This is the position the fingers assume when left to themselves; and if the flexors are not used, or are not passively stretched, they become contracted. The shoulder is flattened, and if the muscles proceeding from the thorax to the arm are extremely weakened, the capsule is pulled upon by the dead weight of the arm and becomes permanently stretched, so that a distinct interval is felt between the head of the bone and the socket. In this case the affected arm, by measurement from the acromion, may seem longer than the sound one.

From what has gone before it will be noticed that cases of infantile spinal paralysis fall naturally into two classes: those in which complete recovery takes place in all the muscles affected, after the lapse of weeks or months; and those in which power is completely restored in some muscles, while others remain permanently useless, and the disease ends in atrophy and deformity. In the muscles in which the paralysis is likely to be lasting, faradic contractility disappears at a very early date—usually before the end of the first week, or in the course of the second. According to the elder Duchenne, muscles which retain some degree of faradic contractility on the seventh or eighth day may be expected to recover their power, and this the more rapidly the less their faradic irritability has been weakened.

Diagnosis.—In a case which is seen at an early period of the disease the symptoms are so characteristic that it is difficult to mistake this form of illness for any other lesion of the nervous system. But every case of paralysis with atrophy is not a case of infantile spinal paralysis. To identify the disease with accuracy we must require all the essential phenomena of the affection, viz., complete motor paralysis without alteration of sensibility or pain in the back or elsewhere; rapid loss of faradic excitability; a normal temperature; absence of paralysis of the face or of the sphincters; complete flaccidity of the limb, without stiffness or contraction of the joints; marked coldness of the affected parts, and no tendency to the formation of sores upon the skin.

In acute generalised myelitis, where the whole of the gray matter is involved and a large part of the white columns, there is lessened cutaneous sensibility; there is paralysis of the sphincters, so that the child can no longer control the bladder or the bowel; there is an increase of reflex excitability; sores form readily on the parts exposed to pressure; the urine is alkaline, purulent, and offensive, and, as a rule, atrophy in the affected muscles does not occur.

Hæmorrhage into the cord produces a sudden paralysis, which is followed by atrophy of the affected muscles and loss of reflex excitability; but here also there is diminution of cutaneous sensibility, the sphincters are paralysed, and bed-sores form early.

Paralysis of cerebral origin may be distinguished by the affection of the cerebral nerves, such as squinting, facial paralysis, etc.; by the palsy being accompanied by tension of the muscles and spasmodic contractures; by the preservation of electrical irritability; by the stiffness and extension of the joints; by increased excitability of tendons, and by the absence of atrophy.

In spasmodic spinal paralysis the loss of power is incomplete, and occurs slowly and insidiously; muscular tension and contractions are present; there is increased irritability of the tendons, and the affected muscles do not atrophy.

The course of infantile paralysis is also very characteristic. The rapid restoration of power in the larger number of muscles affected and the complete paralysis of others is very peculiar; also the arrest of growth, which embraces the whole of the region first affected, is a very striking phenomenon. At a later period, when contractions occur in the limb, the resulting deformity may be distinguished from congenital distortion by the very partial atrophy of muscles, the striking looseness of the ligaments of the joint, and the permanent coldness of the part.

Prognosis.—As infantile paralysis is not a fatal form of illness, our chief anxiety must be to estimate the chances of complete recovery in the paralysed muscles. For our own comfort and that of the friends we may re-

member that complete recovery, or at any rate vast improvement, is the rule and not the exception. Careful testing with the faradic current will give us very accurate means of determining in which muscles speedy restoration of power may be anticipated, and in which of them persistent paralysis is to be feared. The muscles which have lost all physiological connection with the spinal cord no longer respond to the induced current, while they react to slow interruptions of the constant current (reaction of degeneration). This change takes place very rapidly. Faradic irritability is enfeebled as early as the third or fifth day, and is lost by the seventh or eighth.

In testing the irritability of the muscles at this period a weak current should be used—one just sufficient to cause contraction in healthy muscles. Every muscle which does not react to the faradic current after the lapse of a fortnight from the beginning of the illness is likely to be permanently disabled. Still, according to G. Sigerson, muscles which have long ceased to contract may sometimes regain their faradic contractility and recover their power more or less completely. On the other hand, in the muscles which retain some amount of faradic irritability, however faintly they may react to the current, return of power may be confidently predicted. Even when recovery from the paralysis is complete, the child is still liable to some arrest of growth in the affected limb ; and it is well to warn the friends of the patient of this possible consequence of his illness.

Treatment.—If we have the opportunity of seeing the child immediately after the occurrence of the paralysis, we should keep him perfectly quiet in bed, clear out his bowels with a brisk aperient, and employ counter-irritation to the region of the spine. By the repeated application of mustard poultices, first to one part, then to another, of the spine, a derivative action may be kept up as long as the skin will bear it. During the early days of the disease it is well to insist upon a prone position, varied occasionally by laying the patient on his side. The dorsal position, which favours congestion of the vessels within the spinal canal, should, if possible, be avoided. The child should be put upon a diet of milk and broth, and care should be taken that his bowels act regularly once a day. While there is any fever Dr. Althaus recommends a daily subcutaneous injection of a solution of Bonjean's ergotine—a quarter of a grain for a child of twelve months. At first no local treatment is admissible to the paralysed muscles ; and the faradic current should be used only for diagnostic purposes and not as a therapeutic agent. But immediately any recovery of power begins to be noticed, we should employ the faradic current daily, so as to aid the restoration of the affected muscles. If there is at first no response to the induced current, the continuous current, with slow interruptions may be employed. It is advisable to use a current of sufficient strength to cause a visible contraction of the muscles. This, however, is often impossible with children. Even a weak application may cause such agitation and alarm that its employment has to be discontinued. We should not in any case use a strong current at first. Probably a weak current, in its influence upon the nutrition of the muscle, is preferable to none at all. Dr. Gowers recommends that in the beginning such a strength should be employed as the child will bear without much emotional disturbance, and if care be taken not to alarm the child at the first, a current of considerable strength can be perhaps made use of afterwards.

Besides electricity other means should be used. The paralysed limb must be kept warm with cotton wadding. This is a matter the impor-

tance of which has been very properly insisted upon by Dr. R. J. Lee. If the affected parts are very cold, they may be rubbed several times a day before the fire ; and hot applications of any kind—bags of hot salt, bran, hot flannel, etc., may be kept in contact with the limb to maintain its temperature. Great assistance will also be derived from vigorous shampooing. It is advisable to order stimulating liniments for this purpose, as frictions are always employed with more energy if something is given "to be rubbed into the skin." The child should be also encouraged to use the weakened limb as much as possible ; and Volkmann insists strongly upon the worse than uselessness in these cases of crutches or other forms of mechanical support.

It is usual to give strychnia to these patients, either internally or by subcutaneous injection. The remedy has probably little influence in restoring power to the disabled muscles, but as a general tonic its use may be not without value during the stage of recovery. It may be combined with iron and quinine.

In most cases of infantile paralysis, when recovery does not take place within the first two months, the course of the disease is long and tedious, and improvement goes on but slowly. Still, our efforts are eventually rewarded by a striking return of power even in cases which at first had appeared almost hopeless.

The cure of the deformities resulting from atrophy and contraction of muscle come under the department of the surgeon.

CHAPTER XVII.

SPASMODIC SPINAL PARALYSIS.

Spasmodic spinal paralysis, sometimes called spastic paraplegia, appears from the researches of Charcot and of Erb to be due to a sclerosis of the lateral columns of the cord. The disease, which consists in a gradually advancing weakness or paralysis of the limbs—generally the legs—is sometimes seen in children and even in young babies ; indeed in many cases it appears to be congenital. Like infantile spinal paralysis the lesion is accompanied by no disturbance of the cerebral functions, no affection of sensation, and no loss of control over the bladder and rectum ; but, unlike infantile paralysis, the affected muscles seldom waste, there is excessive rigidity of the joints, and the tendinous reflexes, instead of being abolished, are increased in activity.

Causation.—The lesion may develop itself in the earliest childhood. Its causes are unknown. Seligmueller has recorded an instance in which four children of the same family suffered from a form of the affection.

Morbid Anatomy.—No cases of death from this disease have been noticed in children ; but in adults the symptoms have been connected by Charcot with degeneration of the lateral columns of the cord. On section of the cord the gray degeneration is seen to be symmetrical and to occupy the lateral columns on each side of the cord. The diseased region, as seen on the surface of the section, is triangular in shape, and reaches inwards to the anterior gray cornua, outwards to the pia mater ; in front it passes gradually into the healthy substance of the columns. The degeneration is not in patches, but appears to be diffused over the greater portion of the length of the cord, and may reach up to the medulla or even beyond it. In some spots the process is more intense than it is in others. On microscopical examination of the degenerated portions, the neuroglia is found to be thickened, the nerve fibres to be degenerated and wasted, and the ganglion cells to be cloudy and swollen, or atrophied, pigmented, and finally almost destroyed.

Symptoms.—Whatever may be the age of the child when he first comes under observation, we shall generally find that the symptoms date back to the period of infancy, and that they were first noticed only a few weeks or months after birth. On questioning the mother we commonly hear that when quite a baby the child's legs were stiff, and that on this account washing and dressing him was a troublesome matter ; that although able to move his legs when lying down, he could never stand, and that any attempt to do so increased the stiffness. If he did succeed in walking at an age long after that at which a healthy child can run alone, he was never firm on his legs, and soon became weaker and tumbled about. Then the power deserted him altogether, and when placed on his feet his legs became stiff and crossed, the toes touching the ground but the heels being raised. As there is no fever, pain, or evident impairment of nutrition, and

as in many cases the mental development is satisfactory, the weakness is looked upon as a personal peculiarity which the child will "grow out of," and he seldom comes under observation until the disease is fully developed.

In a child so afflicted two phenomena are at once noticed: there is weakness of the lower limbs, and the joints are stiff, and become stiffer when handled.

On examination we find that the legs are moved awkwardly and with difficulty. As the child lies in his cot the limbs are extended and only slightly flexed, and the patient may have some power of bending his joints, although some are moved with greater facility than others. The muscles feel rigid to the touch, and when the joints are forcibly flexed—which can be done without inflicting pain upon the child—they straighten again abruptly, as if moved by a spring. Handling the limbs increases the rigidity of the joints, and often the mere approach of the physician appears to have the same effect. Movement, whether active or passive, produces no tremors in the affected limbs. It only increases the rigidity of the muscles.

When the child is held under the arms, so as to feel the ground with his feet, directly he attempts to walk the thighs are closely pressed together, the knees are slightly bent, the feet are inverted, and the ankles extended so that only the points of the toes touch the floor; the legs become rigid and soon cross one over the other. In bad cases the heels are not brought into contact with the ground at all. Sometimes the child, although he cannot walk, is able to stand, supporting himself against some object. The rigidities appear to contribute to his helplessness as much as the motor weakness; and sometimes the attempt at voluntary movement, conflicting with the stiffness of the muscles, results in a sort of chorea.

The back is often very weak, and the muscles of the abdomen may become hard when the skin is irritated. Control over the sphincters is not interfered with; there is no paralysis of the face, nor any tendency to the formation of sores or sloughs upon the parts exposed to pressure. The degree of intelligence varies in different cases. Often the child seems as quick as others of his age, but sometimes he is dull and stupid. Articulation may be affected, but, as a rule, the patients speak readily and clearly.

Occasionally the arms are affected. In a case reported by Dr. Gee—a little girl, eight years old, in whom the paralysis had existed certainly from the age of twelve months, perhaps from an earlier period—the arms as well as the legs became stiff when the girl was noticed. The arms were rotated outwards; the elbows were strongly extended and the wrists pronated; the hands were also extended strongly and thrown back at the wrist; the fingers were flexed. The child could move the opposing muscles, but with difficulty, and after movement the arms soon returned into the position described. The left arm was more affected than the right. Dr. Gee has described eight cases of this interesting malady, of which the first was observed before the publications of Erb and Charcot had attracted general attention to the disease.

The constant rigidity of the muscles affected is not accompanied, as a rule, by any wasting, although in exceptional cases, when the disease is of long standing, one or more (not all) of the implicated muscles may show some signs of atrophy. The rigidity is a permanent phenomenon, persisting during sleep, and only disappearing temporarily when the child is placed under the complete influence of chloroform. The tendinous reflexes are more active than in the normal state, and the response to faradism is rapid and energetic. Sensation is unimpaired.

In many cases the actual amount of weakening of the muscles appears to be slight. The impediment to walking seems to be more the result of rigidities and contractions of muscles, which prevent the foot and limb from being placed in a fitting position to support the weight of the body and frustrate the voluntary impulse, rather than of any actual paralysis. From observations made upon the adult sufferer, contractions are found to occur as a later phenomenon, the muscles being merely rigid at first without any shortening in their length. When the contractions come on the paresis becomes more noticeable. Eventually it may amount to complete loss of voluntary motor power. This is, however, generally of unequal intensity in different regions, being well developed in certain groups of muscles, imperfect in others. Usually the disease is more advanced in one of the limbs than it is in its fellow.

If a child, the subject of this disease, be able to walk, his gait is very peculiar. The patient behaves as if giddy, and sways from side to side. His limbs are widely separated, and he moves each leg awkwardly forward, often sliding it along the ground. The tendency appears to be to point the foot so that the heel is not in full contact with the floor. Consequently the toes are apt to catch at any unevenness of the ground, and the child would fall on his face if not supported.

As the disease advances all the symptoms become intensified. The rigidities, the contractions, the paresis, and the reflex irritability, all become increased. The lesion does not appear to be fatal to life. Of its later stages little is known, for after a certain degree of intensity is reached, and the patient has been rendered quite helpless, the disease seems to undergo no further change.

Diagnosis.—The essential features of the disease are a slowly growing paralysis of the lower extremities, without wasting, but accompanied by excessive spasmodic rigidity of muscle and increased activity of the tendinous reflexes. The disease is therefore readily distinguished from infantile spinal paralysis, in which wasting and arrest of growth in the affected limb are the rule ; the joints, far from being rigid, are excessively relaxed, and the tendinous reflexes are abolished.

General acute myelitis resembles the spastic disease in its increase of reflex excitability and absence of atrophy, but differs from it by producing paralysis of the sphincters, diminishing the cutaneous sensibility, and promoting the formation of bed-sores. Besides, there is a well-defined horizontal limit beyond which the disease does not pass, and there is no approach to the muscular rigidity which is such a characteristic feature of spasmodic spinal paralysis.

In paralysis of cerebral origin the loss of power is accompanied by tension of muscle and spasmodic contractions, the joints are stiff and extended, the muscles do not atrophy and continue to respond to faradism, and the reflex irritability of tendons is preserved. But in such a case there is paralysis of cerebral nerves, the loss of power is hemiplegic in distribution, the rigidities and contractions are very late to occur, and sensation as well as motion is affected.

Prognosis.—The life of the patient appears to be in no danger from the illness, but at the same time his chances of recovery are small. Little is known as to the course of the disease in the child, but none of Dr. Gee's cases were influenced by treatment in the slightest degree.

Treatment.—Erb recommends the galvanic current applied principally to the spine, but also to the affected limbs, and the application of cold compresses. Drugs appear to have but slight influence on the disease.

In a case of recovery reported by Von der Velden—in a man aged twenty-seven—bromide of potassium, belladonna, and morphia had no beneficial influence ; indeed, the latter seemed to increase the number and intensity of the attacks. Chloral, however, was useful in moderating the spasmodic attacks when they were at their worst, and improvement began to be manifested while the patient was taking the double salt of gold and sodium. In Dr. Gee's cases hemlock, belladonna, Calabar bean, and strychnia—the two last hypodermically—were used in turn, but without the slightest benefit.

CHAPTER XVIII.

PSEUDO-HYPERTROPHIC PARALYSIS.

This singular form of paralysis, in which extreme feebleness of the muscles is combined with an appearance of extraordinary development and vigour,' was first studied and described by Duchenne, of Boulogne. Almost at the same time, however, Dr. Edward Meryon, in England, had published some interesting particulars of four boys in the same family who were all affected with what appears to have been hypertrophic paralysis, although the author at the time was of opinion that the disease was identical with progressive muscular atrophy. Many cases have since been placed upon record, and there must be few children's hospitals which have not at one time or another had an example of the disease within their walls.

Causation.—Of the etiology of the infirmity nothing is known. It is in the large majority of cases confined to the male sex. In Dr. Meryon's first series of cases, above referred to, all the boys (four) of the family suffered from it, while the eight girls escaped. This fact also illustrates another tendency of the disease, viz., its proneness to attack several members of a family. Two, four, and more children of the same parents have been known to be affected, and Dr. Meryon has referred to a striking instance in which eight brothers all died of the disease. This tendency seems to point to a hereditary element in the etiology of the infirmity. In investigating this question it is not enough, as Dr. Gowers has pointed out, to ascertain merely the health of the parents. Females are rarely affected by it, and males, the subjects of the disease, usually die at or soon after puberty. Therefore the tendency must be searched for amongst the collateral branches of the family. Such evidence is generally found on the side of the mother, and instances of the disease in some members of her family can be discovered sufficiently often to determine positively the frequent existence of this one-sided inheritance.

The disease appears to be limited to childhood, and, indeed, is often congenital, the first symptoms manifesting themselves during infancy or shortly after that period. It seldom begins after the sixth year.

Morbid Anatomy.—No morbid changes have as yet been discovered in any part of the nervous system to account for the disease, but the changes in the affected muscles themselves are sufficient to explain the phenomena of the affliction, and especially the apparent inconsistency between the unusual size of the muscles and their remarkable want of power.

In the muscles the morbid process consists in an overgrowth of the interstitial connective tissue between the fibres. The nucleated fibrous tissue and the fat cells gradually increase in quantity and compress the muscular fibres. These under the pressure become narrower, and their striæ farther apart, although still distinct; afterwards the striations become indistinct, and the fibres dwindle and eventually disappear, leaving the

empty sarcolemma sheath running by the side of the fibrous bundles and proliferated fat cells.

If the fat is greatly increased in quantity, the muscles on section may have the appearance of a fatty tumour in which no sign of muscular redness is visible to the naked eye. Under the microscope the fibres are seen to be separated by fat cells, but it is not common to find fatty degeneration of the muscular fibres themselves.

Symptoms.—The earlier symptoms are very apt to escape notice as they have no distinctive character. They consist merely in weakness of certain muscles, usually those of the lower limbs, and sometimes of the back. If the disease begins in early infancy, before the time for walking has arrived, the child is noticed to be heavy to lift, and to want the responsive "spring" which is so marked a feature in the healthy infant. In such a case it is late before he acquires the power of walking. If he has been able to walk before the disease begins, he very quickly gets tired, and shows a curious unsteadiness when on his legs. He can be thrown off his balance by a slight push, and when on the ground rises again with difficulty. When the weakness of the muscles has reached a certain degree, the child is forced to assume a characteristic attitude. In standing he separates his legs widely, and throws his shoulders backwards so as to exaggerate the antero-posterior curve of the lumbar spine. Consequently his belly is protruded, and, in a marked case, a vertical line dropped from the back of the neck falls clear of the buttocks. This attitude is the consequence of weakness of the extensors and flexors of the hip and the extensors of the knee—the muscles which maintain the body upright in standing. The child, feeling these to be insecure, tries by separating his feet to enlarge his base, and as, owing to the weakness of the extensors of the hip, the pelvis is inclined unnaturally forwards, he throws his shoulders backwards so as to keep the centre of gravity in the normal position. As he walks he still continues to separate his feet widely, and he sways his body from side to side so as to keep the centre of gravity over the foot upon which the weight of the body is resting.

After a certain number of months, or, according to Duchenne, a year has elapsed, changes can be noticed in the muscles, and the weakness becomes more marked. The calves of the legs become enlarged, so as to give the appearance of unusual vigour, and generally a similar hypertrophy affects other muscles as well. The gluteal muscles, the muscles of the thighs, the posterior muscles of the spine, the deltoids, and sometimes almost all the muscles of the trunk and limbs may share in this enlargement. If the muscles do not become hypertrophied, they usually waste, and this diminution in size of some muscles renders more striking the extraordinary hypertrophy which affects other muscles in their neighbourhood.

As the weakness of the muscles goes on progressively increasing, the characteristic attitude and gait become more and more marked. At the same time any slight extra strain put upon the muscles in the performance of certain acts increases the difficulty to such a degree that the child is reduced to some very curious expedients in order to accomplish them successfully. Thus, in rising from a chair, he endeavours to assist the extension of the knee-joint by placing a hand on each femur just above the knee. By this means, especially if at the same time he bend forwards, he transfers a large part of the weight from the extremity (the hip) of a lever whose fulcrum is at the knee to a part of the lever close to the fulcrum; or, even, if the body is bent forwards sufficiently to throw the centre of gravity in front of the knees, actually uses the weight to be

moved as a motor power to effect the straightening of the knee-joint. Again, in extending the hip-joints the patient begins by placing his hands, as in the former case, just above the knee, and then moves the hands alternately higher and higher until the straight position is arrived at.

For some time the muscles retain sufficient power to carry the patient at a moderate pace along a level surface ; but he cannot jump, and in mounting the stairs he is forced to do so on his hands and knees. If told to get up from the ground, the child can only obey by going through a series of elaborate manœuvres, all calculated to relieve or assist the weakened muscles. As Dr. Gowers describes the process, the patient, being on all fours, keeps his hands on the ground, and stretches the legs out behind him far apart. Then, still keeping the body supported chiefly by the hands, he manages by shuffling backwards on the toes to get the knees extended. The body is thus supported by the hands and feet all placed as widely apart as possible. Next, the hands are alternately moved backwards along the ground so as to bring the larger portion of the weight of the trunk over the legs. Then, one hand is placed on the knee, and a push with this, and with the other still on the ground, is sufficient to enable the extensors of the hip to bring the trunk into the upright position. In many cases the child cannot rise at all unless near to some piece of furniture, by means of which he can gradually hoist his trunk upwards with his hands.

As the paralysis extends the patient gets more and more helpless; and when the upper limbs become affected, as usually happens after a few years have elapsed, his condition is very distressing.

The affected muscles do not always increase in size. Sometimes they waste, and the hypertrophy and atrophy are irregularly distributed. Usually many more muscles are wasted than are enlarged. The hypertrophy is apt to affect by preference certain muscles. The muscles of the calf, the vasti of the thigh, the glutæi, the infra spinati, and the deltoids are often enlarged. On the contrary, the muscles on the front of the leg are more usually wasted, and wasting is also more common in the latissimus dorsi and the sterno-costal portion of the great pectoral muscle. In the arm the biceps and triceps may be enlarged, but the muscles of the forearm are rarely affected. Sometimes the temporals and masseters are hypertrophied. In some rare cases the muscles, before they begin to enlarge, have been noticed to be smaller than natural.

This form of paralysis is not accompanied by any general fever, but Dr. Ord has noticed a higher temperature in the leg where the muscles are hypertrophied than in the corresponding thigh. This, however, is not a constant phenomenon. At first the muscles respond normally, or nearly so, to the galvanic current, both interrupted and continuous ; but when greatly wasted, the muscular response is weak, or even absent. The knee reflex is usually notably diminished. Sensation, however, is unimpaired, and there is perfect control over the bladder and sphincter.

Towards the end of the disease contraction and shortening may occur in certain muscles—usually in those the opponents of which are excessively enfeebled. This is a phenomenon which is seen in other forms of paralysis, and its mechanism is discussed elsewhere (see page 375). There is, however, one form of contraction which has been said by Duchenne to be a constant symptom of pseudo-hypertrophic paralysis. This is seldom noticed before the end of the sixth year. It takes place at an earlier period than the ordinary paralytic contractions, and occurs as a consequence of shortening in the length of the diseased gastrocnemii. These

muscles draw up the heel so that the patient cannot press this part of his foot to the ground, and as the contraction increases a talipes equinus is developed. The deformity is usually symmetrical. When combined with the muscular weakness it makes walking very difficult. Consequently there is nothing to oppose further contraction, and the extension of the ankle soon becomes extreme.

The disease may be associated with idiocy and mental feebleness, as appears from some cases published by Dr. Langdon Down, and with epilepsy and other forms of cerebral deficiency and disturbance. But these do not appear to be an essential part of the disease; indeed, in most recorded cases the cerebral functions have been unimpaired.

The course of the disease is fairly constant, and the age at which the illness reaches its fatal termination varies, as a rule, according to the age when the symptoms first appeared. Thus, if the symptoms have occurred in infancy, the power of standing is lost about the tenth or twelfth, and death ensues between the fourteenth and eighteenth years. If the early symptoms have been delayed until the sixth or eighth year, the patient is less incapacitated by the time puberty is reached, and may live to the age of nineteen or twenty, or even longer. Still, sometimes the disease runs a shorter course, and it may happen that although late to appear the symptoms develope rapidly, and the patient quickly loses all power of supporting himself upright. Even in the fatal cases death is only indirectly the consequence of the hypertrophic disease. When the muscles of the chest become attacked, the inspiratory power is greatly enfeebled, and any accidental lung complication soon assumes alarming proportions. In fact, it is usually to bronchitis or pneumonia that the fatal termination is to be directly attributed.

Diagnosis.—Inordinate size and firmness of muscle combined with extreme weakness and unsteadiness, developing slowly, and becoming gradually more and more marked, without cerebral symptoms, impairment of sensation, or weakness of the bladder or rectum, are the most characteristic features of the disease. The peculiarities of attitude and gait are also to be noted. The position of the child, as he stands with his feet widely apart, his abdomen protruded and his shoulders thrown back, his rolling gait in walking, and his method of helping to straighten the knees by pressing with his hands upon the femur just above the joint, must not be overlooked.

Hypertrophy of the muscles is not always present. Largeness and hardness of the calves are very characteristic, but scarcely any less characteristic are their contraction and wasting with drawing up of the heels. Dr. Gowers attaches great importance in diagnosis to the increased size of the infra-spinatus muscle, with wasting of the latissimus dorsi and lower part of the pectoralis major.

There is little difficulty in distinguishing the disease from infantile spinal paralysis, which comes on quite suddenly, in which the paralysis, at first general, quickly limits itself to certain muscles, faradic contractility early disappears, and wasting is rapid and extreme; nor from spasmodic spinal paralysis, in which spasm is a marked feature, with great rigidity of joints and exaggeration of the tendinous reflexes. It is more difficult to decide between this affection in its early stage and cerebellar tumour, or the indefinite beginning of intracranial disease in well-nourished children—cases where sometimes all that can be detected is that the child is giddy and falls about. Still, in pseudo-hypertrophic paralysis the attitude is unmistakable, and the way in which the child rises from the ground can scarcely be misinterpreted. Progressive muscular atrophy is so excessively

rare in childhood that it may be left out of consideration. It differs markedly from the disease we are considering by being never attended by muscular pseudo-hypertrophy, and by invariably beginning in the upper part of the body. In a child seen by Duchenne it began in the face.

Prognosis.—When the disease is confirmed we can scarcely hope by any remedial measures to stop the progress of the muscular change. If the patient be seen at an early period of the attack, before any enlargement of the muscles has been noticed, treatment is said to afford more hope of success. In estimating the chances of a lengthened course we must take into consideration the period at which the first symptoms were noticed, the rate at which the affection is advancing, and the age and sex of the patient. According to Dr. Gowers, the progress of the disease appears to be often related to the process of growth ; therefore the less the muscular change has advanced at a period when the growth of the body is completed, the greater the likelihood that the disease will become stationary. As a rule, when it appears late it advances slowly. Therefore in the most favourable cases the affection has appeared late, and has advanced but little at the time of full growth of the body. As these conditions are more often found united in girls than in boys, the female sex is in itself a favourable element in the prognosis.

Treatment.—There is little to be done in the way of treatment. Duchenne states that he has succeeded in arresting the disease in two cases by means of faradism, kneading and shampooing the muscles, and the use of baths. Benedikt recommends the continuous current. Arsenic and phosphorus given internally have been thought to be useful by some. Supports to the spine are of service when there is great weakness of the back, and in cases of marked contraction of the calf muscles the tendo Achillis has been divided with great temporary advantage.

CHAPTER XIX.

IDIOCY.

Mental feebleness or deficiency, either congenital or acquired, is, unfortunately, a far from uncommon defect in childhood. The subject is an important one to the physician, for although he may not be called upon to treat such cases, he is often consulted upon the chances of recovery, and every degree of feebleness of mind, but especially the milder forms of imbecility and mere backwardness, may be brought under his notice.

Causation.—Heredity plays a very important part in the production of mental deficiency in the child. Imbeciles, fortunately, do not often marry, but a tendency to neurotic disease, such as insanity, epilepsy, etc., in the parents has a powerful influence in inducing feebleness of mind in their offspring. Dr. Langdon Down, from careful investigation in two thousand cases of idiocy, found that in no less than forty-five per cent. a well-marked neurosis existed in the families of one or both the parents.

The scrofulous diathesis has been said to favour the occurrence of idiocy; and there is no doubt that a large proportion of imbeciles are the subjects of scrofulous cachexia. Still, mental feebleness is not a necessary part of the diathetic disease; indeed, children of very evident scrofulous constitution often display exceptional intelligence. The explanation may probably be that the scrofulous habit tends to foster the influence of a neurotic tendency, and that the latter will operate with greater force and certainty in cases where it is associated with malnutrition in any of its forms. So, also, consanguineous marriages, and intemperance on the part of the parents, are well-known agencies in giving increased energy to any hereditary neurosis or morbid taint. Therefore any instability of the nervous system which may exist in such persons is likely to develope into a new and more striking phase in their offspring.

The above influences are influences of a very general kind, and all children born of the same parents must be equally subject to them. Idiots are seldom "only" children; indeed, statistics show that they are often born of more than ordinarily prolific parents whose other children exhibit no sign of intellectual deficiency. This being so, we must look for other and more special causes for their mental failing.

These special causes may either operate during gestation, at the time of birth, or after the child is born.

It is a suggestive fact that out of the two thousand cases investigated by Dr. Langdon Down no less than twenty-four per cent. were primiparous children. The cause of this undue preponderance in the first-born is no doubt owing, as Dr. Down points out, not only to the exalted emotional state of the mother during her first pregnancy—a state in which all causes of disturbance would naturally operate with exceptional force, but to the tediousness of the first labour, which is apt to give rise to a condition of suspended animation in the infant. Dr. Down's statistics well illustrate

the force of these influences. Twenty per cent. of the idiots were born with well-marked symptoms of suspended animation ; and of idiots born in this condition, and only resuscitated by assiduous labour, no less than forty per cent. were first-born children. Bearing upon the same matter is the fact of the preponderance of male over female idiots, for the larger head of the former would increase the difficulty of parturition, and conduce to the state of suspended animation which experience shows to be so hurtful to the cerebral functions.

Whether the mother be a primipara or not, powerful emotional shocks are injurious, and may act very unfavourably upon her offspring. In no less than thirty-two per cent. of Dr. Down's cases there was a well-founded history of mental shock. Again, excessive sickness, by impairing the mother's nutrition, is also calculated to exercise an unfavourable influence upon the intellectual development of her infant. Dr. Langdon Down found in ten per cent. of his cases a history of marked and persistent vomiting.

After the child is born other causes come into operation. The mental incapacity may develope at a constitutional crisis, such as the time of the first or second dentition, or of puberty ; the amount of brain-power which had been previously sufficient for the wants of the economy failing to carry it through such critical periods of development. Masturbation in these cases may be an important factor in determining the break-down. Again, accidental causes may come into operation in a child who had never shown symptoms of mental failure. Thus, he may become idiotic as a result of repeated convulsions or epileptic attacks, of chronic hydrocephalus, of injuries or blows upon the head, of some inflammatory condition occurring as a complication of acute disease, and of impairment of the senses interfering with the development of the intellectual faculties.

One form of idiocy—cretinism—is endemic in certain parts, although it may also occur sporadically.

Morbid Anatomy.—In most cases of idiocy—in all in which the mental deficiency is congenital—the brain is small and often imperfectly developed as well. There may be great simplicity in the convolutions, approaching to the condition of the brain in the anthropoid apes ; there may be atrophy of the medulla oblongata, and asymmetry of the base of the brain ; absence of the corpora geniculata, the corpus callosum, or even, as was seen in a case recorded by Cruveilhier, the whole cerebellum ; the convolutions may be shrunken and the brain substance hardened. In other cases the child may be from birth the subject of chronic hydrocephalus. The brain is sometimes abnormally large, but may present no obvious change to the naked eye. Still, from the researches of Dr. M. Jastrowitz it seems that even in these cases careful microscopic examination may detect alterations in structure in the minute tissues of the brain, especially a persistence of anatomical elements which are normal in the embryo, but which ought to have passed into another form in the growing child.

Again, there may be cranial as well as cerebral abnormalities. The sutures and fontanelles may undergo premature coalescence ; and if there be no compensation by unusually slow ossification at the base, allowing of greater expansion in that region, the entire cranium is well proportioned but very small, and profound disturbance of the growth of the brain is the consequence. If, however, there be basic expansion, a special type of physiognomical and physical development, which Griesinger has described as the "Aztec" type, results. When the base of the cranium is shortened by ossification, it is indicated to the eye by malformation of the face. We

find the eyes widely separated, a prominent ridge to the nose, and high and prominent cheek-bones. There may be actual microcephalus, and the development of the pons and medulla is often affected. Usually, however, a certain compensation is found in extension of the skull in different directions, producing many varieties in the shape of the cranium, and allowing of more or less expansion of the brain in the upper regions.

Varieties.—Many different methods of classification of idiots have been proposed. There is the psychical classification of Esquirol, in which the idiot is arranged into three classes, according to the degree of speech of which he is capable. The first class includes those who use merely words and short phrases. The second class consists of those who can articulate monosyllables or certain cries. To the third class are referred those who are capable of articulating neither words nor monosyllables.

Idiots may be also arranged into three classes according to the development of nervous function. A first class exhibits nothing beyond the reflex movement known as excito-motor. In a second class the reflex acts are consensual or sensori-motor, including those of an ideo-motor or emotional character. In a third class we see manifest volition ; their ideas produce some intellectual operations and consequent will.

Another classification is that suggested by Dr. Langdon Down, according to their resemblance to ethnological types—the Caucasian, Ethiopian, Malay, and Mongolian. Dr. Down has also proposed a good practical classification, based on etiology, into 1, Congenital ; 2, Developmental ; 3, Accidental.

The congenital group embraces all those cases where the signs of mental deficiency date from birth, and includes as subdivisions : *a*, Strumous ; *b*, Microcephalic ; *c*, Macrocephalic ; *d*, Hydrocephalic ; *e*, Eclampsic ; *f*, Epileptic ; *g*, Paralytic ; *h*, Choreic.

The developmental idiot is a child who is born with a fair amount of brain power, but who breaks down at one or another of the developmental crises—at the first or second dentition or at puberty. Such children lose the power of speech and their minds seem to give way at one of these evolutional stages. The group includes as subdivisions : *a*, Eclampsic ; *b*, Epileptic ; *c*. Choreic.

In accidental idiocy the mental break-down is the consequence of some shock or traumatic injury, or disease operating upon a healthy child born free from any tendency to intellectual deficiency. This group includes : *a*, Traumatic ; *b*, Inflammatory ; *c*, Epileptic.

Symptoms.—In cases of congenital idiocy the baby begins from an early age to show that he is not the same as other infants. The development of his faculties does not run the ordinary course. He cannot support his head like another child, but lets it hang back on his nurse's arm. Then, he takes little notice. A healthy infant will often recognise his mother by the sixth week ; but long after that period the idiot child shows no recognition of faces. His eyes have a vacant look, seem incapable of fixing upon an object, and often oscillate from side to side (nystagmus). Again, he does not smile or laugh as a child will do whose mental development is advancing naturally ; and manifests a strange inability to grasp with the hand. A healthy child's fingers curl round any object presented to them at a very early age, but the idiot infant seems to have no power of making any use of his hands. Moreover, when danced up and down, his muscles do not contract in sympathy with the movement. He seems to derive no pleasure from the exercise, but remains a dead weight like a heavy doll.

The head is usually noticed to be peculiar in shape from an early age. It is often high in the crown, and perhaps the fontanelles are closed, or nearly so, at the end of six months. Again, from the investigations of Dr. Langdon Down it appears that a high-vaulted palate—the V-shaped palate—with a very narrow transverse diameter is a common deformity of the congenital idiot. The tongue is often corrugated with transverse furrows, and sometimes is not completely under command. It hangs out of the mouth, and the child dribbles in an unusual degree even for a baby. The teeth are commonly late in being cut and often appear irregularly.

At twelve months old, when the child should be able to stand, or should at least crawl on the floor and try to raise himself on to his feet, he lies just as he is put down, without an attempt to move himself along. Often he does not learn to walk until he is three or four years old. It is also difficult to teach him cleanly habits, and he remains infantine in his ways at an age when other children have long been taught decency and order.

When idiocy is congenital, growth and development are impaired as well as mental power, and the general health is far from satisfactory. The patient is stunted in his stature and looks younger than his age. The circulation is often feeble, and the temperature a degree or two lower than that of health. The feet are cold. The heart is frequently small and weak in structure, and there may be an open foramen ovale or other congenital deficiency. Often other malformations are seen, as imperfect development of one or more fingers, a club foot, or some strange shape of the ears. Such children may show signs of rickets, and are not seldom of decidedly scrofulous constitution. As they grow up, an unpleasant smell is often noticed about the body and breath. In bad cases automatic movements are present; chorea and epileptic fits are common complications, and the senses are frequently dull.

Griesinger describes two special varieties of idiots—the apathetic and the excited.

The apathetic class are awkward, clumsy, and disproportioned, with repulsive, old-looking features. From their torpor and impassiveness they seem to be in a dreamy state. Their expression is either brooding and melancholy, or vacuous and indifferent.

The excited or agitated class are just as stupid as the other, but are quick in movement and irritable, passing rapidly from one impression to another, and quite incapable of fixing anything on their mind.

Between these two principal groups there are many intermediate varieties.

There is one form of idiocy, endemic in some countries, sporadic in others, which merits a separate description. This is cretinism. The feebleness of intellect from which cretins suffer is combined with striking peculiarities of bodily structure. The condition is always congenital. It is not hereditary in the ordinary sense, although where the other conditions inducing the disease prevail, the child will become cretinous more certainly if born of cretinous parents. The disease has been said to be dependent upon the general causes of ill health—bad air, bad water, imperfect drainage, insufficient light and poor food, combined with the use of water loaded with calcareous salts. It may therefore prevail in any quarter of the world where these conditions are found; and certain close valleys in the Alps, Pyrenees, and Himalaya mountains are especially notorious for the number of cretins born in them. The value of these causes in producing the condition has, however, been called in question. Perhaps it is best

to say that nothing positive is known with regard to the etiology of the disease. Whatever the cause may be, it appears to be also the cause of goitre, for cretinism and goitre are frequently associated. It has been said that acting feebly the causes produce goitre, acting strongly they give rise to cretinism ; but even this is hypothesis. Cretins are not invariably goitrous. Indeed, in sporadic cases, such as occur from time to time in London, it is not uncommon to find that the thyroid body is absent. In two cases which came under my own notice no trace of a thyroid body could be detected. It is in places where cretinism is endemic that it is usually complicated with goitre ; but even in such neighbourhoods the goitre is not confined to cretinous subjects ; and the area over which goitre is endemic is much larger than that in which cretinism is prevalent.

Virchow's researches have done much to elucidate the chief feature of cretinism. According to this authority, it consists in an abnormal tendency to ossification and coalescence of the three bones which represent the bodies of the last three cranial vertebræ, viz., the basilar process of the occipital bone, the post-sphenoidal, and the præ-sphenoidal bones. In the normal condition ossification in these bones goes on slowly from behind forwards, and traces of unossified cartilage may be found as late as the thirteenth year. During the whole of this time the cartilaginous parts are still growing, and allow of expansion of the base of the skull and enlargement of the cranial cavity in proportion to the wants of the growing brain. In the cretin, in whom ossification in these parts takes place early, the base of the skull cannot elongate ; the distance from the crista galli to the occipital foramen remains short ; the corresponding parts of the brain are imperfectly developed, and the form of the skull is modified. Moreover, the bones of the skull are in many cases greatly thickened and the foramina narrowed. The bones of the limbs frequently show the same tendency to rapid ossification, and the shafts form early union with their epiphyses. Consequently, the growth of the bones is imperfect. The brain undergoes many modifications. Important parts, such as the ganglia at the base, are often ill developed, the medulla oblongata may be small, and the fissure of Sylvius shallow and ill defined.

The physical and mental characteristics of the cretin are well illustrated by a case which was under my care in the East London Children's Hospital. The patient was a little girl, aged seven years, who had come of a healthy family on both sides. She had five perfectly healthy brothers and sisters. The family lived in Shadwell, in the neighbourhood of the hospital. The child was said to have been a fine baby at birth, but as the months passed no teeth appeared, and she showed no inclination to stand or even crawl upon the floor. She generally seemed very dull and apathetic, but sometimes brightened up and became more lively.

At seven years of age, when admitted into the hospital, she was barely thirty-one inches in height. She looked very broad for her height, and weighed thirty-one pounds eight ounces. Head large, nineteen inches in circumference, covered by long, sparse, coarse hair of a dull reddish brown colour ; features large and coarse ; bridge of nose depressed ; eyes wide apart ; lips thick and pouting ; mouth generally kept half open ; teeth square, as if worn down ; tongue large ; eyes gray and dull-looking ; expression vacant as a rule, but sometimes brightening up when amused with a doll or ball. No trace of a thyroid gland could be discovered ; above each clavicle was a semi-globular mass, about the size of a Tangerine orange. The skin was rather dry and shrivelled-looking, with a yellowish tint. The chest was well formed. There was no beading of the ribs or

other sign of rickets. The tibiæ were somewhat bowed outwards, but the limbs were massive and the flesh firm.

The child smiled when spoken to, and could say the word "doll," but appeared to apply it indifferently to all kinds of toys. She could not walk, but crawled about on her hands and feet, keeping her knees raised. When she reached a table or bed, she would raise herself into an upright position with her hands and stand holding by it. The child passed urine and fæces in the bed. Her temperature was habitually subnormal.

The soft globular lumps above the clavicles are frequent in the sporadic form of cretinism. In Mr. Curling's cases they were found after death to consist of fatty tissue.

In another case which came under my notice the patient, who had the appearance of a child, was really over seventeen years of age. His height was half an inch under three feet, his weight, thirty-six pounds fourteen ounces. He had all the physical peculiarities described in the previous case, but was more intelligent and cleanly in his habits. He could answer simple questions as to his food intelligibly. He had the same fatty masses in the supraclavicular hollows, and no thyroid body could be felt. His genitals were those of a child, and he never manifested any sexual propensities.

The symptoms of cretinism seldom appear before the sixth or seventh month. The head is usually large, for cretins never belong to the microcephalic type. The palate is often flat, and not highly arched, as in ordinary congenital idiocy. These patients are usually quiet and good-tempered, although subject to occasional fits of passion. Their senses are often dull, and they endure great cold and heat without apparent discomfort. It is, however, one of the characteristics of idiots generally that their senses are obtuse: they can often bear pain with singular indifference; their taste is not uncommonly impaired or perverted, and sometimes they have but a faint sense of smell. Often their sight is defective from congenital cataract, or imperfect sensibility of the retina, or hypermetropia with diminished accommodation; but unless they have suffered from disease of the ear, their hearing is usually of normal acuteness.

The mental condition of idiots has many varieties. In the lowest form there is complete apathy and torpor; no power of attending to or even recognising their own wants, and no capacity to speak or to understand words spoken to them. Such beings can only make unintelligible noises. They have not the slightest power of will, and seem to have little power of originating a movement, but often repeat mechanically some automatic motion of the head, the body, or a limb.

At the other end of the scale is mere feebleness of mind. Such children can be taught to read, and are capable of great improvement by kindness and perseverance. Even in the higher class of idiots speech is usually defective, partly from malformation of the mouth; partly from want of co-ordination of the lingual muscles; but chiefly, no doubt, from the poverty of their vocabulary, and the small stock of words to which they attach any definite meaning. In all the severer forms of idiocy no attempt at speech is ever made; and, as Griesinger observes, the idiot who does not speak has no internal idea of speech, and is therefore "deficient in the most essential element in the mechanism of abstraction."

Idiocy has been described as a fixed infantile condition, and the idiot has been compared, as regards intelligence, with a healthy child of so many months or years of age. An idiot, however, is not merely a backward child. With him volition is feeble or quite absent; and he has little

imagination or power of abstract thought. Therefore, although his actual degree of intellectual development may correspond with that of the younger child, there is a something still wanting, which if wanting in the child with whom he is compared would occasion very serious anxiety. Sometimes one faculty is developed in idiots to the exclusion of all others. In all treatises on this subject instances are given showing remarkable aptitude for music, drawing, and reckoning; also for various forms of mechanical construction as carpentering, model-making, etc.

Diagnosis.—Idiocy must be distinguished from mere backwardness, and also from cases where the development of the mental faculties suffers through deficiency in the sense of hearing.

Mere backwardness, even when present in a marked degree, is far removed from idiocy. The class of backward children presents many points of interest. The delay in development is usually physical as well as mental. They are small but not usually deformed; and there is no symptom of disease of brain or disorder of mind. They are simply backward children in whom progress of every kind takes place very leisurely. Instead of learning early to walk, and picking up words and ideas with the quickness of a healthy child, they are slow to walk, slow to talk, slow to quit the habits and helplessness of the baby for the decency and independence of later childhood. Still, they do not remain stationary like the idiot; they do learn, although slowly; and with patience can be taught in time much that forms the education of a child of ordinary capacity. Backward children, however, sometimes become idiotic. If they happen to be also epileptic or addicted to self-abuse, they may gradually become duller and duller and fall into a state of complete idiocy.

In all cases of backwardness, especially of lateness of talking, with apparent dulness of mind, the state of the hearing should be inquired into. A child who hears imperfectly is always slow in acquiring the power of articulation; and besides, as Dr. West has pointed out, his difficulty with this defect of keeping up intercourse with other children makes the patient dull, suspicious, and unchildlike.

Idiocy, when confirmed, is of interest chiefly to the specialist. The ordinary practitioner is most concerned with the early symptoms of mental feebleness, as this is seen in the infant. Nothing is commoner than for the family physician to be consulted because the baby "does not seem to take notice."

In a healthy infant the senses come into play in the following order: Sight is the earliest to manifest itself. A fortnight after birth the infant's eyes should follow a light, as that of a lamp; and at the end of a month or six weeks he is often able to recognise his nurse and will smile when she approaches. During the first few weeks babies often squint, especially when looking at a near object. Later they become more expert in focusing their eyes to suit various distances.

The child seldom gives evidence of hearing sounds before the third month, although Darwin states that his infants started at sudden noises when under a fortnight old. Babies do not recognise voices until after the fourth month, and it is the eighth or ninth month before they begin to recognise objects by name.

With regard to movements: a child of two months of age will raise his head from the pillow; and after the third month will begin to use his hands and to toss up his head. At this time (the third month) he can support his head well. It is usually the ninth month before the child "feels his feet," *i.e.*, presses his soles to the ground when held to the

floor. He should walk some time between the tenth and the eighteenth month.

A healthy infant should keep his tongue within his mouth from the earliest age. His fontanelle should not close before the eighteenth month, nor be completely ossified before the end of the second year.

The faculty of speech is acquired much more quickly by some children than by others. Most babies will begin to say words after the end of the first year, and many can talk freely by the end of the second.

It is seldom before the end of the sixth month that any suspicion is felt that all is not right with the infant's mental development. Then it is usually the vacancy of his expression, the absence of any smile to greet his mother's approach, some peculiarity in his way of taking food, and the dead weight of the child as he lies with his head back in his nurse's arms that first excites the anxiety of the parents. In such cases we notice the weakness of the muscles of the back and neck, and their inability to support the head or keep the body erect for a moment, the nystagmus, the vacant look in the eyes, which never seem to fix upon an object, and cannot be made to follow it when it is moved before them, the abnormal flow of saliva from the mouth, and the passiveness of the child's hand when a finger is placed in it—so different from what occurs with the healthy baby who at once squeezes anything which touches his fingers. On inquiry we find either that the child is always whining, or that he is strangely silent and pays no attention to sounds which please other infants of his age; also, perhaps, that he takes the breast or bottle very slowly, and often makes a curious choking noise at the back of his nose. In such cases we generally find that the palate is narrow and highly arched (the **V**-shaped palate); that the head is small and of a curious shape—unsymmetrical, or very high and narrow in the crown; that the fontanelle is excessively small or quite closed; that the hands and feet tend to be cold; that the muscles feel flabby, and on examination we can sometimes discover a congenital heart complaint, a club foot, or some other form of congenital deformity. Dr. Langdon Down has drawn especial attention to the appearance and position of the ear. A helix or the lobule may be quite absent, and the pinna is often planted farther back in relation to the head and face than in the healthy child. Dr. Down also directs that the position of the eye, as to obliqueness, as well as degree of separation, should be noted, as there is often an approach to the ethnical variety described by this physician as the Mongolian type. Also, that the integument about the eyes should be examined for semilunar folds of skin at the inner canthus (epicanthic folds), which are more common in feeble-minded infants than in the healthy.

The cretin can usually be recognised without difficulty by his stunted growth; his large head; his depressed nose, with widely separated eyes; his dull, heavy expression; wide mouth, broad lips, and thick tongue; his shrivelled-looking tawny skin; his heavy limbs and awkward walk. If the disease is endemic, there is probably a goitre; if sporadic, we notice the curious fleshy elastic masses above the clavicles and the absence of a thyroid gland.

Prognosis.—The most hopeful cases are those in which the defect is a congenital one; the worst are those of accidental origin who bear in their faces and persons little trace of their infirmity. Paralysis or epilepsy, or other form of nervous instability, increases the difficulty of the case. So, also, general feebleness of health is a bar to improvement; and profound scrofulous cachexia, or a weak heart and feeble circulation, render the patient less responsive to systematic training than another whose nutrition is more satisfactory.

Dr. Edward Seguin regards as favourable signs: Steadiness of the walk, which deviates little from the centre of gravity ; a hand firm without stiffness, and not disturbed by automatic movements—one which can take and leave hold at command ; an unimpaired state of the senses, especially a look which is easily called into action ; a command of the words, however imperfect or few, which the child may possess, so that they have a connected meaning and come out opportunely ; activity without restlessness ; willingness to obey ; sensibility to praise, and capability of returning as well as of receiving caresses.

A contrary state of things must be looked upon as unfavourable. Moreover, if some feelings of affection have been developed by kind parents, and are not followed by corresponding intellectual progress ; or if the idiocy is complicated by extensive paralysis, or worse, by epilepsy, the prognosis is very bad.

Treatment.—In the treatment of idiocy our first care should be to attend to the general health of the patient, so that he may be put physically into as good a condition as he is capable of reaching, and afterwards to inculcate volition and co-ordinated voluntary movement by careful physical training ; to attend to his moral education, and do what can be done to develop his intellect.

It is very important that the idiot should be removed from the society of healthy children, whose games he cannot share, and whose companionship he cannot enjoy, to association with beings afflicted like himself, in the presence of whom he is not oppressed by a painful sense of inferiority. It is indispensable to the due progress of the feeble in mind that they should be received into asylums and establishments especially devoted to the treatment of such cases. In these every means can be adopted to counteract the scrofulous tendencies of which a large proportion of the patients are the subjects. The building can be erected at a suitable elevation on a porous soil of sand or gravel. The rooms and passages can be large, well ventilated, and suitably warmed. Moreover, a proper system of bathing and shampooing can be established to promote the healthy action of the skin and invigorate the feeble muscles.

The dietary should be liberal, and presented in a form to suit the peculiarities of the patient, for many idiots cannot chew their food. Some, indeed, can only swallow it when it is placed far back on the tongue, so that it may come within the grasp of the pharyngeal muscles.

Residence at a special training school, it is generally held, should begin when the patient is about seven years of age, unless the existence of constitutional disease, epileptic fits, or other complication requiring constant medical supervision necessitate earlier admission. The system of training can be divided into three branches : physical, moral, and intellectual.

The physical training consists in careful education of the muscles by regular co-ordinated movements which bring the will into exercise, and substitute purposive acts for the aimless automatic motions which are so characteristic of the vacant mind. The exercises are graduated, and pass from the simplest movements to others more complex in character, so that, as Dr. Langdon Down observes, "the idiot builds up a series of co-ordinated voluntary movements which are applicable to the wants of daily life."

Moral education teaches the child obedience, and encourages him to endeavour to win the approval and retain the affection of his teachers by doing what he is told is right, and avoiding what he is told is wrong.

The intellectual education is based on a cultivation of the senses.

Touch and feeling are trained to appreciate differences in the form of objects, beginning with simple things and proceeding gradually to the more complex. Sight is cultivated by making the patient appreciate light and darkness, and accustoming him to match coloured counters or string coloured beads. So on with the other senses. Everything that is taught should be taught in the beginning in the simplest way, and we should make sure that the first fact has been thoroughly grasped before we pass on to the second. In this way the mind is educated through the senses, and in time by patience and perseverance astonishing results may be often obtained.

Part 6.

DISEASES OF THE ORGANS OF RESPIRATION.

CHAPTER I.

EXAMINATION OF THE CHEST.

The affections of the lungs constitute a very important branch of the diseases of childhood. The study of these complaints must no doubt present peculiar difficulties, for persons who are fairly conversant with the ordinary maladies of early life will often profess their inability to understand them. In many cases an examination of the chest in a child cannot be carried through without much tact and management; in others the utmost gentleness will not reconcile the patient to a procedure of which he only perceives the inconveniences; and even in the most favourable cases the observer meets with peculiarities in the physical signs which in one unaccustomed to such youthful patients may give rise to considerable perplexity.

In order to examine the chest of a child with success the patient must be raised up to a convenient height. If we stoop down to a child as he sits upon his nurse's lap, our own position is cramped and uncomfortable. Fully to appreciate minute deviations from a healthy state the attitude of the observer should be one of ease. In the case of an infant, to examine the front of the chest the child should be laid upon his back on a cushion placed upon the table. Some babies, however, cry at once when laid upon the back. In such cases the patient may be placed in a sitting position on the cushion supported by the nurse. When the back is examined the nurse should stand up and take the child on her left arm, so that his head and right arm hang over her left shoulder, and his left arm is loosely applied round her neck. In this position the muscles of both shoulders are relaxed. An older child can be seated upon a table for examination. It is needless to say that in both cases the patient should be completely stripped to the waist.

Much may be learned from mere *inspection* of the chest. In the case of an infant the points to which attention should be directed have already been referred to (see page 12). In children of four or five years old and upwards we can often ascertain by this means the existence of a constitutional predisposition. In children of consumptive tendencies the lungs are small. As a consequence the thorax is forced to adapt itself to the size of its con-

tents. The shoulders are narrow and sloping; the ribs are very oblique and the chest elongated; and the scapulæ project backwards like wings. The prominence of the shoulder-blades has given the name of "alar" or "pterygoid" to this variety of chest. In small-lunged children, and children with vulnerable chests, the thorax is often flattened anteriorly, so as to diminish the antero posterior diameter. The flattening is due to yielding of the costal cartilages under the pressure of the atmosphere when the lungs are expanded in the act of inspiration. It is usually the consequence of narrowing of the air-tubes from catarrh of the mucous membrane. If we notice the shape of the chest to correspond to either of these types, we must examine the apices very carefully for signs of disease. Moreover, in the treatment of even the simplest pulmonary derangement in such cases we must be careful to follow up any special medication by invigorating measures, and wait for complete cessation of the cough before permitting the child to resume the ordinary habits of health.

If we notice an infra-mammary depression on each side of the chest, with some prominence of the lower part of the sternum, we infer that the patient has been subject to long-continued or frequently repeated attacks of pulmonary catarrh. In these attacks the air-tubes are narrowed by the presence of catarrh, so that air penetrates insufficiently into the lungs, and expansion, especially of the inferior lobes, is incomplete. As a consequence the lower ribs, corresponding to the imperfectly inflated tissue, are retracted at each descent of the diaphragm. As the lower ribs fall in, the lower end of the breast-bone is forced forwards, so that a horizontal section of the chest at this point, instead of elliptical, would be triangular. After a succession of these catarrhs a certain amount of permanent collapse is induced in the lower lobes, and the deformity becomes a permanent one. The prominence of the sternum from this cause constitutes one of the varieties of "pigeon-breast." The rickety chest is also pigeon-breasted, as is explained elsewhere (see page 139).

The central cup-shaped depression of the lower end of the sternum and corresponding cartilages, sometimes met with, has been referred to in a previous chapter (see page 12).

The movements of the chest in inspiration must be carefully noted. Sometimes we find a general exaggeration of movement combined with imperfect expansion of the chest-wall. This abnormality indicates a pressing want of air from some impediment to the efficient expansion of the lungs. When bilateral, it is seen in cases of catarrhal pneumonia, in advanced phthisis, and in double pleurisy and hydrothorax. When unilateral, it may be produced by one-sided pleurisy, pneumothorax (a very rare condition in the child), extensive fibroid induration, or condensation of lung from a former pleurisy with firm pleural adhesions.

In early life the thoracic walls yield readily to the pressure of the external air, and this pliancy is especially noticeable in infants and rickety children. Consequently in them dyspnœa is often indicated by more or less retraction of the chest-wall in inspiration. This retraction is mostly in the infra-mammary region, and in pronounced cases may produce a deep horizontal furrow across the base of the chest at the level of the ensiform cartilage. If the retraction is limited to this part, it indicates in most cases a catarrh of the inferior lobes of the lungs, which are insufficiently filled with air; but if the ribs are very soft from rickets, the depression may be noticed in ordinary respiration although the lungs are sound. Sometimes the soft parts of the chest also sink in. The intercostal spaces are hollowed; the suprasternal notch and supraclavicular spaces

are excavated; and if the dyspnœa reach an extreme degree, the lower half of the sternum with its attached cartilages is depressed into a deep pit at each inspiratory movement. When the retraction is thus pronounced, there is usually an impediment at the upper part of the trachea. Retraction to this degree is seen in membranous and stridulous laryngitis, in narrowing of the glottis from any cause, and in cases of lodgement of a foreign substance in the upper part of the windpipe. Still, even in some cases of pleurisy with effusion, marked retraction is seen on both sides of the chest although the impediment to full inspiration only affects one lung.

Enlargement of one side of the chest can sometimes be detected by the eye; but it is more accurately estimated by the cyrtometer.[1] A tracing made from this instrument upon paper shows immediately if one side of the chest be larger than the other. A characteristic sign of pleuritic effusion is dilatation and squareness of outline of the affected side.

Unilateral shrinking, from fibroid induration, or old pleurisy with firm adhesions, may be also readily estimated by the same means.

Deficiency of movement of the chest is sometimes better appreciated by the *hand* than by the eye. The hand also detects vibration of the chest-wall, if this be present. In children, however, there is seldom a normal fremitus when the child speaks or cries; for in the high-pitched notes which alone escape from the childish larynx the vibrations succeed one another too rapidly to be readily perceptible by the hand. Consequently, unilateral absence of this sign, which in the adult is an important means of distinguishing between consolidation of the lung and liquid effusion in the pleura, fails us in the case of young patients. Even when detected, vocal fremitus furnishes no certain indication. If present on the sound side, it may be felt strongly over a liquid effusion, for the vibration is readily conducted by the thoracic wall from one side of the chest to the other. I have known it to be felt strongly on the affected side in a case of recent absorption of pleuritic fluid, although almost absent on the sound half of the chest; and again, in a case of apparently exactly similar kind it has been completely absent over the seat of disease, although present elsewhere.

A rhonchal or friction fremitus is much more common than a vocal vibration in the young subject, but the sign is of little value. Fluctuation can sometimes be discovered in the interspaces in cases of pleuritic effusion and is a valuable sign of the presence of fluid. To detect it, a finger of each hand should be placed at the two extremities of the same interspace. The impulse of a gentle tap is then often conducted distinctly through the fluid from one finger to the other.

The exact site of the apex-beat of the heart should be always ascertained, as this may be greatly influenced by disease in the chest cavity. In young children and infants the normal position of the heart's apex is nearer to the left nipple than is the case in the adult. This is partly due to the position of the nipple, which is placed relatively lower than it is in later life. In many children, instead of lying over the fourth rib it is in the fourth interspace or on the upper border of the fifth rib. But in addition to the lower position of the nipple, the heart itself is relatively smaller or seems to lie higher in children, especially during the period of infancy.

[1] A perfectly efficient cyrtometer may be made by taking two pieces of soft metal, without resilience, such as composition gas-tubing, drawn out to one-eighth of an inch, and uniting them by a piece of caoutchouc tubing.

Often the apex will be found to beat in the fourth interspace, exactly on the site of the nipple.

Diseases of the heart-walls of course influence considerably the position of the apex-beat; but when the organ is healthy, the position of its apex may be altered by morbid conditions in neighbouring parts. Effusion into the chest cavity causes displacement of the heart's apex. According to the side affected the heart may be pushed considerably to the right or to the left. In cases of left pleurisy with copious effusion it is not uncommon to find the apex-beat of the heart in the epigastrium, and sometimes the impulse can be felt to the right of the sternum. Cardiac displacement does not, however, always result from effusion into the pleura; and therefore its absence must not be taken to indicate that the physical signs are capable of another interpretation. If adhesions have formed between the pericardium and the left pleura, the heart is held in place and cannot be pushed aside by the effusion. The position of the heart may be also altered by contraction of the lung on one side, but in this case the heart is drawn towards the affected part. In fibroid induration of the lung, disease on the right side moves the heart to the right; disease on the left side draws the organ upwards and to the left.[1]

Besides the position of the heart the exact level of the liver and spleen should be noted, as the position of these organs may help us to a conclusion in a doubtful case. These viscera are often sensibly displaced by the pressure of a liquid effusion in the chest, while displacement of the liver by the bulging of a croupous pneumonia is so rare as to be a clinical curiosity. If the lung be contracted, the liver or spleen is drawn upwards into the chest.

Percussion of the chest in the infant and young child should be conducted with deliberation. If care be taken that the hands are perfectly warm, and that undue violence is avoided, the process seldom arouses any special opposition. It is sometimes recommended to reverse the ordinary arrangement and practise auscultation before employing percussion, but this inversion of the customary rule is at least unnecessary.

In the young subject, except perhaps in the new-born infant, the resonance of the chest is greater than it is in after-life; and the percussion note obtained over an area of consolidation is often so modified by resonance from healthy tissue around that dulness is only imperfectly marked and may escape the notice of an unpractised ear. Percussion should be mediate; and it is advisable always to use two fingers in striking the finger placed upon the chest-wall. By this means, without employing undue force, a larger body of sound is elicited than if the chest is struck with one finger only, and dulness, if present, can be more readily appreciated. As we proceed we must be careful to make constant comparison between different parts of the chest—between opposite sides, between the base and the apex, etc. To make the comparison an accurate one the same period of the respiratory movement should be chosen for striking upon the finger; for if one part of the chest be percussed at the end of an inspiration, and another at the end of an expiration, the difference even in a healthy chest may be considerable. When the consolidation consists in scattered nodules, as in the beginning of catarrhal pneumonia or in lobular collapse, dulness, which escapes the ear when percussion is made in the ordinary manner may often be detected by using "broad percussion," *i.e.*, by strik-

[1] Displacement in the same direction (upwards and to the left) may be a consequence of enlargement of abdominal organs or distention of the peritoneal cavity by fluid.

ing with three fingers upon three fingers placed upon the chest-wall as plexímeters. By this means the sound is collected from a larger area of lung-tissue than if one finger only were employed.

But besides the character of the sound elicited in percussion, it is important to attend to the degree of resistance of the chest-wall. The resistance to the percussing finger varies greatly in different cases and is a sign of no little importance. In the consolidation of pneumonia and in that of pulmonary atelectasis, when the collapse occupies only a superficial layer of tissue, resistance is slight. In more extensive collapse, as when the condensed tissue embraces an entire lobe, and in fibroid induration of the lung, the resistance is greater ; but the maximum of resistance is reached in cases of cirrhosis of the lung, with superadded catarrhal pneumonia, and in pleuritic effusion. The resistance is here extreme, and the sensation conveyed to the finger is that of percussing a thick block of wood. It is very important to educate the sense of touch so as readily to appreciate the several degrees of resistance, as this faculty is a great addition to our resources in the matter of diagnosis.

In percussing the supra-spinous fossæ it is very necessary to see that the muscles of the shoulders are equally relaxed on both sides. Elevation of the shoulder, or a cramped position contracting the muscles of one side, will modify the percussion note and make the sound more or less dull, although the lung is perfectly healthy. If an infant be placed in his nurse's arms in the position already described, and an older child be made to sit with arms folded, shoulders depressed and back slightly bowed, the results of percussion may be depended upon. Too much stress should not be laid upon slight differences between the two sides. A temporary collapse of the air-cells at the apex is not uncommon from imperfect expansion of this part of the lung, and therefore slight dulness noticed at one visit may on the next have completely disappeared. There is also a special source of error in percussing the posterior bases of the lungs in children which it is important to be aware of. In young subjects the liver is relatively large, and rises higher on the right side of the chest than it does in older persons. There is therefore normally a certain dulness of percussion in the right infra-scapular region. This dulness is more extensive in some healthy children than it is in others. We may recognise the cause of the modified note by remarking that the breath-sounds at this point, although weak, are perfectly healthy.

Special varieties of the percussion note have little or no diagnostic value in young subjects. The tubular (or tracheal) note is often obtained in various states of the lung-tissue, and is not characteristic of any special condition. The "cracked-jar" note is a natural phenomenon in early life if the yielding chest be percussed during expiration or when the mouth is open.

In *auscultation* of the chest, however young the child, the stethoscope should always be used. This instrument is even of greater value in the young subject than it is in the adult, for the chest being smaller, it is more important to limit as narrowly as possible the area under investigation. I have rarely known children object to its employment if the instrument had been first placed in their hands and spoken of as "a trumpet." Indeed, the use of this familiar word usually awakens their interest and actually facilitates the examination.

In the normal state the breath-sounds are coarser and harsher (puerile respiration) than they become in older persons, and this harshness in certain patients is so pronounced that it is not unfrequently mistaken by an

inexperienced observer for a sign of disease. The harsh character of the breath-sound is especially marked at the apices, and the expiration at this part of the lung is often prolonged without the peculiarity being an abnormal phenomenon. Conduction of sounds from the pharynx and trachea to the apices is especially common, and it is not rare to find the respiration at the supra-spinous fossæ curiously loud and hollow or blowing, although the lungs are healthy. This hollow breathing is no doubt conducted from the throat. It is often a sign of enlargement of the bronchial glands, these bodies forming a medium of communication between the windpipe and the wall of the chest. It may be heard, however, in cases of enlarged tonsils, and is sometimes present, while the mouth is closed, in children in whom no other morbid condition of any kind can be discovered. In such cases it is greatly modified in character when the mouth is open. The source of this variety of blowing breathing can usually be detected by noticing that it is heard equally plainly at both apices, is chiefly marked in expiration, and is accompanied by no rhonchal sound or any dulness of the percussion note.

Weakness of the vesicular murmur is much less common as a normal condition than loudness of the breath-sound. It is, however, present in some children as an individual peculiarity. If general over both sides, it is a sign of no importance. If limited to particular spots, it is of greater moment, and when noticed at the base of one side should not be disregarded. It may be an early sign of pleurisy or may indicate collapse. At the apices it often arises from insufficient expansion of lung-tissue, and may be of trifling consequence. In such a case it usually passes off quickly, and at the next examination may no longer be detected.

The readiness with which sounds are conveyed from one part of the chest to another is a common source of error. Thus, sounds generated at the base of one lung may often be plainly heard at the corresponding part of the other and healthy lung. In cases of dilated bronchus from fibroid induration it is not uncommon to find cavernous breathing with metallic gurgling rhonchus at both posterior bases—on the sound as well as on the affected side. So, also, a subcrepitant râle developed in one lung may be plainly heard on the opposite side, perhaps over the site of a loculated pleurisy or collapsed lobe, and give rise to much perplexity. In these cases the origin of the transmitted sound can usually be detected by noticing that the quality and pitch of the conducted breath-sound or râle are exactly that heard on the affected half of the chest, only diminished in intensity; the sound is identical in character but weaker in force. This is rarely if ever the case with sounds generated spontaneously in two different spots.

Bronchial, blowing and cavernous breath-sounds are produced in children by the same mechanism which gives rise to them in the adult, and correspond to much the same conditions. In the child, however, peculiarities in this respect are sometimes noticed. The morbid quality conferred upon the breath-sound is often a step in advance of that heard under similar conditions in the adult. Thus, cavernous breathing is more often a sign of mere solidification of tissue, and is frequently present when the lung is compressed by pleuritic effusion. So, also, the amphoric breath-sound with tinkling resonance of the voice or cough is almost always the consequence of a large cavity or great dilatation of a bronchus. It is heard in cases of phthisis, of cirrhosis of the lung, or of subacute catarrhal pneumonia. Pneumothorax, to which cause it is almost solely owing in the adult, is a very rare condition in the child, and the morbid sign can seldom be attributed to this cause.

Although the auscultatory sounds are frequently magnified in the child, it sometimes happens that the contrary condition is found. A patch of consolidation, if covered by a layer of healthy lung-tissue, may give rise to no dulness or alteration of breath-sound, and a bronchophonic resonance of the voice and cry may be the only sign which betrays its existence. In crying infants the intensified vocal resonance is an important test of consolidation. If the resonance have an ægophonic quality it is characteristic of moderate effusion.

The examination of the chest should always be as complete as possible. It is not enough merely to examine the posterior part of the thorax, trusting that if this be healthy the anterior part is healthy too. A patch of croupous pneumonia or a loculated pleurisy may occupy any part of the lung or chest cavity. Either may be confined to the apex, may lie under one arm, or may be found seated anteriorly or laterally as well as behind. If, therefore the front of the chest is left unnoticed, we may overlook disease which closer examination would have discovered. Even if the child cry during the operation, much may still be learned. The cry usually ceases each time the breath is taken in, so that inspiration is audible. Its quality can therefore be ascertained at this time. Moreover, as the chest is expanded deeply after a prolonged crying expiration, the air-cells are fully inflated and few adventitious sounds can escape our notice.

CHAPTER II.

LARYNGITIS.

Inflammation of the larynx is a not uncommon affection in childhood. The disease may occur as a simple catarrh of the larynx or as a more severe inflammation resulting from a burn or scald. In these cases it is of course a primary lesion. It may also occur secondarily as a consequence of a constitutional disease, such as tubercle or syphilis. There is a special form of the primary affection which is accompanied by spasm and is peculiar to early life. This complaint is often confounded with membranous croup, and is the "catarrhal croup" of the older writers. It is seldom a fatal disease, although it produces very alarming symptoms. In the present chapter three varieties of laryngitis will be described, viz., simple laryngitis, stridulous laryngitis, and tubercular laryngitis. The lesions which affect the larynx in cases of inherited syphilis are referred to elsewhere (see page 204).

SIMPLE LARYNGITIS.

Causation.—On account of the sensitiveness of scrofulous children to changes of temperature and their liability to catarrh, laryngitis is more common in them than it is in others who are free from this unfortunate disposition. In some the larynx seems to have a special proneness to suffer in the cold or changeable seasons of the year. No period of childhood is exempt from laryngeal catarrh, for although the disorder is more often seen in children over six years old, it may be met with as early as the end of infancy. In infancy, however, the complaint in the simple form is comparatively rare. At this period laryngitis is commonly the consequence of a syphilitic taint. Amongst the children of the poor severe laryngitis from burns and scalds is sometimes met with. This form of the disease is almost confined to children between two and three years old, and is due to an attempt to drink water from the spout of a kettle as this stands simmering by the side of the fire. A violent inflammation results from this accident and may quickly end in death. An equally severe laryngitis with œdema of the glottis is sometimes met with as a secondary affection following serious acute disease. It may occur as a sequel of small-pox, erysipelas, or typhoid fever. Œdema of the glottis without inflammation is also sometimes a symptom of acute Bright's disease.

Chronic laryngitis is less common than the acute variety, but sometimes occurs in weakly children as the result of an acute attack. It may follow measles or membranous croup, and is apt to prove obstinate.

Morbid Anatomy.—The mucous membrane and submucous tissue become congested and œdematous, and their colour is redder than in health. In cases of simple laryngitis the change is probably confined to the epiglottis and ary-epiglottidean folds, leaving the true vocal cords unaltered.

Some thick mucous is secreted. Ulceration is very rare in early life, and probably never occurs in the primary form of the disease.

In the severe laryngitis which is the result of a scald the soft palate and fauces are white and swollen ; and the epiglottis and parts around are thickened and congested. A so-called false membrane often forms upon the surface. This to the eye appears to be identical with the false membrane of diphtheria, but is said to differ from it in its microscopical characters. It is probably, as Dr. Wallace long ago suggested, the natural epithelial layer altered in structure.

Symptoms.—In the *mild form* the child is hoarse and soon loses his voice more or less completely. His cough is hoarse and infrequent ; sometimes it occurs in paroxysms. There is little or no fever, and the breathing is not interfered with. If the hoarseness do not proceed to actual aphonia, it is often more marked in the evening. The cough, too, is generally worse at night when the child goes to bed. The hoarseness of the voice may be only noticed when the child is crying. If the patient be kept in a suitable temperature, the symptoms of catarrh subside after a few days, and seldom last longer than a week. If the indisposition is lightly treated, and measures are not taken to protect the child from further exposure, the complaint may become more serious and may be complicated with spasm (stridulous laryngitis).

The *more severe* variety is well illustrated by cases of scald or burn of the larynx, although, as has been said, the affection is sometimes due to other causes.

Immediately after the scald the child complains of pain in the throat, and this part on inspection is seen to look white and shrivelled ; but there is at first no difficulty of breathing and the larynx seems to have escaped. The patient screams violently and will not attempt to swallow ; but after a time the immediate effects of the accident appear to pass off, and when put to bed the child falls quietly asleep. After a few hours, however, usually from three to six, his breathing is noticed to be noisy and whistling. Laryngitis has now begun. The respirations become laboured and rapid ; the face is pale and tinted with lividity about the eyelids and mouth ; the pulse is small and feeble ; the skin is cool ; the extremities are cold ; and the child is drowsy, although he can be roused with difficulty. If at this stage the finger be passed into the back of the fauces, the epiglottis will be felt hard and swollen to the shape of a gooseberry or small marble. There is recession of the soft parts of the chest in inspiration, and an examination detects sonorous and sibilant rales all over the lungs. There is no dulness on percussion.

After a few hours all the symptoms become aggravated. The breathing is more and more laboured and "croupy," the larynx rises and falls rapidly, and at each inspiration the soft parts of the chest—the intercostal spaces, supra-clavicular fossæ, and the epigastrium—sink deeply in. The child lies with his head retracted, his face swollen and livid, his eyes injected, his nares acting, and his mouth open, making convulsive gasps for breath. His extremities are cold, and his pulse is often too frequent and feeble to be counted. Although only half conscious the child is much agitated, tossing his arms about and showing signs of the greatest distress. Percussion of the back usually detects some want of resonance, and much large bubbling is heard in the air-tubes. Sometimes there is local dulness from collapse of lung. In this state the child may sink and die slowly, or expire more suddenly in a convulsive fit.

The above is an aggravated case, but unfortunately far from an uncom-

mon one. Death may occur as early as twenty-four hours after the accident. The end is not, however, always reached so rapidly. The child may linger for two, three, or four days before he finally sinks; or life may be prolonged to the end of the week. The duration depends in great measure upon the degree of interference with respiration and the patient's capacity for taking nourishment. If the œdema of the glottis be less complete, the breathing after being laboured and stridulous for twenty-four or forty-eight hours, with signs of deficient aëration of the blood, may become easier, and then gradually return to a normal state. The voice is very hoarse and the cough "croupy." In these cases the dyspnœa varies in degree from time to time, being subject to occasional increase when the child is distressed or made to swallow. After the cessation of the more urgent symptoms the voice may remain hoarse and the cough be occasionally "croupy" for some days.

A little boy, aged four months, was brought to the East London Children's Hospital at one P.M. On the previous night the bed on which he was lying had caught fire, and the child, who had been placed on a waterproof cloth, was surrounded with flame and smoke. Happily he was quickly rescued, although not before the palliasse had been nearly destroyed. When taken out his body was blackened with the smoke. Soon afterwards his breathing became difficult, and at times the mother thought he would be suffocated.

On admission the skin of the arms was seen to be tinted brown from the action of the heated air, but there was no external sign of burn. The infant's breathing was laboured, and his cry hoarse and weak. At each inspiration the soft parts of the chest receded deeply. The face was dusky, the nares acted strongly, and the external jugulars and superficial veins generally were unusually visible. The fauces looked red and swollen. Temperature, 98°; pulse, 160; respirations, 72. In the evening the temperature rose to 103°; pulse, 140; respirations, 80. The child slept fairly well in the night, and in the morning expectorated a piece of membrane one inch in length and a quarter of an inch broad. It had the ordinary naked-eye appearance of false membrane. The next day the breathing was easier and the lividity of the face less. Two days afterwards signs of pneumonia were discovered at the left back; but this disease ran a favourable course, and in about ten days from the time of the accident the child was convalescent. He never had any difficulty in swallowing. He was treated with hot linseed-meal poultices and a saline mixture containing small doses of antimonial wine.

In cases such as these, if tracheotomy has to be performed on account of the intensity of the dyspnœa, the patient often dies from a secondary inflammation of the lung. The ordinary non-traumatic laryngitis in the child, if at all severe, is also usually associated with bronchitis, pneumonia, or pleurisy.

The chronic form of laryngitis is sometimes seen in connection with follicular pharyngitis. It is indicated by an altered quality of the voice, which becomes thick and veiled, and is sometimes quite hoarse in the evening. There is also a hard cough, which may be paroxysmal, and is often accompanied by pain shooting up into the sides of the head or the ears. I have occasionally met with a simple chronic laryngitis unconnected with any abnormal state of the fauces, and apparently not the consequence of a constitutional cachexia. One such case, occurring in a child aged one year and eleven months, will be afterwards referred to.

Diagnosis.—The simple form of the disease, where there is much

hoarseness of the voice and cry, a thick cough, and some redness of the fauces, without fever, or with only moderate pyrexia, cannot be mistaken. If the symptoms become more urgent, and there is laboured breathing, pneumonia and bronchitis may be excluded by the absence of the characteristic physical signs about the lungs, and the normal or only slightly elevated temperature. Still, it must be remembered that these cases, whether due or not to a traumatic cause, are often complicated by acute chest disease.

In the case of scald of the larynx, the history will usually be sufficient to decide the nature of the illness. It must not be forgotten that in this variety of laryngitis the symptoms seldom come on directly after the accident, but that there is almost invariably an interval of some hours before the signs of dyspnœa begin to be noticed. In every such case, then, we must be on our guard, and must not conclude that all danger has passed because the child appears at first to have escaped serious injury.

In epidemics of diphtheria a slight scald of the larynx may predispose a child to fall a victim to the zymotic disease. Mr. Parker has published the case of a little girl, aged three years, in whom "croupy" symptoms came on three days after an apparently trifling scald of the throat, and in spite of tracheotomy the patient died on the sixth day of the illness. On examination of the air-passages, the epiglottis and ary-epiglottidean folds were covered with membrane; the tracheal mucous membrane was intensely injected and coarsely granular in appearance, and this condition was seen to extend as far as the tertiary bronchi. Pieces of thinnish, red, well-formed membrane were also found on the pharynx and in some of the tubes. In this case the illness came on at too late a period after the accident to be fairly attributable to the scald; the symptoms were those of laryngeal diphtheria, and the anatomical characters were indicative of a specific and not of a simple inflammation of the larynx and trachea.

In all cases of chronic hoarseness it is as important in the child as it is in the adult to use the laryngoscope wherever practicable. Children, unfortunately, are usually troublesome subjects for this method of investigation; but if the child is old enough to understand the object of the examination, we can often, by perseverance and by making him suck lumps of ice before the instrument is applied, succeed in getting a view of the vocal cords. By this means we can sometimes exclude the presence of chronic inflammation and obtain a valuable hint for treatment. It must be remembered that hoarseness may be the consequence of the imperfect approximation of the vocal cords. Dr. Vivian Poore has referred to the case of a little boy who had been long under treatment for laryngitis. In this case the hoarseness was found by the laryngoscope to be due to excessive anæmia of the larynx, with failure in the power of the adductors; and fresh air, good diet, and iron soon restored the lad to health.

Chronic laryngitis must not be confounded with the alteration of voice which occurs as a consequence of enlarged and caseous bronchial glands. In that disease hoarseness is a late symptom, and does not appear until general pressure signs have been developed in the chest (see page 182).

Sometimes hysterical aphonia is found in girls. It is distinguished from chronic laryngitis by the history. It begins quite suddenly and is at once complete. Equally suddenly it subsides.

A girl, between eleven and twelve years old, was under the care of my colleague, Dr. Donkin, in the East London Children's Hospital. The patient was one of fifteen children, and there was no neurotic tendency in the family. One child had died of croup, and the girl herself had had a

"croupy" cough up to the age of seven years. She was of healthy appearance and seemed very intelligent. Twelve weeks before her admission she had been called in the morning and had answered in her usual voice; but when she was dressed it was found that she had complete aphonia. Her breathing was natural, and she was not subject to attacks of dyspnœa. She had no cough or soreness of the throat, but there seemed to be some tenderness at the angle of the jaw. Her voice was quite whispering, but she could laugh louder than she could talk. She did not appear to be troubled by her infirmity, but was anxious to get well on account of her education.

A galvanic current was applied to the larynx. The girl cried loudly during the operation. After a second application of the same kind the voice suddenly returned; and she never relapsed.

Prognosis.—In uncomplicated cases of simple laryngitis, unless the inflammation be due to a traumatic cause, the child almost invariably recovers. In the traumatic variety the prognosis is very serious. In cases which are complicated by some acute lung affection the prognosis depends upon the pulmonary rather than upon the laryngeal complaint.

Treatment.—In ordinary simple laryngitis the child should be kept in an equable temperature; his throat should be enveloped in cotton wool or a cold-water compress; and inhalation should be prescribed of steam impregnated with tincture of benzoin (a teaspoonful to the pint of boiling water). The bowels should be relieved by a mercurial purge; and if there be much oppression of breathing, an emetic should be ordered of ipecacuanha wine. Afterwards, a saline diaphoretic can be given containing five or ten drops of antimonial wine to the dose. A mustard foot-bath is also useful. If the cough is troublesome and disturbs the rest, small doses of paregoric may be added to the mixture.

In severe cases, where the dyspnœa is distressing, a blister may be applied to the neck below the chin, or towards the top of the sternum. The child should be placed in a tent-bedstead, as in diphtheria, and the air around the patient should be kept moist by the steam boiler, as recommended for that disease. The general treatment will depend upon the lung affection, which in these cases usually complicates the laryngitis.

In the violent and distressing cases which result from a scald of the glottis energetic treatment is required, as from the moment when the dyspnœa becomes urgent the life of the child is in the greatest danger. Dr. Bevan, of Dublin, after considerable experience of this form of disease, powerfully advocates a return to the old treatment by repeated doses of calomel. He states that if this plan be adopted, immediate relief to the symptoms is noticed directly green stools begin to be passed, showing that the system is under the influence of the drug. Dr. Bevan gives a grain of the salt every half hour, and recommends that this medication be begun directly the child is seen after the accident, without waiting for laryngeal symptoms to declare themselves. He greatly prefers this method of treatment to any mechanical measures for admitting air into the lungs, as these, he says, are almost invariably followed by death from pneumonia. With our improved methods of after-treatment the operation of tracheotomy is, however, less often followed by fatal consequences than was formerly the case; and if the dyspnœa is urgent and threatens life, I should not hesitate to advocate the procedure, putting the child afterwards in a tent-bedstead in a warmed and moistened atmosphere.

The calomel treatment certainly seems to offer good results. In each of Dr. Bevan's cases the patient took between fifty and sixty grains of

calomel; and of four children treated in this manner, although the symptoms were excessively severe, all recovered without any sign of having been injuriously affected by the remedy. In addition to giving calomel by the mouth, mercurial inunctions were used in the worst cases to the skin; a few leeches were applied to the upper part of the chest; and the bowels were relieved by a copious enema. In each case, too, the treatment was begun by an emetic to clear out the stomach. Dr. Bevan states that green stools may be expected in from eight to twenty-six hours after the first dose of the calomel.

It is important to support the strength. If there is total inability to swallow, the patient must be fed with white-wine whey by the stomach-tube passed through the nose.

In cases of chronic laryngitis the throat should be brushed every two or three days with a strong solution of perchloride of iron. A little boy, aged one year and eleven months, was under my care for chronic hoarseness of three months' standing. The child, although anæmic, had a healthy appearance, and there was no history of syphilis or trace of the disease about the body. He was quickly cured by the application to the larynx every third morning of a solution of perchloride of iron in glycerine (two drachms of the strong solution to the ounce). The application caused no spasm or other uncomfortable symptom.

Iron and cod-liver oil are useful in these cases; and the throat may be painted externally with tincture of iodine.

STRIDULOUS LARYNGITIS.

Stridulous laryngitis (false croup, catarrhal croup, spasmodic laryngitis) is a common affection in early life. For a long time it was confounded with diphtheritic laryngitis, and no doubt a sharp attack of laryngeal catarrh with spasm produces sufficiently serious symptoms. The disease, however, is rarely fatal.

Causation.—Stridulous laryngitis is especially a disease of childhood after the period of infancy has passed, for it is comparatively rare under the age of two years. Between the second and seventh year the disorder is common; but after the latter date it again becomes exceptional. I have met with it, however, as late as the fourteenth year. When it occurs in the course of the second year the patient will be usually found on examination to be the subject of rickets. The complaint appears to be predisposed to by an hereditary spasmodic tendency; but the patients are not necessarily in any way feeble or under-nourished. As a rule, perhaps they are sturdy looking and strong. Boys are attacked twice as often as girls; and the affection is frequently seen more than once in the same individual; indeed, it may be said to have a tendency to recur.

The exciting causes of the complaint are those common to laryngeal catarrh. The affection is sometimes an early symptom of measles and whooping-cough. It may occur as a complication in the course of the latter, and occasionally returns under the influence of a slight chill after the attack of pertussis is at an end.

Morbid Anatomy.—In the rare cases where death has resulted from this complaint the glottis and vocal cords have been found little altered, or more or less uniformly reddened. Sometimes they have been slightly swollen. An excess of mucus has been usually present. It is stated that small linear ulcers have been sometimes noticed on close inspection of the vocal cords.

Symptoms.—Stridulous laryngitis consists of a catarrh of the larynx with superadded spasm—the spasmodic element being probably the consequence of special nervous excitability in the individual patient. In some children (and these are usually rickety infants) a very trifling degree of catarrh may induce spasm. These cases are very mild as a rule, and quickly subside. In older children the catarrh is more serious. The complaint then lasts longer and is accompanied by more violent symptoms.

In the mildest form of the complaint the pulmonary catarrh is often very trifling. The child may be put to bed apparently well, or with merely a slight cold. About eleven or twelve o'clock he starts up suddenly from his sleep with a hoarse, barking, sonorous cough, and a loud, whistling, stridor in his breathing. It will be noticed, however, that the stridulous character is confined to the inspiration, and that the expiration is short and comparatively noiseless. The movements of the chest are laboured and violent, the soft parts sink in at each inspiration, the nares act, and the eyes are staring and frightened-looking. If the impediment to breathing is great, the face becomes livid, the eyes are injected, and the child is excessively restless and agitated. His voice, however, remains hoarse and loud. It is rarely weak, and only becomes suppressed and whispering in cases of exceptional severity.

The seizure lasts from a few minutes to half an hour, or even longer, for sometimes, after appearing to relax, the spasm becomes again distressing. In the end it subsides completely and the child falls asleep, but he may again be roused up by a milder seizure a few hours afterwards. On the following morning he may wake up apparently well, or with some slight thickness of the voice and a loud clang in his cough, but these symptoms pass off after a day or two. In many cases the attack returns on the following night, and may be repeated yet a third time, but the symptoms are seldom so severe as on the first occasion. During the attack the temperature may rise to 102° or 103°, or higher, but in the morning is usually normal.

In more severe cases of stridulous laryngitis the complaint does not pass off so quickly. The catarrh is often not limited to the larynx, but also occupies the bronchi. The attacks then occur not only at night but also in the daytime, and in the intervals the breathing is more or less oppressed and "croupy," and the voice and cough hoarse. The dyspnœa in these cases may be a very serious symptom, the child having the greatest difficulty in obtaining even a minimum supply of air. Indeed, in the worst cases during the access the face is livid, the hands and nails grow purple, the eyes become fixed, convulsive twitchings are noticed in the limbs, and an examination of the chest may detect signs of collapse at the bases of the lungs. In rare instances the patient dies suffocated unless relieved. The complaint is accompanied by moderate fever which persists between the attacks, and the complexion remains pale, with some lividity about the lips, until the free passage of air is again completely restored. An examination of the urine seldom detects albumen, but in the worst attacks, probably from renal congestion, albuminuria may be present.

A healthy-looking boy, aged four years and two months, was taken ill on March 1st with sneezing, coughing, and signs of tightness of the chest. The same night he was roused by a severe attack of dyspnœa, his breathing was oppressed and stridulous, and his cough loud and clanging. All the next day his voice was weak and hoarse, and his cough barking and hard.

When the child was seen on March 4th, his cough was hoarse and

loud. The breathing was laboured, 46 ; the pulse, 140 ; the temperature, 101.4°. The skin was moist. The respiratory movements were very laborious, the shoulders rising and falling, and the soft parts of the chest and the epigastrium sinking in deeply. The chest was resonant, and the breath-sounds were loud and snoring. One-sixth of a grain of tartrate of antimony was given every three hours in a saline mixture.

On the night of the 5th the child had another severe attack of dyspnœa. He was accordingly put into a tent-bedstead and the air was kept moistened by the steam-kettle. The next day the cough was loose, and the voice, although hoarse, was much stronger. The dyspnœa did not return, and the child was discharged convalescent on March 11th. The temperature remained over 100°, morning and evening, until March 9th.

In an ordinary case of moderate severity the cough loses its hard, barking character after a few days and becomes loose, the hoarseness of voice diminishes, and the child is soon convalescent. If, however, there be general pulmonary catarrh, any neglect may easily aggravate the case into one of broncho-pneumonia, or in a weakly subject collapse of the lung may occur. In either case the child may die. Fatal cases of laryngitis stridulosa are in the large majority of cases so complicated, for few children die from the dyspnœa alone.

In rare cases stridulous laryngitis, like laryngismus stridulus, may be accompanied by carpo-pedal contractions. A little girl, between four and five years old, was brought to me for contraction of the fingers, which had much alarmed her parents and made them fear that the child was "going to be paralysed." The patient was much emaciated from long-continued intestinal catarrh, and had a pained expression of face. For a month she had had a cough, and at night was often roused by attacks of stridulous laryngitis, in which respiration became noisy, and she seemed to have much difficulty in getting her breath. On examining her hands the fingers were found to be unusually straight-looking, the hands being bent only at the knuckles. The child could, however, squeeze well with both hands. It was stated that the fingers would often become quite stiff, with the thumbs turned rigidly into the palms of the hands. The girl was not rickety ; her lungs were healthy ; and there was no enlargement of the abdominal organs or mesenteric glands. An iron mixture was prescribed, and the child was ordered some claret with her dinner. Under this treatment the symptoms soon subsided and the patient regained flesh and strength.

Diagnosis.—Stridulous laryngitis must not be confounded with true membranous croup—a disease to which it often presents a striking resemblance. A distinction between these two affections is of the utmost practical importance ; for the operation of tracheotomy, which is especially indicated in cases of membranous laryngitis, is rarely if ever necessary in the stridulous disorder, and if performed imports into the case an element of danger which would otherwise be wanting.

In laryngitis stridulosa the invasion is much more sudden, and the dyspnœa at once attains its maximum intensity ; indeed, if the attack be repeated it seldom reaches the violence of its first access. The voice in false croup, although weakened and hoarse, is rarely suppressed, and the child, if persuaded to exert himself, can usually speak fairly loudly. Even young children, although silent and unwilling to cry when much hampered for breath, if disposed to do so, can often emit a considerable volume of sound. The cough, too, is loud and clanging, and rarely assumes the muffled, whispering character so distinctive of membranous laryngitis. Again, the stridor of the breathing is chiefly marked in inspiration, the

expiration being much easier and comparatively noiseless. In false croup, also, there is no enlargement of the submaxillary glands, such as is apt to occur in cases of membranous laryngitis when there is any accompanying affection of the pharynx. An examination of the urine rarely discovers the presence of albumen.

In all these features the stridulous catarrh differs from the membranous inflammation. In the latter the dyspnœa begins gradually and attains its maximum by degrees; the voice becomes entirely suppressed; the cough is a hoarse muffled sound which is almost pathognomonic; the stridor is as marked in expiration as it is in inspiration; and albuminuria is sometimes met with. Lastly, in true membranous croup the diphtheritic exudation can often be discovered in the pharynx. Still, absence of exudation is not to be depended upon as excluding diphtheria, for the membrane may be limited to the air-passages, and fragments are not always coughed up. In a doubtful case, where the symptoms of spasmodic laryngitis are exceptionally severe, the points to be relied upon for excluding diphtheritic croup are: The severe and sudden onset; the comparative absence of stridor in the expiration; and the quality of the voice, which is not completely muffled or suppressed. The age of the patient is also of some practical value in diagnosis. In a child under twelve months old, or over seven years, the case is very unlikely to be one of stridulous laryngitis.

Laryngitis stridulosa may be also confounded with laryngismus stridulus, with retro-pharyngeal abscess, and with œdema of the glottis. The distinctive characters of the first-named complaint are elsewhere described (see page 271). Retro-pharyngeal abscess is at once recognised by the inability of the child to breathe when lying down, the increase to his distress occasioned by pressure on the larynx, and the presence of a swelling at the back of the throat. Œdema of the glottis is usually the consequence of a scald or burn, or follows an attack of acute specific disease; the distress is more continuous, without marked remissions in the dyspnœa, and the thickened epiglottis can be felt with the finger.

Prognosis.—As a rule, the child has a good prospect of recovery, even in serious cases, if the operation of tracheotomy be not performed. The most urgent dyspnœa usually subsides under suitable treatment, and it is very rare for the child to die suffocated. When the disease ends fatally, the unfavourable issue is usually the consequence of an inflammatory complication. Stridulous laryngitis sometimes accompanies the onset of a pneumonia, or from want of proper precautions the tracheal catarrh may be allowed to extend into the finer tubes. In such a case the prognosis is not favourable, for attacks of suffocation occurring in a child the subject of bronchitis or pneumonia are necessarily dangerous. Still, even in these cases the child may recover, for often the spasm becomes less marked when the inflammatory complication declares itself.

Treatment.—In the milder attacks of laryngitis stridulosa the child should be at once placed in a warm bath (95° Fah.) for fifteen or twenty minutes, and should be made to vomit by a dose of ipecacuanha wine. Afterwards a small dose of chloral (gr. iij.–iv. to child of eighteen months old) may be given, with a few drops of sal volatile, to prevent a relapse in the course of the night. In the morning it is well to prescribe a diaphoretic mixture (such as vini ipecacuanhæ, ℥x.; liq. ammoniæ acetatis, ℥xx.; glycerini, ℥x.; aq. ad ʒ j.), to be taken every three or four hours, and to give directions that the child be kept in one room of a suitable temperature. If the tongue is loaded, a grain of calomel should be given with two grains of jalapine.

In the very severe cases a warm bath is also useful. Afterwards the child should be placed in a tent-bedstead, in a warmed and moistened atmosphere, as recommended for membranous croup. An emetic in all these cases produces great relief. A teaspoonful of ipecacuanha wine, or a quarter of a grain of sulphate of copper, may be given every ten minutes until the desired effect is produced. The vomited matters in all severe cases should be searched for shreds or patches of false membrane. As long as there is fever the child must be kept in bed, and while the voice remains hoarse it is wise to keep the air moistened by means of the steam-kettle (see page 103). Tracheotomy is rarely if ever necessary in mere spasmodic laryngitis. The most violent attack of suffocation seldom fails to be relieved by a warm bath, an emetic, and steam inhalations. Graves' plan of applying a sponge wrung out of hot water to the neck, below the chin, is also of service. It must not be forgotten to attend to the bowels, and a mercurial purge is a great help to the other treatment.

If the spasms return repeatedly, which, however, is rarely the case if the above treatment have been adopted, an antispasmodic may be required. Chloral is perhaps the best, and may be given to a child of two years of age in doses of three grains three times a day.

If any inflammatory complication arise, such as bronchitis, pneumonia, etc., special measures must be adopted as recommended for these diseases. If the case be uncomplicated, diaphoretics should be given when the spasm subsides, and the child should be treated for an ordinary pulmonary catarrh, taking care to withhold all stimulating expectorants as long as the cough continues barking and hard. Sometimes a few drops of paregoric added to the saline expectorant mixture seem to aid its effect in reducing the hardness of the cough. All the time the diet must be regulated as directed for pulmonary catarrh.

In cases where the attacks of laryngitis tend repeatedly to recur, endeavours must be made to strengthen the child and diminish his susceptibility to changes of temperature. He should be dressed from head to foot in woollen underclothing; should pass much of his time out of doors; and should have a cold douche every morning, given with all the precautions recommended in a previous chapter (see page 17). Moreover, as children with this tendency often have cold feet, care should be taken that the extremities are thoroughly warm when the child leaves the house. A little alcohol with the dinner is a useful medicine in these cases.

TUBERCULAR LARYNGITIS.

In childhood the laryngeal mucous membrane is comparatively rarely the seat of the gray granulation; for it is only in after-life that laryngeal phthisis becomes a common manifestation of the tubercular cachexia. Still, even at this early age tubercular granules and ulcerations are occasionally present; and these usually occur in cases where the force of the disease is expended more particularly upon the lungs, the other organs being comparatively unaffected.

Causation.—Ulcers of the larynx are much more common than tubercular granules without breach of surface. MM. Rilliet and Barthez state that they have only met with a single case of tubercle of the laryngeal mucous membrane unaccompanied by ulceration, and quote a second from M. Tonnelé, which occurred in a child of fourteen. According to these authors, the ulcers are usually of small size, varying from the head of a pin to a large lentil. They are circular and cleanly cut, unless they occupy

the vocal cords. In that case they are more commonly oval, with their long diameter in the direction of the cord. Their borders are thin and reddish in colour, and their base is usually composed of the submucous tissue—rarely of the muscular fibres. The ulcers, for the most part, are single, although sometimes more than one is present in the same case. The seat may be one or other of the vocal cords, or the posterior angle of the glottis, or the base of the epiglottis. The mucous membrane is unaltered or thickened; sometimes it is reddened.

The trachea and larger bronchi may be also the seat of ulcers, but more usually the tracheal mucous membrance is merely reddened and thickened.

Symptoms.—The symptoms of the laryngeal complication are often indefinite. There may be merely some alteration of the voice, slight pain in the region of the larynx, and if there is much swelling, dyspnœa. The voice is often thick and husky; it is never whispering as in the adult. The cough is little altered, and has no special quality pointing to this particular lesion. There is seldom pain or difficulty of deglutition; and the pain in the larynx, if present at all, is rarely of much moment. The small size and limited number of the sores is sufficient, no doubt, to account for the absence of special symptoms; for in the adult, when aphonia is present, the ulceration is generally extensive.

Dyspnœa may be a marked symptom. A little boy, aged two years and nine months, whose father had died of consumption, was admitted into the hospital, under my care, for difficulty of breathing. For six weeks previously his breath had been noticed to be short, and for a fortnight his respiration had been accompanied by a stridor. For three weeks he had been unable to swallow any solid food, although he could take liquids without difficulty.

On admission his dyspnœa was marked. At each inspiration the lower half of the breastbone was bent deeply inwards, so as to leave a pit in the epigastrium. At the same time the intercostal spaces and supra-clavicular hollows were markedly retracted. His nares worked, and all the accessory muscles of respiration were in strong action. There was some lividity of the face, and the breath-sound was accompanied by a hoarse stridor. His voice was hoarse, but not whispering. The cough was little altered, and had no metallic or ringing quality. On examination of the chest there was some dulness at each supra-spinous fossa, and much coarse bubbling was heard all over both lungs. Temperature at 6 P.M., 101.6°; respirations, 40; pulse, 136. There was no albumen in the urine.

The boy was in the hospital a week. His dyspnœa all the time continued with little change. There were no exacerbations or remissions. His temperature varied between 100.6° in the morning, and 102° to 103° at night. His bowels acted twice a day, as a rule, although in one day he was purged seven times; and he never complained of pain in the abdomen until a few hours before the end. His death occurred quite suddenly. The child, after complaining of stomach-ache, which did not appear to be severe, suddenly sank into a state of collapse, in which he died.

On examination of the body many ulcers were found in the ilium, one of which had ruptured and caused profuse extravasation into the peritoneal cavity. The ulcers were circular, and did not follow the course of the vessels, as in ordinary tubercular or scrofulous ulceration. The liver was fatty, but the abdominal organs seemed to be healthy. No gray granulations were seen anywhere but in the lungs. These organs, however, were stuffed with them; and there was some consolidation at the apices. The mucous membrane of the larynx and epiglottis was excessively swollen and

red, so that the glottis formed a mere chink. No ulcerations were discovered in this part, and my notes make no mention of gray granulations about the larynx. The trachea was healthy, and nowhere was there any sign of false membrane.

In this interesting case the larynx was the seat of severe chronic inflammation, and had the child lived a short time longer it is probable that ulcers would have formed in the glottis. As it was, the intestinal complication carried him off before any further change could take place.

Diagnosis.—In the child, on account of the extreme difficulty of using the laryngoscope, owing to the resistance of the patient, it is very rare to be able to ascertain by actual inspection the existence of ulcers or granules on the laryngeal mucous membrane. In children who have reached the age of ten or twelve years the instrument may, however, be sometimes used; but great irritability of the fauces usually attends any laryngeal catarrh, and the attempt to inspect the throat has often to be abandoned.

In coming to the conclusion that a child has tubercular ulceration of the glottis we must first exclude ulceration from other causes. Syphilis must be set aside by inquiry into the family history, and special antecedents of the patient, and by careful examination of the body for signs of the inherited disease. We must also make sure that the child has not suffered lately from any complaint which tends to give rise to chronic inflammation or ulceration of the larynx, such as measles, small-pox, or membranous croup. If all these diseases can be excluded, and we find hoarseness of the voice and cough, with stridulous breathing, in a child who is evidently suffering from tuberculosis, we cannot but explain the local symptoms in the light of the general disease. A persistent, steady dyspnœa, without exacerbations or remissions, would add strength to the explanation. If, however, suffocative attacks come on, and the child is first seen when suffering from more or less paroxysmal dyspnœa, an exact diagnosis may be very difficult. The history would, indeed, point to a chronic interference with the action of the glottis; but such interference might be produced by warty growths or polypi of the vocal cords, and without a laryngoscopic examination a diagnosis is probably impossible. Such a case as the following, for example, would give rise to great perplexity.

A little boy, four years old, but short for his age, and of rickety build, who had been treated for syphilis in his infancy, is brought to the hospital for difficulty of breathing. It is said that for four months he has been noticed to breathe stertorously and to have a hoarse cough. The cough is worse at night, and is often followed by vomiting. The child's face is rather turgid and congested, and the jugular veins are visible. On inspection of the chest it is seen that at each inspiration the ribs and lower half of the breast-bone are greatly retracted. At the same time the pulse fails in force, and there is a stridulous sound from the throat. Examination of the chest shows no sign of disease; resonance is normal, and a loud stridor conducted from the throat is heard at all parts of the chest-wall. The heart's apex is in the normal site. An attempt to make a laryngoscopic examination has to be abandoned on account of the child's struggles. Temperature at 9 A.M., 101.8°; pulse, 140; respirations, 36.

After admission into the hospital the temperature for the first eleven days is over 100°, both morning and evening. The child is found to suffer from severe fits of dyspnœa, which come on usually at night. In these attacks he is excessively agitated, sitting up in bed and throwing himself about, his face gets livid and his lips are blue. He makes constant attempts to cough, as if to remove some obstacle, but the cough is very hoarse

and smothered. In one of these attacks the distress is so great, and the signs of approaching suffocation so pronounced, that tracheotomy is performed. After the operation the breathing is easier, but signs of pneumonia manifest themselves, and the child dies. After death an examination of the larynx discovers several warty growths attached to the true vocal cords. One of these growths is long and pedunculated.

In a case such as the above, if a correct diagnosis can be arrived at in the absence of a laryngoscopic examination, it can only be by exclusion; but the elevated temperature would be an element of perplexity, and would not be in favour of warty growths. A digital examination is of little value in such a case, for the growths, being seated on the true vocal cords, are quite out of reach of the finger.

Prognosis.—The prognosis is always unfavourable, but the gravity of the case depends much upon the general disease and little upon the laryngeal complication. It is only in cases where the inflammatory swelling has almost occluded the opening of the glottis that any special danger is likely to arise from the condition of the larynx. These cases, fortunately, appear to be very rare.

Treatment.—Little can be done in the way of special medication for tubercular laryngitis. The treatment to be adopted must consist of the measures recommended in cases of simple inflammation. The neck should be kept warm externally, and inhalations of steam, medicated with the compound tincture of benzoin, should be prescribed. If the cough is troublesome and disturbs the rest, small doses of laudanum, morphia, or paregoric may be administered. Two to three drops of liquor morphiæ, with the same quantity of spirits of chloroform and ten of glycerine, in a teaspoonful of water, form a useful linctus for these cases. The general treatment must be that recommended for the constitutional affection.

CHAPTER III.

SUPPURATION ABOUT THE LARYNX.

The formation of an abscess in connection with the larynx is not a common complaint at any period of life. But the disease, when present in the child, causes so much interference with respiration, and produces symptoms which bear so close a resemblance to those of membranous croup, that it must not be passed over without a word of notice.

Three cases of suppuration about the larynx were published some years ago by Dr. W. Stephenson, of Aberdeen. Two others have been placed upon record by Dr. John S. Parry, of Philadelphia. A few cases are also scattered about in the various journals.

Causation.—A state of feeble health appears to favour the occurrence of the disease, for the patient is generally weakly and cachectic-looking. In two of Dr. Stephenson's cases the child was just convalescent from an acute specific disease (scarlatina and small-pox). In a case narrated by MM. Rilliet and Barthez, under the name of submucous laryngitis, the boy (aged four years and a half) was still in a weakly condition after an attack of measles. A preliminary period of ill-health is not, however, indispensable, for in one of Dr. Parry's cases (a little negro baby of four and a half months old) the infant seemed to be in perfect health just before the first symptoms appeared.

Morbid Anatomy.—The abscess is usually situated at some point in the immediate neighbourhood of the larynx. In one of Dr. Stephenson's cases its seat was at the outer side of the right thyroid cartilage, laying bare the upper margin, and extending to the superior cornu. It had opened internally. In another a sac containing pus was seated in front of the thyroid cartilage, and extended upwards on each side as far as the upper margin of the alæ of the cartilage, the pouch on the right side being somewhat larger than that on the left. In one of Dr. Parry's cases an exactly similar condition was met with. The thyroid cartilage itself may be eroded and roughened and denuded of perichondrium.

Symptoms.—The symptoms produced by suppuration around the larynx are very similar to those which arise as a consequence of retro-pharyngeal abscess, for in both cases there is pressure upon the air and food passages. There is dyspnœa and laboured breathing; hoarse, noisy inspiration, and increase of distress in the recumbent position. Swallowing is greatly impeded; the child, if an infant, refuses the breast; if older, he cries when an attempt is made to force him to take nourishment. An effort to swallow is often followed by cough, and an increase in the dyspnœa, with return of the fluid through the mouth and nose.

The most prominent symptom is the dyspnœa. The child's eyes are prominent and his face dusky. His breathing is hurried (40–50) and his nares act with respiration. If an infant, he lies back, with head retracted and the muscles of the nucha rigid. If able to sit up, he sits huddled

together in his cot instead of lying down, and whimpers if disturbed. Each inspiration is accompanied by a loud rattling stridor, and at the same time the soft parts of the chest are retracted and the epigastrium is depressed. The expirations are short and comparatively noiseless. The difficulty of breathing varies in degree. It is subject to exacerbations, during which the child is in the greatest agitation, and seems on the point of suffocation. In the intervals, although quieter, he is still greatly distressed. Anything which irritates or disturbs the patient, such as attempts to give food or medicine, encourages the attacks; and if he try to swallow, the dyspnœa comes on at once. The voice is almost suppressed, and the cry is hoarse or whispering. Cough is either absent or is merely hoarse without clangor. In one case it was paroxysmal.

The physical signs of the chest are normal, with the exception of the loud stridor which is transmitted to all parts of the chest-wall and quite obscures the normal vesicular murmur. On examination of the throat the fauces appear to be perfectly healthy, and the finger pushed to the back of the pharynx finds no tumour such as is present in cases of retropharyngeal abscess. At first, too, the most careful examination of the neck may detect no deviation from the normal state; but after a few days a little swelling may perhaps be discovered on careful inspection. In some cases the larynx has been usually prominent or pressed out of the mesial line. The swelling in most of the cases appeared at some part of the posterior border of the thyroid cartilage, just in front of the sternomastoid muscle, and in two cases it spread to the front. In one instance it was noticed to become more prominent in expiration, and to recede again in inspiration. The swelling is not hard, and rarely fluctuates; indeed, as Dr. Stephenson remarks, "it may feel more like air than fluid."

If the swelling is punctured and the accumulated pus let out, instant relief is obtained. The dyspnœa subsides and rapidly disappears; the child takes food without hesitation or difficulty, and the cough improves. The voice may, however, remain feeble for some weeks afterwards. The duration of the disease is short. In all published cases the suppuration ran an acute course, and ended fatally in many instances. As in the case of abscess behind the pharynx, death may be the consequence of exhaustion, or the child may die suffocated in an access of dyspnœa.

Diagnosis.—In reading the above description of the phenomena attending upon suppuration about the larynx the resemblance of the disease, in its course and symptoms, to retro-pharyngeal abscess cannot fail to be remarked. We find in each instance difficulty of swallowing, paroxysmal dyspnœa and stridulous breathing, and a marked increase in the child's distress when he lies down. In either case, too, the trachea may be pushed out of place and may be more prominent than natural. The chief distinguishing mark is the presence of a tumour in the fauces if the abscess is situated behind the pharynx; while if the suppuration occurs around the larynx the fauces are natural.

The distinction between such a condition and membranous croup is described elsewhere (see page 594). It may, however, be here noticed that in children who are old enough to sit upright, orthopnœa is a very characteristic symptom of interference with the passage of air through the larynx and trachea from *outside pressure*. In membranous croup no such symptom is noticed, for in that disease there is no aggravation of the dyspnœa when the child is recumbent. On the contrary, he often breathes more easily in that position. Again, the progression of the symptoms is more gradual in

the case of abscess. The stertor comes on more slowly and increases in intensity as the sac increases in size.

Prognosis.—The prospect of recovery depends upon the general health of the child, and upon the appearance of local swelling or fluctuation at some point in the front of the neck. If the abscess can be detected and its contents evacuated, recovery may take place; but if the child be a feeble cachectic subject, especially if he be much exhausted by sleeplessness and want of food, the operation may come too late to save life. In this disease the prognosis is distinctly less favourable than it is in retropharyngeal abscess.

Treatment.—If the presence of an abscess about the larynx be suspected, the throat should be enveloped in hot poultices, frequently changed, so as to hasten the formation of matter and quicken its approach to the surface. If any swelling can be detected by the side of the thyroid cartilage, it should be punctured with a small trocar without reference to the absence of fluctuation. Even if no swelling can be seen, in cases where the symptoms are very urgent and we feel strong suspicions of the formation of pus in the neighbourhood of the larynx, it is justifiable to make exploratory punctures. Some point on a line with the posterior border of the thyroid cartilage should be chosen for the operation. If the exploration be attended by no satisfactory result, and the symptoms continue urgent, tracheotomy should be performed.

At the same time every effort should be made to support the strength of the child. Port wine should be given, or the brandy-and-egg mixture; and pounded meat made fluid with gravy or strong beef-tea, eggs and milk, etc., must be administered in suitable quantities. If the child cannot swallow, he must be fed, if possible, through a stomach-tube introduced by the nose.

CHAPTER IV.

CROUPOUS PNEUMONIA.

Croupous or lobar pneumonia may be seen at any period of childhood, but in infancy is comparatively rare. Up to the end of the second year inflammation of the lung usually assumes the catarrhal form, and even in the third year pneumonia is more often catarrhal than croupous. After the third year both forms of the disease are about equally common, and with each succeeding year inflammation of the lung, if it occurs, is more and more likely to be of the croupous variety.

Causation.—Of late years a tendency has been growing to look upon croupous pneumonia as an acute general disease, of which the pulmonary consolidation is the anatomical expression, and no longer to regard it as a mere local inflammation. Some observers have compared it to acute rheumatism and tonsillitis. Others, who see in the affection the effects of a special poison, have even placed it in the same class with typhoid fever and other similar specific distempers.

That the disease is a general one, with a marked local manifestation, seems to be evident, for the general symptoms are not proportioned in severity to the extent of lung surface involved ; they may precede by some days any evidence of local mischief, and the highest elevation of temperature is often reached before the point of most complete consolidation is arrived at. Moreover, the character of the symptoms differs in many respects from the ordinary type of constitutional disturbance set up by a local injury : head symptoms are more common, sweating is more frequent, and a herpetic eruption is an ordinary phenomenon. Again, the morbid exudation, which is the chief local expression of the disease, is of a kind peculiar to pneumonia, and cannot be produced by ordinary inflammatory agency. Still, although the affection may be a general one, it does not follow, as some observers are disposed to believe, that it ought to be classed amongst the diseases which result from specific infection. There are no doubt some facts which seem to favour this view. Thus, pneumonia has been occasionally known to occur in epidemics, and in some outbreaks facts have been noted which seem to point to personal communication of the disease by contagion. The illness sometimes appears to be preceded by a prodromal interval, and to pass through a stage of invasion before local symptoms are manifested; it runs a definite, uniform course ; is often accompanied by complications which assume different degrees of prominence in different outbreaks, and its type varies in severity, the rate of mortality being higher in some epidemics than it is in others. In all these features the disease seems to incline to the class of acute specific maladies. The question whether or not the illness can be set up by impressions of cold, is one of great importance, for if it can arise from a simple chill, the disease can have no pretensions to be the consequence of a specific poison. There is a conflict of testimony upon this point. It is said that pneumo-

nia is most frequent in the tropics, and diminishes in prevalence as the distance from this zone increases. It is not especially common in cold latitudes; and Koch in his cases failed to trace any relation between the attack and the external temperature. Other observers, however, have noticed a connection between the illness and meteorological conditions; and there is no doubt that in seasons where the temperature is changeable and the weather damp the disease is more common than at times when the temperature is uniformly high or uniformly low. Biach states, as a result of his observations, that the coincidence of rapid atmospheric depression, a low temperature, and sudden changes of temperature tends to produce the disease.

Perhaps in the present state of our knowledge it may be sufficient to class pneumonia with tonsillitis, and, indeed, it bears a great resemblance to that disease in the conditions under which it appears to originate. In addition to cold, bad drainage seems to have a powerful influence in exciting the malady. Many mysterious cases of pneumonia arising in schools have been finally traced to contamination of the air of dormitories by sewer-gas, and have ceased after measures have been taken to rectify the faulty condition of the drains.

Pneumonia sometimes occurs secondarily to other forms of illness. Thus it may be a consequence of an altered state of the blood, as in the acute febrile diseases, or may be due to imperfect purification of the blood, as in Bright's disease. In other cases, again, it may be a purely accidental complication.

Lastly, although pneumonia often attacks children who are to all appearance strong and healthy, its occurrence, like that of other acute diseases, is favoured by conditions which reduce the strength and lower the resisting power. Therefore impairment of health must be looked upon as one of the predisposing causes of the malady.

Morbid Anatomy.—The morbid processes which constitute an attack of pneumonia are divisible into three well-marked stages. In the first—the stage of *engorgement*—there is congestion of the capillary vessels which ramify between the air-vesicles and on the minute bronchia, and swelling of the alveolar epithelium. The organ is heavier than natural, and darker in tint. It still contains air, and therefore crepitates on pressure although less perfectly than natural; but its substance tears readily, retains the mark of the finger, and on section pours out a reddish, frothy fluid from the divided surfaces.

In the second stage—the stage of *red hepatisation*—the alveolar epithelium is swollen and granular. An exudation of the constituents of the blood coagulates in the air-vesicles. The alveoli and small air-passages connected with them are crowded with white and red blood corpuscles, which distend these little cavities and cause complete consolidation of the lung. The affected part, therefore, is airless and can no longer crepitate. It tears with the utmost ease. Its bulk is increased; it sinks in water; and on section the surface is dryish and somewhat granular, although pressure causes a thick, turbid fluid to ooze out. The colour is reddish-brown, marbled here and there with gray. Usually the adjacent pleura is also inflamed. It is opaque and congested, and adhering to it are patches of lymph.

In the third stage—the stage of *gray hepatisation*—the colour of the diseased part of the lung becomes grayish or whitish-yellow. White blood corpuscles continue to exude into the air-cells, and there is besides proliferation of the alveolar epithelium; so that with the microscope we find

epithelial cells, granule cells, and leucocytes. The fibrinous exudation disintegrates, and the cells quickly undergo fatty degeneration. The organ is still heavy and airless, and is very soft in consistence, so that a little pressure breaks it down. The cut or torn surface is but slightly granular, and on pressure gives out a puriform fluid.

These various stages of the disease may usually be seen to occupy different part of the lung at the same time; for as the disease spreads from one part of the organ to another, it is far more advanced in the part first attacked. The extent of tissue involved is subject to great variety. The affection may be limited to a small patch, or may involve a whole lobe, or even the entire lung. It attacks the base by preference, but is far from uncommon at the apex, especially in the child. Usually the consolidation is confined to one side of the chest; but double pneumonia is said to be more common in children than in adults.

The process of *resolution* in the affected part consists in a fatty degeneration and liquefaction of the contents of the alveoli and small air-tubes. Thus softened and liquefied the inflammatory products are readily absorbed or coughed up; the air-cells are freed; and the circulation through the capillaries ramifying on the alveolar partitions is restored. Resolution is the normal and favourable termination to a croupous pneumonia; and if the illness be primary is the common ending in the child. In exceptional cases, usually when the disease is secondary, suppuration may occur with the formation of an abscess, or the inflammatory process may pass into gangrene. Still, gangrene is rare as a consequence of pneumonia; and probably never occurs as a result of the uncomplicated disease. It may, however, follow in cases where emboli derived from ante-mortem clotting in the right heart are arrested in the pulmonary capillaries. If Bouillard's statement that a peculiar tendency to the formation of such clots is a common feature of the true pneumonic disease be correct, it is surprising that the gangrenous change is not more often met with. Croupous pneumonia is not a cause of phthisis. A simple unabsorbed consolidation, such as is common after catarrhal inflammation of the lung, rarely if ever results from the croupous form of the disease.

On account of the apparent analogy between pneumonia and the acute specific diseases, pathologists have searched carefully amongst the morbid products in the lung for signs of microscopic organisms, such as have been shown to exist in cases of erysipelas. Friedländer, of Berlin, in searching amongst the fibrinous effusions in the bronchial tubes, and in examining sections of the lung-tissue and inflamed pleura, found in each of eight cases submitted to investigation ellipsoidal micrococci which were coloured deeply by the aniline dyes. The organisms were found, as a rule, arranged in pairs or chains; but in some parts they swarmed in enormous numbers, especially in the interior of the alveoli and the lymphatic vessels. Koch, Klebs, and other observers have also described similar organisms.

Symptoms.—The onset of croupous pneumonia is sudden, and is usually marked by signs of great perturbation of the nervous system. The child is often convulsed, and the eclamptic seizures may succeed one another, with only short intervals of quiet, for hours together. In other cases the patient complains of severe headache and pains about the chest. He vomits repeatedly; shivers or cowers over the fire; and towards the evening may become delirious. From the first the temperature is high, the thermometer marking 103°–105°, or a still greater elevation. From the first, too, cough is noticed, and is a source of much distress from the pain it excites in the chest. The cough is characteristic. It assumes the form of a short, sharp

hack, and in older children may be accompanied by the expectoration of a rusty sputum. The cheeks are brightly flushed; the eyes look heavy, and the face is distressed; the nares act; the tongue is thickly furred; epistaxis is a common symptom; and the weakness is often from the first a notable feature in the case. This weakness often amounts to marked muscular prostration. An infant lies quietly and takes no notice of what goes on around him. An older child seems stupid, and often makes no reply to questions addressed to him, as to do so requires an amount of exertion to which he feels himself unequal.

As the disease goes on there is little alteration in the symptoms. The child lies on his back in his bed. He is very thirsty, but has no inclination for food. His face continues flushed, and often a patch of herpes is seen on the upper lip. His breathing is hurried and short; and its rhythm is altered, the pause taking place at the end instead of at the beginning of inspiration. This is probably due to an effort to suppress the cough. The peculiar character of the cough has been already referred to. It occurs in short single hacks, one to each short inspiration; and these often continue until the child seems quite exhausted.

After three or four days the flush disappears from the cheeks, and the face is left pale, with a little lividity about the eyelids and mouth. The nervous symptoms also subside, and the nocturnal delirium rarely lasts longer than three or four nights. Usually the period of completion of the exudation is marked by a subsidence of the more severe features of the case. The temperature remains elevated, but the child looks less dull and self-absorbed; his expression of distress passes away, and he takes some interest in what is going on around him. The period of resolution is marked by a sudden fall of the temperature, which sinks below the level of health, and the child passes rapidly into a state of convalescence.

The more special symptoms will now be considered in detail.

Nervous symptoms are, as a rule, more violent at the beginning of the disease. Convulsions cease after a few hours, and although delirium may persist for several nights, it rarely continues after consolidation has been completed. Severe cerebral symptoms are said to be more common in cases where the apex of the lung is the part to be attacked, but they are not limited to such cases; indeed, in children they are often quite as marked when any other part of the lung is involved. It is very common to find a pneumonia of the apex unaccompanied by any sign of nervous irritation; and according to my experience inflammation of this part of the lung, in the large majority of cases, runs in the child an especially short and favourable course.

When nervous symptoms occur the form they take is subject to considerable variety. In infants there is usually great drowsiness, preceded, perhaps, by convulsions, and often accompanied by twitchings of the facial muscles and of the muscles of the limbs. Sometimes the child clutches at his mother's dress as if in fear of falling; and when the drowsiness passes off he cries fretfully as if in pain. In an older child severe headache and delirium are usually the most prominent of the nervous symptoms. Thus, a little girl, aged nine years, came back from school complaining of headache and pains in the chest and back. For the next two days she vomited repeatedly, groaned with the pain in her head, and was delirious at night, lying with her head back and her arms up to her forehead. There was no squint; her nose bled once, and she coughed and expectorated phlegm streaked with blood. The child was seen at the hospital three days afterwards. Her temperature was then (6 P.M.) 103°, and there was con-

solidation of the lower two-thirds of the left lung on the posterior aspect.

In many cases where nervous symptoms are prominent there is a sallow tint of the face, with tenderness over the liver, and a constipated state of the bowels. The symptoms of nervous excitement do not appear to be dependent upon undue elevation of temperature, for they do not necessarily occur in cases where the pyrexia is most marked ; nor do they seem to have any connection with the ordinary reflex excitability of the nervous system so common in the young child.

A little girl, aged three years, was noticed to be very restless and irritable for a fortnight. At the end of that time she had a fit while at dinner. The child was brought to the hospital and remained convulsed for two hours. She was kept in the hospital for about a week, on account of twitchings in the muscles and a certain excitability of manner, although she had no return of the fits and seemed to be perfectly intelligent. The bowels were costive and had been much confined, otherwise no derangement of organs could be discovered. After her discharge the child remained well for a fortnight, and was then brought back to the hospital with an attack of lobar pneumonia involving the lower part of the right lung. In this attack, although the temperature was high (about 104°, both morning and evening) the illness had not been ushered in by convulsions ; there was complete absence of nervous excitement ; and the disease ran an exceptionally mild course.

The *breathing* in pneumonia is hurried from the first. There is no actual dyspnœa, for in an ordinary case we find none of the distress which is seen when a child is consciously suffering from shortness of breath. He lies down in his bed and requires no support by additional pillows. The nares dilate widely, but the respiratory movements are merely increased in rapidity without being exaggerated in degree. The pulse is also quicker than normal, but is proportionately less hurried than the breathing. Consequently there is a disturbance of the relation naturally existing between the pulse and the respiration which is a very important symptom. The ratio from being 1 to 3.5 is reduced to 1 to 2.5 or even 1 to 2. Thus, a respiratory rate of 75 with a pulse rate of 140 is very commonly met with. Although the rapidity of breathing is not accompanied under ordinary circumstances by a feeling of dyspnœa, the child shows by his manner that the supply of air to his lungs is a pressing necessity, for he will not willingly allow the process to be interrupted. He will bear much discomfort without complaint, and indeed the passiveness of a young child under examination is a characteristic feature of the disease. If he begin to cry he usually ceases to do so very quickly. If he suck, he does so hurriedly, stopping at short intervals to breathe through his half-open mouth, as air cannot be admitted in sufficient quantity through the nose.

The *tongue* is thickly furred, and in severe cases may become dry and brown. Vomiting often occurs at the beginning. The bowels are usually confined, but may be loose, and in exceptional cases there is profuse diarrhœa. The appetite is completely lost, and there is great thirst.

The *urine* is diminished in quantity. Its specific gravity is high, and it is often thick with lithates. The excretion of urea and uric acid is above the average of health ; but there is a great diminution in the amount of chlorides ; and at the height of the disease these salts may disappear altogether from the urine. Occasionally there is albuminuria ; and bile pigment is often noticed.

The *pyrexia* is high from the first, and the remission in the morning is

often very slight, seldom exceeding a degree or a degree and a half. The temperature rises usually to between 103° and 105°, but may be higher. It often reaches its maximum on the third day. When the temperature falls it falls suddenly. Thus, in the case of a little girl, aged five years, on the evening of the fifth day the thermometer registered 104.2°. It then began to fall. At 10 P.M. it was 101.2° ; at 2 A.M. on the following morning it was 100.2° ; and at 6 A.M. 99°. It remained all day at this level, being the same at 10 P.M.

Although in ordinary cases of pneumonia there is no actual dyspnœa, in exceptional instances we find serious suffering from want of breath. It occasionally happens that when a large area of lung has become rapidly consolidated the heart's action is seriously embarrassed by the impediment to the pulmonary circulation. The over-distended right ventricle labours violently to force the circulation onwards ; but its walls soon become weakened and dilated by the pressure to which they are exposed. We find the child propped up in his cot struggling for breath with a pale or livid face. His nares dilate widely at each inspiration ; the chest-walls are forcibly elevated, but expand only imperfectly ; and there is great recession of the suprasternal notch, the intercostal spaces, and the epigastrium as each breath is drawn. The child can hardly speak, but his expression indicates terror and distress, and beads of sweat often stand upon his brow. On inspecting the chest the right auricle can usually be seen beating in the second and third interspaces to the right of the sternum ; the heart's action is violent, while the pulse at the wrist is so feeble as to be hardly perceptible. There is, indeed, little blood in the systemic circulation, but the pulmonary system is engorged. These cases are not so common in the child as they are in the adult ; but they are occasionally met with in early life, and unless prompt assistance be rendered may quickly prove fatal.

A *physical examination* of the chest may not at first discover any signs of the inflammatory lesion in the lung. Often two or three days elapse before any characteristic changes are to be discovered by the finger or the ear. Usually on the first day or two the percussion-note is normal, and with the stethoscope we find merely a sonoro-sibilant rhonchus scattered more or less widely over the lung. Even when consolidation occurs, if this be situated in the middle of a lobe, we may find bronchial breathing, with a puff of fine crepitation at the end of inspiration, but the percussion-note may be normal as long as a thin layer of healthy lung-tissue intervene between the diseased spot and the surface.

In an ordinary case the physical signs of the disease are as follows :

During the stage of *engorgement* inspection can seldom discover any impairment of movement on the affected side. In young children this is always difficult to detect, for the respiration being chiefly diaphragmatic, the chest-walls take a comparatively small part in the respiratory movement. There may be at first no dulness on percussion, or the note may have a slightly higher pitch than that over the sound lung. The breathing is very harsh and rather louder than natural, and towards the termination of this stage a fine puff of crepitation is caught at the end of inspiration. This is usually only to be heard when the child draws a deep breath. In ordinary breathing there may be a little coarse bronchitic rhonchus both with inspiration and expiration which presents nothing characteristic.

In the stage of *hepatisation* a faint vocal vibration may be sometimes detected over the affected side when the child speaks or cries. This sign is a very capricious one. It may be noticed in very young subjects and be absent in a much older child. If present, it is a sign of value, but no

inference can be drawn if it fail to be perceived. The percussion-note over the affected part is now dull; but the dulness is far from being complete, as in pleurisy. The sense of resistance, too, although increased, is not extreme, as in the case of effusion. It is rather greater than natural, and that is all. In babies and young children the increase of resistance may be very trifling. Auscultation over the consolidated spot discovers a loud tubular breath-sound, and the crepitation, which was before heard at the end of inspiration, is now no longer to be perceived, although at the borders of the solidified region it may still be detected. If the child can be persuaded to speak, the resonance of the voice is high-pitched and sniffling, and is conducted with much greater distinctness than natural to the ear. This sign is, however, not always present, and in a case of undoubted consolidation the resonance of the voice may be normal. Indeed, in exceptional cases—owing possibly to plugging of a tube with mucus—vocal resonance, and even blowing breathing itself, may be indistinct and distant-sounding, or even altogether suppressed. On the other hand, if the consolidated spot is in the middle of a lobe, completely surrounded by healthy tissue, and the patient be an infant, a bronchophonic resonance of the cry may be the only sign to be detected of the pulmonary lesion.

When *resolution* occurs in the affected part, crepitation returns, coarser and more like bubbling than before; the breath-sound becomes less high-pitched and metallic, and gradually loses its blowing quality. The dulness also diminishes and finally disappears. Returning crepitation is often absent in the child, and resolution frequently takes place without any moist rhonchus being heard. The excessive resonance of the voice and cry usually persist over the affected spot for some time, or until the consolidation has completely disappeared. Resolution is carried on more rapidly in some children than in others. In many cases, however, when dulness persists for some weeks after subsidence of the general symptoms, the impairment of the percussion-note is due to a layer of lymph over the pleura at the affected spot.

The physical signs just described usually occupy the lower two-thirds of one side; but may be found at any part of the lung. Often they are confined to the apex; or may be discovered over a limited area under one of the arms. As has been already observed, they are often slow to develope; and therefore, when from the general symptoms croupous pneumonia is suspected, frequent and complete examination should be made until the situation of the local lesion is discovered. An important peculiarity of this form of disease is that the physical signs, unless situated at the apex of the lung, are usually confined to one aspect of the chest. If they are detected at the posterior aspect, the signs are normal in front; while inflammation of the anterior part of the lung produces no alteration of resonance or respiratory sound at the back of the chest. Therefore a complete examination of the chest must be made before we are justified in saying that no signs of pneumonia are present.

Terminations.—In the large majority of cases in the child croupous pneumonia ends in resolution and recovery. In the primary form of the disease an unfavourable termination is very rare; and even in cases of secondary pneumonia, unless the child be a new-born infant or in a state of great weakness, it is exceptional for him to die. When death takes place it usually occurs on the fourth or fifth day as a result of failure of the heart. It may, however, happen later as a consequence of abscess or gangrene of the lung.

When resolution occurs, the improvement is very sudden, and the dis-

ease terminates by crisis. The temperature, which had given little or no sign of reduction, falls suddenly in the course of twelve hours to the normal level, and remains low for four-and-twenty hours, even if it afterwards undergo a moderate increase. The crisis often occurs on the fifth day, but may be deferred until the eighth or ninth, and in rare cases until later. The violence of the onset, the height of the fever, and the severity of the nervous symptoms are not in proportion to the extent of surface involved, nor are they to be taken as an indication that the course of the disease will be prolonged; for cases in which the general symptoms are very pronounced may come to an end on the fifth day. The cessation of the pyrexia is followed by an immediate improvement in the child's condition. The skin becomes moist; the tongue cleans; the pulse and respiration fall in frequency and regain their normal relation to one another; the cough is loose and less frequent; the urine is more profuse; and the appetite returns. The favourable change in the general symptoms precedes the improvement in the physical signs, and for a day or two the resonance may continue to be impaired, and the breathing to be bronchial or blowing over the affected part of the lung.

In exceptional cases the termination by resolution occurs more gradually. The temperature perhaps falls suddenly, but almost immediately rises again; so that for two or three days, a week, or even longer, the bodily heat may continue to be considerable at night, with a morning fall. Sometimes, after remaining low for two or three days the thermometer again registers a high degree of temperature and the child passes through a complete relapse of his illness. The relapse is, however, usually shorter and less severe than the original attack.

The termination by *abscess* of the lung is not often seen except in cases where the pulmonary affection is secondary to pyæmia. It does, however, occasionally occur in children of weakly constitution who are living in thoroughly insanitary conditions; and may also be seen in cases where inflammation is set up in the lung as a consequence of impaction of a foreign body in one of the bronchi.

When abscess of the lung occurs in a case of secondary pneumonia the temperature remains high, or if it fall, rapidly rises again and assumes a hectic type; there is great weakness; the tongue becomes dry and brown, and the complexion dull and earthy in tint, with livid discolouration of the eyelids and lips. On examination of the chest the dulness is found to persist, and the breathing to be bronchial or blowing, with much large bubbling or even metallic rhonchus. Unless the abscess burst into a bronchial tube, and its contents be evacuated, the physical signs are not characteristic of the lesion. If, however, the purulent contents are discharged, cavernous breathing, whispering bronchophony, and the usual signs of a cavity may be detected at the seat of the disease. If the abscess be the result of pyæmic infection, the general symptoms are those of the constitutional state, and the local signs, not being the consequence of any extensive local inflammation, may be overlooked, more especially as the abscesses are small and are often completely surrounded by healthy lung-tissue.

Gangrene of the lung will be considered in a separate chapter.

Pneumonia is occasionally *latent*. This form of the disease is most commonly seen when the patient is a young child worn and wasted by chronic abdominal derangement, whose nervous irritability is almost completely lost. In such cases the ordinary symptoms of invasion are not noticed. There is no sign of pain in the chest. Even the cough may be infrequent or absent. A slight rise in the temperature, increased rapidity

of breathing, perversion of the pulse-respiration ratio, and indications of early prostration may be the only symptoms excited by the intercurrent malady.

Complications.—Inflammation of neighbouring tissues often complicates a case of pneumonia. In the child a certain amount of *bronchitis* is a common feature of the illness. In almost all cases we can detect some sonoro-sibilant rhonchus not only in the affected lung but also on the opposite side of the chest. In many instances there is also some moist rhonchus. As a rule the amount of bronchitis is trifling, and the complication is rarely sufficiently marked to be a source of danger.

Plastic pleurisy may also accompany the pulmonary inflammation, and sometimes there is a moderate liquid effusion. The pleurisy is seldom of much moment, and absorption usually occurs rapidly when resolution of the inflammation has taken place. As has been before remarked, the persistence of dulness over the seat of disease during convalescence is commonly due to the presence of a layer of lymph upon the pleural lining of the chest.

Pericarditis is sometimes induced by extension of the inflammation; but this complication is less common in pneumonia than in the case of pleurisy. In the child the inflammation of the pericardium, when it occurs in the course of a croupous pneumonia, is usually plastic, and is but rarely accompanied by effusion. In regard to prognosis it is probably of small importance.

Jaundice is sometimes seen, and is usually mild. It is due to pressure upon the bile-ducts by hyperæmic portal vessels, the circulation through the liver being impeded owing to the condition of the lung. It may also arise from gastro-duodenal catarrh. If this be sufficiently intense to create an impediment to the introduction of nourishment, the consequences may be serious. Gastric or intestinal catarrh may be present without jaundice. Diarrhœa is a symptom not unfrequently seen at the beginning of an attack of pneumonia. As a rule, the purging is not excessive, and ill consequences rarely follow from the intestinal derangement.

Diagnosis.—In a well-marked case of croupous pneumonia the diagnosis is not difficult. The sudden occurrence of high fever, headache, pain in the side, short hacking cough, perverted pulse-respiration ratio, and rapidly increasing muscular weakness is very suggestive of this disease. It is important to bear in mind the nervous symptoms which often accompany the onset of the illness, or we may alarm ourselves with suspicions that an inflammatory head affection is about to manifest itself. But although a feverish child is often light-headed at night, and wanders somewhat in his talk, high fever with early and marked delirium is not a common occurrence; indeed, this combination breaking in upon a state of health, if combined with a short hacking cough, is almost peculiar to pneumonia. If, in addition, we notice that the nares dilate at each inspiration, and that the breathing is quickened out of proportion to the pulse, we are justified in entertaining the strongest suspicions that the attack is one of croupous inflammation of the lung.

In some cases cough is absent, or is so slight that it passes quite unnoticed, and the nares are motionless in inspiration. Still, the sudden occurrence of a high temperature, with pungent heat of skin, as estimated by the hand, combined with early delirium, should suggest the presence of pneumonia. In all such cases the chest should be minutely examined for confirmatory evidence. It must be remembered that the physical signs are often slow to appear, and that forty-eight hours, or even three or four days,

may pass without any consolidation of the lung being discovered. It must also be remembered that the severity of the symptoms is not in proportion to the extent of lung-tissue involved, and that after a violent onset the local signs may be confined to a mere patch of solidification at any part of the pulmonary surface. We must not, therefore, content ourselves with a cursory examination of the bases of the lungs. Careful attention must also be directed to the apices, and we must not forget to search the axillæ on either side for evidence of disease. In cases of pneumonic consolidation the dulness is not complete, and is accompanied by little increase in resistance. Moreover, in the large majority of cases the signs are limited to one aspect of the chest. Sometimes a faint vibration of the chest-wall, inappreciable upon the healthy side, may be detected over the seat of disease when the child speaks or cries.

The combination of high fever, headache, and diarrhœa may be perplexing. If the patient be an infant, the symptoms may be ascribed to teething, and the condition of the lung may be overlooked. The nares, however, act, and the respiration, if counted, will be found to be hurried out of proportion to the pulse. If a physical examination be made, as it ought to be, a matter of routine, the nature of these cases will not escape recognition. In an older child the same combination of symptoms would suggest enteric fever. But the violent onset, the flushed cheeks, the active nares, the rapid breathing, the hacking cough, are very unlike the beginning of enteric fever; and if delirium come on, it begins very early (on the first or second day) in pneumonia, while in typhoid fever it is rarely seen before the end of the first week.

In young children, in whom the disease may begin with violent convulsions, or with a drowsiness approaching to stupor, the diagnosis is very difficult, especially as there is often no cough. Usually until signs of consolidation are discovered at some part of the chest the nature of the illness must remain doubtful. Still, drowsiness and a temperature of 103° or 104°, without signs of severe headache, but with rapid, regular, breathing, a perverted pulse-respiration ratio, and pungent heat of skin should suggest the presence of pneumonia.

In the latent form, which usually occurs in wasted children, rapid breathing and active nares ought always to lead us to make careful and repeated examination of the chest.

The distinguishing marks of catarrhal pneumonia and collapse of the lung are considered in the chapters treating of those subjects.

Prognosis.—Primary croupous pneumonia, unless very extensive, almost always terminates favourably, and even in infants is seldom dangerous. Resolution takes place early, as a rule, and the consolidation clears completely away, leaving the lung as sound as before. The situation of the local lesion has no influence upon the prognosis, and no special danger is connected with inflammation of the apex of the lung. The nervous symptoms, however serious they may appear, need cause no alarm, for they subside altogether when consolidation becomes established. Delirium in itself, without other signs of nervous disturbance, is rarely an unfavourable symptom in a feverish child. It usually disappears after a few days, but may return again towards the end of the disease as a result of weakness; but this recurrence, if the indication which it furnishes is attended to, is rarely followed by dangerous consequences.

The secondary forms of pneumonia are more serious than the primary, for the tendency to failure of the heart's action is increased by weakness induced by previous disease. So, also, the existence of a depressing com-

plication adds to the danger of the case. Pneumonia occurring in the course of Bright's disease is an especially serious form of the complaint.

A very rapid pulse (over 140) is an unfavourable sign, especially if the pulsations are irregular in force and rhythm. So, also, a rise of temperature above 105° should be regarded with anxiety, although in early life this phenomenon is less serious than a similar elevation would be in the case of an adult.

Treatment.—In an ordinary case of primary croupous pneumonia little is required beyond keeping the child quiet in bed in a well ventilated room, wrapping the affected side of the chest in cotton wool or linseed meal poultices frequently renewed, and administering a simple effervescing saline or other febrifuge draught several times in the day. The pain in the side is usually greatly relieved by the use of hot poultices and other applications. To be efficient, however, these should be used as hot as the skin can bear them ; and dry heat, such as a bag filled with heated bran or salt, is perhaps better—it is certainly more manageable—than hot flannels. If any severe pain is complained of, a proportion of mustard (one-fifth or one-sixth) may be added to the poultice, and this may be allowed to remain for six or eight hours in contact with the skin. If the cough is distressing a few drops of ipecacuanha wine and of compound tincture of camphor may be included in the mixture ; and a few drops of antimonial wine may be added with advantage on account of its diaphoretic action upon the skin. The old plan of attempting to reduce the inflammation by large doses of antimony is one to be very strongly deprecated. If the bowels are confined, or the complexion has a sallow cast and there is tenderness over the liver, an aperient powder should be prescribed, such as a grain of calomel with two or three grains of jalapine ; but the aperient seldom requires repetition. Violent purgation in this disease is decidedly injurious.

The diet should consist of meat broths and milk until the consolidation is complete. When the establishment of blowing breathing and the disappearance of crepitation show that the process of repair is about to begin the diet can be improved. Strong beef-tea should then be given at proper intervals, and a yolk of egg may be added to the diet. The thirst may be relieved as often as the child requires drink, but he must not be allowed to take a large quantity of fluid at one time. In the case of an infant at the breast, or one who is brought up by hand, some thin barley-water should be given from time to time to relieve thirst, so that the quantity of food the child takes may be restricted.

If the pyrexia rise to a high level and the child seem distressed by the intensity of the fever, the temperature may be reduced by sponging the surface of the body with tepid water ; or if absolutely necessary, the child may be placed in a tepid bath of the temperature of 70°. If, however, the bath be used, great care must be taken not to depress the child, as failure of the heart's action is one of the dangers to be apprehended in cases of pneumonia. Both before immersion and after removal from the bath a stimulant should be given, and if the feet feel cold, a hot bottle should be put into the bottom of the cot. Quinine is strongly recommended by some authors as a valuable remedy at an early period of the illness. It is given partly as an anti-pyretic, for it is said quickly to reduce the temperature without weakening the heart ; partly for its supposed influence in checking the spread of the disease over the lung. To be of service as an anti-pyretic the drug must be given in full doses ; and it must be remembered that children bear the remedy well. For an infant of twelve months one grain should be administered three times a day. This

quantity can be increased by one grain and a half for every year of the child's life. Aconite and other depressing anti-pyretic drugs are dangerous remedies to employ in cases of pneumonia on account of their weakening influence on the heart.

In cases where great dyspnœa and threatened cardiac failure arise from over-distention of the right side of the heart, it becomes a serious question whether abstraction of a small quantity of blood is not called for. If the danger is imminent I should not hesitate to take one, two, or more ounces of blood from the arm. Life can often be saved by this means. Even while the blood is flowing the inspirations become slower and quieter and expand the chest more fully ; the pulse gains in fulness and force ; and the anxiety and feeling of oppression subside. I can look back upon several fatal cases which I now believe might have been saved had I had the courage to relieve the labouring heart by the judicious removal of blood. It is in such cases alone that bleeding is justifiable in this disease ; and here the treatment is directed not against the inflammation, but against one of its consequences, viz., the overtaxing of the heart by the impediment to the pulmonary circulation.

It is not often that stimulants are required in cases of primary pneumonia in children, but if the disease is secondary they may have to be resorted to. Great rapidity of the pulse is an indication for stimulants which must not be disregarded ; and if a pulse of 140 is found to be intermittent in force and rhythm, doses of egg-and-brandy should be given at regular intervals until improvement occurs.

Delirium at the beginning of the disease, if noisy, may be usually quieted by tepid sponging of the surface of the body. If necessary, a small dose of Dover's powder can be given at night. Chloral, on account of its depressing effect, must not be used. If delirium occur later in the illness it is a sign of debility, and energetic stimulation will be required. Sleeplessness can also be usually removed by tepid sponging in the evening.

If diarrhœa occur, it may often be promptly checked by a dose of castor-oil or of rhubarb (gr. iij.–v.), with double the quantity of the aromatic chalk powder given every night. Astringents are rarely necessary in these cases ; but if the purging continue, sal volatile may be given with spirits of chloroform and a drop or two of laudanum, according to the age of the child, three or four times a day. A layer of cotton wadding should be applied to the belly under a flannel binder for the sake of warmth ; and food should be given in small quantities at a time.

Directly the temperature falls tonics should be given ; and the diet of health may be returned to ; taking care that the food is digestible in kind, and that it is given in quantities suitable to a convalescent.

CHAPTER V.

CATARRHAL PNEUMONIA.

Catarrhal or lobular pneumonia, or broncho-pneumonia, is the common form of inflammation of the lung met with in infancy, and is frequently seen in early childhood. The disease is quite distinct from the croupous form previously described, differing from it in its pathology, its symptoms, and its tendency to end in death. Catarrhal pneumonia is nearly always a secondary affection, and results from spread of inflammation from the bronchial mucous membrane to the alveoli. Consequently, the disease invariably attacks both lungs, although it may be more extensive on one side of the body than on the other.

Causation.—As broncho-pneumonia is always preceded by pulmonary catarrh, the causes which induce bronchitis in the child may be looked upon as tending in a great measure to set up catarrhal pneumonia in the air-vesicles. These are especially cold and damp, and the inhalation of dust and other irritating particles in the air.

A severe bronchitis in the young child always inclines to spread to the finer tubes and air-cells; but certain forms of illness have great influence in determining the extension of the inflammation. Thus, measles and whooping-cough number lobular pneumonia amongst their most frequent sequelæ, and the disease is also common as a secondary consequence of diphtheria. In scrofulous and tubercular subjects, and even in children who are merely weakly and under-nourished, lobular pneumonia is readily excited. Therefore any influence which diminishes the resisting power of the child and lowers his general health must be looked upon as a predisposing cause of the complaint. Thus, bad feeding, insanitary conditions, and depressing derangement or disease may all help to induce this form of pneumonia. It is very common in the case of young children for the illness to be preceded by a history of more or less persistent diarrhœa. A young child who is subject to attacks of intestinal catarrh becomes excessively sensitive to chills, and after a time acquires a catarrhal propensity which, combined with the weakness induced by the digestive derangement, is likely to result in an attack of catarrhal pneumonia. Neglected colds on the chest may set up broncho-pneumonia in the most robust subjects; but amongst the well-to-do classes it is comparatively rare to find this disease in children who are not strumous or delicate, or rickety, or who have not been lately suffering from an attack of measles or whooping-cough.

Morbid Anatomy.—Lobular pneumonia may arise as a consequence of direct extension of the inflammation from the larger tubes to the smaller, and thence to the air-cells; or may occur secondarily to collapse of the lung. In the infant the latter is the method in which the disease usually originates, for in such young subjects, on account of the narrowing of the bronchial tubes, the feeble inspiratory power, and the normal softness and

compressibility of the chest-walls, collapse of the lung is a very common consequence of pulmonary catarrh. The special tendency of rickets to be complicated by bronchitis and catarrhal pneumonia has been elsewhere referred to. The difficulty of expanding the chest in this disease, owing to the softening of the ribs, greatly contributes to setting up collapse of the lung; and any additional impediment, such as a catarrhal state of the bronchial membrane, promotes the exhaustion of the air-cells. Collapse of the lung is followed by congestion of the small vessels, owing to the impediment created by imperfect aëration of the blood, and to the absence of the expansion and contraction of the air-cells, whose movement in a state of health materially advances the pulmonary circulation. As a result of congestion of vessels there is œdema which causes great diminution in the consistence and cohesion of the tissue at the affected spot. In this state the part is ready for the development of inflammatory changes. Inflammation readily extends to it from the air-tubes; or the irritation induced by the penetration into it of secretion from the bronchial mucous membrane excites the inflammatory process.

Lobular pneumonia usually begins in isolated groups of vesicles, being often determined by the presence in them of inflammatory products drawn from the small tubes with which they are in communication. On inspection of the lungs we see scattered nodules of consolidation of a reddish gray colour scattered over the surface. They vary in size from a small pea to a nut. Their consistence is friable, their substance smooth or faintly granular, and their circumference ill-defined. As the process advances, the nodules which were at first isolated become united at their borders so as to produce considerable tracts of consolidation; and at the same time the solidified parts become firmer, dryer, and of a yellowish gray colour. In their centres we can sometimes see divided air-tubes filled with purulent matter.

The lung-tissue in which the nodules are embedded exhibits collapse, congestion, œdema, and emphysema in various stages and degrees. A certain amount of dilatation of vesicles is almost invariably present in the neighbourhood of collapsed portions of lung, and there is, moreover, an appreciable degree of cylindrical dilatation of all the minuter bronchi, especially of those portions which immediately adjoin the terminal alveoli. The walls of these tubes are excessively attenuated. The dilatation appears to be the consequence in some cases of accumulation of secretion. In others it is due to diminution of the respiratory surface, for plugging of some tubes with mucus causes an increased rush of air to the parts which still remain pervious.

The consolidating matter itself consists in a very small degree of exuded corpuscles, as in the case of croupous pneumonia. On examination the alveoli will be found to be stuffed with cells, but these are in great part derived from proliferation of the epithelial lining of the vesicles. Mixed up with these epithelial elements are leucocytes and much gelatinous mucoid matter—probably secretion from the inflamed bronchial mucous membrane which has been drawn into the alveoli. In all cases of catarrhal pneumonia large quantities of thick puriform bronchial secretion are found filling the air-cells and plugging the finest tubes. When this is very copious the amount of epithelial cells is comparatively insignificant. Thus, some of the nodules of consolidation appear to be composed almost exclusively of thick bronchial secretion; and a microscopic examination shows very few proliferated cells and little change in the epithelial lining of the alveoli. In other parts the nodules are composed almost entirely of epi-

thelial elements, and the epithelium lining the alveolar walls is swollen, granular, and partially detached.

These lesions are found in both lungs ; and the process begins in the most depending part, *i.e.*, in the lower lobes at the posterior aspect ; for gravitation greatly aids the passage into the cells of these parts of purulent secretion descending from the tubes. The extension of the inflammation laterally is always irregular, and the selection of the lobules for attack apparently capricious ; for while some become consolidated, others in immediate contact with them remain healthy or merely congested. The nodules and patches of solidification are at first isolated, but tend to coalesce, and in the latter period of the disease comparatively wide areas of consolidation may be found.

The pleura in the neighbourhood of the spots of consolidation is reddened with points of ecchymosis, and adhering to it is often a little plastic lymph.

If the case do not terminate unfavourably, resolution usually ensues. A process of fatty degeneration takes place in the contents of the alveoli. The consolidating material becomes softened down and is removed more or less rapidly by absorption and expectoration. The process of resolution often occupies some time even when the lung finally returns to a normal condition. Often, however, the process of fatty metamorphosis becomes arrested. The cells then atrophy and become caseous, and a chronic consolidation is left which forms one of the varieties of pulmonary phthisis. In other cases an indurative pneumonic process is set up which leads to a great development of fibroid tissue in the part. The walls of the air-tubes and the alveoli become thickened and indurated and the tubes dilated. This condition forms a special variety of lung disease which will be afterwards described (see fibroid induration of the lung).

Symptoms.—Broncho-pneumonia is a secondary disease. Its symptoms are always preceded by those characteristic of a more or less severe pulmonary catarrh. In weakly, ill-nourished children, especially if they are suffering from an attack of measles, a comparatively trifling catarrh will set up lobular inflammation of the lungs. In a robust child inflammation of the alveoli seldom ensues unless the preliminary catarrh has been long continued or very severe. When broncho-pneumonia follows an ordinary catarrh of the lungs, the disease usually runs a very acute and rapid course and commonly ends in death. When it arises in the course of an attack of measles or whooping-cough the complication is more subacute in character and the proportion of recoveries is greater. Still, such cases tend to leave unabsorbed deposits in the lungs.

After the symptoms of pulmonary catarrh have continued for some time they suddenly change their character. The temperature rises ; the cough becomes short and hacking ; the pulse and respirations are hurried ; the face is more or less livid ; the nares act ; and in the infant a well marked labial line becomes developed, passing from the angle of the mouth downwards and outwards to the ramus of the lower jaw.

The pyrexia varies in degree. In children in whom an ordinary bronchitis gives rise to fever, the temperature, when inflammation of the lung is superadded, may reach a high level. Thus, the thermometer may mark 104° or 105°, but undergoes more decided variations during the twenty-four hours than is the case in croupous pneumonia. In most instances there is a decided remission between 6 A.M. and noon ; the chief elevation occurring between 10 P.M. and 3 or 4 A.M. Sometimes, however, for twenty-four or forty-eight hours the temperature may remain at about the same level,

varying only by half a degree. In spite of the pyrexia the skin is often moist, and in some cases perspiration is profuse.

In catarrhal as in croupous pneumonia the pulse-respiration ratio is perverted ; but the disproportionate rapidity of the breathing is variable according to the acuteness of the case In the severe acute variety the ratio may be 1 to 2 or even 1 to 1.5 ; while in the subacute form the ratio may be only 1 to 2.5 or 3. The pulse is very rapid (120 to 150, or even higher), but is small and feeble, for the impediment to the passage of blood through the lungs obstructs the whole circulation. Consequently the arteries are comparatively empty, while the venous system, as is shown by the fulness of all the superficial veins, is congested.

The breathing besides being hurried is laborious, and there is evident dyspnœa. The child often cannot lie down in bed and has to be supported by pillows. At each inspiration the nares dilate widely, and the shoulders rise with the laboured action of the accessory muscles. Often the child endeavours to aid the expansion of his chest by grasping tightly the bars of his cot. Still, with all his endeavours the patient is unable to fill his lungs with air, for at each movement of the chest the intercostal spaces and supra clavicular hollows become depressed, the epigastrium sinks in, and the lower ribs are retracted.

The cough, when the air-cells become attacked, changes its character and seems painful. This change in the cough is a very valuable sign. Instead of the prolonged, rather paroxysmal cough of bronchitis, we hear the short hard hack of pneumonia ; and this may be repeated with each expiration for many minutes together, causing great distress and exhaustion.

Looseness of the bowels is a common symptom, the stools being slimy and thick, or thin and watery. Vomiting, induced by the cough, is also often present ; and much mucus is discharged both from the stomach and lungs. Nervous symptoms are sometimes noticed. In an uncomplicated case convulsions do not occur in the *course* of the illness, although they may be present shortly before death when asphyxia is imminent ; but twitchings and spasmodic movements of the muscles of the eyeball are often seen during sleep.

At this time a physical examination of the chest discovers merely the signs of bronchitis ; for the consolidation being limited to small scattered nodules and surrounded by emphysematous air-cells, can rarely be detected by percussion. Sometimes, however, by employing broad percussion, *i.e.*, by striking with three fingers on three fingers applied to the chest-wall as pleximeters, we notice some diminution of healthy pulmonary tone ; and in some cases a careful exploration distinguishes certain spots where there is more evident diminution in resonance, and perhaps bronchial breathing over the same limited area. If the pneumonia occurs in collapsed portions of lung we can often find at each base a pyramidal strip of dulness reaching upwards for a certain distance, when percussion is made very lightly. With the stethoscope general fine bubbling rhonchus is heard, and in certain spots this will be noticed to be finer, dryer, and more crepitating in character. This crepitating quality is especially noticeable over an area where the breathing is bronchial ; for unlike croupous pneumonia, the crepitus is not lost when consolidation occurs.

As the illness advances, and the nodules of consolidation grow larger and coalesce, more and more of the respiratory surface becomes involved, so that cyanotic symptoms are manifest. The face grows excessively

pale, with a dusky tint around the eyes and mouth; the expression is anxious; the eyeballs are staring and suffused. The respirations may rise to 70, 80, or even more in the minute; and the breathing grows more and more laborious. The child is painfully apathetic and dull. If an infant, he refuses his bottle, and can with difficulty be persuaded to swallow fluids from a spoon. His hands and feet are purple and often cold to the touch, although the internal temperature of the body is still febrile. At this period cough almost ceases, partly from exhaustion, partly from impaired irritability of the respiratory centre. In this state the child sinks and dies, the end being often preceded by a fit of convulsions. Before death, when this takes place from asphyxia, the internal temperature may be subnormal. In the case of a little rickety boy, aged thirteen months, with only two teeth, who died on the eleventh day from extensive catarrhal pneumonia of both lungs, the temperature at 6 P.M. on the evening before death had fallen to 98° in the rectum.

At this stage of the disease percussion discovers more or less extensive dulness of the back on each side; and the breathing is bronchial or tubular, especially about the angle of the scapula. The respiration is accompanied by much fine metallic crepitation both in inspiration and expiration; and this is often very superficial-sounding, as if generated immediately underneath the stethoscope. In the front of the chest there is seldom dulness, unless perhaps the resonance at the bases is diminished; but usually a certain amount of coarse crepitation may be heard in the mammary and infra-mammary region on each side. A curious feature at this time is the indifference of the child to the discomforts of the examination. He allows himself to be placed in any position without complaint, and seems to be quite careless what is done to him.

If the disease terminate favourably, there is no critical fall of temperature, as is the case with the croupous variety of pneumonia. On the contrary, the diminution in the pyrexia takes place very gradually, and the improvement in the general condition does not occur until the local symptoms have given signs of amendment. Thus, the pulse and respiration are reduced in frequency, the breathing becomes less laborious, the pulse fuller, and the superficial veins less distended. The pallor and lividity of the face are less noticeable and the expression loses its distress. The tongue cleans, vomiting ceases, and the appetite returns. Still, the temperature, although it continues to fall, is some days before it sinks to a natural level. The physical signs are also very slow to improve, and absorption takes place very gradually. This variety of pneumonia, as has been said, is apt to leave behind it caseous unabsorbed masses in the lung which may lead to serious illness in the future. Still, under favourable conditions these often become absorbed even although a period of months has elapsed since the attack was at an end.

If the disease do not prove fatal or show signs of resolution at the end of a week or ten days, it often takes on a subacute course. In some cases, especially where the catarrhal pneumonia occurs as a complication of measles or whooping-cough, the subacute character may prevail from the first. In this form the symptoms are less severe than in the acute variety, and the course of the disease is much longer. The temperature does not reach so high a level, remaining usually at about 102°, with morning remissions. Sometimes the pyrexia undergoes curious alternations. Thus, after being moderate for a few days (99°-101°) the temperature suddenly shoots up to 104° or 105°, and after a day or two sinks again to the same level as before. The pulse and respiration are both hurried, but their normal rela-

tion is comparatively little altered. As the disease advances the cough loses its hacking character and occurs in violent paroxysms almost indistinguishable from those of pertussis. Their duration is, however, shorter, and inspiration is noiseless or less decidedly crowing. They may be followed by vomiting. This character of the cough should lead us to suspect considerable dilatation of the bronchi.

Vomiting and some looseness of the bowels are common symptoms. The tongue is furred ; the appetite is impaired ; the strength is diminished ; and the child wastes rapidly and becomes very feeble. In these cases, in addition to the physical signs of broncho-pneumonia which have been already described, we find very clear evidence of dilatation of bronchi. At each posterior base, but more pronounced on one side than on the other, cavernous breathing is heard with a coarse metallic ringing crepitation, sounding very close to the ear ; or the respiratory sound may be amphoric with tinkling echo. In many cases, too, the vocal resonance is bronchophonic, and the faintest laryngeal sound is conducted clearly to the end of the stethoscope.

These cases often continue for weeks, but under judicious treatment generally end in recovery. There is, however, a great tendency to imperfect absorption of the deposit ; and unless the child be placed under favourable sanitary conditions a chronic consolidation may be left which is afterwards a source of danger. Sometimes, too, these cases pass into fibroid induration of the lung.

Complications.—The complications of simple catarrhal pneumonia are not numerous. The illness sometimes begins with stridulous laryngitis, and in the rare cases where the spasmodic disease ends fatally death is usually due to the presence of the pulmonary inflammation. Gastric and intestinal catarrh have already been mentioned as frequent complications of the pneumonia. In the child a catarrh is seldom simple ; often several tracts of mucous membrane share in the derangement.

Catarrhal pneumonia is itself also a common complication of other forms of illness. Measles, whooping-cough, and rickets have already been referred to. General tuberculosis in many, perhaps in most, instances becomes complicated with this form of pulmonary inflammation ; and in the case of fibroid induration of the lung the danger of the disease consists in a great measure in the repeated attacks of catarrhal pneumonia to which children with this form of lung affection are peculiarly prone.

Diagnosis.—At the beginning of the illness we have to found our diagnosis upon the general symptoms alone, for there is at first no sign of consolidation, and physical examination of the chest only reveals the presence of severe bronchitis. Mere elevation of temperature is no proof that the inflammation has spread to the alveoli, for in many children—especially those with scrofulous tendencies—a pulmonary catarrh is accompanied by moderate pyrexia. If, however, the temperature reach 104° or 105,° and at the same time the cough get suddenly short, hacking, and painful, while the breathing becomes disproportionately quickened so as to cause notable perversion of the pulse-respiration ratio, this combination of symptoms is very suggestive of catarrhal pneumonia. A perverted pulse-respiration ratio alone is not characteristic, for this may occur in cases of collapse of the lung. Still, if with great hurry of breathing we find the respiratory movements laborious, and notice that the soft parts of the chest recede deeply at each breath, the sign is in favour of pneumonia ; for in pulmonary collapse the breathing, although excessively hurried, is shallow,

and unless the ribs are much softened from rickets the recession at the base of the chest is slight.

Quite at the beginning of the illness it may be difficult to distinguish the disease from the croupous form of pneumonia where the signs of consolidation are delayed. At this time the age of the child, the history of the attack, and the character of the breathing are important points of distinction. In an infant the inflammation is probably catarrhal, and if the child is frail or badly nourished, is almost certainly so. The history of previous cough points strongly to the lobular form ; and laborious breathing, great recession of the chest-walls in inspiration and a very evident feeling of dyspnœa are distinctive of catarrhal rather than of croupous pneumonia. The latter disease rarely attacks a feeble, ill-nourished *infant ;* it comes on suddenly without previous catarrh ; the breathing, although hurried, is not laborious ; and there is no true dyspnœa, the child not being distressed by the recumbent posture.

When extensive areas of lung have become consolidated, the catarrhal origin of the lesion is distinguished by attention to the crepitation. This râle in croupous pneumonia ceases to be heard over the solidified area and can only be detected at its confines. In catarrhal pneumonia the crepitating rhonchus becomes finer and crisper towards the centre of the consolidation, and is heard with the most typical bronchial or blowing breathing, being sometimes, indeed, so copious as almost or entirely to cover the breath-sound. Moreover, moist and dry bronchitic râles are heard over the lungs generally. In croupous pneumonia this is not often the case, for although some sonoro-sibilant rhonchus is occasionally present, this is trifling in amount, and, as a rule, is not accompanied by moist sounds.

One of the chief difficulties in the case of catarrhal pneumonia is to exclude tuberculosis. That we should be able to do so is of the greatest importance with regard to prognosis ; for while, if the inflammation be uncomplicated, recovery may take place, if the child is tubercular death is certain. The subacute form of the disease occurring in a weakly child and accompanied by diarrhœa and rapid wasting, presents symptoms which are identical with those resulting from acute tuberculosis with secondary lung complication. The physical signs are also the same, for no additional feature is furnished by the presence of the gray granulation in the lungs. Family history is here of importance. If we can discover that other children of the same parents have died with symptoms of tubercular meningitis, the history is suggestive of tubercle. If, again, we can learn that before the onset of the disease the child was losing strength and growing pale and thin without evident cause, the fact is also in favour of tuberculosis. Again, the age of the patient must be considered. Over the age of six years catarrhal is less common than croupous pneumonia. Therefore, if the catarrhal inflammation occurs in a child more than six years old, who has been previously wasting without apparent reason, and has not lately suffered from measles or whooping-cough, we have here strong evidence in favour of tubercle. Of the actual symptoms the only one which in any way points to a constitutional cause for the illness is the presence of œdema without albuminuria ; but this phenomenon, although it may add weight to other evidence, is in itself of little value in a weakly child. If, however, any serious symptoms arise pointing to the brain, and convulsions occur, followed by squint, unequal pupils, ptosis, or rigidity of joints, we can have no hesitation in concluding the case to be one of acute tuberculosis. It must be remembered that terminal convulsions are common in catarrhal pneumonia from asphyxia, and are quickly followed by death. But convulsions occurring in

the *course* of the illness and not evidently the consequence of impurity of blood, are very suspicious of tuberculosis, even although no other sign of nerve-lesion be immediately manifested.

When dilatation of the bronchi occurs in an advanced case of the subacute variety of catarrhal pneumonia it is important to exclude ulcerative destruction of lung. Thus, in the fifth or sixth week of a broncho-pneumonia a child is seen with a temperature of 100° in the morning, rising to 102° or 103° at night. At the same time an examination of the chest discovers a fine crepitating rhonchus at the base of each lung, with impaired resonance over the lower half posteriorly of each side, and at one base dulness, loud cavernous breathing, metallic gurgling rhonchus, and bronchophony. These latter signs are evidently significative of a cavity ; but the cavity may be a dilated bronchus or a vomica in the lung. To which of these causes the physical signs are to be attributed must be decided by reference to the general symptoms and the progress of the case. The position of the cavity, indeed, at the base of the lung, points rather to bronchiectasis than to a vomica, but this is not conclusive proof. If, however, we find that the temperature begins to fall, the child's appetite to return, the general nutrition to improve, and at the same time notice that the cavernous sounds become less intense, the respiration less shrill, and the gurgling less metallic, we may safely infer that no disintegration of lung-tissue has taken place.

Prognosis.—The prospect of the patient's recovery in a case of broncho-pneumonia is always doubtful. In new-born infants, indeed, the illness almost invariably terminates fatally ; but even up to the end of infancy the rate of mortality is very high. When the disease *succeeds* to measles or whooping-cough its course is less acute than when it arises as a consequence of simple pulmonary catarrh, and in these cases there is a greater proportion of recoveries. If, however, the lobular pneumonia come on during the spasmodic stage of pertussis, or towards the beginning of an attack of measles, it is very commonly fatal. The existence of any debilitating condition or exhausting disease increases the danger of the case. Thus in diphtheria the occurrence of secondary broncho-pneumonia is an event of the utmost gravity ; and in rickets the local weakness of the softened ribs, combined with the general want of power in the patient, militates powerfully against a favourable termination to his illness. The danger is usually great in proportion to the degree to which aëration of the blood is interfered with. Therefore lividity of the face, blueness of the nails, lips, and eyelids, smallness and rapidity of the pulse with dilatation of the superficial veins, great perversion of the pulse-respiration ratio, suppression of the cough, and marked apathy or somnolence are symptoms indicative of serious danger. If convulsions occur at a late period of the illness we must prepare the child's relatives for the worst.

Treatment.—The occurrence of catarrhal pneumonia may often be prevented by judicious treatment of the preliminary catarrh, and especially by the employment of energetic measures on the first sign of collapse of the lung. This subject is discussed elsewhere.

When lobular pneumonia has supervened, the indications to be fulfilled are three in number. We have to reduce the temperature, to promote expansion of the lung, and to support the strength of the patient.

In order to lessen the temperature tepid bathing is often resorted to. The child should be placed in water of the temperature of 70°. In this he may remain for ten or fifteen minutes at a time. The bath must be repeated more than once in the four-and-twenty hours, for the reduction of

temperature is only a passing improvement, and the pyrexia quickly returns. This method is highly spoken of by Rilliet and Barthez, who recommend its employment in every case, unless the prostration of the patient be extreme. Another method is that advocated by Bartels. It consists in packing the child in a cold, wet sheet, covered with a thick folded blanket, for three or four hours at a time. The process in this case also requires to be repeated at intervals, so long as no signs of exhaustion are noted, in order to maintain the improvement. The effect of either of these measures is not only to lessen the fever, but also to increase the depth and reduce the frequency of the breathing.

Another very valuable resource is energetic counter-irritation of the skin of the chest. A large poultice of mustard and linseed meal (one part of the former to five or six of the latter) should be applied for six or eight hours to the back. Afterwards a similar poultice should be allowed to remain for a like time on the front of the chest. On removal of the poultice the chest should be covered with cotton-wool. These applications will often have to be repeated several times, for in this disease there is great tolerance of irritation of the skin even in the case of a young infant. Even if the surface is blistered by the application, no harm will be done. Indeed, I have been in the habit of ordering the poultices to be continued until some signs of blistering of the skin have been noticed. The chest can then be covered with cotton-wool. In bad cases, instead of the mustard poultice, dry cupping of the back is useful. In one severe case of this disease—a child of three years of age—I attribute the recovery of the patient entirely to the timely use of this energetic application.

While these methods of treatment are being carried out, the strength of the child must be upheld. Stimulants should be given early, and no attempt to lower the temperature should be made without at the same time administering brandy or the brandy-and-egg mixture. In this disease, as in all others which rapidly depress the powers of the patient, children respond well to stimulants; and alcohol should be given every two or three hours, or oftener, according to the strength of the pulse, the rapidity of the breathing, and the degree of pallor and lividity of the face. The effect of the stimulant is to give strength to the circulation, to reduce the number of the respirations and to further the aëration of the blood. If the child cannot or will not swallow the remedy, it may be administered, as in other exhausting forms of illness, by the syringe and elastic tube (see page 15), or through a caoutchouc tube passed into the stomach through the nose.

The diet must consist of milk diluted with barley-water and guarded by a few drops of the saccharated solution of lime, of strong beef-tea, yolks of eggs, and meat essence. In the case of young infants the breast milk, white wine whey, and milk and barley-water with Mellin's Food should be given.

With regard to medicines:—Emetics are useful at the beginning of the disease. A drachm of ipecacuanha wine, or half a grain of sulphate of copper dissolved in a dessert-spoonful of water, may be given every ten minutes until vomiting is produced. This remedy must not, however, be repeated after the first two or three days, as the strength of the child quickly fails. Narcotics are to be avoided, for our object is in every way to promote cough in order to maintain efficient expansion of the air-cells and aid the expulsion of secretion. The best form of mixture is that which combines alkalies with stimulants. Thus, we can order a few grains of bicarbonate of soda or potash with four or five drops of sal volatile and an equal quantity

of spirits of chloroform in glycerine and water every three hours. Later, the infusion of senega or serpentaria may be substituted for the water in the draught. Medication by drugs is, however, as a rule, of very secondary importance in the more acute forms of the illness; but if the disease occur as a complication of pertussis, the special antispasmodic treatment for that disease may have to be continued.

When the inflammation runs a very subacute course much benefit is often derived from the free administration of iron. For a child five or six years old ten drops of the tincture of the perchloride of iron may be given every three hours, freely diluted; and a rapid improvement, both in the physical signs and general symptoms, often follows very quickly. Directly the pyrexia subsides quinine and other tonics, and cod-liver oil should be given; and the child should be removed, as soon as he is fit for the journey, to a bracing seaside air.

CHAPTER VI.

PLEURISY.

Pleurisy is a very common disease in young subjects, and one which, although seldom immediately fatal, often produces remote consequences of a very serious kind. In childhood the effused fluid becomes purulent at a very early period; and the retention in the chest-cavity of a collection of purulent matter seriously hinders the nutrition of the patient, and may lead to various forms of disease, both general and local.

Causation.—Pleurisy is comparatively rare during the first twelve months of life. It becomes much more common during the second year, and after that age is one of the most frequently met with of all diseases of childhood. The inflammation may be primary or secondary. In the first case it appears to be often the consequence of exposure to changes of temperature; at least it is difficult to discover any other cause for it than a chill. It may be also excited by mechanical causes, such as direct irritation from injury to the chest-wall, or rupture into the chest-cavity of abscesses or hydatid cysts. Secondary pleurisy may arise from extension of inflammation from the lung, the pericardium, or the peritoneum. It may occur in the course of acute rheumatism, scarlatina, measles, typhoid fever, small-pox, and inherited syphilis; and is very often a consequence of renal disease, and sometimes of tuberculosis.

Morbid Anatomy.—Inflammation of the pleura is usually confined to one side of the chest, and may be general over that side or limited to certain regions (localised or loculated pleurisy). The inflammation begins with hyperæmia of vessels and infiltration of the serous and subserous tissues. An effusion of inflammatory lymph then takes place, and of fluid which may accumulate to a large amount in the pleural cavity. The serous membrane is rough and lustreless, and becomes coated with a layer of effused lymph. This is at first merely a thin, coherent membrane; but gradually its thickness increases. The surface is sometimes ribbed or honeycombed in appearance, and we occasionally see strings or bands of lymph passing between the opposed surfaces of the pleura, connecting them with one another. The lymph consists of albumen, fibrine, and corpuscles derived from proliferating epithelium. It is at first loosely attached to the serous membrane beneath, but gradually becomes more firmly adherent. Eventually new vessels form in it, so that it is organised and converted into connective tissue. In this way the opposed surfaces become firmly united, and the pleural cavity, where these adhesions occur, is obliterated.

The effused fluid is at first yellowish or greenish, and transparent, but it soon becomes turbid and opaque, and in children very quickly purulent. The serous effusion contains both albumen and fibrine, and coagulates spontaneously after removal. The pus is usually quite healthy in appearance and without unpleasant smell; but in exceptional cases it is dark coloured and very offensive. Sometimes it is stained or streaked

with blood. The quantity of effused fluid is very variable. It may be merely an ounce or two, or may reach two or three pints. When thus copious, the whole side is dilated, the intercostal spaces are widened, and neighbouring organs are displaced. The lung is compressed, and if, as sometimes happens, although very rarely in the child, it is bound down by a thick layer of false membrane, it may not expand again as the fluid becomes absorbed. In that case it leads to the same deformities as are noticed under similar conditions in the adult. It is, however, very rare to find a greatly contracted chest from an old pleurisy in the child. Even if the chest fall in at first, it will be often found to right itself in a surprising way in the course of time ; and a child who was left with curved spine and retracted ribs may be seen again, after an interval of twelve months, with a chest as symmetrical as if it had never been affected. It is rare to find a child permanently deformed by this means.

In some cases the amount of fluid is small. This is most commonly seen when the pleural inflammation is secondary to peritonitis, pericarditis, or pneumonia. Sometimes the pleural cavity, instead of forming one large abscess, may be divided into several distinct sacs by false membrane and adhesions, so that one of these may be emptied without draining the others. It is not so very uncommon to meet with more than one loculated empyema in the same subject ; and great difficulty is found in such cases in completely relieving the chest of its purulent contents.

A large collection of purulent fluid in the pleural cavity rarely becomes absorbed. If not removed by operation, a spot at some part of the chest-wall—usually the fifth interspace in the inframammary region—is noticed to be red and very tender. This soon becomes prominent and forms a large superficial abscess, which, if not opened artificially, bursts and the pus slowly drains away. By this means caries of a rib is sometimes produced. The abscess does not always point low down. It may appear higher up in the chest, as above the clavicle, or in an upper intercostal space ; and I have known it to open in the supraspinous fossa. In some cases, instead of bursting externally, the purulent collection opens into a bronchus and the matter is coughed up through the lung. In others it perforates the diaphragm, and passes downwards like a psoas abscess behind the peritoneum. Steiner in one case saw it open into the gullet.

Whether the fluid be removed artificially or escape by perforation of the chest-wall, it may after a time drain away completely and leave the patient convalescent. Sometimes, however, a discharging sinus is left which remains open for years. In these cases amyloid disease of organs often follows, or the child may die from general tuberculosis.

Symptoms.—The onset of pleurisy, although sudden, is not often violent. Usually it begins with a feeling of chilliness, or in older children with a rigor, and with pain in the side, followed after an interval by cough. It is rarely ushered in by a convulsive seizure, as is so commonly the case with pneumonia. The pain is often severe. It is felt in the side or is referred to the epigastrium or the stomach. In infants who cannot speak, its existence is announced by violent fits of crying, which may be excited at once by pressure on the chest as in lifting the child up. An older child complains bitterly of the pain, and often gives evidence of his suffering by the distressed expression of his face, especially if a cough cause any sudden movement of the side. There is also tenderness of the chest-wall over the seat of disease, for pressure is evidently painful. In addition to the above symptoms there is generally headache ; the tongue is furred ; there may be vomiting, and for the first few days there is always fever, even in cases

where the temperature is afterwards normal. The pulse is quickened, and the respirations are more hurried than natural; but they are not, as is the case with pneumonia, increased out of proportion to the pulse. Consequently, there is little or no perversion of the pulse-respiration ratio. The cough does not usually begin until an appreciable interval has passed from the onset of the illness. Often, for the first twenty-four or forty-eight hours, little cough is noticed. When it comes on it is hard and dry, and the increased movement of the chest-walls by which it is accompanied is a cause of much suffering. The strength of the child fails comparatively little. There is by no means the marked muscular prostration which is so noticeable a feature in pneumonia. On the contrary, if the pain be not severe, the child seldom takes voluntarily to his bed, but will walk about as usual without any pronounced sense of fatigue. If the pain is severe, he is quiet and indisposed to exert himself; but this inclination to rest is the consequence of pain, which is increased by movement, and is not due to any sense of muscular weakness.

The degree of fever varies. Usually for the first few days the temperature rises to 102° or 103° in the evening, falling to 99° or 100° in the morning. After the first week the fever may either persist, or the temperature may fall gradually to the normal level. In a child of perfectly healthy constitution, if the pleurisy be primary and uncomplicated, the fever usually is moderate and quickly subsides. Persistent high temperature in a case in which the pleurisy is primary and uncomplicated is usually a sign that the patient is of strumous constitution.

It is not in every case that the onset of the disease is so marked as described above. The illness often begins insidiously and is only discovered by the pallor of the child, and the shortness of his breath on any exertion. The latent form of the disease is especially common in infants, particularly if the child is suffering at the time of the attack from any wasting disease. In these cases there is often no fever, or only a trifling rise of temperature; there may be no cough; and attention may only be directed to the chest by noticing that the child is breathing quickly and has less appetite than usual for his food.

The pain of pleurisy is usually only severe at the beginning of the illness, and often subsides as effusion takes place into the pleura. This is not, however, always the case. Sometimes it continues with extreme tenderness of the affected side until towards the close of the disease. Unless the tenderness be great, the child usually lies on the affected side for the sake of giving increased freedom to the healthy lung, which has to do double duty as a respiratory organ. If the tenderness is marked, the patient lies on his back. It is not often that he is seen resting on the sound side.

If the disease continues for two or three weeks, the fluid usually becomes purulent. There are, unfortunately, no positive symptoms which indicate that the effusion is no longer serous. Even the time which has elapsed from the beginning of the illness is no positive guide, for in some children the fluid becomes purulent much more quickly than it does in others; and in exceptional cases it may be purulent from the first. The tint of the face is, however, often a suspicious symptom. For many years I have been accustomed to note the colour of the face in children the subjects of pleurisy. In many it assumes a peculiar straw-yellow hue which is unlike the complexion of any other disease. This symptom is rarely seen during the first week of the illness, and seldom attracts the eye before the end of the second week. If well defined, it is often coexistent with purulent

change in the contents of the pleural cavity. Still, I have seen it well marked in a case where the fluid withdrawn by the aspirator was perfectly clear. A boy in the East London Children's Hospital, aged six years, was noticed to have a most marked straw-yellow tint of the face and neck. The left side of the chest was full of fluid, which had pushed his heart into the epigastrium. With the aspirator, nineteen ounces of clear pale yellow fluid were withdrawn.

When the fluid has become purulent (empyema) the child usually wastes; but great differences are observed in the extent to which nutrition suffers even in these cases. Much, probably, depends upon the temperature, as this may be taken to indicate with fair accuracy the degree to which the system is fretted by the purulent contents of the thorax. If there be much fever, wasting is rapid. The child has a distressed expression and becomes profoundly anæmic; his strength diminishes; the straw tint of the face may spread more or less over the whole body; the skin becomes dry and harsh, and the fingers get clubbed at the extremities. In very rare cases a trace of œdema may be detected in the legs without albuminuria; but I have known this symptom to occur only in one instance, and in this albuminuria followed after a few weeks. Empyema in scrofulous subjects is almost invariably accompanied by fever. The temperature rises to 102° or 103° at night, sinking in the morning to the natural level. In children of healthy constitution the presence or absence of fever appears to depend in a great measure upon the natural nervous excitability of the child and his tendency to respond readily to any source of irritation. In many children with a chest more than half full of purulent fluid the temperature is normal and the nutrition fairly good; and although signs of anæmia may be noticed, the strength and spirits are not greatly depressed.

The *physical signs* in cases of pleurisy in the child must be studied with attention, for they often resemble those of croupous pneumonia very closely. On account of the weakness of vocal fremitus in early life no assistance is to be obtained from the presence or absence of vibration of the chest-wall —a sign which in the adult is of extreme value in the detection of fluid. The auscultatory signs, also, may present so close a similarity to those of inflammation of the lung that, in themselves, without reference to the situation in which they occur, they are not distinctive of pleurisy. Indeed, in many cases it is only by a comparison of the physical signs with the general symptoms of the disease that we can arrive at an accurate conclusion as to the nature of the illness.

On *inspection* of the chest-wall we can often detect a certain impairment of movement on the affected side; but the intercostal spaces are not necessarily bulged and motionless even in cases where the amount of fluid is large. In young children, whose respiration is principally diaphragmatic, the walls of the chest move comparatively little in inspiration; and the closest inspection can often discover no difference in this respect between the two sides. Although the intercostal spaces may move as in health, the whole of the affected side is fuller than the other. It may not, indeed, as has been pointed out by Dr. Gee, show any difference to the measuring tape; but the outline, as taken with the cyrtometer, is much squarer than natural from a bulging at the antero-lateral angle of the chest-wall. If the amount of effusion is more than moderate, the neighbouring organs are displaced by pressure of the fluid. The liver and spleen can be felt more distinctly than in the normal state, and the heart's apex is pushed to one side. In cases of right-sided pleurisy the apex is displaced to the left, and can be felt beating outside the nipple line. If the effusion occupy the left

side, the cardiac impulse may be felt near the ensiform cartilage. These signs, especially the latter, according to my experience, are as well marked in the child as in the adult, and should be always looked for. Displacement of the heart to the right is sometimes prevented by adhesions formed between the pericardium and the left pleura. Sometimes an alteration in the size of the heart may prevent the displacement of the organ from being noticed. Thus, if the left ventricle is much hypertrophied, the apex-beat under ordinary circumstances is felt to the left of the nipple line. In such a case displacement of the heart to the right by fluid in the left pleura may do no more than restore the apex-beat to the normal position. A little girl, aged nine years, with old-standing heart disease and hypertrophy of the left ventricle, was admitted into the hospital with considerable pleuritic effusion of the left side. The heart's apex was felt beating behind the sixth rib in the left nipple line. After absorption of the fluid the cardiac apex had moved one inch to the outer side of the nipple line.

Palpation of the affected side does not always discover obliteration of the intercostal depressions, although sometimes it will do so. Often, especially in cases where there is little thickness of lymph lining the pleura, a tap with the finger between two of the ribs will be readily transmitted through the fluid to a second finger resting upon a distant part of the same interspace. Vocal vibration of the chest-wall is, as a rule, completely absent in the healthy child. Sometimes, however, if strong on the sound side, it may be conducted by the chest-wall to the other half of the chest, and be felt distinctly over the whole of the affected side. I have known this phenomenon to be present in a case where ten ounces of fluid were removed by paracentesis. Immediately before the operation the vocal vibration was little less strong than on the sound side. On account of its frequent absence, and uncertain value when present, vocal fremitus is not to be depended upon in the young subject. If, however, we can feel a distinct fremitus over the sound lung, its absence over the affected side of the chest is important; but this is exceptional.

On *percussion* of the affected side there is complete dulness with greatly increased sense of resistance. These are very important signs. In no form of pulmonary consolidation—except, perhaps, in extensive fibroid induration of the lung with secondary pneumonia—is such a dull, flat note, with so marked a sense of resistance to the finger, to be found. The impression to the ear and the touch is exactly that derived from percussing a thick block of wood. The dead, flat note is not, however, to be obtained all over the affected side of the chest. In the upper intercostal spaces in front, and along the side of the spine behind, a tubular (tympanitic) note is often elicited, due to the presence of under-lying relaxed lung-tissue; and in the infra-axillary region it is common to find a well-marked resonance, owing to the transmission of the stomach note through the lower part of the fluid. This *pseudo*-resonance is often a source of perplexity; but we usually find that on employing very gentle percussion in this region the note is dull, while a sharper stroke in the same spot produces a loud resonance such as was heard at first. It is very important not to be misled by this source of confusion, for one of the distinctive marks of fluid in the pleura lies in the general distribution of the dull percussion note on the affected side. In ordinary cases of pleurisy the dulness extends all round the side of the chest, both behind and in front, although the upper limit of the dulness rises to a higher level at the back than it does anteriorly.

Besides the general distribution of the dulness, the alteration of the percussion note on change of position is a valuable sign of fluid in the chest.

If the amount of fluid is moderate, and is not confined within narrow limits by adhesions, it tends to gravitate to the most depending part, so that the side of the chest which is turned uppermost gives a clear note to the percussing finger. This sign is almost invariably present during the stage of absorption.

The *auscultatory* signs of pleurisy in the child are often very peculiar. Sometimes, as in the adult, we find weak, almost suppressed, breathing over the area of dulness, with an occasional graze or scrape of friction above the upper border of the effusion. Often, however, the signs are much less characteristic. It is not uncommon to find a loud blowing, tubular, or even cavernous breath-sound over the scapula behind and in the axillary region. Sometimes this is heard almost as far as the base, and usually it can be detected below the level of the effused fluid. This character of the respiratory sound is not confined to cases where the lung is consolidated from pneumonia, for it is often present when the temperature is normal. The vocal resonance may be exaggerated, and about the lower angle of the scapula is frequently bronchophonic. Often it has a pronounced ægophonic quality. The bronchophonic character is not, however, always found in places where the breathing is bronchial or blowing. Over a spot where the respiration is typically tubular, vocal resonance may be completely suppressed.

The characters of the friction-sound in children are also peculiar. It is exceptional to hear the common rub or scrape which is so familiar a sign in the adult patient. In the child the friction-sound has often a crackling or crepitating character, which to the inexperienced ear is suggestive rather of intra- than of extra-pulmonary mechanism. It has not, however, the puffy character of pneumonic crepitation; and is very superficial sounding, as if generated close to the ear. Often, from the character of the sound alone, it is difficult to say whether it is produced in the lung or in the pleura, especially as a large, hard, bubbling rhonchus is sometimes heard, which is evidently of intra-pulmonary mechanism and is due to catarrh of the air-tubes. This disappears after a cough.

The friction is not limited to spots in the pleura above the level of the fluid. In pleurisy, as in pericarditis, effusion does not necessarily suppress friction. It is not uncommon to hear an unmistakable friction-sound at a spot where immediately afterwards the aspirating needle withdraws several ounces of fluid.

In cases where the effusion is very copious the symptoms may be distressing, and the child's life be placed in the greatest danger. This is especially the case when the fluid occupies the left side of the chest. In this situation it may push the heart so far to the right that the apex is felt beating under the right nipple. Consequently, the large vessels may be bent out of their natural course, and great obstruction to the circulation may result from the interference with their calibre. The healthy lung, hampered in its functions, may become engorged, and the difficulty in the return of blood to the heart may produce great congestion of the head, face, and extremities. The child is seen sitting up, gasping for breath, with an agonized expression on his dusky face. His eyes are staring and congested; his hands and feet are purple; his skin is cold and bathed in sweat; the veins of the neck are swollen; his pulse is small, feeble, and frequent; and unless the distress be quickly relieved death is certain.

Terminations.—In cases where the fluid remains serous, it usually becomes rapidly absorbed. The general symptoms are slight and quickly

subside, and the physical signs return to a state of health. In these cases dulness on percussion and weak breathing can be detected longer in the infra-axillary region than elsewhere. If absorption of the fluid be slow, some retraction of the side is often observed for a time ; but in such cases it is usually slight, and is seldom noticed to the degree which is so common after removal of a purulent fluid from the chest. If absorption is complete, the deformity soon passes away and the chest recovers its symmetry.

When the fluid has become purulent, absorption goes on very slowly. It is only when the quantity is very small that anything approaching to completeness of absorption is found. It is in cases of empyema that distortion of the chest is commonly noticed. The spine becomes curved with the concavity towards the diseased side ; the shoulder, nipple, and inferior angle of the scapula sink, and the lower part of the shoulder-blade projects backwards from the chest-wall. Such retraction of the affected side takes place before absorption has ceased. Indeed, as Dr. T. Barlow has very justly pointed out, the fact that retraction of the side has occurred is by no means a positive proof that absorption has been completed. On the contrary, if the deformity continues without improvement, it rather tends to suggest the possibility of some unabsorbed purulent matter remaining at the base of the lung or between the lobes. In many of these cases a layer of cheesy matter is left coating the base of the lung ; and a quantity of thick creamy pus is often found on dissection collected in a limited abscess on the surface of the diaphragm.

If the amount of purulent fluid is large, it sooner or later, unless withdrawn by the aspirator, points at some part of the chest-wall. If this occur in an upper intercostal space, the contained fluid cannot be completely evacuated, and a continuous discharge occurs through the opening. The child grows daily weaker and thinner. His breath is short ; his face gets sallow and often earthy in tint, with lividity about the eyes and mouth ; his fingers become clubbed ; his digestion is impaired, his tongue foul, and his breath offensive ; the liver and spleen become enlarged from albuminoid degeneration ; the cough is spasmodic and painful ; and the child sinks and dies from asthenia. Death may be preceded by profuse diarrhœa, which, sometimes at least, is due to albuminoid change in the coats of the bowel.

If the abscess point in a lower intercostal space, so that the chest cavity can be completely drained, recovery may occur without operative interference. I have met with at least one such case where, although there was at first some deformity of the affected side, this entirely disappeared ; but it must be confessed that such a fortunate result is not common.

Sometimes the purulent fluid, instead of discharging itself through the chest-wall, perforates a bronchus and is coughed up through the lung. Large quantities of purulent matter may be thus expectorated, but contrary to what might be supposed, no air enters the pleural cavity and the physical signs are not found to have undergone any special alteration. Indeed, if the case terminate fatally, it is very rare to find on the closest examination any direct communication between the lung and the chest cavity. Spontaneous evacuation through the lung is not confined to cases where no operative procedure has been attempted. It may also occur after a part of the contained fluid has been removed by paracentesis This mode of ending is often followed by complete recovery. If the pleural cavity can be thoroughly evacuated by this means, and the lung is not

bound down beyond possibility of expansion, recovery may take place without any permanent retraction of the affected side.

A little boy, aged five years, was brought into the East London Children's Hospital for an empyema of six weeks' standing. The effusion occupied the right side and appeared to be copious, for the intercostal spaces were obliterated and the heart's apex was felt beating to the outer side of the left nipple line. On percussion, dulness was complete over the whole of the right side, both back and front; there was marked sense of resistance; and the breath-sounds, although blowing in quality, were excessively weak. The temperature was normal.

A few days after the boy's admission eleven ounces of thick, greenish, inodorous pus were withdrawn by the aspirator. After the operation the dulness and weak blowing breathing remained the same, but the intercostal spaces had become visible, and the heart's apex had returned as far as the nipple line. A week afterwards the boy coughed up twelve ounces of thick pus, and in a few days a further four ounces. After this the percussion note was decidedly less dull; the resistance was diminished; and the breathing was loud and tubular over the whole of the upper half of that side, cavernous below. Vocal resonance was loud and ægophonic.

For some weeks the boy continued to spit up several ounces of purulent matter every few days; and in the end made a perfect recovery without any contraction of the chest-wall. The temperature was normal as a rule; although sometimes it would suddenly rise to 103° or 104°, but never remained elevated more than a few hours. These elevations did not correspond with or precede the passage of pus through the lung. A year afterwards the boy was readmitted with acute pleurisy of the opposite side (the left); and this attack also was perfectly recovered from.

In many cases of perforation of a bronchus there is the same difficulty in completely evacuating the pleural cavity as is found when the discharge takes place through the chest-wall. Sometimes the opening into the bronchus closes, and pus ceases to be expectorated. Retention of purulent matter then occurs, and the chest may become much distorted, or the child, after a lingering illness, may die of asthenia.

Even when the operation of paracentesis is performed and the purulent fluid is removed artificially, the case is by no means necessarily at an end. Sometimes, after withdrawal of as much fluid as can be made to pass through the aspirator, no further accumulation occurs; absorption of what remains in the pleural cavity goes on uninterruptedly, and the child is soon well. These cases are, however, exceptional. It is often necessary to repeat the operation several times, and not unfrequently, as the purulent fluid continually reaccumulates, other measures have to be adopted as will be afterwards described. In prolonged cases, whether a fistula be present in the chest-wall or not, secondary tuberculosis is liable to occur; and it is not very uncommon to find great enlargement of the liver and spleen from amyloid degeneration.

Another occasional consequence of long-standing pleurisy is a fibroid change at the base of the lung leading to induration of the tissues and dilatation of bronchi. This subject is elsewhere referred to (see Fibroid Induration).

Varieties.—Certain varieties of the disease are commonly met with. In some cases the lymph exudation is unaccompanied by liquid effusion (plastic or dry pleurisy). In others, the inflammation, instead of being general over the whole side, is confined within certain limits (localised or loculated pleurisy). In others, again, the disease may attack the two sides simulta-

neously. Double pleurisy is often in the child the consequence of tuberculosis.

Plastic Pleurisy, although sometimes primary, is for the most part in young subjects secondary to some other disease. It is common in cases of phthisis, and sometimes occurs in the course of catarrhal pneumonia. Dry or plastic pleurisy is often overlooked, as it may give rise to but few symptoms, or to symptoms so slight that they are masked by the other more prominent manifestations of the disease in the course of which they have arisen. This form is of little importance. It is usually accompanied by some pain in the side and a teasing cough. On examination of the chest, dulness is discovered at the seat of pain, and a little crepitating friction or a superficial rub can be heard with the stethoscope. The inflammation leads to adhesion between the opposed surfaces of the pleura.

Loculated Pleurisy is very common in children. The inflammation may occupy any part of the serous surface. It may be limited to the membrane covering the diaphragm or to that surrounding the base of the lung ; it may be seated at the upper part of the pleural cavity, such as the infra-clavicular region ; or it may occupy the space between the lobes. In many cases the localisation of the disease is due to old adhesions resulting from a previous attack, so that the fluid thrown out is prevented from gravitating downwards or spreading over the general cavity of the pleura ; but in others no history of a similar illness can be discovered.

In ordinary cases of loculated pleurisy the general symptoms do not differ from those met with in the more common form of the disease. But the physical signs are more characteristic. Over the collection of fluid the percussion-note is completely dull, with great sense of resistance ; the respiration is weak, and may be of bronchial, blowing, or cavernous quality ; there is seldom any friction-sound to be heard, and the vocal resonance is ordinarily suppressed. Such signs may be discovered over the whole front of the chest ; they may be limited to the infra-clavicular or infra-mammary regions ; they may be found in the scapular region behind, or at the lower part of the axillary region at the side. The most difficult to detect of these partial pleurisies is no doubt that variety in which the inflammation and effusion are confined to an interlobar space. In such a case there may be considerable retraction of the side from compression of the lung ; or the physical signs may occupy so limited an area as to escape recognition, and there may be no displacement of the heart. After the fluid has become purulent, the cough, the wasting, and the cachectic appearance of the child, coupled with the insignificant character of the physical signs, often suggest tuberculosis.

Diaphragmatic pleurisy is rare in the child. The disease begins suddenly with a severe pain shooting across the chest and great oppression of breathing. The child sits up in bed with a distressed face. His skin is hot, and every attempt to draw a deep breath is a cause of great suffering. The physical signs are often very indefinite ; but usually some dulness may be discovered at the extreme base on one side, with weak breathing ; and often after a day or two the ordinary signs of pleurisy can be detected at the lower part of the same side ; for diaphragmatic pleurisy rarely remains limited to the diaphragm in early life.

Tuberculous Pleurisy.—When pleurisy occurs as a consequence of tuberculosis it is usually double ; but every case of double pleurisy in the child is not necessarily tuberculous. Nor, again, in every case of pleurisy in a tuberculous subject is the serous inflammation always secondary to the diathetic disease. It has been already stated that tuberculosis

is a common sequel of empyema of long standing; and a purulent collection in the chest precedes tuberculosis much more often than it follows it. In cases where pleurisy is met with as a secondary disease the inflammation is usually of the plastic variety; although sometimes there is also serous or purulent effusion in the chest-cavity. We can only say positively that tuberculosis is the primary disease when the symptoms of the constitutional malady—wasting, moderate fever, loss of colour and strength, a distressed expression of face and occasional cough—have preceded by a definite interval the local signs of serous inflammation.

When tuberculosis follows empyema the temperature, if it had subsided, rises to between 101° and 102° or higher every evening, falling again to between 99° and 100° in the morning. The child loses flesh, colour, and strength more rapidly than the condition of his chest is sufficient to explain. His face is haggard and careworn; his skin harsh and dry; often diarrhœa comes on; sometimes he vomits; his belly swells; and an attack of basic meningitis usually brings the illness rapidly to a close.

Complications.—Besides tuberculosis and amyloid disease of organs (which have been already alluded to), there are other complications which may be present in cases of pleurisy. *Pericarditis* is not uncommon as an accompaniment of the pleural inflammation. This subject is referred to elsewhere (see page 158). Moreover, serous inflammation in the chest sometimes spreads upwards from the peritoneum. More often, however, it penetrates downwards through the diaphragm to the abdominal cavity. It is then usually fatal (see page 685).

Diagnosis.—On account of the resemblance of its physical signs to those of pneumonia, pleurisy is often mistaken for that disease. The difficulty in making the distinction is due principally to the absence of vocal fremitus in the child; to the occasional loud blowing or tubular breathing which is often heard over the seat of dulness; and to the crackling character of the friction, which suggests rather an intra-pulmonary crepitation than a pleural rub. In order to distinguish between the two diseases we must take into account the mode of invasion, the nature of the symptoms, and the character of the physical signs; for in all these points great differences are to be observed.

The occurrence of pain in the side and fever, followed after an interval by cough, is characteristic of pleurisy. In pneumonia cough is usually present from the beginning, and pain in the side, unless pleurisy accompany the inflammation of the lung, is moderate or absent. The after symptoms also are different. In pleurisy the cough is dry and painful; the pulse-respiration ratio is unaltered; the face is pale or congested at first, afterwards straw yellow; and there is little loss of muscular strength. In pneumonia the cough occurs in short hacks, accompanied in the older children by the expectoration of rusty sputum; the pulse-respiration ratio is perverted; the face has a bright flush on the cheeks; and muscular prostration is a marked feature. The physical signs also are distinctive. In pleurisy the chest, even if not enlarged to the measuring tape, is square in outline; the heart's apex is displaced; the dulness is complete, the note being perfectly flat, and the sense of resistance to the finger extreme; the respiratory sounds, although they may be as tubular as in a case of typical pulmonary inflammation, are always less loud at the base than above; and the crackling friction has not the "puffy" character of pneumonic crepitation. The chief difference, however, consists in the fact that in an ordinary case of pleurisy the abnormal physical signs are found both at the back and front of the affected side. In pneumonia there is no displacement of

the heart's apex; the dulness is not complete; the sense of resistance, although greater than natural, is only moderately increased; the resonance of the voice at the angle of the scapula is never ægophonic; and the physical signs, unless the inflammation occupy the apex of the lung, are limited to the anterior or posterior aspect of the chest, and are only in very extreme cases found over the whole of the affected side.

Between an ordinary case of pleuritic effusion and an ordinary case of lobar inflammation of the lung the differences are so great, that there is little difficulty in making the distinction. But to decide between a localised pleurisy and a case of lobar pneumonia is not so easy. Still, even here, by attention to the mode of invasion and the character of the symptoms, and by remarking that, although limited to one aspect or one region of the chest, the percussion-note is completely toneless, the sense of resistance is extreme, and the weak breath-sound is not accompanied by crepitation at the borders of the dull area (for, in localised pleurisy friction is rarely to be heard), we can usually come to a satisfactory conclusion. The very fact of these physical signs continuing for a considerable time unchanged is in itself a strong argument in favour of the pleuritic nature of the complaint. Dr. Wilks, indeed, lays it down as a rule that local dulness with distant tubular breathing, or absence of breath-sound, persisting after an inflammatory attack in the chest, indicates the presence of a local empyema; and if no adventitious sounds accompany the respiration, we may, no doubt, commit ourselves to this diagnosis without hesitation.

Ordinary cases of catarrhal pneumonia, where the inflammation occupies both lungs, can rarely resemble pleurisy closely enough to be confounded with it. Unless the catarrhal pneumonia be accompanied by plastic pleurisy, the percussion-note is only moderately dull; the resistance is little increased; there is usually loud tubular or cavernous breathing at the extreme base from dilatation of the bronchi; and the profuse crepitation has a crisp metallic quality which bears little resemblance to the sound produced in an inflamed pleura. It is in cases where the catarrhal inflammation occurs secondarily in a lung which is already the seat of fibroid induration that a real difficulty is found. Here the inflammation is confined to one lung and spreads rapidly, so as to involve the whole thickness of the organ. Consequently, the lung, already indurated by the fibroid change, gives a character to the percussion-note which is indistinguishable from that produced by pleuritic effusion; and we find a complete, toneless dulness with marked sense of resistance all round the affected side—both at the back and front. In the indurated lung, however, the tubular or cavernous breath-sound is accompanied by a large metallic bubbling rhonchus. In pleurisy the breathing is usually accompanied by no adventitious sound; but if a little crepitating friction be present, it is much drier in character, and has not the loud ringing resonance which is given to a rhonchus generated in a rigid dilated air-tube. In both the vocal resonance may be bronchophonic, but in pneumonia it never has an ægophonic quality.

Collapse of the lung in exceptional cases may present a very close resemblance to pleurisy; but the dulness on percussion is rarely so complete, and the sense of resistance seldom so great in collapse as in fluid effusion. The resistance in the latter case to the percussing finger is an element of the utmost importance in the diagnosis, and is only equalled in point of intensity by a fibroid induration of the lung with superadded catarrhal pneumonia, as already described.

With regard to the varieties of pleurisy, it is often very difficult to say whether the fluid is serous or purulent, or, indeed, whether the physical

signs are not due to a coating of lymph without liquid effusion at all. If a change in the percussion-note and the character of the physical signs follows a change in the position of the patient, the presence of fluid is placed beyond the possibility of doubt. But if no such characteristic sign of fluid can be discovered, it is no proof that fluid is not present. The effusion may be kept in place by adhesions, or there may be sufficient lymph coating the pleura to produce a dull percussion-note, although fluid be no longer in contact with the wall of the chest at the point of examination. An ægophonic resonance of the voice is a certain sign of effusion; but its absence is by itself no sufficient proof of the absence of fluid. If, however, the outline of the affected side be elliptical and the heart's apex in the natural position; if the intercostal spaces sink in normally, the percussion-note be dull in all changes of position, the respiration be weak over the affected side without blowing quality, and the vocal resonance not at all ægophonic, it is almost certain that no fluid is present. Even here, however, no positive conclusion can be arrived at, for with such signs there may be an encysted collection of pus at almost any part of the chest.

The distinction between a serous and a purulent effusion is very difficult. No information can be gained from the temperature, for this may be elevated or not without reference to the character of the fluid. It is often high with a serous effusion and perfectly normal with a large purulent collection in the chest. Again, the physical signs are the same whatever be the nature of the pleural contents; for Bacelli's sign (*i.e.*, the clear and articulate conduction of the whispered voice to the chest-wall as indicative of serous and exclusive of purulent effusion) has not unfortunately the value attributed to it by this physician. The tint of the face, however, if the complexion have assumed the straw yellow hue, although not a decisive proof, is very suggestive of empyema; and marked clubbing of the finger-ends, according to Dr. T. Barlow, is never the consequence of serous effusion. In every case of doubt an exploratory puncture[1] with the hypodermic injection syringe, by withdrawing a specimen of the fluid, will at once decide the question.

Hydrothorax is as a rule readily distinguished from pleurisy by noting the evidences which are always present of interference with the general circulation. Dropsy of the pleura is almost always a part of general anasarca. There is disease of the heart or kidneys; the effusion occurs on both sides simultaneously; and there is also ascites or more or less general œdema.

Prognosis.—In cases of pleurisy the prognosis depends in a great measure upon the age and constitution of the child. Under the age of six months the disease is a very serious one, and often ends in death. After that early period the prognosis is good, as a rule, if the child be not the subject of a diathetic taint. The scrofulous habit is, however, a distinctly unfavourable element, for although the disease may eventually end happily, the fluid tends to become quickly purulent; the febrile excitement is usually great; interference with nutrition is marked; and not unfrequently the fluid is continually reproduced as often as it is evacuated.

If the fluid remain serous, recovery is certain unless the fluid accumulate to such a degree as to dislocate the heart and interfere with the passage of the blood through the large vessels. In such cases death may occur unless the child be rapidly relieved by operation. When the fluid has become

[1] It may be observed, with regard to making exploratory punctures, that the operation is less painful if a spot be selected where the skin is thin, as in the axilla, than if the needle be introduced in the back, where the cutis is thick and resistant.

purulent the prospect is more serious, but less so in childhood than in after years; for if proper measures be adopted a large majority of these cases recover. A high temperature is an unfavourable sign, and the continuance of the pyrexia after discharge of the purulent matter by operation should occasion great anxiety. Still, even in these cases recovery often follows. Again, the sudden sinking of the temperature to a point below the level of health is, as Wunderlich has pointed out, a sign of unfavourable import.

If the empyema burst spontaneously through the chest-wall, recovery rarely takes place unless the opening be seated in a lower intercostal space, or unless an artificial opening be established in a more suitable position. Spontaneous cure is more likely to follow evacuation through a bronchus; and a large proportion of these cases get well. Still, if the circumstances are such that retention of purulent matter takes place, the child, if left alone, may sink exhausted.

Fetor of the pus is a bad sign. Unless prompt antiseptic measures are adopted, these cases always end fatally.

Secondary pleurisy is much more dangerous than the primary form of the disease. The fluid is more likely to become purulent at an early date; and the child, already weakened by his first illness, is in an unfavourable condition to support the exhausting influence of a chronic empyema upon his nutrition.

Treatment.—A child attacked by acute pleurisy should be at once put to bed, for absolute rest is of the highest importance. A febrifuge mixture should be ordered, and the diet should consist of milk and broth. If the pain in the side be severe, a leech or two may be applied if the child is robust; or a hypodermic injection may be given containing one-twelfth of a grain of morphia for a child of four years of age. A firm bandage round the chest is often successful in giving great relief; and a thick layer of wadding around the affected side is useful for the sake of warmth. Some physicians advocate a careful strapping of the chest over the affected lung with broad strips of adhesive plaster. I have made use of this plan, but cannot say I have noticed any distinct advantage from its employment. In diaphragmatic pleurisy where the pain is severe, a firmly applied bandage to the abdomen, so as to limit the action of the diaphragm, often affords ease. The bowels, if confined, must be relieved by mild aperients, such as the liquid extract of rhamnus frangula or the compound liquorice powder; but violent purgation is hurtful and should be avoided. Mercury, the favourite remedy in former days, is now seldom recommended. Still, in some cases, one grain of gray powder given twice a day, with an equal quantity of quinine, or with five grains of the peroxide of iron, has sometimes seemed to me to be beneficial. Iodide of potassium is, however, usually to be preferred, and this salt, given in full doses, I believe to be of distinct advantage to the patient. I am in the habit of ordering for a child of four years old, five, eight, or ten grains of the iodide, to be taken every six hours, and look upon the remedy given in such doses as a valuable promoter of absorption. The internal remedy should be always supplemented by counter-irritation of the chest-wall. Directly the temperature falls, or earlier if effusion appears to have ceased, the liniment or tincture of iodine (according to the sensitiveness of the skin) should be painted over a limited surface every night. This application is most useful if applied over an area of two or three inches in diameter—repainting the same on each occasion. When the skin begins to look dry and cracked, another spot is selected, and the process is repeated regularly as before.

If, after a week, the fluid remains stationary, without sign of absorption it is better to change from the iodide to a chalybeate, or to add five or six grains of the tartrate of iron to the mixture. In scrofulous children, when effusion has ceased, it is advisable to improve the diet; and pounded meat, strong meat broths, yolks of eggs, and moderate quantities of stimulant are usually required.

If at the end of a fortnight the effusion has been unchanged in amount, it is probably purulent. An exploratory puncture should be made with a fine needle syringe, and if pus be withdrawn, measures should at once be taken to evacuate the chest. If the fluid is found to be serous it is advisable to wait for a few days, for this small operation and the abstraction of even the limited quantity withdrawn by the test puncture, may act as a stimulus to absorption and be followed by the rapid removal of the fluid by natural means. At the same time the quantity of liquid taken by the child should be restricted; for a dry diet in such cases by stinting the blood of fluid often greatly promotes the action of the absorbent vessels.

Often when effusion is undoubtedly present the introduction of the exploring needle is followed by no appearance of fluid; or although pus has been withdrawn by the test puncture the aspirator needle is introduced without any result. The instrument may have entered the chest-cavity at a spot where the lung is adherent to the parietes, or the layer of false membrane lining the pleura may be so thick that the needle fails to penetrate into the sac. In choosing a place for the puncture it is advisable to select one where the dulness is complete; and it is well, as Dr. Allbutt has suggested, to look for a spot where there is bulging of the intercostal space, as here the false membranes are scanty and thin. Often it is necessary to puncture several times, on each occasion selecting a fresh spot, before we succeed in obtaining evidence of fluid.

In some cases the difficulty met with in withdrawing the fluid is due to rigidity of the chest-walls. If the walls of the empyema cavity cannot collapse, there is no expolsive force to drive out the fluid. As Mr. R. W. Parker has pointed out, the pleural cavity is emptied by the pressure of the atmosphere acting in three different ways. It acts on the condensed lung causing it to re-expand, on the diaphragm causing it to ascend, and on the thoracic wall causing it to fall in. If for any reason pressure cannot be brought to bear on the confined fluid, no amount of *suction* force will have any power of withdrawing the liquid contents of the chest. In not a few cases, the aspirator being found to be useless and no fluid appearing after repeated punctures, we are forced to incise the chest and insert a drainage-tube in order to evacuate the pleural cavity. Mr. Parker has devised an apparatus to meet this difficulty, by means of which filtered, warmed, and carbolised air can be pumped into the upper part of the chest while fluid passes out through the aspirator needle introduced into the lower part.

The above are not the only causes by which thoracentesis is rendered difficult. Large thick flakes of lymph may be present and obstruct the opening of the needle or drainage-tube. A child, aged one year and eight months, was admitted under my care into the East London Children's Hospital, with the physical signs of a large effusion on the left side of the chest. An exploratory puncture showed pus to be present. Many attempts were made to aspirate the chest, but only small quantities of pus could be withdrawn. After repeated failures it was determined, in consultation with

my colleague Mr. Parker, to incise the wall and put in a drainage-tube. This was done, but even then pus did not flow freely. Mr. Parker then put in his finger through the opening in the chest-wall and found large flakes of thick membraniform lymph which had to be removed by the forceps. A large quantity of pus was then expelled, containing smaller flakes of lymph, besides pultaceous matter. Listerian precautions were observed and the case did well.

When the effusion of fluid has accumulated to such a degree as seriously to hamper the circulation and produce a cyanotic tint of the skin, the aspirator should be used at once, as instant relief is required to avert death. If, however, the effusion be more moderate and no danger be anticipated, the question of operative interference will depend upon the nature of the pleural contents, and the presence or absence of signs of absorption. If the fluid be purulent there is no likelihood of a spontaneous cure by absorption. Therefore retention of the purulent contents can in any case only do harm; and in children with tubercular or scrofulous tendencies a collection of pus should not be allowed to remain in the chest a day longer than is necessary. Even if the fluid be still serous, it is well to remove it if after three weeks no sign of absorption has been noticed. In many of these cases the serous fluid is not renewed after emptying the chest; and often if only a portion of the contents be evacuated the remainder is rapidly taken up by the absorbent vessels.

In cases of empyema it is best in the first instance to employ the aspirator, as sometimes after the chest-cavity has been evacuated by this means the fluid is not reproduced. During the operation the child should be in a semi-recumbent position, supported by the nurse, and the needle should be introduced, as recommended by Bowditch, in an interspace immediately below the inferior angle of the scapula, unless the empyema be loculated. The operation often provokes cough; but this may be disregarded unless it grow excessive, in which case the needle may be withdrawn. If there be any sign of faintness, we should at once remove the aspirator and close the wound.

Sudden death, although fortunately a very uncommon catastrophe, is sometimes a consequence of the rapid withdrawal of fluid from the chest. The accident may arise from syncope, from rapid interference with the function of the healthy lung, or from cerebral embolism. If the effusion have been copious enough to produce marked cardiac displacement and interfere with the circulation through the large vessels, the muscular substance of the heart may be in a state of temporary mal-nutrition from having been supplied for some time with imperfectly purified blood. The sudden withdrawal of the pressure, combined with the slight shock of the operation, may so impress the weakened organ as completely to paralyse its action; or if this be borne without result, a sudden movement of the patient which throws extra work upon the circulatory centre may prove fatal.

Death sometimes occurs through asphyxia. The disappearance of fluid from the pleura is followed by an afflux of blood to the capillaries not only of the lately compressed lung, but also of that on the sound side; for the latter has been likewise relieved from pressure by the return of the heart and mediastinum to their normal position. If the afflux of blood becomes a distinct congestion, acute œdema may result, unless the vessels retain sufficient tonicity to enable them to resist the abnormal pressure. Again, cerebral embolism may occur, as in a case reported by M. Vallin, in which this observer attributed the catastrophe to the sudden disengagement of

fibrinous clots which had formed in the pulmonary veins of the affected side. Such clots are liable to become detached as a consequence of expansion of the lung, of a sudden movement, or of washing out of the pleural cavity.

If after one or more applications of the aspirator we find that purulent fluid is always reproduced, or if the fluid withdrawn is fetid, it is better to make an opening in the chest and introduce a drainage-tube. Opinions are divided as to whether a single or double opening is to be preferred. If a single opening allows of perfect evacuation of the pleural cavity, it seems to be preferable to a double aperture, for the drainage-tube passing from one opening to the other may, as Dr. Allbutt has suggested, act as a seton and keep up a constant irritation. If a single opening be made, the spot selected should be at some point on a level with the lower angle of the scapula. One end of the drainage-tube should be passed through the opening, and the other may be allowed to dip into a large bottle half full of water. The operation should be performed with antiseptic precautions. If chloroform be given, great care must be exercised in its administration. It is better to do without anæsthetics and produce local insensibility by freezing the skin at the site of the operation.

After the tube has been inserted the chest should be bound round with an antiseptic binder, and the pleural cavity may be left to drain itself. It will not be necessary to wash it out with disinfecting solutions unless signs of decomposition have been noticed. If, however, the pus which flows after the operation is fetid, injections of a solution of iodine may be employed, diluting one drachm of the tincture with one ounce of water; or carbolic acid may be used diluted with thirty times its bulk of water. This measure will not be required when the pus continues to be perfectly sweet. In such cases the introduction of antiseptic solutions seems to keep up an irritation which it is desirable to avoid. Moreover, the operation is usually distressing to the patient, and is not without danger, for syncope and other alarming symptoms have sometimes been seen to follow the introduction of the fluid. In cases where the empyema is fetid, Mr. R. W. Parker recommends a double opening to be made in the chest-wall through which the drainage-tube can be threaded, and prefers, to injections of an antiseptic fluid, placing the child daily in a warm bath with sufficient depth of water to cover the upper opening. The water can be medicated, if desired, by a weak antiseptic solution. It is needless to say that all instruments used in operation upon such cases should be scrupulously clean and be carefully disinfected before use.

Complete drainage of the cavity is followed in most cases by great improvement in the condition of the child. His temperature, if it had been elevated, falls; his appetite improves; and if diarrhœa had been present, the stools become fewer in number and much healthier in appearance. Any after-elevation of the temperature or return of the signs of distress and irritation should lead us to suspect some retention of fluid in the pleural cavity, or the onset of some complication, such as a secondary tuberculosis. In the first case it will be well to wash out the chest thoroughly. In the second, special measures must be resorted to for the treatment of the complication. If secondary tuberculosis have come on, the prospects of the child are most gloomy, and little can be done to arrest the downward progress of the disease.

In cases where the above method of drainage fails to bring about closure of the cavity, owing to imperfect expansion of the lung or rigidity of the chest-walls, which are slow to adapt themselves to the diminished size

of the organ, resection of a portion of the rib seems often to be of advantage in helping the disease to a favourable termination.

In all cases of chronic empyema the strength of the child should be supported by a free supply of nourishing food. Meat (pounded if necessary) strong meat essence, milk, eggs, etc., should be given in quantities such as the patient can digest; and port wine, St. Raphael tannin wine, or the brandy-and-egg mixture should be offered in sufficient doses. Cod-liver oil is also, especially in children of scrofulous constitution, an important addition to the treatment.

CHAPTER VII.

COLLAPSE OF THE LUNG.

Collapse of the lung is a common lesion in infancy. In some new-born babies the lungs after birth are imperfectly expanded so that the alveoli over a larger or smaller area remain closed as in the fœtal state. This variety is called *congenital atelectasis.* In other cases, although perfect expansion has been effected after birth, and the respiratory functions have been thoroughly established, collapse is induced in the lung as a consequence of disease, and a tract of variable extent becomes again condensed and airless. The latter lesion, which is called *post-natal atelectasis* is more common than the former, and indeed is one of the most familiar of pulmonary lesions in the young child. These varieties will be considered separately.

CONGENITAL ATELECTASIS.

This variety of pulmonary collapse was first described in the year 1832 by Dr. Edward Jöng, who gave it the name which it still retains. Congenital atelectasis rarely occurs except in feeble infants, such as have been born prematurely, or are the offspring of weakly mothers, or have entered life under conditions unfavourable to the efficient establishment of the respiratory functions. A tedious labour producing long compression of the cord; too energetic uterine contractions causing a too early separation of the placenta from the womb; a low temperature of the external air; a high temperature with imperfect ventilation and deficiency of oxygen—the imperfect expansion has been attributed to all these causes. In addition, the presence of mucus or fluid in the air-tubes may act as a direct mechanical impediment to the entrance of air and prevent the inflation of a part of the pulmonary tissue.

Morbid Anatomy.—On inspection of a lung which is the seat of this lesion the unexpanded portion is at once recognised by its dark red or purplish colour, contrasting with the rosy tint of the inflated tissue. Being perfectly airless, it looks shrunken and depressed, does not crepitate when squeezed, and feels tough and dense like soft leather. If a portion be cut out and placed in water, it sinks instantly to the bottom of the vessel. On examination of the cut surface with a lens, the outline of the air-cells may be visible; but if the child have survived for some weeks, the vesicular structure can often hardly be perceived. The parts of the lung which thus remain airless after birth are most commonly the least bulky portions, such as the thin lower borders of the lobes, especially the inferior lobes and the middle lobe of the right lung. Often, however, the collapse is not confined to these parts, but extends for some distance over the posterior surface, and penetrates pretty deeply into the organ.

If the child die early, the unexpanded lobules can be readily inflated after death by a blow-pipe passed into the bronchus; but if life has been

prolonged for a period of weeks, re-inflation is not so easy and may only be effected by the expenditure of considerable force.

In cases of congenital atelectasis other parts besides the lungs often remain in the fœtal state. The foramen ovale is usually open, and perhaps the ductus arteriosus may still remain unclosed.

Symptoms.—In a new-born infant, when expansion of the lungs is imperfect, the child is usually small and ill-nourished. His appearance and manner show great want of power, and his muscles feel soft and flabby. His complexion is dirty white or pale, with lividity about the eyelids and mouth. He lies quietly without movement, and seems very apathetic, seldom attempting to cry. If he do, he utters only a feeble whimper and never makes a loud sound. Often he merely draws up the corners of his mouth without making any sound at all. The fingers and toes are of a dark red or purple tint, and feel cool to the touch; indeed, the internal temperature of the child is below the normal level, and often reaches only 97.5° in the rectum. The respiratory movements are not laboured; on the contrary, they are shallow and short, and evidently expand the chest very imperfectly. As in all cases where the bases of the lungs fail to expand in a young child, the corresponding ribs sink in to a certain extent at each inspiration. Still, on account of the feebleness of the inspiratory movements the depression at the bases is less noticeable than it is in some other diseases. When put to the breast the child is unable to suck, and has to be fed with a syringe or a spoon. Sometimes he cannot swallow. The pulse is very feeble and the fontanelle is more or less deeply depressed. A warm bath seems to revive the child for the time, and even gives a little colour to the skin; but after removal the infant sinks into his former depression.

An examination of the chest furnishes little information. If the unexpanded area is small, we may detect no sign to indicate the nature of the lesion. There may be a little want of resonance at the bases of the lungs posteriorly; but on account of the small size of the thorax at this period of life, and the facility with which sounds are conveyed from one part to the other, the vesicular murmur may appear to be as loud at the bases as at any other part of the chest. It is only in cases where the collapse is very extensive that any suppression or alteration of the respiratory sound can be detected.

The after-symptoms vary according to the extent of the useless portion of the lungs. If this be considerable, the weakness continues; the breathing remains shallow and short; lividity increases; the eyes are motionless; the pupils dilated, and the skin is cool. Soon the temperature falls still further, twitches and spasmodic movements are noticed in the face and limbs, and the child sinking into a state of stupor, dies asphyxiated on the second, third, or fourth day.

In the less severe cases, or in cases where judicious treatment has succeeded in increasing the area of inflated tissue, the child at first may seem to be going on well, although he never exhibits in his movements the vigour of one whose lungs are well expanded. His movements are more or less languid, and he sucks feebly or cannot be persuaded to take the bottle or the breast. After a time he seems to grow weaker and can only be kept warm with difficulty. His respirations get more and more shallow and his cry feebler. The child is always sleepy, and lies dosing with livid mouth and eyelids, the latter often incompletely closed. The fontanelle is depressed. From this point he may sink gradually and die after a series of convulsive fits, or may be roused by energetic treatment which

again inflates the closed air-cells. But in such a case, although the child may be apparently restored, the unfavourable symptoms usually return, and it is rare for the patient to recover. In most cases after a time remedies seem to be useless and the infant can no longer be revived. Thrombosis of the cerebral sinuses, according to Stiffen, is often found in these cases.

Even in cases where recovery is apparently complete, the lung is not always perfectly expanded, and a slight catarrh may cause sudden and unexpected death. Mr. W. Burke Ryan has related the case of a child, aged five weeks and in good condition, who one evening was noticed to cough, and the next morning died quite suddenly. On examination of the body, both lungs were found to be shrunken and firmly contracted so as to leave the greater part of the pericardium exposed. They sank instantly in water; and when cut into little pieces, not the smallest bit floated. An examination with a small lens showed no trace of cellular structure, and an examination by Mr. Quekett of small sections with a higher power discovered many of the alveoli to be filled up by small granules or cells which rendered them solid.

Cases of congenital atelectasis which recover completely are usually those in which energetic treatment has been adopted within a few hours of birth and has resulted in healthy inflation of the whole lung. In the beginning this may be often accomplished; but delay leads to such change in the closed air-cells that they can be rarely sufficiently inflated to take useful part in the respiratory process. Moreover, from the observations of F. Weber and Stiffen, it appears that in cases where the child survives with permanent atelectasis of a portion of the lungs, the constant obstruction to the pulmonary circulation leads to hypertrophy of the right side of the heart, prevents the closure of the foramen ovale and ductus arteriosus, and may eventually induce hypertrophy of the left auricle and ventricle.

Diagnosis.—The history of these cases reveals a constant state of weakness and torpor. This want of power, combined with lividity of the face, inability to suck, shallow breathing, and low temperature, is very suggestive. If in addition we notice the signs and symptoms of imperfect expansion of the chest, and on a physical examination fail to find evidence of marked consolidation, we can have little difficulty in ascribing the symptoms to their true origin.

Prognosis.—The prospect of recovery depends partly upon the cause of the atelectasis, partly upon the strength of the child, and partly upon the period after birth at which restorative measures are adopted. If the imperfect expansion of the lungs be due to some obstacle in the tubes themselves, or to some temporary accident occurring at the time of birth, the child's strength is usually good and treatment employed promptly is generally successful. If, however, means are not adopted early to enforce expansion of the unused alveoli, the prognosis is little less unfavourable than when the atelectasis is due to general weakness of the patient. In the latter case the chances of permanent improvement are not good, but vary according to the strength of the child. The unfavourable signs are: inability to suck; increasing lividity; a sub-normal and falling temperature and great apathy of manner. If the child ceases to be able to swallow, or if tonic or clonic spasms are noticed in the muscles of the face or limbs, we can entertain little hope of his recovery.

Treatment.—When a child is born apparently lifeless after a tedious labour measures must be at once adopted to promote efficient expansion of the lungs. It is important, however, that whatever is done should be done with due deliberation and care, avoiding unnecessary hurry or vio-

lence. In a new-born infant the organs are especially tender, and may be fatally injured by heedless energy. Cases have been met with in which the liver and spleen have been ruptured by an over-zealous practitioner in his haste to promote inflation of the lungs. The chest of a new-born infant is in a state of absolute airlessness; and therefore methods of resuscitation which depend for their success upon elastic recoil of the chest-walls are without any value. So, also, the method of mouth-to-mouth insufflation, pressing at the same time the larynx backwards against the gullet so as to close the latter passage, fails to introduce air into the lungs. Dr. F. H. Champneys, from a series of elaborate experiments upon the bodies of new-born infants, concludes that the best method of resuscitation is that of Dr. Silvester. The child is laid on his back on a table with a pillow under his shoulders, and the operator standing behind the body grasps the arms above the elbows and everts them. He then in successive movements raises the arms upwards by the side of the child's head; extends them gently upwards and forwards for a few seconds; then turns them down and presses them gently and firmly for a few moments against the sides of the chest. While this is being done the tongue should be held forwards by an assistant. The movements should be repeated fifteen times in the minute, and should be continued for at least half an hour if no satisfactory result be previously obtained.

M. Greult advocates placing the infant in water as hot as the hand can bear—which he finds to be about 113° F.—and employing artificial respiration while the child remains in the bath. He relates the case of a primipara who after a tedious labour was delivered by forceps. The infant, when born, was breathless, cold, with scarcely any movement of the heart and but feeble pulsation in the cord. The child was at once placed in water which felt burning hot to the hand, and artificial respiration was begun. At the end of one minute the skin reddened, and a slight movement of the chest indicated the beginning of respiration. At the end of two minutes the child began to cry, to breathe, and to move his limbs.

In cases where the infant breathes, but is evidently labouring under imperfect expansion of the lungs, he should be warmly covered or even wrapped in cotton wool, and kept perfectly quiet in a room heated to a temperature of 70° or 75.° The best position is that recommended by the late Dr. C. D. Meigs, viz., upon the right side with the head and shoulders raised at an angle of 45°. If the patient cannot suck he should be fed with breast milk or some efficient substitute, as directed elsewhere (see page 603). The food must be given with the syringe and elastic tube (see page 15). Stimulants are indispensable. Five drops of brandy can be given in a syringeful of the food every two, three, or four hours, or the child may be fed with white wine whey. If the lividity increases and other unfavourable signs are noticed, attempts should be made to force the child to cry or gasp by slapping the chest with the corner of a towel wetted with cold water. Emetics are also useful in freeing the tubes of mucus and forcing the patient to respire deeply. Sulphate of copper (a quarter of a grain in a teaspoonful of water) is the best form in which they can be given. Emetics, however, must not be used if the child is very feeble.

Stimulating embrocations rubbed into the chest are often of service, and immersion in a strong mustard bath (one ounce of mustard to each gallon of water) until the skin becomes very red is a stimulant of very powerful efficacy. The internal administration of stimulants should be continued as long as the child is able to swallow. Unfortunately in bad cases the results of all these measures are far from encouraging.

POST-NATAL ATELECTASIS.

The form of collapse of the lung which occurs in infants whose lungs have been fully expanded at birth is a very common lesion. It occurs almost invariably in the course of a pulmonary catarrh, and is one of the accidents which render this form of derangement so fatal in weakly or rickety children.

Causation.—The immediate cause of collapse of the lung is the presence in the bronchial tubes of mucus which the child is unable to expel by reason of feebleness of the respiratory apparatus. Dr. Gairdner, of Glasgow, in his treatise explains very clearly the mechanism by which exhaustion of the lobules is effected. In the act of inspiration a plug of mucus is carried inwards along a tube the calibre of which is constantly diminishing. When the narrowness of the tube prevents further advance, the mucus forms a plug which completely obstructs the channel. During expiration the plug is slightly dislodged so as to permit of the escape of some of the air contained in the lobule; but at each inspiration it is again drawn backwards so as to close the tube completely against any air entering to replace that which has just escaped. In this manner after a time the lobules beyond the point of obstruction are completely exhausted and the tissue becomes shrunken and condensed. Even if the plug of mucus be completely impacted in the tube so that it cannot be dislodged during expiration, collapse may still occur, for the pent-up air in the alveoli is exposed to such pressure by the elasticity and contractility of the alveolar parieties that it is absorbed.

The retention of mucus in the tubes is the consequence of inability to cough it away, and any cause which diminishes the energy of the inspiratory act increases the difficulty of drawing in air past the impediment in the bronchus. New-born infants do not know how to cough, for the act of coughing is only partly involuntary. It is in part an effort of volition to remove an obstacle to the free passage of air in the tubes. An infant who has not acquired a knowledge of the means by which the impediment may be expelled, suffers the obstruction to remain without employing the necessary force to effect its removal. Even if the child knows how to cough, he may not have the power to carry out the act with sufficient energy to make it effectual. In the act of coughing a full inspiration is first taken. The glottis is then closed, and pressure is brought to bear upon the lungs by the muscles of expiration. While this pressure is at its height the glottis is relaxed, and the rush of air passing out carries with it the mucus which was obstructing the tubes. If, however, the lungs cannot be sufficiently filled, or if, owing to weakness of the patient, the force of the expiratory muscles is insufficient to bring adequate pressure to bear upon the lungs, the cough is ineffectual in freeing the tubes of their contents.

Weakness of the inspiratory act is a powerful agent in preventing the entrance of a sufficient supply of air. In ordinary respiration the elasticity and contractility of the lung have to be overcome by the muscles of inspiration. If these muscles are feeble, as they are in a weakly infant, the obstacle to efficient inflation of the lungs is already great. If, however, in addition, the respiratory muscles are opposed by reflex contraction of the bronchial muscles, owing to the irritation of the catarrhal process, and also by mucus in the tubes, they may prove quite unequal to the task. Therefore any cause which increases the child's general weakness predisposes to pulmonary collapse. Thus vomiting, diarrhœa, insanitary conditions, im-

proper feeding, and all the exhausting forms of illness may have this result.

Besides the causes which have been enumerated, the force of the inspiratory act may be weakened by mechanical means. Interference with the action of the diaphragm may have important consequences in this respect. This influence is especially seen in the case of young infants. For some time after birth respiration is principally diaphragmatic on account of the circular shape of the chest, which allows of little lateral expansion. Therefore any resistance to the descent of the diaphragm, such as would be produced by ascites, or great increase in size of the abdominal organs, or flatulent distention, may so weaken the force of the inspiratory act that a very trifling catarrh determines wide-spread and fatal collapse of the lung.

Another mechanical means by which the force of the inspiratory act may be interfered with is deficient rigidity of the chest-wall. Abnormal softening of the ribs is a very important agent in the production of collapse, and the frequency and danger of the lesion in rickety subjects is mainly owing to this simple cause. The parieties of the chest in the infant are naturally more flexible than they are in the adult. Even when the ribs and their cartilages are perfectly sound, considerable recession of the lower ribs may be seen at each inspiration if an impediment exist at any part of the air-passages to interfere with the ready entrance of air into the lung. If the ribs are softened, as in rickets, the same recession is noticed although the passages may be perfectly free ; for the softened ribs cannot resist the pressure of the atmosphere, and the force of the inspired air is insufficient by itself to prevent the thoracic parieties, where least supported, from sinking in. Consequently in this disease the lower lobes of the lungs are very insufficiently filled with air. If such a child suffer from pulmonary catarrh, the additional obstacle to efficient inspiration created by the mucus in the tubes may lead to complete collapse of the inferior parts of the lungs. On account of the mechanism by which it is produced, collapse of the lung must always be a secondary lesion. It is found as a complication of various forms of illness. Diseases of which pulmonary catarrh is a common symptom, as whooping-cough and measles ; diseases which interfere directly with the passage of air through the glottis, as diphtheria, laryngitis stridulosa, post-pharyngeal and other abscesses in the neighbourhood of the larynx ; diseases which diminish the force of the inspiratory act, either by mechanical opposition as in abdominal tumours and rickets, or by impairing the muscular strength of the patient—in all these cases collapse of the lung is liable to be found.

Morbid Anatomy.—The extent of the collapsed area is in proportion to the calibre of the tube at the point of obstruction. According, therefore, as the lesion involves many lobules over a considerable surface, or is limited to a few, the collapse is said to be diffused or lobular. The airless part of the lung is shrunken and therefore depressed. It is purple in colour and to the touch feels soft and dense. It does not crepitate. On section the surface is smooth, and blood or bloody serum exudes on pressure. Around the collapsed portion the air-cells are emphysematous.

Lobular collapse is often situated at the anterior edges of the lungs, but may occupy any other parts. The diffused variety is most common at the posterior surface, but may be seen elsewhere. It penetrates for a variable distance into the organ, and sometimes an entire lobe or even the greater part of the lung may be found shrunken and airless. After death, if the lesion be recent, the collapsed tissue can be completely reinflated through the bronchus.

Symptoms.—The symptoms are found to vary considerably in different cases according to the extent of the collapse and the degree of strength of the patient. In a very weakly infant rapid and extensive collapse is often a cause of sudden death. In such cases the preliminary catarrh is not necessarily severe. Often, indeed, it is trifling; and the rapidity with which death occurs gives rise to much surprise and consternation. The impaction in a large bronchus of a single plug of mucus may be thus followed in a young and feeble subject by rapidly fatal consequences. Another common result of the lesion is a convulsive seizure; and sometimes the fits succeed one another with great rapidity, each attack increasing the exhaustion of the patient and aggravating the pulmonary mischief until death ensues. These cases are not, however, always immediately fatal. In a sensitive child collapse of comparatively limited extent, if it occur suddenly, may give rise to an eclamptic seizure; but this may not be repeated, and perhaps by judicious and energetic treatment the child's life may be saved.

Such severe symptoms are, however, exceptional. In most cases the occurrence of collapse is indicated by less striking phenomena. A weakly infant is suffering from the ordinary symptoms of bronchial catarrh. He coughs more or less loosely and his breathing is moderately hurried, but there is nothing to excite apprehension. Suddenly, however, a change occurs. The child becomes restless and evidently distressed; his face gets distinctly livid, especially about the eyelids and mouth; his breathing, which had been more laboured than natural, increases in rapidity but diminishes in depth; the cough ceases or is feeble and faint; and the internal temperature of the body is found to be below the level of health.

The face usually indicates profound depression. The features look pinched; the eyes are dull and hollow; and the forehead is often moist with a cool, clammy perspiration. The nares act in respiration, and the breathing is very rapid. The number of respirations commonly reaches 70 or 80 in the minute, and the perversion of the pulse-respiration ratio is extreme. In very young infants the breathing is usually very shallow, with little movement of the chest-walls; but in infants eight or nine months old, whose ribs are softened by rickets, the bases of the chest sink in to some extent at each inspiratory movement. The child refuses to suck and often seems to have difficulty in swallowing, so that he can hardly be persuaded to take milk from a spoon.

The physical signs, if any are to be discovered, consist in slight dulness at the posterior base of one lung, or extending upwards in a narrow vertical strip at each side of the spine. The dulness can often only be discovered by very gentle percussion, as a sharp blow with the finger brings out the resonance from healthy tissue underlying the condensed layer. The breathing conducted from healthy tissue around is of bronchial quality, and may be weak or fairly loud, according to the strength of the respiratory movement. Vocal resonance is usually annulled. Sometimes coarse crepitation is heard at the confines of the collapsed area. These signs are only to be discovered when the lesion is of the diffused variety. In lobular collapse any dulness which may be occasioned by the presence of the solidified patches is neutralised by the compensatory emphysema set up in their neighbourhood.

When the above symptoms and signs are noticed, the infant's condition is a very serious one; and unless prompt measures are taken to excite expansion of the collapsed tissue and expel the obstructing mucus, death must inevitably ensue. The lividity increases or changes to an ashy hue,

the breathing grows more and more shallow, and the child dies in a state of stupor from slow asphyxia, or expires in a convulsive attack.

In children over a year old, who are not the subjects of rickets, the symptoms are usually less severe, and the physical signs more nearly resemble those which exist under similar circumstances in the adult. If the ribs are softened from rickets, the impediment thus raised to efficient inspiration greatly aggravates the effects of limitation of the respiratory surface, and in children as old as two or three years the signs of suffering are well marked. If, however, the chest-wall preserves its normal rigidity, the symptoms are much less characteristic. The respiration may be hurried, although this is not always the case, and the complexion may show some signs of deficient aëration of the blood ; but the child is not prostrated by the lesion ; he can cry fairly loudly, and his cough is not suppressed. On examination of the chest, we find dulness of variable extent on one side, usually at the base ; the respiration is weak and harsh over the same area with absence of vocal resonance, and large moist râles are heard about the back. In some cases, as when the collapsed area immediately surrounds a large bronchial tube, the rhonchus may be metallic and ringing as if produced in a cavity.

If the lesion occupy the apex, the breathing is often loud and bronchial or blowing, and the dulness may be complete. In this situation collapse is very likely to be mistaken for consolidation arising from other causes.

A rickety little boy, aged eighteen months, who had cut only sixteen teeth, was being treated in the East London Children's Hospital for chronic diarrhœa arising from ulceration of the bowels. The chest was not deformed and there was no softening of the ribs. An elder sister had died in the hospital from tubercular peritonitis. About a week after the child's admission he began to cough, and in a few days it was noticed that the percussion-note at the right supra-spinous fossa was decidedly high-pitched, and that the respiration there had a faint bronchial quality. There was a little coarse bubbling about the back on each side. The temperature had been generally about 100° at night, sinking to 99° in the morning. The pulse was 96–100 ; the respirations 26–30.

Some days afterwards dulness at the right apex behind had become complete, and the breathing was bronchial with a click in the middle of inspiration. In front the percussion-note was quite healthy. The moist râles over the back persisted. Temperature in the evening, 99°–100° ; pulse, 80–102 ; respirations, 20–30. All the time the diarrhœa continued and the child wasted rapidly. There was more or less general œdema. The urine was albuminous and contained renal epithelium. A few days afterwards the child died quietly.

On examination of the body, both lungs were found to be emphysematous with scattered patches of lobular collapse. At the posterior part of the apex of the right lung was a patch of collapse which occupied the upper third of the lobe. Ulcers were found in the lower part of the sygmoid flexure and rectum. The kidneys were congested. There was no sign of gray granulations or of caseous nodules anywhere about the body.

This case was mistaken for one of acute tuberculosis with tuberculous ulceration of the bowels. The moderate pyrexia, the œdema, the albuminuria, and the increasing signs of consolidation of the right apex seemed to justify this view, especially when considered in relation to the history of tubercular peritonitis in the elder sister.

In some cases of lobular collapse where the symptoms are not very

severe, a considerable change all at once is found to occur. The temperature rises, the breathing becomes laboured, and the lividity and signs of distress increase. These symptoms indicate the beginning of catarrhal pneumonia.

Sometimes after an attack of pleurisy the lung is left condensed and airless and adherent to the chest-wall, without any marked contraction of the side. This condition may produce very puzzling physical signs.

A little girl, aged fourteen months, with eleven teeth, was said to have been a fine child until the age of ten months. At that time she had begun to suffer from a cough which was called whooping-cough by the medical attendant. The child was brought to the hospital for the cough, which had continued for four months, and for general wasting of two months' standing. On examination, although there was no obvious contraction of the right side of the chest, the respiratory movement of that side was seen to be impaired. The lower intercostal spaces, however, sank in fairly well, although less deeply than on the opposite side. On percussion, complete dulness with increased resistance was found over the greater part of the right side. It extended over the whole posterior region, and reached upwards in the axilla to the second rib, and in front to the third. Towards the spine behind the note had a wooden quality. Posteriorly and laterally the breath-sounds were cavernous with abundant crisp, clicking sounds. In front the breathing was bronchial. The resonance of the cough was abnormally strong.

On the left side there was no dulness, but the breathing was blowing towards the apex, and some clicking rhonchus was heard all over the left back. The heart's apex was in the fourth interspace slightly to the outer side of the left nipple line. The edge of the liver could be felt one inch below the ribs.

The chest was twice explored with a fine aspirating syringe, but no fluid could be detected. The child eventually died. Her temperature until shortly before death was normal.

On examination of the body the right lung was found to be much shrunken and to be universally attached by old but readily separable adhesions to the chest-wall. It was almost entirely non-crepitant, and felt very tough and firm in texture. Inflation only partially succeeded in dilating the condensed tissue and much force had to be employed. On section the texture of this lung was found to be throughout excessively tough and firm. It was thought there was some slight dilatation of the bronchi. A few nodular caseous masses were found scattered over the parenchyma. The left lung was generally emphysematous, with the exception of the inferior part of the lower lobe, which was collapsed, but could be reinflated with the blow-pipe. This lung passed across the middle line of the chest and encroached largely upon the right pleural cavity. On section it was pale and contained little blood. The kidneys looked fatty. The heart and other organs appeared to be healthy.

This case had been, no doubt, one of pleurisy in which the effusion had become absorbed, leaving the lung in a state of condensation and collapse, similar to the gray induration described by Addison. The physical signs were very similar to those of fibroid induration of the lung; indeed, this was the opinion expressed as to the nature of the case, in spite of the tender age of the patient.

Diagnosis.—When the collapse assumes the lobular form, the diagnosis has to be made without the aid of physical signs. In a well-marked example, however, the symptoms are so characteristic that an accurate opinion can

be formed without much hesitation. Our conclusion is based upon the fact that in the course of a pulmonary catarrh signs are suddenly observed indicating feebleness of inspiratory power and deficient aëration of the blood. Thus, a weakly or rickety infant, who has been noticed to cough for a day or two, all at once begins to exhibit signs of restlessness and distress. His cough ceases, his cry is replaced by a feeble whimper or a mere distortion of the features without sound; the eyes are hollow; the complexion is livid; the nares act; the breathing is shallow and is hurried out of proportion to the pulse and the temperature is low.

If pulmonary catarrh attack a feeble infant, we must always be prepared for the establishment of collapse, and the sudden occurrence of the symptoms enumerated, combined with a low temperature and the absence of all physical signs connected with the chest, leaves us no other explanation of the child's condition. The only other disease which would be accompanied by a similar train of symptoms and an equal perversion of the pulse respiration ratio, without any abnormality of the physical signs, is acute broncho-pneumonia. In this disease, however, the temperature is high, the breathing very laborious, and the cough loud and hacking. In pulmonary collapse the temperature is normal, or even below the natural level of health; the cough is feeble or suppressed, and the breathing is shallow, for even if there is recession at the base of the chest from rickets, there is no laboured movement of the shoulders or upper part of the thoracic wall.

A difficulty sometimes arises from the slightness of the pulmonary catarrh. The cough may be unnoticed by careless attendants, and the occurrence of such symptoms without being preceded by any history of cough may excite some surprise. It is necessary, therefore, to remember that atelectasis may be the consequence of a very slight catarrh, and that we are justified from the symptoms alone, and without the presence of physical signs, in drawing the conclusion that the child is suffering from collapse of the lung.

When lobular collapse occurs in the course of an attack of mild bronchitis, the presence of the lesion may be inferred by remarking that the symptoms of prostration and deficient oxydation of the blood are exaggerated out of all proportion to the physical signs. If the bronchitis be severe, we may conclude that atelectasis is present if the breathing becomes suddenly shallow and rapid; if the cough and cry become suppressed; while the lividity and general distress are still further aggravated, and the internal temperature of the body falls below the level of health.

In cases of diffused atelectasis an examination of the chest reveals dulness, bronchial breathing, and a sub-crepitant rhonchus. The disease may then be mistaken for croupous pneumonia or pleurisy. In a young infant, however, little hesitation is occasioned, for the symptoms induced by atelectasis are very different from those resulting from either of the diseases which have been mentioned. It is principally in cases where the lesion occurs after the end of the first year that any perplexity is experienced. At this age the general symptoms are usually less severe and the child's weakness much less pronounced. Still, the history of the illness is very different in collapse from that of a case of inflammation either of the lung or the pleura. Moreover, in pneumonia the high temperature is a distinguishing mark of great value; and tubular breathing, with a fine, puffy crepitation noticed at the borders of the dull area, are signs which are not heard in collapse of the lung. From a localised pleurisy the lesion is not always so easily distinguished. Collapse of a mere layer of tissue on the surface of the lung gives rise to only moderate dulness quite unlike

the dead, toneless note over even a thin stratum of fluid. If, however, an entire pulmonary lobe be collapsed, the dulness may be very marked and the resistance notably increased, although perhaps to a less extent than is found in cases of pleurisy; still, the difference is one only of degree. To add to the resemblance, the breathing in either case may be weak and bronchial without rhonchus or other adventitious sound. If, however, the vocal resonance be œgophonic, the sign is characteristic of pleurisy and is never found over merely collapsed lung-tissue. In most cases the symptoms alone in the two diseases are sufficiently different to warrant a diagnosis. In atelectasis the distress is greater, and the signs of lividity are more noticeable than in the case of pleurisy of equal extent; for in the latter disease, unless a great accumulation of fluid occur, or the pain be severe, the child, as a rule, appears little inconvenienced by his illness.

When the collapse occupies the apex of the lung, as in the case narrated above, it is often distinguished with difficulty from an ordinary caseous consolidation, especially if any complication be present, as in that case, to raise the temperature of the body above the natural level. Still, one distinguishing mark which was present in the case referred to might suggest simple condensation of tissue, viz., the limitation of the dulness to one aspect of the chest. Complete dulness arising from consolidation would be certainly accompanied by a corresponding alteration of the percussion-note on and above the clavicle as well as at the supra-spinous fossa.

Prognosis.—Post-natal atelectasis is always a grave lesion, especially in weakly children. Indeed, if the collapse occur in the course of a severe attack of bronchitis, and the patient be a feeble or rickety infant under the age of twelve months, death may be looked upon as inevitable. Even when the preliminary catarrh is less severe, the life of the child is placed in great danger; and if the collapse be extensive, or the softening of the ribs extreme, treatment must be very prompt and energetic indeed to afford any prospect of success. The occurrence of convulsions greatly increases the danger of the case; and marked apathy and torpor, persistent increase of lividity, great shallowness of breathing, and inability to swallow are all symptoms of unfavourable import. On the contrary, if the face become clearer and the breathing deeper, and especially if the child begin to suck his fingers, to take his bottle readily, or to show any interest in what passes around him, we may have hopes of his recovery.

Treatment.—Re-inflation of the collapsed air-cells in cases of atelectasis can only be effected by measures which increase the vigour of the inspiratory movement. To attain this object we must make use of energetic stimulation both internally and externally. The child should be placed as quickly as possible in a hot mustard-bath of the strength of one ounce of mustard to each gallon of hot water. In this bath he should be allowed to remain until the arms of the person supporting him begin to prick and tingle uncomfortably. After being removed and dried, the chest should be wrapped loosely in cotton wool, and the child be laid quietly in his cot with head and shoulders raised. The temperature of the room should be between 70° and 75°. If any signs are observed of accumulation of phlegm in the tubes, an emetic is useful; and a quarter or half a grain of sulphate of copper (according to the age of the child) may be given in a teaspoonful of water every ten minutes until vomiting is produced. The emetic is also valuable in forcing the child to take a deep breath. Mechanical means of increasing the depth of the inspirations form an important part of the treatment. The infant should not be allowed to sleep too long at one time. Drowsiness is one of the commonest

symptoms of this lesion ; but a careful eye should be kept upon the patient during his sleep, and if signs of increasing lividity are noticed, he must be taken up and put into a mustard-bath, or made to cry by frictions to the soles of his feet or by the application of a strong stimulating liniment to the chest-wall. The linimentum ammoniæ of the British Pharmacopœia, diluted, if necessary, with an equal quantity of olive-oil, is very useful for this purpose.

If the child can suck, he should take white wine whey with cream from a bottle. In many cases, however, on account of his inability to draw up the fluid through the tube, it is necessary to feed him with the syringe. In addition, or as a variety, the child may be fed with milk and barley-water with Mellin's food, and five or ten drops of pale brandy must be given at regular intervals. In the case of a weakly infant, when the symptoms of prostration are great, the stimulant will be required every half hour until the child revives. Older children may take milk, strong beef-tea, and the brandy-and-egg mixture.

The above measures must be put in force directly any signs are discovered indicating the occurrence of collapse. The earlier special treatment is begun, the more likely is it to be successful. It is of the utmost importance that the child be not allowed to sleep himself to death, as he will probably do if left alone. He must be roused at intervals and made to inspire ; and our efforts must be continued perseveringly until signs are noted of returning vigour or of improved aëration of the blood. Even then he must be carefully watched that he may not relapse, and stimulation must be continued until all danger has passed.

Drugs are not of much value in this lesion. Opium is to be carefully avoided. Diffusible stimulants may, however, be given if thought advisable. The best of these is quinine dissolved in sal volatile in the proportion of one grain to the drachm. Three or four drops of this solution may be given occasionally in a spoonful of the food.

CHAPTER VIII.

FIBROID INDURATION OF THE LUNG.

Fibroid induration of the lung (cirrhosis of the lung, interstitial pneumonia) is not very uncommon in children, and is often mistaken for phthisis. The complaint gives rise to a chronic derangement of health which is subject to marked variations according to the season of the year. In cold and changeable weather the patient suffers greatly from attacks of bronchitis and catarrhal pneumonia. Consequently, at these times he is apt to be feverish and grow pale and thin, even if his life be not put in actual peril. In warmer and more settled weather he usually greatly improves and gains considerably both in flesh and strength. Cases of very chronic "consumption," in which the patient is constantly ill and failing during the winter, but revives and regains flesh during the summer months, are often examples of this form of pulmonary disease. Cirrhosis of the lung rarely attacks infants. It is usually found in children of five years old and upwards.

Pathology.—Fibroid induration is always a secondary complaint, and usually owes its origin to an attack of inflammation of the lung. Both croupous and catarrhal pneumonia tend to promote a multiplication of the connective tissue elements ; but in children the fibroid increase is commonly due to the lobular form, especially to the subacute variety which is apt to follow attacks of measles and whooping-cough. Catarrhal pneumonia is always accompanied by dilatation of the bronchi, and this condition of the air-tubes favours the catarrhal process. It hinders the escape of secretion and so maintains a state of continual irritation of the air-tubes and their terminal alveoli. As a result, the persistence of the pulmonary inflammation tends to promote a fibroid thickening of the walls of the bronchi and air-cells ; the dilatation of the tubes becomes a permanent lesion, and this, again, helps in its turn to perpetuate the irritation.

Croupous pneumonia is less often than the preceding a cause of cirrhosis ; but sometimes, if the disease is protracted, thickening and induration may occur in the walls of the alveoli, and the indurating process may continue after the original disease is at an end. Weber has reported the cases of three children in whom the disease had this origin, for he had himself treated the patients for the primary attack of pneumonia.

Sometimes, although rarely in young subjects, inflammation of the pleura may lead to the fibroid overgrowth. It is in cases where the lung has been subjected to long-continued compression that this consequence is most likely to occur. The thickening in this form is limited at first to the superficial interlobular septa ; but the process may afterwards penetrate more deeply and be accompanied by dilatation of the bronchi.

Induration of the two lungs as a consequence of the inhalation of grit in the course of industrial labour is not found in children. Young persons under twelve years of age are not exposed to this source of disease ; and

even in adults whose employment obliges them to breathe continually an air filled with irritating particles, disease of the lung thus induced is invariably chronic, and only becomes developed after an exposure extending over many years.

Morbid Anatomy.—On examination of a lung, the seat of fibroid induration, a great development is noticed of fibro-nucleated tissue in the walls of the alveoli, the interlobular connective tissue, and the bronchial tubes. As this increases it involves all the connective tissue of the lung. The organ becomes excessively dense and shrunken. Its substance is firm and tough, and a section shows a smooth or faintly granular surface, iron-gray or grayish-red in colour, intersected in all directions by white fibrous bands. Dotted over it are white rings of various sizes, which are the divided walls of thickened and dilated tubes.

The fibroid material is not spread evenly over the parenchyma, but often surrounds islets of more healthy tissue, which are thus separated from one another by the dense fibrous bands. Sometimes in the neighbourhood of the fibroid parts the uninvaded tissue may be emphysematous. Small cavities containing cheesy matter or thick purulent fluid are seen here and there in the dense tissue. Some of these are dilatations of the bronchi; others are the result of ulceration which has spread from the enlarged tubes. Sometimes, as in the case of a child five years old who was under my care in the East London Children's Hospital, large expanded channels are found radiating from the root of the lung and ending abruptly, like the fingers of a glove, at the surface of the organ immediately underneath the pleura.

When the disease follows upon an attack of croupous pneumonia the change principally involves the alveoli. The walls of the air-cells become greatly thickened, and in some cases, at least, as in an instance reported by Dr. Sidney Coupland, the exudation products filling the alveoli become organised into a fibrillated and at first vascularised mesh-work. By this means the alveoli are either compressed or filled up, and in either case effaced; and as the tissue shrinks, the new vessels which had been developed in the growing tissue become obliterated.

If the cirrhosis originate in a broncho-pneumonia the alveolar walls are thickened as in the former case; but in addition there is great development of fibroid tissue in the walls of the bronchi and in the connective tissue between the lobules. In these cases whitish bands are seen radiating from the thickened walls of the air-tubes.

When the morbid process starts from the pleura, dense fibrous bands pass inwards from the surface. The pleura itself is greatly thickened, and the lung-tissue underlying it may be converted after a time into a dense fibrous substance. At first, however, the fibroid degeneration is more partial than in cases where the disease is the consequence of pneumonia.

Microscopic examination discovers closely packed wavy fibres in the denser portions, or even a homogeneous or faintly fibrillated material with a few small round or fusiform cells.

The alveoli, where not completely compressed and effaced, are either empty or are filled with nucleated and epithelial cells, granular corpuscles, and granules.

The bronchi are either obliterated or are greatly thickened and dilated, especially in parts where the disease is most advanced. The tubes are in some cases regularly enlarged, but sometimes more local dilatations are seen forming cavities of various sizes. The lining mucus membrane may be ulcerated, and in very advanced cases ulcerative destruction of tissue

may have penetrated from these spots into the lung. This form of the disease has been called "fibroid phthisis" by Sir Andrew Clark.

Fibroid induration is usually limited to one lung, the other being healthy or emphysematous. It may occupy any part of the organ but more commonly affects the base than the apex.

In addition to the mischief in the lung, disease is often found in other parts. The liver, spleen, and sometimes the kidneys may be the seat of amyloid degeneration. In some cases the liver has been found to be cirrhotic and the kidneys to be granular.

Symptoms.—In the early stage of the disease the development of fibroid tissue in the lung is accompanied by no special symptoms. The process most commonly begins at the end of an attack of catarrhal pneumonia. In some children we find a peculiar tendency to recurring attacks of this form of pneumonia of very unusual duration. Between the attacks the child seems almost well, and an examination of the back detects merely a slight impairment of resonance on one side (best detected by "broad percussion" upon three fingers at once), with perceptible increase in the resistance. The respiratory sounds, however, are normal. When an attack of catarrhal pneumonia comes on, the symptoms and signs are those peculiar to that form of inflammation of the lung. If death occur after a prolonged attack of broncho-pneumonia, we may find one of the lungs small, shrunken, and particularly firm to the touch; and notice on section that the interlobular septa and walls of the bronchioles are much thickened, especially at the base of the organ, and that the bronchi are dilated. Such a condition constitutes an early stage of the fibroid change in the lung. The incipient fibrosis, beyond conferring a certain high-pitched quality upon the percussion note—and this sign is but an indefinite one—gives rise to no symptoms. Nutrition is not interfered with, the appetite is good, and the temperature is normal. Pyrexia, cough, loss of appetite, and impairment of nutrition only occur as a result of an intercurrent inflammatory attack; and at these times only are any pronounced physical signs to be detected on examination of the chest. Dulness is then marked and extensive; the breathing becomes blowing or tubular; and coarse bubbling or sub-crepitant rhonchus—more or less metallic and ringing according to the degree of acute dilatation of the tubes—is to be heard with the stethoscope. After each of these attacks the lung is left in a distinctly worse condition than before. The fibroid overgrowth increases in the lung; the bronchi get to be permanently dilated; and the lining membrane of the air-tubes becomes the seat of more or less persistent catarrh.

Even when the fibroid overgrowth has increased to such a degree as seriously to impair the usefulness of the lung as a respiratory organ, the influence of the disease upon general nutrition may be comparatively slight so long as the chest is free from intercurrent attacks of bronchitis or catarrhal pneumonia. Special symptoms arising from contraction of the lung and consequent obstruction to the pulmonary and systemic circulation are to be noticed; but if no secondary disease of organs has been induced by his illness, the child is often fairly stout and strong. Therefore, in warm and settled weather, which brings with it freedom from catarrh, his health may afford little subject for complaint; but in changeable seasons, and especially during the winter months, he wastes rapidly and exhibits all the symptoms of "consumption."

When the disease occurs as a sequel to an attack of pleurisy, the early symptoms vary according as to whether the pleuritic effusion and consequent compression of the lung have been moderate or excessive. In the

first case, unless a local catarrh be present the general symptoms may be insignificant; and a physical examination may only detect dulness at the extreme base behind, with very weak bronchial breathing and some coarse bubbles with respiration. The child may be subject to paroxysmal cough, but need not for a long time necessarily suffer in his nutrition through the condition of his lung. If, however, effusion have been copious, and the lung be bound down by thick bands of lymph, the symptoms and physical signs are those of pleurisy with retraction, combined with paroxysmal cough, profuse expectoration of offensive muco-purulent sputa, and the other phenomena which attend a case of pronounced cirrhosis of the lung.

In the fully established disease we find the following signs:

On account of the diminution in size of the affected lung, the chest-wall corresponding to the shrunken organ is retracted. The ribs are flattened over the seat of disease, and the respiratory movement is impaired or suppressed. If the lung is much reduced in size, the shoulder, the nipple, and the inferior angle of the scapula are lowered, the ribs are approximated, and the circumference of the chest on that side is diminished to the measuring tape. An outline of the chest drawn from the cyrtometer shows this difference between the two sides very clearly. In addition a certain displacement of soft parts in the neighbourhood is to be noted. The mediastinum is drawn towards the affected side, and the opposite lung is found on percussion to project across the middle line of the chest. The heart is also displaced, unless adhesions between the pericardium and adjoining pleura retain it in its normal position. If the upper part of the left lung be the seat of disease, the heart is drawn upwards. If the right lung be affected, the heart is pulled towards the right side, and in extreme cases may be felt beating to the right of the sternum. Vocal vibration is sometimes plainly perceptible over the indurated organ, although it is absent from the sound side. In other cases no fremitus may be perceived over the affected half of the chest when the child speaks, although it can be felt over the healthy lung. The percussion-note is of wooden or tubular quality, and there is usually marked resistance of the chest-wall. This increase of resistance is especially noticeable when the diseased lung is the seat of an intercurrent attack of broncho-pneumonia; and the percussion note at this time may be as completely dull and toneless as in cases of pleuritic effusion. The breath-sound is found to vary according to the amount of secretion retained in the tubes at the time of examination. If the dilated tubes are full of muco-pus, the breath-sound is weak and bronchial, with little rhonchus; and resonance of the voice when the child speaks is faint or suppressed. If the air-passages are comparatively empty, the respiration is loud and blowing, often intensely cavernous, or even amphoric, with metallic echo: and large, crisp, metallic bubbles, with dry, creaking sounds, are heard with both inspiration and expiration. These signs are in most cases limited to one-half of the chest.

The symptoms noted in a case of pronounced cirrhosis are in part due to the condition of the lung itself; but in part they are the consequence of the obstructed pulmonary circulation.

The cough is a very characteristic symptom. Owing to retention of secretion in the dilated tubes, and to loss of elasticity in their indurated walls, cough is severe and spasmodic. It occurs at comparatively rare intervals, and consists in a rapid succession of loose-sounding hacks which often continue for many minutes. The child's face becomes congested and his eyelids suffused, and his whole body often shakes with the violence of the paroxysm. After lasting a variable time the cough ends in

spasmodic contractions of the diaphragm, and enormous quantities of offensive purulent matter are retched or expectorated. The unpleasant smell of the morbid secretion is due partly to its retention and consequent putrefaction in the dilated tubes, and partly to the presence in it of gangrenous shreds of mucous membrane. The same causes communicate a fetor to the child's breath, which can be perceived at a considerable distance from his cot. Sometimes the expectorated matters are tinged with blood; but hæmoptysis from this cause is not common in the child. Epistaxis may, however, occur, and the blood from the nose may be swallowed and retched up again at the end of a cough, so as to appear as if brought up from the lungs.

The respirations are usually from 30 to 35 in the minute. If bronchopneumonia be superadded, the breathing becomes much more hurried, and the pulse-respiration ratio is perverted.

The appetite is often good, and although the child is pale as a rule, his nutrition, as has been said, unless interfered with by an intercurrent inflammatory attack, may be fairly satisfactory. During the attacks of catarrhal pneumonia, however, he wastes rapidly; and if the disease has produced marked contraction of the side, the child is usually greatly emaciated.

Pyrexia is not a symptom of the uncomplicated disease. When present, it usually indicates the occurrence of bronchitis or pneumonia, and is then 102° or 103°, or even higher. A more moderate pyrexia may be the consequence of ulceration of the bronchial tubes. In these cases a microscopical examination of the sputum will discover the presence of fibres of elastic tissue.

In addition to the above symptoms others are present which are the consequence of interference with the pulmonary circulation. The right side of the heart becomes hypertrophied, and the systemic venous system is fuller than natural, so that the veins of the neck and chest, and often of the limbs, are abnormally prominent. The fingers are clubbed, and in advanced cases there may be a congested, turgid appearance of the face.

Amyloid disease of the liver, spleen, and kidneys is commonly present in advanced cases. If this be marked, there may be great anæmia and general dropsy.

Although in most cases fibroid induration of the lung is accompanied by marked contraction of the side, this symptom is not always present. In one of the most pronounced examples of the disease which has come under my notice—a child of five years old—the chest was well-shaped, and the affected half, although slightly flattened posteriorly and at the junction of the lateral and anterior thirds, was little inferior to the healthy side in actual measurement. In this case dissection of the body showed that the shrinking and condensation of the lung tissue was compensated for by enormous dilatation of the air-tubes, so that the space occupied by the organ in the chest cavity was little diminished. Even if the lung be condensed so as to reduce its volume much below the standard of health, marked contraction of the chest may be prevented by the drawing into the affected side of movable organs in the neighbourhood. Thus, in a boy—aged eleven years—in whom the shrunken right lung was reduced to a mere mass of gristle, the enlarged amyloid liver was drawn upwards so that its upper border was at the level of the third rib. This displacement prevented the chest from falling in, and the contraction of the side was limited to a little flattening under the clavicle.

In cases where ulcerative destruction of lung ensues (fibroid phthisis)

there is great interference with nutrition. The temperature is elevated, there is often hectic, and diarrhœa may occur with ulceration of the bowels. The symptoms are those common to the third stage of consumption, and the physical signs are such as have been described as accompanying confirmed pulmonary cirrhosis. In these cases the destructive process is soon followed by signs of deposit at the apex of the opposite lung.

Fibroid induration does not always go on to fibroid phthisis. In children, at least, this is an exceptional mode of ending of the disease. As a rule the child succumbs to one of the intercurrent attacks of bronchopneumonia, or falls a victim to a secondary acute tuberculosis.

Diagnosis.—In the early stage of fibroid induration of the lung a certain diagnosis is impossible. We may suspect that the process is proceeding if a child be subject to repeated attacks of inflammation of the lung, and if after an unusually prolonged attack of catarrhal pneumonia the percussion-note remains high pitched, and the indications of dilatation of the bronchi are slow to subside; but no positive opinion can be hazarded upon such insufficient data.

The diagnosis of the confirmed disease rests upon the signs of shrinking and condensation of lung tissue combined with evidence of dilatation of the bronchi. There is great retraction of the affected side, indicated by falling in of the chest-wall, lowering of the shoulder, nipple, and inferior angle of the scapula, with curving of the spine—the concavity being towards the affected side. Neighbouring organs are displaced. If the right lung be diseased, the liver is drawn upwards, the heart is felt beating to the right of its normal position, and the resonance of the left lung passes across the middle line of the chest. If the left lung be contracted, the heart is drawn upwards and the right lung encroaches upon the left pleural cavity.

On examination of the chest the percussion-note is wooden or tubular, with marked resistance, the breath-sound is weak or bronchial if the tubes contain much secretion, while after cough and expectoration loud blowing or cavernous breathing is heard, with large metallic bubbling rhonchus, and intense bronchophonic resonance of the voice. We find, also, indications of interference with the pulmonary circulation. The right ventricle is hypertrophied; the veins of the neck, chest, and arms are fuller than natural, and the fingers are clubbed.

The violent paroxysmal cough ending in retching, and the discharge of a large quantity of offensive purulent mucus is very characteristic; and this symptom, combined with the sudden change in the physical signs which is noticed at once when the dilated tubes have been relieved of their contents, is a strong argument in favour of fibroid induration.

Pleurisy, with retraction of the side, presents physical signs very similar to the above. But in this case, although the breathing in the child is not unfrequently hollow, it is rarely cavernous, and is not accompanied by metallic gurgling. Moreover, the cough is not paroxysmal, and expectoration is scanty or absent. Cirrhosis of the lung may, however, follow upon long-standing pleurisy. It is detected by the gradual supervention of signs of bronchial dilatation with copious purulent sputa.

If on account of extreme dilatation of the bronchi no retraction of the side is present, the characteristic cough, the profuse sputa, the sudden change in the physical signs after expectoration, and the history of repeated failure of health, with rapid improvement under favourable conditions of living, are symptoms of the utmost value.

Ordinary pulmonary phthisis is usually combined with a certain degree

of fibroid overgrowth. The distinction between dilated bronchi and cavities due to ulcerative destruction of lung is elsewhere considered (see page 514). In any case the strict limitation of the disease to one side of the chest is a strong argument in favour of the fibroid disease, for pulmonary phthisis in the third stage is never confined to one lung. It must be remembered that cavities resulting from ulceration of lung may be combined with dilated bronchi (fibroid phthisis). In such a case the apex of the opposite lung is probably also the seat of disease. The diagnosis will then rest upon the history of the illness and the evidence of marked contraction.

Prognosis.—Although fibroid induration of the lung usually tends to increase, the immediate prospects of the child are not unfavourable so long as the disease is limited in extent and remains uncomplicated. The danger of these cases arises from the secondary disturbances, which are a common and unfortunate consequence of this condition of the lung. A catarrh causes great increase of bronchial secretion, and often leads to retention and decomposition of purulent matter in the dilated tubes. The irritation thus induced may be sufficient by itself to set up a catarrhal pneumonia. Fortunately in these attacks the type of the intercurrent disease is usually subacute ; but its course is apt to be protracted, and if the fibroid consolidation is advanced, or the nutrition of the child impaired, the patient may succumb to the complication.

The continuance of healthy nutrition is very necessary to the favourable progress of these cases, and any derangement which tends to reduce the strength, such as digestive disturbance, vomiting, or diarrhœa, is distinctly injurious. The progress is more favourable when the disease is seated at the upper part of the lung than when it occupies the base. In the first case, on account of the downward direction of the air-tubes, retention of secretion is less liable to occur ; in the second case the force of gravity helps to favour accumulation in the tubes.

In the later stage of the illness, when amyloid disease of organs has occurred, the prognosis is serious ; but even at this period, if the patient be living in a climate which allows him to pass much of his time in the open air without risk of chill, nutrition may be carried on fairly well. Œdema with or without amyloid change is an unfavourable sign, as it indicates a a very unsatisfactory state of the blood.

Treatment.—In the treatment of this chronic disease we can do nothing to remedy the mischief in the lung so far as it is already completed. Wherever the fibroid change has advanced, the tissue affected is injured beyond hope of repair, and no treatment can cause absorption of the morbid material in the lung. Still, we can do much by careful attention to the conditions of life of the child to prevent further spread of the disease. Our efforts must be directed to the removal of irritation in the lung, so as to arrest the tendency to active change, and to the promotion of healthy nutrition. The chief cause of the extension of the indurating process is the presence of bronchial secretion in the tubes. We must therefore do all in our power to avert the risk of chill ; and if a catarrh attack the lung, it must be treated without delay. The child must be dressed from head to foot in flannel or woollen underclothing, and should never leave the house in cold or damp weather without suitable covering to his neck and chest. This precaution is the more necessary as confinement to hot rooms is to be deprecated ; and if the child be properly protected from cold, regular exercise should be insisted upon. If practicable, it is desirable that the child should pass the winter in a dry and bracing, but equable climate, where he is not liable to suffer from constant changes of temperature. His diet

should be nutritious, consisting of meat, eggs, milk, etc., avoiding excess of farinaceous food ; and if he be weakly, half a glass of port wine, or of the St. Raphael tannin wine, diluted with an equal quantity of water, may be given him with his dinner. Iron and cod-liver oil are always indicated in these cases.

Directly signs of catarrh are noticed the child must be confined to his bed, and be subjected to the treatment recommended for such cases (see Bronchitis).

In the more advanced stage of the disease much may be done by suitable medication to relieve the more distressing symptoms. One of our first objects should be to control the amount of secretion and destroy its fetor. Astringent remedies given by the mouth and inhaled into the lungs are very useful for this purpose. The child should take quinine (gr. j.–ij.), with tinct. ferri perchloridi (℥ x.–xx.) and a few drops of liq. morphiæ several times in the day ; and astringent and antiseptic solutions should be sprayed into the throat at suitable intervals. These solutions must not be too strong or they may excite so much cough that their use will have to be discontinued. Alum (gr. x. to the oz. of water) and tannin (half a grain to the oz.) are both very useful ; or we may use carbolic acid or creasote (℥ xx. to the pint of hot water) combined with a drachm of tinct. benzoini co. as an inhalation. Turpentine given internally is often a valuable remedy in diminishing the amount of secretion. It may be administered in doses of ten or twenty drops every three or four hours. Reducing the quantity of fluid allowed for drink will often considerably diminish the secretion ; but children do not readily submit to this deprivation.

Vomiting is useful, as the act helps to effect the discharge of secretion from the tubes ; but the paroxysms of cough are apt to be excited by taking food, and if the contents of the stomach are ejected shortly after a meal the loss of nourishment may cause serious interference with nutrition. In these cases it is advisable to give small doses of arsenic (℥ j.–ij.) two or three times a day, or a drop or two of liq. strychniæ, for both of these remedies tend to control the retching efforts at the end of a fit of coughing. But the vomiting should be excited at a more convenient time, as in the early morning, by a draught of warm water, mustard and water, or a grain of sulphate of copper.

Cod-liver oil and tonics are of great service at all stages of the disease ; and if amyloid degeneration of organs has occurred, and there be anæmia, iron is especially indicated. Dropsy must be treated on a similar plan. Any complications which arise in the course of the disease must receive immediate attention ; for it is indispensable to maintain the healthy working of the animal functions. Therefore indigestion, diarrhoea, etc., must be treated by diet and suitable remedies, as directed in the chapters treating of these subjects.

CHAPTER IX.

BRONCHITIS.

Inflammation of the mucous membrane lining the air-tubes is a common cause of death in infancy and childhood. The disease may be dangerous not only in itself but through its tendency to be accompanied by collapse of the lung or to pass into broncho-pneumonia. In young infants death, when it occurs in bronchitis, is seldom due to the uncomplicated disease. It is usually to be ascribed to one of the consequences which have been referred to. In older children a simple bronchitis may prove fatal, but up to the age of five or six years the untoward result is commonly due to extension of the inflammation to the finest tubes and terminal alveoli.

Bronchitis may be a mild complaint or an affection of the utmost gravity. When the disease attacks only the large tubes, it is usually of little consequence and can be readily cured by judicious treatment, although even in these cases, if the patient be a weakly infant, fatal collapse may occur very suddenly and unexpectedly. When the disease spreads to the smaller tubes (capillary bronchitis) the illness is a very serious one, and many of these cases prove fatal.

Causation.—Bronchitis may arise from exposure to weather and to changes of temperature like other forms of catarrhal derangement. It may also be set up by irritants inhaled into the air-passages. Thus an escape of gas in the nursery is sometimes a cause of bronchial catarrh. During the pyrexia attendant upon dentition children are especially sensitive to the causes of pulmonary disorder, and very slight chills will give rise to bronchitis in such subjects. Some children are said always to "cut their teeth with a cough." In other words, their exceptional sensibility at this time to atmospheric influences makes them catch cold very readily.

Damp and cold combined, especially where great variations of temperature occur, are fruitful causes of catarrhal disorders; and if in a climate where such conditions prevail the child is insufficiently clothed, he usually becomes a frequent sufferer from bronchial derangements. Some mothers have a curious dislike to flannel worn next to the skin, and accustom their children in all seasons to depend solely upon the warmth of their frocks and wrappers for protection against the cold. The common result of such a practice is to increase the natural susceptibility to chill; and many a child's life has been sacrificed to this senseless prejudice.

Besides the primary form of bronchitis which is induced by the above causes, the disease is frequently met with as a secondary affection. There are many forms of illness which are habitually complicated by pulmonary catarrh. Whooping-cough, measles, typhoid fever, and acute pulmonary tuberculosis are amongst the number. In others an intercurrent bronchitis is a frequent phenomenon. Thus in scarlatina, small-pox, diphtheria, certain special lung diseases, as croupous pneumonia and pleurisy, and

in diseases of the heart and kidneys, bronchitis is a frequent complication.

Morbid Anatomy.—The anatomical changes induced by the disease involve primarily the mucous membrane, and may spread thence to deeper structures. The membrane is congested and consequently reddened and thickened. Sometimes it is softened. The secretion is at first diminished, but afterwards becomes copious and watery; then thicker and more like pus. Under the microscope we find epithelial cells (many of them embryonic), granular cells, and pus corpuscles.

When the bronchitis is capillary, the finer tubes are often found completely occluded by this viscid muco-pus. This is especially the case in the lower lobes, into which the secretion has probably penetrated by inhalation and gravitation. More or less collapse is then usually found in the tissue with which the obstructed tubes are in connection.

The inflammatory process is at first limited to the mucous membrane, but if the disease continues, may penetrate to the submucous tissue or even involve the whole thickness of the bronchial wall. In these cases dilatation of the channel may take place, and acute enlargement (emphysema) of the air-cells may be found. Often the two opposite conditions of lobular collapse and lobular emphysema may be found side by side.

Ulcerative excavations, described by Dr. Gairdner as "bronchial abscesses," sometimes occur. These are found in the centre of collapsed lobules, and consist of little collections of pus the size of a hemp-seed or larger. They communicate with the terminal tubes, and may be formed of dilatations of these tubes or of ulcerative destruction of the walls of adjoining air-cells. In the former case they are lined by a fine villous membrane; in the latter they are minute cavities in the lung substance, and their purulent contents lie in immediate contact with the lung tissue. According to Dr. Gairdner, these purulent collections are the direct result of pus accumulated primarily in the extreme bronchial tubes of the collapsed lobules. The general appearance of these abscesses is that of softening tubercles, for which, indeed, they have been often mistaken.

In the majority of cases bronchitis is limited to the larger tubes, but even then the purulent secretion may be drawn inwards into the fine bronchi; and these are often found filled with viscid, yellow matter, even when their lining membrane is not inflamed. In young infants, who cannot cough at will, this retention is very liable to occur, and, as is elsewhere explained, is one of the causes which render collapse of the lung so common a lesion in the beginning of life.

Besides the anatomical characters which have been described, spots of catarrhal pneumonia are very common. The appearances resulting from this form of disease and the mode of its production are described elsewhere (see catarrhal pneumonia).

In chronic bronchitis the mucous membrane often appears to be little affected, although sometimes it is smooth and polished. The smaller tubes are considerably dilated; their transverse fibres are hypertrophied; and the sub-mucous connective tissue is generally thickened. Considerable emphysema is usually met with, and collapse is an almost invariable feature of this form of the disease.

Symptoms.—When the inflammation is confined to the larger bronchi, the symptoms are not severe unless the patient be a very young or weakly subject. In a new-born child or a feeble, wasted infant a slight degree of bronchial catarrh may be accompanied by very serious symptoms, and even

lead to death from the occurrence of pulmonary collapse. This form of the disease is described elsewhere (see Collapse of the Lung).

In stronger infants and older children the occurrence of catarrh of the larger bronchi is indicated by coryza and cough. The child sneezes and coughs at intervals. He complains of no pain, and if the cough is hard at the first it soon becomes loose, and ceases after a few days. In these mild cases the general symptoms are slight or wanting. There is no fever; the child is lively and cheerful, and his appetite is little impaired. The tongue is usually furred, and there is some costiveness; but an aperient powder soon remedies this inconvenience, and the child is quickly well. In such cases the only physical sign to be detected about the chest is the presence of a little sonoro-sibilant rhonchus or an occasional large bubble in the inter-scapular region.

Although these cases are mild in themselves and easily cured, they may yet, by neglect, be so prolonged as to cause considerable interference with nutrition. If care be not taken to protect the patient from the ordinary causes of chill, he may pass through a succession of little colds, so that his cough continues for several weeks, and may be accompanied by a certain amount of catarrh of the stomach. Consequently, the child looks pale and gets flabby and languid. In such a state his condition may not only be considered an anxious one by his parents, who begin to entertain fears of consumption, but the resisting power of the child against changes of temperature being really lowered, he is very apt to alarm the practitioner by suddenly developing all the symptoms of acute broncho-pneumonia.

If the catarrh assume a severe form, it often begins with fever and soreness behind the sternum. The temperature rises to 100° or 101°; the tongue is thickly furred; the pulse and respiration are both hurried, although their relation to one another is little altered; and the bowels are confined. The nares act with respiration. The cough is at first hard and frequent and increases the pain in the chest. The skin is moist, the face flushed, and the child, if an infant, constantly requires to be in his nurse's arms. He is very thirsty, and on this account takes his bottle with eagerness. A certain amount of gastro-intestinal catarrh often accompanies the bronchitis. The child may vomit, and his bowels are often relaxed. Usually, after a day or two the temperature subsides, the cough becomes looser, and the soreness of the chest abates. Under proper treatment, the child is usually well at the end of the week.

The physical signs in these cases are of trifling amount. They consist merely in more or less large bubbling at each base, with dry rhonchus and occasional bubbling râles at various parts of the lungs.

When the inflammation penetrates into the smaller tubes (capillary bronchitis) the symptoms become alarming. The features look pinched, and the expression is one of extreme distress. The face is pale, with much lividity about the eyelids and mouth. The child is restless. His dyspnœa is great, and his respiratory movements are laboured as well as hurried; but if the disease is uncomplicated with collapse or lobular pneumonia, there is little disturbance of the normal proportion between the pulse and respiration. Often the child is subject to suffocative spasms if laid down, and has to be supported partially upright in his nurse's arms, or raised in his cot by pillows. At each inspiration considerable recession is noticed of the soft parts of the chest; and if the ribs are yielding from rickets, the retraction of the bases of the chest may be extreme. The temperature at first is raised to 101° or 102°, but when aëration of the blood is greatly interfered with the mercury usually sinks to 99°.

The pulse rises to 140 or 150, or even higher, and is small and often hard. The cough is hacking and hoarse, and occurs in stifling paroxysms, greatly increasing the difficulty of breathing and intensifying the lividity of the face. The skin is moist and beads of sweat are often seen standing upon the brows. The tongue is moist and thickly furred. Appetite is completely lost and the child is very thirsty. Still, on account of the dyspnœa an infant is quite unable to draw fluid from a bottle. The mouth is required as an air-passage, and the needs of respiration preclude its being used for any other purpose. Vomiting sometimes follows a paroxysm of cough, and much whitish or yellowish phlegm is thrown up with the contents of the stomach. In this state the child rarely speaks or cries. Crying interferes with respiration, and he has no breath to spare.

On examination of the chest percussion discovers no dulness. With the stethoscope the breath sounds are found to be more or less completely covered by a copious sub-crepitant rhonchus which is heard over both lungs. In an uncomplicated case the breathing is nowhere bronchial or blowing, and the resonance of the voice is unaltered. These cases are, however, so often complicated with atelectasis or broncho-pneumonia that the physical signs connected with these forms of disease are often to be detected at the posterior bases.

Unless an amelioration in the symptoms occurs suddenly, the distress becomes more and more marked. The fits of dyspnœa are more frequent and alarming. The child, as long as his strength will allow, tosses in his bed, throwing his arms about restlessly. In an infant or rickety child the symptoms pass on to those which have been described as characteristic of atelectasis or of catarrhal pneumonia. In older children, in whom these complications are less likely to occur, the face assumes a leaden hue; the fingers and nails grow purple; the breathing is more hurried, and the pulse gets excessively rapid and small. As the weakness and asphyxia become more marked the cough ceases; the restlessness diminishes; the child becomes drowsy and intensely apathetic, and soon dies comatose or convulsed. The temperature often sinks to a normal level when the symptoms of asphyxia become more pronounced, but often rises again before death to 102° or 103°.

If the case terminate favourably, the eyes grow brighter and the lividity begins to clear; the cough is looser and less paroxysmal; the pulse slackens; the breathing is less laboured; and the child takes more notice, seeming to be less absorbed in his own uneasy sensations.

The *chronic* form of bronchitis is not rare at the age of five or six years and upwards. It usually occurs in children of scrofulous tendencies who have been subject to repeated attacks of bronchial catarrh, and suffer in consequence from some permanent emphysema of the lungs. Such children are very sensitive to chills, and are apt to be troubled in the changeable seasons of the year with a distressing cough and shortness of breath. Measles and pertussis in strumous subjects are often followed by the same pulmonary susceptibility, so that during the colder months the patients wheeze and cough, and present all the symptoms of chronic bronchitis such as result from the same conditions in elderly persons.

In the milder form of the disease the child merely suffers from a chronic cough, which undergoes very noticeable exacerbations on any change of the weather, and on the occurrence of a chill is complicated for a time by the symptoms of an acute attack of pulmonary catarrh. These cases often give much trouble and are very difficult of cure.

In a severer form, when the emphysema is marked, the chest becomes

barrel-shaped; the skin is habitually dry and the fingers are slightly clubbed. These children are almost invariably short and thick-set, with coarse features, thick turgid lips, broad shoulders, and large bones. They often stoop as they walk. During the summer months they are fairly well, with a good appetite; and although they may pant after exertion, do not suffer from noticeable shortness of breath. In the winter they have a persistent cough, and cannot indulge in noisy games, as much movement produces instant dyspnœa. The cough is loose and paroxysmal; sometimes they expectorate frothy, yellow phlegm. The face is usually livid and puffy-looking. The appetite is capricious, and vomiting is frequent after cough. The bowels are costive.

On examination of the chest we find general hyper-resonance; and the respiratory sounds are more or less concealed by a fine crackling rhonchus. If, as often happens, there is dilatation of the bronchi, the respiration in the inter-scapular region may be bronchial or even cavernous. As a rule the temperature is normal.

Chronic catarrh of the stomach or bowels, or both, often occurs in these cases. The appetite is poor; the bowels are loose and contain much mucus; and the loss of flesh is rapid. With great care the pulmonary catarrh may be kept under, and if the child's strength be properly supported, life may be prolonged until the return of more genial weather, when the patient very quickly begins to improve. In too many cases, however, death ensues as a consequence of an intercurrent attack in which the temperature rises, and the symptoms which have been described as the consequence of capillary bronchitis are noticed.

A boy, aged thirteen years, both of whose parents were said to be "weak in the chest," was healthy up to the age of eight years, when he had an attack of measles followed by pertussis. From that time he suffered from cough which was always worse in the winter. He was admitted into the Victoria Park Hospital in February for a severe bronchitis.

The boy was fairly nourished and well built, although short for his age. His chest was full and expanded above, but at the lower part on each side there was some infra-mammary depression. The spine was straight. The heart's apex was in the fifth interspace, three quarters of an inch to the inner side of the nipple line. Its impulse could be also felt in the epigastrium. The skin was dry and harsh; the fingers were slightly clubbed; the liver and spleen seemed pushed downwards. The face was congested, turgid, and more or less livid. The breathing was laboured, and the boy could not lie down in his bed. The temperature was normal and the urine healthy.

On examination of the chest the percussion note generally was hyper-resonant; and everywhere over the chest the breath sounds were concealed by a copious, fine, crackling rhonchus. This at the base was very superficial and ringing. The boy remained in the hospital until June, being sometimes better, sometimes worse; and the amount of rhonchus varied considerably from time to time. The temperature rarely rose above 99°. On his discharge, although his breathing was much better and his general condition fairly good, much rhonchus remained at the bases of the lungs.

Diagnosis.—There is little difficulty about the diagnosis of bronchitis. In the milder form a mistake is hardly possible unless from teething or other cause there is a high degree of fever. With considerable pyrexia the derangement may be mistaken for measles or broncho-pneumonia. In the first case the occurrence of the characteristic rash on the fourth day will clear up the difficulty. In the second, the absence of distress in the

face, the normal pulse-respiration ratio, and the limited amount of rhonchus detected by the ear will furnish a sufficient distinction.

In capillary bronchitis the laboured breathing, the thick and often paroxysmal cough, the copious mucous râles heard with the stethoscope, combined with the absence of dulness on percussion and of bronchial or blowing breathing, are sufficiently distinctive. A point of great importance is the exclusion of atelectasis and of catarrhal pneumonia. The new features introduced into the case by the occurrence of either of these complications are referred to elsewhere (see pages 467 and 436).

Prognosis.—As long as the catarrh remains limited to the larger tubes the prognosis depends upon the age and general strength of the patient. However slight the disorder may be, we can never feel sure that in a newborn, a weakly, or a rickety infant fatal collapse of the lung may not follow unexpectedly. In all such cases, therefore, we should warn the parents of this possible danger, and caution them to watch carefully for lividity, drowsiness, or other sign indicating insufficient aëration of the blood.

In capillary bronchitis the danger is great, however healthy the child may have previously been ; and if the patient be weakly or the subject of rickets, the peril is really urgent. Indeed, few such cases recover. The extremity of the danger is indicated by a high degree of interference with the aëration of the blood. If the child become intensely apathetic or irresistibly drowsy, with blueness of finger-ends, an ashy-gray face, dull and lustreless eyes, and a normal or sub-normal temperature, death can scarcely be avoided. Other signs of unfavourable import are suppression of the cough, great rapidity of the pulse and respiration, smallness of pulse and fulness of superficial veins, with retraction of the base of the chest in inspiration.

Signs indicative of collapse of the lung or of broncho-pneumonia augur ill for the child's chances of recovery.

Treatment.—A pulmonary catarrh in a child, especially if the patient be weakly or of a rickety constitution, should never be treated lightly. In the mildest case the patient should be kept in his room and be made to take a saline mixture containing a few drops of ipecacuanha or antimonial wine in each dose. If there is any rise of temperature, he should be at once put to bed. This is essential. Perfect quiet is necessary for a feverish child ; and even if pyrexia be absent, the repose and equable temperature of his cot will hasten the patient's recovery more certainly than the most energetic medication. Indeed, without this precaution treatment loses more than half its value. In the next place we must employ counter-irritation. There is, however, a right and a wrong way even of using a poultice. Weak applications in these cases are better than strong irritants ; for a far more effectual impression is made by acting slowly upon a large surface of the skin, than by producing a more violent irritation of a comparatively limited area. One part of mustard should be diluted with five or six times its bulk of finely ground linseed meal. The ingredients should be carefully mixed in the dry state and made into a poultice with hot but not boiling water. The application should be sufficiently large to cover the whole front of the chest, and should be allowed to remain in contact with the skin for six or eight hours, or even longer if the child can bear it. A layer of cotton wool should be then applied in its place, and a fresh poultice of similar strength should be made for the back and be kept on for an equal period of time. An infant will bear this strength well. For an older child a larger proportion of mustard may be used ; but it is seldom wise to employ an application which cannot be borne for at least six hours.

The effect of these measures is seen very quickly. In the milder forms of the disease the hard cough becomes soft and loose, the soreness of the chest subsides, and the pyrexia quickly disappears. Even in the more severe variety a sensible diminution in the distress and the labour of breathing is usually manifested when the skin becomes very red from the action of the irritant.

The diet should consist of milk and broth; and the child should be allowed to drink freely of thin barley-water.

For medicine, a grain of calomel should be given in a little sugar, and be followed after a few hours by a dose of castor-oil or other mild aperient. A febrifuge mixture can then be prescribed, such as citrate of potash or the solution of acetate of ammonia with a few drops of ipecacuanha or antimonial wine. A pleasant form in which these can be given is the following:—

℞. Vini ipecacuanhæ ..... ♏ v.
Liq. ammoniæ acetatis. ..... ♏ x.
Glycerini. ..... ♏ xv.
Aquam floræ aurantii. ..... ad ʒ j.
M. Ft. haustus.
Sig. To be taken every four hours.

The above is suitable to an infant. For older children the proportions may be increased, or the draught can be given more frequently.

Unless the bronchitis be severe, the bronchial derangement quickly yields to this treatment and the patient is soon convalescent. If the cough continue after it has become loose, and the child's appetite has returned, a few drops of paregoric and tincture of squill added to the mixture will soon effect its removal. Stimulating expectorants are as useful at the later stage of the catarrh, after the cough has become loose and easy, as they are injurious at an earlier period when it is hard and painful.

In capillary bronchitis the child should wear a flannel night-dress, and the temperature of his room should be kept at 70° or 75°. It is also advisable to moisten the air round his cot by vapour from one of the many varieties of bronchitis kettle, or by Dr. R. J. Lee's "steam-draught inhaler." The poulticing of the chest should be carried out energetically; and when the skin can no longer bear the irritant, the chest should be wrapped in cotton wool.

In this severe form of the disease stimulant expectorants are not only useless as remedial agents, but tend directly to increase the congestion and irritation of the mucous membrane. However feeble the child may be, if the cough is hard and the chest tight, ammonia, squill, tolu, and other remedies which exercise a stimulating effect upon the mucous membrane should be avoided. In such cases the distress of the patient is most certainly relieved and his strength improved by medicines, such as salines with ipecacuanha, which promote free secretion from the tubes. If necessary, this treatment can be supplemented by general stimulants, such as alcohol; and in weakly children it is very necessary to counteract any depressing effect of the remedies upon the system by the free administration of brandy-and-egg. In young children whose strength is good it is often useful at the earlier periods of the disease, when the cough is hard and much soreness is complained of in the chest, to give two or three grains of powdered ipecacuanha in a teaspoonful of mucilage twice a day on an empty stomach. The emetic in these small doses excites vomiting with

very little effort, and causes the expulsion of much mucus from the stomach and lungs. After a few doses of this remedy the character of the cough often undergoes a marked change for the better, and the distress of the patient is greatly relieved. So long, therefore, as there is fever with hard cough, tightness behind the sternum, and lividity of the face, we should confine ourselves to ipecacuanha or antimonial wines (℥ v.–x.), citrate of potash (gr. iij.–v.), solution of acetate of ammonia (℥ x.–xxx.), spirits of nitrous ether (℥ x.–xxx.), and similar remedies.

Although the medicines recommended are all such as aid the free secretion of mucus, they are not given with any object of producing depression. On the contrary, we should watch the patient carefully for signs of prostration, and hold ourselves in readiness to correct any undue sedative influence by alcoholic stimulation. We must not, however, be in a hurry to give wine or brandy. A small feeble pulse will be often found to become fuller and stronger as secretion from the inflamed mucous membrane becomes more copious and the congestion of the pulmonary vessels declines.

In children of four or five years old and upwards a grain of calomel with two or three grains of jalapine at the beginning of the treatment is always useful. It is unnecessary to keep up a free action of the bowels, for these cases appear to be little benefited by purging; but a thorough unloading of the liver is very useful as a preliminary measure. Even in infants half a grain of calomel followed by a teaspoonful of castor oil often seems to render the after-course of the disease milder and more tractable.

The above method of treatment will usually be found successful in cases of primary capillary bronchitis, when the patient is seen before collapse of the lung has occurred or the disease has passed into a chronic broncho-pneumonia. It is important that we should not allow ourselves to be tempted, by the apparent prostration of the patient, to prescribe ammonia and other stimulating drugs. When the pulmonary vessels are congested and the obstruction to the circulation is extreme, the heart labours, the face is livid, and the pulse is small and feeble; but these symptoms constitute no real indication for ammonia. We shall best relieve the impediment to the pulmonary circulation and promote the aëration of the blood by measures which relieve the congestion by producing free secretion from the overloaded vessels.

Opium should not be given unless the restlessness is great, and even then the remedy is hardly a judicious one; for anything which dulls the sensibility of the bronchial mucous membrane hinders the expulsion of the phlegm and favours collapse of the air-cells. Aconite, veratrum viride, and other powerful cardiac sedatives are only admissible during the first forty-eight hours, and must on no account be given to young infants.

In capillary bronchitis, as in the case of the milder forms of the disease, when the cough is quite loose and secretion free, small doses of morphia or paregoric, with ammonia and infusion of senega or serpentaria, will soon bring the disease to a favourable ending. Profuseness of secretion at a late stage of the illness is an indication for small doses of iron. In infants, perhaps a few drops of sal volatile make the better remedy; but after this age the administration of four or five grains of the citrate of iron with a drop or two of liq. morphiæ, and a few grains of the bi-carbonate of soda, is attended with great benefit. So, also, a grain of quinine with a couple of drops of dilute nitric acid, and the same quantity of laudanum or solution of morphia, given several times in the day, will soon brace up the relaxed mucous membrane and diminish the frequency of the cough. These remedies must of course be confined to the later stage of

the disease, after the pyrexia has subsided, and when secretion is copious from want of tone.

In all forms of bronchial catarrh in weakly infants or rickety children the patient should be carefully watched for signs of collapse of the lung. If we notice the child suddenly to become drowsy, and find that this change is associated with lividity of the face, very rapid and shallow breathing, and a fall of temperature to a sub-normal level, energetic measures should be taken to promote re-expansion of the collapsed lobules (see Atelectasis).

A secondary bronchitis, such as that which is apt to occur in the subjects of rickets, must be treated upon the same principles; but in these cases alcoholic stimulation is usually required early.

In *chronic* bronchitis the child should, if possible, be sent away for the winter to a mild climate where he can pass his time out of doors without risk of chill. A sea voyage is very beneficial to these patients. As this form of the disease usually occurs in scrofulous children, the general treatment which has been recommended for that constitutional condition should be put in force.

The intercurrent acute attacks must be treated upon the principles which have been already indicated. Still, after the disease has returned to its ordinary chronic course expectoration is often very difficult, and the breathing oppressed; and with the stethoscope we hear much large bubbling at the bases and for a considerable distance over both lungs. In these cases the ordinary expectorants seem to exercise little influence unless combined with tonics. Quinine or quinine and iron, given with tincture of squill, ipecacuanha, and a drop or two of solution of morphia will often be found successful in relieving the symptoms. Cod-liver oil is also of great value not only in improving the general health, but also in checking secretion and promoting the expulsion of phlegm. Tar taken internally has sometimes a marked influence in checking secretion and giving a more healthy tone to the mucous membrane. A drop of liquid tar may be given on a small lump of sugar two or three times in the day; or for children who can take pills the remedy may be given as follows:

℞. Picis liquidæ ..... gr. ij.
Lycopodii ..... gr. j.
Pulv. glycyrrhizæ ..... gr. ss.
Glycerini ..... q. s.
M. Ft. pilula.
Sig. To be taken three or four times a day.

Inhalations are of service in these cases. The vapour of hot water impregnated with creasote, carbolic acid, or tincture of iodine (of either twenty drops to the pint), or of oil of turpentine (one drachm to the pint), can be inhaled for half an hour several times in the day from Dr. R. J. Lee's "steam-draught inhaler."

The hypodermic injection of pilocarpine is often useful. In the case of the boy referred to above, one-fifteenth of a grain of the hydrochlorate of pilocarpine was injected under the skin twice a day. The remedy caused copious sweating, and produced vomiting by which much mucus was expelled from the lungs. The effect of the drug was decided in diminishing for a time the amount of secretion, although it produced little permanent impression upon the disease.

Counter-irritation of the chest with the tincture or liniment of iodine

is often attended with great benefit; and warm woollen clothing worn next to the skin is essential to improvement. Still, in spite of all our efforts, although the child may appear better for the time, a cure is hardly possible in pronounced cases so long as the patient remains in a cold, damp climate. His only hope of throwing off the disease lies in his removal to a suitable air where he is not exposed to the constant risk of chill, and where no untoward conditions are present to interfere with his favourable progress.

CHAPTER X.

EMPHYSEMA.

Pulmonary emphysema is not uncommon in the child. As an acute lesion it is of frequent occurrence, arising in the course of various forms of pulmonary disease. It is then of little consequence, is accompanied by few symptoms, and usually subsides when the primary complaint has disappeared. As a chronic affection emphysema is met with much more rarely in early life ; but a child so afflicted presents all the symptoms common to the adult sufferer, and may have his health permanently injured and his life considerably shortened by this condition of his lung. The lesion may be seen both in the vesicular and interlobular forms, and has been found at all periods of childhood, even in new born infants.

Causation.—Pulmonary emphysema is always a secondary disease, and appears to be mainly due to forcible distention of the air-cells in the act of coughing. It is found in various forms of lung disease, especially in whooping-cough, bronchitis, and catarrhal pneumonia. Of these the violent cough of pertussis and catarrhal pneumonia produce the lesion with the greatest certainty, and emphysema is a constant complication of every severe attack of these two diseases.

It seems probable that over-distention of the air-cells in these cases may be effected both by inspiratory and expiratory mechanism. In whooping-cough and bronchitis many air-vesicles are rendered impervious by patches of disseminated collapse. In lobular pneumonia considerable portions of lung may be closed to the entrance of air. In all these cases the diminution in the respiratory surface necessitates increased energy of inspiratory movement, so that the air-vesicles which remain pervious are over-distended. Again, a serious strain upon the air-cells is induced by strong expiratory efforts made when the glottis is closed, as when the patient is preparing to cough. Such efforts drive the air into the parts of the lungs which are the least supported, and dilate to excess the alveoli in these situations. In pertussis, especially, where the child strives with all his might to repress the cough, the strain is often very severe and long continued. Marked emphysema of the apices and anterior margins of the lungs may be excited by this means, and if the over-stretched walls of the air-cells have been injured by the distention, the lesion may be a permanent one. Usually the alveoli return to their normal size when their walls cease to be distended. It is only when the dilatation has been carried to an extreme degree, so as to impair the elasticity of the alveolar parietes, that the distention continues as a permanent condition.

Besides the diseases which have been mentioned, any complaint of which cough is a symptom may give rise to emphysema ; as phthisis, where the alveoli at the bases often become distended ; pleurisy, where the air-vesicles of the sound lung are often temporarily over-dilated ; also stridulous laryngitis, if prolonged, and membranous croup. In advanced

rickets, where there is marked grooving of the sides of the chest, the sternum is forced forwards at each inspiration, and the anterior borders of the lungs become over-distended with air. The mechanism of this form of emphysema is referred to elsewhere (see page 134). The tendency to perpetuation of the vesicular dilatation appears to be influenced by the scrofulous diathesis. It may be that in that constitutional condition the elasticity of the alveolar walls is more readily impaired ; or it may be that the susceptibility to catarrh of the pulmonary membrane and other mucous tracts, inseparable from the strumous habit, induces a more frequent and persistent strain upon the air-cells. In any case the subjects of chronic emphysema in early life are usually found to be well-marked examples of the scrofulous diathesis.

Pulmonary emphysema may be found at all ages. It is not uncommon even in infants recently born. Thus, out of thirty-seven cases collected by Hervieux, nineteen occurred in infants under twenty days old, and of these one had lived no longer than two days. So, in a child who died of tetanus under my care in the East London Children's Hospital, aged fifty hours, the lungs after death were found to be emphysematous along the anterior margins, and also in spots over the surface. There were some solid patches of unexpanded tissue in each lower lobe.

Morbid Anatomy.—Pulmonary emphysema may be of the interlobular or vesicular variety.

In *interlobular emphysema* the air occupies the connective tissue lying between the lobules and under the pleura. When infiltrated into the tissue between the lobules, air collects in small bubbles like little beads. When in the sub-pleural tissue, it forms blebs of varying size—sometimes isolated, when they may reach the size of a small nut ; sometimes arranged in lines, when they are rarely larger than an ear of wheat. Their shape is elongated or spherical. When thus extravasated into the pulmonary connective tissue, the air has been known to make its way into the anterior or posterior mediastinum and thence into the sub-cutaneous tissue of the face and neck. Thus, in a case published in 1834 by Dr. Bird Herapath—a child eighteen months old who had died of bronchitis secondary to whooping-cough—air was found to have escaped from one of the lobules seated at the root of the right lung into the anterior mediastinum. Starting from this point the air, without entering the pleura, had escaped along the sub-pleural connective tissue and formed numerous emphysematous swellings on the lung. It had distended the areolar tissue of the anterior mediastinum, and passing upwards had infiltrated into the cellular tissue of the neck, beneath the deeper cervical fascia and the subcutaneous tissue of the neck and chest. A similar case, in a child four months old, has been recorded by Dr. Pepper, of Philadelphia. In rare cases pneumothorax has been produced by rupture of the pleura and escape of air into the pleural cavity.

Interlobular emphysema is almost always produced by rupture of an air-vesicle during a violent fit of coughing. It may, however, be the result of injury from without.

In *vesicular emphysema* the apices and anterior borders of the lungs are the parts commonly affected. These portions are dull white in colour, dry, and bloodless. They convey to the finger a peculiar soft sensation, which Hervieux has compared to that noticed when pressing a piece of wadding covered with satin. Close inspection in a good light shows a multitude of little, bright, transparent points the size of a pin's head. Sometimes rather larger projections are visible, and these are often angular.

When the chest is opened in these cases the lungs remain distended, and their anterior borders are usually in contact so as to hide the greater portion of the cardiac surface.

Symptoms.—Interlobular emphysema, unless the air spread through the mediastinum to the sub-cutaneous tissue of the neck and chest, gives rise to no symptoms. Its existence is only discovered on post-mortem examination of the body.

Even in the *vesicular* variety the limited amount of emphysema which is found when the disease is acute, as in cases of catarrhal pneumonia, or acute bronchitis with collapse, gives little evidence of its presence. Our knowledge of the morbid anatomy of such cases enables us to infer its existence, but the occurrence of abnormal dilatation of the air-cells gives rise to no additional symptoms, and produces no characteristic modification of the physical signs.

It is in the *chronic* form of the disease that we are able positively to determine the existence of over-distention of the pulmonary alveoli. In a pronounced case of emphysema the symptoms and physical signs are those familiar to us as a consequence of a similar condition in the adult. Such children, as has been already remarked, almost always present the characteristic features of the strumous constitution. The patient is usually short for his age and of sturdy build. His head is rather large, his neck short with prominent jugular veins, and his face pallid with a blueish tint round the mouth and eyes. The chest is flattened laterally at the base, and the lower part of the sternum is somewhat projecting. Consequently, its antero-posterior diameter is increased. The intercostal spaces are obliterated, and in rare cases slight bulging may be noticed above the clavicles. Sometimes the back is a little rounded, but I have never noticed the stoop of the shoulders, which is such a marked feature in the adult, unless the emphysema were combined with a persistent chronic bronchitis. The heart is pushed down so as to be felt beating in the epigastrium, and the liver and spleen are often appreciably displaced.

When a deep breath is taken the chest-walls rise and the shoulders are elevated; but there is little expansion of the upper part of the thorax, and the constriction at the base is exaggerated. On percussion, general hyperresonance is found in the front of the chest and the cardiac area of dulness is lessened. With the stethoscope we find that the breath sounds are loud and wheezing above, weak although very harsh below, and more or less sonoro-sibilant rhonchus is heard at various parts of the chest.

The symptoms vary according to the condition of the pulmonary mucous membrane; for, with such a state of lung, the child is excessively susceptible to fresh catarrh. At his best his breathing is habitually short and oppressed, but he coughs little and his appetite and spirits may be good. It is when a new catarrh comes on that his troubles begin. When this accident happens, the breathing at once becomes difficult and wheezing, and he is subject to attacks of dyspnœa which appear sometimes to be of the nature of asthmatic seizures. There is, however, another cause for these attacks. In scrofulous subjects the bronchial glands of the mediastina and lungs are apt to enlarge as a result of pulmonary irritation; and these by their pressure upon the vagus, or directly upon the air-tubes, may produce serious impediment to the entrance of air. The child's cough is husky and often occurs in paroxysms. He cannot lie down in his bed, and is much troubled at night by cough and dyspnœa. If these symptoms continue, the patient passes into the condition which is described elsewhere under the name of chronic bronchitis, and a case is there narrated in which

chronic pulmonary catarrh was associated with permanent emphysema of the lungs.

In cases where the attacks of catarrh are only occasional and pass completely away, the habitual state of the child is not unsatisfactory; but he is liable at any moment to be laid by under the influence of a fresh chill.

I may cite as a good example of chronic pulmonary emphysema the case of a little boy, aged three years, stout and thick-set, with large ends to his bones. The child only finished cutting his teeth at the age of two years and nine months, and was no doubt slightly rickety. He was said to have been wheezing off and on for eighteen months. Ten months previously he had been ill for a month with a severe attack of bronchitis, and had since that time been a constant sufferer from wheezing and shortness of breath. In this boy the upper part of the chest was full and rounded, and there was some considerable constriction at the base. The heart's apex could be seen and felt in the epigastrium and between that point and the left nipple. The percussion note was drum-like all over the front of the chest, and much whistling and snoring rhonchus was heard over both lungs. The heart-sounds were healthy.

Another little boy, aged two years and nine months, was said to have had a cough all his life, although it was better in the summer than the winter, and might even cease altogether for about six weeks in the warmest weather. The child was twelve months old before he cut his first tooth, and did not walk until the end of his second year. The ends of his long bones were full; but his limbs were straight, and he was not a marked specimen of rickets. The breathing was not much oppressed; the cough was hoarse, and the voice husky. He was not subject to attacks of distressing dyspnœa, and was said never to have lost his voice. This little lad's chest was perceptibly retracted in the infra-mammary regions, and the lower part of the breast-bone projected. The spine was straight and the back rather flattened between the scapulæ. At each breath there was a slight sinking of the epigastrium. On percussion there was general hyper-resonance of the front of the chest, especially along the sternum. Some sibilant and large bubbling rhonchi were heard at each base behind.

In such cases as the above the emphysema is no doubt kept up by the repeated attacks of pulmonary catarrh. It is possible that if by residence in a suitable climate such intercurrent attacks could be prevented, the emphysema might subside and the lungs return to a normal condition; but upon this point I cannot speak with certainty.

It is not often in the child that serious secondary effects, such as passive congestion of the liver and kidneys, dilated hypertrophy of the right heart, œdema, etc., are noticed, although in some cases I have thought that the right ventricle was larger than natural. The danger of the disease consists principally in the repeated attacks of bronchitis from which these patients almost invariably suffer, and in the tendency of such attacks, if not immediately fatal, to run a chronic course. Usually, sooner or later, the life of the patient is brought prematurely to a close by this means.

Diagnosis.—In the acute form of emphysema there are no symptoms sufficiently distinctive to indicate with certainty the presence of the lesion. This, however, is of little consequence, for no special treatment is required. In the large majority of cases the dilated air-cells return to their natural size when the cause or causes which have induced the distention are no longer in operation.

In chronic emphysema the chest distended in the upper regions and hyper-resonant on percussion, the diminished area of cardiac dulness, the

pulsation at the epigastrium, the displacement of the liver and spleen (if present), and the wheezing breath-sounds are sufficiently characteristic of the lesion.

Prognosis.—In chronic emphysema the prognosis is not favourable; for although the disease in itself is little hurtful to life, the accompanying tendency to catarrh is a serious danger to the patient. If the child be found to suffer from repeated attacks of bronchitis, and in the intervals to be wheezy and scant of breath, we can never feel satisfied with his condition or at ease with regard to his future prospects.

In cases of interlobular emphysema, where this has led to infiltration of air into the subcutaneous tissue of the neck and chest, the prognosis depends chiefly upon the disease, in the course of which the complication has arisen. The presence of subcutaneous emphysema is probably of little consequence, for the infiltrated air usually becomes absorbed very quickly.

Treatment.—In cases where acute emphysema is suspected no special treatment is required. So, also, in interlobular emphysema, where this has made itself evident by the passage of air into the subcutaneous tissue, no special measures are needed to hasten the absorption of the infiltrated gases. They may safely be left to disperse at leisure.

In chronic emphysema any existing bronchitis should receive immediate attention, and the treatment must be conducted upon the principles described elsewhere (see Bronchitis). In the attacks of acute dyspnœa emetics are very useful; and ipecacuanha wine or the turpeth mineral, each of which produces free secretion of mucus, are to be preferred for this purpose. A teaspoonful of the former, or three or four grains of the latter in syrup, may be given every fifteen minutes until an effect is produced. If the attacks continue, the feet should be soaked in a hot mustard foot-bath, mustard poultices should be applied to the chest and back, and a draught containing ether and the tincture of lobelia may be given every hour. Children bear lobelia well. Ten drops of the ethereal tincture may be given to a child of two years old every hour or half hour without any danger. In very severe cases the fumes of Himrod's powder may be inhaled. When the bronchitis has subsided iron should be given. A good form for its administration is the tartarate of iron with iodide of potassium. The combination makes a perfectly clear mixture with distilled water. It may be sweetened with glycerine.

The food of the child should be nutritious and digestible. The diet should be regulated upon the principles already laid down for the treatment of scrofula. In fact, emphysematous subjects, who, as has been said, are very often of the strumous habit, require in all points such general treatment as is recommended elsewhere for children suffering from the scrofulous cachexia. The most important point in the treatment of pulmonary emphysema lies in the adoption of means for the prevention of catarrh. With this object we should urge upon the child's parents the necessity of removing the patient to an equable climate where he can live an out-door life without danger of chill. It is only by keeping the lungs free from catarrh that we can hope to promote a return of the air-cells to their normal condition.

CHAPTER XI.

GANGRENE OF THE LUNG.

Gangrene of the lung is not a common disease of childhood. If the number of recorded cases be a fair measure of the relative frequency of the lesion, this form of illness would appear to be much more often met with in adult life than at an earlier age. A contrary opinion has, however, prevailed, chiefly on the authority of E. Boudet, who in the space of five months met with five cases of pulmonary gangrene in the child. This experience is, however, too exceptional to furnish a satisfactory base for statistical calculation.

The extent of tissue which undergoes the gangrenous change is variable. The lesion may occupy only a limited patch in one of the lobes (circumscribed gangrene), or may involve the whole of the lobe, or even of the lung (diffused gangrene).

Causation.—Pulmonary gangrene may be the consequence of a general condition affecting the whole body, or may arise in constitutionally healthy subjects from some local cause which interferes with the circulation of the blood in the lung.

In the first case, a disposition to spontaneous mortification of tissue is manifested as a result of the eruptive fevers, especially measles, and other depressing diseases which cause great prostration of nervous power and lower the nutrition of the whole body. The gangrene is usually of the diffused variety, and the lung is often not the only organ which suffers from the morbid tendency. There may be also gangrene of the gums, the cheeks, the pharynx, and in female children of the vagina, and these commonly precede in point of time any manifestation of a similar affection of the pulmonary organs.

Of the local causes which interfere with the circulation through the lungs the most common in children is probably the presence of a foreign body in the air-passages. The irritation of the intruding substance sets up a form of pneumonia which may run rapidly into gangrene. Of the few examples of the lesion which have come under my own care one was a case of this kind. It is narrated shortly in another chapter (see page 529). In cases where lobar pneumonia ends in mortification of the lung the gangrenous lesion cannot be looked upon as a natural consequence of the pulmonary inflammation. Indeed, the inflammatory disease is often not a true croupous pneumonia, but an acute hepatisation of the lung resulting from the presence in the organ of some local irritant. Thus, a variety of pulmonary inflammation with which gangrene is often associated is that due to emboli swept into the pulmonary circulation from an ante-mortem clot formed in the right side of the heart. The irritation of these emboli causes complete stasis in neighbouring vessels, and sets up putrefaction and gangrene in the lung tissue around. Bouillard states that this accident may happen in cases of true croupous pneumonia and determine the

gangrenous change; indeed, according to this observer, a peculiar tendency to the formation of such coagula is a common feature of the pneumonic disease. But even if this be the case, the mortification of tissue is induced by something superadded to the original lesion, and is not to be regarded as an ordinary incident of the croupous form of pulmonary inflammation.

The retention of decomposing secretions in dilated bronchi and cavities in the lung is another local cause of the gangrenous lesion in the child. It may arise in the course of phthisis, or at the end of an attack of acute catarrhal pneumonia. So, also, extensive hemorrhage into the lung, if it undergo putrefaction, is said to be a cause of gangrenous changes in the surrounding tissue. No doubt in all these cases a debilitated or cachectic state of the system favours the occurrence of pulmonary gangrene; but mortification of the lung may arise in children of sound constitution who are well nourished, and whose sanitary surroundings have been to all appearance satisfactory.

Morbid Anatomy.—The commonest form in which gangrene of the lung is met with in the child is that of a patch of mortification situated in the centre of a lobe and surrounded by gray hepatised tissue. The gangrenous patch consists of a pulpy detritus, yellowish-grey, dark green, or slate grey in colour, and intolerably offensive in its smell. It gradually breaks down and leaves a cavity with disintegrated gangrenous shreds adhering to its walls. This is the circumscribed variety in which the number of sphacelated masses may be one or more. In some cases the diseased area is very small, and the lesion consists merely in greenish streaks of gangrenous odour and semi-liquid consistence in the centre of a broncho-pneumonic nodule. In other instances we find patches of catarrhal pneumonia enclosing small gangrenous abscesses of variable number, communicating here and there with a bronchus.

In the diffused variety the gangrenous change involves more or less of the whole lobe. Thus, in a case recorded by Dr. Hayes, after the death of the patient—a boy of seven years of age—the lower half of the inferior lobe of the right lung was in a state of grey hepatisation. Its tissue was very friable, and drops of pus exuded from it on pressure. The remainder of the lung was of a dark purplish colour. Its tissue broke down on the slightest pressure and gave forth an unbearable stench. The centre of the middle lobe was occupied by an irregular cavity, about the size of a large walnut, filled with putrid matter.

In the circumscribed form the seat of the lesion is usually the lower lobe or the periphery of the organ. In the latter case the pleura may be inflamed or may participate in the sphacelating process. In my own case, related elsewhere, not only was the whole of the left lung in a state of gangrene, but adhesions had formed between the adjacent layers of the pleura at the posterior surface. Moreover, the chest-wall had been perforated in the eighth intercostal space, and a communication had formed between the disintegrated lung and an extensive abscess which lay outside the wall of the chest.

If adhesion of the pleura does not occur, pneumothorax may arise from rupture of the lung into the pleural cavity.

In many cases the bronchial glands are enlarged and cheesy. In two of Rilliet and Barthez' cases they were gangrenous.

Symptoms.—The symptoms of the disease are often very indefinite. They may consist only of general drooping, disinclination to exertion, pallor and wasting, with slight cough and obscure pains about the chest.

The physical signs may be also indefinite, consisting merely of slight dulness at a certain part of the chest, with feebleness of breath-sound. After a time the child dies without any more characteristic symptoms having been developed, and the autopsy discovers a patch of gangrene in the lung. In almost all the cases observed by Rilliet and Barthez, these experienced physicians failed to detect the nature of the illness during the life of the patient.

In more pronounced cases the disease may begin gradually or suddenly. In the first case the child is noticed to be failing. His appetite is poor, he looks pale, and his flesh feels flabby. Soon he complains of pains in the chest, coughs occasionally, and sits by the fire if the weather is chilly, refusing to play, and objecting to any exertion. He is thirsty and sleeps restlessly at night, being often disturbed in his sleep by cough.

The sudden onset may be announced by headache and sickness, a feeling of chilliness, or even a rigor. The child is feverish, with a dry skin; is very restless and anxious, and the pulse is quickened. Perhaps there may be pain in the side and a dry cough.

When the symptoms are fully developed the patient is pale and weakly looking, with a haggard expression of countenance, and dull, sunken eyes. The tongue is foul, and appetite is almost completely lost. The bowels are seldom relaxed; sometimes there is marked constipation. There is often great restlessness, so that the child is in constant uneasy movement in his bed. The pulse is feeble and frequent, 130–150; the respirations 30–40. The temperature is high, and may reach 103° or 104° in the evening, usually falling in the morning to 100° or 101°. The cough is frequent and loose. It is often excited by movement and may be accompanied by pains in the back or side. Usually there is expectoration even in young children, for the sputum is too offensive to be swallowed. It exhales a sickening odour, and is frothy and reddish-brown in colour. On standing it deposits a reddish-brown, shreddy sediment, containing greyish putrid granules, in which Leyden and Jaffe have discovered bacteria and a special fungus—the leptothrix pulmonaris. In quantity the expectoration varies from time to time, being sometimes copious, sometimes scanty and more tenacious. Occasionally the fetid odour ceases to be noticed, but it usually quickly returns. A similar odour is perceived in the breath of the patient, especially during cough. As in the case of the expectoration, its offensiveness occasionally ceases for a time. The cough may be so harassing and frequent as almost entirely to prevent sleep; and the consequent exhaustion, combined with the unwillingness of the child to take adequate nourishment, adds greatly to his weakness.

In most published cases great variation has been noticed in the intensity of the symptoms. Sometimes the pulse is excessively frequent and feeble, the eyes sunken and lustreless, the restlessness extreme, the cough distressing, and the face earthy or lead-coloured. The breathing also may be laboured and difficult. Thus, in a case recorded by Dr. Sturges there were attacks of violent dyspnœa in which the face looked pinched and blue, the expression was terrified, the body was covered with a clammy sweat, and no pulse could be felt at the wrist. At other times the symptoms are less distressing, the face looks brighter, the cough is quieter, the pulse fuller, and the manner more composed. The patient, however, from day to day grows evidently weaker, and in the large majority of cases sinks after a further period of suffering. Sometimes death is preceded by one or more attacks of hæmoptysis. In a case reported by

Dr. Hayes, the child, on the afternoon before his death, after a fit of coughing, spat up half a pint of red, frothy blood; and the hæmoptysis was repeated in the evening shortly before he died.

In some cases gangrene of the gums or cheek has been observed; and if the signs from the lungs are not marked, the fetor of breath may be attributed to the presence of these lesions.

The duration of the illness in cases which terminate in death is never very prolonged. Dr. L. Atkins, who has collected thirty-one cases of the affection, states that it varies between two days and twenty. The child usually dies from asthenia. The complexion grows more and more livid, the pulse weaker and more rapid, and death may be preceded by a gush of blood from the mouth or by rupture of the lung and the formation of pneumo-thorax.

In the rare cases in which recovery has been recorded, the fetor of the breath disappeared at the end of a fortnight or three weeks; but convalescence was very slow.

The *physical signs* in cases of pulmonary gangrene are not distinctive of the lesion. At first the signs are usually those of bronchitis. Percussion of the chest discovers no dulness, and with the stethoscope we find merely large bubbling rhonchus pervading the lung on both sides. After a few days a limited area of dulness is detected at some part of the chest—usually the posterior base; the breath-sound becomes bronchial, and the râles are drier and more crepitating in character. The dulness usually extends its area and may pass to the front of the chest. If eventually a cavity form, it may give no evidence of its presence unless its situation be near the periphery. In that case the breathing may become bronchial, blowing, or cavernous, and the rhonchus larger and more distinctly gurgling. In the case of a large cavity amphoric respiration with metallic tinkle may be discovered at some point in the dull area.

In a case which was under the care of my colleague Dr. Donkin, in the East London Children's Hospital—a microcephalic idiot, between two and three years old, who was admitted for rigidity and paralysis of joints, with partial loss of consciousness—the breath a few days before death was noticed to have an insupportably offensive odour. The child began to cough slightly, and the pulse and respiration were greatly hurried. On examination of the chest dulness was discovered at the left base, passing round from the back to the front, being most intense beneath the left axilla. Much large bubbling rhonchus was heard all over both sides, especially the left. The child grew rapidly worse, the face became much pinched, and petechiæ appeared upon the abdomen. The temperature, which had been always high, rose to 108° shortly before death. An autopsy revealed two small embolic infarctions in the left lung. The lower lobe was completely solidified, and contained a cavity the size of a hen's egg. This excavation was partially lined with a membrane, and held much stinking fluid and detritus. The right lung was merely congested with patches of collapse.

In this case the high temperature noted before death was probably due more to the condition of the brain than to that of the lung. The cavity seems to have been the consequence of breaking down of an inflammatory consolidation set up by a metastatic infarction, the gangrenous nature of the process being determined by the low nervous power of the patient.

Diagnosis.—On account of the uncertain character of the symptoms and physical signs which present no definite features by which the disease

can be recognised, we are forced to rely solely upon a gangrenous odour from the breath and expectoration for evidence of the nature of the lesion. Without this symptom there is really nothing in the condition of the child to suggest that the inflammatory process has gone on to mortification of tissue ; for a cachectic appearance, great feebleness, a haggard look, constant restlessness, and varying intensity of symptoms are common to many forms of illness. If the characteristic fetor of breath be present alone, it may be the consequence of other conditions. In gangrenous stomatitis and gangrene of the pharynx the same phenomenon may be observed ; and in many cases of cirrhosis of the lung, when secretion is retained and becomes decomposed in the dilated tubes, the odour of the breath may be exceedingly offensive. In the latter disease, although the breath and expectoration may be very offensive without obvious gangrene being present, shreds of sphacelated tissue are, no doubt, present in the matters discharged from the lung. If gangrene of the lung coincide with the same condition of the mouth the unpleasant odour is usually attributed to the lesion which is within reach of the eye, and the pulmonary gangrene may not improbably pass unrecognised. The appearance of offensive expectoration, however, at once directs attention to the lung, and if hæmoptysis occur, the blood giving out the same unbearable odour, doubt is no longer possible.

In infants and the youngest children expectoration is sometimes absent, but a gangrenous odour from the breath is seldom wanting. Fetor of the breath in such cases is the more characteristic, as fibroid induration of the lung is very rare below the age of six years, and gangrene of the mouth is not often met with during the first two years of life.

Prognosis.—Recovery is so exceptional a termination of the disease that in any particular case the patient's chance of escape is very small. Variations in the severity of the symptoms are a common feature of the illness, and we must not allow our hopes to rise too high merely because we find the child looking brighter and more composed, and notice that the fetid odour from the breath is no longer to be perceived. Such a favourable change is too often only a temporary improvement, to be followed, perhaps in a few hours, by a return of all the worst symptoms. If, however, the characteristic odour is not reproduced, and we find that the pulse becomes fuller and stronger, and the cough less distressing ; that the tongue begins to clean and the appetite to return, we may venture to hope that the favourable change may be maintained. According to Kohts, when the gangrene results from the presence of a foreign body in the lung the prospect is less desperate than in other cases, but this can only be if the irritating substance is expelled.

Treatment.—In the treatment of this distressing disease we must do our best to support the strength of the child and make energetic employment of disinfecting and stimulating inhalations.

The chamber should, if possible, be large, and must be kept thoroughly ventilated. It should be continually disinfected by spraying with carbolic acid or Condy's fluid, and pans of either disinfectant should stand about the room.

The child should be made frequently to inhale vapours or sprays impregnated with oil of turpentine (℥ xx.–xxx.) to the pint of boiling water, or with creasote or carbolic acid (℥ xx.–xxx. to the pint). Glycerine of carbolic acid may be also given internally, in one or two drop doses, according to the age of the child ; and Traube recommends the salicylate of soda or the acetate of lead. The sulpho-carbolates are said to be of service in

removing fetor, if given freely. The sulpho-carbolate of soda may be given to a child of four years old in doses of four grains every six hours. Bucquoy recommends the tincture of eucalyptus for the same purpose, and states that the remedy not only reduces the offensive odour of the breath and sputum, but relieves the violence of the cough. A child of four years old may take five or six drops three times a day.

Quinine and the mineral acids are preferred by some; and it is important that the former, if employed, should be given in full doses. For each dose the quantity may be calculated at one grain and a half for each year of the child's age; and this may be given three or four times in the twenty-four hours. Ammonia and bark have also their advocates. The bowels must be kept regular. If they are confined a dose of castor-oil will usually relieve the constipation.

Alcoholic stimulants are always required. For an infant white wine whey, for an older child the brandy-and-egg mixture should be given at frequent intervals.

With regard to diet: an infant should be restricted to milk diluted with barley-water and guarded with a few drops of the saccharated solution of lime (twenty drops to the teacupful). An older child can take milk, strong beef-tea, pounded meat, eggs, etc., in quantities regulated according to his age and powers of digestion. In this, as in all other cases where the debility is great, we must remember that the digestion shares in the general weakness; and must be careful not to overload the stomach or fill the blood with unassimilable nutriment in our anxiety to sustain the strength and obviate death from asthenia.

CHAPTER XII.

PULMONARY PHTHISIS.

Pulmonary phthisis is a common disease in the child. The term signifies ulceration of the pulmonary tissue. The affection is therefore perfectly distinct from acute tuberculosis. The latter is a *general* disease in which the lungs, if they are involved at all, are affected in common with most other organs of the body, and if they undergo disintegration, break down as a consequence of inflammatory changes due only indirectly to the presence of the grey granulation. Pulmonary phthisis, even when the consequence of a general dyscrasia, is especially a *lung* disease, which if it run its course unchecked passes on necessarily to softening and excavation.

Phthisis may be acute or chronic. The acute form is not uncommon in young subjects, and consists in rapid hepatisation and caseous infiltration of the lungs, with equally rapid softening and disintegration. This form of the disease is to be distinguished from acute pulmonary tuberculosis, although it may be combined with it.

Chronic phthisis is seen in two principal forms, viz., chronic tubercular phthisis and catarrhal or pneumonic phthisis. These varieties differ markedly in their mode of origin, their course, and often in their termination, and are, no doubt, the consequence of very distinct pathological conditions.

Causation.—Most cases of pulmonary phthisis are dependent upon a general predisposition, which may be hereditary or acquired. The child may be born into a consumptive family and thus inherit a constitutional delicacy which renders him especially sensitive to morbific influences. On the other hand, although without any family tendency to this form of illness, the patient may yet, through the agency of special disease, aided perhaps by insanitary surroundings, acquire a pulmonary weakness which sooner or later, under suitable conditions, developes phthisical changes in the lung.

The inherited disease may consist of either form of phthisis; and either variety may be acquired by a child in whose family no tendency to consumption can be discovered. Even chronic tubercular phthisis, although in the majority of cases no doubt the consequence of an inherited predisposition, may be excited by infective agency through the presence of softening cheesy matter at some part of the body. A special pulmonary delicacy is often the consequence of whooping-cough and measles. These diseases are very liable to be complicated by catarrhal pneumonia, and it often happens that after convalescence the absorption of the consolidating material is incomplete. Consequently a caseous lump is left at some part of the lung, which after remaining inactive for a shorter or longer period begins at length to soften and set up irritation in its neighbourhood. But even if perfect absorption of the consolidating material take place, a certain susceptibility may be left after the subsidence of the inflammation, so that the child becomes attacked again and again by obstinate catarrhs. These

catarrhs in favourable subjects are apt to lead to cellular infiltration of the bronchial walls and gradual invasion of the alveoli. In this way a catarrhal or pneumonic phthisis is eventually developed.

In children of scrofulous tendencies there is very commonly a pulmonary weakness. The child is very subject to catarrhs, and he has also the proneness inseparable from his strumous constitution to rapid proliferation and caseation of cellular elements. In such a subject a catarrhal phthisis is readily set up. So, also, in subjects especially prone to tubercular formation the lung irritation may induce this variety of pathological change. In the present day, owing to the discovery by Koch of the tubercle bacillus, there is a tendency to look upon all forms of phthisis as due to infective agency. According to this view, the various pathological conditions would be all tubercular, as the bacillus appears in most cases to be discoverable either in the sputum or the pulmonary tissue of the part affected. The question, however, is as yet far from settled; and looking at the wide differences in the clinical characters of the several forms of pulmonary phthisis, it seems desirable to consider these diseases from a clinical rather than from an anatomical point of view.

The causes which tend to originate a pulmonary weakness or encourage a natural delicacy of lung are all those which in any way help to lower nutrition and depress the natural vigour of the body. In childhood—a period of life in which nutrition is only maintained at a healthy standard by the continual influx of nutritive material—any interference with the digestive or assimilative processes has an exceptional influence in diminishing resisting power. It is for this reason, probably, that in unwholesome conditions of living slight febrile attacks, such as are incidental to many of the less serious ailments of early life, may start an enfeebling process which ultimately determines phthisical changes. In this way unsuitable food and close rooms, a damp residence, mental depression from unkind treatment, over-exercise of the immature brain, and any other like agency may have an influence in exciting the mischief in the lung.

Certain diseases have an undoubted tendency to be followed by phthisis. On this account measles and whooping-cough are justly dreaded for the injurious influence they are known to exercise upon scrofulous and weakly subjects. These affections not only encourage a special lung weakness, but also by promoting enlargement and caseation of the lymphatic glands, may set up a focus of infection by which, through the medium of the blood-vessels or lymphatics, secondary inflammatory processes of a more or less acute character may be excited in the lung. Scarlatina, too, is sometimes a cause of phthisis, acting by similar means; empyema may induce the pulmonary mischief through absorption of infective material from the pleura; and the disease not uncommonly arises in children who suffer from scrofulous joints and old-standing caries of bone. The influence of catarrhal pneumonia in inducing the disease has been already referred to.

Since the discovery of the bacillus the question of the infectiveness of phthisis from person to person has again assumed considerable prominence. The presence of bacilli has been discovered in the air expired by consumptive patients; and if this microphyte be indeed the agent by which the infection is conveyed, it would seem to follow as a logical conclusion that the disease must be continually communicated by this means. Whether, however, it be that a predisposition of rare intensity is required for the ready reception and development of the bacillus, or that the importance of this organism as an infecting agent has been overestimated,

the fact remains that the disease is practically not communicable by this means.

Morbid Anatomy.—In all cases of pulmonary phthisis the lungs after death are found to be more or less consolidated by a cheesy-looking substance which is in various stages of softening and disorganization. Whether the disease has begun by a chronic process of tuberculisation, or has originated in a catarrhal pneumonia and epithelial accumulation in the alveoli, the degeneration of the morbid material gives rise to caseous solidification of very similar character. Even when the primary pathological change consists in a chronic formation of grey tubercle in the lung tissue, a secondary catarrhal pneumonia is usually set up sooner or later; and the resulting caseous infiltration materially contributes to the enlargement of the area of solidification. Again, when the form of phthisis is originally catarrhal, softening of the cheesy material which infiltrates the lung may be a source of infection. By this means a secondary formation of miliary tubercle is excited, at first in the immediate neighbourhood of the affected region, afterwards more generally over both the lungs. Consequently, in most cases, the pathological changes are not simple, but tend to complicate one another, so that the lung is at the same time the seat of different morbid processes. We often find grey or yellow granulations combined with masses of yellow infiltration of various extent. In these masses the tissue is soft and friable, and on section is found to be dryish, of a straw or grey colour, and streaked or spotted with black pigment. The surface is commonly marked with intersecting lines which indicate the position of the interlobular septa. At the borders of the consolidated region is usually a zone of reddish-grey glutinous infiltration. Often many of these caseous masses are seen scattered over the lung, the pulmonary tissue between them being œdematous or congested, and partially collapsed.

If the phthisis has reached an advanced stage, cavities from breaking down of the consolidating material are usually found. Cavities are not uncommon in the young subject, and are probably met with less frequently in the child than in the adult, only because the disease in early life often proves fatal from a secondary tuberculosis or other exhausting complication before the stage of excavation has been arrived at. When softening begins, it always occurs first in the centre of the caseous mass. The dead shrunken cells and molecular débris lying around them are loosened by the imbibition of watery fluid, and the cheesy material is converted into a soft purulent pulp. The wall of the bronchus, which lies in the centre of the nodule, then becomes perforated, and the cheesy matter is coughed up, leaving a ragged excavation. The softening may attack the cheesy masses generally through the lung, as happens in the more acute form of the disease; or may begin in those situated in the upper part of the lung, and thus pass gradually from apex to base. The expectorated matter in these cases contains particles of elastic tissue and shrunken cells, and often under the microscope exhibits bacilli in large quantities.

In cases where the disease consists principally of the grey and yellow miliary nodules, these bodies are seen grouped in clusters and more or less closely aggregated. They are more numerous towards the apex; but sometimes the whole of both lungs may be seen to be stuffed with them; and in some parts, in addition, there may be softening cheesy masses, more or less disintegrated. In most cases the lungs are also found to be the seat of increased fibrosis, and some dilatation of the smaller air-tubes can be perceived.

The real tubercular phthisis attacks both lungs simultaneously. The catarrhal form begins in one lung, and it is not until signs of softening are noticed that the opposite lung becomes affected. This softening of the cheesy matter in the affected lung is often a signal for a more general diffusion of the disease. The apex of the opposite lung is attacked, and caseation and softening occur in the glands of Peyer's patches and in the solitary follicles in the neighbourhood of the ilio-cæcal valve, giving rise eventually to ulceration of the bowels.

On microscopical examination of the lungs, the seat of pulmonary phthisis, various histological changes are discovered. According to Dr. T. Henry Green, these are mainly of four kinds: 1st, a filling of the pulmonary vesicles with fibrinous exudation and leucocytes; 2d, an accumulation of large epithelial cells within the alveoli; 3d, an infiltration and thickening of the walls of the air-vesicles, and often also of the terminal bronchi with small cells; 4th, an increase of the interlobular connective tissue. These various changes occur in varying degrees in different cases, but all of them are said to be present in the majority of instances, although in very different proportions.

In a practical treatise it is unnecessary to enter minutely into the various pathological changes which combine to make up a case of pulmonary phthisis; and the reader is referred to the standard works on pathological anatomy for fuller information upon this subject. The preceding sketch is necessarily brief and imperfect; but some reference to the conditions which give rise to the signs and symptoms about to be enumerated was indispensable.

The acute and chronic forms of pulmonary phthisis will be described separately.

ACUTE PHTHISIS.

Acute phthisis, or "galloping consumption," is not uncommon in early life. The term is sometimes used to include cases of acute pulmonary tuberculosis. It is, however, more properly restricted to cases of rapid catarrhal pneumonia where, as a result of an acute inflammatory process, the air-cells become stuffed with epithelial elements which undergo rapid caseation, and the solidified tissue quickly breaks down into cavities. The consolidation is at first lobular and is generally diffused over the lungs. Softening takes place pretty equally in all parts at the same time, so that the lung becomes destroyed by sinuous and burrowing cavities separated by reddened and œdematous tissue; much purulent matter is formed, and the lining membrane of the air-passages is excessively red. In this form miliary tubercle may occur as a complication, but its appearance is comparatively rare, for the disease is essentially pneumonic in its nature.

Acute phthisis generally occurs in a child who has been reduced in health by previous illness or bad hygienic conditions, and is sometimes seen to attack one already the subject of a chronic consolidation which had given rise to but few symptoms. The age of patients so affected is usually five or six years and upwards.

Symptoms.—The general features of the illness are those of an acute attack of pneumonia combined with very great severity of the general symptoms. At first the child usually complains of a pain in the side. This may come on quite suddenly during some slight muscular exercise. Thus, in a little girl under my care, the child first complained while she was helping her mother to make a bed. The pain may subside after a time, or be complained of occasionally all through the illness. Cough comes on at

the same time with the pain, and the child is noticed to be very feverish at night. In older children the cough is usually accompanied by expectoration. The sputum is at first whitish and aërated, but as the lungs begin to break down it becomes yellow or greenish and nummulated, and is found to contain large quantities of yellow elastic tissue. The number of bacilli found in the sputum is not, however, always very great. In some cases under my care these organisms were found in much less quantities than in cases of phthisis which ran a more chronic course.

Dyspnœa is always an early symptom ; the appetite is very poor, thirst is great, the tongue is furred, the bowels are relaxed or confined, and the child wastes with extreme rapidity. In some cases swelling of the abdomen is noticed, and the liver may be found to be enlarged from fatty infiltration.

The fever is often very high. It is not uncommon to find that the temperature rises to 104° or 105° at night, sinking to 100° or 101° in the morning. It soon begins to be accompanied by copious sweats, and the night-clothes may be drenched by the profuseness of the secretion.

Examination of the chest discovers principally the signs of broncho-pneumonia. Dulness is noticed, usually beginning at the upper part of the lung. At the onset this may be limited to one side of the chest, but the opposite lung becomes very quickly affected. That first attacked, however, generally maintains its precedence and keeps in advance of its fellow throughout the course of the disease. The diminution of resonance involves more and more of the area of the lung, and is accompanied by bronchial or blowing breathing which may be more or less covered by a copious, coarse, subcrepitant rhonchus. This râle is usually heard over the whole extent of both inspiration and expiration, and is very large and metallic in quality. In spots here and there cavernous respiration may be heard after a time ; and the rhonchus in such places is larger and more ringing than elsewhere. If a cavity of some size form, the breath-sounds may be amphoric. Vocal resonance is usually stronger than natural, and may be bronchophonic in places.

The above are the physical signs in a typical case of the disease ; but it must be confessed that in many cases, especially in the younger children, cavities may form in the lung without any sign of their existence being noticed on examination of the chest. In such cases the signs are chiefly those of catarrhal pneumonia ; but the dulness begins at the upper part of the chest instead of the lower, and the rhonchus is usually larger and more ringing and metallic than in an ordinary case of broncho-pneumonia. The child in all cases looks excessively haggard and ill. The wasting is very rapid ; in a surprisingly short time the temples and cheeks get hollow, and the flesh seems to fall away from the body. Often more or less general œdema is noticed, although an examination of the urine may discover no trace of albumen.

A little girl, aged thirteen years, was said to have been healthy until the age of six years, when she had an attack of measles followed very shortly by scarlatina. Enlarged glands formed in her neck soon afterwards, and some of these suppurated. Since that time the girl had been delicate, but had never coughed until ten months before coming under observation. For four months her cough had been very distressing, and she had suffered much from pain in the side. She had been very feverish, had sweated profusely at night, and had wasted rapidly.

The girl was much emaciated and very weak. She had a distressed, haggard expression. The cervical glands were enlarged, and her neck bore many scars resulting from former suppurations. On examination of the

chest the clavicles were seen to be very prominent from retraction of the apices of the lungs. There was much diminution of resonance over the whole of the right side and at the upper third on the left; and much coarse, metallic, bubbling rhonchus was heard over the whole of both sides. The respiration was cavernous towards each apex, and bronchial below. The liver was enlarged, reaching nearly to the navel.

The girl complained greatly of dyspnoea and sweated freely at night. Her cough was troublesome, and she expectorated nummular sputa. She said the sputa had never contained blood. Her face and feet were œdematous, and her urine contained albumen. There was no diarrhœa.

During the first few days the girl's temperature was 101° at night, sinking to the normal level in the morning. It then became subnormal both morning and evening, and the patient died on the twelfth day after admission into the hospital. On inspection of the body cavities were found at the upper part of each lung, and other small collections of purulent matter were scattered over both organs. The pulmonary tissue generally was red, and easily broke down under the finger. At the base of the right lung a marked increase in the fibrous tissue was noticed, and the bronchial tubes in that situation were somewhat dilated. No grey or yellow tubercles were to be seen. The pleural surfaces were firmly adherent. The kidneys appeared to be healthy.

Death is preceded in these cases by great prostration, restlessness, and inability to sleep, complete anorexia, a glossy eroded tongue, and sordes upon the teeth and lips. The duration of the illness is comparatively short, and death usually takes place at the end of five or six months.

Diagnosis.—The disease with which acute phthisis is most liable to be confounded is acute pulmonary tuberculosis. In the beginning, however, the affection may be mistaken for croupous pneumonia. The sudden onset, accompanied by pain in the side, cough, and high fever, presents sometimes a close resemblance to an ordinary case of inflammation of the lung. Still, the temperature does not maintain the same little varying elevation in acute phthisis as in croupous pneumonia, and the course of the illness in the two cases is very different. Instead of the sudden crisis which occurs in pneumonia about the end of the first week, the symptoms persist and grow more and more severe, the signs of consolidation continue to extend themselves, the opposite lung is quickly affected, and very soon elastic tissue, and perhaps bacilli, can be discovered in the sputum.

From acute pulmonary tuberculosis the disease is distinguished by its more abrupt onset, the early signs of pulmonary consolidation, and the absence of indications pointing to the implication of other cavities of the body. Comparatively few cases of pulmonary tuberculosis in the child terminate without some signs of intracranial mischief; but when acute phthisis is uncomplicated by tuberculosis these are absent. The two diseases are, however, sometimes present together. The existence of the tubercular malady is then made evident sooner or later by the onset of convulsions, squinting, rigidity of joints, and other symptoms pointing to meningitis.

Prognosis.—Acute phthisis is a very fatal disease, and the prognosis is consequently very unfavourable. The patients do not invariably die, but instances of recovery are exceptionally rare. In any case the best we can hope for is a remission in the acuteness of the symptoms. Sometimes the disease, its first force expended, loses a part of its energy and becomes more measured and tranquil in its course. It may even settle down into

an ordinary case of chronic phthisis. It is impossible in any individual instance to anticipate such a result; but a diminution in the pyrexia, if combined with an improvement in the appetite and a brighter expression in the face of the child, is a sign of good omen. A decrease in the fever, if unaccompanied by other signs of improvement, so far from being a favourable symptom, is one to be regarded with great anxiety; and if, under such circumstances, the temperature fall to a subnormal level, it may be an indication that the end is not far off.

The *treatment* of these cases will be considered afterwards.

CHRONIC PULMONARY PHTHISIS.

The two principal forms in which chronic pulmonary phthisis usually presents itself in the child have well-marked and very distinctive characters. Chronic catarrhal or pneumonic phthisis, which begins as a slowly forming consolidation of one lung, or succeeds to an attack of acute catarrhal pneumonia from imperfect absorption of the solidifying material, has at first the characters of a local disease. It is accompanied by certain signs and symptoms which indicate the existence of irritation within the lung; but as a rule the general health is comparatively little interfered with, nutrition is fairly performed, and the appearance of the child gives little evidence of serious pulmonary mischief. It is only when softening is set up at the seat of consolidation, and infection of the system follows with secondary deposits in the opposite lung and other parts of the body, that signs occur indicating that the patient is suffering from a general disease. Even when these general symptoms arise, they remain for a long time insignificant as compared with the signs of extensive disease discovered on examination of the chest. On the other hand, chronic tubercular phthisis has completely different characters. From the first—indeed, before any signs of pulmonary irritation have been noticed—there is some fever and wasting, showing general distress of the system; and throughout the whole course of the illness the general symptoms continue severe out of all proportion to the actual extent of lung mischief discoverable by the stethoscope. Therefore, whatever opinions may be held with regard to the pathology of these two varieties, they still remain two distinct clinical types marked out from one another by very separate and distinctive features.

Symptoms.—The peculiarities in the size and shape of the chest often met with in children of consumptive tendencies are elsewhere referred to (see page 399). It may, however, be remarked that although small lungs and a narrow elongated chest are often found associated with an inherited pulmonary weakness, phthisis is not confined to such subjects. We shall never be justified in excluding pulmonary phthisis because the child's shoulders are broad and his chest well proportioned. In the pneumonic form of phthisis the eye often detects nothing to raise a suspicion of pulmonary mischief. It is the tubercular variety which is most constantly combined with narrow sloping shoulders and flattened ribs.

In both varieties of phthisis we find local symptoms significant of pulmonary distress, and general symptoms arising from irritation of the system and impaired nutrition. The severity of the case is usually very fairly indicated by the degree in which the latter predominate over the former.

In *chronic pneumonic phthisis* the first sign of the disease is usually

cough. The patient may have lately passed through an attack of acute catarrhal pneumonia, or may have suffered from neglected pulmonary catarrh with gradual implication of the alveoli at one apex. In the first case the child recovers his strength but slowly. He continues to cough, often violently ; and is more or less feverish at night. After a time, however, the fever subsides, and the child regains flesh and a certain proportion of his strength ; but he still looks pale and has a frequent hacking cough. In the second case the disease creeps on insensibly, and at last it is noticed that the child coughs, and is pale and easily tired. However the disease may have originated, the symptoms are insignificant as long as the unabsorbed deposit in the lung is undergoing no active change. A child with an unabsorbed mass of caseous matter in his lung may be plump, active, and cheerful ; but he is usually rather pale, may complain of pains in the limbs, and is apt to cough a little in the morning or in the day after exertion. On examination of the chest at this period we find slight dulness with some little increase of resistance at the apex or any other part of the chest on one side. If at the apex, the dulness is best detected at the supra-spinous fossa. The breathing is bronchial and some coarse clicks are heard with inspiration. The resonance of the voice is also increased. Children with the lung in this condition are very susceptible to chills ; and if first seen when the lungs are the seat of a fresh catarrh, general bubbling may be heard all over the diseased side ; and also, but to a less extent, over the opposite lung. When this happens it is difficult to form a correct opinion as to the actual amount of disease present in the chest ; and it is well to correct our first impressions by the results of a subsequent examination.

At this stage of the illness, before softening has begun, absorption is still possible, and sometimes occurs in young subjects many months after the first symptoms have been noticed.

When softening begins the general symptoms become more pronounced. There is fever, the evening temperature rising to 102° or 103°; there is marked pallor, although the cheeks become flushed towards night ; and the expression is distressed. Often the child sweats towards the morning. These symptoms indicate an infection of the system by absorption from the softening area. The disease from being local is becoming general ; and the consequences are quickly seen in the interference with nutrition which never fails to ensue. The child begins to lose flesh and strength ; his spirits fail ; his appetite and digestion become poor, and he shows all the symptoms of suffering. The course of the disease is almost always unequal. Every now and again an improvement is seen to take place. By careful nursing and treatment the fever diminishes or subsides ; the nutrition improves ; and flesh and strength are regained. It is not uncommon to see a child fairly plump and to all appearance in tolerable health, who yet has a cavity in one lung and signs of consolidation at the opposite apex.

During this stage pains are often complained of in the shoulder of the affected side. They come and go, and seldom continue for long together. The respirations are usually more hurried than in health, but when the child is quiet are not necessarily much exaggerated. The increased frequency of breathing is a cause of no inconvenience to the patient, and unless after exertion does not give rise to a feeling of dyspnœa. The cough is frequent and fairly loose. If expectoration occur, the sputum consists of yellowish or greenish muco-purulent matter which under the microscope is found to contain fragments of yellow elastic tissue and

often bacilli, the latter perhaps in large quantities. Hæmoptysis is rare, but does occur in exceptional cases. Children accustomed to a sufficiency of good food seldom have much appetite, and often show a complete disgust for food. In hospital patients, however, the appetite may remain keen; and a child with cavities in his lungs and a high temperature may be seen to enjoy his meals almost as if he were well. The digestion is usually impaired, and, probably from the quantity of acrid mucus which is swallowed, vomiting is not uncommon. Diarrhœa, too, is a familiar symptom. In cases where the appetite is preserved nutrition may seem for a time to go on fairly well in spite of the pyrexia. Hospital patients often gain weight after admission, although the evening temperature may stand every night at 102° or 103°.

The physical signs in the stage of softening consist of an increase in the dulness, for the irritation set up by the changes occurring at the diseased spot induces an extension of the catarrhal process; and an alteration in the quality of the breathing, which becomes blowing or even cavernous. It is accompanied by a moist crackling rhonchus which, as a cavity forms, becomes very metallic and ringing. At this time the apex of the opposite lung should always be carefully examined. In many cases slight loss of resonance with high-pitched or faintly bronchial breathing will be found at the supra-spinous fossa, and a click or dry crackle can be heard at the end of inspiration. It is at this period of the illness that diarrhœa is especially frequent; and if caseation and softening occur in the solitary follicles of the intestine and the glands of Peyer's patches, the stools may soon begin to present the characters peculiar to ulceration of the mucous membrane (see page 662). If this complication occur, the child wastes rapidly and becomes haggard and hollow-eyed. He sweats profusely at night; is restless; refuses food; and quickly dies with all the symptoms of prostration. The temperature in these cases seldom reaches a high elevation. It is usually between 101° and 102° in the evening.

Children who are the subjects of a chronic caseous consolidation of the lung often suffer from attacks of secondary catarrhal pneumonia. In these attacks the boundaries of the original mischief are not always extended. It is common to find the chief force of the complication expended upon a different part of the lung. Thus, a child with signs of consolidation at the apex of the right lung is attacked with catarrhal pneumonia. A loud crepitating rhonchus is heard all over both sides of the chest, and at the right posterior base there is some dulness with tubular breathing and a metallic quality of the rhonchus. The basic dulness becomes gradually more pronounced, and at this spot the respiration gets to be cavernous or even amphoric, and the rhonchus to be excessively metallic and ringing. The vocal resonance is bronchophonic. The temperature rises to 103° or 104° in the evening. After two or three weeks the temperature begins to fall and the dulness to diminish; the hard metallic rhonchus becomes looser and more bubbling; the cavernous breathing is less intense at the base, and the gurgling is less large and metallic. The child begins to regain flesh, and when lost sight of, although looking plump and well, has still the old mischief at the apex, and the signs of consolidation with cavernous breathing still persist at the base of the lung. In such a case, which is no imaginary one, the child recovers from his intercurrent attack with two consolidations instead of one. The catarrhal pneumonia has given rise to a cheesy deposit at the base of the lung and dilatation of the bronchi. This, of course, if the patient be placed under favourable conditions, may possibly be recovered from; but the probable consequence of such a condition, if time be allowed

for the change, is the development of a fibroid overgrowth at the spot and permanent bronchiectasis.

An attack of broncho-pneumonia is often a cause of death, or the patient dies worn out with fever, diarrhœa, cough, and want of sleep. In not a few cases a secondary tuberculosis supervenes, or the case may be complicated by a more chronic and less general formation of miliary tubercle confined to the lungs. These are called cases of *tuberculo-pneumonic* phthisis.

CHRONIC TUBERCULAR PHTHISIS.

In this form of the disease the illness begins in a very gradual manner, and the special symptoms arising from the lungs are preceded by others showing the existence of general disorder of health. The child is noticed to be languid and listless. He looks pallid; has little appetite; complains of pains in his legs, and is disinclined for his usual games. He is often found to flush at night and his hands are noticed to be hot. After these symptoms have continued for several weeks the patient begins to have a slight cough. This at first is merely a short occasional hack which excites little attention; but after a time it becomes more frequent and annoying. The course of the illness in this variety is less irregular than in that previously described; but still the downward progress is more rapid at some times than at others. The temperature, although it undergoes considerable variations, rarely stands at a normal level in the evening; but unless the disease be complicated with catarrhal pneumonia the pyrexia is not high and seldom reaches 102°. Wasting is usually persistent; but if the patient has been exposed to privation, the comforts of a hospital may induce a temporary improvement in nutrition, although the pyrexia continues and the other symptoms remain unaltered. Cough for a long time may be a very insignificant symptom and, even with signs of extensive disease of the lungs, may be almost absent. The breathing is often rapid, rising to thirty or forty in the minute. Increased hurry of breathing, according to Niemeyer, may be one of the earliest local symptoms, occurring before any physical signs of the disease can be discovered in the chest. The digestive organs are weak and irritable. Vomiting is common and is often excited by cough. Purging is also a frequent symptom. In many cases examination of the belly discovers fatty enlargement of the liver, and œdema is often noticed in the limbs. Death may occur from general weakness, from catarrhal pneumonia, or from the extension of the tubercular formation to other parts.

The physical signs of tubercular phthisis appear late, and at first are curiously insignificant when compared with the severity of the general symptoms. We find a child pale and thin, with a depressed, saddened look. The borders of his mouth have a faint blue tint; he pants after exertion, and coughs occasionally a short hard hack. We are told that he has been failing for several months; that he eats scarcely anything; has lost all his spirits, and gets flushed and feverish at night. On examination of his chest we discover merely some slight want of resonance at the apices of the lungs with weak, harsh breathing. A faint dry crackle of rhonchus is caught at the end of inspiration, and is brought out more clearly by a cough. The chest is elongated, with a narrow antero-posterior diameter, but the lungs, although naturally small, appear healthy except for the signs which have been mentioned.

As the disease progresses the physical phenomena become more pro-

nounced. They are always discoverable at both apices, although more marked on one side than on the other. Usually the area of dulness is increased by a pneumonic process set up in the lung; and marked dulness with blowing breathing and the ordinary signs of consolidation are discovered. The disease then after a time presents much the same characters to physical examination as those referred to in describing the catarrhal variety of phthisis. In exceptional cases disorganisation goes on without the aid of a pneumonic process. We then find the feeble breath-sound to become gradually blowing, and eventually cavernous sounds are discovered at the apex.

Tubercular and tuberculo-pneumonic forms of phthisis are often met with in scrofulous children who suffer from long-standing disease of the joints. In such cases the articular affection has probably been the original cause of the pulmonary mischief; and by the continual irritation to which it gives rise may influence the condition of the patient very unfavourably. In these cases it is often advisable to remove the diseased joint, even although the amount of disease in the lung is too extensive to allow of lasting improvement. Life may be considerably prolonged and the comfort of the patient greatly promoted by this step.

A little girl, aged eight years, was a patient in the East London Children's Hospital under the care of my colleague, Mr. R. W. Parker. The girl's father had died of consumption, and she herself had been suffering from strumous disease of the right astragalus for six months. The child was much emaciated and very anæmic and feeble. Her skin was harsh and dry, her eyelids were swollen; and the cervical and inguinal glands of each side could be felt to be enlarged. The finger ends were somewhat thickened. There was no albumen in the urine. The temperature was usually normal in the morning, but would rise towards night to between 101° and 103°. At Mr. Parker's request I examined the child's chest, and found the signs of a cavity at the upper part of the right lung, with evidence of considerable consolidation over the lower lobes. The left lung was also diseased, although to a less extent. A moist crackling rhonchus was heard over both sides of the chest. Although this child was evidently suffering from tuberculo-pneumonic phthisis, and the pulmonary mischief was very extensive, the system was obviously so greatly distressed by the irritation and pain of the diseased ankle, that Mr. Parker decided upon amputating the foot. After the operation the temperature, which on the previous evening had been 101.6°, fell to 98° at 6.30 P. M., and remained for the most part at a normal level while the child remained in the hospital. The clicking rhonchus also ceased to be heard in the chest; the face lost its distressed look; and nutrition improved in a surprising manner, the patient gaining between six and seven pounds in three weeks. Unfortunately, after the child left the hospital and returned to her own poor home, the improvement was not maintained, and in a few months we heard that she was dead. Still the remarkably good results which followed the removal of the diseased joint are very instructive, and fully justified the operation.

The majority of cases of pulmonary phthisis are seen in children of six or seven years and upwards; but younger children and even infants are subject to the disease. In very young patients ulceration of the lung is not always easy to recognise. Serious disease may be present without giving rise to any very characteristic symptoms. The child is no doubt feeble and wasted, but loss of flesh and strength are common in very young children with almost any form of illness. Cough may be trifling and the breath-

ing not obviously interfered with. Even a physical examination of the chest may yield us little information, for over the site of a cavity the percussion note may be merely tubular (tympanitic) and the breathing bronchial with moist clicking sounds. Moreover, the occurrence of softening in a cheesy pulmonary deposit is usually a signal for the occurrence of secondary deposits elsewhere; and cheesy and ulcerating intestinal glands with the consequent diarrhœa may completely draw away the attention from the lungs. When pulmonary phthisis occurs in the young child, it runs a comparatively rapid course. It is in the large majority of cases primarily of the catarrhal form, and is most commonly the consequence of an attack of sub-acute broncho-pneumonia succeeding to measles or whooping-cough.

Diagnosis.—In the diagnosis of pulmonary phthisis in the child an accurate account of the beginning and course of the illness is very important. At the same time it is necessary to remember that a history of cough with persistent loss of flesh is no sufficient proof that the child is suffering from pulmonary consumption. Scrofulous children and others with a like susceptibility to chills, are very subject to attacks of pulmonary and intestinal catarrh. Such patients may be troubled with continual cough, and lose flesh steadily without any organic mischief being set up in the lung. They may even be feverish at the onset of every new chill without this additional symptom being evidence of phthisis. No doubt the condition of such children is one of danger, for they often eventually develop pulmonary disease; but until this has actually taken place, ordinary precautions for the avoidance of chills will quickly cause the symptoms to disappear.

Even if examination of the chest discovers slight dulness at the supraspinous fossa of one side with a high-pitched or faintly bronchial quality of breathing, these signs are not necessarily due to phthisical consolidation. Weakly children are very liable to temporary collapse at the apices of the lungs from insufficient expansion. In such cases the morbid signs are limited strictly to one aspect of the chest—the back or the front—and can often be made to disappear if the child is instructed to take two or three full inspirations in rapid succession.

In young subjects consolidation, as a result of catarrhal pneumonia, may be met with at all parts of the lung. It is seen as often at the base as at the apex, both in front and behind. In all cases, therefore, it should be made a rule to search the chest completely before we allow ourselves to exclude the existence of a cheesy deposit. If this be done quietly and gently, as directed elsewhere (see page 13), the examination can usually be carried to a successful issue. In infants, as has been already remarked, phthisis may be present although but few symptoms of the disease have been noticed. The cough may be insignificant, the breathing quiet, and a looseness of the bowels of some standing may seem to explain sufficiently the pallor and wasting of the body and the distressed expression of the child's face. If, however, at the same time the evening temperature is higher than natural, the symptom is a suspicious one; and if the state of the stools indicates the existence of ulceration of mucous membrane (see page 662), we must remember that this condition is often dependent upon chronic pulmonary mischief. In every case the physician, if he do his duty, will take nothing for granted, but will make systematic examination of all the organs of the body.

A distinction between the catarrhal and tubercular forms of phthisis is readily made by comparing in each case the local signs with the general symptoms of the disease. Catarrhal phthisis, even when it begins at the apex by slow extension of the catarrhal process to the pulmonary alveoli,

produces comparatively little impairment of the general nutrition of the body. The patient coughs and is a little feverish at night; but his appetite is usually good; his strength is little impaired; and he retains a fair amount of flesh. Even when the progress of the disease has led to extensive consolidation of the lung, the marked contrast between the mildness of the general symptoms and the severity of the local signs discovered by physical examination, is sufficient to reveal the nature of the pulmonary mischief. In chronic tubercular phthisis the general symptoms are severe from the first. The child is pale and thin, feverish and languid, for some time before he is noticed to cough; and it is still some time longer before examination of the chest discovers any positive indication that the lungs are the seat of pathological change. Moreover in catarrhal phthisis, until softening begins in the deposit, the disease is confined to one lung. In tubercular phthisis the physical signs, when they do present themselves, are discovered at both apices.

On account of the frequency with which secondary attacks of sub-acute catarrhal pneumonia complicate cases of old consolidation, dilated bronchi are often present. These give rise to all the signs characteristic of excavation; and it is very important to satisfy ourselves as to the nature of the pathological condition. Dilated bronchi are most common in the child at the base of the lung, while cavities are more frequently seated nearer to the apex. Therefore the situation of the signs at the base, although by no means conclusive evidence, points rather to bronchiectasis than to a vomica. Again, the general symptoms are of great importance. Dilated bronchi, unless occurring as a chronic condition in a case of fibroid induration of the lung, are met with towards the end of an attack of broncho-pneumonia. If then we find that, with the physical signs of a pulmonary cavity, the general condition of the child is improving; that the temperature shows signs of falling; the appetite improves, and the flesh and strength begin to return, the evidence is strong that the signs are not the consequence of ulcerative destruction of lung. Moreover, much assistance is to be derived from a microscopical examination of the sputum, where this can be obtained. In pulmonary ulceration *areolar* fibres of yellow elastic tissue will be seen in the muco-pus vomited or expectorated; in cases of bronchiectasis these will be absent. Lastly the progress of the signs will furnish corroborative evidence. Cavities tend to grow larger, dilated bronchi to contract. If, therefore, while the general symptoms remain stationary, the area over which the cavernous signs are heard is found to extend itself, we cannot but conclude that disorganisation of lung is advancing; while if, with general improvement, the local signs diminish in intensity, our opinion that these are due to dilatation of bronchi receives additional confirmation.

The distinction between pulmonary phthisis and fibroid induration of the lung is considered elsewhere (see page 478).

Empyema is often confounded with phthisis; and there is no doubt that the general appearance of a child the subject of old-standing purulent effusion is very like that of a consumptive patient. There may be the same hectic, the same emaciation, and the same weakness. In each case the child is irritable and restless with a hacking cough, some shortness of breath, a poor appetite, and a feeble digestion. On examination of the chest in each case we find dulness, often extensive, with perhaps loud cavernous breathing. But the history of the illness is very different in the two diseases. In pleurisy it begins with pain in the side followed after an interval by cough; the dulness is complete with extreme sense of resistance; it occupies both the front and back of the chest, unless the

empyema be loculated ; and reaches down to the extreme base. Moreover, the disease is strictly limited to one lung, the other being healthy ; and sighs of pressure are noticed ; the affected side is expanded ; the intercostal spaces are less hollowed ; and the heart's apex is displaced. On the other hand, in a case of pulmonary phthisis sufficiently extensive to simulate a pleuritic effusion, the opposite lung will certainly show signs of disease. There will be no displacement of the heart or bulging of the side ; the dulness will not be complete ; the resistance to percussion will not be greatly exaggerated, if no great excess of fibroid tissue is present ; and the breath-sounds will be accompanied by a large-sized metallic gurgling rhonchus. In either case the vocal resonance will probably be bronchophonic ; but in empyema it often has an ægophonic quality.

Catarrhal phthisis in the young subject is very liable to be complicated by tuberculosis as a result of infection of the system by softening cheesy matter. The occurrence of tuberculosis is sometimes indicated by a rise of temperature and an increase in the rapidity of the breathing without any extension of the physical signs. Great irritability of the stomach and bowels is often induced ; the child vomits repeatedly, and the bowels are relaxed. Usually in these cases signs of intracranial irritation become quickly manifested ; and convulsions occur followed by squinting, ptosis, rigidity of joints, and other well-known signs of tubercular meningitis.

Prognosis.—The gravity of the case in the two forms of pulmonary phthisis is very different. In an early stage of catarrhal phthisis we may reasonably hope, by putting the patient into the best sanitary conditions, to effect removal of the caseous consolidation. Absorption of a chronic solidification left after an attack of catarrhal pneumonia may be effected in the young subject after the lapse of many months ; and I have often seen cases in which signs of pneumonic phthisis occurring at the apex, from slow extension of a catarrh to the alveoli, have disappeared when the child has been sent to winter in a suitable climate. Indeed, if we can protect the patient from fresh chills, and secure for him an adequate supply of perfectly pure air—such conditions with good and sufficient food will do much to help him on his way to recovery. It is difficult to say at what period of time it becomes hopeless to expect absorption of a cheesy deposit. I believe that so long as no active change has taken place at the affected spot this fortunate termination to the case is still possible if the patient be a child.

When a secondary catarrhal pneumonia occurs in a case of pneumonic phthisis the child will not necessarily die ; indeed, the acute attack usually runs a sub-acute course and is eventually recovered from. Still, the future prospects of the child are sensibly darkened by the addition usually made to the amount of previously existing disease by the passage of the complication.

Cases of chronic tubercular phthisis always go on from bad to worse ; for although by a suitable climate and the careful avoidance of chills, attacks of catarrhal pneumonia may be prevented, the normal course of the tubercular disease is little affected by the treatment.

In all cases, signs of very unfavourable import are :—Great rapidity of breathing, and signs of lividity ; a high evening temperature ; a red glazed tongue, with or without great disturbance of the stomach ; diarrhœa. The scrofulous constitution or a strong hereditary predisposition to phthisis is an element in the case of the utmost gravity. As far as is at present known, the quantity of the bacilli discovered in the sputa furnishes little information of importance in prognosis ; for these organisms are not found to be

necessarily most numerous in cases where the diseased processes are most active.

Treatment.—Children born into families in which there is a consumptive tendency require special care in their bringing up; and every available means should be adopted to counteract their unfortunate predisposition. Infants should, if possible, be suckled by a healthy wet-nurse, and every precaution should be taken to ensure the purity of the air they breathe. As they grow, they should be accustomed to warm clothing, perfect cleanliness, and regularity of meals. Their food should be plain and well selected, avoiding excess of sweets and farinaceous matters, which are so apt to excite and maintain an acid condition of the alimentary canal. Their residence should be, if possible, on a dry soil and in a bracing air. If this be not practicable, they should at any rate be sent away to a more suitable habitation during the spring and fall of the year—times when the changeable season is so prejudicial to delicate children. They should be trained regularly to strengthen their muscles by out-door games; and if the lungs are small, and the chest consequently narrow, every means should be resorted to to invigorate the pectoral muscles and expand the cavity of the chest. All forms of catarrh should be attended to with peculiar care, and the parents should be warned that neglect of such derangements may entail the most serious consequences. By such means a child naturally delicate may, as he grows up, appear to cast off many of the external signs of his constitutional tendency; and although, no doubt, still exceptionally sensitive to unhealthy influences, may preserve his vigour under conditions which would quickly prove injurious to another less carefully nurtured. A cold douche in the morning on rising from bed is of great service in these cases; and if the shock is too great under ordinary conditions, the bath will be readily borne when given with the precautions recommended in a previous chapter (see page 17).

If a child with such a tendency be attacked by measles or whooping-cough, the parents should be warned, as the disease subsides, of the danger of neglecting the catarrhal complications which are so liable to occur in the later stages of these specific maladies. In every case where it is possible the patient should be sent for his convalescence to a good sea-side air. If catarrhal pneumonia have occurred, the clearing up of the consolidation must be carefully watched. Good ventilation and careful dieting are more than ever necessary; and if absorption appear to flag, measures should be taken at once to alter the conditions under which the patient is living, and a change of air should be insisted upon. Alkalies and alkaline sprays are very useful in these cases, and the citrate of iron and quinine may be given with the citrate of potash with great advantage.

In cases of *acute phthisis* energetic measures must be adopted. We should at once take steps to reduce the pyrexia, which is considerable, and to maintain the strength of the patient. Dr. McCall Anderson recommends the application of cold, either by iced cloths, Leiter's temperature regulators, or, if these means fail, by cold baths. He has found the application to the abdomen of cloths wrung out of ice-cold water and frequently renewed, very useful in lowering the temperature, and speaks highly of Niemeyer's combination of digitalis, quinine, and opium. I cannot myself say that I have seen much benefit result from this form of medication, but if thought desirable, half a grain each of the two former drugs may be given with an eighth or tenth of a grain of opium every four hours to a child of ten years old. Of other drugs, large doses of quinine seem to have only a temporary effect, and the salicylates in my hands have proved worse than

useless as anti-pyretics. They seem to exert little influence upon the temperature, while they irritate the stomach and cause nausea. Our chief resource for reducing the temperature in this as in other forms of febrile disease, consists in the application of cold.

In order to maintain the strength Dr. Anderson recommends hourly feeding, both day and night, with simple food, such as milk, broths, etc., and gives brandy or other stimulant as seems to be required. The profuse sweats must be controlled by the subcutaneous injection of atropine (gr. $\frac{1}{100}$). According to this author the most striking results may be sometimes obtained, and a complete cure occasionally effected by the above means.

In the *chronic* forms of phthisis it is also of the utmost importance to improve the nutrition of the body. The absorption of recent deposits and the obsolescence of more chronic consolidations are best promoted by plenty of fresh air, the avoidance of chills, and a liberal supply of good food. In order, however, that the child may profit by an abundant dietary, it is essential that his digestive organs should be maintained in a high state of efficiency. The subjects of pulmonary phthisis resemble in one respect hand-fed infants. Like them they are liable to repeated attacks of gastro-intestinal catarrh, which gives rise to indigestion and flatulence. These attacks, by the influence they exercise upon general nutrition, may produce very serious consequences. If a child with disordered stomach be fed continually with food which he has no means of digesting, not only is the gastric derangement protracted, but his system is kept in a state of fever which often culminates in a fresh attack of pneumonia. In any case, such a condition of the body is not calculated to encourage the healthy removal of morbid products. In all these attacks the diet should be at once altered. The child should take for food little but milk alkalinised with lime drops and diluted with barley water, weak broth, and dry toast. For medicine he may have an alkali with nux vomica to act as an antacid and stomachic. By this means the gastric derangement will be quickly overcome.

In all cases where the parents are in a position to afford the expense, a change of climate is of great service. A child who is the subject of an unabsorbed pneumonic deposit, whether this succeed to an attack of broncho-pneumonia, or have occurred more slowly from neglected catarrh, should change the conditions under which he has been living. If he reside at the sea-side, he should be sent inland; if inland, he should be sent to the sea-side. A good sea voyage often brings about a complete cure in these cases. The body should be warmly clothed, the bed-room should be large, airy, and well ventilated, and the child should pass a large part of the day out of doors whenever the weather permits. Cod-liver oil is useful as a help to the treatment, but not as a substitute for it; and iron and quinine with an alkali should be prescribed as already recommended.

When softening begins at the seat of mischief and evident constitutional symptoms are observed, the child should be carefully protected from chills, and at the same time be insured a plentiful supply of fresh air. Mild counter-irritants should be applied to the chest over the diseased spot, such as painting with tincture of iodine or rubbing in a weak croton-oil liniment. The hypophosphite of lime (gr. iij.–v.) is of sensible value in these cases, and will often, when debility and weariness are complained of, cause an immediate improvement in the strength. In other cases arsenic is of great service, and may be given with quinine in doses of three to five minims of the arsenical solution three times a day. Lately iodoform has been recommended with the object of reducing secretion, moderating fever and cough, and arresting the progress of caseation. I have seen benefit

result from half-grain doses of the remedy given three times a day with extract of gentian. If the pyrexia is high, it may be reduced by sponging the surface with tepid water; and night-sweats are usually readily controlled by one or two drops of the liq. atropiæ at bedtime given in a teaspoonful of water.

For some years, and especially since the discovery by Koch of the "tubercle bacillus," antiseptic inhalations have come greatly into favour. At night the air of the bed-room may be impregnated with the fumes of tar or creasote by Dr. J. R. Lee's "steam-draught inhaler" or some similar instrument. In the day-time, by means of a perforated metal respirator, such as that devised by Dr. Coghill, of Ventnor, various antiseptic substances may be inhaled for an hour at a time more or less frequently during the day. At the Victoria Park Hospital we have been in the habit of using for this purpose a preparation composed of two drachms each of the etherial tincture of iodine and carbolic acid, one drachm of creasote, and one ounce of rectified spirit. Of this ten drops are poured upon a piece of cotton wool and used in the respirator several times in the day. In many cases it is well to use the antiseptic frequently; and if the child will submit to the inconvenience he may be made to wear the respirator all day long. In such a case the antiseptic drops can be renewed every two or three hours. Very good results are often obtained by the help of this method of medication. The violence of the cough is often diminished after the respirator has been worn for a short time, and the sputum is more readily brought away from the lungs. Expectorant mixtures will often have to be given in addition. The disadvantage of all these drugs, however, is their unfortunate tendency to cause derangement of the stomach. When made use of it is advisable, if possible, to combine the expectorant with an alkali or a mineral acid. If the cough is hard and tight, a few drops of ipecacuanha wine should be given, with five or six grains of bi-carbonate of soda, in a draught sweetened with glycerine. Afterwards, when secretion is more copious, four or five drops of sal volatile may be combined with a drop or two of liq. morphiæ, or five to fifteen drops of paregoric, in glycerine and water. These may be followed by an alkaline and iron mixture, or a draught containing pernitrate of iron and dilute nitric acid. Cod-liver oil should always be given if it can be borne. When this does not agree, maltine often proves a good substitute, and is usually taken readily by a child.

In all cases the state of the digestive organs must be watched with the greatest vigilance, and any sign of acidity or flatulence must be a signal for a prompt reconsideration of the dietary. Pepsin is often useful given with dilute hydrochloric acid and strychnia, as recommended elsewhere (see page 641). If a difficulty is found in digesting starches, the liq. pepticus (Benger) given with an alkali about an hour after meals is of service. In such cases, also, the measures recommended for the treatment of chronic diarrhœa may be adopted with advantage (see page 640).

If the cough excite vomiting, this symptom can be generally allayed by the administration of one drop of Fowler's solution of arsenic before a meal; or half a drop of liq. strychniæ often has an equally beneficial action. If hæmoptysis occur, the child should be kept perfectly quiet in bed; fluids should be given to him in small quantities at a time, and he may take fifteen to twenty drops of the liquid extract of ergot with mildly aperient doses of Epsom salts three times a day. If, however, the bowels are ulcerated, the saline laxative must be omitted. Diarrhœa dependent upon this intestinal lesion must be treated as recommended elsewhere (see page 666).

CHAPTER XIII.

PAROXYSMAL DYSPNŒA.

Dyspnœa is a symptom frequently met with in early life. The term does not denote merely increased rapidity of breathing. The respiratory movements may be hurried without the patient's being sensible of any unusual effort in the act of breathing or of suffering from imperfect aëration of the blood. To constitute dyspnœa there must be perceptible distress ; and the term may be defined as a *conscious* embarrassment in the performance of the respiratory function.

Dyspnœa is by no means confined to cases of pulmonary mischief ; indeed, in the child, extreme difficulty and labour of breathing, with great lividity of face, although possibly produced by disease of the lung, is yet more commonly the consequence of some other cause. The most urgent and alarming form of dyspnœa is seen in cases of impediment to the passage of air through the glottis. We find it carried to its highest point in stridulous and membranous laryngitis, in obstruction of the windpipe by a foreign body, in extra laryngeal pressure from an abscess in the pharynx, and in pressure upon the trachea or a large bronchus by a mass of enlarged glands. Again, intense dyspnœa may be found in a case where air penetrates freely into the lungs. If the circulation through the pulmonary vessels is obstructed, as when a clot is slowly forming in the pulmonary artery, the suffering from deficient aëration of blood may amount to an agony. So, also, in serious disease of the heart dyspnœa is a common symptom, for the passage of blood through the lungs is impeded by the valvular lesion.

Again, external pressure upon the lung will excite a very pronounced feeling of dyspnœa. When one lung is entirely compressed, and the heart dislocated by a copious liquid effusion into the pleura, dyspnœa may be urgent and threaten actual suffocation. When the ribs are greatly softened, as in a case of advanced rickets, the pressure of the atmosphere upon the yielding chest-walls may cause such impediment to the expansion of the lungs that serious dyspnœa may be induced. If at the same time the descent of the diaphragm is impeded by accumulation of flatus in the belly, the danger is really imminent. On the other hand, in cases of actual pulmonary mischief dyspnœa is not always present. We find it, indeed, in catarrhal pneumonia and bronchitis, especially if the latter disease is accompanied by any occlusion of the tubes ; but in other cases of interference with the pulmonary function it is exceptional to see signs of suffering from conscious want of air carried to an extreme degree. Even in advanced phthisis distress from this cause is rarely great ; and in croupous pneumonia and collapse of the lung the respirations, although greatly quickened, are accompanied by little or no exaggeration of movement, and dyspnœa in the sense of an active feeling of oppression of the chest cannot be said to exist.

In every case of dyspnœa we have, therefore, to examine very carefully in order to discover the cause to which the impediment to respiration may be correctly attributed. As a rule, perhaps, dyspnœa is irregular in its severity. It is subject to temporary increase and diminution, so that the patient from a condition of great distress may pass into a state of comparative ease. The term "paroxysmal dyspnœa" is, however, confined to cases where the difficulty of breathing occurs in attacks of variable severity, which last a longer or shorter time and then pass completely away.

There are certain rare causes of remittent dyspnœa in the child which may be mentioned. These are—paralysis of the respiratory muscles and of the diaphragm, such as may occur as a sequel of diphtheria (see page 100); interstitial œdema of the lung from acute Bright's disease (see page 39); and clotting of blood in the pulmonary artery (see page 98). These lesions are, however, exceptional, and the dyspnœa they induce is not paroxysmal in the correct sense of the word; for although the feeling of suffocation moderates, it does not entirely subside.

As commonly met with in the child, paroxysmal dyspnœa, *i.e.*, dyspnœa occurring in paroxysms with intervals of *complete* intermission, is a result of the following causes:

Stridulous laryngitis.

Pressure upon the trachea or a large bronchus by swollen bronchial glands.

Obstruction of a bronchus by a foreign body.

True bronchial asthma, occurring often in the course of chronic bronchitis and emphysema.

Of these the first-named disease is fully considered elsewhere. It requires no further notice in this place, as the severity of the laryngeal symptoms at once indicates the seat of the impedient to respiration. The other forms of paroxysmal dyspnœa are often confounded together under the common name of "asthmatic attacks." Dyspnœa arising from the pressure of enlarged bronchial glands and the difficulty of breathing induced by the presence of a foreign body in the air-tubes are described in other parts of this treatise. They will, however, be again referred to in discussing the diagnosis of asthma.

Bronchial asthma is comparatively seldom met with in the child. When it occurs at this period of life, it appears to be almost invariably the consequence of whooping-cough or catarrhal pneumonia. The seizures always assume the "catarrhal form;" indeed, the subjects of the disease are usually sufferers from emphysema of the lungs, and the attack of dyspnœa occurs as a consequence of a fresh catarrh. In many cases the child comes of a gouty family, and sometimes the pulmonary disease appears to be hereditary. The tendency to asthma is occasionally associated with a tendency to general eczematous eruption; and Dr. West states that he has never known eczema to be very extensive and very long continued without a marked liability to asthma being associated with it. The two affections may alternate—the one subsiding when the other appears—as in the case of a boy of six years old referred to by Caillaut; but they may be also coexistent, and the cure of the one is often followed by the disappearance of the other.

The exciting causes of the attack appear to be in most cases the inhalation of some irritating matters, either in fine dust or vapour, directly into the air-tubes. A paroxysm sometimes follows an indigestible meal, or is induced by food imperfectly masticated and hurriedly swallowed. It has been consequently suggested that irritation of the gastric filaments of the

pneumogastric may be reflected to the pulmonary branches of the nerve, and through them set up spasm of the tubes. But the theory of reflex action is surely exposed to a severe strain by such an explanation.

Without expressing any opinion upon the vexed question of the nature of the asthmatic seizure—whether it be a pure neurosis (as is commonly held) or not—I may observe that it is at least curious that in children, whose tendency to nervous spasm of every kind is one of the physiological peculiarities of early life, pure asthma should be an affection so rarely met with; that while general convulsions may be induced by peripheral irritation of various degrees of severity, while spasmodic contraction of the glottis may be set up by a trifling laryngeal catarrh, an attack of paroxysmal dyspnoea from spasmodic occlusion of the smaller air-tubes should be a phenomenon of such infrequent occurrence. That it is extremely rare there can be no doubt. Of the recorded cases of asthma in young children there are very few in which direct pressure upon the bifurcation of the trachea or a main bronchus by enlarged bronchial glands can be excluded. I have seen many cases of so-called asthma in the child, but have rarely failed to find evidence of swelling—often of considerable swelling—of these glands.

Symptoms.—Asthmatic children, as has been said, are usually the subjects of emphysema. This condition often gives little evidence of its presence until the lungs are attacked by a fresh catarrh. The breathing then becomes excessively oppressed, so that the child is unable to lie down in his bed. The face is pale, with a dusky tint round the mouth and eyes; the eyes are staring and congested; the mouth is open; the lips are purple; the nostrils work violently, and the forehead is covered with beads of sweat. The child is very restless, throwing about his arms, and his face expresses great suffering. His heart acts violently and irregularly, but the pulse is small and weak. When the chest is uncovered, all the respiratory muscles are seen to be in action, but the chest remains fully distended and moves but slightly at each breath. There is little hurry of breathing on account of the increased length of expiration, and the temperature is not elevated. The cough is usually short and dry, but not at all paroxysmal.

On examination of the chest during an attack we find general hyperresonance of the percussion note; the vesicular murmur is either very feeble or completely suppressed, and is often quite covered by large sonorosibilant rhonchus. At the base copious subcrepitant râles may be heard.

The attack lasts for a variable time. It usually continues more or less severely for two or three days, and then gradually subsides. As a rule, the more severe the dyspnœa, the shorter its duration; but for days or even weeks after the attack is over the child may wake up wheezing in the morning, and his breath may be short for some hours after rising from his bed.

Sometimes the onset of the attack is heralded by severe coryza, with repeated sneezing, and this is quickly followed by distressing dyspnœa. The oppression of breathing seems sometimes to threaten actual suffocation and in all cases the severity of the suffering from want of air is out of all proportion to the insignificant character of the physical signs. The seizure, however, invariably ends in recovery. After a time the breathing becomes easier, and eventually all distress is at an end; but before the termination of the attack is reached there may be many alternations in the intensity of the dyspnœa, and even after the days have become peaceful the nights may still be disturbed by a return of the paroxysms.

Diagnosis.—In cases of paroxysmal dyspnœa it is important with regard

both to prognosis and treatment to ascertain the exact cause of the distressing symptom.

When the dyspnœa is due to occlusion of the larynx from spasm, from impaction of a foreign body, or from the pressure of a retro-pharyngeal abscess, the difficulty lies chiefly in inspiration. As each breath is drawn the soft parts of the chest sink in and the epigastrium is deeply retracted. The inspiration is excessively long and laborious, the expiration short and comparatively easy. At the same time crowing sounds are produced in the glottis and point unmistakably to the seat of the impediment.

In cases where the hindrance to respiration is seated at a lower level, as when a main bronchus is obstructed by a foreign body, or the trachea at its bifurcation is compressed by a mass of swollen glands, and also in cases of bronchial asthma, the distress is chiefly seen in expiration, which is prolonged, laborious, and ineffectual. Attacks of dyspnœa from these causes require to be very carefully discriminated, as they are all commonly spoken of as "asthmatic attacks." The most frequent of these in children, beyond all comparison, is enlargement of the bronchial glands; and most cases of "asthma" in early life are due to direct pressure by swollen glands upon the air-tubes. Scrofulous children are very sensitive to chills and readily take cold. They are consequently frequent sufferers from pulmonary catarrh. In these attacks the glands undergo a rapid temporary increase in size, and their enlargement may set up serious pressure upon the windpipe at its bifurcation.

Dyspnœa from this cause is often intense, and comes on in violent paroxysms which usually occur at night. The character of these seizures has been elsewhere described (see page 182). In such cases there is not always dulness at the upper part of the sternum, or between the scapulæ; for alteration of the percussion-note can only be noticed in cases where the swollen glands are in contact with some part of the chest-wall. The chief collection of bronchial glands lies in the bifurcation of the trachea; but others are distributed along the course of the bronchi as far as the third or fourth subdivisions. Enlarged glands, therefore, may be found after death deep in the substance of the lung, as described by Cruveilhier. The effect of enlargement of these bodies is to press upon and flatten the air-passages; and if the calibre of the tube be at the same time lessened by viscid secretion, the channel for the time may be completely occluded. By such means the most serious dyspnœa may be produced.

A little girl, between three and four years old, was said to be subject to feverish attacks which lasted from a few days to a week. In these the child first showed symptoms of catarrh and then began to suffer from urgent dyspnœa. In the last of these attacks, as described to me, the breathlessness began quite suddenly at night and woke the child up from her sleep. She was said to have started up gasping in the utmost distress, and her voice was hoarse. After about an hour the paroxysm subsided and the child had a violent attack of spasmodic cough, retching up much phlegm. The seizures were repeated for six nights in succession, becoming, however, less severe towards the end of this period. In the daytime the patient seemed fairly well, although towards evening her breathing would be a little short. Her nose also bled a great deal. This little girl was brought to me some time after the last attack had subsided, when she had returned to her usual health. The jugular veins on each side of the neck were then noticed to be full, and the venous radicles on the front of the chest to be unnaturally visible. There was a suspicion of dulness on the upper bone of the sternum, and when the child bent her head backwards a venous hum

was heard at that spot, ceasing when the chin was again depressed. The lungs did not appear to be emphysematous, nor was there any dulness at either apex ; but the breath-sounds were very loud and hollow at the supra-spinous fossæ, especially in expiration.

There can be little doubt that this child was suffering from enlargement of the bronchial glands. The character of the attacks, accompanied by hoarseness of the voice, the bleeding from the nose, the fulness of the jugular in the neck and of the superficial veins of the chest, the hollow breathing at the apices without sign of disease of lung, and the venous hum heard at the upper part of the sternum when the head was retracted—indicating some pressure set up in that position upon the left innominate vein—all these signs were very suggestive of glandular enlargement. The child had a scrofulous appearance and was living in a cold, damp situation. She was treated with iodide of iron and cod-liver oil, and was sent to pass the winter at Bournemouth, whence she returned greatly improved.

This subject of glandular enlargement in the mediastinum has been already considered in another place. The reader is therefore referred to the chapter on scrofula for fuller details with regard to the phenomena produced by the lesion and the signs by which its presence may be ascertained (see pages 182 and 183).

The intrusion of a foreign substance into the bronchus is sometimes a cause of paroxysmal dyspnœa. This accident may be suspected if a first attack come on quite suddenly at or shortly after a meal, or under circumstances which justify the assumption, as when a child is playing with small objects which might readily slip into the larynx. In such a case, if the object be a small one, the breathing is not always affected at once ; and if some cough and discomfort are excited at the first, these symptoms almost invariably subside, to return after a longer or shorter interval. Professor Henoch has reported the case of a girl, aged nine years, who went to bed apparently in good health, but was restless, complaining of discomfort during the night. Towards the morning she was seized with extreme dyspnœa and cyanosis. The child was taken to the hospital, where no signs of pulmonary disease could be detected. Shortly after her return home she began to vomit large quantities of undigested food, amongst which were found pieces of a hard-boiled egg which she had hurriedly swallowed on the previous evening. When the vomiting had subsided the girl had a good night's rest and the dyspnœa did not return. In this case Dr. Henoch attributed the dyspnœa to irritation of the gastric filaments of the vagus ; but it seems more probable, as Dr. Birkart has suggested, that the symptoms were due to actual bronchial obstruction by a portion of the imperfectly masticated food. The ordinary symptoms produced by the presence in the air-tubes of a foreign substance, and the means by which the cause of the dyspnœa may be recognised, are treated of more fully in another chapter (see page 527).

The diagnosis of bronchial asthma has usually to be made by exclusion, no other cause being found to which the access of dyspnœa can be attributed. When called to a child who is said to be suffering from attacks of severe dyspnœa, unaccompanied by laryngeal stridor, we should first of all suspect the presence of enlarged bronchial glands. If the most careful examination fails to detect the existence of any such lesion ; if we find that in the interval of such attacks the child is well and hearty, without albuminuria or sign of disease of the heart ; that the seizures came on under the influence of a pulmonary catarrh ; and that the only physical

signs discoverable consist in a certain hyper-resonance of the percussion-note with an occasional click or coo of rhonchus, we may conclude that we have to do with a case of bronchial asthma.

Prognosis.—If the child be in such a position in life that proper measures can be taken for his relief, his prospects are not unfavourable. If he can be sent away to a proper climate, be warmly dressed and carefully attended to, dyspnœa from enlarged bronchial glands or from bronchial asthma is usually recovered from. The most serious forms of paroxysmal dyspnœa are those which result from the presence of a foreign body in the air-passages; from interstitial pulmonary œdema in Bright's disease; and from clotting in the pulmonary artery. In the last of these, few cases recover. In the case of Bright's disease when the illness is of the acute form, we may have hopes that if the immediate danger can be tided over, the child may eventually recover. If the renal mischief be chronic, the prognosis is very unfavourable. When the dyspnœa is due to the entrance of a foreign body into the air-passages, the prognosis is given elsewhere (see page 533).

Treatment.—If the child be first seen during an attack we are forced to treat the dyspnœa without reference to its cause. Strong mustard poultice should be applied to the chest and moved about from one place to another over the front and back of the thorax. Secretion should be promoted by giving hot liquids to drink; and a very useful form is that composed of a dessert-spoonful of liq. ammoniæ acetatis, diluted with three or four times its bulk of hot water. Trousseau recommends the burning of stramonium leaves in the room; but this is a very uncertain remedy and has lately fallen out of favour in the case of the adult. The fumes of nitre paper are preferred by some. Enough should be used to make the atmosphere thick with the nitrous vapour. If we can discover that the child has lately swallowed some indigestible food or notice any undue distention of the abdomen, it will be well to relieve the stomach by an emetic dose of ipecacuanha wine.

When the attack of dyspnœa has subsided or the respiration has become easier, we shall be probably able to examine the patient sufficiently to form an opinion as to the cause of the distress in breathing. When the dyspnœa is due to enlargement of the bronchial glands, or to any of the less common causes which have been mentioned, the general treatment to be pursued is described in other parts of this treatise.

If the case be one of bronchial asthma the child is almost invariably the subject of pulmonary emphysema, and the treatment recommended for that condition of the lung should be scrupulously carried out. All means which invigorate the general health are useful, and cod-liver oil with iron, especially the iodide of iron, should be prescribed. Fowler's solution of arsenic is also often of service, especially in cases where the asthmatic symptoms are associated with eczema of the scalp or other part of the body. Dr. Thorowgood advocates the use of a tonic during the day, and recommends a sedative at night, such as a dose of the extract of stramonium or tincture of belladonna. Thus, a child of six years old may take three or four drops of the liq. arsenicalis with ten of the tincture of perchloride of iron freely diluted after each meal, and on going to bed twenty to thirty drops of the tincture of belladonna.

The hypodermic injection of pilocarpine may be used in these cases, as directed by Dr. Berkart. Children bear this remedy well. For a child of five years old, gr. $\frac{1}{10}$ to gr. $\frac{1}{8}$ may be injected under the skin when the child is put to bed. In the daytime the arsenic and iron can be continued.

When the attacks of dyspnœa come on chiefly at night, the child should be forbidden to eat heartily in the latter part of the day, and should by no means be permitted to go to bed shortly after a full meal. Indeed, care should be taken at every meal that the stomach is not overloaded, and Dr. Thorowgood's caution that moderation should be exercised in the use of farinaceous and saccharine articles is especially wise in the case of a child.

The whole secret of the treatment of these cases consists in employing all available measures for improving the general strength and in guarding the patient carefully from chills. Exercise, gymnastics, and games which further the development of the muscles and promote the action of the skin are all very useful.

CHAPTER XIV.

FOREIGN BODIES IN THE AIR-TUBES.

The passage of solid substances into the air-tubes is a far from uncommon accident and one to which children, for obvious reasons, are peculiarly liable. Articles of the most varied description have been inadvertently drawn into the trachea, and their retention in the bronchi may not only produce the most serious distress but set up profound disorganization in the affected lung.

Fruit-stones, as might be expected, are perhaps the commonest things to make their way into the trachea; also peas, beans, grains of corn, various seeds, bits of solid food, fish-bones, portions of nut-shell, and any small articles which lie about in a room or can be picked up from the floor, such as little coins, tin tacks, dress-hooks, buttons—all of these objects, and many others, have been known to pass between the vocal cords and be imprisoned in a bronchus. It is at first difficult to understand how a substance as large as a plum- or date-stone can pass through the narrow aperture formed by the vocal cords in a young child. It must be remembered, however, that when the chest-walls are expanded in the act of inspiration, if a solid body is drawn into the opening, a very strong pressure from the external atmosphere forces it onwards, while resistance is very trifling on account of the tendency to form a vacuum inside the chest. Consequently, the substance is driven through the opening with considerable force.

Morbid Anatomy.—The morbid changes which result from the presence of a foreign substance in the air-passages are often very extensive. The immediate consequences are congestion and irritation of the mucous membrane lining the trachea, and if the substance is small enough to penetrate into them, of the bronchi. Secretion then takes place of a thin frothy fluid which soon becomes purulent, and may be so profuse that after death the air-tubes are found filled with yellow puriform matter. Thick lymph may be also thrown out so as partly to coat the obstruction. In a case recorded by Mr. Bullock the lymph became organized into fibrinous casts and almost closed the upper portion of the windpipe. The muco-pus is thick and ropy and in long-standing cases may be inexpressibly fetid.

A substance capable of passing into the larger bronchi soon sets up inflammation in the lung. The inflammation may be limited to one lobe, or may spread to the entire organ. Sometimes both lungs are affected simultaneously, owing to the offending substance being dislodged by the repeated cough and falling back into one or the other bronchus indiscriminately. The affected part becomes consolidated, and if the irritation persist, soon disintegrates and breaks down. Cavities are thus produced which are filled with offensive and even gangrenous débris and much purulent matter. If there be no sufficient communication with an air-passage, the contents may be retained; but usually an opening becomes established

with the bronchus and much fetid matter is expectorated. In scrofulous or tubercular subjects gray granulations may be developed in the hepatized tissue around the cavity, and it has happened that the child has died from general tuberculosis. The bronchial glands also become enlarged and cheesy.

Besides pneumonia, other pulmonary lesions may be present. More or less emphysema is usually produced, and collapse of portions of the lung may occur. The inflammatory action may not be confined to the lung. Empyema is a common consequence of the presence of the irritant; and enormous quantities of purulent fluid have been found distending the pleural cavity. Pericarditis has also been known to occur, and in a case recorded by Mr. Solly a large abscess had formed in the mediastinum as a consequence of the pericardial inflammation. Sometimes the abscess of the lung becomes adherent to the chest-wall and points in an intercostal space or elsewhere. Dr. Wilks has referred to a case in which an ear of corn escaped in this manner from an abscess which had formed in the supra-scapular region; and other cases of a similar kind are on record.

Symptoms.—The irritation produced by the entrance of a foreign body into the trachea and bronchi varies greatly in different patients. Although in the majority of cases the suffering is extreme, in a few instances curiously little discomfort appears to be excited. It is important to be aware that violent dyspnœa is not an unfailing symptom of this accident. In some recorded cases a little cough has been the only inconvenience complained of. Dr. Goodheart has stated that on two occasions in his experience in which dissection revealed gangrene of the lung set up by a spicula of bone in one of the bronchi no symptoms had been noted during life pointing to the entrance of a foreign substance into the air-tubes; and thence concludes that pulmonary disease is more often excited by this mischance than is commonly supposed.

Still, although in exceptional cases the suffering may be slight, as a rule the intrusion of any adventitious matter into the wind-pipe is a cause of immediate and extreme distress. If the substance be of large size it may completely occlude the glottis and cause sudden death. Many cases are on record in which the entrance of the wind-pipe has been blocked up by a lump of food with immediately fatal results. Smaller bodies which can pass readily into the air-tubes, if not arrested at the bifurcation of the trachea, fall as a rule into the right bronchus. Mr. Goodall of Dublin pointed out many years ago that the septum of the division of the windpipe is placed considerably to the left of the mesial line, and that this position tends to deflect any substance falling against it into the right division of the air-tube.

The first consequence of the accident is usually a fit of severe dyspnœa with sense of impending suffocation. The child shows all the symptoms of the most extreme distress. His eyes look wild; his face is livid; his nares work; his chest heaves convulsively; he tears with his hand at his throat, and bursts into a paroxysm of spasmodic cough. As a rule expiration seems more difficult than inspiration, and the effort to discharge air from the lungs is laborious and painful. In some cases foam tinged with blood appears at the lips. The early symptoms are more severe if the object lodges sufficiently near to the glottis to keep up irritation of the vocal cords. The attacks of spasmodic cough are then almost incessant and the difficulty of breathing extreme. In ordinary cases after some minutes the more urgent symptoms abate and may entirely subside, so that the child who a short time before had seemed on the very point of

suffocation returns to his play as if nothing had happened; but after a period of calm the paroxysms usually return with more or less violence. The period of repose which follows the first access of dyspnœa is of very variable duration. It may last from a few minutes to several hours; and cases have been published in which no return of the distress was experienced for many months. The degree of suffering in these cases, according to Dr. Stokes, is dependent to a considerable extent upon the completeness with which the intruding body interferes with the passage of air through the tube. He states that in all cases which have come under his own observation the distress was great in proportion to the feebleness of respiratory murmur in the affected lung. A smooth body, therefore, such as a bean, by completely occluding the tube causes greater suffering than a more irregular substance will do; for the latter, although it obstructs the passage, does not render it absolutely impermeable.

Often in addition to recurring attacks of dyspnœa and spasmodic cough there is a fixed pain or soreness referred to the throat or some part of the chest, back, or side. This sensation is probably dependent upon the impaction of the intruding substance in some particular part of the bronchus, for it has been known suddenly to shift its place, passing from the throat to the chest or to the region of the nipple. In some cases the pain is accompanied by a sense of constriction. Often, also, there is inability to lie on one or the other side, such a position increasing the uneasy feeling and impeding the respiration. Sometimes the child can only breathe with ease in the sitting position, and has to be propped up in bed with pillows. The fits of coughing are of a peculiar character. They are usually excessively spasmodic and often resemble the cough of pertussis. They are accompanied by much congestion and lividity of the face, but are not followed by attempts to vomit. Sometimes the paroxysms are so violent as to lead to a convulsive seizure. If the object introduced is a fruit-stone or similar solid substance, and is free to move in the air-passages, the cough may be accompanied by a peculiar clicking or flapping noise heard in the direction of the larynx, and produced apparently by the impact of the object driven upwards against the glottis by the current of air. In many cases the impact may be felt as well as heard if the finger and thumb be applied during the cough to opposite sides of the larynx.

The voice may be unaltered unless the object be arrested in the neighbourhood of the glottis, as in one of the ventricles of the larynx, in which case there may be any degree of hoarseness even to complete aphonia.

On inspection of the chest considerable recession of the soft parts is usually to be noticed in inspiration, and there may be a swelling of the neck and upper part of the chest from surgical emphysema. Often a physical examination at an early period detects little or no deviation from a healthy state. There may be perfect resonance; the respiration may be normal, and nothing may be heard but a little sonorous or sibilant rhonchus over the lung in connection with the occluded bronchus. If the foreign substance be impacted and immovable in the air-tube, signs of collapse may be noticed at some part of the lung a few days after the accident; or there may be absolute suppression of the respiratory murmur over the whole of the affected side.

Whenever irritation is excited in the air-passages there is fever, and the general health of the child necessarily suffers from the constant distress and interference with sleep. Food can, however, be taken without difficulty.

In some cases after a few hours or a day or two a spontaneous expul-

sion of the offending substance takes place during a fit of coughing and the patient is instantly relieved. If, however, the child is less fortunate and the foreign body remains in the tubes, its presence being unknown or efforts to procure its removal having proved fruitless, serious consequences ensue. The object may become impacted in the larynx, causing death by suffocation; it may set up a violent catarrhal pneumonia and the patient may quickly die; it may give rise to suppuration and gangrene; or it may lead to chronic phthisis which ends fatally after a more or less lingering illness.

Spontaneous expulsion usually takes place, as has been said, during a violent fit of coughing. It may occur after a short or a long interval; and in some cases a period of years has elapsed before the offending substance has been ejected. The completeness of recovery in such cases depends upon the degree to which the lung has suffered from the presence of the intruder. If the foreign body have only given rise to irritation in the lung, its removal is followed by instant and permanent relief. If, however, pneumonia have been set up, or an abscess have formed, or chronic phthisical changes have been induced, the patient may die, although the original cause of his suffering has disappeared.

In cases where the foreign body remains in the tubes, a constant source of irritation and of interference with the function of the affected organ, the physical signs depend upon the form of lesion which is produced. In some cases profound disorganization of the lung follows, and extra-costal suppuration may be set up leading to the formation of a large superficial abscess.

A little boy, aged seven years, whose family history showed no tendency to phthisis, was in his usual health when, on March 28th, he returned from school saying he had swallowed a date-stone. He complained of difficulty of breathing and pain in the side, and coughed a great deal. The symptoms apparently were not very severe, for the child was only brought to the hospital on April 8th. On his admission it was noted: "Much recession of the lower parts of the chest on inspiration; intercostal spaces move equally on the two sides. Resonance good over both sides, but on the left the inspiration is everywhere high-pitched and bronchial, and is as loud below as above. No rhonchus or friction. Heart's apex between the fifth and sixth ribs just outside the nipple line. A faint double friction-sound at the base of the heart and a soft systolic murmur at the apex."

At this time nothing was known of the accident; and as there was but little oppression of breathing and the cough soon after admission was found to be spasmodic, the boy was thought to be developing whooping-cough and was sent out by the House Surgeon.

On April 22d, the child was brought back to the hospital with a full account of the origin of the illness. It was stated that after his discharge he had continued to cough in a spasmodic manner and to whoop occasionally. He had often complained of pain in his stomach and left side and his breathing had been oppressed. He had little appetite. His skin had been hot with occasional perspirations. Shortly before his return to the hospital the aspirator had been used to the chest by a practitioner of the neighbourhood, but no fluid had escaped.

The boy appeared to be excessively ill. He complained much of pain in the abdomen and lay with his knees drawn up. The abdominal parietes were somewhat retracted. Over the left back reaching from the posterior axillary line nearly to the spine, and from a little above the lower angle of the scapula to the tenth rib, was a large superficial collection of

matter. This on being opened was found to consist of very offensive pus. The abscess evidently communicated with the pleural cavity, for air was sucked in through the wound at each inspiration. The boy's breathing was laboured and his voice whispering. An examination of the chest was difficult on account of the tenderness of the side. It was however, ascertained that resonance of the left back, although impaired, was not quite lost, and that the respiratory sounds were concealed by loud creaking and gurgling rhonchus.

The boy remained very prostrate and in great distress. He was excessively restless and occasionally screamed in a very hoarse voice. The discharge from the wound was inexpressibly fetid. He died on April 25th. His temperature after readmission varied between 100° and 102.4°.

On examination of the body, seventeen hours after death, the superficial abscess cavity was found to extend from the middle line of the right clavicle across the chest and round the left side to the spine. The skin over it was sodden and seemed almost decomposed. The body was much emaciated. On opening the chest the right lung was generally adherent to the chest-wall, although not very firmly. Its substance was somewhat congested but otherwise normal. The bronchi were injected and their mucous lining œdematous.

The left lung, firmly adherent on its posterior surface, was extensively disorganized. Its substance tore easily and the smell was almost insupportable. The surface of the diaphragm had the appearance of an abscess. In the eighth interspace, about one inch behind the posterior axillary line, was a large ulcerated depression rather more than an inch in diameter, at the bottom of which was a perforation communicating through the intercostal space with the superficial abscess. The trachea was injected, and in the left bronchus was a date-stone impacted about an inch and a half from the bifurcation. The lining membrane of the bronchus was red and œdematous, but the air-passages contained no excess of fluid. On account of the disorganized state of the lung it was impossible to say whether an abscess had originally formed in the neighbourhood of the date-stone. There was no peritonitis. The left ventricle of the heart was hypertrophied, and the edges of the mitral valve were much thickened.

This case is peculiar on account of the situation of the foreign body, which had passed into the left bronchus instead of the right. When the child was first brought to the hospital no mention was made of his accident, and nothing in his symptoms suggested the presence of a solid substance in his lung. There was no great distress of breathing, and the physical signs, such as they were, were limited to the left lung, the right side of the chest being healthy.

The foreign body after passing the rima glottidis may be caught in one of the ventricles of the larynx; it may become fixed in the trachea; or may pass further down and lodge in one of the primary divisions of the air-tube. There are, therefore, certain varieties in the symptoms according to the position of the obstruction.

If the solid substance remain in the larynx, the voice is suppressed; the dyspnœa is continuous; the cough is generally violent and croupy; the child feels as if he should choke; and there is often pain referred to the situation of the cricoid cartilage. It may, however, be remarked that aphonia is not limited to these cases, and that a hoarse whispering voice does not necessarily indicate that the obstacle is fixed in the larynx. In the case just narrated, although the fruit-stone was impacted in the left

bronchus and the larynx was free, the voice was hoarse and almost suppressed.

If the substance lodge in the trachea below the larynx, the suffering produced is not very great, as a rule, so long as the passage remains pervious. In the often-quoted case related by Mr. McNamara of Dublin, in which a boy who had constructed a whistle out of a plum-stone, inadvertently drew the toy by a strong inspiration through the glottis, the object remained fixed transversely in the lower part of the larynx, and gave rise to a whistling sound as the air passed through it in expiration. The only inconvenience produced by the accident while the obstacle remained in this situation was an occasional suffocative cough ; but this did not prevent the boy from running about and playing as usual.

In the bronchus the symptoms produced by the presence of a foreign body vary according as this is fixed or is free to move. If a smooth substance, such as a fruit-stone, become fixed in the bronchus, it causes great distress by plugging the air-tube and arresting the function of the corresponding lung. The air cannot enter or escape. Consequently the patient experiences great dyspnœa from sudden loss of half his breathing surface. He has attacks of spasmodic cough from the irritation induced at the seat of obstruction, and on the affected side the vesicular murmur is weakened or suppressed. Catarrhal pneumonia in this case follows very quickly. If the impacted body be irregular in shape, so as still to allow the passage of air through the tube, there is less oppression of breathing, and in many cases less irritation in the lung ; also, the pathological results are more chronic in their course.

If the intruding substance be free to move, as is sometimes the case with a rounded body which does not so readily become impacted in the air-tube, very curious consequences follow. When the object is carried against or into the larynx, it produces spasmodic cough and an agonizing feeling of suffocation. As it descends again into the lower tube there succeeds a period of comparative calm ; and the physical signs which have been described as indicating impaction of the substance in the bronchus may perhaps be noticed. This alternation of suffocative cough with intervals of more or less complete repose are very characteristic. It is in these cases that the presence of the foreign body can sometimes be detected by the ear and the touch. In the case of a little girl, aged two years, who was under my care in the East London Children's Hospital suffering from the presence of a haricot bean in the air-tubes, the physical signs noted by the House Surgeon, Mr. Scott Battams, on the evening of the day on which the accident happened were : "Air enters fairly well into both sides of the chest. At the apices expiration is prolonged and wheezing. On listening at the middle of the right back a sound is heard as if a solid body were drawn down in inspiration and carried away again in a forced expiration." The child, although not much troubled by dyspnœa, suffered greatly from cough ; and when this was violent the finger and thumb placed on either side of the upper part of the trachea could feel a distinct impact as of some solid body striking this part of the tube with each impulse of cough. Afterwards with the stethoscope placed upon the same part a dull thud-like sound was distinctly audible as the object was forced upwards by the current of air.

Diagnosis.—Whenever a foreign body has passed into the windpipe it is of the utmost importance to the patient that there should be no mystery as to the cause of his symptoms, for recovery will probably depend upon ready measures being taken for the expulsion of the offending substance.

The diagnosis rests upon the history of the accident and the sudden occurrence of the symptoms in a child previously healthy; also, upon the nature and situation of the physical signs to be discovered on examination of the chest.

The history is not always to be obtained. Thus, in the case of a baby, unless the child have been seen to play with some small object immediately before the suffocative attack occurred, the likelihood of a foreign body having passed into the trachea may not even be entertained. Again, the history may be misleading. Attacks of spasmodic laryngitis may occur in a young child while at play; and if any small objects likely to produce such symptoms are found within his reach, the inference that a similar object has been introduced into the air-passage is sufficiently obvious. If the attack of laryngitis occurred first under such circumstances, this inference would be almost unavoidable. Still, although not necessarily conclusive, a history of the probable introduction of a solid substance into the windpipe is of great value. If a child while in his usual health has been eating stoned fruit, or playing with small articles such as peas, haricot beans, or grains of corn, and is seized all at once with violent oppression of breathing and spasmodic cough, we should consider very carefully the evidence to be obtained from a physical examination of the chest. It must be remembered that the first distress is only temporary, and is suceeeded by a period of calm, of variable duration. When called to such a case, therefore, we must not conclude because the child's suffering has subsided that all danger is at an end.

The physical signs in these cases may be indicative of pulmonary irritation or of more or less complete obstruction of a bronchus. The irritation set up in the air-tube leads quickly to increased secretion, so that more or less sibilant or sonorous rhonchus and bubbling râles are usually heard with the stethoscope. If in a case where the symptoms occurred suddenly under circumstances suggesting the introduction of a solid substance into the windpipe, the above signs of irritation are discovered on one side only, and that side the right side, the evidence must be looked upon as important.

Signs of plugging of a bronchus are, however, of the greater value. Complete absence of breath-sound and of respiratory movement over the whole of the affected side without alteration in the normal resonance—these signs occurring suddenly in a child in whom suffocative cough began all at once in the midst of perfect health, would be strong evidence of the presence of a foreign body in the air-tubes, even in the absence of any history pointing to such an accident. If in such a case violent suffocative cough breaks out again, and at the same time the morbid phenomena disappear from the chest, the vesicular murmur returning with natural loudness on the side previously silent, the phenomenon is very characteristic. These alternations of comparative calm and absence of breath-sound with violent spasmodic cough and perfectly normal physical signs may be looked upon as pathognomonic. If the impact of the imprisoned body can be felt and heard in the trachea during the cough, the evidence thus furnished of the presence of a solid substance in the air-passages is practically conclusive.

If the tube, instead of being perfectly closed is partially permeable, appreciable weakness of the vesicular murmur may be noticed on the affected side. Such a sign occurring alone may have little importance attached to it; but if with weak breathing over the right lung we notice sonoro-sibilant rhonchus or bubbling râles over the upper part of the same side, the other lung being healthy, the combination is of some value.

When the foreign body remains in the larynx caught in one of the ventricles, the resulting symptoms—aphonia, dyspnœa, violent croupy cough, and sense of choking—may suggest stridulous laryngitis or membranous croup. In such a case the history of the seizure, especially the sudden occurrence of the distress in a child previously in a state of perfect health, is of great importance. In stridulous laryngitis, although the complaint often begins with much violence and quite suddenly, the spasm almost invariably occurs at night, the child starting from his sleep with urgent dyspnœa; and the symptoms subside completely after a short time. In the case of a solid substance in the larynx the access occurs while the child is awake and at play; the dyspnœa is more continuous; and the remission, if it occur while the foreign body remains in the neighbourhood of the larynx, is far less complete.

In membranous croup the attacks of dyspnœa come on gradually, and slowly increase in severity; the voice is not whispering at the first; and in many cases patches of false membrane may be seen in the fauces.

Prognosis.—If expulsion of the imprisoned body cannot be effected, the prognosis is very gloomy; for although cases have been recorded in which the patient has continued for years to suffer little from the presence of the solid substance in his air-passages, such cases are very exceptional. Most commonly ill effects are not slow in making themselves evident. The prognosis is more favourable if the impacted object is of irregular shape, so as to allow air to pass and repass it in the tube. In such cases the patient may escape rapid death. In almost all the instances in which chronic phthisical changes have been developed as a consequence of the accident the substance has been of an irregular shape.

If expulsion is effected, the prognosis necessarily depends upon the changes which have been set up by the irritation of the substance during its retention. Chronic phthisical symptoms often subside in a surprising manner after the ejection of the offending body, and in such cases, unless disorganization have proceeded too far, recovery may be hoped for. If abscess or gangrene have been set up in the lung, death generally ensues.

Treatment.—When we are satisfied that a foreign body is retained in the air-tubes treatment must be energetic. Emetics have been found of little value and may therefore be dispensed with; but if we are certain that the solid substance is of small size, the child should be at once turned head downwards and shaken in the hope of dislodging the imprisoned body and aiding its escape from the tubes. Often violent cough comes on during the operation, and sometimes so much spasm is excited in the glottis by the solid body pressing against it, that our efforts have to be promptly discontinued. This proceeding is more likely to be attended by good results if the substance is small. A shot, a seed, or object of similar size, would be able to pass without difficulty between the vocal cords, while a larger one might become impacted in the glottis and cause speedy death by suffocation. Whenever, therefore, the foreign body is known to be of some size, it is wiser to postpone all violent measures, such as eversion and succussion, until an artificial opening has been established in the trachea. This procedure is equally important whether the imprisoned body be fixed or be free to move. If it be fixed, the air-tube can be directly searched by a long forceps, and the object may sometimes be seized and withdrawn in this manner. If it be free to move, an artificial opening in the trachea is a great aid to its escape, as under these altered conditions the glottis relaxes readily and there is no risk of dangerous spasm.

After the operation the imprisoned body may be ejected through the

wound or may pass through the relaxed glottis. In the latter case it is apt to be swallowed. If, therefore, it be not found after the signs of suffering have subsided, the stools must be carefully examined.

If the early measures for promoting the escape of the solid body do not succeed, or if on account of the size of the substance we fear to employ them, it is seldom judicious to delay the operation of tracheotomy. It must be remembered that it is only in exceptional cases that the continued presence of a foreign substance in the air-tubes has been borne without dangerous injury to the lung. As long as it remains in the respiratory passages there is constant danger of suffocation from the lodging of the object in the larynx, and of serious disorganization of the lungs from the irritation set up in the tubes. Therefore, if we are satisfied that a solid body is imprisoned in the passages, the fact that the resulting symptoms are not urgent should not induce us to postpone the operation. As Mr. Barwell has observed, "If a body be impacted in the larynx or trachea, urgent symptoms will mean merely increased irritability and spasm of the glottis, and on removal of the foreign body this will naturally cease. If the body be in the bronchus and do not move, urgent symptoms will mean the establishment of serious disease in the lung," and this may not disappear when the foreign substance is removed.

The operation is equally necessary whatever be the nature of the substance in the trachea. Soft matters, such as gristle, etc., will not become disintegrated in the air-tubes ; and small vegetable substances, such as seeds and grains of corn, may swell up to a much larger size through absorption of moisture.

Part 7.

DISEASES OF THE HEART.

CHAPTER I.

CONGENITAL HEART DISEASE.

Like other parts of the body the heart is subject to malformations from arrest of development. These vary in importance according to the period of intra-uterine life in which they occur; but all, since they affect the centre of the circulatory system, materially hamper the distribution of the blood-current and therefore interfere with the due discharge of all the nutritive functions of the body.

In its progress from the simplicity of its rudimentary state to the complex machinery of the fully developed organ, the heart passes through a variety of changes. At first a mere tube doubled upon itself, it soon becomes divided into three cavities—a simple auricle, a simple ventricle, and the arterial bulb. At this stage the organ resembles a horse-shoe in shape, the ventricle occupying the position of the curve. This cavity then begins to bulge out more conspicuously at its lower part so as to suggest by its appearance the later form of the heart; and at the same time the auricle and the bulb approach more closely together. Next, the auricle and ventricle become each divided into two parts by a septum; and the bulbus arteriosus is also divided into two channels which are the future aorta and pulmonary artery. The auricular and ventricular septa are each at first incomplete, so that the cavities severally communicate; and the opening in the auricular septum—the foramen ovale—remains open until birth.

Just before the completion of intra-uterine existence the course of the blood-current is as follows:—Starting from the placenta, in which it has been to a certain extent purified and recharged with oxygen, the blood enters the body of the fœtus through the umbilical vein and is conveyed to the under service of the liver. At this point a portion passes directly into the inferior vena cava by the *ductus venosus;* the remainder joins the blood in the portal vein and circulates through the liver before it reaches the inferior vena cava and is conveyed with the first portion to the right auricle. Here it meets with the blood returning from the head and neck by the superior vena cava. The two currents do not, however, mix. That

coming from the head passes, as it would do in the adult, through the auriculo-ventricular orifice to the right ventricle. From this point a small quantity reaches the lungs through the pulmonary artery; but the larger portion is directed through the *ductus arteriosus* into the aorta below the origin of the great vessels, and passes to the lower part of the body and the placenta. The blood reaching the right auricle by the inferior vena cava, instead of entering the right ventricle, is directed by the Eustachian valve through the foramen ovale into the left auricle. Consequently, this portion of the blood also escapes the passage through the lungs, and is distributed by the left ventricle to the head and body generally through the aorta.

At birth, the lungs, which had been previously inactive, come into play, and blood is drawn into them through the pulmonary artery. As a necessary consequence, the foramen ovale[1] and ductus arteriosus—the channels by means of which the passage through the lungs had been avoided, become useless. The arterial duct contracts and ceases to be pervious; while the foramen ovale also closes and the separation of the auricles is henceforth complete.

The arrest of development of the heart, which is the cause of the congenital malformation, may occur at any of the stages which have been referred to. The heart may retain its nearly primitive form of a double cavity with only rudimentary divisions between the two sides, and the aorta and pulmonary artery may be still undeveloped from the original arterial trunk. This form is not common, but examples have been noticed. In the earliest of these, placed on record by Mr. Wilson in 1788, the infant survived its birth seven days.

If the arrest take place at a later period, the septa dividing the cavities are more nearly complete, and the aorta and pulmonary artery are distinct vessels. This condition is far more common than the preceding. Its prominent feature, in addition to the still imperfect state of the partitions, is a displacement or even a transposition of the great vessels. The aorta is displaced to the right, arising in part from the right ventricle; or it springs completely from that cavity and the pulmonary artery takes its origin from the left ventricle. When the aorta is merely displaced to the right, without malposition of the pulmonary artery, we usually find some obstruction to the passage of blood from the right ventricle through the latter vessel. The artery is too small, or its valves are incomplete, or the blood is prevented from passing freely into it by some constriction of the ventricle near the outlet, or its channel may be even entirely obliterated. In all such cases the foramen ovale must remain open or the circulation could no longer be carried on. The blood being unable to find its way in sufficient quantity to the left side of the heart through the lungs, continues to follow its original course through the opening in the auricular septum, and the foramen ovale is prevented from closing. If, however, in such a case the aorta arise sufficiently to the right to allow of the escape of blood through it from the right ventricle, the foramen ovale and ductus arteriosus may cease to be pervious.

Constriction of the pulmonary artery with deficiency in the septum of the ventricles, so that the aorta communicates with the right ventricular cavity, is the commonest form of congenital malformation of the heart. Whether in such a case the foramen ovale and ductus arteriosus are closed

[1] Under normal conditions the foramen ovale should be closed by the end of the first week, and the ductus arteriosus by the end of the third month after birth.

or not depends, as has been said, upon the freedom with which the blood can escape from the right side of the heart through the displaced aorta. If the right ventricle is not unduly distended, and the pulmonary artery allows enough blood to get away, both these channels may become closed. In the other case, where the aorta and pulmonary artery are transposed, the septum of the ventricles is usually imperfect, and the foramen ovale and ductus arteriosus still remain open.

Sometimes the descending aorta is found to arise from the pulmonary artery, being apparently a continuation of the ductus arteriosus. In this case a small ascending aorta springs from the left ventricle to supply the head and neck by the usual vessels. The pulmonary artery communicates through an opening in the ventricular septum with the left ventricle. The foramen ovale is usually closed.

In contradistinction to the class of cases where the fœtal openings remain pervious after birth is another class in which these orifices close too early, before uterine life has reached its term. If the foramen ovale is obliterated prematurely, the whole quantity of blood has to pass through the pulmonary artery and ductus arteriosus. Consequently, the right side of the heart is enormously hypertrophied while the left side is smaller than natural. In cases where the ductus arteriosus has undergone early obliteration, the aorta usually springs from the right ventricle, and this vessel commonly gives branches to the lungs, the pulmonary artery being very small and rudimentary.

Besides the varieties which have been mentioned, the congenital disease may also consist in defects in the valves, or in narrowing of the orifices of the large vessels which spring from the heart. Sometimes, as in the preceding cases, the defect may arise from malformation, as when the number of the valves is deficient or otherwise abnormal; but it may also be due to intra-uterine endocarditis. Inflammation, when it attacks the fœtal heart, almost invariably affects the right side, which at this period of life is more active than the left. The tricuspid valve may be beaded, or the pulmonary semi-lunar valves may be more or less adherent. In many cases the three pulmonary valves are found united into a funnel-shaped dome with a small orifice at the apex, through which the blood is propelled with difficulty. A similar atresia of the aortic orifice is much less frequently met with. When the latter malformation exists, the arteries of the head and upper limbs are probably filled through the pulmonary artery by the ductus arteriosus.

It is possible that these inflammatory lesions may be occasionally excited, as Dr. Von Hoffman suggests, by extravasation into the placenta, from which hæmorrhagic foci, pathological products, may be introduced through villous absorption into the fœtal circulation.

Morbid Anatomy.—In addition to the malformations which have been described, the heart is always found to be greatly enlarged, especially on the right side. Moreover, morbid conditions are usually seen in other organs. There is often more or less atelectasis of the lungs, and the expanded portions have a dark, congested appearance. The liver and spleen are not unfrequently swollen and congested; and effusions may be found in the pleura and peritoneum. Also, morbid conditions of the brain are common. There may be congestion or inflammation or effusion; or an abscess may be formed in its substance.

The congenital imperfections of the heart may be complicated by inflammation in or around the organ, for the original malformation, far from guarding the patient from subsequent inflammation, appears rather

to prepare the way for it. We may therefore find the anatomical characters of endocarditis or inflammation of the pericardium.

Symptoms.—In cases of congenital heart disease the most striking symptom is the purplish or livid tint of the skin which, if the child survive its birth many months, rarely fails to be developed. Indeed, from this peculiarity of colour such cases are often spoken of as cases of cyanosis or "morbus cœruleus." The depth of the purple tint varies greatly in different subjects. In some it merely gives a dusky or swarthy hue to the skin. In others the discolouration may reach a deep purple or even almost a black colour. It is distinguishable in all parts of the body; but is most noticeable in the cheeks, lips, and eyelids, and also in the ends of the fingers and toes. Even in the same subject the symptom is liable to variation. While the child is completely at rest the tint most nearly approaches the normal colouring; but movement, especially fretfulness or anger, makes the skin darker at once. The cause of the cyanotic tint has been the subject of discussion. By Morgagni it was attributed to intense general congestion, and by Hunter to great contamination of the arterial current with unoxygenized blood. The latter view has been shown to be untenable. Cyanosis may exist without any admixture of venous and arterial blood; and in many cases where such admixture occurs the depth of tint is not in proportion to the amount of venous blood which is poured into the aorta. Dr. Peacock gives his support to the theory of Morgagni, and attributes the discolouration to stasis of blood in capillaries dilated by long-standing congestion, aided by imperfect aëration of the whole mass of the circulating fluid.

The cyanotic tint is not always an early symptom. We often find that the child at birth presented no peculiarity of colour, and that it was only after an interval of weeks or months that anything was noticed to excite suspicions of disease. In less common cases the tint of the skin is normal throughout.

In addition to the blueness of the ends of the fingers and toes, these parts are usually clubbed from systemic venous congestion, and the nails are incurvated. The shape of the chest is often peculiar. It is sometimes called "pigeon-breasted," but the prominence of the sternum is only noticeable at the lower part from flattening in each infra-mammary region. At the upper part the chest is abnormally prominent and rounded. The coldness of the hands and feet is another striking peculiarity in a cyanotic child. Indeed, the external temperature of the body may be several degrees below the normal level; but if the thermometer be placed in the rectum the internal temperature will be found little lower than natural. It is, however, subject to variations, being sometimes for several days below the normal level (97°–98°); at other times more nearly natural. In these patients, as in healthy children, the ordinary heat of the body is liable to be disturbed by teething and other sources of irritation; and is sometimes found to run up to 102° or even higher from this cause.

Dyspnœa and palpitation of the heart are common symptoms. In the case of an infant the mother often remarks upon the beating of her child's heart when the patient is washed or otherwise disturbed; and older children may complain spontaneously of the throbbing when they attempt to run. At these times there is usually shortness of breath, and cough may be present. In some cases when the cyanosis is extreme, the cough may be accompanied by the expectoration of blood. The pulse is often irregular and intermittent, but its strength is fair.

Sometimes dropsical symptoms come on. There may be œdema of

the legs, or ascites; but serous effusions are less common than might be supposed, for, as Dr. Chevers has pointed out, the venous system seems to adapt itself to the overloading. The right auricle, cava, and systemic veins are often of unusual capacity from the first; and the veins of the liver are capable of containing a vast quantity of delayed blood. The superficial veins of the chest or limbs are rarely more visible than natural, but the skin is habitually dry and may be harsh. The liver and spleen can often be felt to be enlarged; and on account of the congestion of the kidneys the urine is habitually scanty and high coloured. On account, too, of the congestion of the alimentary canal, the tongue is generally foul, the breath offensive, and the digestion feeble. The appetite is poor or capricious; and the bowels costive or irregular, with clay-coloured pasty stools. The gums are often dark-coloured and spongy-looking, and may be ulcerated at their edges. Sometimes they bleed.

Cyanotic children are generally irritable and easily disturbed. Consequently at a first examination it is often impossible to come to a satisfactory conclusion even as to the physical signs present in the case. These are liable to vary according to the character of the congenital lesion, and may possibly be absent altogether; for if the malformation consist in a mere transposition of the aorta and pulmonary artery, without narrowing of the channels or persistence of the fœtal openings, no murmur will be heard, and careful examination will detect no sign of cardiac enlargement. The most common malformation, as has been said, is that in which the pulmonary artery is greatly constricted, and the septum between the ventricles is deficient, so that the aorta appears to arise in part from the right ventricle. In such a case there is great hypertrophy of the right ventricle; we find a very strong pulsation all over the præcordial region, and a forcible impulse between the left nipple and the ensiform cartilage. The impact may be accompanied by a systolic thrill. On listening to the chest we hear a loud systolic murmur in the course of the pulmonary artery. In the case of a boy who died at the age of nearly six years in the East London Children's Hospital with this condition, the apex beat of the heart was in the fifth interspace in the nipple line. The impulse was felt very strongly over the whole præcordial region, in the epigastrium, and even to the right of the lower part of the sternum. The arteries in the neck also pulsated strongly. A loud systolic murmur was heard all over the front and back of the thorax. It was rather louder at the base of the heart than at the apex, and became much fainter towards the armpits. The point of greatest intensity was over the site of the pulmonary valves. In this child there was no discolouration of the skin.

Even a patent foramen ovale without constriction of orifices or other abnormal condition will give rise to a murmur. In a case published by Dr. Balthazar Foster—in a little girl of two years old—a faint murmur was heard with the latter part of the first sound at the level of the lower edge of the third rib at its junction with the sternum. It did not, however, extend over a wide area, and was audible neither at the base of the heart nor the apex.

Infants who suffer from congenital malformation of the heart are usually thin. If, however, the patient survive the period of infancy, he may not be wasted and may even have a sturdy appearance. He is usually lethargic and dull of intellect; and is cautious in his movements, as experience has taught him that exertion is apt to be followed by palpitation and dyspnœa. In most cases where serious malformation of the heart exists the patient is subject to attacks of syncope, and often symp-

toms occur referable to disorder of the nervous system. In the case referred to above, the patient died of cerebritis. Another cyanotic child under my care in the East London Children's Hospital—a little girl nearly two years old—suffered, while she remained under observation, from general loss of power, with ptosis of the right eyelid and contraction with rigidity of the muscles of the left forearm. The child had all the signs of carious disease of the right petrous bone. Disease of this part of the skull seems to be a not uncommon lesion in children who suffer from congenital malformation of the heart. Dr. Lawrence Humphry has kindly communicated to me the notes of a case which occurred during his period of office as Resident Physician in the Victoria Park Hospital. The patient—a cyanotic boy between five and six years old—had suffered from long-continued otorrhœa. A fortnight before his death the discharge ceased. The child then began to complain of headache, which became very severe. This symptom was soon followed by attacks of violent convulsions, without loss of consciousness in the intervals, and the boy died in a few days. After death, in addition to the ordinary form of congenital malformation (stenosis of the pulmonary artery, deficiency in the ventricular septum, and origin of the aorta from both ventricles) an abscess was found in the middle lobe of the left cerebral hemisphere, and the petrous bone on that side was diseased.

Convulsions are very common, especially in infants; and startings and twitchings during sleep are seldom absent whatever be the age of the patient. Another curious symptom is great heaviness and somnolence. In many cyanotic children attacks of uncontrollable sleepiness form a prominent feature in the case. These attacks are apt to come on after a meal. The child shows symptoms of great drowsiness; the face becomes purple, and the breathing slow and heavy. In extreme cases the sleep becomes so profound that it resembles coma and the child cannot be roused. After some hours, however, the patient revives, his heaviness passes off, and he is restored to his normal condition.

The duration of life is very variable. It is dependent chiefly upon the degree of obstruction to the circulation. Nearly one-half of the cases die before they have completed the first year, and two-thirds before they are two years old. Death often occurs in a convulsive fit; and infants usually die in or directly after such a seizure. Moreover, attacks of syncope are common, and the failure of the heart's action is sometimes not recovered from. In some cases the patient falls a victim to pneumonia or other intercurrent disease; indeed, on account of the impaired state of nutrition usually prevailing, the resisting power of the child is feeble, and derangements prove fatal which a stronger subject would have little difficulty in overcoming. Many of these children become tubercular or phthisical, and, as has been said, in not a few cases death is preceded by symptoms pointing to cerebral mischief.

Diagnosis.—A child, cyanotic from malformation of the heart, presents a very characteristic appearance. His dusky tint, his purple lips and eyelids, his livid and clubbed finger-tips—these symptoms, together with the physical signs and the history of the patient, can leave little doubt as to the existence of a congenital lesion of the heart. If, however, cyanosis is absent, the nature of the case is less immediately recognisable; but by a careful review of the physical signs we can usually arrive at a correct conclusion. If we are able to localize the murmur at the pulmonary orifice, and can discover signs of hypertrophy of the right ventricle (increase of the heart's dulness to the right with pulsation in the epigastrium), these signs

are almost pathognomonic of congenital disease, for endocarditis affecting the right side of the heart is rare after birth. Sometimes, on account of the small size of the chest in young subjects, it is impossible, especially in an infant, to discover the point of greatest intensity of the murmur. In such a case, signs of hypertrophy of the right heart are doubly important; and if we notice clubbing of the finger-ends, and find that after movement the child's face becomes livid or his lips blue, the existence of congenital heart disease, in the absence of any affection of the lungs, may be safely asserted. According to some observers, attacks of dyspnœa alone, occurring from trifling causes, are very suspicious of this form of lesion. Louis was of opinion that "suffocative attacks brought on by the slightest cause, often periodic, always very frequent, and accompanied or followed by syncope, and with or without blue discolouration of the body, generally" formed sufficient grounds for the diagnosis of an abnormal communication between the right and left cavities of the heart. Again, the occurrence of tuberculosis in a child the subject of old-standing heart disease, although not conclusive evidence, points very decidedly to a congenital origin for the cardiac mischief.

Even in cases where all necessary symptoms are present, and the congenital origin of the heart-lesion is unmistakable, the exact variety of malformation must often remain a mystery. The difficulties in ascertaining the form in which the arrest of development has occurred are very great. In the case of a fully developed heart we are dealing with an organ the structure of which is known. We are acquainted with the number and situation of its openings, the number and mechanism of the valves which close them, and the direction normally taken by the current of blood. In such a heart any morbid alteration of the physical signs has a definite meaning; and in ordinary cases there is little uncertainty as to the cause which has given rise to it. In the case of a heart the seat of a congenital malformation, the conditions are very different. The number of openings is undetermined; their position is doubtful, and even the direction in which the blood is flowing can only be conjectured. In such cases, therefore, an exact diagnosis is often impossible. Still, there are certain general rules which should not be forgotten. Thus, some forms of malformation prove very quickly fatal. An infant whose heart remains in a primitive state, consisting merely of two cavities, will probably be dead within a month. Therefore at a more advanced age this variety may be excluded. Another form of congenital disease which usually has an early termination is transposition of the aorta and pulmonary artery. Children in whom this form of malformation occurs rarely live longer than two or at the most three years. One little boy under my care with this form of lesion survived to the age of eighteen months; but the majority of the recorded examples have died within the first twelve months. So, also, the variety which consists in the origin of the aorta from the pulmonary artery is not likely to be present in a child who has survived the first year.

In children who have reached the age of three years the above conditions may be excluded with a high degree of probability. At this age we should search for signs indicative of atresia of the pulmonary artery. If we can localize the murmur over the pulmonary valves, and can ascertain the existence of hypertrophy of the right side of the heart, we may safely infer the presence of contraction of the orifice of the pulmonary artery. In such a case there is probably also deficiency of the ventricular septum, with a communication between the aorta and the right ventricle, and perhaps patency of the arterial duct. This, it may be repeated, is the

commonest form of congenital malformation. Still, other morbid conditions of which we know nothing may also be present. Patency of the foramen ovale is seldom the only abnormality, but, if in a child of three years old or upwards we find the symptoms of congenital heart disease without cardiac murmur, or with a very faint bruit limited strictly to the level of the third interspace towards the middle line, and without signs of hypertrophy of the right ventricle, this condition may be suspected. In no case, probably, can a positive diagnosis be arrived at; at least, we can never say that the condition diagnosticated is the only cardiac lesion present.

Prognosis.—The prospects of a child, the subject of congenital malformation of the heart, are necessarily very unfavourable. On account of the difficulties under which his circulation is carried on, and the persistent congestion of his whole venous system, the child's nutrition is faulty and his vitality low. He has therefore little power to throw off even trifling derangements, and is peculiarly sensitive to disturbing influences. In addition, then, to the dangers directly attendant upon his congenital defect, he is exposed to constant risk from the serious consequences, in his enfeebled state, of the ordinary ailments of childhood. Every change in the growth and development of the infant is a new period of trial. The first establishment of the respiratory function at birth, the occurrence of dentition, the time of weaning, and all the innumerable causes of disturbance to which infant life is liable, are distinct sources of peril. To one or another of such dangers a large proportion of these patients succumb; and, as has already been stated, hardly one-third of the whole number of cases survives to the age of two years.

On account of the difficulty of ascertaining the exact variety and extent of the cardiac defect, the prognosis during the first few months of life is especially serious. Later, as the child grows and arrives at a period when the more fatal forms of malformation may be excluded, his prospects improve; but they can rarely be said to be otherwise than unfavourable, for a comparatively small proportion of these patients live to attain adult years.

Of special symptoms, some should be regarded with anxiety. Frequent attacks of syncope are dangerous; great drowsiness is of unfavourable omen; and convulsions or other sign of cerebral irritation have a very sinister meaning. According to Dr. Chevers, failure of the renal secretion, or the occurrence of albuminuria, as indicating the probable beginning of structural changes in organs which have always been hampered in the discharge of their functions, is to be viewed with much apprehension.

Treatment.—The treatment of these cases consists in the adoption of wise rules for the diet and general management of the patient, and in early attention to any intercurrent disorder by which he may be attacked. On account of the general sensitiveness to chills, and the tendency to lowering of the temperature, the child must be warmly dressed with a flannel band to his belly, and should be clothed in some woollen material from head to foot. His diet should be carefully arranged so as to avoid excess of fermentable matters, such as starches and sweets; and he should be taken out of doors, whenever the weather is not too unfavourable, in his nurse's arms or a suitable carriage. If a perambulator be used, a hot bottle to the child's feet is a necessity unless the weather be warm. The patient's bowels should be kept regular, and an occasional mercurial purge is useful to afford some relief to his congested liver. If palpitations are violent, small doses of the infusion of digitalis may be given; and Dr. Peacock speaks highly of the beneficial effects of Dover's powder. It is important to excite the regular

action of the skin, which in these patients is habitually dry. Tepid baths should be given twice a day, and should be always followed by careful frictions over the whole body with the hand. Small quantities of alcohol are also of service, and may be given in the form of brandy or the St. Raphael tannin wine. The attacks of dyspnœa are best treated by stimulants and small doses of digitalis and ammonia.

Any catarrh, whether of the lungs or bowels, must be attended to without delay ; and if albuminuria be detected in the urine, or the renal secretion become scanty, gentle aperients and diuretics should be at once resorted to. In cases of extreme discolouration, the peroxide of hydrogen has been recommended ; and Dr. Balthazar Foster states that given three times a day in eight-minim doses the beneficial effects of the remedy are very decided.

CHAPTER II.

CHRONIC VALVULAR DISEASE OF THE HEART.[1]

Chronic disease of the heart is very common in childhood; and there are few forms of valvular lesion found in the adult which may not be also met with in the young subject. The signs and symptoms to which such faulty conditions give rise are much the same at all ages. A child, like an adult, may have valvular disease without himself being conscious of discomfort or betraying to others any sign of inconvenience; or he may suffer from breathlessness, palpitation, general œdema, and all the other symptoms which are liable to arise in an older person similarly affected. The physical signs of valvular lesion, and of consequent alteration in size of the organ, also resemble very closely those met with in adult life. It is not, therefore, necessary to enter into these subjects at great length. It will be sufficient to point out any peculiarities of feature conferred upon the cardiac disease in the child by the youthful age of the patient.

Causation.—Amongst the causes of valvular defect of the heart, rheumatism takes by far the most important place. To this disease, indeed, most of the cases of heart disease occurring in early life are to be attributed. The manifestations of rheumatism in the child, as is stated elsewhere, are often very trifling; and in infancy, on account of the difficulty of referring signs of distress to their true source, the disease no doubt often escapes detection altogether. Next to rheumatism, scarlatina is perhaps the most common cause of endocardial inflammation. This disease is often followed by joint pains and other symptoms indistinguishable from rheumatism; and chronic valvular disease of the heart appears in not a few cases to owe its origin to this exanthem. According to Bouillaud, measles is also an occasional precursor of endocarditis; and Dr. Samson has recorded a case in which both pericarditis and endocarditis occurred a fortnight after convalescence from measles had begun. This fever, however, is no doubt a much less common cause of the valvular disease than the other maladies which have been mentioned. In certain cases, chorea appears to be a starting point for valvular mischief. Sometimes, without any evidence of rheumatism, we find a murmur become developed in the course of the choreic attack; and it may happen that the morbid sound continues after the cessation of the nervous derangement, and is accompanied after a time by displacement of the heart's apex and other signs of hypertrophy. Still, in these and other cases where no history of rheumatism is to be obtained, it is possible that the endocardial lesion may still have a rheumatic origin. The tendency of this disease is to attack the fibrous tissues of the body generally; but all need not suffer at the same time. The selection, even, of the joints to be affected by the disease is apparently capricious. Some are

[1] Acute peri- and endo-carditis and their consequences are considered in the chapter on acute rheumatism.

attacked while others are passed over. It is surely, therefore, not unreasonable to suppose that the fibrous tissues of the heart may be implicated while those of the joints are left unharmed. In addition to the preceding, syphilis may be an occasional cause of the heart lesion, for valvular imperfection is sometimes found in very young infants, the subjects of inherited syphilis.

Atheromatous degenerations, which are so common a cause of valvular lesion in the adult, rarely occur in early life. It once, however, happened to me to meet with a small calcareous mass on one of the aortic valves in a little girl three years old. The mass had given rise during life to a systolic murmur which was most intense at the base of the heart, but could be heard distinctly at all parts of the chest. This child had never had rheumatism, as far as could be discovered, but had suffered from measles nearly two years previously.

Rickets has been said to be a cause of hypertrophy of the heart; but I cannot say that I have ever myself met with a case of cardiac enlargement which I was able to attribute to the chest distortion produced by this disease. When the framework of the thorax is much deformed, the heart is, no doubt, forced more forwards towards the wall of the chest, and a larger area of impulse is consequently perceptible. It is common in such cases to be able to feel the contractions of the right ventricle in the epigastrium; but this sign alone is insufficient proof of enlargement of the right side of the heart in the absence of extension of dulness to the right of the sternum, and other necessary signs of that condition.

In some cases valvular lesions are probably congenital in their origin, arising from endocarditis occurring during intra-uterine life. In most of these cases the valves on the right side of the heart only are attacked. Chronic valvular disease, according to some authors, is more common in boys than in girls; but my own experience would point to a directly opposite conclusion.

Morbid Anatomy.—In most cases of chronic valvular disease in the young subject the lesion consists in a beading or puckering of valves or other cause of insufficiency, or in a narrowing of the valvular opening. The valve most commonly affected is the mitral; the next, that closing the aorta. Beading of the tricuspid valve is rarely seen. This lesion, however, occurred in a case under my care in the East London Children's Hospital. A girl aged thirteen was admitted, suffering from general venous congestion, cyanosis, and anasarca. The child's fingers were clubbed, and her breathing was hurried with some degree of orthopnœa. The patient was said never to have had rheumatism, but had suffered from measles and scarlatina, and seven years previously had had an attack of chorea, from which all her trouble was dated. On examination there was evidence of great hypertrophy of the left ventricle, and a strong pre-systolic thrill and loud pre-systolic murmur were discovered at the apex. There was also a short diastolic thrill at the base to the left of the sternum, and a diastolic murmur was heard at this spot. There were, in addition, signs of double hydrothorax. On examination of the body after death, the heart was found to be very large, especially transversely, and to weigh twelve and a half ounces. The right auricle and ventricle were much distended with dark *post-mortem* clot; and were both dilated, the ventricle being much hypertrophied. The tricuspid valve seemed to be competent, and measured three and a half inches in circumference. Its edges on the auricular surface were fringed with papillæ which measured about one-eighth of an inch in length. The left auricle was dilated and hypertrophied to a less degree

than the left ventricle. The mitral orifice was contracted to a mere slit, with a circumference of one inch. The pulmonary artery was very large, but the valves were competent. The aortic orifice leaked very slowly by the water test, but had probably been competent during life. The lungs and other organs showed the usual signs of prolonged venous congestion.

The heart was shown at a meeting of the Pathological Society by my colleague, Dr. Radcliffe Crocker. In his comments upon the case, Dr. Crocker suggested that the basic systolic murmur had been probably due to a temporary incompetence of the pulmonary valves, owing to dilatation of the artery from extreme congestion of the lungs. Such a cause for pulmonary regurgitation is supported by the authority of Hope and Hayden. The tricuspid valve is seldom diseased primarily. When the seat of thickening or other lesion, it almost always seems to be affected secondarily, being usually found, as in the above case, in connection with a serious stricture of the mitral orifice.

Adhesion of the layers of the pericardium is found in not a few cases. The adhesions are often very thick and strong; and the lymph appears to have penetrated between the muscular fibres of the heart; for these are often torn in the attempt to separate the firmly attached serous membrane. Great hypertrophy and dilatation of the organ usually accompanies this condition.

It is important not to mistake for pathological beading of valves a condition to which Parrot has drawn attention. According to this observer, in a large proportion of infants who die during the first month after birth, hæmatomata and fibrous nodules are found on the auriculo-ventricular valves. The *hæmatomata* are little spherical or conical tumours of a dark purple or nearly black colour. In size they may be so small as scarcely to be visible to the unaided sight, or may reach the size of a millet-seed. They are placed singly or are arranged in groups. These little projections are seated exclusively on the mitral and tricuspid valves at the part where the tendinous cords are inserted. They lie close to the free edge of the valve, and are covered by the most superficial layer of the endocardium. In a short time they lose their colour, and sink down into little flattened prominences before they finally disappear. They cease to be visible shortly after the end of the first month of life. Parrot attributes their origin to rupture of intravalvular vessels. The *fibrous nodules* occupy the same situation as the preceding, and are seen as little flattened projections widened towards the base. They are composed of a dense fibro-elastic tissue. These nodules, especially the former, occur too frequently, and are too harmless in their character, to be ranked as pathological lesions, for no ill results appear to follow their presence on the valves. Strictly speaking, no doubt, they are not healthy productions, but they scarcely merit the name of disease.

The effect upon the heart's substance of the morbid changes in the valves is much the same in the child as in the adult. Hypertrophy and dilatation follow, and in severe cases may reach an extreme degree. In the young subject there is great power of compensation; and we often find that the vigour of the heart becomes rapidly increased so as to make up for the valvular deficiency, and the health of the child is seemingly unimpaired. In examining the heart in early life we must not make the mistake of attributing all murmurs to valvular imperfection—that is to say, to a degree of imperfection injurious to health. It is more common in the child than in the adult to find a systolic murmur at the apex of the heart, without any other sign of regurgitation through the auriculo-ven-

tricular opening. Such a murmur may persist for years, and finally disappear without having led to any alteration in the site of the apex beat, or other indication of ventricular hypertrophy. In such cases there is probably some roughening of the surface of the valve, which, however, still remains perfectly competent to perform its functions.

Symptoms.—A valvular lesion of the heart does not necessarily give rise to symptoms of discomfort; and it seems that in some children years can pass without any sign of distress being manifested on account of the cardiac mischief. It is common to find signs of valvular insufficiency in a child who has been brought for advice on account of some casual derangement quite unconnected with the condition of the heart; and even in cases where breathlessness has been noticed, it is often a recent symptom, while the enlargement of the organ indicates that the valvular lesion is of much more remote origin. When regurgitation is slight, the increase of power quickly acquired by the heart compensates completely for the defect, and no unfavourable symptoms are noticed until dilatation occurs, or a new attack of endocarditis aggravates the original imperfection.

Usually, the earliest and by far the most commonly present symptom is breathlessness. It is noticed that when the child plays at any boisterous game, he becomes very pale, and pants in an unusual manner. If very pronounced, the symptom may be accompanied by some lividity of the lips, and pain about the chest. In advanced cases, where much dilatation has ensued, orthopnœa may be present, and is a symptom of great gravity; and sometimes attacks of syncope are noticed. Palpitation is complained of in childhood less commonly than in adult life; but if the patient be anæmic, the heart's action may be tumultuous on slight exertion. Anæmia is a frequent consequence of the more aggravated forms of cardiac lesion. As in the adult, it is usually present if there be insufficiency of the aortic valves; but even in this case it may not be noticeable as long as the child is kept quiet. A little girl lately under my care, with aortic and mitral regurgitation, always had a good colour as long as she remained in the hospital; indeed, the healthiness of her complexion was the subject of remark by those who were acquainted with the serious lesion under which she was labouring.

Hæmorrhages sometimes occur. The nose may bleed repeatedly; and in older children hæmoptysis may be seen, especially if there be mitral stenosis as well as regurgitation. A little girl, aged twelve years, with mitral obstructive and regurgitant disease and great hypertrophy of both ventricles, frequently expectorated blood. The symptom would be probably met with more frequently were it not for the childish habit of swallowing all sputa brought up from the lungs. Another common consequence of the pulmonary congestion induced by the valvular lesion and the resulting tendency to catarrh, is cough. This is usually short and hacking; but if loose, for the reason stated is rarely accompanied by expectoration. When dilatation of the heart occurs, œdema follows quickly, and the disease then presents the same distressing features which are so familiar to every one in the case of the adult.

An occasional accident is embolism. This is sometimes the consequence of ulcerative endocarditis, disintegrating particles of an infective organic matter being carried off into the circulation and deposited in various organs, where they produce the consequences known to follow the presence of such infarcts. This complication, which is accompanied by high temperature and symptoms of blood contamination, has been already referred to (see page 158). It appears, however, that an ulcerative process

is not necessary to the separation of portions of fibrinous matter from the valves. We occasionally meet with cases where a child, the subject of recognised heart lesion, but making no complaint and appearing to be little troubled by his infirmity, suddenly becomes paralysed on one side from obstruction of the middle cerebral artery. The symptoms which accompany the onset of the paralysis vary. The child may vomit repeatedly; or be seized by convulsions followed by unconsciousness; or pass into a state of delirium or even violent excitement. Sometimes the embolism takes place more quietly; and nothing is noticed until it is found that the child's face is drawn, and that one side of the body has lost its power.

A little girl, aged six years, had been subject for sixteen months to shortness of breath after any exertion, and at such times to blueness of the lips. She had never been known to have rheumatism; but, six months before her admission to the hospital, had had an attack of measles, which had been followed by whooping-cough. There was a suspicious history pointing to syphilis, and the child was being treated by one of my surgical colleagues for keratitis. Her temperature was normal.

On May 10th, the patient was noticed to be dull and apparently sulky. She passed her urine and fæces once involuntarily, which she had never done before; and her temperature on that evening was 99.6°. On the next morning the mercury registered 99.4°, and the child's mouth was noticed to be drawn to the left side; she could not stand; her right arm was completely useless; and her right eye closed imperfectly. In addition, she was aphasic. Although drowsy, she could be easily roused, and she took her food well, having no difficulty in swallowing.

On examination of the heart, a loud systolic murmur was heard all over the front of the chest, and also at the back; but it was louder on the left side, posteriorly, than on the right. In the left axillary region it was well heard, but became greatly diminished in intensity at the posterior axillary line. In front, the pitch of the murmur was highest at the base of the heart, and fell perceptibly towards the left nipple; but in intensity of sound there was little difference between the nipple and the upper part of the sternum. The point of maximum intensity appeared to be the pulmonary valves. The apex beat was in the fifth interspace in the nipple line, and the right border reached nearly a finger's breadth beyond the right margin of the sternum. There was no clubbing of the fingers nor any signs of cyanosis, at least while the child was at rest. That evening (May 11th) the temperature was 101.4°.

On May 12th (the second day of the paralysis), the temperature was 101.6° at 8 A.M., and rose in the evening to 103.8°. The incontinence of urine still continued, and the paralysis and aphasia remained the same. The child was perfectly conscious and intelligent, and tried in vain to speak. Her tongue, when protruded, deviated to the right side; the right arm and leg were perfectly flaccid, and their sensibility was diminished. The muscles responded well to the interrupted current. The temperature fell somewhat on the third day of the paralysis, but remained more elevated than natural, in the evening, for several weeks, with occasional rises. Thus, on one or two occasions it suddenly rose to 102°; and on one occasion to 104°, in the evening, and then quickly became normal. During the child's stay in the hospital there was no sign of embolism of other organs. Her right leg rapidly improved, and she regained the power of walking; but the arm continued powerless, and when discharged on August 14th, the patient was still unable to speak.

In this girl there was doubtless a congenital lesion of the heart, consist-

ing in part of narrowing of the pulmonary artery, and, as a consequence, the right side of the heart had become hypertrophied. It is probable, also, that there was insufficiency of the mitral valve, from endocarditis occurring after birth; and that it was from this source the embolus was derived, which had become arrested in the middle cerebral artery.

In another case, a boy, aged eleven years, who was suffering from stenosis and insufficiency of the mitral orifice, was taken suddenly with paralysis of the right side, combined with difficulty of speech, while recovering from an attack of small-pox.

It is not always in the arteries of the brain that the embolus is arrested. The fragment may lodge in the kidney, producing albuminuria; in the liver, causing enlargement and slight jaundice; and in the spleen, leading to perceptible swelling of the organ. In the latter case, according to Dr. Gee, the infarction is peculiarly liable to be associated with fever of the hectic type, without the endocarditis to which it is owing being necessarily ulcerative.

There is one other result of embolism which may be noticed, although its consequences are not so immediately obvious. Aneurismal dilatations in the child are now known, from the researches of Dr. J. W. Ogle and others, to be due to this accident. Aneurisms seated on the small arteries of the brain, leading to fatal hemorrhage, sometimes occur in young subjects, and are doubtless to be attributed to plugging of the vessel by this means. The same condition is also occasionally seen in the larger arteries, as the external iliac.

Besides embolism, other occasional complications may be observed in cases of heart disease. On account of the rheumatic disposition of the majority of such patients, evidences of that constitutional state are often observable. Skin eruptions, especially eczema, erythema, and urticaria, are common; pleurisy and pericarditis are not unfrequent lesions; and joint pains are often complained of. Another common complication is some form of nervous derangement. Chorea is liable to occur in the subjects of heart disease; and Dr. Sansom has remarked the occasional association of epilepsy with cardiac mischief. In some cases, impairment of nutrition is the only evidence of ill health. A little boy, aged seven years, was brought to the hospital with signs of mitral stenosis and insufficiency. Still, the boy had no cough, and did not appear to be breathless on exertion. For six months, however, he had been persistently wasting, although, with the exception of occasional abdominal pains, there was no evidence of digestive derangement, or other sufficient cause for the impaired state of his nutrition. In some cases the wasting is combined with anæmia, which may even reach an extreme degree.

The most common form of heart lesion met with in childhood is regurgitation through the mitral orifice. Next in order of frequency is regurgitant combined with constrictive disease. Then follow a combination of constrictive and regurgitant disease of the aortic orifice, and constrictive disease alone. Stenosis of the mitral orifice, unaccompanied by insufficiency of the valve, is not common in the child; and regurgitation through the aortic orifice is far rarer than it becomes in after-life years. It will be unnecessary to describe the physical signs and special symptoms connected with these various lesions, since they do not, as a rule, present any peculiarities dependent upon the early age of the patient. With regard, however, to aortic regurgitant disease, it may be remarked that this form of heart lesion, as has been previously stated, is not always accompanied in the child by any striking pallor of the complexion; nor is it often indi-

cated by any marked alteration of the pulse. The pulse is regular, and is weakened by raising the hand above the head; but the characteristic hammer-like beat of the artery is usually absent. Moreover, the pulsation of the more superficial vessels, although visible if narrowly looked for, is seldom sufficiently marked to catch the eye unsought.

Terminations.—When death occurs in cases of heart disease, during childhood, the fatal event is often brought about by some inflammatory complication. Children so afflicted are more weakened than is the case with a healthy subject, by casual derangements, and have less vigour with which to bear up against a serious disease. When death is due directly to the heart lesion, it generally occurs in cases where the pericardium has become firmly adherent to the substance of the heart, and has led to serious interference with the nutrition of the organ. The cavities become greatly dilated, and the feeble walls are no longer equal to the discharge of their functions. Great congestion of the lungs follows, and there is general stasis of blood in the systemic venous system, with its inevitable consequences. In most cases of death from cardiac dropsy, the pericardium is found firmly adherent to the heart.

Sudden death is not very common from cardiac lesion in the child. When it takes place it is probably the result of clotting of blood in the large vessels of the heart. A little girl was under my care in the East London Children's Hospital for chorea, which had followed closely upon an attack of sub-acute rheumatism. The child was low and depressed, and her complexion was markedly anæmic. The choreic movements were bilateral, affecting the face, tongue, and eyes, but were only moderate in degree. When she took food into her mouth, the muscles of deglutition acted convulsively. On examination of the heart there was a loud bellows murmur at the apex, conducted well into the axilla. This evidently dated from some previous attack of rheumatism. During the girl's stay in the hospital, fibrous nodules were developed on the tip of each spinous process of the vertebræ. The child was treated at first with chloral; afterwards, with quinine and iron. She took three ounces of port wine daily. In spite of the treatment, she wasted, and seemed to grow weaker. After a time, as no improvement occurred, the patient was removed by her friends; and we afterwards heard that she died quite suddenly on the following day. No *post-mortem* examination was obtained.

Sometimes the clotting takes place more slowly. A little boy, suffering from mitral regurgitant disease, with much dilated hypertrophy of the left ventricle, was noticed for two days to be uneasy and restless, with some dulness of manner. On the third day he was seized with dyspnœa, which became gradually more severe. The child grew excessively restless, and threw himself about in his bed. When I saw him (at 3 P.M.) he was sitting up in bed, supported by the nurse. His eyes were staring and wild-looking, his face much congested, his lips and cheeks purple, his finger-nails blue. The breathing was laborious, and the nares acted. The heart's action was excited and forcible, but the pulse at the wrist was excessively weak. The boy was very restless, constantly changing his position and throwing his arms about. He was quite sensible, and made no complaint.

Six leeches were applied to the region of the heart. They bled freely, but the symptoms continued, the lividity deepened, and the boy died in a few hours. No examination of the body was allowed; but there can be little doubt that death was occasioned by *ante-mortem* clotting in the heart or large vessels near their origin.

Diagnosis.—The existence of a valvular lesion of the heart is ascertained

almost as readily in the young subject as it is in the adult. Even if a child cry during the examination of his chest, the heart sounds can usually be perceived during the short interval of inspiration. In most cases, however, if the patient be not frightened by abruptness of movement, and if he be allowed to play with the stethoscope before the instrument is applied to his chest, a young child will submit to the process of auscultation without any complaint.

When a murmur is detected, we have to decide if it be of recent origin. A recent murmur is soft and of low pitch; but as time goes on it becomes harsher and its pitch rises. If the lesion affect the calibre of the orifice at which it is generated, or interfere with the closure of the valves, it soon leads to some enlargement of the heart and alteration in the position of the apex-beat. If, in a child who is suffering from acute or sub-acute rheumatism, we detect a harsh, high-pitched, systolic murmur at the apex, we may conclude that the cardiac lesion dates from a period considerably anterior to the existing illness. In noting the position of the apex-beat, and its relation to the nipple, it is important to remember that in many children the nipple lies at a lower level in the chest than is the case in the adult. Instead of the fourth rib, it is often placed on the upper border of the fifth. In such a subject the normal position of the apex-beat would be in the fifth interspace just below the nipple and slightly to its inner side.

In every case of indisposition in the child, however apparently trifling it may seem, the heart should be carefully examined, for, as has been said, a valvular lesion may be present without giving rise to symptoms of discomfort, and evidence of disease is sometimes found very unexpectedly. There are, however, certain combinations of symptoms which should at least excite suspicion. Attacks of palpitation in the child are less commonly than in the adult the consequence of functional derangement or dyspeptic disorder, and, if present in a marked degree, should suggest cardiac mischief. Frequent epistaxis in an anæmic child is not uncommonly the result of mitral disease; and if a child who is not anæmic becomes breathless after exertion, especially if the shortness of breath is accompanied by lividity of the lips, the symptom should excite the strongest suspicions.

The presence of a murmur at the apex is not in itself sufficient evidence of a serious lesion. Heart murmurs in children not uncommonly disappear. This statement is true not only of recent soft murmurs, such as are heard in cases of chorea or acute rheumatism, but also of louder and harsher murmurs which are known to be of longer duration. In all cases where a harsh murmur is detected, signs of hypertrophy of the left ventricle should be searched for. If no enlargement be discovered, and the apex-beat remain in its normal position, it is highly improbable that any serious valvular defect is present (see page 163). The apex-beat of the heart may, however, be in an abnormal position without the alteration in site being the result of endocardial disease. The causes which lead to displacement of the organ are referred to elsewhere (see page 402).

Again, a basic heart murmur may be produced by causes acting from without. Pressure upon the large vessels by caseous bronchial glands may so narrow the channel as to give rise to a systolic murmur. In these cases, however, other signs will be found, explanatory of the abnormal phenomenon (see page 181).

The detection of a cardiac murmur will sometimes furnish an explanation of symptoms which would be otherwise obscure. In all cases where hemiplegia occurs suddenly in a child, attention should be at once directed

to the heart. But mere pyrexia is sometimes caused by embolism in other organs, where irritation and disturbance give rise to less characteristic symptoms than are found when a portion of brain is suddenly rendered useless. In cases of ulcerative endocarditis, continued high temperature, and a condition bearing a close resemblance to enteric fever, may be induced by the accident; but even when the fragments of organic matter thrown off from the valves have not this infective character, an irregular pyrexia may be set up. Careful search in these cases will often discover some local symptoms suggestive of the presence of an infarct. The spleen may be found to be swollen; the liver may be enlarged, with slight jaundice; albuminuria may occur from embolism of a kidney; or petechiæ may be noticed in the skin from obstruction to the circulation through the cutaneous capillaries. In all these cases the source of the mischief will be discovered on examination of the heart.

Prognosis.—As long as the cardiac lesion gives rise to no symptoms, the prognosis is very favourable. If a mitral murmur, although harsh in quality and high in pitch, be accompanied by no signs of hypertrophy of the left ventricle, there is reason to hope that it may ultimately disappear. If signs of enlargement of the heart are noticed, we cannot expect that the valvular lesion will be recovered from; for a temporary dilatation of the left ventricle, such as is apt to occur in chlorotic girls, I do not think is common in the child; but as long as the health of the patient seems to suffer in no way from the disease, little apprehension of immediate danger need be entertained. Directly, however, any symptoms are noted indicating impairment of nutrition or obstruction to the circulation, there is cause for anxiety. Serious breathlessness, lividity on slight exertion, marked anæmia and perceptible loss of flesh, are all unpromising symptoms.

The prognosis is more favourable in cases of mitral insufficiency than of mitral stenosis. If the mitral disease has led to tricuspid insufficiency, speedy dilatation of the cavities of the heart may be anticipated. When signs of dropsy begin to be perceived, the danger is really imminent. By judicious treatment and careful nursing the end may be postponed, but cannot in any case be far distant.

Attacks of rheumatism and chorea, being apt to aggravate the valvular lesion, are greatly to be dreaded; and all forms of inflammatory chest affection, as they increase the work of the heart, are likely to have injurious consequences. Embolism is a very serious accident. If the embolus lodge in the middle cerebral artery and produce hemiplegia, the complication, although it may not destroy life, may lead to permanent impairment of movement of the limbs. In the second of my cases of cerebral embolism referred to above—a boy eleven years old—the patient, two years after the attack of paralysis, had very little use of the right arm. He could walk, however, and had recovered the power of speech. If the brain be unaffected, and the embolism occur in other organs, the resulting irritation and disturbance may prove fatal, even although the fragment detached from the valve be destitute of any infective property.

Treatment.—In cases where a valvular lesion exists without producing any sign of inconvenience, there is no reason for special medication. The parents should, however, be cautioned to spare the child all unnecessary fatigue, and to prevent him as much as possible from taking part in violent exercises. Excitement of the heart should be prevented. In the case of a schoolboy this is, of course, a matter of great difficulty; for, as long as the child is untroubled by uneasy sensations, he cannot be convinced of the necessity for quiet. Little girls are fortunately less addicted to boisterous

games. Measures should be taken to prevent fresh attacks of rheumatism, and the child should wear woollen underclothing all the year round.

Directly palpitations, breathlessness after exertion, or anæmia, begin to be noticed, more active measures must be taken. Too energetic action of the heart must be quieted by digitalis. This valuable drug has always seemed to me to be well borne by young patients. The best form in which it can be given is the infusion, of which a child of ten years old will take, without any inconvenience, two drachms three times in the day. On account of the importance in these cases of keeping up a gentle action of the bowels, I usually combine the remedy with a mild aperient and a vegetable bitter. One drachm each of the infusions of digitalis, senna, and calumba, given three times a day before meals, is often followed by great benefit; or, if desired, the proportion of digitalis may be doubled. If the digestion is weak, a few drops of dilute nitric acid may be added to the draught. When any signs of anæmia are present, iron should be given in addition. This medicine is best administered separately, and I prefer the exsiccated sulphate in these cases to all other forms of iron. Four or five grains of the salt may be given in glycerine directly after each meal.

Great care is necessary in the matter of diet. The child is not to be overloaded with food because he is weakly and seems to be losing flesh. His meals should be small, that his stomach may not be oppressed; and the quantity allowed should be such as his digestion can bear and his tissues readily assimilate. If the blood be overcharged with superabundant material which is useless for purposes of nutrition, extra work is thrown upon the excretory organs, whose duty it is to eliminate it from the system. It is well to order four small meals in the day, of which one may consist of meat with vegetables, a second of a piece of fish or an egg, and the two others of milk and bread and butter. The quality of the food should be also attended to. All rheumatic subjects have a special tendency to flatulence and acidity; and this tendency is favoured by excess of starchy matters and sweets. It is often remarkable to note the immediate improvement which takes place in the condition of a child who has been pampered and overfed "because he is delicate," when these simple rules are attended to.

When dilatation of the heart occurs, and leads to stasis of blood in the systemic veins and general œdema, diuretics are indicated. This condition must be treated in the child upon the same principles as are followed in the case of the adult. The kidneys must be stimulated to act by the acetates of potash and ammonia, spirits of nitrous ether, juniper, fresh broom tops, squill and digitalis. One especially valuable diuretic in these cases is the tincture of cantharides. I have seen a formidable amount of dropsy clear away completely in a child of nine years old under the influence of ten drops of this remedy given three times a day, after other means had been used without making any impression upon the effusion. I have tried the resin of copaiba, but the drug has proved of little service in my hands. Drs. Leech and Brackenridge speak highly of the value of caffein. The action of diuretics is greatly aided by dry-cupping the region of the kidneys, and afterwards applying a succession of hot linseed-meal poultices to the loins. For aperients, I prefer the compound jalap powder to elaterium, which has a very uncertain action on the child. Stimulants are of service, and unsweetened gin may be given in suitable doses as required. If it be necessary to puncture the legs, Dr. Southey's cannulæ

should be employed; and Dr. Goodhart's suggestion that these instruments should be steeped in some boiling germicide before being used, is one of distinct practical value.

When embolism occurs in a cerebral artery, producing hemiplegia, the bisulphite of soda may be given in doses of ten or fifteen grains three times a day. This drug has a marked action in rapidly relieving the phlebitis which is so common in women lately delivered; but my experience is too small to enable me to speak confidently of its value in the cases above referred to.

Part 8.

DISEASES OF THE MOUTH AND THROAT.

CHAPTER I.

THE DERANGEMENTS OF TEETHING.

The period of active development of the milk teeth is always a time of trial for the young child. Many an infant seems healthy and sturdy up to this point; but when the time of teething arrives his nutrition falters and he begins to fail. On this account mothers, if they do not look upon the eruption of the teeth as a disease in itself, are at least in the habit of attributing every complaint which occurs during the first two years of life to the influence of this normal physiological process. In the medical profession the views held with regard to the influence exercised by teething upon the infant economy were at one time very similar. At the beginning of this century, dental development was looked upon as one of the chief causes of death in the infant. One author classes it amongst the fatal diseases of childhood. Others estimate the mortality from this cause at one-tenth, one-sixth, one-third, and even one-half of the whole number of deaths under the age of two years. Even in the present day it is common to find dentition included in the etiology of almost every variety of nervous disorder occurring in the child.

The period of dentition coincides with that of the most active physical progress. Towards the end of the first year of life the follicular apparatus of the intestines is undergoing considerable development; the cerebro-spinal system is passing through a stage of rapid growth and high functional activity; and most organs and tissues of the body are in a state of active change. The evolution of the teeth is not, therefore, a solitary instance of developmental progress, but corresponds to a similar activity of growth in other parts. No doubt, a period, such as this, of quick transition is a period of exceptional susceptibility. Derangements of function are very liable to occur; but to attribute these exclusively to one of the many physiological processes of which the body is the seat, merely because this process is external and visible to the eye, while the others are internal and cannot be seen, is to generalize hastily, and from very insufficient data.

There is another reason why, at the time of teething, various forms of

illness are liable to arise. The stomatitis so commonly induced by the advance of a tooth in the gum, is a cause of pyrexia. A feverish child is very susceptible to chills, and is liable to be disordered by the irritating influence of unsuitable food. In such a state, also, the digestive power of the infant is weakened, so that the food on which he has been thriving may cease to agree. Derangements of the stomach and bowels, thus induced, if prolonged as they often are by improper treatment, cause serious interference with nutrition and not uncommonly bring the infant to the grave. To say, however, that in such a case the child dies from teething, is incorrect. He dies from mal-nutrition, brought on by persistence in forcing upon him food which is no food, because he cannot digest it. His diet, instead of supplying him with the nourishment he requires, ferments, turns acid, and sets up catarrhal diarrhœa; so that at last he succumbs, worn and exhausted by purging and starvation. The looseness of the bowels, which is so apt to occur during the period of teething, cannot be attributed with any justice directly to the process of dentition. The feverish child is attacked by intestinal catarrh, because his body for the time is more than usually susceptible to the influences which are capable of exciting that derangement; but teething is the cause, not of the purging, but of the fever. So, also, in the case of pulmonary catarrh, which in some subjects is a common accompaniment of the eruption of each separate tooth, it is to the pyrexia, and not to the accidental cause of the pyrexia, that the derangement is to be ascribed. In support of this view, it may be remarked that diarrhœa is a more common complication of dentition during the warmer months, when the weather is liable to sudden and unexpected changes, and the temperature varies rapidly while the dress of the child remains the same; and is less common during the winter, when more care is taken to guard the child's body from the cold. Again, the pulmonary accidents are more common in raw, damp weather, at the times when such disorders are especially apt to prevail.

On account of the early age of the infant, and for the reasons which have been given, the first dentition is more liable than the second to be accompanied by serious disturbances; but even in cutting the second crop of teeth, digestive troubles are likely to occur, as will be afterwards described.

The *first dentition* begins under normal conditions in the middle of the first year, and ends toward the beginning of the third. The eruption of the milk teeth may, however, be anticipated or delayed through individual peculiarity, or some abnormal constitutional state. Thus, cases occasionally occur in which the child is found to have a tooth when he is born. Such teeth are usually sharp and hook-shaped, and are often loose, consisting merely of the crown of the tooth embedded in a fold of the gum. Henoch has described another variety of congenital tooth, which is firmly fixed in the socket. The tooth is destitute of enamel, and looks yellow, with a rough surface. Henoch attributes the eruption to a periostitis of the alveolar border, which pushes the rudimentary tooth outwards by swelling and exudation within the socket.

It is not uncommon for teeth to begin to be cut at the third or fourth month; but in such cases the eruption of one or two teeth is usually followed by a pause, and the continuance of the process is deferred until the usual age. In certain states of the constitution, dentition is early. Thus, children with tubercular tendencies, or who suffer from a syphilitic cachexia, cut their teeth early, as a rule. In rickets, on the contrary, dentition is always late, and in exceptional cases no tooth may appear until the

end of the second or beginning of the third year. Ordinary malnutrition, when the child has not become rickety, does not interfere with the evolution of the milk teeth. In chronic diarrhœa, when the child is very weakly, and much wasted by constant purging, I have often noticed with surprise that the natural evolution of the teeth has been in no way retarded by the distressing complaint.

In an ordinary case the milk teeth appear in the following order:—Lower central incisors, upper central incisors, upper lateral incisors, lower lateral incisors, first molars, canines, back molars. Of these the first should appear between the seventh and ninth month. At twelve months old the infant should have cut eight teeth, and the four first molars should be in process of evolution. He should cut his eye-teeth (canines) between the sixteenth and twentieth month; and the whole number of the first crop (twenty) should have pierced the gum soon after the end of the second year. The teeth are usually cut in pairs; and after the completion of each group there is usually a pause before the evolution of the next group begins.

The order given above, although that which most commonly obtains, is yet often departed from in children whose health is perfectly good. Many babies cut their teeth "cross," as it is called. The lateral incisors sometimes appear before the central front teeth; the first molars may precede the lateral incisors; the last molars may precede the canines; and in a few instances I have seen a canine tooth cut before any of the first molars have appeared, but this last exception is a very rare one. Sometimes in rickety children, when dentition is greatly retarded, the first tooth to appear is one of the first molars. Thus, a rickety little boy under my care cut his first tooth—one of the first molars—at the age of two years. Another cut his earliest tooth—also a first molar—at fifteen months.

Although the full number of the milk teeth when dentition is completed is twenty, this number is not always reached. It may happen that certain teeth never appear at all. Thus, a little girl under my care, aged two years and nine months, was seen to have all the milk teeth except the two upper lateral incisors. On the left side there was a narrow space remaining between the left middle incisor and the canine; but in this space the gum was sharp, and there was no sign of a tooth. On the right side, the right central incisor and the adjoining canine were in contact. In the same way I have known the whole four canines to be absent. In some cases the peculiarity is a hereditary one. In a case which came under my notice the left lower lateral incisor was wanting in a little girl of two years old. The same incompleteness of the milk teeth had occurred in the mother. This lady had three other children—all boys—whose early dentition had presented no deviation from the normal type. It is certainly curious that the irregularity which had occurred in the mother should have been reproduced in the only one of her children whose sex was the same as her own. It is important to be aware that incompleteness of the first crop of teeth does not necessarily imply that a similar irregularity will be met with in the second. Mr. Tomes, in his work on dental surgery, refers to the case of a little girl who cut none of her milk teeth, but in whom the permanent set appeared as usual. Sometimes, instead of too few, too many milk teeth are developed. A little girl between two and three years old lately came under my notice who had five perfect incisors in the lower jaw.

The process of dentition is much easier in some children than it is in others; but it is difficult to assign a reason for these differences. The fa-

cility with which the teeth appear seems to be dependent more upon individual peculiarity than upon actual bodily health. Teeth cut early are not always cut easily; and delayed dentition is not always, nor even usually, troublesome. A perfectly healthy child may cut his teeth with much suffering, although fully up to time; while a rickety child, although very late in teething, may suffer no inconvenience at all in the process.

Symptoms.—The symptoms which accompany the eruption of the milk teeth are very variable. Sometimes no signs at all are noticed, and nothing is known of the matter until accident discovers the presence of a tooth through the gum. Usually, however, the infant is restless and irritable; he flushes and is feverish. A copious secretion of saliva occurs, and the child "dribbles," the fluid flowing from his lips over his chin. At night he is disturbed in his sleep, and in the daytime may be noticed suddenly to give a little cry, or contract his features as if in pain. He also makes "munching" movements with his jaws, sucks his lips, and gives every indication of uneasiness in his gums. Most writers on this subject, following Hippocrates, describe a painful itching sensation of the gum, which is said to be present in these cases, and whether or not the sensation is correctly described as an itching, there is no doubt that it causes distress, and appears to be relieved by gentle frictions with the finger or any other smooth object. On examining the mouth, the gum is found to be swollen and cushiony, and sometimes, shortly before the tooth appears, is very tense and hot. At this time, friction, which before was pleasant, becomes very painful. The gum is evidently tender, and the child may be sometimes seen to hold his mouth half open, as if he feared to close his jaws. All the symptoms subside when the tooth pierces the gum.

The pyrexia of teething is very irregular. It is often higher in the morning than at night, and is liable to rapid variations. Thus, a little boy, aged fifteen months, had eight teeth, and was cutting his left lower molar. At 6 A.M. his temperature (in the rectum) was 99°. At 10 A.M. it had risen to 103.8°; and at 10 P.M. was 102.2°. It gradually fell during the night (being taken every four hours), and at 10 A.M. on the following morning was 100°. It then rose again to 102° at 6 P.M.; fell to 98° at 2 A.M. (third day), and at 10 A.M. stood once more at 103.8°. A good dose of castor oil was then given, and the temperature at once became normal.

In a teething infant the mercury often registers 104° at 8 or 9 A.M.; indeed, in a young patient such an amount of fever in the morning is alone a circumstance of great suspicion, and should at once lead us to examine the state of the gums. Few diseases, at this early age, cause so much pyrexia at this period of the day.

The symptoms which have been enumerated do not necessarily herald the immediate appearance of the tooth, but will be often found to come and go—waxing and waning in severity, and sometimes subsiding altogether, so that the infant passes through alternate periods of suffering and ease for some days, or even weeks, before the tooth comes through the gum. Usually, more distress is experienced during the eruption of the canine teeth than at any other period of dentition.

Complications.—The symptoms just described may be looked upon as natural to the process of teething. In many cases, other symptoms are noticed, expressive of derangements which do not follow naturally from the evolution of the teeth. They arise as accidental troubles, and must be attributed to the ordinary causes of ill health acting upon a body in a state of irritation and fever, and therefore peculiarly susceptible to their influence. These are stomatitis and aphthæ; repeated vomiting or diarrhœa,

more or less prolonged, from catarrh of the stomach or bowels; cough from pulmonary catarrh; otitis; various forms of skin disease, and certain troubles of the nervous system, such as squinting, convulsions, etc.

The *stomatitis* is of the simple form, as a rule, and consists of an erythematous redness of the mucous membrane of the gums over a considerable area. The affected gums are somewhat swollen, and are hot and tender to the touch. If the tenderness is great, the child may refuse to suck the bottle or its mother's breast. High fever always accompanies this complication. The ulcerative form of stomatitis is also sometimes present, and has the characters described in the following chapter.

Attacks of *vomiting* and *diarrhœa*, from acute gastric and intestinal catarrh, are common in teething children. For the reasons which have been stated, infants, whether teething or not, are at all times liable to ready disturbance of indigestion; indeed, at this age, digestive troubles form a large proportion of their ailments. Therefore, vomiting is especially apt to occur when the stomach is irritable and weak from pyrexia, unless the child's diet be promptly modified to suit the altered state of his digestive organs. In the same way, whether from the irritation of undigested food, or the sensitiveness of the heated body to even trifling variations of the external temperature, purging of a mild character is a very common symptom. If the teeth are cut in rapid succession, a looseness of the bowels may prevail to a greater or less degree during the whole period of dentition. If this looseness remains confined within moderate bounds, it may do no apparent harm to the patient; but it should not on that account be allowed to continue, for at any time a severe attack of inflammatory diarrhœa may supervene, with not improbably fatal consequences. This serious accident is especially liable to occur in hand-fed babies, who, while they are suffering from intestinal irritation, are naturally more than commonly sensitive to the disturbing influence of undigested food. The ordinary diarrhœa of teething consists of green or yellow matter, with small lumps of curd. It is often passed with straining, and its passage is preceded by griping pains.

In cases of chronic diarrhœa, the influence of teething is often distinctly pronounced. The irritation of the gum set up by the advancing tooth tends to maintain an irritable state of the bowels, so that, although the actual purging may be readily kept under control, an intolerance of milk and the fermentable articles of food continues to prevail, and is very difficult to overcome. Often in such cases, in spite of the most careful dieting, attacks of looseness are frequent; the child remains weak and low, and seems to make no progress towards recovery. When, however, the tooth appears, and a pause occurs in the process of dentition, immediate improvement is noticed; the motions become healthy, and flesh and strength begin to return.

Pulmonary catarrh, with a hard cough, is a common complication of teething; and the high fever by which these attacks are accompanied may cause great anxiety, as it gives a false appearance of gravity to what is really a trifling ailment. The child coughs a more or less hard cough, which may even have a "croupy" sound; his nares dilate in inspiration, and the breathing is hurried. His mouth is hot and dry, and dribbling, if it had been previously noticed, ceases when the fever begins. The child is very irritable and restless; his tongue is furred, and his bowels are confined. The catarrh is usually relieved by appropriate remedies; but if care be not taken, and the child be exposed to cold or draught, a really severe bronchitis or broncho-pneumonia may be induced.

Otitis is a not uncommon accident at this period. Dr. Woakes has explained the mechanism by which inflammation of the middle ear is produced. Irritation is conveyed from the inflamed gum to the otic ganglion, and is then deflected to the vessel supplying the tympanic membrane. As a consequence, this membrane becomes acutely congested, giving rise to severe pain; and if the irritation persist, it may lead to inflammation and suppuration within the tympanic cavity. The membrane soon becomes perforated, and a purulent discharge issues from the external auditory meatus (see otitis).

The forms of *skin disease* which are liable to arise in teething infants are the erythematous rashes and eczematous eruptions. The former are usually transient, and readily subside; but the latter may spread over the greater part of the body, putting the child to the greatest distress from constant itching, and obstinately resisting treatment.

Of the *nervous disorders* which are apt to occur at this period it is very difficult to say how far they are due to the actual process of teething, or to what degree the rapid development of the cerebro-spinal system is answerable for these accidents. In some impressionable infants a very tense, swollen gum may, I believe, like any other variety of irritation in any part of the body, be sufficient to induce an eclamptic attack. In many cases the convulsion is probably to be ascribed to otitis, set up by the state of the gum. Trousseau has suggested that a high degree of fever may be in itself a sufficient cause for the nervous trouble; but I have never met with a case of convulsions in the child which I could attribute to this cause alone; for the initial convulsion, which is so common at the beginning of many acute diseases in early life, is probably owing to other causes than mere elevation of temperature. It is easy to understand that an excitable infant, whose whole nervous system is in a state of disquiet from pain, disturbed sleep, and continued dental irritation, may have convulsions induced by a very slight additional stimulus. In such a child a lump of indigestible food, or a scybalous nodule in the bowels, may increase the irritation to an irresistible degree, and it is probable that some such secondary cause often has a share in the production of the eclamptic seizure.

In the *second dentition*, the order in which the teeth appear is more regular than in the case of the first. The eruption of the permanent teeth begins between the ages of five and a half and seven years with the appearance of a permanent molar behind the last of the temporary teeth. Next come the central incisors about the eighth year; the lateral incisors at about the ninth; the first and second bicuspids in the place of the temporary molars at the tenth and eleventh; the canines between the twelfth and thirteenth, and the second molars at about the time of puberty. The last four permanent molars are cut later. The only exception to the above sequence that I have noticed is that in rare cases the eruption of the central incisors precedes the appearance of the early molars.

In certain exceptional cases the milk teeth have been known to be retained into adult life. Some years ago Mr. Napier showed at a meeting of the Royal Medical and Chirurgical Society the cast of the mouth of a young lady of twenty-five in whom the milk teeth were still retained, with the exception of the upper central incisors. The same abnormality had occurred in the case of the lady's sister, and it had been also noticed in one of the mother's relatives.

The beginning of the second dentition in delicate children is often accompanied by signs of gastric or intestinal irritation. The child seems very sensitive to changes of temperature, and is subject to attacks of loose-

ness of the bowels. He is often irritable and restless; looks pale, with dark circles round his eyes, and sleeps badly at night. His stools often contain mucus in large quantities. Such children are very liable to the so-called "night terrors," which in all cases, so far as my experience has extended, are merely attacks of nightmare, the consequence of indigestion and acidity, and can be at once arrested by diet and suitable treatment. If, however, care be not taken to modify the child's diet to suit the degree of digestive weakness, the derangement continues and the patient begins to lose flesh; indeed, in some cases a great degree of emaciation is reached.

Diagnosis.—The clinical importance of the first dentition consists in the frequency with which the process is found to complicate all the various derangements and diseases to which infancy is liable. The pyrexia induced by teething often infuses an element of obscurity into a case which would otherwise present little difficulty. In infants we must be always prepared for this source of confusion, and should never forget to ascertain the state of the gums before bringing our examination to a close.

In the case of pulmonary catarrh attacking a teething child, the combination of fever with cough, rapid breathing and active nares, suggests the presence of pneumonia. It will, however, be noticed that the child does not look ill; his cough is looser and less hacking than the cough of pneumonia; his pulse-respiration ratio is not perverted, and the history is not that of inflammation of the lung. In searching further for a cause for the pyrexia, the gums will be noticed to be tense and swollen, and the source of the fever is immediately explained. We must not, however, in all cases where the gums are hot and uneasy, at once conclude that they are the sole cause of the symptoms noticed. It sometimes happens that serious cerebral disease occurs in a teething child; and if, mistaking their nature, we attribute the nervous symptoms to dental irritation, we make a mistake which the friends of the patient are not likely readily to forget. Therefore, nervous symptoms occurring in the course of teething must in every case receive careful attention. Headache, mild delirium, vertigo, startings, twitches, and convulsive attacks are so commonly the consequence of general nervous disturbance from any cause, that they have lost all claim to be considered special manifestations of cerebral disease. If, however, the bowels become obstinately confined, the pulse slow and irregular, the breathing unequal and sighing; and if, in addition to these suspicious symptoms, we notice that the child frequently frowns and avoids the light; that he is sullen and drowsy, lies with his eyes half closed, and screams out suddenly as if in pain, we have every reason to fear the occurrence of tubercular meningitis. In all doubtful cases the effect of a mild aperient should be tried. Castor oil brings rapid relief in most of the disturbances of a teething child. Therefore, if the nervous symptoms disappear after the operation of this simple remedy, their purely functional origin is at once apparent.

In the case of diarrhœa from intestinal catarrh occurring in a teething child, there is not the same source of fallacy as in the other complications, for in ordinary cases looseness of the bowels at once causes pyrexia to subside.

Treatment.—The derangements which occur during dentition must be treated upon ordinary principles, and the reader is referred to the various chapters devoted to these derangements for information upon this subject. It may, however, be remarked that it is especially important in a teething child to keep the belly warm, and to avoid all sources of chill. Also, that

it is essential, in all cases where signs of gastric or intestinal disturbance are noticed, to reduce at once the quantity of fermentable food which is being taken, as fermentation and acidity are the earliest consequences of the catarrhal derangement. In cases of diarrhœa there should be no hesitation about arresting the looseness as quickly as possible. A dose of castor oil should be given ; and if the purging do not cease after the action of the aperient, it will yield readily to bismuth (gr. v.–x.) with aromatic chalk powder (gr. v.), or to one-grain doses of oxide of zinc. If fever is high, or the gum seems to be especially painful, great relief will follow an aperient dose of castor oil. This at once reduces the pyrexia and calms the tension and uneasiness of the gum. The irritation of the swollen and inflamed gum may be reduced almost immediately by rubbing the afflicted part with the finger, moistened with fresh lemon-juice. Some smarting is at first excited by the application, and the child's wailings are increased ; but after a few minutes the smarting subsides, and with it disappears much of the discomfort previously experienced. This practice is common, I am told, amongst the native nurses in the Cape Colony.

The practice of lancing the gum, which at one time was looked upon as a sovereign remedy for all the disorders incident to the period of teething, has now but few supporters. The only condition for which I should feel inclined to have recourse to it is that in which convulsive attacks occur in a child whose gums are very tense, swollen, and tender. In such a case, where it is our object to remove all sources of irritation, the gums may be lanced freely with advantage. Lancing the gums with any view of thereby hastening the evolution of the tooth below, is, of course, putting the child to very unnecessary pain.

If, during the *second dentition*, signs of digestive disturbance are noticed, and the child looks pale and begins to waste, and especially if the symptoms called "night terrors" are noticed, the bowels should be acted upon by a mild aperient every three or four days ; the diet should be regulated, restricting the quantity of farinaceous food and sweets (especially forbidding potatoes, puddings, cakes, and fruit), and the child may take six or eight grains of bicarbonate of soda two hours after each meal. I have never seen a case of "night terrors" which has resisted this treatment.

CHAPTER II.

STOMATITIS.

Infants and young children are very liable to derangement of the mucous membrane lining the interior of the mouth. Partly on account of the irritation of the gums resulting from dentition, partly on account of the ready sympathy which exists between the membrane lining the buccal cavity and that of the digestive apparatus with which it is continuous, an inflammatory condition of the mouth is a common disorder. In a healthy child the lesion produces little more than passing discomfort, and readily subsides. In a cachectic or weakly subject the derangement may be more serious, and in some cases the inflammation passes into severe ulceration or even gangrene.

The simple form of stomatitis, which is often a complication of teething, has already been described. In the present chapter two other varieties of disease resulting from inflammation of the mucous membrane will be considered, viz., aphthous or follicular stomatitis, and ulcerative stomatitis. The following chapter will be devoted to a serious and often fatal disease—gangrene of the mouth, or cancrum oris.

APHTHOUS STOMATITIS.

The derangement called aphthous stomatitis (follicular stomatitis or aphthæ) is a common source of inconvenience to young children. It is induced almost invariably by derangement of the stomach, and is often seen during the progress of the first dentition—a time at which so many forms of gastric and intestinal disorder are apt to arise. Actual irritation of the mucous membrane of the mouth may also give rise to aphthæ ; for children who are over-indulged with sweets often suffer from this complaint, even if the digestion is unimpaired.

Symptoms.—Aphthæ consists of a vesicular eruption of the mucous membrane of the mouth. Pearly gray or yellowish vesicles appear, varying in size from a pin's head to a millet-seed. They are circular or oval in shape, and their base is surrounded by a red areola. After two or three days the vesicle ruptures and a round ulcer remains. The base of the ulcer is grayish in colour, from the presence of a sebaceous secretion ; the edges are thickened, and there is redness of the mucous membrane surrounding the sore. Under appropriate treatment the ulcer soon heals, and the complaint is at an end. The number of the aphthæ varies from two or three to fifteen or twenty, or even more. They may occupy any part of the mucous membrane, but usually appear first on the inner side of the lower lip and gums ; afterwards on the tip and edges of the tongue, the cheeks, and on the palate.

Aphthæ are sometimes accompanied by a considerable rise of the temperature, and the thermometer may mark 103° or 104° ; but fever is not

an invariable rule. The tongue is very sore, and the child, if an infant, sucks with great difficulty, or may even altogether refuse the bottle or the breast. He is peevish and thirsty; often vomits; has a sour smell from the breath, and shows all the signs of disordered stomach. Often the bowels are relaxed.

If the sores are so numerous as to be almost confluent, the child's condition may cause some anxiety. He refuses all nourishment on account of the smarting excited by the movements of the tongue in the act of swallowing. His breath is offensive; salivation is profuse; the fontanelle becomes deeply depressed, and the sub-maxillary glands are sometimes enlarged. This severe form is seldom seen except in weakly babies, and may come on at the end of an attack of diarrhœa. In these cases the unfavourable termination of the illness may be hastened by the impediment thus created to the taking of nourishment. In weakly or cachectic children the complaint is sometimes obstinate; for although the course of each individual ulcer may not be unusually prolonged, fresh vesicles continually appear as long as the digestive derangement to which they owe their origin remains unrelieved. Again, in rare cases, the ulcers are slow to heal, and may give some trouble before they are cured.

Diagnosis.—Aphthæ are not difficult to recognise. In the vesicular stage the nature of the derangement can scarcely be mistaken; and when the ulcers have formed, their circular shape, uniform size, and the limitation of the inflammation to the immediate neighbourhood of the sore, will prevent the disorder being mistaken for the more serious lesion—ulcerative stomatitis.

Prognosis.—The derangement is of little consequence, as a rule. Even in the cachectic child, in whom the distribution of the sores is more extended, and their course more obstinate, than in the healthy subject, any danger which may be present is due more to the accompanying general condition than to the local complaint. In a healthy subject, the derangement, under judicious treatment, will readily subside.

Treatment.—In ordinary cases of aphthæ all that is required is a dose of rhubarb and soda, with a grain of gray powder to clear away unhealthy secretion from the bowels, and attention to the cleanliness of the mouth. After each meal the mouth should be washed out with a piece of linen rag, or a large soft brush, soaked in tepid water. Afterwards, glycerine and borax (half a drachm to the ounce) may be applied with a soft camel's hair pencil. If an ulcer is slow to heal, it may be touched gently with a solution of nitrate of silver (ten grains to the ounce of water).

In the more obstinate cases, attention must be paid to the general condition of the patient, and any chronic derangement of the alimentary canal must be remedied. In a cachectic child, the use of an alcoholic stimulant in sufficient doses will often cause a speedy improvement in the state of the mouth.

ULCERATIVE STOMATITIS.

While follicular stomatitis is more common during the first eighteen months or two years of life, the ulcerative form of stomatitis is most frequently seen after the age of two years, when the first dentition has been completed. The disease is a common one in hospital out-patient rooms, and appears to be predisposed to by insanitary surroundings, a poor dietary, a weakly constitution, or a cachectic state. On this account it may be seen in children who are overfed during convalescence from an acute illness, and is an occasional consequence of a gastro-intestinal disorder. It

is said, also, sometimes to be epidemic. Its immediate cause is often uncleanliness of the mouth, allowing of the accumulation of tartar on the teeth, and sometimes it is set up by the irritation of a decayed tooth. In rickety children, and those whose teeth decay rapidly and whose general nutrition is unsatisfactory, ulceration of the gums is not an uncommon source of discomfort. The influence of feebleness of health, and an insufficient dietary, in producing the derangement, is so marked as to seem to justify Dr. Cheadle's suggestion that many cases of ulcerative stomatitis occurring in ill-nourished children may be due to undeveloped scurvy.

In addition to the causes which have been mentioned, ulcerative stomatitis may be one of the consequences of a special constitutional disease. Thus, it is sometimes present in cases of lymphadenoma, being then due to the development of the lymphoid growth in the sub-mucous tissue.

Symptoms.—The ulceration begins in the gums, and is often confined to them. The gums at the affected part become red, swollen, and spongy-looking, either generally or in patches. Their edges, especially where they rise up between the teeth, are soft, red, and unusually prominent, and they bleed very easily. The colour then grows deeper and more purple, and often at the borders of the gum the tooth is of a greenish-yellow colour. There is some pain in mastication ; salivation is copious, and an offensive odour is noticed from the mouth. Soon a soft, pultaceous, grayish-yellow matter forms upon the inflamed mucous membrane. This appears to arise from gangrenous softening of its most superficial layer, and adheres very closely to the tissue beneath it. If detached, an ulcerated surface is discovered, irregular in shape, grayish in colour, and bounded by a well-defined bright red line. If treatment is not promptly resorted to, the disease usually spreads from the gums to the tongue, the cheeks, and the lips. On the tongue the lesion is usually limited to the part of the organ in contact with the affected gum ; and, indeed, in the majority of cases, the ulceration is confined to one side of the mouth, and both cheeks are rarely affected at the same time. The shape of the ulcerated surface varies according to its seat. On the lips it is more or less circular ; on the gums it is elongated, and on the interior of the cheek, from conjunction of several neighbouring ulcers, it is irregular or sinuous.

As a consequence of the ulceration of the gums, the corresponding teeth often become loose, and sometimes fall out. Chewing is very painful, and the child is unwilling, by movement of his jaws, to increase his discomfort. Even the motions necessary for swallowing the copious saliva seem to be painful, for a young child allows it to flow away from his half-open mouth. Like the breath, the salivary secretion is horribly offensive, and is often streaked or more or less discoloured with blood. If there is disorder of the stomach, the effort of retching may cause a more copious hæmorrhage from the inflamed and ulcerated surfaces ; and the blood, mixing with the vomited matters during their passage through the mouth, may appear to come with them from the stomach.

When the cheek becomes affected there is some swelling, but this is moderate, and no induration can be detected. The sub-maxillary glands are swollen and sometimes painful. The general health of the child suffers much less than might be expected. During the first few days the temperature may rise to 102°, or even higher ; but the pyrexia quickly subsides, and the nutrition of the patient appears to undergo little change unless diarrhœa occur. The duration of the complaint is very variable. If proper measures are taken, the ulceration is soon at an end ; but if left

untreated, the lesion may persist for months, and is said sometimes to pass into cancrum oris.

Diagnosis.—The general redness of the mucous membrane ; the pultaceous matter adherent to its surface ; the peculiar fœtor of the breath—these symptoms, together with the large size, the irregular shape, and the want of uniformity of the ulcers, will serve to distinguish this complaint from the preceding. From cancrum oris it is distinguished by its slower course, its want of induration, and the absence of black slough. The exudation cannot be confounded with the leathery, false membrane peculiar to the diphtheritic inflammation ; moreover, the latter disease is not usually accompanied by ulceration of the mucous membrane.

Prognosis.—Ulcerative stomatitis is rather inconvenient than dangerous. However severe the affection may appear when first seen, it is tractable enough when judicious measures are adopted ; and the worst results that can follow are loss of teeth, with perhaps a superficial necrosis of an alveolar process.

Treatment.—In every case of ulcerative stomatitis our first care should be to rectify any deficiencies in the sanitary surroundings of the patient, or to remove him at once to a more healthy locality. Fresh air should be especially insisted upon, and the child should pass a large part of his time out of doors. His diet should be rearranged, giving meat, eggs, and milk in suitable quantities, especially avoiding sweets and an undesirable excess of farinaceous food. Alcohol is of great value. The child may take port wine, diluted with an equal quantity of water, with his dinner, or two or three teaspoonfuls of the brandy-and-egg mixture several times in the day.

In addition to the above measures, no time should be lost in prescribing chlorate of potash. This remedy has an almost specific action upon this form of ulceration. The solution, however, must not be too weak. Three grains, dissolved in a teaspoonful of water, may be given every four hours to a child of two years old. For an older child, the dose may be increased to five or six grains. In some cases, larger quantities are found to be necessary, and may be given to quite young children without apprehension. A case which has resisted the remedy when given in five-grain doses, may yield to it promptly when the dose is raised to fifteen. Of local applications, the best is tepid water. Cleanliness is of great importance, and after each meal the child, if old enough, should be directed to wash his mouth with warm water, so as to prevent food from collecting about the inflamed surface. In the case of younger children, the mouth should be swabbed out with a piece of soft linen rag dipped in warm water, as directed for aphthæ. Other applications which may be used are powdered alum, or a powder of chloride of lime. These should be applied dry to the ulcerated surface with the finger, and are especially useful when the ulcers are indolent and slow to heal. Underwood speaks highly of the decoction of cinchona, made sharp with dilute sulphuric acid, as an application to the sores. Local treatment, however, with the exception of careful cleansing of the mouth, is seldom required. Few cases will be found to resist the chlorate of potash treatment, especially if this be combined with plenty of fresh air, and the employment of an invigorating diet with a sufficient quantity of alcoholic stimulant. No local treatment can be expected to succeed if these measures are neglected.

CHAPTER III.

GANGRENOUS STOMATITIS.

Gangrenous stomatitis (cancrum oris, or noma) is fortunately much less common than the other inflammatory affections of the mouth and cheeks. The disease is a very serious one, and in the large majority of cases proves fatal to the child. Even when recovery happily occurs, the destruction of tissue, if at all extensive, leads to very unsightly contraction of the side of the face.

Causation.—Cancrum oris is seldom seen, except in hospital practice, or amongst the poor. It appears to be one of the consequences of a weakly habit of body, and is most probably predisposed to by insanitary conditions and insufficient food. The cases which have come under my notice have been in children at the East end of London, living in miserable, squalid dwellings, and very poorly clothed and fed. Sometimes the gangrene arises as a sequel of a specific fever or serious inflammatory disease. Thus, it has been known to follow measles, typhoid fever, scarlatina, and small-pox. It may appear in scrofulous and tubercular subjects, or in children who have been exhausted by a prolonged attack of bronchopneumonia, or catarrhal derangement of the bowels. It is doubtful whether the injudicious and prolonged use of mercury can set up the disease. That it can do so, although stated positively, has been denied with much reason. In any case, it is important not to mistake the early symptoms of the disease for those of mercurial poisoning.

Ulcerative stomatitis is said, in rare cases, to end in cancrum oris. The two diseases appear to be induced by very similar conditions. A little girl, aged five years, died in the East London Children's Hospital from extensive gangrene of the right side of the face. A few days afterward, her brother, aged seven years, was admitted with severe ulcerative stomatitis, inside the left cheek. The parents of these children were very poor, and the patients themselves had been half-starved and very insufficiently clad. Neither had lately suffered from any acute disease. Cancrum oris is rarely seen after the sixth year, and girls are said to be more subject to it than boys.

Morbid Anatomy.—On *post-mortem* examination of cases of gangrenous stomatitis, the affected part of the cheek or lip is found to be swollen, tense, and hard to the touch. It presents, at its most prominent part, a dry, black, well-defined slough. This varies in size and shape, according to the extent to which the mortification of the tissues has spread. It may dip more or less deeply into the substance of the cheek, and always involves both surfaces. The tissues in the neighbourhood of the slough are thickened, infiltrated, and hardened. Often the dry, black eschar occupies the surface of the cheek; beneath it, the tissues are swollen and indurated, and in the interior of the mouth, at the affected part, the mucous membrane is seen to be occupied by a greyish ulcerated surface, or a moist,

loose slough, which can be readily scraped away with the handle of the scalpel.

The gums at the seat of disease are often sloughy and soft; the teeth are loosened, and the alveolar processes blackened and necrosed. Sometimes the lymphatic glands in the neighbourhood are enlarged.

According to Rilliet and Barthez, the smaller blood-vessels of the diseased cheek are obliterated by coagulæ where they pass through the mortified tissues. In parts merely infiltrated and swollen they are still permeable, although their walls are thickened. Batta Segale states that he has discovered micrococci and bacilli in the detritus obtained from the gangrenous lesion, but it is not clear that the noma was dependent upon the presence of these organisms.

Other organs may be the seat of disease. Broncho-pneumonia is very common, and pyæmic abscesses have been found in the lungs. Sometimes gangrene of other parts has been seen, especially of the lungs and the vulva or scrotum.

Symptoms.—In some cases pain in one side of the face is the first symptom complained of. The child looks pale and ill; the face begins to swell, and at the same time, or soon after, examination of the cheek detects a firm spot, around which the tissues are soft and œdematous. At this stage, inspection of the interior of the mouth will discover a small greyish ulcer of the mucous membrane, corresponding to the hardened spot felt in the substance of the cheek. The breath has a gangrenous odour, and a dark bloody saliva escapes from the mouth. There is little or no fever; the pulse is small and frequent, and the child is unwilling to take solid food, probably from the pain excited by mastication. Soon the affected cheek becomes tense and shining, the swelling increases, and a small red spot forms on the surface. At the same time a brown slough developes on the mucous membrane.

The ulcer is not always seated on the cheek. It may occupy the gum, or be placed at the junction of the gum with the cheek. Wherever it first appears, it soon spreads, and may involve the gum, the cheek, the lip, and perhaps the whole side of the mouth. When the internal slough separates, which it may do on the third or fourth day, it leaves a ragged ulcer. At the same time, in severe cases, the red spot noted on the outer surface of the cheek becomes deeper in colour, and rapidly changes into a dry, black slough. Sometimes the internal and external sloughs are separated by infiltrated and œdematous tissue; but often the two sloughs come into contact, so as to involve the whole depth of the cheek. In this case, when the slough separates, a ragged opening is left, of variable size. In the interior of the mouth the gums are more or less extensively destroyed; the corresponding teeth get loose, and often fall out, and the maxillary bone may become necrosed. The separation of the slough is often unattended by hæmorrhage, but sometimes copious bleeding takes place. The face, on the affected side, where it has not been invaded by the gangrenous process, is swollen and œdematous, and the infiltrated eyelids can no longer be opened.

At this stage the general condition of the child varies. If he have not been exhausted by previous acute illness, although weak, he is not prostrated, and may be able to sit up in bed without assistance. In most cases, however, he is excessively feeble and helpless; there may be great drowsiness; the pulse is scarcely perceptible; diarrhœa may come on, and general œdema may occur. Sometimes the appetite persists, and the child takes liquid food with avidity; but, usually, towards the end he refuses

food, and even drink. If broncho-pneumonia supervene, as often happens, the temperature, which had been normal, or even below the natural level, rises, and the respiration becomes hurried and laborious.

In fatal cases the duration of the illness varies according to the rapidity with which the gangrenous process spreads, and to the condition of the child at the time when the disease begins. In very rapid cases the child may die in five or six days. Usually, death takes place between the tenth and fourteenth day. If the child be in an enfeebled or cachectic state at the time when the first symptoms are noticed, the gangrene usually spreads rapidly, and the end may be reached before the slough has had time to separate. If broncho-pneumonia arise, or a profuse diarrhœa be set up, or septicæmia be induced, or gangrene appear in another part of the body, the illness may end in death rather abruptly.

If recovery take place, it is usually in cases where the gangrene rapidly limits itself, and does not spread through the entire substance of the cheek. The slough is then thrown off, and a reparative process is set up, which ends in more or less puckering of the affected side of the face. The fall of the slough is, however, not always followed by repair. In some cases the gangrene continues at the borders of the wound, and the morbid process goes on unchecked.

Diagnosis.—Cancrum oris in its mildest form is distinguished from a bad case of ulcerative stomatitis by its rapid progress, the induration of the cheek at the base of the ulcer, and the infiltration of the tissues around. Malignant pustule presents symptoms somewhat similar to those of cancrum oris, but differs from it by always beginning on the external surface and extending inwards to the mucous membrane. In gangrenous stomatitis, the mucous membrane is the first part to be affected.

Prognosis.—The disease is fatal in the large majority of cases. If it lead to perforation of the cheek, especially if the gangrene be widely spread, death is almost certain. I have known one case recover after perforation of the cheek; but in this instance, the gangrenous process, although it penetrated deeply into the cheek, had no great lateral extension. When recovery took place, a deep puckered cicatrix was left in the cheek at the site of the disease.

If a complication arise, such as broncho-pneumonia or diarrhœa, the child's small chance of recovery is still further reduced. As long as he continues to take nourishment well, and to digest it, we may retain some hope of recovery. If he begin to refuse his food, or even to receive it with indifference, the sign is a bad one.

Treatment.—As in all diseases which result from debility and malnutrition, measures should be at once adopted to improve the general health, and provide the child with suitable nourishment according to his age and digestive capabilities. Pounded meat, strong beef-tea, eggs, and milk, should be given in small quantities at frequent intervals, taking care that the stomach is not overloaded, and that the powers of digestion are not overtaxed. Stimulants are of great value. Port wine, or the brandy-and-egg mixture, should be given several times a day with food. In this disease, a child bears stimulants well. Half an ounce of port wine, or two teaspoonfuls of the egg flip, can be given every two, three, or four hours, to a child of five or six years of age. The bowels must be attended to, and if much milk is being taken, a teaspoonful of compound liquorice powder should be administered every other night. Fresh air is also of great importance, and the window of the room should be kept open night and day. On account of the fœtor of the breath, which causes a most offensive odour in the neighbourhood

of the patient, the room must be frequently sprayed with a solution of carbolic acid (one part in thirty of water).

For local treatment, our first care should be to destroy the diseased surface in the interior of the mouth with a powerful caustic. Strong nitric acid is usually employed for this purpose. The acid should be applied once and effectually. The operation must be performed with care, so as not to touch the teeth, or any part which is not the actual seat of disease; and immediately after the application the mouth should be well syringed with a solution of carbonate of soda or chloride of lime. Besides nitric acid, strong hydrochloric acid, the acid nitrate of mercury, nitrate of silver, and the strong solution of perchloride of iron have been used, and all have their advocates. Dr. J. Lewis Smith speaks highly of a combination of sulphate of copper (℥ ij.) with pulv. cinchonæ (℥ ss.), in four ounces of water. This application, which was originally recommended by Maunsell and Evanson, is milder than the others; but applied carefully twice in the day it is said to have remarkable efficacy. If a stronger caustic is employed, a second application should not be made within twenty-four hours of the first; indeed, the operation should only be repeated if the further spread of the gangrene is unmistakable. The fœtor of the breath must be corrected by frequent syringing with a disinfecting agent. A solution of chlorinated soda (liq. sodæ chlorinatæ ℥ j., aquæ ℨ j.) is perhaps the most useful; or one part of carbolic acid to ten parts of water, as recommended by Labarraque, may be employed for the same purpose.

The internal administration of quinine and iron seems to be beneficial in these cases, given in full doses. A child of three or four years old will take well two grains of quinine and twenty drops of perchloride of iron, with glycerine and water, every six hours. After separation of the sloughs, any sign of repair should be encouraged by stimulating applications. A weak solution of sulphate of zinc (gr. iij. to the oz.), or any ordinary lotion for granulating wounds, may be used for this purpose.

CHAPTER IV.

THRUSH.

Thrush is a parasitic disorder, and is due to a fungus which attaches itself to the mucous membrane of the mouth and gullet. The complaint is of importance, not so much in itself, for when it appears in a healthy child the vegetation is readily dispersed, as on account of the debility and serious intestinal and other derangements by which it is often accompanied. Strictly speaking, thrush is a *symptom* rather than a disease, and often indicates a condition of the system which should give rise to most serious apprehension.

Causation.—Thrush is a cryptogamic growth which finds its nidus in altered secretion from the mucous membrane. It is most common in infants during the first few weeks or months of life, and any derangement which involves the mucous lining of the mouth may tend to its production. In such subjects, the vegetation is the expression of a local state, and this local state may itself be the consequence of a cachectic condition or constitutional disease. The development of the fungus is favoured by heat of weather, want of cleanliness, and indigestible food. It is consequently very common during the summer months amongst hand-fed infants, especially amongst those who are supplied with a highly fermentable diet, and are allowed to suck their food from dirty bottles. In such cases, the passage through the mouth of sour fluid, and the derangement of the stomach which results from fermentation and acidity, maintain a state of constant oral catarrh which forms a congenial medium for the development of the parasite. In a severe form the complaint is never seen except in imperfectly nourished infants, whose food is ill-selected, and whose general management leaves much to be desired. Imperfect ventilation, and general insanitary surroundings, are no doubt agencies which further the invasion of the fungus and assist its growth. New-born infants crowded together in Foundling Hospitals often suffer greatly from such influences, and in these institutions thrush is a common and much-dreaded visitor. Even after the first infancy, the later stage of many acute and chronic forms of disease is liable to be complicated by the presence of the parasite, for in the young child a catarrhal condition of the alimentary mucous membrane often forms a necessary part of such illnesses.

In children suckled at the breast, the parasite is rarely seen ; and if, on account of some temporary derangement, it succeeds in establishing itself upon the mucous membrane, it is readily dislodged by suitable treatment, and quickly made to disappear. Thrush does not seem to be contagious in the ordinary sense of the term. No doubt, if the mycelium be purposely brought into contact with the mucous membrane of a child who is in a favourable condition for its reception, the plant may flourish in its new situation ; but in a child whose mucous membrane is in a healthy state, the experiment will be tried in vain.

Morbid Anatomy.—The parasitic growth which constitutes thrush, consists of the mycelium and spores of a cryptogamic vegetation which was first described by Robin under the name of oidium albicans. The fungus has now been identified by Haller as identical with the oidium lactis which results from the acid fermentation of milk. The mucous membrane of the mouth is first seen to be red, and its secretion has a distinctly acid reaction. Then, in the course of a few hours, little white points appear upon the reddened surface, especially on the cheeks and the inner surface of the lips. These increase in number and in size, and by the second day are seen to have united into patches which cover a considerable extent of surface. Even before the appearance of the white points, a gentle scraping of the mucous membrane reveals to the microscope many spores of the fungus. These are elongated cells—egg-shaped bodies—which are often attached to one another by their ends, so as to form groups of two, three, or four. The white points are found, on examination, to consist of these connected spores, combined with scaly epithelium from the mucous membrane, detached spores and molecular deposit.

The white, newly-formed membrane coats the interior of the mouth and gullet; but is usually confined to parts covered with scaly epithelium, for it avoids the nasal passages, and seldom penetrates into the larynx. Parrot, however, states that he has seen evidence of its presence on the vocal cords. The advance of the membrane down the alimentary canal was for a long time supposed to be arrested at the cardiac end of the stomach; but Parrot asserts that the fungus is occasionally to be discovered in the stomach and bowels. In these situations it presents a peculiar appearance. In the stomach it is seen as small granules, separate or grouped, and varying in size from a millet-seed to a particle invisible to the naked eye. The smaller are pointed; the larger are slightly depressed in the middle. In colour, they differ little from the mucous membrane on which they are placed, but some have a faint yellow tint. They adhere firmly to the surface, and cannot be scraped off or washed away. The thrush granules affect principally the posterior surface, especially the neighbourhood of the posterior curvature, and lie nearer to the cardia than to the pylorus. Surrounding them, the mucous membrane retains its colour, or is of a rose or violet tint. Parrot examined sections of the gastric mucous membrane, and found the more superficial portions of the glands to be destroyed by the parasitic vegetation, which had penetrated into their interior, and had also advanced, although to a less extent, into the intervening tissue. According to Wagner, the spores and filaments can be sometimes detected within the blood-vessels of the part.

In the intestines, Parrot states that he has succeeded in discovering the fungus only in rare cases. In each instance its seat was the cæcum. Whether the growth has the power of attaching itself to the anus, is not clear, for an examination of the whitish pultaceous matter sometimes found at the orifice of the rectum, revealed merely pavement epithelium in stratified layers, with some doubtful cells which presented a certain analogy with the filaments of thrush. On the mucous membrane of the mouth, the thrush membrane is at first white, and firmly adherent. After a few days its colour becomes browner, and its connection with the mucous surface less intimate, so that it can be readily wiped away with a brush or piece of wet rag.

In all cases of death from the serious intestinal derangement or the constitutional cachexia of which thrush is a chief local expression, extreme atrophy of the tissues is a striking phenomenon. The infants are usually

in a state of profound malnutrition, and present, according to Parrot, fatty degeneration of the kidneys, the lungs, and the brain, sometimes ulceration of the stomach, and, not unfrequently, hæmorrhages within the cranial cavity.

Symptoms.—In cases where the parasitic growth attaches itself to the mucous membrane of a sturdy infant, the appearance of the white points is preceded by redness and soreness of the mouth, and a rise of temperature. The child is noticed to suck with difficulty, and, if hand-fed, may refuse the bottle. He seldom, however, declines the breast for this reason. Often he makes movements with his lips, cries if a finger is introduced into his mouth, and is evidently uneasy. His temperature often rises at night to 103° or 104°. At the same time there may be a little looseness of the bowels, preceded by colicky pains. The motions are slimy or green, but not very offensive. Often they are acrid, and cause some redness and excoriation of the nates. This is looked upon by nurses as a satisfactory symptom, being considered to indicate that the thrush "has gone through" the child. In many cases there is derangement of the stomach, and vomiting.

The above constitutes the whole of the symptoms. Although the temperature is raised, the stools have an innocent appearance, and the face expresses no distress. In the mouth, the thrush is limited to a few white patches, looking like particles of curd adhering to the mucous membrane. They are seen on the inner side of the cheeks and lips, on the tongue, sometimes on the hard palate, but seldom, in these cases, at the back of the throat. They may be removed with a little trouble, and leave the mucous surface on which they had been seated raw-looking and bright red. When thus removed, similar little patches quickly appear in their place, but after a few days the surface cleans, and the child is well.

This simple variety is the shape the complaint assumes in ordinary cases, and practitioners whose experience is collected entirely from families in easy circumstances may have observed it in no other form. In hospitals and asylums where infants are admitted it is seen as a much more serious complaint. In babies who have been neglected or fed injudiciously, and confined to dirty, ill-ventilated, foul-smelling rooms—poor, miserable little objects, who have sunk from these causes and the consequent bowel derangement into a state of extreme atrophy and weakness, the whole of the interior of the mouth and fauces is often completely lined by the white thrush membrane. The layer adheres closely to the mucous membrane, and can only be detached with great difficulty. If this be done, the mucous surface beneath is seen to be raw, and sometimes ulcerated. According to Valleix, shallow ulcers on the hard palate may precede the appearance of the parasitic vegetation. An infant so affected cannot suck, and, indeed, often can hardly swallow. His mouth is dry; his lips are red and dry-looking, and at the surfaces where they come into contact, white scattered particles of thrush can be perceived, even when the lips are almost closed. The child's eyes and cheeks are sunken; his face is pale and haggard, and marked with a well-defined nasal line which becomes a deep furrow on any movement of the lips. The buttocks and genitals are often covered with an erythematous or eczematous redness, and ulcerations may be noticed on the internal malleoli, and sometimes also on other bony projections. His skin is loose and is excessively inelastic, often lying in lax folds upon the belly. The child whimpers feebly, but never cries. His mouth has a sour, or even a cadaverous smell. The motions, more or less profuse, are equally offensive. He gets weaker and weaker, and gradually sinks out of life. Sometimes the condition known as "spurious hydrocephalus" is noticed before death. The

temperature varies. Sometimes, on the first appearance of the parasite, the internal temperature is found to be 101°, or higher, although the extremities feel cold; but after a time the temperature falls below the level of health, and may be only 96° or 97° in the rectum. In many of these cases, the secretion of urine is diminished. According to Parrot, it often contains albumen; and this pathologist is disposed to attribute the cerebral phenomena which are apt to occur in these cases to toxic causes, from retention in the blood of urinary elements.

In these severe cases the general symptoms depend upon the intestinal catarrh, or other primary lesion, whatever it may be, which has reduced the infant's strength, and prepared the way for the invasion of the parasite. Often the illness ends in a profuse diarrhœa, but the bowels are not invariably relaxed. In some cases, an attack of catarrhal pneumonia, or pulmonary catarrh, with collapse of the lung, may bring the life of the infant prematurely to a close.

Diagnosis.—Thrush is not difficult to detect. We have merely to examine the mouth of the infant, and observe the white adherent patches sprinkled over the surface of the mucous membrane. If a particle of one of these patches be detached and placed under the microscope, the characteristic spores and filaments will at once be noticed.

It is possible that, in the rare cases where diphtheritic false membrane is seen on the interior of the lips and mouth, it may be mistaken for thrush, but diphtheritic membrane is thicker, tougher, and more leathery in texture, less white in colour, and under the microscope shows no spores. Moreover, the superficial cervical glands are enlarged and tender in diphtheria. In cases of thrush they are not affected.

Particles of curd clinging to the gums and cheeks of a child who has just taken his bottle have exactly the appearance of disseminated particles of thrush; but they can be readily wiped off with a small brush or feather, and on their disappearance leave no redness of the mucous membrane.

Prognosis.—In cases of thrush, the probabilities of the child's recovery depend partly upon his general condition, partly upon the extent of surface covered by the vegetation. If thrush appear in the mouth of a sturdy, well-nourished child, as a consequence of some temporary derangement, the symptom is one of little consequence, and the parasite can be readily dispersed. In a child, enfeebled and wasted by chronic digestive derangement, or the victim of inherited syphilis, the appearance of thrush in the mouth is a symptom of the utmost gravity. In such a case, the child's only chance of recovery depends upon the rapid introduction of nourishment into his system, but a deranged condition of the mucous membrane may neutralize all our efforts to improve the state of his nutrition. In an infant so reduced, the rapidity with which the fungus is seen to spread over the surface, may be taken as a measure of the severity of the digestive derangement. If it rapidly cover the whole interior of the mouth and throat, the child's chances of recovery in his weakly state are small indeed.

Treatment.—In mild cases of thrush, our first care should be to remedy the temporary gastric derangement which has allowed the parasitic growth to effect a lodgment on the mucous membrane. The diet must be modified as recommended in the chapter on infantile atrophy; and if the bowels are relaxed, the looseness must be arrested by suitable treatment (see page 626). If not relaxed, they should be acted on by a dose of rhubarb, with a grain of gray powder. Afterwards, a draught containing a few grains of carbonate of soda, with an aromatic, should be given three or four times a day. If there is nausea, the stomach should be cleared out by

an emetic of sulphate of copper (half a grain in a teaspoonful of water), or a teaspoonful of ipecacuanha wine, given every ten minutes until vomiting is produced.

Fresh air is of extreme importance. If the weather is suitable, the child should pass much of the day out of doors; and especial care should be taken that his sleeping-chamber is sufficiently ventilated, and that soiled linen is not allowed to remain in the room to vitiate the air.

With regard to local treatment:—Perfect cleanliness is indispensable. Directly the infant has taken the bottle, his mouth should be swabbed out with a piece of soft linen rag, or a large camel's-hair brush, moistened with warm water. Afterwards, the whole of the interior of the mouth should be brushed over with a solution of borax (half a drachm to the ounce) in water sweetened with glycerine. If this treatment be repeated after each meal, it will not be long before all signs of the fungus have disappeared.

In the more severe examples of the complaint the same local treatment must be employed. If the fungus be suspected to have passed into the gullet, the child may be forced to swallow a few drops of the wash diluted with water. If superficial ulceration are seen, ten grains of sulphate of zinc may be added to each ounce of the wash, for use as an application to the mucous membrane. The chief difficulty in these cases is to improve the child's nutrition and increase his strength. If the parents are in a position to supply a wet nurse, this method of feeding should be adopted at once. If the child is forced to trust to the bottle, ass' milk or the milk of the goat is preferable to that of the cow. Either should be given pancreatised according to the method recommended elsewhere (see page 606). White wine whey is a valuable resource in these cases, and if the infant be much reduced in flesh and strength, with small digestive power, he may subsist upon it entirely for the first few days. A dessert-spoonful of fresh cream shaken up with each bottleful of the whey makes it more nutritious, and is a very digestible addition to the meal. In all cases, the internal treatment will depend upon the accompanying conditions, and especially upon the nature of the illness in the course of which the local complaint has appeared. Often the child is the subject of a chronic intestinal catarrh. This must be treated as directed elsewhere (see page 640). If the purging is moderate, and there is no reason to suspect the presence of ulceration of the bowels, much benefit may be often derived from a powder containing one grain of rhubarb, with one grain of powdered bark, and three grains of aromatic chalk, given two or three times in the day.

Fresh air, with warmth to the belly, and the most perfect cleanliness, not only of the child's body and linen, but also of all spoons, cups, feeding-bottles, etc., used in his nursery, are essential to his recovery.

CHAPTER V.

PHARYNGITIS.

PHARYNGITIS, or sore throat, is common at all ages, and is a frequent complaint in early life. The disorder may be met with as a simple catarrh of mucous membrane; as an inflammation affecting especially the mucous follicles; as an eruption of herpes in the pharynx, or as part of a severe constitutional disease. Four varieties will then be considered, viz., simple catarrhal pharyngitis; follicular pharyngitis; herpetic pharyngitis, and tubercular pharyngitis.

SIMPLE CATARRHAL PHARYNGITIS.

Causation.—Catarrh of the pharynx, like catarrh attacking other parts of the body, is usually the consequence of a chill. Any cause which inclines the body to be affected by changes of temperature will help to induce the disorder. It is, therefore, common in scrofulous subjects, in children enfeebled by confinement to heated, ill-ventilated rooms, and in those resident in houses where the air is contaminated by an imperfect system of drainage. Direct irritants to the throat will also set up pharyngitis, which at once passes beyond the limits of an ordinary pharyngeal catarrh. The children of the poor are often brought to the hospital with severe scalds of the throat from attempting to drink boiling water out of the spout of a kettle. In the above cases the disorder is a primary lesion. It may, however, occur secondarily to some general disease. Thus, catarrh of the pharynx is an invariable consequence of measles and scarlatina. It is also common in typhoid fever, in rheumatism, and in erysipelas. In all cases, the derangement is an acute process, although, if frequently repeated, it tends to set up a relaxed and congested state of mucous membrane.

Symptoms.—In mild cases, the first symptom is usually a sore feeling in the throat, which is increased by swallowing. On examination of the throat the back of the fauces, the soft palate, and the tonsils are noticed to be red, and the latter may be slightly swollen. The tongue is furred, and the child is thirsty. In scrofulous subjects the temperature almost invariably rises, and there is a certain amount of pallor and languor. In the slighter forms little more is to be discovered. After a day or two the child begins to snuffle, and the throat affection disappears as a nasal catarrh becomes established.

In the severe variety the earlier symptoms are more pronounced. The child feels ill and looks tired. His face is pale, his eyelids are dark, he complains of weariness and aching in the limbs, and asks to go to bed. Often he sits over the fire and says he is cold. In a few hours soreness of the throat begins. The fauces are found to be red and the tonsils to be slightly swollen. Whitish pultaceous matter may be seen at the openings of the crypts of the tonsils, and sometimes at the back of the pharynx. In

scrofulous subjects the temperature generally rises to 104° or 105°, and in such children the glands of the neck, although little enlarged, are tender when the neck is pressed. The tongue is thickly furred, and in most cases the nasal passages and the gastric mucous membrane are also the seat of catarrh. Moreover, the eyes look red and watery, and the child avoids the light. In a day or two the catarrh often spreads to the Eustachian tubes, so that there is some deafness. The voice is nasal, and swallowing causes great pain, so that the child refuses all solid food. The bowels are usually confined ; but if there is any intestinal catarrh, the disorder may be accompanied by purging.

After twenty-four, or, at the latest, forty-eight hours, the fever considerably diminishes, but the temperature may remain at 100° or 101° for a day or two longer. Usually, after the third or fourth day the symptoms begin to subside, and by the end of the week the child is convalescent. If the patient has suffered many times previously, the deafness may not subside with the other symptoms, but may persist for a week or so longer.

A scald in the throat is accompanied by great nervous prostration. There is severe pain in swallowing, and consequently an almost entire inability to take food. The mucous membrane of the mouth, palate, and pharynx, looks whitish ; raw patches are seen, from which the mucous membrane has been removed, and there is much swelling. Often the larynx is also injured, so that acute laryngitis is set up, and œdema of the glottis may be induced.

Diagnosis.—An ordinary pharyngitis can usually be readily recognised. The chief difficulty is to exclude diseases of which pharyngitis is a prominent symptom, especially scarlatina and measles.

In scarlatina, the pharynx usually presents a peculiar appearance. The redness is of a very bright colour, and is diffused over the whole of the fauces. Often it is punctiform on the soft palate, or, even if the redness here is uniform, the punctate appearance can be detected at the edges of the redness. Moreover, in scarlatina, the feeling of soreness begins quite suddenly, as a rule, and the attack is accompanied by vomiting and a very rapid pulse. In twenty-four hours the characteristic eruption is to be discovered.

If the signs of catarrh are general, and the sore throat is accompanied by slight ophthalmia and running from the nose, measles may be suspected. Indeed, the invasion of the eruptive fever is accompanied by symptoms which cannot be distinguished from those of an ordinary catarrh. If, on the third day, the fever is as high, or higher, than on the first, the continuance of the pyrexia tells in favour of the exanthem ; but no positive opinion should be hazarded until after the fourth day, when, if the case be one of measles, the characteristic rash may be expected to appear.

Treatment.—It is not often that medical advice is sought in a case of ordinary catarrh, the derangement being one which is considered especially suitable for domestic medication. If, however, the fever is high, the medical practitioner may be called in. A feverish child should be confined to his bed. He should take a grain of calomel, followed by a saline aperient, and his diet should consist of milk, broth, and dry toast. A cold compress, or a layer of cotton wool, may be applied to the throat. If the case be seen early, it is useful to prescribe the hypophosphite of lime, which has a really remarkable influence in cutting short an ordinary catarrh. For a child five years of age, three grains of the salt may be given with five drops of spirits of chloroform and ten of tincture of cardamoms, in two teaspoonfuls of water, three times a day. A mild catarrh is often arrested at

once by this means, and even in severe cases the course of the derangement is sensibly shortened by the remedy. The pyrexia usually subsides quickly after the action of the aperient. If it persist, a drop or two of tincture of aconite may be given in a teaspoonful of water every two or three hours.

If the throat remain relaxed after the subsidence of the pyrexia, a mild astringent gargle, if the child can use it, or a rhatany or tannin lozenge sucked two or three times a day, will produce a bracing effect. In cases where there remains a great sensitiveness to chills, the susceptibility may be considerably diminished by the daily use of a cold douche, administered in the manner elsewhere recommended (see page 17).

Severe scalds of the throat usually occur in the younger children. If the pain be severe, it may be allayed to some extent by sucking ice, or by administering, occasionally, a teaspoonful of crushed ice on which a little sugar has been sprinkled. Small doses of opium are often necessary; and this remedy applied locally, as by spraying the throat with glycerine and water, made anodyne with a few drops of laudanum, is very beneficial. If the child cannot swallow, he may be fed through a stomach-tube passed through the nose, as directed in a previous chapter (see page 15). Rectal alimentation is very unsatisfactory in young subjects.

If laryngitis occur, it must be treated as described elsewhere (see page 410).

FOLLICULAR PHARYNGITIS.

Chronic inflammation of the follicles of the pharynx is an obstinate complaint which is often seen in children. The disorder is an important one, as it may induce deafness, and frequently gives rise to a persistent cough, which is a cause of much anxiety to the patient's relatives.

Causation.—Follicular pharyngitis is especially likely to attack strumous subjects, and those who belong to families in which there is a gouty or rheumatic tendency. The disorder is not often seen in very young children, although Dr. Morell Mackenzie has met with it as early as the third year. It is most commonly found in children of eleven or twelve years of age and upwards. It sometimes appears to follow certain specific fevers, such as measles, scarlatina, and small-pox. In other cases it is apparently excited by exposure to cold acting upon a weakly frame. The subjects of the disorder are often ill-nourished and feeble-looking; and this fact, coupled with the cough which is so common a consequence of the disease, may give rise to fears of consumption.

Morbid Anatomy.—The follicles are enlarged and their walls thickened. They are filled with a cheesy secretion consisting of degenerated epithelial cells, molecules, and oil-globules; and sometimes contain concretions of carbonate of lime.

Symptoms.—The case is seldom seen until the derangement is advanced. It is then, usually, as has been said, the cough which excites the alarm of the parents. The cough is frequent and hard, and the child often clears his voice, and when questioned complains that he has a "tickling" in his throat. The symptoms vary in severity from time to time. When the disease is severe, the cough is accompanied by pain shooting up into the head or ears. It often comes on in paroxysms, and these are apt to occur in the night. There is also an uneasy sensation in swallowing, and the child may complain that "coughing makes his throat sore." In advanced cases the disease extends to the larynx, producing hoarseness, and into the Eustachian tubes, causing dulness of hearing. If the posterior nares are attacked, the sense of smell may be impaired; if the soft palate, the sense

of taste may be affected. Loss of these senses is not common in the child, or is difficult to ascertain ; but a certain impairment of hearing is frequently complained of. Indeed, I am informed by Mr. Reeves that of the children who are brought on account of deafness to the Ear Department of the London Hospital, a full third owe their infirmity to this affection of the throat. In such cases, a peculiar flattening of the nostrils is often produced, owing to the swelling of the posterior nares. The appearance is similar to that which has been so often remarked upon as resulting from a chronic enlargement of the tonsils, and is indeed produced, like it, by the disuse of the nasal passages in respiration. Disease of the middle ear, with discharge from the meatus, may be also a consequence of the pharyngeal affection. A catarrh is very apt to spread along the Eustachian tube into the tympanum ; and the secretion being unable to escape through the occluded tubes, accumulates, and leads to ulceration of the tympanic membrane, and otorrhœa.

In mild cases of follicular pharyngitis there is little interference with deglutition ; but when the disease is more pronounced, swallowing may be difficult as well as painful, and the attempt to swallow is said sometimes to give rise to spasm of the pharynx.

On inspection of the fauces, we find small eminences scattered over the mucous membrane at the back of the pharynx. These are rounded or elongated in shape, and may be so numerous as to present a granular appearance. Their colour, and that of the whole mucous membrane, is deeper than natural, and enlarged superficial veins may be seen running in the depressions between the prominent follicles. If the disease is extensive, similar granules are found on the pillars of the fauces and on the tonsils. Sometimes mucus, more or less stringy and turbid, may be seen clinging to the tonsils, or hanging down from behind the soft palate, and this may be mixed up with yellow-looking exudation from the diseased follicles.

In scrofulous children, ulceration is very apt to occur. The ulcers are seated in the follicles. If isolated, they are small and circular, but when placed closely together, they are larger and irregular from junction of the borders of neighbouring sores. The uvula is elongated, and its surface is dotted over with enlarged glands.

Diagnosis.—The diagnosis of follicular pharyngitis presents no difficulty. If the patient is brought on account of cough, examination of the chest usually reveals no sign of disease, while inspection of the throat discovers the characteristic granular appearance of the pharynx.

Prognosis.— In children, the disease can usually be arrested by suitable treatment, but it may tend to recur afterwards from slight exposure. Follicular pharyngitis may be associated with phthisis, and, according to Dr. Horace Green, is sometimes a cause of it.

Treatment.—As children suffering from this complaint are usually weakly and under-nourished, the general health must be first attended to, and the child will often be greatly benefited by cod-liver oil and tonics, such as iron and quinine. A little sound claret diluted with water may be given him with his dinner. In fact, the constitutional treatment recommended in cases of strongly marked strumous diathesis is often required.

For a cure of the local disorder, local treatment is essential. In mild cases, a more healthy action of the pharyngeal mucous membrane may be induced by astringent applications, especially by brushing the throat two or three times daily with the glycerine of tannin, or with equal parts of strong perchloride of iron and glycerine. Dr. J. Sawyer speaks highly of the local application of borax. A saturated solution should be sprayed into

the throat for several minutes, three or four times in the day, at an interval after food. The extract of eucalyptus, in the form of a lozenge, is also serviceable when secretion is copious.

In more severe cases, it may be necessary to destroy each follicle separately by a caustic or the galvanic cautery. The latter, which can be put cold into the throat and rapidly heated *in situ*, is no doubt the most convenient. Moreover, its action being instantaneous, the application is less painful than that of the more slowly-acting escharotic. If a caustic be used, nitrate of silver, properly employed, is one of the most successful. The throat must be first cleansed with a brush soaked in warm water; then with a piece of lunar caustic, sharpened to a fine point, each enlarged follicle or ulcer must be touched separately. The number of follicles to be destroyed at one visit must vary according to the sensitiveness of the child, and the distress produced by the application. On the first occasion, only one or two may be destroyed as a trial test.

Instead of the lunar caustic, other caustics, such as Dr. Morell Mackenzie's "London paste," may be employed.

HERPES OF THE PHARYNX.

Herpes on the skin is a common eruption in the child. Sometimes the rash appears on the pharynx, and produces great discomfort.

Causation.—The causes of herpes are doubtful. The complaint is said to be excited by exposure to cold, but a constitutional tendency appears to be necessary to its development. There is no doubt that, as Trousseau first pointed out, pharyngeal herpes is especially common during outbreaks of diphtheria, and that in such cases the zymotic disease may become engrafted upon the herpetic eruption.

Symptoms.—The complaint begins with febrile symptoms, followed after a few hours by soreness of the throat. The child complains of a painful feeling in deglutition, which is usually distinctly confined to one spot. On examination, a few whitish vesicles are seen clustered together on the soft palate, on one of the pillars of the fauces, or on one of the tonsils. Around them, the mucous membrane is redder than natural, and swollen. Sometimes the vesicles are more numerous, and more generally distributed. The vesicles last from twenty-four to forty-eight hours, and may then disappear without rupture, or burst, leaving little white spots from macerated epithelium, or circular ulcers which soon heal. Sometimes, instead of healing rapidly, the ulcers become covered with pultaceous exudation, and, if the sores are numerous, the exudation may form a continuous layer. More usually, however, the patches are small and isolated. Their seat is generally the soft palate, or one tonsil; seldom the back of the pharynx. After three or four days the exudation becomes detached and disappears. Sometimes more than one crop of vesicles is noticed. Often, herpes of the pharynx is associated with the same condition of the lip; and the vesicles are said sometimes to invade the larynx and the openings of the Eustachian tubes, so as to affect the respiration and the sense of hearing.

Diagnosis.—When the disease is seen in the vesicular stage it is readily recognised. If, however, inspection is delayed until the patches of exudation have formed, the case may be mistaken for one of diphtheria; more especially, as this form of the complaint is often associated with outbreaks of that disease. If, however, herpes of the lip is present, and especially if small circular ulcers can be seen mixed up with the small patches of exu-

dation, we may suspect pharyngeal herpes. Still, it is often impossible to distinguish the case from a mild attack of diphtheria.

Treatment.—The complaint requires little treatment. Attention must be paid to the bowels. If the tongue is furred, it is well to administer a mercurial purge, such as a grain of calomel with two or three grains of jalapine. While the pyrexia lasts, the child should be kept in bed and put upon slops—indeed, the pain induced by deglutition will prevent his wishing to swallow solid food. If the fever is high, tincture of aconite may be given in doses of one or two drops, every hour, or two hours. If the discomfort in the throat is great, it may be relieved by inhalations of steam, medicated with compound tincture of benzoin (℥ j. to the pint). If in the stage of exudation there is any fœtor of the breath, inhalations or sprays containing creasote or carbolic acid (♏ xx. of each to the pint) may be made use of. As an internal remedy for children, Dr. Morell Mackenzie speaks highly of arsenic. Three or four drops of Fowler's solution may be given three times a day, directly after food, to a child five years of age. If there is any doubt as to the nature of the complaint, and diphtheria be epidemic in the neighbourhood, the treatment for that disease should be at once adopted.

TUBERCULAR PHARYNGITIS.

In children, the subjects of tuberculosis, the pharynx, like any other part of the body, may become affected as a consequence of the diathetic state. The pharyngeal complaint is only a part of the general disease; but it may occur in children in whom no pulmonary symptoms are present, and in subjects who have not previously suffered from delicacy of the throat.

Morbid Anatomy.—The mucous membrane is the seat of ulceration, which is limited at first to one side of the fauces. The ulcers are due to the caseation and breaking down of gray granulations themselves, and not to the development of these granules around a sore formed by the disintegration of ordinary cheesy matter, such as may result from proliferation of the cellular contents of a glandular follicle. Fränkel states that in a previously sound portion of the velum palati he has been able to follow the whole process with the eye. Thus the gray nodules have sprung up, have become caseous and disintegrated, and have been replaced by ulcers under his own immediate observation. On microscopic examination, the base of the ulcer is seen to be infiltrated with round cells, which permeate the sub-mucous tissue, and even reach to the muscles. The same cells also infiltrate the cellular tissue of the glandulæ. The special gland cells are often in a state of fatty degeneration, and tend to become cheesy.

The other organs of the body are also the seat of the gray granulation.

Symptoms.—The first symptom pointing to the throat is soreness, and this seems to be exceptionally severe, for the child makes it the subject of continual complaint. In deglutition the pain often shoots up to the ears, and usually becomes so great on taking solids that no persuasions can induce the child to swallow anything but liquid food. In addition to pain, there is sometimes difficulty in deglutition, and liquids may return through the mouth and nose.

On examination of the throat, the mucous membrane is seen to be ulcerated. The ulcers generally begin on one side—on the tonsil or one of the pillars of the fauces, and spread slowly to the soft and hard palate and the back of the pharynx. According to Fränkel, they begin as gray isolated or confluent nodules, which afterwards undergo caseous degeneration and ulceration. They tend to spread transversely rather than in a vertical di-

rection, and seldom penetrate deeply into the tissues. The floor of the ulcer is irregular and cheesy ; the borders are congested and undermined. In the neighbourhood of the sores, gray miliary nodules can be distinctly seen dotting the mucous membrane. If the uvula is not invaded by the destructive process, it often becomes atrophied. In the opposite case, it swells to a considerable thickness, and may be dotted over with hard nodules. Eventually it may be eaten away.

The ulceration may spread extensively. In a case reported by Dr. Gee —a child six years old—the whole of the pharynx down to its union with the gullet was covered with yellow purulent matter. The mucous membrane was extensively destroyed, so as to lay bare the pharyngeal muscles. The soft palate, back and front, was in the same condition. The uvula was destroyed, as well as the mucous membrane of the tongue, half way to the foramen cæcum. The right tonsil was gone, and the ary-epiglottidean folds were ulcerated superficially. The true vocal cords and the larynx below them were unaffected.

As a consequence of the ulceration, the voice acquires a nasal quality, as it does in most cases of pharyngitis. The glands of the neck become enlarged along the borders of the sterno-mastoid muscles, and at the angles of the jaw.

When the case is first seen, the general nutrition of the child is not necessarily unsatisfactory. The degree to which it is impaired depends in a great measure upon the period at which the pharyngeal affection arises in the general disease. If it occur early, the child, although thin, is not emaciated. His thinness is no doubt chiefly due to the influence of the cachexia upon nutrition, but is probably also in part the consequence of difficulty and pain in swallowing, which is a bar to the taking of sufficient food. The general symptoms are those of tuberculosis. There is fever, but seldom a very high temperature, the evening rise not often passing beyond 102° or 103°. There is usually cough, and an examination of the chest may detect signs of consolidation ; but in some cases no evidence of tubercle can be discovered at first in either the chest or the abdomen. As the disease advances, however, signs of mischief become manifest in other parts of the body. Spots of dulness may be discovered at the apices of the lungs ; a secondary catarrhal pneumonia becomes developed ; signs of tubercular peritonitis are to be discerned, or symptoms of tubercular meningitis occur ; and sometimes a persistent purging is set up, with all the signs of tubercular ulceration of the intestines.

Diagnosis.—The chief difficulty in the diagnosis of tubercle of the pharynx lies in separating it from syphilitic ulceration of the same part. The distinction is, however, easier in the child than it is in the adult, for in young subjects the latter disease is almost invariably a congenital malady. If, then, by careful questioning of the parents, we can find no history of miscarriages on the part of the mother, or of syphilitic symptoms in the patient himself shortly after birth ; if the child bear about him no evidence of past syphilitic disease, such as flattened bridge of the nose, small pits, and linear cicatrices about the angles of the mouth, prominence of the forehead, opacity of the cornea, or enlargement of the spleen ; if, too, the permanent incisors have appeared and show no sign of malformation—in such a case we may exclude syphilis with tolerable certainty. If, on the other hand, a hereditary tendency to phthisis can be discovered, or if other children of the family have died with symptoms of tubercular meningitis, the evidence is in favour of tubercle. Still, a history of syphilis, although pointing strongly to this cause for the ulceration, does not make it certain that

the pharyngeal disease is a result of the venereal taint, for a syphilitic child may fall a victim to tuberculosis. Nor, again, if signs of tubercle are to be discovered in other organs, can we, from this circumstance alone, positively exclude a syphilitic origin of the throat lesion, unless we are supported in this judgment by the family and personal history of the child. Fortunately, however, careful observations of the fauces itself furnishes sufficient evidence. In syphilis, the ulcers have sharper edges, penetrate more deeply, tend to produce contractile scars, and have no gray nodules in their neighbourhood. Tuberculous ulcers, as has been already remarked, are superficial, as a rule, with irregular nodular, eroded, and undermined edges, and a cheesy floor. In their neighbourhood, gray miliary nodules are seen underneath the epithelium. Moreover, in tuberculosis, the ulceration spreads very slowly, and the cervical glands are invariably enlarged. In syphilis, the extension is more rapid, and the glands of the neck are rarely indurated and swollen. Again, syphilitic ulceration is not accompanied by fever, while in tubercular pharyngitis the temperature is always elevated. The diagnosis will therefore rest upon the complete absence of all syphilitic history, either family or personal; the appearance of the sores themselves, with the gray miliary nodules in their neighbourhood; the enlargement of the superficial glands, and the presence of fever.

Prognosis.—The disease is always fatal; and, indeed, the pharyngeal lesion tends to hasten the end by the rapid exhaustion it induces through the difficulty of supp'ying a sufficient quantity of nourishment. Death usually occurs in from two to six months.

Treatment.—Little can be done in the way of treatment in retarding the downward course of the illness. Nutritious food in small bulk, such as meat essence, pounded meat made liquid with gravy, yolks of egg, milk, etc., should be given; and the strength of the patient may be also supported by doses of the brandy-and-egg mixture or port wine. If the child be unwilling or unable to swallow, nourishment must be administered by the stomach-tube passed through the nose.

We must endeavour to relieve the distress of the child by soothing applications. Brushing the affected part with glycerole of morphia is recommended by Isambert. For a child of seven or eight years old, the strength of the application may be one grain in three drachms. Inhalations of steam also appear to relieve.

CHAPTER VI.

QUINSY.

Acute inflammation of the tonsils, or quinsy, is a frequent complaint of later childhood, but is comparatively rarely met with during the first few years of life. One of the peculiarities of the affection is its disposition to recur. A first attack leaves behind it a tendency to a second, and the same subject will be found to suffer from the disease again and again under the influence of apparently trivial causes. A common consequence of these repeated attacks is a hypertrophied condition of the tonsils. This may be a source of great inconvenience, and may even have a serious effect upon the health and general development of the child.

The tonsils are often found to share in a general inflammation affecting the mucous membrane of the mouth and fauces, and in scarlatina and diphtheria they are almost invariably inflamed and swollen. The name "quinsy" is, however, applied to a special primary affection which appears to be something more than a mere local complaint. Acute tonsillitis has, indeed, been compared to croupous pneumonia—another disease which is no longer regarded as a purely local inflammation. In each of these forms of illness, we find general symptoms severe out of all proportion to the local lesion; a rapid rise of temperature which often precedes the more special symptoms, and a critical fall on the fifth or sixth day. In each disease, too, the attack appears to be due to very similar causes.

Causation.—Although occasionally met with in young children, quinsy cannot be said to be common until about the eighth or ninth years. In all cases there is probably a special individual susceptibility rendering the patient more liable to be affected by cold and damp, which appear to be the ordinary causes of catarrh. Any influence which exercises a depressing effect upon the system will no doubt assist the action of these causes, and some observers are disposed to believe that in unfavourable subjects such depressing influences alone are capable of exciting the attack. There appears to be a distinct connection between tonsillitis and acute rheumatism. Quinsy is common in rheumatic subjects, and attacks of rheumatism are often preceded by acute inflammation of the tonsils. Indeed, so frequently is this the case that quinsy has been looked upon as an early manifestation of the rheumatic tendency.

The inhalation of sewer gas is another common cause of tonsillitis. Inmates of houses where the waste-water pipes run directly into the soil-pipe, or where the main soil-pipe is defective and leaks under the basement floor, are often subject to repeated attacks of quinsy, and also to a slower inflammation of the tonsils, which resists all treatment as long as the patient remains in the vitiated atmosphere.

Chronic hypertrophy of the tonsils is not always the consequence of the acute form of the disease. In scrofulous children, enlargement of these glands may arise from a process of slow inflammation. The same thing is

occasionally seen in children in whom no hereditary diathetic tendency can be discovered, and in families where the other members are strong and healthy. In these cases it will be generally found that the patient, if he has not suffered from repeated attacks of the acute form of the disease, has been long exposed to insanitary or other depressing influences by which his development and general nutrition have sustained distinct injury. The child may have lived in a vitiated atmosphere, been overworked at school, or been subjected to other sources of depression which have reduced his strength and diminished his vital powers.

The chronic inflammation of the tonsils, which is the consequence of a diathetic tendency, is seldom seen before the fifth or sixth year. When the hypertrophy occurs in children of healthier constitution, it often begins earlier, being found in infants under twelve or eighteen months old. It has been suggested by Robert, that in such young subjects the enlargement may be a consequence of teething, and it is possible that the change in the tonsils may have some connection with the general glandular activity which is known to prevail at this period of life.

Morbid Anatomy.—In acute tonsillitis, the inflamed tonsil becomes swollen with inflammatory exudation. An increased production of epithelial cells takes place in the recesses of the gland. The crypts are distended with them, and the cells appear as creamy-looking masses at the orifices. Almost at the same time the lymphatic follicles swell and soften, and form abscesses which run together so as to give rise to a considerable collection of pus. This is eventually expelled by one or more openings. The inflammation then subsides, and the swelling more or less completely disappears. It seldom happens that both tonsils are attacked at exactly the same time. Usually, the inflammation begins first on one side, and partly runs its course before the tonsil on the other side begins to suffer. There is also more or less inflammation of the soft palate and pillars of the fauces, and the salivary glands may participate in the inflammation and get hard and swollen.

In tonsils permanently enlarged from chronic inflammation, the increase in size is due to an inflammatory hypertrophy of the sub-mucous connective tissue. The glands are enlarged and hard, and their surface is often uneven.

Symptoms.—The inflammation begins with a chill, or even a distinct rigor, and the child complains of a feeling of dryness and aching in the region of the fauces. His temperature rises to between 102° and 103°, and he looks and feels ill. Often there is general aching and soreness of the body, such as is experienced at the beginning of attacks of severe catarrh; the pulse is rapid and full, and the tongue is thickly-coated with fur. On inspection of the throat, the tonsils are seen to be swollen and vividly red, and there is also redness of the soft palate, uvula, and pillars of the fauces. The uvula is not, however, swollen at the first, although later it is apt to become œdematous.

As the inflammatory process increases, the pain and aching at the back of the throat grow more distressing, and the discomfort is increased by a secretion of thick mucus from the inflamed mucous membrane. Deglutition is accompanied by a sharp pain, which often shoots up into the ears and side of the head, and all movement of the jaws is painful. The child is afraid or unable to swallow, and often an attempt to do so produces a choking sensation, and a return of the fluid through the nose. Singing in the ears and deafness are often present, and the voice of the sufferer has a peculiar nasal quality which is very characteristic. At the height of the disease, the temperature is often as high as 104°; the skin is moist and

clammy; the pulse is rapid and compressible; there is a feeling of great prostration, and the face is pale, haggard, and distressed.

If one tonsil only be affected, at the end of five or six days a yellowish spot can be detected on the reddened and glossy surface of the gland. In a few hours, or on the following day, the abscess bursts at this point, and discharges a large quantity of thick pus, to the great and almost immediate relief of the patient. Often, however, at this time, or shortly before, the opposite tonsil begins to swell, and the discomfort, if it had partially abated, returns.

The swollen gland may reach a large size. It can be felt externally behind the angle of the jaw, and often seems to block up the whole passage of the throat. When the inflammation runs its course on both sides at the same time, there may be difficulty of breathing, and the face assumes an agonized expression of distress. Fortunately, any but a favourable termination to the complaint is excessively rare; and the child's friends may be comforted by the assurance that the severity of the symptoms is out of all proportion to the actual danger of the illness, and that recovery may be expected with confidence. When the abscess bursts, its purulent contents are almost invariably swallowed by the child; but the cessation of much of his distress, the relief shown in his face, the rapid fall of temperature, and the improvement in his general symptoms, allow us to infer, even without examination of the throat, that evacuation of the matter has occurred.

After discharge of its contents the gland begins to diminish in size; deglutition, although still painful, is accomplished with greater ease; the haggard expression of the face disappears, and the desire for food begins to return. Often, at this time, a discharge of blood takes place from the abscess. The appearance of blood from the mouth may be a cause of great alarm to the child's relatives, and it is well to warn them of the possibility of its occurrence.

The duration of the disease is from one to two weeks, according to whether both tonsils or only one becomes inflamed. Convalescence is short, and after the cessation of the attack, the child quickly recovers his strength.

In a considerable proportion of cases, especially if judicious treatment is early adopted, the inflammatory process stops short of suppuration. The redness then begins to diminish, and the swelling to subside, at the end of forty-eight hours, or in the course of the fourth day. In many of these instances, the red and swollen tonsils are speckled over with gray patches from the secretion at the mouths of the follicles, and sometimes shallow ulcers are seen on the inside of the cheeks and lips, or on the tongue, but rarely on the tonsils themselves. In this form of the disease, the febrile action is less high than in the suppurative variety, but the depression and feeling of illness are fully as severe. When occurring in this form, tonsillitis is probably always a consequence of insanitary conditions. The cases are often met with in groups, several inmates of the same house or row of houses being attacked almost at the same time. Although included under the name of quinsy, the disease is probably distinct in its nature from the suppurative variety, and, if suitable treatment be adopted early, it can be readily arrested.

In *chronic hypertrophy of the tonsils*, the glands are enlarged and hard. They can be felt externally behind the angle of the jaw, and, on inspection of the throat, are seen as two globular bodies projecting towards one another, so as almost to touch in the middle of the throat. The anterior surface is smooth and shining, but the internal face is irregular from the open-

ings of the glandular recesses. Their colour is usually of a pale brick red, but when at all congested, as they are apt to be on the occurrence of the slightest chill, they become of a deeper tint, and yellow curdy masses appear at the orifices of the crypts. At these times, they often meet in the middle line, and the friction of the two bodies against one another may, as Dr. G. V. Poore has pointed out, be a cause of superficial ulceration. One of the results of this chronic enlargement of the glands is the frequent recurrence of attacks of inflammation, which, although amounting to no more than superficial pharyngitis, are yet a source of great discomfort. Usually, at least once in the twelve months, the inflammatory process is more severe, and the patient passes through a regular attack of quinsy.

A child who suffers from this chronic enlargement of the tonsils, presents many very characteristic symptoms. He has often an unhealthy appearance, being undersized, pale, and thin. The imperfect state of nutrition in such patients is well seen in cases where one member of a family is alone affected. The frail appearance of the child then contrasts strikingly with the robust and healthy look of his more fortunate brothers and sisters. It has been supposed that this imperfect performance of the nutritive processes is due to the impediment to respiration set up by the swollen bodies, and the consequent insufficient combustion of waste-products in the body. I cannot, however, think this a satisfactory explanation of the phenomenon. It appears to me to be rather the result of the striking susceptibility to chills almost invariably manifested by these patients. Their gastric mucous membrane is therefore kept in a state of almost continual catarrh. As a consequence, digestion is laboured and imperfect, and the nutritive needs of the system are insufficiently supplied. Such children are often excessively irritable and restless. Their complexion is sallow, with a dark discolouration under the eyes. They sleep badly at night, dreaming and talking incoherently. Their bowels are often confined, and their stools light-coloured and offensive. Sometimes the face turns suddenly white, and the child complains of flatulent pains and of distention of the belly.

In all cases where the enlargement of the glands is at all considerable, the mucous membrane in the neighbourhood of the tonsils is habitually congested and relaxed. The child snores in his sleep; speaks with a thick nasal tone of voice, and may be dull of hearing from the turgid state of his Eustachian tubes. Slight hæmorrhages often occur at night from the surface of the glands, and blood-stained saliva may flow from the child's open mouth on to the pillow. Sometimes the posterior nares are almost completely closed to the passage of air. The nostrils then become flattened so as to narrow the nasal apertures. In such children, the palate is often high and arched; the upper jaw is small; the teeth are crowded and overlap, and the front of the jaw is curiously rounded at the lips.

In extreme cases, the entrance of air through the larynx is impeded; often sufficiently so to induce a state of permanent collapse at the bases of the lungs. The lower end of the sternum, with the cartilages connected with it, is then forced backwards so as to present a cup-shaped depression at that point. The upper portion of the sternum is made prominent, and one form of pigeon-breast is produced. This variety of the pigeon-breast may be readily distinguished from a somewhat similar condition in the rickety child. In the latter, the whole sternum protrudes, from softening of the ribs. In the former, the upper part of the breast-bone is prominent, and the depression at the lower part is the result of yielding, not in the ribs, but in the cartilages.

Fœtor of the breath is a common consequence of enlarged tonsils, for

the glandular recesses become filled with a cheesy, decomposing secretion. Cough is also a frequent symptom It is often distressing and paroxysmal, and when combined with the pallid, weakly appearance above referred to, may give rise to fears of consumption. Such apprehensions are sometimes rather confirmed than allayed by the results of a physical examination of the chest. In many such cases, a peculiar hollow quality of breath-sound, probably conducted from the pharynx, is heard with the stethoscope at each supra-spinous fossa. To an inexperienced observer, this sign may suggest consolidation of the lungs. There is, however, no dulness on percussion, and the abnormal quality of breath-sound is heard principally in expiration, and is greatly diminished, or even completely suppressed, when the child opens his mouth widely.

Diagnosis.—Primary inflammation of the tonsils can only be mistaken for the secondary inflammation which occurs in scarlatina and diphtheria. In the first case, the absence of the characteristic eruption at the end of twenty-four hours is quite sufficient to exclude the infectious fever. But, besides the rash, the appearance of the inflamed mucous membrane is very different in the two diseases. In scarlatina, it is more widely diffused, and of a more brilliant red, than at the beginning of quinsy ; and on the soft palate the redness is usually punctiform, which is not the case in tonsillitis.

In diphtheria, the ash-coloured leathery appearance of the false membrane is different from the curdy patches of quinsy ; and in the former disease there is early swelling of the cervical glands. In inflammation of the tonsils these glands are not usually affected.

Prognosis.—In quinsy, the prognosis is rarely otherwise than favourable. Cases are said occasionally to have happened in which suffocation has resulted from the inflammation. Rilliet and Barthez have referred to such a case, in which a little girl, aged thirteen, died of suffocation on the second day ; but it is very doubtful if this was an uncomplicated case of quinsy, and the accident is one not greatly to be dreaded.

In cases of chronic enlargement of the tonsils, the glands, if left alone, usually become smaller after puberty. But while they remain swollen they give rise to so much inconvenience as well as induce so much interference with the nutritive processes, that measures should be always adopted for their early reduction or removal.

Treatment.—In every case of quinsy it is advisable, as an important preliminary to further treatment, to clear out the bowels with a good mercurial purge, followed by a saline draught. Linseed-meal poultices, or a cold water compress, must be kept applied to the throat, and if old enough to gargle, the child may use a weak solution of chlorate of potash sweetened with glycerine. If the case is seen early, aconite given frequently, in very small doses, is found in many cases to have a distinctly beneficial effect. It reduces the temperature, promotes the action of the skin, and often quickly brings the inflammation to a close. The tincture should be used in doses of one drop in a teaspoonful of water every hour. Guaiacum is greatly praised by some authors. It can be given in doses of three or four grains in a teaspoonful of glycerine several times in the day ; or the child may suck a guaiacum lozenge every three or four hours. The salicylate of soda is another remedy which has been lately held up as a specific in certain cases of quinsy. This drug, like the preceding, is especially adapted for cases which arise under the influence of cold and damp, and may therefore be supposed to be allied in their nature to rheumatism. To a child of ten years old it may be given in doses of ten or fifteen grains every four hours ; or half that quantity every two hours. If the salt be

suspended in mucilage flavoured with tincture of orange peel, and sweetened with spirits of chloroform, the resulting mixture is not unpleasant to a child. If given sufficiently early, it is often found to shorten, in a remarkable manner, the course of the inflammation, and prevent suppuration. The old-fashioned treatment by salines, with moderate doses of antimonial wine, following the indispensable purge, finds favour with many practitioners, and is no doubt often very successful. Attention to the bowels, indeed, must never be neglected. A good dose of calomel, or gray powder, with colocynth or jalapine, renders the after-course of the disease much less harassing, and, if all irritation of the throat is avoided, greatly helps the patient along in his path to recovery.

Astringent gargles can only be allowed in the early stage of the disease. A solution of alum (twenty grains to the ounce) may be used in this way, but is only admissible if the febrile action is mild, and if the case is seen within the first twenty-four hours. At a later period, ordinary astringent applications often do much more harm than good. There is, however, an exception to this rule, for brushing the surface of the inflamed tonsils with the pure solution of the subacetate of lead is often attended with surprising relief to the discomfort. This application may be used once in the day, whatever be the period of the illness. Another application which is often of service is the bi-carbonate of soda, applied in the powder. An ordinary throat brush, well charged with the powder, may be used to convey the latter to the tonsil.

Directly signs of suppuration are noticed, the child should be made to inhale the steam of hot water, and hot poultices should be sedulously applied to the throat. If old enough, the child should be directed to gargle frequently with warm water, to which, if there be any fœtor, a little Condy's fluid has been added. If necessary, the matter when it forms can be let out by a touch of the lancet, but in most cases it will be safe to allow it to find its own way to the surface. Still, if signs of dyspnœa are noticed, or the swelling is very large, operative interference is advisable. After the abscess has been evacuated, quinine should be given in full doses.

The diet must consist at first of milk and broth. When the difficulty of swallowing becomes great, strong meat essence should be given, and the strength may be supported, if the child appear very weak, by the brandy-and-egg mixture, or port wine. In cases of the non-suppurative form of the disease, where, although the depression is great, febrile action is moderate, and the inflammation is accompanied by shallow ulcers on the tongue and cheeks, chlorate of potash is very useful, and may be given in doses of five to ten grains every three or four hours. These cases also are greatly benefited by purgation, and Epsom salts with quinine form a good combination. A child of twelve years of age will take well two grains of quinine, with half a drachm of sulphate of magnesia, and five drops of dilute sulphuric acid, every six hours. This treatment cleans the loaded tongue, and improves all the symptoms with remarkable quickness. In young children, too, a glass of port wine, given quite at the beginning of the attack, seems often to have the power of preventing any further development of the complaint.

In the *chronic* form of tonsillar enlargement, it is of exfreme importance to improve the general nutrition of the child. It will be usually found on inquiry that he suffers from repeated attacks of gastric derangement. Our first care must be to improve the condition of the digestive organs by the means recommended elsewhere (see Gastric Catarrh). A broad flannel bandage, to protect the stomach from chills, is here of extreme importance.

Usually, when the gastric mucous membrane has been restored to a healthy state, the general condition of the child improves, although the size of the tonsils has undergone no diminution. Cod-liver oil and iron wine, or quinine and tonics generally, may be given to hasten the return of flesh and strength. A little alcohol, in the form of light claret, is very useful in these cases. As special internal treatment of the swollen tonsils, Mr. Lennox Browne speaks highly of the influence of a combination of sulphide of calcium and iodoform (half a grain of each), given three times a day, in reducing the size of the glands.

Of *local* measures, no doubt the best and most effective proceeding is excision. The tonsils having been removed, the tendency to catarrh in a great measure subsides; the digestion improves; the child begins to regain flesh and colour, and the congested state of the mucous membrane, which had been the source of so much discomfort and inconvenience, is at once relieved. The operation is a by no means painful one, and is followed by such immediate improvement that it should be recommended in every case. Often, however, the suggestion is not approved of by the parents, and other means of reducing the size of the glands will have to be resorted to. The tonsils may be painted twice a day with a mixture of equal parts of tinct. iodi and liq. potassæ; or once a day with the pure tinct. iodi. Powdered alum may be applied according to Quinart's method, rubbing it into the gland vigorously with the finger; or the throat may be brushed twice a day with glycerine of tannin. These applications are, however, of doubtful efficacy. I have used them myself, and seen them employed by others, but even if the size of the glands is reduced for a time by such means, the improvement is seldom a permanent one. Dr. Morell Mackenzie speaks highly of a paste composed of equal parts of caustic lime and soda with spirit. This is to be applied to different parts of the swollen surface once or twice a week. Other caustics, such as nitrate of silver, Vienna paste, and chloride of zinc (in the stick) have been used, and the galvano-cautery has also been employed. By the use of these agents, small portions of the enlarged and toughened glands are destroyed on each application; but the size of the tonsils is but slowly reduced by this means —indeed, the patience of the child's relatives is usually exhausted before any definite results have been obtained. A more rapid method is that recommended by Dr. Gordon Holmes. A thin stick of nitrate of silver is pressed into the tonsillar crypts, and worked round for a few seconds. Small sloughs are thus formed, which are soon discharged. The process can be repeated every other day, and by this means, with little suffering to the child, for the operation is followed by but little external soreness of the throat, the size of the glands may be quickly and materially reduced. Another plan is to inject a solution of ergotin (℥ j.—jss. to ℥ j.) with the hypodermic syringe into the enlarged tonsil. Three to five drops may be slowly introduced into the gland once or twice a week. The operation seems to cause some pain, and is so greatly dreaded by the child that it is difficult to persevere with it for long together. I have never seen a case where the glands have been appreciably diminished by this means.

French authors recommend sulphurous baths as efficacious in reducing the size of the glands, but I cannot speak from my own experience of the value of this method of treatment.

CHAPTER VII.

RETRO-PHARYNGEAL ABSCESS.

Collections of matter occasionally form in the loose cellular tissue at the back of the pharynx. The disease is of importance, as the abscess, by its situation, interferes seriously with the functions of respiration and deglutition, and gives rise to symptoms which, unless referred to their true origin, may be a source of considerable perplexity.

Causation.—Retro-pharyngeal abscess is more common in childhood than in after years, and during the first twelve months than at a later period of life. In eighty-nine cases collected by Gautier, nearly one-third of the patients were infants under a year old.

Scrofulous tendencies appear to have a powerful influence in favouring the occurrence of the disease. In the subjects of this diathesis, the abscess is sometimes found to occur as a sequel of one of the acute specific diseases —of scarlatina, measles, diphtheria, or erysipelas. Caries of the cervical vertebræ, to which such children are prone, may induce it; and it may follow tonsillitis, ulcerations about the mouth, or eczema of the scalp or back of the neck. In many cases, however, the cause of the malady is obscure. It has been attributed to exposure to cold, to the action of irritants, such as too hot liquids, and to injury from fish-bones, pins, and pointed spiculæ of bone inadvertently swallowed. Indeed, such substances have been occasionally discovered in the contents of the abscess.

Morbid Anatomy.—The collections of matter situated behind the posterior wall of the pharynx vary considerably in size. Sometimes they are as large as a hen's egg, and may even extend for a considerable distance upwards and downwards. They are not always seated in the middle line; indeed, more commonly, perhaps, they are placed at an appreciable distance to one side. They are almost invariably single, and their contents consist of purulent and cheesy matter. Sometimes the abscess may open spontaneously. In other cases it may set up ulceration in a large vessel, such as the carotid, and give rise to fatal hæmorrhage. Occasionally it has been known to force its way along the cellular tissue of the neck, and open into the mediastinum or the pleural cavity. In a case which was under the care of my colleague, Mr. Parker, in the East London Children's Hospital—a little boy fifteen months old—the abscess formed a fluctuating swelling, the size of a hen's egg, below and behind the angle of the lower jaw on the right side. There was also a soft, cushiony tumour at the back of the pharynx. After the abscess had been opened externally, pressure on the pharyngeal swelling caused pus to well up through the wound.

In young infants, the primary seat of the suppuration appears to be the lymphatic glands which lie along the posterior wall of the pharynx. Kormann states that with his finger he has been able to detect enlargement of these glands in certain cases of thrush, ulcerative stomatitis, ozæna, etc., but that only in one instance has he known the inflammation to pro-

ceed to suppuration. Fleming, too, in 1850, attributed the post-pharyngeal suppurations to inflammation of these glands.

Symptoms.—Unless the retro-pharyngeal abscess be due to caries of the cervical vertebræ, the case seldom comes under observation until some impediment to breathing has attracted the attention of the mother. The earlier symptoms are usually so indefinite that they excite very little notice. If, however, the purulent collection occurs as a consequence of suppuration of bone, the formation of the abscess is preceded by symptoms indicative of caries of the vertebræ of the neck. These symptoms have been described elsewhere (see page 178).

Pain or difficulty in swallowing, is perhaps the first symptom observed. The presence of the pharyngeal swelling so interferes with the passage of food that the patient may have the greatest difficulty in taking nourishment. Liquids can often be swallowed, but solid matters pass only with great effort, or not at all. Sometimes the obstacle appears to be complete. In these cases, the child, if an infant, sucks eagerly for a few seconds, and then suddenly throwing back his head, discharges the fluid he has taken through the mouth and nose. As a consequence of the impediment, serious interference with nutrition invariably follows, and the child loses flesh rapidly. It must be said, however, that cases are sometimes met with in which no difficulty of deglutition is present, and nutrition appears to be little affected by the presence of the abscess.

Dyspnœa is another symptom which is usually to be noticed, and often occurs at the same time with the preceding. There appears to be direct interference with the entrance of air into the lungs, for at each inspiration the child makes a curious grating or whistling sound, and at the same time the soft parts of the chest sink in, and the epigastrium is retracted. The dyspnœa varies in degree. It is subject to paroxysmal exacerbations, but in the intervals the respiration is far from tranquil. When the child lies down, the breathing is always especially difficult, and the dyspnœa is therefore particularly noticeable at night. In severe cases, the patient is obliged to raise himself in bed in order to breathe with any approach to ease, and may often be found sitting up in his cot with his legs doubled beneath his body. He cries fretfully if disturbed, or invited to take either food or drink, and will not willingly make any attempt to swallow. The dyspnœa is always increased when pressure is made externally upon the larynx.

Cough is usually present, generally dry and hard, but sometimes paroxysmal like the cough of pertussis. The voice has a nasal quality, especially if the swelling is high up in the pharynx. It is seldom hoarse if the case be uncomplicated.

Stiffness of the neck is a characteristic symptom, for movement of the head upon the shoulders is always painful. Consequently, the child holds the head in a curiously rigid way, sometimes inclined to one side or bent somewhat backwards. When the neck is examined, it is often found to be swollen. Sometimes the depression behind the angle of the jaw is obliterated, and Mondière points to this as a characteristic symptom. Sometimes the larynx is pushed forwards, or forced to one side out of the middle line. Pressure upon the neck or larynx is always painful.

On inspecting the throat, a swelling can usually be seen at the back of the pharynx, protruding from beneath the soft palate, and seeming to touch the back of the tongue. The mucous membrane may not be altered in colour, and often there is no redness of the fauces. On touching the swelling with the finger, it is usually felt to be soft and elastic like a sac

filled with fluid, but may feel firm like a solid growth. The finger should be passed round the borders of the prominence so as to define its limits. The swelling does not always come into view when the mouth is opened; for not only is it often obscured by more or less frothy mucus, but its situation may be such that it is not readily discovered. If, then, we suspect its existence, the finger should be rapidly passed upwards to the back of the nose, and downwards behind the glottis. By this means the position of the abscess can usually be ascertained.

The above symptoms are to be discovered in most cases of the disease; but the course and form of the illness vary greatly according to whether the suppuration is an acute or chronic lesion.

In an *acute* suppuration behind the pharynx the symptoms are very much more pressing and severe than in the more chronic form of retro-pharyngeal abscess. The disease generally begins with high fever, severe headache, and vomiting. After a few days, stiffness of the muscles of the neck is noticed, with a peculiar fixed position of the head, and there may be swelling of the neck and great tenderness. In some cases, the stiffness extends to the muscles of the jaw, so that the mouth can be opened only imperfectly. At the same time, or soon afterwards, there is difficulty in swallowing, and the breathing is laboured and stertorous. If the child is laid down these symptoms are increased, and often the recumbent position induces a state of somnolence approaching to stupor. If the symptoms are not relieved, the condition of the child becomes more and more distressed. His face is swollen and livid, and the jugular veins are prominent. He lingers for a few days in this state, and then dies, exhausted from inanition, or suffocated in a paroxysm of dyspnœa. Death is often preceded by a series of convulsive attacks.

In the more *chronic* cases, there is little or no fever, and the symptoms generally are much less urgent. There is, however, usually a noticeable interference with nutrition, and the loss of flesh is considerable.

The duration of the disease varies greatly. In some cases it runs a very acute course, and ends fatally in a fortnight or three weeks. This form is most common when the suppuration occurs as a sequel of fever. In other cases, the dyspnœa and dysphagia continue for months before their true significance is realised.

A little girl, aged three years, was brought to me at the hospital for difficulty of breathing. The mother stated that two years previously, while teething, the child had suffered from an eruption on the head. This had been quickly followed by a swelling at the right side of the neck, which, after growing larger for two months, had burst. Very shortly afterwards the breathing had been noticed to be oppressed, and the respiration had begun to be accompanied by a peculiar whistling or rattling noise. This symptom had continued ever since, and was always worse at night. The child was said to sleep very heavily, with her eyes only partially closed. Sometimes she had seemed to have a difficulty in swallowing.

When first seen, the child was lying asleep, resting on the right side of her chest. She was sweating profusely about the head and neck. Her face was flushed, and the eyes were only partially closed. The mouth was open, and the nares were motionless in respiration. At each breath the intercostal spaces sank in deeply, and the epigastrium was depressed. With each inspiration a peculiar grating noise was heard, which seemed to proceed from the throat. The expirations were less noisy, but still abnormal. The glands along the edge of the sterno-mastoid, and those below the jaw,

were enlarged and painless, and the larynx and trachea seemed pushed out of the middle line to the left.

On inspecting the fauces, a swelling about the size of a plover's egg could be seen at the back of the pharynx. On pressing this with the finger, it felt firm like a solid tumour.

The swelling was punctured with a large trocar and canula, and half an ounce of thick pus was evacuated. After the operation the breathing became quieter, and swallowing was effected without difficulty. The abscess continued to discharge for some days and then healed. When the child left the hospital she seemed well in health, but some thickening remained at the back of the pharynx.

In this case, the disease had lasted for two years, and was apparently the consequence of slow softening of a cheesy gland at the back of the pharynx. The cervical glands were also enlarged and caseous; and from one of these, seated behind the angle of the jaw, a quantity of cheesy matter was scooped out by my colleague, Mr. Reeves.

Whatever be the length of its course, a retro-pharyngeal abscess, if unrecognised, generally terminates in death. As has been before remarked, the child usually dies suffocated in a paroxysm of dyspnœa, or gradually wastes away from starvation and exhaustion. Even spontaneous bursting of the abscess appears to be attended with great danger, and cases are reported in which suffocation has been the consequence of the passage of the purulent matter into the trachea.

Diagnosis.—Amongst the various causes of dyspnœa in the child, it must not be forgotten that retro-pharyngeal abscess is one; and in every case where the breathing is difficult and stertorous, the pharynx should be examined as a matter of routine. If this be done, the disease is not likely to be overlooked, for a finger passed to the back of the pharynx at once detects the presence of the abscess. Moreover, information may be sometimes gained from mere inspection of the neck. Any unusual prominence of the trachea, or displacement of that tube to the right or left of the middle line, suggests an extra-laryngeal cause for the dyspnœa. So, also, if we find the child sitting up in bed and refusing to lie down; or if laid down, starting up again in an access of suffocation, we should suspect external pressure upon the larynx. The more characteristic symptoms are: Stiffness and swelling of the neck, and difficulty of swallowing, combined with orthopnœa and stridulous breathing. The most characteristic sign is a swelling at the back of the pharynx, which is not, indeed, always to be seen, but can invariably be felt by digital exploration.

The disease is more likely to be misapprehended in the acute than in the chronic form; for the violence of the symptoms, the lividity of the face, the urgency of the dyspnœa, and the stertorous character of the breathing, suggest the presence of membranous croup. But in that disease, stertor is present from the beginning; the dyspnœa is not increased by pressure made upon the trachea, and is relieved when the head is low; the voice rapidly becomes hoarse and then whispering; and unless the pharynx be the seat of false membrane, there is no difficulty in swallowing.

Œdema of the glottis also presents many points of similarity with abscess of the pharynx; but in the former case the stridor is only marked in inspiration, the expiration being noiseless; and when the finger is passed into the throat it detects no tumour, but can feel the thickened epiglottis and the swollen ary-epiglottidean folds. Still, the two diseases may be present together; but if a tumour can be felt at the back of the pharynx on digital examination, the nature of the disease cannot be doubtful.

Prognosis.—If the abscess is detected in time, the prognosis is favourable. When death occurs in this disease, it is usually in cases where the cause of the symptoms has been overlooked, and no attempt has been made to relieve the child by the only means which are likely to prove effectual. The worst cases are those in which the abscess is the consequence of careous disease of bone; but even these may end in recovery if the matter be evacuated before the child has become exhausted.

Treatment.—In the treatment of retro-pharyngeal abscess, no time should be lost. Directly the tumour is recognised, it should be opened, whether fluctuation be present or not. In order to avoid any risk of penetration of the pus into the larynx, it is perhaps safer to use a large trocar and canula; but the abscess may be opened with a knife without danger if care be taken to bend the child's head promptly forwards when the incision is made. The bistoury should be guarded to within half an inch of its point by winding adhesive plaster round the blade. The opening must be made as near the middle line as possible; and the instrument may be pushed boldly forwards, for the pus often lies at some distance from the surface. If a trocar be used, the abscess sometimes refills, and may require a second puncture after a few days.

The general health of the child must be attended to. Good diet and a certain quantity of stimulant should be allowed; and he may take quinine and cod-liver oil. When convalescent, the patient will be benefited by a visit to the seaside.

Part 9.

DISEASES OF THE DIGESTIVE ORGANS.

CHAPTER I.

INFANTILE ATROPHY.

Infantile atrophy, or the slow wasting which is a familiar symptom in hand-fed babies, is one of the commonest causes of death in early infancy. The child ceases to digest his food—possibly he has never begun to do so; gradually dwindles away, and after a longer or shorter period, dies with all the symptoms of starvation. This condition, which, under the name of "marasmus," finds a large place in the mortality returns of all countries, is a perfectly curable complaint, and may be arrested at almost any stage by the exercise of judgment and care in the feeding and general management of the infant.

Causation.—Infantile atrophy is the consequence of insufficient nourishment. The child wastes because he is starved. But it is not to actual lack of feeding that the starvation is usually to be ascribed. A baby fed from a breast which secretes milk poor in quality and insufficient for the child's support, will, of course, grow slowly thinner; but an infant supplied largely with farinaceous compounds from which his feeble digestive organs fail to derive even a minimum of nourishment, will waste with startling rapidity. Starvation is then a relative term. The tissues may be starved, although the stomach is regularly filled. In every case, the nutrition of the infant is dependent upon his power of extracting a sufficiency of nourishment from his so-called "food." It may seem unnecessary to insist upon so self-evident a matter; but in practice it is common to find a diet persisted with which the infant's stomach rejects, or his tissues fail to assimilate. Many a baby's life is sacrificed through the inability of those about the child to understand that feeding and nourishing are not quite the same thing.

For efficient nourishment, four classes of substance are indispensable, viz., albuminates, hydro-carbonates, fats, and salts. It is further necessary that these should be presented to the child in such a form that they can be digested with ease. The most perfect food for infants—the only one, in fact, which can be relied upon in itself to furnish all these requirements—is milk. Milk contains nitrogenous matter in the curd, fat in the cream, be-

sides sugar and the salts which are essential to perfect nutrition. In the milk of the mother or of a good nurse the new-born infant finds these elements combined in exactly the proportions best adapted to supply all the wants of his system. In the milk of animals, the proportions deviate more or less widely from the human standard. Cow's milk, especially, contains a larger proportion of curd and cream than is found in human milk, but less sugar; and although to an exceptionally sturdy infant this difference may be immaterial, for a child of ordinary powers it will be necessary, by suitable preparation, to bring the milk into closer resemblance with the natural diet of which he has been deprived.

The chief obstacle to the digestion of cow's milk by young babies is not, however, the mere difference in the proportion of the several constituents. Were this so, dilution with water and the addition of sugar of milk would be sufficient to perfect the resemblance between the two fluids. A more important difference is the denseness of the clot formed by the curd of cow's milk. Ample dilution with water does not affect this property. Under the action of the gastric juice, the particles of casein still run together into a solid, compact lump. This is not the case with milk from the breast. Human milk forms a light, loose flocculent clot, which is readily disintegrated and digested in the stomach. The difficulty which even the strongest children find in digesting cow's milk, is shown by the masses of hard curd which a child fed exclusively upon this diet passes daily from the bowels. This difference between the two milks is answerable for much of the trouble and disappointment experienced in bringing up infants by hand. But it is not merely new-born infants for whom a diet of cow's milk is inappropriate. Gastric and intestinal disorders often date from the time of weaning; and this is partly the consequence of an abrupt change from human to cow's milk in cases where little or no care is taken to make the new diet a digestible one. The heavy curd of cow's milk is often difficult of digestion, even by children of ten or twelve months old, if they have been accustomed only to the breast; and unless measures are adopted to hinder the firm clotting of the casein, serious dangers may arise.

The difference in the constitution of the milk of the woman, the cow, the ass, and the goat, are seen in the following table prepared by MM. Vernois and Becquerel:—

	Sp. Gr.	Water.	Solids.	Sugar.	Casein and Extractives.	Butter.	Salts.
Woman.....	1032.67	889.08	110.92	43.64	39.24	26.66	1.38
Cow.....	1033.38	864.06	135.94	38.03	55.15	36.14	6.64
Ass.....	1034.57	890.12	107.88	50.46	35.65	18.53	5.24
Goat	1033.53	844.90	153.10	36.91	55.14	56.87	6.18

The milk of the ass approximates most nearly in composition to that of the human breast, and is much more digestible than the milk of the cow. The goat yields a milk which chemically resembles very closely that of the cow, but in practice it is found to be far more digestible by the child. This is no doubt due to the looser clot formed in the stomach by its coagulated curd.

As cow's milk diluted with water is considerably less digestible than the

milk of the human breast, it is not surprising that a weakly child should fail to derive sufficient nourishment from such a diet. If he be fed with large quantities of farinaceous food, his difficulties are still further increased. The new-born infant has only a feeble capacity for digesting starch. His salivary secretion is excessively scanty, and his pancreas can scarcely be said to furnish any secretion at all. According to the experiments of Korowin, of St. Petersburg, it is not until the end of the third month after birth that the pancreatic fluid is found to have any appreciable action upon starch. The two secretions upon which the digestion of starch chiefly depends are therefore almost completely absent in early infancy. Yet it is to a being quite unprepared by nature for this diet that farinaceous substances under the misleading name of "Infants' Foods" are so universally given. Many babies are fed with them exclusively from their birth; others take them in large quantities as an addition to the breast-milk. In either case, the meal is in great part undigested, and gives rise to much flatulence and pain in its passage along the alimentary canal. It must be borne in mind that the effect of an indigestible diet is not merely the withholding of nourishment. To the weakness of starvation or semi-starvation must be joined the additional weakness induced by catarrh of mucous membrane from the constant passage along the bowel of undigested and fermenting food. The irritation thus set up gives rise to repeated attacks of vomiting and diarrhœa; and even between the attacks, although the irritation is for the time less severe, the child is restless and uncomfortable, crying and whining, and unable to sleep from the colicky pains in his belly. Unfortunately for the infant, this consequence of his unsuitable diet is often mistaken by ignorant or too anxious attendants for signs of hunger; and while the poor sufferer is still labouring to dispose of his last meal, another supply of food, which his craving forces him eagerly to swallow, increases his difficulty and discomfort. It is not, then, surprising that the infant, extracting no nourishment from his frequent meals, grows daily thinner and more feeble, and sinks at last, worn out by purging, pain, and want of sleep.

The symptoms of indigestion which always precede the more pronounced signs of infantile atrophy, sometimes come on quite suddenly and unexpectedly in an infant who has been fed with judgment, and has at first appeared to thrive. The falling off is due, in the majority of cases, to some casual derangement of the stomach and bowels which induces an acid change in his food. The child consequently ceases to be able to digest his milk. The fluid undergoes fermentation in his stomach, and generates an acid which irritates the delicate mucous membrane and increases the disturbance of the digestive organs. Severe symptoms are often the consequence of this indigestion, so that, unless timely measures are taken to avert the danger, the child's life may be sacrificed. An attack of gastric catarrh, induced by a slight chill, is the commonest cause of this sudden indigestion; but sometimes the derangement is the result of overfeeding, the child's meals being too large or too frequently repeated; or, again, the feeding apparatus may have been neglected, so that milk put into a dirty, sour bottle, has begun to ferment before the child swallows it. In warm weather, milk soon becomes sour, even in clean vessels; indeed, if some time have elapsed since the milk was drawn from the udder, it may be delivered at the house in a slightly acid state, although appearing to be perfectly fresh to the eye, the smell, and even to the taste.

There is one other cause of infantile indigestion and bowel complaint which should be mentioned, as the fault is a common one. In households

where it is the custom to prepare for the infant in the morning the whole day's supply of food, an acid change in the mixture almost invariably takes place, so that in the afternoon or evening the food is no longer fit for the child's consumption. The change may occur without necessarily producing any alteration appreciable by the senses. Test paper will, however, show acidity, and the microscope will probably reveal bacteria in active motion.

A derangement of the stomach and bowels, occurring suddenly from any of these causes, not only interferes with the infant's nutrition for the time, but often produces much more serious consequences. It may set up a disorder in the digestive system which is never afterwards recovered from, and start a process of gradual wasting which ends only with the death of the child. It is, indeed, in incidents of this kind that the chief danger of artificial feeding consists; for a diet arranged originally with care and judgment ceases to be appropriate in these altered conditions. An immediate change is imperative if the derangement is to be remedied; and for some time afterwards a careful watch must be kept over the infant's digestion, lest the disorder return.

Infantile atrophy is seldom seen to any serious extent in infants at the breast, but sometimes a certain degree of malnutrition is observable in babies who take no other food. This may result from different causes. An infant may be consigned to a wet-nurse whose own child is much older than her adopted suckling. It is well-known that, as time passes, human milk becomes proportionately richer in curd and cream. An infant, newborn, and with naturally feeble digestive power, put to the breast at a late period of lactation, may consequently fail to thrive; or may even suffer from indigestion and bowel complaint through the richness of the milk. Again, in some women, the milk, although abundant, is of poor quality, and insufficient for the support of a strong baby, so that the child soon shows signs of deficient nutrition. Human milk is also affected by dietetic and emotional causes, and the secretion is apt to be influenced by the general state of health. There are many reasons, therefore, why a child, even while at the breast, should be subject to casual derangements. Still, these are usually trifling, and seldom produce any serious effect upon his nutrition.

It sometimes happens that a mother's milk is not well suited for the nourishment of her offspring, even in cases where the secretion is copious, the child a sturdy boy, and the health of the mother in every way satisfactory. Some years ago I was asked by a gentleman to go and see his child—a little boy of seven months of age. I found that the child had been suffering for some weeks from severe abdominal pains. He was excessively peevish and fretful, and at night would wake up with a scream, and twist about his body under the influence of severe griping pain. His bowels were very confined, and the motions consisted almost entirely of curd. He was taking nothing but the breast. Aperients had been found to relieve the child for a time, but the symptoms always returned when the effect of the purgative had passed away. Whenever the breast was stopped for a few days, he immediately improved, but relapsed as soon as suckling was resumed. The child had lost flesh, and was evidently suffering from his inability to digest the curd of his mother's milk. It was therefore a matter of great importance to enable him to do so; otherwise he would have to be weaned, and fed in a different way. The mother had herself, by taking salines and other medicines, and by making many modifications in her diet under medical advice, endeavoured to alter the quality of her milk, but without success.

Several methods of remedying the evil were tried. The intervals between the times of suckling were increased, so as to give a longer period for digestion ; but this change had no effect whatever. Alternate meals of barley-water were then given from a feeding-bottle. By this means, the quantity of milk taken by the child in the course of the day was diminished, and the interval between the times of suckling was still further increased. No improvement, however, followed the alteration. The griping pains still continued, and the constant fretfulness of the child was most distressing to the mother. The plan was at last adopted of giving the child barley-water from a bottle immediately before he took the breast, in the hope that by this means the milk might be diluted directly it reached the stomach. This method succeeded perfectly, and the child had no further unpleasant symptoms.

In this instance, the infant's stomach was in a perfectly healthy state. The fault lay in the mother's milk, which was too heavy for the child's powers of digestion. In the large majority of cases of indigestion in infants reared at the breast, the fault is in the digestive organs of the child, an attack of gastric catarrh having rendered him for the time incapable of digesting his mother's milk. In these cases, the indigestion is a temporary failing, and is easily remedied by suitable treatment. Without judicious management, the derangement may be prolonged indefinitely ; and it not unfrequently happens that the mother is directed to wean her baby under the mistaken notion that her milk is unfit for its support.

Morbid Anatomy.—In cases of death from infantile atrophy, the tissues are found excessively wasted, and there is complete absence of adipose tissue from the body. The general pathological appearances are such as have been already described as common to cases of thrush (see page 572).

Symptoms.—When a child at the breast depends for his support upon a scanty supply of poor milk, he suffers no pain, but wastes persistently. The infant is peevish from hunger, and at times cries violently. For the same reason he sleeps little, and at night is very troublesome. In the day-time he often lies quietly sucking his fingers until they are raw. His fontanelle is level or depressed ; his skin is moist ; his bowels are confined ; the motions scanty and often almost solid. He soon becomes pale and flabby, and does not grow. If the milk, although poor and watery, is abundant, the child frequently requires the breast. He sleeps much, and often is found asleep with the nipple still in his mouth. This, indeed, is a common sign of watery milk. If noticed in a child who is not thriving, but in whom no positive derangement can be discovered, measures should at once be taken to change the nurse, or supplement the breast-milk by a suitable diet.

In hand-fed babies, infantile atrophy is often seen in its most extreme degree. A child fed with unsuitable food is not only starved, but is kept in a state of continual distress ; so that we find persistent wasting combined with symptoms more or less striking of gastric and intestinal disturbance.

The loss of flesh is noticed from the very beginning. Its rapidity depends partly upon the kind of food chosen ; partly upon the natural strength of the child, and his capacity for extracting nourishment from his unwholesome diet. A puny infant, fed with large quantities of arrow-root, or other equally inappropriate food, wastes very rapidly, and at the end of two or three months, if he lives so long, may actually appear to have made no advance in size or in strength since his birth. Such an infant is pale and miserably thin, his skin is dry, and has a faint yellow tint ; his eyes are hollow ; his cheek-bones project ; his lips are livid, and their

slightest movement shows a deep furrow encircling the corners of the mouth; his expression is uneasy and languid; his feet and hands are habitually cold, and he whines and cries fretfully for hours together. These children often have a ravenous appetite for food, and will swallow greedily whatever is offered to them. The meal, however, produces merely a temporary relief, and as soon as the griping pains to which it gives rise make themselves felt, the child's wailings are renewed. The abdominal pains excited by the indigestible nature of his food are often very severe. The infant may become quite stiff and rigid from his suffering, and scream with white, drawn face and staring eyes until exhausted. Sometimes the griping gives rise to a convulsive fit, although this is rare, but the irritation of the bowels, and acidity, not unfrequently excite signs of nervous irritation ; we notice sudden starts and twitches, a slight squint, a peculiar rotation of the eyeball upwards, and contractions of the fingers and toes.

Eruptions on the skin, such as strophulus and urticaria, are common ; and in the later stage of the illness, aphthæ or thrush may appear in the mouth.

The state of the bowels varies. It is probably dependent upon the degree to which the mucous membrane is irritated by the child's unsuitable diet. If this irritation be only moderate, the bowels are usually confined. The infant is restless, and may be noticed to be feverish at night. His tongue is coated with a thick white fur. He is evidently in a state of great discomfort, for his temper is peevish and fretful, his movements are uneasy and jerking, and he occasionally breaks out into piercing cries, drawing up his knees and twisting about his body under the influence of abdominal pain. At night the griping is especially violent; the child scarcely sleeps at all, or if he be quiet for a moment in uneasy sleep, he soon starts up again, screaming with a fresh attack of pain. The motions are scanty and rare. The bowels sometimes remain confined for twenty-four hours or longer, and when they are at last relieved, hard, clay-coloured balls, tinged with green mucus, are expelled with great effort and straining. These balls consist of hard curd and farinaceous matter. A full dose of castor-oil, which clears away the curd, allays the symptoms for a time ; but usually, if the same diet be persisted in without any change, they return in a day or two, and the child is in the same distress as before.

In almost all cases of infantile atrophy, the ordinary uniform course of the derangement is interrupted by intercurrent attacks of vomiting and diarrhœa. These attacks not only greatly increase the rapidity of the wasting, but, if of great severity, may bring the illness abruptly to an end.

Troublesome vomiting in a young baby, the consequence of gastric catarrh, is a very serious ailment. All food swallowed is instantly returned, and clear fluid, like water, or bile-stained mucus, is occasionally ejected. The vomited matters, and even the breath of the child, have an offensive, sour smell. The belly is swollen and often seems tender; the hands and feet are very difficult to keep warm ; the eyes grow quickly hollow; the lids close imperfectly; the complexion is sallow or half jaundiced, and the fontanelle is deeply depressed. At first the tongue is thickly furred, later it is apt to have a red, glazed appearance. The child is very fretful. He soon becomes too weak to cry loudly, but whimpers feebly to himself in a pitiful way, and scarcely seems to sleep at all. If no diarrhœa complicate the ailment, the bowels are confined, and the patient often seems to be disturbed by flatulence, for he draws up his legs uneasily

with a troubled grimace. If treatment do not succeed in checking the disorder, the vomiting continues, and is excited by the least movement. The complexion becomes earthy, the hands and feet grow purple, and the temperature in the rectum may fall as low as 96° or 97°. At this period, thrush usually appears in the mouth, and death may be preceded by symptoms of spurious hydrocephalus.

Steady, persistent vomiting such as has been described, is less common than are shorter attacks of sickness accompanied by diarrhœa. These are apt to occur in children at an early period of the atrophy, and must be looked upon as an effort of nature to relieve the alimentary canal of its unwholesome burden. It is only at a later period of the illness that they are apt to become obstinate, and when thus confirmed, the ailment is very difficult to overcome. A chronic diarrhœa, such as is elsewhere described (see page 633), often arises in the course of infantile atrophy, and, if not treated judiciously, determines a fatal issue to the illness. In most cases, indeed, death is the consequence of a persistent looseness of the bowels which nothing will arrest. But, in an infant reduced to a weakly state by a long course of improper food, any acute ailment, however apparently trifling it may be, will often prove fatal. A new symptom occurring at a late period of atrophy is therefore to be regarded with very serious apprehension.

Diagnosis.—A state of extreme emaciation may be present in the infant as a result of other causes than injudicious management and unwholesome feeding. Infants, the subjects of inherited syphilis, are often excessively puny and feeble, and acute tuberculosis may attack a child of a few months old and gravely impair the nutrition of the patient.

In the first case, the symptoms induced by the syphilitic poison are sufficiently distinct. The child snuffles and cries hoarsely. His skin is dry, wrinkled, and of the colour of old parchment. It is sprinkled over with the characteristic coppery or rust-coloured spots, and the buttocks and perinæum, often, also, the genitals and upper parts of the thighs, are the colour of the lean of ham. Mucous tubercles are probably to be discovered at the margin of the anus and the lips. The corners of the mouth are fissured, and the nostrils red-looking and excoriated. The bridge of the nose is flattened, and an examination of the belly will probably detect enlargement of the spleen. None of these symptoms are to be found in simple infantile atrophy. The earthy tint of the face and body sometimes resulting from chronic digestive trouble is very different from the parchment-like hue of the inherited disease; strophulus, arising from the same cause, can hardly be mistaken for the coppery spots of syphilis; and hoarseness, snuffling, and the other symptoms which have been enumerated, are never the consequence of weakness and wasting, however profound.

In acute tuberculosis, the temperature is elevated, and a thermometer in the rectum will be found to mark 100° or 101° in the evening. In infantile atrophy, there is no pyrexia; on the contrary, the bodily heat is usually lower than in health. Moreover, in the former disease, the child coughs, and even if the lungs are not the seat of pneumonia, a clicking rhonchus will be discovered here and there about the chest. In tuberculosis, too, a slight amount of œdema of the legs is almost invariably present in the infant.

Syphilis and tuberculosis having been excluded, the diagnosis is easy. The wasting must be due to chronic digestive derangement, or to unsuitable food, or to both of these causes combined. In the case of either chronic vomiting or chronic diarrhœa, the characteristic symptom of these

derangements will be present. Still, in many cases of malnutrition, where the wasting is extreme, there is no irritability of stomach, and the bowels are habitually confined. In these cases the child is peevish and fretful. His belly is distended, and his skin dry and dull-looking. The nasal line encircling the corners of his mouth is well-defined. His feet are often cold, and the bodily temperature in the rectum is sub-normal (97°–97.5°). His stools consist of hard light-coloured balls, or of unformed putty-like matter. The child is subject to attacks of abdominal pain, and is very noisy and troublesome at night.

Prognosis.—Unless the infant be reduced to a state of extreme weakness and depression, the prognosis is not unfavourable. It is often surprising to mark the immediate improvement which takes place when the child is put to the breast, or is supplied with a food he is capable of digesting. If signs of spurious hydrocephalus have been noticed, if the mouth be the seat of thrush, or if a chronic diarrhœa have been established, the prognosis is more serious, and, indeed, these cases often end unfavourably. Chronic vomiting, however, can usually be arrested by judicious treatment, if the infant retain sufficient strength to respond to the restorative measures adopted.

Treatment.—In endeavouring to improve the nutrition of a child who is suffering from infantile atrophy, we have to take into account the degree of weakness of the infant, and the more or less disordered state of his digestive organs. If a wet nurse can be procured, a return to the breast, if the child can be persuaded to take it, usually arrests at once all unfavourable symptoms ; especially, if the alteration in the mode of feeding be aided by an aperient dose of castor-oil, followed by an antacid and stomachic mixture. In many cases, however, this method of treatment is not within our reach, and we have to trust to a judicious revision of the child's dietary and general management.

The successful rearing of an infant by artificial means is not a difficult matter. It requires intelligence and tact; but, above all, it requires watchfulness. If we are vigilant to detect the first signs of discomfort and acidity, and at once modify the diet accordingly, we may be sure of preserving a healthy tone in the stomach, and warding off all the accidents to which a child less carefully nurtured might possibly succumb.

During the first month after birth, the infant usually is able to obtain some milk from its mother's breast. This, however, may have to be supplemented by other food, and sometimes the babe is forced to depend entirely upon artificial feeding from the beginning. For the first six weeks he may be fed with condensed milk diluted with water, or thin barley-water, in the proportion of one teaspoonful of the milk to the half bottle. Preserved milk at this time almost invariably agrees well. Care must, however, be taken to use only milk from a tin which has been newly-opened ; for when exposed to the air, the milk, although still apparently fresh, rapidly breeds bacteria, and becomes unfit for the child's consumption. In hot weather, too, the barley-water should be freshly made twice in the day. Like the condensed milk, it must be kept in a refrigerator or other cool place, and should never be heated to the boiling point after it has once been made, as to do so excites rapid fermentation.

After six weeks, or, at the most, two months, have elapsed from birth, the child should be put upon cow's milk. It is important, especially in warm weather, that this should be perfectly fresh. If slightly acid from keeping, as it often is when delivered at the house, the acidity should be neutralised by the addition of a little carbonate of soda.

To make this milk an efficient substitute for human breast-milk, it will not be sufficient to sweeten it with sugar and dilute it with water. It is necessary, in addition, to prevent the firm clotting of its curd under the action of the gastric juice. This may be done by using lime-water to dilute the milk, adding it in sufficient quantity to partially neutralise the gastric secretion, and thus in a great measure prevent coagulation in the stomach. To do this effectually, at least a third-part of the mixture should consist of lime-water. To two tablespoonfuls of fresh milk, add an equal quantity of hot filtered water, and alkalinise by two tablespoonfuls of lime-water. The infant should suck this food from a feeding-bottle. Its temperature when taken should be 95°. If too cool after being prepared, the feeding-bottle should be allowed to stand for a few minutes in a little basinful of hot water.

Another plan by which the casein of cow's milk may be made digestible, consists in mechanically separating the particles of curd by the addition of some thickening substance, such as gelatine or barley-water. This method of preparing the milk is to be preferred to the previous one, as it leaves the gastric juice unaltered, and does nothing to impair the child's digestive power. It merely forces the curd to form a multitude of small clots, instead of running together into one large, dense lump. For a child of two months of age, the milk should be diluted with an equal quantity of barley-water, and be sweetened with a small teaspoonful of sugar of milk.

The proportion of milk taken by the infant for each meal should be gradually increased as he grows older. From a half, the quantity may rise by degrees to two-thirds, and then to three-fourths, and a larger quantity of milk-sugar may also be added.

Barley-water rarely disagrees even with the youngest infants, although in them the capacity for digesting starch is very feeble, as has been already explained. If preferred, however, instead of barley-water, the milk may be diluted with plain water, and the thickening material be supplied by a teaspoonful of isinglass or gelatine. Mellin's food, too, may be used from the first, and is almost always well digested.

Farinaceous matters, unless guarded by malt, as in Mellin's food, should not be given to a child younger than six months.

The milk prepared in one of the ways described must be given in suitable quantities and at regular intervals. Six or eight tablespoonfuls will be enough to make a meal for an infant of four or five weeks old. The child should take his food half reclining, as when in his mother's arms, and the bottle must be removed directly its contents are exhausted. After taking his food, the child should sleep for two hours. Any sign of fretfulness or discomfort at this age must be taken to imply indigestion and flatulence. If this be the case, a teaspoonful of some aromatic water, such as cinnamon or dill, may be added to the next bottle of food. The feeding apparatus must be kept perfectly clean. It is well to wash out the bottle directly after it has been used, with soda and water, and then to let it stand in cold water until again required. It is desirable to have two bottles and to use them alternately.

When the child is six months of age he may begin to take farinaceous food. A teaspoonful of Chapman's entire wheaten flour, baked in an oven, can be given once or twice a day, rubbed up, not boiled, with milk. If there is constipation, a similar quantity of fine oatmeal may be used instead of the flour. When the farinaceous food is first begun, a teaspoonful of the flour rubbed up with milk can be added to the meal of milk thick-

ened with Mellin's food. Later, the flour can be given with milk as a separate meal.

No beef-tea or broth should be allowed until the baby is at least ten months of age. At that time he may begin to take weak beef, veal, or mutton broth, and may also have the yolk of an egg lightly boiled, or beaten up with milk in the bottle. The child may take light pudding at the age of twelve months, but no meat for several months longer.

All changes made in the diet from the earliest period to the latest should be made cautiously, and their effect carefully observed. If the meal appear to excite indigestion and flatulence, the new food must be given on the next occasion in smaller quantity, or we may wait for a week before giving it a second time.

Scrupulous cleanliness, and the purest air attainable, are of great importance. The child should be washed over the whole body twice a day—once with soap. He should wear a flannel binder round the belly. No slops or soiled linen should be allowed to remain in the nursery, and the window of the room should be kept open as much as is practicable. The infant should be taken out of doors for several hours in the day; and while every care is taken to guard his sensitive body against sudden changes of temperature, he must not be covered up by too-heavy clothes, and shut off from every breath of air for fear of his catching cold. A child ought to lie cool at night, and the furniture of his cot, although sufficiently thick to insure necessary warmth, should not be cumbersome so as to be a burden.

The above directions, strictly carried out, will be found to succeed in most cases where the child's digestive organs have not been irritated and weakened by unsuitable meals. Often, however, the infant only comes under observation after attempts—more or less injudicious—have been made to rear him, and advice is sought because the measures adopted have been found to be unsuccessful. Exceptional cases are also sometimes met with, where the infant from the first is unable to digest cow's milk. However carefully the food may be prepared, each meal either excites vomiting, or produces great acidity and flatulence, and the general nutrition of the child becomes gradually impaired.

In every case of milk indigestion, we should inquire carefully as to the time of feeding, the quantity supplied at each meal, and the attention bestowed upon cleanliness in the feeding apparatus.

The inability to digest cow's milk may be a natural peculiarity of the infant, or a merely temporary incapacity arising from a disordered state of the digestive organs. In the first case, if a wet-nurse cannot be procured, or is objected to, we may give the milk of the goat or ass. Either of these is usually well digested by children who find cow's milk too heavy. The addition of a third or fourth part of barley-water still further increases the digestibility of the meal, and Mellin's food may be dissolved in the mixture with advantage. Both these milks should be boiled before being used. Ass's milk sometimes has laxative properties which boiling will remove. By the same means the strong flavour of goat's milk may be diminished, although this is often not objected to by the infant. An aromatic, such as a couple of teaspoonfuls of cinnamon water, added to the milk, seems often to supply a stimulus to digestion; and I have known infants who were invariably troubled with flatulence and discomfort after a meal of plain cow's milk and barley-water, digest perfectly the same mixture when thus aromatised. If test paper show slight acidity of the milk, a pinch of bicarbonate of soda should be always added to the bottle.

Condensed milk is often recommended in these cases, and is usually

well digested, but the nourishment it supplies is very insufficient for a growing baby. The child may get fat, but is usually lethargic and dull. Although big, he is not strong; and unless the milk be largely supplemented by Mellin's food, the infant will probably drift into rickets before he is seven or eight months old. The same may be said of the other foods containing preserved milk, as Nestle's and Oettli's Swiss milk food. They are often more easily digested than undiluted cow's milk, but after the first few months should not be relied upon to supply the whole nourishment of the baby. In all cases it is advisable to revert to fresh cow's milk as soon as this can be done with safety. There is another reason why an infant should not be allowed to derive his whole nourishment from tinned and preserved foods. It is now a recognised fact that hand-fed babies are liable to a form of scurvy; and if the child be entirely deprived of fresh milk and other anti-scorbutic foods, this consequence of injudicious feeding is very likely to be brought about (see page 253).

It is in cases where ordinary cow's milk is digested with difficulty that Dr. Robert's plan of pancreatising the milk is so valuable. Pancreatised milk is prepared in the following way:—To a pint of new cow's milk is added half a pint of boiling water, two teaspoonfuls of Benger's pancreatic solution, and twenty grains of bicarbonate of soda dissolved in a little water. The whole is stirred up in a jug, which is afterwards covered, and then placed in a warm situation under a "cosey." At the end of an hour, the contents of the jug are emptied into a sauce-pan, and the mixture is boiled for two minutes to stop further action of the pancreatine upon the milk. The food is then ready for use. It may be sweetened to the child's taste with sugar of milk. In milk so prepared, the casein is peptonised by the action of the pancreatine, and the main difficulty in the digestion of the milk is removed. This method is, in my opinion, far preferable to that suggested by Prof. Frankland. In the latter method (*artificial human milk*), the cow's milk is diluted with a third part of whey, and no doubt by this means the normal proportion of casein in woman's milk may be exactly imitated; but the process does nothing to render the stiff curd more digestible, and the firm clotting of the casein is just the difficulty which it is so essential to overcome.

A temporary incapacity for digesting milk on account of gastric derangement, is a common phenomenon in the young child, and, indeed, is the most frequent cause of failure in hand-feeding. If a change be not made in a diet which evidently disagrees, it is not long before a catarrh of the gastric mucous membrane becomes established. This derangement, when once confirmed, is not always easy to control, and, if very stringent measures are not promptly taken, may lead to the death of the child. A mild form of gastric disturbance sufficient to prevent the digestion of milk, is not unfrequently met with, even in children at the breast. It is indicated by a sour smell from the mouth, a slight sallow tinge of the skin, and by the vomiting of each meal directly after it has been swallowed. Sometimes the bowels are relaxed, from participation of the intestinal mucous membrane in the derangement. A condition such as this may exist almost from birth. It is a common accident in hand-fed babies, and if neglected, leads, as has been said, to serious and perhaps fatal consequences.

In children at the breast, the derangement is usually quickly remedied by the administration two or three times a day of a few grains of bicarbonate of soda, and half a drop of the tincture of nux vomica, in a teaspoonful of some aromatic water. In infants artificially fed, the disorder is not so

easily cured, and a complete change in the diet will be required. The pancreatised milk is very useful in these cases, and in conjunction with the alkaline mixture just referred to, will often quickly restore the digestive organs to a healthy condition. If this do not succeed, it will be necessary to stop all milk-food for a day or two. The youngest infants bear a temporary deprivation of milk exceedingly well; and when, as in the derangement spoken of, the symptoms are the direct consequence of fermentation and acidity, a withdrawal of the fermentable material is followed by immediate and striking improvement. Even in the most obstinate and protracted cases of gastric derangement in young babies, the withholding of milk-food, combined with proper measures to support the strength and maintain the heat of the body, will be generally successful in restoring the infant to health. The same treatment is of equal service in cases of severe acute gastric catarrh in hand-fed babies.

Some time ago I was asked to see an infant two months old, whom I found suffering from acute gastric catarrh, and in a state of great exhaustion. She had been brought up by hand, and was being fed upon milk and barley-water in equal proportions. This she vomited as soon as it had been swallowed, bringing it up curdled and intensely acid. There was a sour smell from the breath, and although the disease had only lasted a few days, the eyes were hollow, the face looked pinched, the fontanelle was deeply depressed, and she lay motionless on the nurse's lap with her eyes half closed. Her hands and feet were cold to the touch and looked purple. For a day or two her bowels had been much relaxed. She was taking small doses of lead and opium to check the diarrhœa, but each dose was returned almost immediately. The child was ordered to be kept warm and perfectly quiet. A week mustard poultice was applied for an hour to the epigastrium. The milk was stopped, and the child was fed with weak veal broth and thin barley-water mixed together in equal proportions, and given cold at intervals with a teaspoon. A few drops of brandy were also given occasionally, as seemed desirable. As a result of this treatment, the vomiting stopped at once, and the child when seen three days afterwards was found to be greatly improved. The breath had lost its sour smell, the face was no longer pinched, the eyes were not hollow, the fontanelle was not depressed, and when asleep the child closed her eyelids. The motions were still rather watery, although the number was natural. The medicine and diet were continued for a few days longer, and the child was soon well.

The most important part of the treatment in this case was the substitution of veal broth for milk. Directly the supply of fermentable matter was stopped, fermentation ceased, acid was no longer formed, and the digestive organs returned to a healthy condition. Here the derangement was acute. In the following case the complaint was chronic, the inability to digest cow's milk having extended over a lengthened period.

A little girl, ten months of age, very thin and weakly-looking, had been weaned at the age of eight months. Since that time she had been unable to digest milk, vomiting it at once whenever it was given to her. For nearly two months, therefore, she had been fed on two dessert-spoonfuls of farinaceous food made with water into a thick cream, and given every two hours with a spoon. She refused to take it from a bottle. Twice a day the food was made with beef-tea instead of with water. After a meal the child often vomited, but when this happened she was immediately fed again. The result of such a diet was to be expected. The child, although ten months old, could not sit up. She was becoming rapidly thinner. She slept very little, crying and whining the greater part of the night. She was

said to show no signs of abdominal pain, but the bowels acted three times a day, and the motions were relaxed and horribly offensive. The feet were almost always cold.

Such a case, which is far from being an uncommon one, is readily treated, however severe may be the vomiting, by restricting the diet to equal parts of weak veal broth and thin barley-water, given cold in small quantities at a time; by warmth to the belly and extremities; by perfect quiet, and by suitable remedies. The best sedative is liq. arsenicalis—half a drop for the dose—given with a few grains of bicarbonate of soda in some aromatic water. It may be sweetened with spirits of chloroform. After a few days of such treatment, the power of digesting milk usually returns. But at first it should be given sparingly, either pancreatised, or freely diluted with barley-water, and only once or twice in the day. If the inability to digest milk continue, the case must be treated as described under the head of Chronic Diarrhœa (see page 640).

It may be necessary to begin the treatment by a dose of castor-oil, or rhubarb and soda, to clear away undigested food from the bowels. If the child is very weak, white wine whey [1] is very useful. This may be sucked from a feeding-bottle, or given with a syringe-feeder, and the infant, if feeble, may take it in large quantities. Alternate meals of this whey, and of weak veal broth diluted with an equal proportion of thin barley-water, forms a very suitable diet for such cases. Mellin's food, dissolved in thin barley-water, or plain whey and barley-water, is also very useful; and a dessert-spoonful of fresh cream, shaken up with a teacupful of plain or white wine whey, is a very valuable resource in obstinate cases.

For the treatment of constipation, colic, looseness of the bowels, thrush, and the other accidents attendant upon improper feeding and general mismanagement, the reader is referred to the chapters treating of these special subjects. In conclusion, it may again be remarked that success in the artificial feeding of infants depends, in the first place, upon the selection of a suitable diet; and in the second, upon extreme watchfulness to detect the earliest signs of indigestion and acidity, and to make the necessary changes in the food which have been indicated above. Action must be prompt, for delay is often fatal. A food must be changed directly it ceases to agree, and any symptom of indigestion must be met at once with a suitable remedy. A derangement which in the beginning might have been arrested without difficulty soon assumes serious proportions, and if allowed to continue, will quickly bring a weakly infant to the grave.

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[1] To make white wine whey:—Put a breakfastcupful of new milk in a saucepan on the fire. When it comes to the boil, add a wineglassful of sound sherry. Then boil again for one minute and strain off the curd. Sweeten with white sugar.

CHAPTER II.

GASTRIC CATARRH.

Catarrh of the stomach in early life is a derangement of common occurrence. It is met with in two forms—a febrile and a non-febrile variety. A first attack renders the gastric mucous membrane more susceptible than before, and predisposes to a second: on this account, the disorder is frequently found to recur repeatedly in the same subject, and serious interference with the child's nutrition may be the consequence. Catarrh of the stomach, unaccompanied by fever, is perhaps the commonest derangement to which children are exposed. It is a perpetual danger to hand-fed babies, and forms, indeed, the chief obstacle to the successful rearing of infants. The disorder as met with in early infancy has been already described (see Infantile Atrophy). The present chapter treats only of catarrh as it affects older children, after the period of infancy has passed by.

Causation.—In childhood, the mucous membrane is especially liable to be affected by chills, but the "cold" does not always show itself in the form of sore-throat or cough. A gastric or intestinal disorder is a familiar consequence of exposure to changes of temperature, and to this cause most cases of the derangement can be attributed. A child who has suffered from many such attacks, often acquires an extraordinary susceptibility to alternations of temperature, and the most trifling chill will be sufficient to induce a return of his complaint. In such children, the mere going out with cold feet into raw, damp air, is a common cause of a fresh attack. Insufficient clothing is sometimes the sole cause of the derangement. Children whose parents have a foolish objection to flannel, often suffer greatly from continued catarrhs. I have known cases where complete loss of appetite and persistent wasting resulted from this deficiency, and ceased at once when proper measures were taken to protect the child's body from the cold.

Certain constitutional states predispose the child to be readily affected by chills. In rickets, a susceptibility to catarrh is a marked feature of the disease. Pulmonary and gastric catarrhs are of constant occurrence in such subjects, and if the disease be present in a severe form, may lead to a rapidly fatal issue. Scrofulous children, again, are very prone to suffer from catarrhal disorders, and gastric derangement in them is very common from this cause. There is one peculiarity of gastric catarrh, as it occurs in scrofulous subjects, which is of importance. It is that the complaint is almost invariably accompanied with fever. In such children, the recurring attacks of pyrexia, lasting from a few days to a week, which are often complained of, are cases of the febrile variety of acute gastric catarrh.

During the second dentition, the trifling febrile disturbance which is excited by the passage of the tooth through the gum, may render the child very susceptible to chills, and attacks of gastric catarrh at this time are very common.

Besides exposure to cold, irritation of the mucous membrane by unsuitable food may be a source of catarrh. In infants, as has been already described, this is the cause to which the derangement can be most commonly attributed. In older children, also, gastric catarrh may be produced by similar means, and may be set up by excess of rich sauces, fruit, or sweets. As in the case of a chill, the susceptibility to suffer from these causes may be increased by temporary or constitutional states. During the evolution of a tooth, food which would be readily digested at another time, is often found to disagree.

Morbid Anatomy.—A mucous membrane, the seat of catarrh, is injected in spots, and a layer of tough mucus covers its surface. In the stomach the mucous surface is often found softened; but this condition, which, under the name of gelatinous softening, or gastro-malacia, was at one time regarded as a pathological feature of great importance, and the cause of the symptoms which had been observed during life, is now admitted to be a mere post-mortem change which has no practical significance. The gastric membrane is thickened, and exhibits patches of redness. The stomach often contains much mucus, and not unfrequently fermenting food.

Symptoms.—Attacks of gastric catarrh may or may not be accompanied by elevation of temperature. The severe acute attack, with high fever, is the less common, and is limited, or nearly so, to the subjects of struma. The subacute, non-febrile gastric derangement is much more often met with. It is milder in character and more quickly subsides: indeed, from the slightness of the symptoms by which it is accompanied, the attack may pass almost unnoticed, or be spoken of as "liver" or "biliousness."

In the *acute febrile form*, the child feels chilly, or even shivers, and then becomes very feverish, the temperature rising, perhaps, in the evening of the first day or two, to 104°. The patient complains of no pain, but is languid and irritable. He has a sallow complexion, and looks dark under the eyes, but his general expression is placid, and unless the child is tired by exercise, there is none of the pinched, haggard aspect which is so common in cases of really serious illness. The appetite is lost, and there is some thirst. The tongue is usually furred on the dorsum, but may be clean and red at the tip and edges. Vomiting is not common, but may occur, although it is rarely distressing. If the catarrh affect the intestinal mucous membrane as well as that of the stomach, there is some diarrhœa; otherwise the bowels are confined. Purging, if present, may be accompanied by some pain in the belly, but this, as a rule is insignificant. At night the child is often restless, and is disturbed by dreams from which he may wake in great terror. During the day, if the catarrh is severe, he is generally drowsy, and sits or lies about without wishing to join in the sports of his companions. While the attack lasts, nutrition is in abeyance, and the flesh and strength manifestly suffer. After a week or ten days, the pyrexia, which had been gradually subsiding, disappears; the appetite and spirits return, and the patient is convalescent.

Often the gastric catarrh is accompanied by symptoms pointing to a similar condition of other tracts of mucous membrane. The child may suffer slightly from catarrh of the nose; the throat may be a little sore; the eyes may be weak and distressed by a strong light, or there may be slight cough. Even if the fever is high, delirium is not common, but there is occasionally some frontal headache. If the catarrh pass along the duodenum to the common bile duct, a mild jaundice is noticed.

In many cases, an attack such as the above passes off, and the child does not suffer again from a similar illness. Often, however, the catarrh, instead

of occurring in one solitary instance, returns repeatedly at short intervals. Cases of recurring gastric catarrh of greater or less severity are far from uncommon; and these attacks, if the intervals between them are short, may exercise a very injurious influence upon the health and general development of the patient. Children, the subjects of such catarrhs, become pale and thin, for their nutrition is being constantly interrupted. By its influence upon appetite and digestion, the catarrh checks for a time the introduction of nourishment into the system, and nutrition is hardly restored on the cessation of the attack when a return of the derangement suspends it again as before. In this way the child may become an almost constant sufferer from disordered stomach, and his continued ill health and persistent wasting excite the gravest apprehensions amongst his relatives. Such cases are often supposed to be cases of consumption; and, indeed, if there be any inherited chest weakness, long-continued interference with nutrition, such as is produced by a frequent recurrence of these attacks, may go far to encourage the tendency to phthisis.

In the *non-febrile* variety, the symptoms are much less striking, for, pyrexia being absent, the spirits are less depressed and the patient utters no complaint. Most children suffer at times from what is called "biliousness." For two or three days together they lose their appetite, mope and lie about, have a dull, pasty or sallow complexion, and look dark under the eyes. At night they sleep badly, and they are restless and irritable in the day. These symptoms are produced by a temporary catarrh of the stomach which interferes for the time with the digestion of food, but passing off, leaves no ill consequences behind. When, however, the attacks are frequent, digestion is weak, even in the intervals of comparative health, and nutrition becomes seriously impaired. Such children complain often of flatulent pains in the sides, and may be subject to attacks of syncope from pressure upwards of the distended stomach against the heart. Their bowels are usually costive. The appetite varies greatly. Sometimes it is excessively keen; at others it is poor and capricious. In many cases, indeed, the child seems to have no appetite at all, and the greatest difficulty is experienced in making him swallow his food.

These symptoms may be greatly aggravated by an unsuitable dietary. If a child who suffers from the condition described be supplied with an excess of fermentable food, such as potatoes, puddings, jams, and sweet cakes, he is kept in a state of chronic acid dyspepsia which is a source of constant discomfort to himself and anxiety to his friends. The whole system being full of acid generated by fermenting food, the child is wayward and cross in temper, and excessively fidgety and restless. His speech is often hesitating, and he may stammer in his talk. His muscles are irritable and twitch easily, so that he winks his eyes and distorts in nervous fashion the corners of his mouth. The so-called *nervous* habits of children often owe their origin to this derangement.

Sickness is not a common symptom in these cases, for gastric catarrh is by no means always accompanied by irritability of stomach. Sometimes, however, the child at rare intervals brings up a large quantity of sour-smelling fluid and mucus. Frontal headache, more or less severe, is rarely absent, and oftentimes the pain is distressing. The wearing periodical headaches of children are not uncommonly owing to this cause. The urine is noticed from time to time to be thick with lithates; and, in rare cases, quantities of fine uric acid sand are passed, precipitated by the free acid with which the urine is charged.

In some cases a curious condition of the tongue is noticed. On the

dorsum are seen rounded or oval patches, which appear to consist in a removal of the epithelial covering. The surface of the patches is distinctly depressed, and the colour is that of the dorsum generally. The edges are circumscribed and irregular. The number of these patches is usually three or four. They may be seated on the dorsum or on the edges of the tongue. At times, small rounded ulcers (aphthæ) and red elevated papillæ are seen at the tip of the tongue in addition to the depressed patches on the dorsum. If aphthæ are not present, there is no pain or soreness.

Symptoms such as the above show a high degree of digestive derangement, aggravated by an unsuitable dietary, and are almost invariably the consequence of repeated attacks of catarrh of the stomach. Under such circumstances, nutrition is interfered with, the child wastes perceptibly, and the apprehensions of the parents are carried to a high degree. When, on the other hand, the indisposition is only occasional, and the symptoms are not severe, little attention is excited. The child is supposed to be a bilious subject, and unless the attacks become so frequent as to cause an evident diminution in bulk, or some new symptom is noticed which excites the alarm of the friends, medical advice is considered unnecessary.

In cases where, owing to the mildness or infrequency of the attacks of gastric derangement, general nutrition has not suffered, the occurrence of fainting fits may induce the parents to apply for medical assistance. Attacks of syncope, more or less complete, are not uncommon in these cases. Naturally enough, they give rise to great anxiety, especially if conjoined with palpitations and flatulent pains about the chest. They are then considered to be symptomatic of heart disease. Thus, a little girl, aged eleven years and a half," fainted for the first time six years ago. She has since fainted on five different occasions. At these times she has always been noticed to be dull and languid, with a poor appetite, but otherwise has seemed to be well. Is subject to sharp pains in the left hypochondrium, under the influence of which her face will become ghastly white. She sleeps badly, talking and moaning, and often lies awake at night. Has never suffered from worms; bowels are confined. Has sometimes a sallow complexion." This young lady, who was a well-grown, well-nourished girl, with perfectly sound organs, soon lost all her symptoms under suitable treatment.

In some cases, the non-febrile form of the complaint is accompanied by more serious symptoms. There may be severe pain in the epigastrium, violent headache, and distressing retching and vomiting, first of food and afterwards of bilious or watery fluid. Such attacks are usually soon over. They are commonly produced by the introduction of some irritant into the stomach, and cease soon after the complete ejection of the offending matters from the body. For some days afterwards the child is languid, his digestion weak, and vomiting is easily excited.

In children of eight or nine years of age or upwards, the dyspepsia induced by repeated attacks of gastric catarrh may give rise to more or less severe pain after food, a tendency to vomit, pyrosis, and other symptoms such as accompany the derangement in the adult. These symptoms are seldom met with except in children who are habitually over-fed, or are indulged with rich sauces and highly-spiced and stimulating food. They usually quickly subside under a change of diet.

Diagnosis.—The febrile form of acute gastric catarrh often presents some difficulty in the diagnosis, for the symptoms are frequently indefinite, and the case may be mistaken for one of far more serious disease. Such cases have been confounded with cases of acute tuberculosis, and they often

present a strong likeness to the mild form of enteric fever. The principal points upon which the diagnosis is founded will be best illustrated by the narration of the following case seen in consultation with Dr. G nther.

A little girl, aged seven years, of a strumous disposition, had been delicate and subject to occasional failure of appetite for some months. For about a week she had been feverish, the bodily temperature rising sometimes as high as 104° Fahr. Her appetite had been completely lost, but she had not suffered from sickness. The bowels, at first sluggish, had been somewhat relaxed for two days, the motions passed being moderate in quantity, but loose, rather offensive, and bright yellow in colour. She had occasionally complained of abdominal pains. During the whole time of her illness the child had snuffled slightly, and at first her throat had been a little sore, but there had been no cough. She had complained sometimes of frontal headache, but had not been delirious.

At my visit I found the child lying in bed with her face turned away from the window, as the light, she said, hurt her eyes. There was no sallowness of complexion. Her expression was placid, and not at all anxious or distressed. The tongue was a little furred on the dorsum, and rather red at the tip and edges. She was thirsty, but had no desire for food. The abdomen was soft, without tenderness or distention. The spleen was very indistinctly felt; it seemed to be slightly enlarged. There was no rash of any kind on the body, nor any œdema of the legs. The urine was not albuminous. The heart sounds were healthy. There was no rhonchus, nor any other abnormal sign about the lungs. Respiration regular, 24; pulse regular, 108; temperature, 101° (at 4 P.M.).

This case, which was seen on the seventh or eighth day of the illness, when the ordinary eruptive fevers could be excluded, might have been acute tuberculosis, typhoid fever, or acute gastric catarrh. The occurrence of fever, with a history of previous delicacy of health, was quite in keeping with the ordinary course of tuberculosis. There was, however, no family history of any such complaint, and this important fact, together with the complete absence of distress or anxiety in the expression of the child, and the absence also of any œdema of the extremities, was held sufficient evidence to exclude the presence of this formidable disease.

Between typhoid fever and acute gastric catarrh the distinction was more difficult. The temperature, it is true, although always elevated, had not followed the course of the temperature in a typical case of enteric fever; but in children this fever is often mild, and frequently deviates from the ordinary type. Again, the absence of eruption did not exclude typhoid fever, for the eighth day is early for the rash to appear, and in children typhoid spots are sometimes absent altogether in undoubted cases of the disease. On the other hand, the state of the spleen was doubtful. Some slight enlargement was suspected; if this was so, the fact pointed distinctly to typhoid fever.

In favour of acute gastric catarrh was the slight snuffling, the mild sore throat, the complete absence of delirium or of apparent discomfort, and the irregularity of the fever. Altogether, the symptoms pointed, perhaps, more decidedly to gastric catarrh than to the more serious disease, but it was impossible to exclude typhoid fever; therefore, a guarded opinion was expressed as to the nature of the case. The temperature fell on the following (eighth or ninth) day. This early termination seemed to decide the question in favour of catarrh, for it is only in very exceptional cases that typhoid fever subsides before the fourteenth day.

When gastric catarrh, instead of occurring in one solitary attack, as in the above instance, recurs repeatedly at short intervals, the diagnosis is more easy. This recurrent form is well illustrated by the following case which was sent to me by Dr. Lister, of Croydon.

A little girl, aged seven years, pallid in appearance and ill-grown, had been wasting slowly for eighteen months. During the whole of this time she had suffered every two or three weeks from attacks of feverishness. In these illnesses the symptoms were the same. The temperature rose to 103° and 104°. The child looked sallow in the face, and was very irritable and languid. She was thirsty, but refused her food. Sometimes she vomited, but in the earlier attacks the bowels were never relaxed. She got thinner and weaker, and looked ill. A few months previously she had had a severe attack at Lowestoft, in which she had been slightly jaundiced. Six weeks before her visit to me she had had a still more violent attack, which had left her completely jaundiced. This had been followed for the first time in her experience by diarrhœa; and for a fortnight the motions were green and slimy, and sometimes contained clots of blood. They were passed with straining and some pain. At the time of her visit, the looseness had in a great measure subsided, but the child still had a faint yellow tint of the skin. Her heart and lungs were healthy, and there was no sign of enlargement of the bronchial glands. Between the attacks of illness the child was said, as a rule, to be fairly well. On the subsidence of the fever her appetite would return, and she would begin to regain flesh. Unfortunately, before her strength could be said to be thoroughly restored, it would be again reduced by a new access of fever.

Jaundice in children after the period of infancy, is, in the large majority of cases, catarrhal. In this child, its occurrence with the two last attacks of fever helped greatly to explain the nature of these attacks, and the cause of the ill-health from which the child was suffering. Moreover, in the most recent illness, a new feature had been noticed in the diarrhœa which had followed the jaundice and still further delayed convalescence. In this diarrhœa, the characters of the stools, which contained mucus and blood, and were passed with straining and pain, pointed to a catarrh of the lower bowel. Explaining, then, the earlier attacks in the light afforded by the latter, it was evident that the child's sensitiveness to changes of temperature showed itself in the form of repeated attacks of acute gastric catarrh, accompanied by fever. This fact being once established, the treatment of the case was conducted upon the principles to be described, and the child had no return of her feverish symptoms.

The non-febrile form of the disease may be recognised without difficulty. Frequently-recurring attacks of indigestion, a tendency to acidity and flatulence, restlessness and irritability after indulgence in sweets and other forms of fermentable food, are almost invariably the consequence of gastric catarrh. The complaint is so common a one that it should be always suspected in children who are habitually pale, thin, and nervous, with a sallow complexion, and who are subject periodically to fits of irritability and ill-temper. Continued loss of appetite from this cause often excites apprehensions that the child is becoming consumptive. The real cause of his wasting may, however, be detected by noticing that the chest, on examination, shows no sign of disease; that his expression, although occasionally wearied, as after exertion or before going to bed, is not habitually distressed, and that the evening temperature is normal. On inquiry, too, it will be found that the wasting is not a constant feature, but that the child is better and worse, sometimes appearing to be almost well and to gain flesh;

at others, being languid, moping, and sallow-looking when indigestion is excited by a fresh attack of catarrh.

Treatment.—Whether the gastric catarrh assumes the febrile or the non-febrile form, its treatment is the same. Our object is, firstly, to put a stop to the existing derangement, and, secondly, to adopt such measures as will prevent its recurrence.

To cure the existing catarrh, we must do our best to remove all sources of irritation which may be keeping up the disorder. The acrid mucus, a free secretion of which is one of the ordinary phenomena of the catarrhal state, is a constant source of fermentation and acidity. It very quickly induces an acid change in the more fermentable articles of food. Therefore, if the stomach be oppressed by sour matters, shown by uneasiness at the epigastrium, a sour smell from the breath, and a feeling of nausea, immediate benefit will be derived from an emetic dose of ipecacuanha wine. Afterwards, a draught composed of tincture of nux vomica (℥j.–iij.), with bicarbonate of soda (gr. iv.–vi.), in water sweetened with spirits of chloroform, taken two or three times a day, will soon restore the gastric mucous membrane to a healthy condition. Strong purgatives are to be avoided, but as there is usually constipation in these cases, an occasional mild aperient will be required, such as compound liquorice powder or castor-oil. If there be fever which does not subside after the action of the emetic, the child may be allowed to take fluids from time to time in moderate quantities. The best are unsweetened barley-water, flavoured, if desired, with orange-flower-water, and fresh whey.

During the treatment, as long as any signs of acidity of the stomach persist, care should be taken to exclude from the diet all matters capable of favouring the tendency to fermentation of food ; and even for some time afterwards, readily fermentable substances, such as starches and sweets, should be taken sparingly, lest the derangement be encouraged to return. At first, nothing should be allowed but freshly-made broths, with dry toast, and when milk is once more permitted, it must be guarded with a fourth part of lime-water, or with saccharated solution of lime, in the proportion of twenty drops to the teacupful. While the derangement continues, no fruit, cake, sweets, light puddings, or potatoes should be permitted. When the appetite begins to return, a little fish, chicken, or mutton may be allowed, but the child must not be pressed to eat ; indeed, until his digestive power be completely restored, the utmost care must be taken not to overload the stomach with food.

The above measures will effect a considerable improvement in the condition of the child, but at this point the treatment may be said only to have begun. The patient is in a weakly state from successive attacks of gastric catarrh. We have therefore to adopt measures to strengthen the digestive power, and take such precautions as will insure him against a relapse.

To give tone to the stomach and strengthen digestive power, preparations of iron are required. It is a common practice in such cases to administer the preparation of the phosphates of iron and lime known as "Parrish's chemical food." This syrup is a very favourite remedy with mothers, who, misled, perhaps, by the name, give it largely, and with the worst results. Theoretically, no doubt, it is an active tonic, but practically it is highly pernicious. The reason is that the syrup in which the phosphates are dissolved supplies material for fermentation, and each dose is soon followed by acidity and flatulence, so that the medicine really aggravates the mischief it is intended to allay. The better plan is to give the dialysed iron, or, if there be any tendency to acidity remaining, the ammonio-citrate, with a few

grains of bicarbonate of soda, sweetened with spirits of chloroform. After a time a change may be made to the solution of strychnia, with the perchloride or pernitrate of iron, given directly after food. All this time, the quantity of fermentable material taken at meals much be restricted, as already recommended. During the same time, a mild aperient should be given every few days, whether it seems to be required or not, to insure proper relief to the bowels, and prevent the retention of any excess of mucous secretion.

In spite of this treatment, however, the child will not be secure against relapses unless special precautions are taken to guard the body against chills. The catarrhal state, whatever be the organ affected, tends constantly to repeat itself under the influence of slight causes, and there is little doubt that it induces an extreme sensitiveness to changes of temperature. Children who suffer from attacks of catarrh of the stomach and bowels, should wear a broad flannel bandage applied tightly to the abdomen, so as to reach from the hips upwards to the arm-pits; and the medical practitioner should look upon it as his first duty in these cases to see that it is properly applied. The binder should be considered as part of the child's ordinary dress, and be cast off at night with the rest of his clothes. In many cases it is necessary, in addition to the above precautions, to fortify the resisting power of the child by cold bathing. Some caution, however, is often required in recommending this step to parents. Mothers are apt to take fright at the very mention of cold water; and it is true that, in the case of weakly children, reaction is difficult to establish, so that a cold bath given in the ordinary way would not be attended with benefit. If, however, the bath be given according to the method advocated on a previous page (see page 17), and the skin be first stimulated by vigorous friction so as to enable the body to resist the shock of the cold douche, and the shock itself be lessened by making the child sit in a few inches of hot water, the bath will have a highly invigorating effect and be followed by immediate reaction. The continued use of this bath, besides having a remarkably tonic effect upon the system generally, confers great resisting power against changes of temperature, and considerably reduces the child's susceptibility to chills.

By means such as have been indicated, the most obstinate gastric catarrh may be treated with success. But it must be borne in mind that success depends upon equal attention to all the points that have been insisted upon. A flannel binder will be of little value if the tendency to fermentation is encouraged by the immoderate use of starches and sweets; and even cold douching may not be sufficient to neutralise the ill-effects of rapid changes of temperature acting upon a body imperfectly protected from the cold. In all cases, it is advisable to avoid the use of syrups in making medicines palatable to children. The pharmacopœia syrups are not well borne by young subjects, and often do more harm than good. It is far better to sweeten the child's physic with glycerine, or a few drops of spirits of chloroform.

In cases where habitual pain after food is complained of, the treatment found useful in similar cases in the adult should be resorted to. The diet should be arranged on the principles already indicated. Both sauces and highly-spiced or fermentable food should be forbidden, and the child should take bismuth and soda, or small doses of dilute hydrocyanic acid with an alkali.

CHAPTER III.

CONSTIPATION.

Children of all ages are subject to constipation. Usually, it is a temporary derangement, which quickly subsides under suitable treatment. In other cases it amounts to a positive infirmity, and is exceedingly obstinate and difficult of cure. The term constipation is a relative one. In itself, it implies injury to the health from retention in the alimentary canal of matters which ought to be discharged. The condition is therefore compatible with a daily evacuation, if the relief afforded to the system is incomplete. In infants who require the bowels to be emptied several times in the day, a single stool in the twenty-four hours is a sign of costiveness which should not be neglected.

All forms of mechanical obstruction to the passage of the intestinal contents give rise to arrested or imperfect evacuation as a prominent symptom. This variety of constipation is not here referred to. The form under consideration in this chapter is due to deficiency of expulsive action, and not to narrowing of the channel, or other kind of mechanical hindrance.

Causation.—One of the commonest causes of constipation is an unsuitable dietary. This is especially the case in infants. A child brought up by hand, and fed with excess of farinaceous food, is often troubled with an obstinate form of costiveness which is a source of continual discomfort. The frequent passage along the bowels of undigested starchy matter keeps the mucous membrane in a state of constant hyper-secretion. A slimy mucus is thrown out which coats the lumps of undigested food so that the muscular coat of the bowel in its contractions can have little hold upon their slippery surface, and they are forced forwards with difficulty.

Still, all cases of constipation occurring in hand-fed babies cannot be attributed to this cause. Often, the most careful examination of the stools can detect no excess of mucus. On the contrary, the motions are hard and lumpy, and seem to be drier than natural. This very dryness of the evacuations appears in many cases to constitute a cause of infrequent relief to the bowels. We know from cases of diabetes in the adult, where the excessive drain of water from the kidneys diminishes intestinal secretion, how commonly constipation results from this want of moisture. In the young child, a similar deficiency of secretion, however induced, may cause dryness of the fæcal contents and diminish the facility of their passage. Special articles of diet have a constipating effect upon certain children. In some, rice interferes with the regular action of the bowels. In others, eggs may induce a like sluggishness. I have known troublesome costiveness continue as long as the yolk of an egg was allowed every day, and disappear at once when the number of eggs was reduced to two in the week.

Atony of the bowel, or actual deficiency of expulsive power, is a not uncommon cause of constipation even in young subjects. In badly-nourished children, the muscular coat of the intestine must share in the general mal-

nutrition; and as, in this condition, the lower part of the colon and rectum are apt to be over-distended by accumulation of undigested food, the difficulty of carrying forwards the fæcal masses is increased. In some cases, the difficulty is added to by a peculiarity of infancy upon which Dr. Jacobi has laid much stress as a cause of constipation in very early life. In the newborn infant, the length of the large gut is proportionately greater by about one-third than it is in the adult. This excess of length is due, not to the ascending and transverse colon, which are rather shorter at this age than they become in after years, but to the descending colon and sigmoid flexure. Consequently, the flexure is thrown into many curves, and is often bent upon itself so repeatedly as seriously to retard the passage of its contents.

Sluggishness of peristaltic action, if not complete atony of the bowel, may be a sequence of certain diseases. After chronic diarrhœa, a state of constipation commonly prevails which is very difficult of cure. Typhoid fever often leaves a similar condition behind it, and after an attack of acute rheumatism the same inactivity of the bowels is often noticed. Again, ulceration of the intestinal mucous membrane, when not accompanied by catarrh, almost invariably induces deficient fæcal excretion, and sometimes, in these cases, excrementitial matters may be long retained. In typhoid fever, constipation of a week or longer is frequently met with, and indeed, in many cases, no effort at expulsion appears to be made until the bowels are excited to contract by a copious enema. In these cases, no doubt, the normal peristaltic action of the bowels at the seat of ulceration is paralysed by the inflammatory process there existing; but a similar sluggishness of the intestinal mucous membrane may be induced by disease in a distant part of the body. Thus, disease of the brain or its membranes is usually accompanied by constipation as a prominent symptom, and in another part of this volume reasons are given for supposing that Bright's disease in the young child may produce the same result.

There is one cause of constipation in infants which must not be forgotten. This is the sluggishness of the bowels which is induced by opium. Hand-fed babies are apt to be very peevish and troublesome at night, and an unscrupulous nurse will often drug the child with "soothing syrup" or other opiate in order that her own sleep may be undisturbed. This practice induces a very obstinate form of constipation, and, unless detected, may be a cause of much perplexity to the medical attendant. It is therefore important in obstinate cases to examine the child's pupils.

The causes which have been referred to may influence the state of the bowels at all periods of childhood, but there are other causes which largely prevail after the period of infancy has passed. Habitual neglect of the calls of nature is as common a cause of constipation in young people as it is in their elders. The lower bowel, when it finds its warnings neglected, soon becomes accustomed to the presence of its fæcal contents, and requires something more than the ordinary stimulus to excite its action. Whether from necessity or convenience, school-children of both sexes often suppress the natural desire for relief; but if the favourable moment is allowed to pass, efforts made at another time are often ineffectual, and a habit of constipation is thus acquired which may be very difficult to overcome. Even during infancy, constipation may be made worse by this means. Children of ten or twelve months old, who have been subjected to much pain from distention of the sphincter by hard fæcal masses, will often resist, as long as possible, the desire to empty the bowel, in order to spare themselves unnecessary suffering. In such cases, if measures are not taken to enforce due evacuation, serious accumulation may ensue.

Want of exercise is another cause which is often found to prevail amongst young girls, especially if they are much confined to the house and pressed too quickly forward in their studies, and very obstinate constipation may result from their sedentary life.

Symptoms.—In *infancy*, deficient excretion from the bowels is usually indicated by a pasty, dull complexion, fretfulness, and agitation, especially at night. The child's sleep is not the sound, unbroken sleep of health. He often starts and twitches, and is roused up by the least noise. Flatulence is an early consequence. The child seems to suffer from occasional twinges of pain, for he often cries suddenly without evident cause, and draws up his lower limbs uneasily. His upper lip looks purple; the muscles of his mouth twitch, and if the pain is severe, his whole complexion may become ghastly white. If the constipation is obstinate, the stools are voided with great difficulty; and in cases where several days pass without any relief, defecation is only effected with much straining and pain. The infant often makes violent efforts to unload his bowel of its accumulated burden, and will strain until his face is purple, his bowel prolapses, and his navel starts. Tinging of the fæcal masses with blood from rupture of small vessels about the anus is often seen, and umbilical hernia not unfrequently owes its origin to this cause.

The belly is generally swollen from flatulence, and sometimes the gas accumulates in such quantity as to cause a fit of violent colic, in which the child gives signs of extreme suffering, screaming and writhing and drawing up his legs. Actual convulsions may be induced by this cause. In cases where irritation of the bowels is excited by the retention of excrementitial matters, the temperature may become elevated for a time, but it subsides at once when the accumulation has been removed. In many children, the torpor of the bowel is accompanied by languid circulation, so that the hands and feet are habitually cold. If the state of constipation continue, the general health usually suffers; the flesh gets flabby, and the child is peevish and fretful, with a tendency to vomit. Palpation of the abdomen will often discover hard masses in the descending colon. These are well-defined lumps, are painless, and can be indented by firm pressure with the finger.

In *older children*, we see little more than dulness of complexion, a furred tongue, and some want of sprightliness and activity. The child may complain of discomfort after food and of occasional headaches. His breath is often unpleasant, and there may be aphthæ on the tongue and lips, or red patches on the tongue from which the epithelium appears to have been thrown off. Sometimes the bowels act only at rare intervals, and if proper measures are not resorted to, may remain confined for a week together, or even longer. Such children are subject to sick-headaches, and have habitually a pasty-looking, unhealthy tint of skin.

If the constipation proceed to actual impaction of fæcal masses in the bowel, more striking symptoms are noticed. The impaction usually takes place in the rectum itself, and consists of a quantity of hard lumps which it is very difficult to break down and bring away. The presence of the hard masses causes irritation, which shows itself by more or less pain in the lower part of the belly, by tenesmus, and often by difficulty of micturition. The child is generally sallow, listless, and weakly-looking. The appetite may be unaltered, but is usually poor. The tongue is often quite clean, although the breath is fœtid. The belly is distended and sometimes tender. Diarrhœa may be a consequence of the intestinal irritation. The motions are scanty and thin; they usually contain a few small scybala, and are passed with much pain and tenesmus. Instead of loose, they may be very small and solid, with excess of mucus.

In some cases, in addition to irritation, positive injury may be caused by the presence of the fæcal masses. Dr. T. Chambers has reported the case of a girl, aged eleven years, who had suffered for three months from a persistent diarrhœa which was the consequence of a vast accumulation of fæces in the rectum. The mass by its pressure had caused absorption of the triangular cushion which constitutes the perinæum, and had reduced the recto-vaginal septum to a mere membrane.

These cases, if not judiciously treated, may actually prove fatal. Dr. Bristowe has referred to the case of a little girl, eight years old, who had long suffered from a tendency to constipation, and had occasionally gone for three weeks without relief to the bowels. When she came under observation she had had no passage for seven weeks. The child was pale and thin, with a strumous look. Her belly was large and tense, although painless, her tongue clean and her appetite poor. She grew weaker, and looked haggard and anxious. Her belly became more distended, and occasional colicky pains were complained of. Towards the end, her tongue became foul; she often vomited, passed high-coloured urine in small quantity, and eventually sank from exhaustion. The vomiting was never stercoraceous. After death, the intestines were found greatly distended and their coats hypertrophied. They were full of olive-green, semi-solid fæces, which were of thicker consistence in the rectum than elsewhere; and immediately above the anus was a hard conical plug of fæcal matter which completely prevented the escape of the contents of the bowel.

If impaction take place at a higher point in the bowel—in the cæcum or at a bend of the colon—symptoms of complete occlusion may arise, and inflammation is often excited in the intestine. Over the seat of obstruction there is pain, which may extend to the whole abdomen, and be violent and paroxysmal; there is tenesmus, and the bowels are obstinately confined. The child vomits repeatedly, throwing up at first bile and mucus, afterwards feculent matter. Hiccough may be distressing. The abdomen is distended. The tongue is thickly furred, and perhaps dry and brown. The pulse is rapid, small, and thready; the temperature is often high, and the prostration is extreme. On examination of the belly, a hard swelling may be detected through the muscular wall, and can often be indented with the finger; or, if inflammation have occurred, there is some tension of the parietes, and an intensely tender swelling can be discovered at the seat of obstruction. Inflammation of the cæcum (typhlitis) is the most familiar instance of this inflammatory form of the disorder. Firm impaction of the colon with fæces is a variety of obstruction which, if not relieved by the adoption of suitable measures, may be as fatal to the patient as any other form of intestinal occlusion, but it is eminently curable if the nature of the impediment be recognised in time.

Diagnosis.—In ordinary cases, the want of regularity in defecation, and the infrequent passage of hard, scanty stools, is a sufficient token of the existence of constipation. But often the indications are much less precise. In infancy, as has already been remarked, a single stool in the four-and-twenty hours constitutes a state of constipation which requires attention. Even in older children a daily evacuation may occur and yet the relief to the bowels be incomplete. Habitual sallowness of complexion, offensive breath, wakefulness at night and startings in sleep, are common indications of a loaded bowel, especially if the symptoms occur in a well-nourished child who presents no other indication of ill-health; and dyspeptic symptoms (discomfort and a feeling of heaviness after meals, occasional nausea and a furred tongue) will often be found to arise from the same condition.

It is very important in cases where the evacuations are very small, frequent, and watery, or loose, to remember that this condition is often a consequence of the accumulation of fæcal masses in the rectum. In such cases, we may expect to find distention of the belly and tenesmus, with some pain in the lower bowel in defecation ; and the stools, on inspection, will be found to consist of offensive, thin feculent matter containing mucus and a few small, hard scybalæ. When these symptoms are noticed in a child of four or five years of age or upwards, it is of importance to examine the rectum ; and often by this means the cause of the apparent looseness may be discovered at once. Still, even if we obtain evidence of fæcal accumulation, caution is often necessary. We must not at once conclude that retained fæcal matter constitutes the whole of the derangement, and that when this has been removed the child will be well. Ulceration of the bowels is often accompanied by this very group of symptoms. This subject is considered elsewhere (see page 661).

If actual impaction of fæces occur so as to offer an insuperable obstacle at any point of the intestinal canal, symptoms of occlusion of the bowel arise. The distinction between this condition and intussusception is explained in the chapter treating of the latter subject.

Treatment.—The regular action of the bowels is at all ages so much a matter of habit that the child as soon as he can walk, or even earlier, should be trained to regularity in this important particular. Every morning after breakfast he should be accustomed to go punctually to stool, and nothing should be allowed to interfere with this necessary duty. By this means the bowels become accustomed to regular relief at the same period of the day. The mother should herself see that the rule is enforced, for an inattentive nurse, from ignorance or carelessness, is very apt to neglect it.

In infants, constipation may be combated by careful regimen, by the adoption of special articles of diet, by enemata, and by drugs. In the first place, the dietary should be revised and excess of starchy matter excluded. If the child is eight or ten months old, the first meal in the day may consist of a teaspoonful of fine oatmeal rubbed up carefully with cold milk into a thin, smooth paste, and then stirred briskly while hot milk is added. Mellin's "Food for Infants," probably on account of the glucose it contains, often has an admirable effect in regulating the bowels of infants who are inclined to costiveness, and is a very useful resource. If the constipation is only temporary and occasional, a small lump of manna dissolved in a dessert-spoonful of warm water, strained and added to the bottle of food, has a ready aperient effect ; or fifteen to twenty drops of the liquid extract of rhamnus frangula will be equally successful. In cases where the constipation is habitual, I have found a combination of the infusions of senna and gentian a remedy of unfailing usefulness. I usually combine these with the tinctures of belladonna and nux vomica, as in the following draught. The quantity ordered is suitable to a child between eight and twelve months of age, and can be given at first three times in the day immediately before a meal :—

℞. Tinct. nucis vomicæ ..... ♏ ss.
Tinct. belladonnæ ..... ♏ v.
Infusi sennæ ..... ♏ xx.
Infusum gentianæ comp. ..... ad. ℥ j.
M. Ft. haustus.

The value of this remedy consists in the fact that the patient does not become dependent upon the medicine. On the contrary, it has a strengthening effect upon the coats of the bowel, so that after a time it can be given twice in the day, then only once, and eventually be discontinued altogether.

The extract of malt, on account of its glucose, is also useful in relieving the constipation of infants; but must be given in sufficient quantity, *i.e.*, a teaspoonful two or three times a day. It is, however, very inferior to the senna mixture, and has the disadvantage that in warm weather it is apt to turn acid on the stomach and cause nausea. In all cases of habitual constipation in infants, the belly should be rubbed firmly with the hand twice a day after the bath, so as to stimulate the peristaltic movement of the bowels. In obstinate cases, Dr. Merriman advises the friction to be made with a liniment composed of half an ounce of the tincture of aloes to one ounce of the compound soap liniment. Professor Stephenson, in an interesting paper, has proposed the use of pepsin, in cases of habitual constipation, for children of all ages. To a child of twelve months old, three grains of the dry powder, or five drops of pepsin wine may be given three times a day. The remedy must be taken for several weeks, and can then be gradually discontinued. If necessary, an occasional dose of castor-oil can be given during the first few days of taking the pepsin, but this is seldom required to be repeated more than twice.

The above methods of treatment are greatly to be preferred in cases of habitual constipation to the mechanical relief of the bowels obtained by means of enemata, or even by the use of suppositories. Suppositories of Castile soap, cocoa butter, or brown gelatine have been strongly advocated by some writers. They are no doubt useful in producing an immediate effect, but have no further influence, and cannot promote healthy and regular action in the future. Enemata are of service in unloading the bowels where there is accumulation of fæcal matter, especially where irritation and colic have been excited by its retention. They should be composed of thin gruel or soap and water, should be used warm, and if the constipation be obstinate or the pain severe, may contain the addition of a spoonful of castor-oil. Care should be taken to use a sufficient quantity of fluid. An enema to be effectual in such a case should consist of at least two-thirds of a pint for a child of six months old. If enemata are given daily to relieve habitual constipation, the quantity need not be so considerable. Four or five ounces will usually be sufficient, and plain water of the temperature of 60° Fahr. may be employed. This daily repetition of enemata is not, however, a plan of treatment to be recommended.

In the case of severe colic in a baby, flannels wrung out of hot water should be applied to the belly, and a copious injection of warm soap and water, with or without the addition of a teaspoonful of castor-oil, should be administered without delay. If the infant seem depressed as a consequence of the pain, he may be given a few drops of pale brandy in a teaspoonful of water, or may take three or four drops of sal volatile in a little aromatic water every few hours. If there be twitching, or any sign of convulsions, the child should be placed at once in a warm bath. If he suffer much from flatulence, a rhubarb and soda powder may be administered, and afterwards a teaspoonful of the following mixture every three or four hours:—

℞. Tinct. rhei..... ℥ ss.
Spirit. chloroformi,
Spirit. ammon. aromat.....āā. ♏ xxiv.
Glycerini..... ℥ ij.
Aquam carui .....ad. ℥ j.
M. Ft. mistura.

This may be given to a child of six months old.

In children, after the age of infancy, constipation must be treated by attention to diet, and by the enforcement of regular habits. The diet should be carefully selected with regard to its digestibility, avoiding excess of farinaceous and saccharine articles. Well-made oatmeal porridge is serviceable at breakfast, and broiled bacon at this meal is not only digestible but useful. With his dinner the child may take a sufficiency of fresh vegetables and fruits, especially baked apples. All children should be cautioned against resisting the desire to empty the bowel, and should be taught regularity in this respect, as has been already recommended.

As an occasional aperient, the compound liquorice powder (a teaspoonful mixed with a small quantity of water or milk at bedtime) is very useful, and much more to be recommended than the syrup of senna and other saccharine laxatives, which tend to promote acidity and flatulence. If the constipation is habitual, it must be treated after the manner followed in the case of an adult patient. The senna mixture recommended above for babies is useful given in suitable doses. If the child can take a pill, Sir Andrew Clark's prescription of small doses of podophyllin and extract of belladonna (one-sixth of a grain of each taken at bedtime) will usually, after a short time, produce a regular daily movement; or two grains of the exsiccated sulphate of iron, with three grains of the aloes and myrrh pill, taken every night or on alternate nights, will effect the same object. In cases where the scanty stools consist of hard, dry lumps, a nightly dose of Hunyadi Janos water (one to two ounces) will quickly produce a complete change in the character of the evacuations, and promote a daily action of the bowels. In all these cases, regular exercise is of the utmost importance.

If impaction of fæces in the bowel be complete, the treatment will vary according as to whether inflammation have or have not been excited in the intestine. If inflammation have occurred, the case must be treated as described in the chapter on typhlitis. If there be no inflammation, but the bowels are merely blocked by the accumulated scybalæ, it is usually in the sigmoid flexure or rectum that the collection of fæcal matters has taken place. In such cases, the persevering use of purgative enemata will eventually relieve the patient. The difficulty commonly is that the solid plug often prevents the passage upwards of the fluid, so that this returns at once by the side of the tube and escapes. If the impacted mass is within reach of the finger, it may usually be broken up by the use of a metallic sound. In a private house, a marrow-spoon, or even the handle of an ordinary spoon of suitable size, may be used for the purpose. In giving the injection, the tube of the enema syringe should be wrapped round with lint at its base, and this, after introduction, should be firmly pressed against the anus so as to resist the escape of the fluid. A large quantity of thin warm gruel, with an ounce of castor-oil and half an ounce of turpentine, must be injected very slowly, and the patient should be instructed to retain it as long as possible. In some cases, especially if the impacting mass is out of reach from the anus, the solid plug may resist repeated enemata. In a case recorded by Mr. Gay—a boy of seven years old who had suffered from complete stoppage of the bowels for three months—the constipation was eventually overcome by introducing a speculum into the rectum, so as to dilate the sphincter, and then directing a stream of water against the obstacle. By this means, after the stream had played for half an hour or more against the mass, the latter became disintegrated, and a quantity of hard matter like cinders was brought away, to the great relief of the patient.

After the removal of the accumulated fæces, it is very important to keep the bowels regular for the future by the means which have been described.

CHAPTER IV.

DIARRHŒA.

Diarrhœa in early life is a subject of the utmost importance, as to it a large proportion of the deaths which occur in infancy are to be ascribed. The term itself is a vague one. It expresses merely an injurious increase in the alvine dejections, without reference to cause, and is applied equally to a trifling derangement, and to a serious, or even fatal illness. It therefore embraces several varieties of intestinal disorder which are clinically distinct, although, anatomically, perhaps, they may present mere differences in degree of the same pathological condition. For practical purposes it will be convenient to describe three forms of bowel complaint. Simple non-inflammatory diarrhœa (mild intestinal catarrh); acute inflammatory diarrhœa (severe intestinal catarrh, or entero-colitis), and choleraic diarrhœa (infantile cholera). Of these, the first only will be treated of in the present chapter.

In *simple non-inflammatory diarrhœa*, the mucous membrane of the bowels is in a state of temporary irritation, resulting from a mild form of catarrh. The disorder is a mere derangement of function, is, as a rule, accompanied by no great violence of purging, and is quickly arrested by suitable treatment. By many writers, this form of diarrhœa is not separated from the more severe variety of muco-enteritis, which will be described afterwards. Its clinical characters are, however, so different, and its symptoms so much less serious, that it is convenient to devote a special chapter to its consideration.

Causation.—Improper feeding is one of the most frequent causes of looseness of the bowels. Amongst hand-fed babies, the disorder is especially common, and unless quickly arrested, is very apt to run on into the inflammatory form, and prove serious. The food may be excessive in quantity, or unsuitable in quality. Often it is both, and an infant of a few months old is supplied with an amount of farinaceous food far in excess of his powers of digestion. The food is consequently carried along the alimentary canal, fermenting and irritating the mucous surface over which it passes, until it is discharged. A common cause of looseness of the bowels, is the practice, which often prevails in badly-regulated nurseries, of preparing for the infant in the morning the whole day's supply of food. The mixture of milk and sweetened farinaceous matter seldom remains unchanged for many hours together, and often, after a short time, is quite unfit for the child's consumption. But besides infants, children of all ages are subject to temporary looseness of the bowels, from the irritation of undigested and fermenting food. In such cases, the alvine flow may be regarded as the natural effort of the bowel to relieve itself of an unwelcome burden. The danger is, that in infants, and weakly children, the mild

catarrhal process may not cease with the expulsion of the offending substance, but may pass on into the more serious form.

A cause which is little less common than the above, is chilling of the surface. Children, and especially young babies, are very sensitive to changes of temperature, and part with their heat very rapidly. Unfortunately, it is at this susceptible age that the body is habitually less covered than at any other period of life. From the time that the child relinquishes his first long clothes, until his third or fourth year, he is exposed, with insufficient protection, to frequent changes of temperature. At all seasons, while indoors, his legs and arms are bare—often his neck and shoulders as well; and not seldom from the waist downwards he is covered by nothing but his short and scanty skirts. It is not, then, surprising that in a changeable climate the child should be subject to frequent chills, and that diarrhœa should be so common a complaint. In England, the derangement is especially prevalent at the end of spring and the beginning of autumn—seasons when the warmth of the day is rapidly succeeded by the cool of the evening. Moreover, it must be within the experience of most medical practitioners, that the sudden alternations which sometimes occur, even in the height of summer, from excessive heat to a cool, or even chilly temperature, are generally followed by an outbreak of diarrhœa amongst the younger members of the community. Rickety children, probably on account of their profuse and ready perspirations, are especially liable to these attacks.

Whilst cutting teeth, young children are more than usually prone to looseness of the bowels. In such cases, the relaxation is popularly ascribed directly to the process of dentition, and the child is said to "cut his teeth with diarrhœa." There is, however, no doubt that the teething process is concerned in the derangement only indirectly. During dentition, a child is often feverish, and pyrexia from any cause reduces the resisting power of the body, and renders it sensitive in an unusual degree to changes of temperature. In one case, the catarrh fastens upon the bowels, in another upon the stomach, in a third upon the lungs, according to the varying susceptibility of the organs; and strictly speaking, the child suffers not because he is teething, but because he is feverish.

Although looseness of the bowels from the above-mentioned causes is usually transient and trifling, it is liable at any time to become severe and even dangerous. An intestinal catarrh, unless quickly arrested, is apt to extend and grow violent, especially in weakly subjects; and an attack of diarrhœa which begins mildly enough, may suddenly change its character and assume very serious proportions.

Morbid Anatomy.—As the derangement is not in itself of much moment, few opportunities of an examination of the intestine are afforded. Such, however, occasionally occur when the derangement has been present in a young child who is feeble and ailing from some more serious affection. In such cases, the mucous membrane may appear to be quite healthy, and if here and there a certain amount of arborescent redness is discovered, this is in all probability a *post-mortem* change. Occasionally, an excess of slimy mucus may be found coating the lining membrane over a greater or less extent of surface.

Symptoms.—In infants, the mild intestinal catarrh which constitutes the non-inflammatory form of diarrhœa usually occurs suddenly. Sometimes it is preceded for some hours by slight griping pains, nausea, or even vomiting, a furred tongue, restlessness, peevishness, and other signs of discomfort; and occasionally, if a very indigestible substance has been swallowed,

by some fever. In a short time, a profuse discharge of thin feculent matter takes place from the bowel, and the pyrexia, if it had been present, subsides at once. At first, the evacuations are fæcal, and contain lumps of undigested food. They have often an offensive sour smell, and may be frothy from evident fermentation. Usually, the early fæcal stools are succeeded by thinner, smaller watery or slimy dejections, showing an excess of mucus, and tinted of a green colour. If the catarrh affect exclusively the lower part of the larger bowel, there is much mucus and perhaps streaks of blood from straining. In the first few hours the stools are usually frequent, but afterwards they become rarer, and five or six—seldom more—are passed in the course of the twenty-four hours. They are more numerous in the day than in the night, and are excited by liquid food, especially if this be taken warm and in large quantities at a time. The belly is not swollen or tender, and the motions after the first are usually voided without pain. If frequent, they have a noticeable effect upon the nutrition of the child. He looks pale, and his flesh quickly becomes soft and flabby to the touch, although to the eye the body may not appear to be wasted. A thermometer placed in the rectum shows no increase of temperature. The duration of the derangement varies from twenty-four hours to two or even three days. If it exceed this period, it often passes into the more serious variety described in the next chapter.

If the diarrhœa be due to a chill, other signs of catarrh may usually be detected. The child snuffles from slight coryza, or coughs from a trifling cold on the chest.

After the age of infancy, the symptoms present little variety from those just described. The child may complain of discomfort in the belly, but preserves his spirits, often his appetite, and will not allow that he is ill. He is usually thirsty, and his tongue is furred, but his general health, and even his nutrition, seem to suffer little, if at all, from the looseness of his bowels.

In children of five or six years of age and upwards a form of looseness of the bowels called "lienteric diarrhœa" is common. This derangement consists in an exaggeration of the normal peristaltic movement, which appears to be at once excited by the taking of food. In these cases, the latter part of a meal is accompanied by an uneasy sensation in the belly which soon becomes a griping pain, and is quickly followed by an urgent desire to evacuate the bowels. Often the child has to hurry away from the table, and the motions are found to consist almost entirely of undigested food and mucus. The bowels act in this manner after each meal, and often also in the morning before breakfast. The abdominal pain may be complained of at other times without being followed by a stool. The tongue is slightly furred, or is clean, red, and irritable-looking. If this looseness continue for several weeks, as it often does, it causes considerable impairment of nutrition.

Treatment.—If an infant be taken with diarrhœa, the treatment will vary according to the period at which the child comes under observation. If he is seen early, and there are signs of abdominal discomfort, especially if the motions contain lumps of undigested curd and starch, it is always best to assist the discharge of the offending matters by a teaspoonful of castor-oil, or a small dose of rhubarb and soda (gr. iv.–vj. of each with gr. j. of powdered cinnamon). This the child will take readily if it be made into a paste with a few drops of glycerine. Afterwards an antacid can be ordered with a carminative. The following, slightly altered and modernised from an old prescription by Boerhaave, is very useful:

℞. Sapon. duri Hispanioli..... gr. xvj.
Cretæ præp..... gr. xx.
Syrupi flor. aurantii..... ℥ ij.
Aq. menthæ sativæ..... ℥ iij.
Aq. fœniculi.....ad. ℥ j.
M.

Sig. A teaspoonful to be given every eight hours to a child between six and twelve months of age. To older children it can be given every six hours.

If, after the action of the laxative, the stools still continue to contain lumps of undigested food, or if the belly remain hard and distended, it is well to repeat the aperient until the dejections assume a more healthy character.

Even if the diarrhœa appears to be occasioned by a chill, it should be treated in the same way ; for there are in such cases acrid secretions which cause great irritation of the bowels until they are removed. At the same time, care should be taken that the abdomen is kept warm with a flannel binder, and that the child, if nursed, is restricted to the breast. If he be fed by hand, the milk should be diluted with barley-water, or with water in which a little gelatine has been dissolved, to insure fine division of the curd, and should be alkalinised by the addition of ten or fifteen drops of the saccharated solution of lime.

In the large majority of cases, an attack of simple diarrhœa is quickly arrested by this means, especially if care be taken that the child is confined to the house and guarded from further chill. If, however, the looseness continue, a powder composed of rhubarb (gr. iij.) and aromatic chalk (gr. v.) should be given at night-time ; and in the day, a small quantity of laudanum should be prescribed with an antacid and warming aromatic :

℞. Sp. ammon. aromat..... ♏ xx.
Tinct. rhei..... ♏ xxiv.
Tinct. opii..... guttæ iv.
Sp. chloroformi..... ♏ xxiv.
Aquam carui.....ad. ℥ j.
M.

Sig. One teaspoonful to be given every eight hours to a child of six months old.

Oxide of zinc (gr. j.) ; bismuth and chalk (gr. iij.–v. of each) ; and the old-fashioned but not the less useful chalk and catechu mixture, are all of service, especially if the stools are acid and frothy. So long, indeed, as signs of fermentation are visible, chalk with an aromatic should form part of the mixture, whatever be the combination adopted. If afterwards the evacuations become thin and watery, an astringent is indicated. Such cases, however, ought strictly to come under the head of inflammatory diarrhœa, and full directions for their treatment will be given in the next chapter.

If the diarrhœa occur in the course of teething, there is often hesitation as to the course to be adopted. Some authorities have been of opinion that the purging should not in such a case be hastily arrested, lest the fever and local inflammation be thereby aggravated. There is, however, no foundation for such apprehensions. I have never seen ill effects follow from the suppression of the intestinal flow. On the contrary, if the infant be weakly and the bowels habitually irritable, the continuance of the relaxation may cause such depression of the strength as to place the child's life in immi-

nent danger. The wisest course to follow is, first to remove irritating secretions by a mild aperient, such as the rhubarb and soda powder, or castor-oil, and afterwards to prescribe one of the antacid mixtures given above. Boerhaave's aromatic soap draught is very useful in these cases.

After the age of infancy children must be treated for the mild form of diarrhœa upon precisely similar principles to those laid down above. They should be confined to the house, and restricted in acid-making articles of food, such as fruit and sweets. A dose of rhubarb and magnesia, followed by a draught, several times in the day, containing spirits of sal volatile with chloric ether and a few drops of laudanum, or chlorodyne in some aromatic water, will soon restore the alimentary mucous membrane to a healthy condition.

Lienteric diarrhœa must not be treated with astringents. The looseness is quickly arrested by small doses of arsenic and nux vomica. For a child of six years old one drop of Fowler's solution of arsenic may be given, with two drops of tincture of nux vomica, three times a day, before food. One or two drops of laudanum may be added if the looseness does not quickly yield.

CHAPTER V.

INFLAMMATORY DIARRHŒA.

Inflammatory diarrhœa (severe intestinal catarrh or entero-colitis) is a much more serious disorder than the preceding. The purging may be severe from the first, or may begin as a mild looseness of the bowels, which quickly becomes more violent, and is accompanied by very evident impairment of the strength and interference with the general nutrition of the patient. In feeble children and infants it is often rapidly fatal, and even robust subjects may die collapsed after a few days. In some cases it passes into a chronic stage, and if not fatal to life, may reduce the child to a state of extreme emaciation and weakness.

Causation.—The causes which have been enumerated as giving rise to the simple non-inflammatory form of diarrhœa may also induce the more serious variety of intestinal catarrh. The severity of the process excited by these agencies is probably often dependent upon constitutional tendency, or upon some special state of the system prevailing in the child at the time of the attack.

Chilling of the surface and improper feeding are, no doubt, answerable for many of these cases. Besides these, the drinking of contaminated water, or the effluvium from decaying organic matter given out by the putrefying refuse of large cities is, no doubt, a frequent cause of the prevalence of severe and often fatal diarrhœa during the summer months. Not unfrequently several of these causes are found in operation at the same time. If an infant born of poor parents, and living in a badly drained and crowded house, be fed in hot weather from an ill-cleaned and sour-smelling bottle, it may be considered certain that acute inflammatory diarrhœa of a violent character will very shortly follow. In bottle-fed infants, indeed, the disease is especially common, and is answerable for a large part of the mortality which occurs in cities during the first twelve months of life.

Severe inflammatory diarrhœa appears to be almost confined to large towns; and the mortality from this cause is greatest during the months of July, August, and September. According to Dr. G. B. Longstaff, it is not so much heat alone, as heat combined with drought that gives its virulence to the disease; for the mortality is greatest in years with hot, dry summers, least in years when the summers are cold and wet. This observer regards the complaint as a communicable zymotic affection, and attributes its origin to a locally bred miasma from the soil or sewer-air. It seems, indeed, likely that in many of the more serious cases of acute inflammatory diarrhœa there may be a strong septic element in the illness. Certainly we often find a degree of nervous prostration quite out of proportion to the amount of purging. Indeed, a state of exhaustion may continue after the diarrhœa has been arrested, and end in death, although days have passed without any excessive looseness of the bowels having been noticed.

Weakness of the child, as might be expected, favours the occurrence of

inflammatory diarrhœa ; but there are certain diseases which are commonly accompanied by catarrh of the bowel. Thus in typhoid fever diarrhœa is a frequent symptom ; and in measles and scarlatina purging may form a very serious complication. Again, causes which promote congestion of the portal system, such as cirrhosis of the liver, and diseases of the heart and lungs, which impede the passage of the blood from the right side of the heart to the left, and therefore interfere with the whole venous circulation, may also help to determine the derangement.

Morbid Anatomy.—The catarrh of the intestine is seldom general, usually it is very partial, and is limited to the large intestine and jejunum. On opening the bowel we find the lining membrane coated at the inflamed part with a layer of thick mucus containing detached epithelial scales. The mucous membrane itself is reddened, and often thickened, and its solitary glands and the glands of Peyer's patches are swollen so as to project above the surface. Sometimes the mesenteric glands are a little swollen.

If the inflammation have passed into a chronic stage it is dark gray or dirty red in colour, and the enlarged follicles can be seen as small, pearly projections. In some cases patches of false membrane are seen on the surface, especially in the large intestine. The mucous membrane then has the appearance of being sprinkled over with bran. The little patches consist of exuded lymph containing epithelial scales. They vary in size and shape, and usually occupy the summits of the ridges of the mucous membrane.

If the catarrhal process has lasted long or been very serious we often find ulcerations. These are usually seen in the large intestine, especially towards the lower part, and in the lower part of the ilium. The ulcers are seated at the follicles and result from suppuration and ulceration starting from the interior. They are at first circular but may extend their edges irregularly. Not rarely we find intussusceptions of the bowel. These usually occupy the small intestine, and several may be present at the same time. They are evidently produced immediately before death, for the invaginated portions can be readily drawn out and show no sign of congestion or swelling.

In many cases of severe intestinal catarrh the liver is fatty. Another frequent complication, according to Kjellberg, is parenchymatous nephritis. This physician states that in 143 cases of fatal intestinal catarrh he found kidney disease in no less than 67. It is more common in infants than in older children, and is often partial, attacking only a portion of the cortical substance.

Symptoms.—The symptoms of acute inflammatory diarrhœa vary to some extent according to the age of the child. As a rule, if the purging be profuse the drain upon the system causes symptoms of depression, which come on earlier and are more severe in infancy than at a later period of childhood. Moreover, in infancy the intestinal disorder is apt to be accompanied by symptoms dependent upon parenchymatous nephritis ; and this complication is not so often seen after the period of the first dentition has come to an end. The derangement will, therefore, be first described as it affects infants, and afterwards as it is met with in older children.

In *infants* inflammatory diarrhœa usually begins like the milder form, with symptoms of discomfort about the belly and some looseness of the bowels ; but the purging soon becomes more severe. If there be any gastric catarrh, the child often vomits ; and both the matter ejected from the stomach and that discharged from the bowels is acid and sour-smelling. The stools at first contain much curd and undigested food, but rapidly change their character and become thin and watery. They are brownish or greenish

in colour, and give out a most offensive odour. Unless the lower bowel be affected there is little mucus visible to the eye, and the stools are passed without straining or signs of pain in the belly. In number they vary from six or seven to fifteen or twenty, or even more, in the twenty-four hours. Their character is found to change from time to time, partly according to the frequency of their passage. Thus, if they follow rapidly upon one another they usually consist of dark-coloured watery fluid, which deposits thick feculent matter on standing. If separated by a longer interval, they become thicker and more distinctly fæcal, and may contain small lumps of curd. Often they vary in character, and are at different times light and pasty, or frothy and dark, or green and very liquid. They are almost always very offensive. Under the microscope Dr. Lewis Smith has detected undigested particles of casein, fibres of meat, crystalline formations, epithelial cells—single or arranged in clusters—mucus, and sometimes blood. According to Nothnagel, of Jena, mucus, invisible to the naked eye, but perceptible under the microscope, indicates a catarrh of the smaller bowel.

The general symptoms are very severe. The infant rapidly wastes, and becomes so weak that he cannot sit up. His eyes get hollow; his face is very pale; the nasal line encircling the corners of his mouth becomes deepened into a distinct wrinkle, and erythematous redness appears upon the buttocks and inner parts of the thighs from the irritation of the discharges; the skin is dry, and the amount of urine is greatly diminished. Often the tongue is quite clean and red, although less moist than in health, and there is great thirst. If there is much gastric catarrh, the tongue may be furred upon the dorsum, and vomiting is often a distressing symptom. The pulse is rapid and feeble. The temperature varies. Sometimes it remains unaltered or may even be subnormal; in other cases it reaches to 102° or 103°, rising and falling irregularly, but never dropping to the level of health.

After a few days, the earlier in proportion to the profuseness of the drain, the child falls into a state of profound depression, with quick, feeble pulse, and rapid, shallow breathing. The eyes are hollow, the purple lids close incompletely, and the face, especially round the mouth, is livid. The fontanelle is deeply depressed. The tongue often gets dry and brown, and thrush may appear upon the cheeks and lips. Often, although the hands and feet feel cold, the internal temperature of the body is very high. A thermometer placed in the rectum will sometimes mark 107°, or even higher, although the child's general appearance is that of collapse. Thus, a little boy, aged nine months, had suffered from diarrhœa for a week, and was occasionally sick. When seen the motions were light coloured, watery, and offensive. His temperature (in the rectum) was 105.6°; pulse, 176; respirations, 64. On the following morning the temperature was 103°; but in the evening it rose to 107.8°, and the child died a few hours afterwards. Just before death the thermometer marked 106°. Another infant, ten months old, had diarrhœa for about a fortnight, the bowels acting five, six, or seven times in the day. At this time the temperature was normal. It then began to rise, and for a few days varied between 101° and 102°. Then it rose rapidly to 107.4°, and the child died with all the signs of collapse. In neither of these cases was permission obtained to make examination of the body, but no complication could be discovered during life to account for the elevation of temperature.

When the catarrh is seated in the larger bowel, especially if it affects principally the descending colon and rectum, the symptoms are more dysenteric in character. Indeed, this form of inflammatory diarrhœa is often

improperly spoken of as "dysentery." The infant usually cries before the passage of a stool from griping pains in the belly; and the evacuations are discharged with great effort and straining. Often the bowel prolapses, and the motions contain streaks or drops of red blood. The stools themselves consist of slimy matter from admixture with mucus, and lumps of coagulated mucus can be distinctly perceived in the fæcal matter. Sometimes the straining continues for a considerable time after the passage of the motion, and the prolapsed bowel protrudes like a bright crimson ball from the anus. Often it can be returned only with great difficulty, and when replaced is shot out again directly by the straining. In this form the stools may be as numerous as when the small intestine is affected, the vomiting as distressing, and the prostrating effect upon the system of the constant purging quite as pronounced. Indeed, if the tenesmus is urgent and the protrusion of the inflamed bowel almost constant, the case is very likely to end fatally.

If the derangement be complicated with parenchymatous nephritis, the signs of general collapse, into which the infant in fatal cases almost invariably sinks, are diversified by others pointing to the kidney. According to Kjellberg's description of such cases the tongue is dry, the skin upon the abdomen is cool and dry, and its elasticity is completely lost, so that when pinched up it remains wrinkled, lying in loose folds; the legs are stretched out and stiff, often œdematous; the urine is very scanty, albuminous, and deposits a sediment containing epithelial and hyaline casts and small round cells. The child vomits occasionally, sometimes shrieks out, and may be convulsed. In the very acute cases the infant is restless, with a very rapid pulse and hot skin. He flexes his thighs on his belly, and although drowsy and stupid, screams at times with pain, and appears to feel acutely the slightest touch upon his body.

In the more protracted cases the infant often falls into a comatose state, which from its resemblance to the third stage of meningitis has been called "spurious hydrocephalus." The child lies in a drowsy condition, from which, however, he can at first be roused. His eyelids are half closed; the pupils are sluggish and may be unequal; the pulse is rapid, and often intermittent; the breathing is irregular and sometimes sighing; the fontanelle is deeply depressed; the features are pinched and sharp; and the complexion is livid or even lead-coloured. The temperature taken in the rectum is subnormal. While in this state the stools—small, watery, and often greenish—may continue, and be passed involuntarily; or the purging may cease, but without being followed by any signs of improvement. Unless energetic measures of stimulation are adopted, the child continues in the same state for twelve or twenty-four hours, or even several days, growing weaker and weaker, and death may be preceded by a slight convulsive seizure.

Spurious hydrocephalus may be the consequence merely of sluggish circulation through the brain of impoverished blood. Often, however, it appears to be owing to the occurrence of thrombosis in the cerebral sinuses. Parrot has suggested that it may be sometimes due to uræmic poisoning from deficient renal secretion.

When the disease occurs *after the age of infancy,* the child is usually able to resist the exhausting effects of the diarrhœa for a longer period than is possible at the earlier age; but he rapidly loses flesh and strength, and if the purging is severe and is accompanied by vomiting, the features soon look pinched, the eyes get hollow, and the expression is haggard and distressed. Unless the lower bowel is affected, pain in the belly is usually

insignificant ; but if the descending colon is the seat of the derangement, there is much tenesmus and griping pain, and the bowel may prolapse. The temperature in these cases is usually moderately elevated during the earlier period of the attack, but often falls to a lower level than that of health when the purging has produced much depression of strength.

The stools are very watery and offensive, usually dark in colour, and if much milk is being taken, may contain lumps of curd. Sometimes, especially in very hot weather, they may be yellow or green from excessive secretion of bile. The urine is comparatively scanty and high-coloured. According to Nothnagel, if the small intestine is the seat of catarrh, the excretion of indican is in excess. When death takes place it is usually by asthenia ; but spurious hydrocephalus is uncommon after the period of infancy has passed, and, according to Kjellberg, kidney complication after that age is equally rare.

At all ages the symptoms of prostration come on earlier and are more pronounced if the child is already reduced in strength when the attack begins, and therefore inflammatory diarrhœa occurring as a secondary complication in a child worn and wasted by previous illness is an excessively serious derangement.

The *chronic form* of intestinal catarrh is a very obstinate and dangerous disorder, and unless treated judiciously is almost certain to end fatally. It may succeed directly to an acute attack, or may begin insidiously. If it occur as a sequel of the acute variety, the stools gradually become fewer and the more urgent symptoms subside. The child, however, does not regain flesh or strength, but remains feeble and pallid. His bowels act three or four times a day, and the evacuations consist of thin, dark, offensive fluid, or of equally offensive pasty matter and mucus.

The insidious beginning of the chronic disorder is very common. If detected early and treated with judgment, it is readily arrested ; but if it continue unchecked, it becomes a confirmed derangement and is much more difficult of cure. Still, even in bad cases the disorder may be usually guided to a successful issue if proper measures are adopted.

A child of eighteen months or two years of age is noticed to be looking pale, and his flesh is found to be flabby. Then he shows less than his usual pleasure at being on his legs, and if the power of walking have been only lately acquired, often refuses altogether to put his feet to the ground. These symptoms occasion great perplexity to the attendants, for the child's appetite continues good—often unusually keen—and his bowels are regularly relieved. On inquiry it will be found that the motions are more numerous than natural, often three or four in the day ; that they are large, offensive, and sour-smelling, and that in appearance they resemble a mass of soft putty. If only one or two stools occur in the day, they are often curiously copious ; and the mother will declare that the quantity of food consumed by the child, considerable as it may be, is quite insufficient to account for the enormous amount of matter passed from the bowels.

For weeks, perhaps, these symptoms go on unchanged. The wasting continues, and all power of digesting what is swallowed seems to be lost. Occasionally for two or three days together the bowels are relaxed, the stools being frothy and sour-smelling, or thin and dark-coloured like dirty water ; but the diarrhœa soon ceases and the motions again become large, soft, and pasty, as they were before. The attacks of acute catarrh repeatedly return, the intervals between them grow shorter, and eventually the looseness becomes a confirmed condition. Often, however, a considerable time may elapse before this stage is arrived at. The child for months may

remain pale and listless, with curious alternations of voracity in feeding and disgust for nourishment of every kind. He is not feverish but sweats copiously. There is no actual diarrhœa, perhaps even no increased frequency of stool. No pain is complained of. The mother will say that she cannot think what is the matter with the child, but that he is wasting away.

When the diarrhœa becomes persistent, the stools vary in character from time to time. In any case, they have an intolerable stench; and may be dark coloured and watery; or thicker, but still fluid, like thin paste; or may consist of green matter, like chopped spinach, diffused through a dark brown liquid. If they show a shreddy deposit, mixed with small black clots of blood, ulceration of the bowels may be confidently predicated, even although no tenderness of the abdomen can be detected.

The wasting now proceeds rapidly. The child gets hollow-eyed, wrinkled, and old-looking. His belly swells from flatulent distention. His limbs often become œdematous. He is excessively feeble, and lies quite motionless, taking little notice of anything. His appetite may be good, even at this stage, but often it is capricious or altogether lost. The water is diminished in quantity, if the purging is severe, and may contain from time to time, a little uric acid sand. Eventually, the child sinks into a state of exhaustion, and dies from asthenia, or is carried off by an attack of inflammation of the lung. All the symptoms which have been described as spurious hydrocephalus, may be noticed before death, and the diarrhœa may quite cease during the last few days of the illness.

These insidious cases are more common during the second year of life, than at any other period, although they may also occur later. When the complaint arises as a result of an acute attack, chronic diarrhœa is often met with during the first year, and is especially frequent in infants who have been weaned early and fed afterwards on unsuitable food.

Diagnosis.—Inflammatory diarrhœa, if accompanied by pyrexia, may be confounded with typhoid fever. The distinguishing points between these two diseases are pointed out elsewhere (see page 83).

The severity and danger of the attack may be detected from the first, by noticing that the temperature in the rectum is raised. In simple diarrhœa, the temperature is normal after the first stool. It is a question of considerable interest to ascertain the exact seat of the catarrh. The presence of jaundice would, of course, indicate that the duodenum was involved; and tenesmus, with or without prolapsus ani, would point to the rectum. From a series of careful and laborious investigations, carried out by Prof. Nothnagel, who submitted to microscopical examination more than one thousand specimens of catarrhal stools, considerable addition has been made to our knowledge of the distribution of the lesion in cases of intestinal catarrh. According to this authority, mucus is passed in considerable quantity in other forms of catarrh besides that affecting the lower bowel, and can be detected by the microscope when not visible to the naked eye. The amount of mucus, and its more or less intimate admixture with the fæcal matter, furnishes important evidence; so, also, from the presence or absence of bile-stained mucus and epithelium, much information can be derived. The results of Prof. Nothnagel's researches may be thus briefly summarised:

If the catarrh affect the jejunum and ilium, no mucus can be seen by ordinary inspection of the stools; but when a specimen is placed under the microscope between two thin plates of glass, islets of mucus are distinctly visible. We can then affirm positively that the catarrh is seated in the small intestine, and that the colon is healthy. If the mucus is tinted with bile pigment, it also indicates jejunal and ilial catarrh; but, in addition, it

shows that there is increased peristaltic action of the colon and the lower part of the ilium. In these cases, the stools are always liquid, for if retained in the colon sufficiently long to acquire firmness, the bile pigment is always transformed, and the play of colours in Gmelin's test can no longer be obtained. Besides bile-stained mucus, cells of cylindrical epithelium, leucocyte-like corpuscles, and fat-globules, all tinted with bile, can be observed. In addition, on examining the urine, the indican[1] excretion is found to be in excess.

When the larger bowel is affected, no bile-tinted mucus globules can be perceived. The stools are of a pulpy consistence, and the mucus they contain is distinctly visible to the unassisted sight. The nearer the affected part of the bowel is to the cæcum, the more intimate is the admixture of the mucus with the general fæcal mass. If pure mucus is passed in large quantity, we may conclude that the sigmoid flexure or the bowel below it is the part involved; and scybala embedded in mucus, point distinctly to the rectum.

Spurious hydrocephalus does not present much difficulty in diagnosis. The history of exhausting disease, the depressed fontanelle, the low temperature, and the signs of general prostration, sufficiently mark out this condition from the ordinary forms of cerebral disease.

Prognosis.—Inflammatory diarrhœa is so fatal a complaint in weakly children that it is very important to estimate the chances of a favourable ending to the derangement. Much will depend upon the age of the child, the sanitary conditions under which he is living, and the state of his previous health. The disease is most dangerous in babies who have been weaned early, and fed afterwards on excess of farinaceous food, or with portions of their parents' meals. Such infants are weakly and ill-nourished at the time of the attack, with irritable bowels from their unsuitable diet. A severe acute catarrh coming on under such conditions, rapidly reduces their remaining strength, and very commonly ends fatally. Older children, having greater vigour, are often able to battle through a complaint which would kill a younger and weaker subject. Therefore, after the age of infancy has passed, the prognosis is more favourable than at an earlier period; but even in these cases, if the attack is violent and the purging severe, the danger is not slight, and the derangement may resist all our efforts to arrest its course.

At all ages, the case is more serious if the temperature is high than if it be only moderately elevated. Also, great frequency in the stools; violent vomiting; early collapse; unusual drowsiness or stupor; stertorous breathing; convulsions, or other sign of cerebral complication, and any sudden marked increase in the pyrexia—all these are signs of very serious import. On the contrary, a fall in the rectal temperature is of good omen. If the internal heat of the body be found to have become normal, we may entertain hopes of improvement, although the general symptoms appear to have undergone no change.

In the chronic form, the prognosis is also more serious in children under the age of two years. Another very important matter is the persistence of the diarrhœa. If the purging is a confirmed derangement, our chances of success are much fewer than if intervals occur, however short,

[1] To test for indican:—Add to the urine to be examined, an equal quantity of fuming hydrochloric acid, and then with a pipette, pour down a few drops of strong solution of chloride of lime. If no indican be present, the colour of the urine so treated becomes red or violet from the action of the test on some unknown constituent. If indican be contained in the urine, the colour of the fluid becomes dark green or blue.

in which the stools are merely soft and pasty without being relaxed. If ulceration of the bowels has occurred, we should look forward to the termination of the illness with very serious apprehension (see Ulceration of the Bowels).

Treatment.—In all cases of severe diarrhœa in the child, especially in the infant, our first care should be to place the patient at once upon a suitable diet. This subject is of the first importance; for it is indispensable to improvement that all food be withheld which is capable of fermenting and giving rise to acidity. Our object is to furnish the child with a diet which will supply nourishment to the system without leaving an undigested residue to irritate the bowels, and so aggravate the derangement we are endeavouring to cure. Milk, in particular, must be prohibited unless the patient be an infant at the breast. If he be suckled, it will sometimes be found that restricting the child entirely to his mother's breast is followed by improvement. Often, however, even this diet will not agree, and other means will have to be adopted. A hand-fed baby must be fed with whey and cream, or whey and barley-water in equal proportions, or with weak veal or chicken tea diluted with whey or barley-water. The food should be given cold, and in small quantities at a time. If the child is weakly, and in any case if he show signs of becoming exhausted, white wine whey is of great service. This must be given cold in suitable quantities at regular intervals. Thus, a feeble infant will take a tablespoonful every hour with advantage at first. Afterwards, as the need for stimulation grows less pressing, other foods may be alternated with the white wine whey; or this may be given only two or three times in the day.

Koumiss has been used largely in these cases, and sometimes appears to agree. My own experience of this food, however, has not been quite satisfactory. In giving koumiss to a young child, the gas should be first expelled by pouring the fluid several times from one vessel to another. The quantity allowed to be taken at each meal must be proportioned to the severity of the purging. If this be insignificant, the child may take the whole contents of his feeding-bottle. If, on the contrary, the looseness be frequent and exhausting, koumiss, like other fluids, must be given sparingly, and the quantity taken on each occasion must be very carefully restricted. The addition of Mellin's food to any of the first-named fluids is useful, and in most cases answers well.

Older children should be fed, while the temperature is high and the purging severe, with plain whey, barley-water, and weak veal or chicken broths, given in small quantities; or if the strength is failing, with the wine whey, or brandy-and-egg mixture, and strong meat essence. When the first violence of the disease has abated, the patient may begin to take milk, but it should be well-diluted with barley-water to insure fine division of the curd, and be alkalinised by the addition of the saccharated solution of lime, fifteen or twenty drops to the teacupful. Whatever be the age of the patient, any sign of exhaustion must be combated by energetic stimulation. Brandy must be given internally, and the skin must be irritated by warm mustard baths.

After regulation of the diet, the next matter is to see that the belly is kept warm. The whole abdomen should be covered with a thick layer of cotton wadding, and this must be kept in place by a broad flannel binder. If there is any tendency to coldness of the feet, they must be warmed by a hot bottle.

Purity of the air is another point which is not to be neglected. The window should be opened—care being of course taken that the child is

not exposed to draught—and a free circulation of air through the room can be insured by a small lamp placed in the fire-grate. Few persons should be allowed in the sick room; and all soiled linen should be removed at once to another part of the house.

In all cases of severe intestinal catarrh, a careful watch should be kept over the temperature, and any great increase in the bodily heat should be at once reduced by tepid bathing. In tropical climates, the treatment of inflammatory diarrhœa by baths has been found very successful. A point of great practical importance in applying this method, is to remember the depressing effect of the illness, and to be careful that the application of cold is not carried to the point of inducing prostration. The more weakly the child, the more careful should we be so to regulate our measures, as to avoid a shock to the system which might be too severe to awaken any responsive reaction. The use of the bath at once reduces the temperature, and even in cases which eventually prove fatal, its immediate effect is often encouraging.

A little girl, aged twelve months, with twelve teeth, was seized with severe diarrhœa. The stools were buff-coloured and watery, without lumps, and were passed very frequently in the day. After about a week, the dejections became frothy, and had a dark green tint. There was much tenesmus, and the bowel sometimes prolapsed. On an average, there were about fifteen stools in the twenty-four hours. The child was very weak, and had no appetite, but was thirsty. She never vomited.

When first seen on the twelfth day of the purging, the tongue was red, with some fur on the dorsum. The skin was inelastic. The abdomen was distended, but unless the child strained, the parietes were flaccid, and there was no tenderness. The eyes were hollow, the mouth livid, and the nasal line was well marked. The fontanelle was depressed. The temperature was 103.4°.

The child was ordered to be fed with veal-broth and barley-water in equal proportions, and to take as medicine, powders of bismuth and aromatic chalk. After each motion she was bathed in cold water. After six of these baths, each of which had greatly reduced the temperature, the bodily heat remained normal, the stools were reduced to three in the twenty-four hours, and the child's appearance was much improved. She looked brighter, the eyes were less hollow, and there was less lividity about the lips. The stools were green and slimy, and were evacuated with straining. Unfortunately, after a few days of this improvement, although there was no increase in the diarrhœa, the child seemed to sink from exhaustion, and died on the nineteenth day of the illness.

In this and similar cases, the child was placed in cold water, and bathed for a minute or two with a sponge. When the child is very weak, it is advisable to make use of water warmed to the temperature of 70°, and to bathe him in this water for a few minutes, or until sufficient evidence of reduced temperature is obtained. Afterwards, he should be placed between blankets in his cot, with a hot bottle to his feet. A stimulant is usually required after the bath; and may be given with advantage, also, when the child is taken out of his cot to be placed in the water.

The above measures are all of great importance, and constitute in themselves the main treatment of the disease. The use of drugs, although often of signal service in the conduct of the case, cannot be expected to lead to any good result unless the other matters have been first attended to.

If the case is seen early, it is well to begin the medicinal treatment with a gentle laxative, such as castor-oil, or rhubarb and soda. Afterwards, if the temperature is only moderately elevated, not passing above 100° in the rectum, the aperient should be followed by an astringent mixture containing

opium. For a child of six months old, two grains of the extract of hæmatoxylon may be combined with five drops of the tincture of catechu, and half a drop of laudanum in a chalk mixture, and given every six hours in the day and night. If the case resist this treatment, it usually goes on, and appears to be little influenced by astringents, however ingeniously they may be varied and combined. The cases we meet with in children's hospitals, have usually been treated with a variety of the ordinary binding remedies, but the diarrhœa continues apparently unaffected by changes in the physic. After seeing many of these cases, we are led to rely less upon the pharmacopœia than upon attention to diet and the other means by which the disorder may be controlled. Of astringent remedies I prefer the extracts of hæmatoxylon (gr. ij.–v.), and rhatany (gr. ij.–v.), or the tincture of catechu (ɱ v.–x.), to gallic acid, sulphuric acid, and lead. In my hands, dilute sulphuric acid has appeared to be almost inert unless given in a fairly concentrated form ; gallic acid is often disappointing as a cure for diarrhœa, and lead I believe to be inadmissible for infants, as it has seemed to me to be not unfrequently a cause of convulsions.

In cases which resist the ordinary astringents, the old prescription of dilute nitric acid with opium is often of special value. For a child of six months old, two drops of the dilute acid, with half a drop of tinct. opii, may be combined with a quarter of a drop of tinct. capsici, or two of tinct. zingiberis, and given in a teaspoonful of water sweetened with glycerine, three times a day. When the diarrhœa is accompanied by a high temperature, astringents are seldom of much service until the pyrexia has subsided. In these serious cases, the temperature must first be reduced by cool or tepid bathing ; and for medicine, the child may take a few drops of castor-oil (ɱ iij.–vj., according to his age), with one or two drops of laudanum, several times in the day. Another remedy, from which the best results sometimes follow, is ipecacuanha. The value of ipecacuanha in small and repeated doses in the bowel complaints of children, has long been known. Certainly, there are few drugs which have a more striking effect upon the mucous membrane of the intestine. The dose of ipecacuanha should always be combined with an aromatic. One-tenth or one-eighth of a grain may be given with a few grains of aromatic chalk powder in mucilage every three or four hours. Even in these small doses, the remedy may sometimes exercise a depressing effect upon the system ; it is well, therefore, to combine with each dose a few drops of chloric ether or sal volatile. Another form in which the remedy may be administered is the time-honoured combination of Dover's powder with mercury and chalk. I have known obstinate cases of inflammatory diarrhœa, which had resisted other methods of treatment, to yield quickly to small and repeated doses of this compound powder. To a child of six months old, I order a quarter of a grain of each (Dover's powder and gray powder) every three hours. Ipecacuanha is also useful in somewhat larger doses, so as to produce a slight emetic action. Given in quantities of half a grain or a grain to a child of six months old twice in the day, it will often produce vomiting without much retching ; and if the stools have been previously pasty and sour-smelling, will cause a very rapid improvement in their character. When the lower bowel is affected, and there is great tenesmus, ipecacuanha is especially indicated. In such cases, it may be administered suspended in thin starch (gr. v. to ʒ ij.) as an injection twice a day. The castor-oil and opium mixture is also useful where the lower bowel is the seat of catarrh, and has great influence in allaying the pain and tenesmus. One-eighth of a grain of powdered ipecacuanha may be usefully combined with this mixture. If the stomach is very irri-

table, and the diarrhœa is accompanied by excessive vomiting, ipecacuanha is of the utmost service. This drug, although an emetic in large doses, in feeble doses is a sedative ; and if given very frequently in small quantities, has a very striking influence in improving the condition of the patient. In fact, fully to exhibit the value of this remedy, we should select a case in which the vomiting is frequent and the tenesmus distressing, and give one or two drops of ipecacuanha wine in half a teaspoonful of water regularly every hour. Antimony, which has a similar action to ipecacuanha, is also useful in like cases. Two drops of the wine, combined with half a drop of opium, and two or three of tincture of ginger, form a very satisfactory remedy given every four or six hours. In all cases where the lower bowel is inflamed, an injection of tinct. opii in thin warm starch (℥ iij.–v. to ℥ ss.) is most useful in relieving the tenesmus and checking the purging. It may be administered every night. Dr. Tyson recommends chloral to be used in the same way, and prescribes half a drachm of the chloral hydrate to two ounces of thin starch. Of this, one drachm is to be used at a time. A drug which is often useful when other astringents fail, is bismuth ; but to be efficacious, the dose of this drug must be large. For a child of six months old, it will be useless to give a smaller quantity than ten grains every four hours. I usually combine the bismuth with a few grains of the aromatic chalk powder, and have often met with very good results from this remedy.

Directly a reduction in the temperature and an increase in the consistence of the stools show that the first acute violence of the disease is subsiding, astringent remedies are called for, and the case must be treated as already described.

If the lower bowel is acutely inflamed, and prolapses as a crimson ball which cannot be returned, or is replaced with great difficulty, the protruded gut should be first fomented with warm water ; next, half an ounce of thin, warm starch, containing four drops of laudanum and five grains of powdered ipecacuanha, should be thrown up the rectum ; lastly, a thick poultice of boiled starch should be applied over the fundament. The enema may be repeated twice a day, but the fomentation and poultice should be renewed after each action of the bowels. If prolapsus occur later, as a consequence of relaxation of the sphincter and irritability of the mucous membrane at the lower part of the rectum, the bowel should be returned by pressure with the oiled finger, and if necessary may be retained in place by a pad. Astringent and tonic remedies internally, such as pernitrate of iron and nux vomica (for a child of six months old : liq. ferri pernitratis, ℥ iij. ; tinct. nucis vomicæ, ℥ ½ ; aquam ad., ℥ j. ; to be taken three times a day), and enemata of infusion of rhatany after each protrusion, will usually quickly put an end to the prolapse. Ordinary cases of prolapsus ani in children, the consequence of repeated catarrhs of the lower bowel, without any great frequency or urgency in the dejections, may be readily cured in most cases by the application of an efficient flannel binder to the belly. The occurrence of fresh catarrhs being thus prevented, the relaxed mucous membrane soon recovers its tone.

In cases where the symptoms known as "spurious hydrocephalus" are noticed, or in any case where signs of prostration are visible, the child should be placed for ten minutes in a warm mustard bath, and should be afterwards wrapped in flannel, with hot bottles to his sides and against his feet. The brandy-and-egg mixture can then be given every hour or half hour in doses of one teaspoonful, or if the patient be a young infant white wine whey may be used instead. In all cases of inflammatory diarrhœa, the quantity of food to be taken at one time must be carefully regulated

according to the strength of the child. If the purging be severe, and especially if it be accompanied by distressing vomiting, liquid food should be given in quantities of one spoonful every half hour. Sometimes no more than one teaspoonful can be borne at one time.

In the *chronic* form of inflammatory diarrhœa, the treatment consists mainly in a careful regulation of the food. Milk in such a case is an irritant poison which must be strictly forbidden; and starches are digested with difficulty, and must be very sparingly allowed.

In the insidious beginning of the disorder, when large pasty stools are being passed, the child, if an infant, should be fed with weak veal-broth and barley-water in equal proportions; whey with cream; the yolk of one egg beaten up with broth or whey; and Mellin's food mixed with whey or barley-water. The meals should be frequently varied during the day, and the quantity allowed must be strictly proportioned to the infant's powers of digestion. For medicine, he may take a powder of rhubarb (gr. ij.–iij.) and aromatic chalk (gr. iij.–v.) every night for three nights; and in the day, a mixture composed of half a drop or a drop of laudanum with four or five grains of the bicarbonate of soda in some aromatic water. If the stools still continue pasty in character, although reduced in quantity, a couple of grains of pepsin may be given two or three times a day in water and glycerine, before food. In such young children, if the derangement have not passed beyond this early stage, it is usually readily arrested by this means. The infant should be warmly clothed, with a flannel bandage round his belly, and should be taken out frequently into the open air.

In older children, if the derangement have persisted for a considerable time, digestion and nutrition are less easily restored. The same plan must be adopted of forbidding milk, and greatly restricting the quantity of starchy food. The child should take the yolk of an egg for his breakfast, with a slice or two of thin, well-toasted bread and fresh butter. For dinner, the lean of an under-done mutton-chop, with well-boiled cauliflower, and fried bread crumbs. For his evening meal, strong broth, meat-jelly, or meat-essence. It is best, in obstinate cases, to accustom the child to take malt biscuits, or malted rusks, instead of ordinary bread and toast, as the former are much more readily digested. Sometimes the pancreatic emulsion seems to be beneficial, but apart from the disagreeable taste of this preparation, which renders it exceedingly unpleasant to the patient, it often causes nausea and discomfort, and has to be discontinued. Pepsin (gr. iij.–v.) is, however, very useful, and the extract of malt often proves a valuable aid to digestion. Still, maltine must be given with caution, as, if it contain excess of glucose, it may encourage looseness of the bowels.

I have found raw meat of immense service in cases where the stools continue pasty and offensive in spite of the most careful regulation of the diet. It is prepared by mincing a piece of raw rump-steak or mutton-chop, pounding it finely in a mortar, and then straining through a fine sieve. Meat so prepared may be eaten as it is, or diffused through meat-broth or meat-jelly, or spread upon bread and butter. It may be taken in large quantities. If possible, the child should be induced to swallow from a quarter to half a pound in the course of the day. Before each meal of raw meat, a dose of pepsin should be administered. Children soon take a liking for this food. At first it is only partially digested, and the decomposing residue gives a most offensive smell to the stools; but after a few days, especially if pepsin be taken, the meat ceases to be visible in the motions. By the above measures, strictly carried out, the most obstinate cases can be arrested. The child rapidly regains flesh and strength, and after a time

his power of digesting milk and starch returns. Very careful watching, however, is required in order to carry the illness to a successful issue. The stools must be inspected every day, and any sign of looseness, offensiveness, or hyper-secretion of mucus will require to be promptly attended to. Offensiveness of the motions is due to the presence in them of undigested and decomposing food. This is often the consequence of abnormal briskness of peristaltic action, which forces the contents of the bowel too rapidly along; or it may be due to mere weakness of digestive power. In the first case, one drop of laudanum should be given three times a day to quiet exaggerated peristaltic action. In the second, the diet must be revised, especially in the matter of farinaceous food, and no starch unguarded by malt should be allowed to be taken. Excess of mucus may usually be quickly moderated by the castor-oil and opium mixture previously recommended, or by a few drops (v.–x.) of liq. hydrargyri perchloridi, given every two or three hours during the day. Slight looseness of the bowels is readily arrested by nightly doses of powdered rhubarb (gr. iij.–v.) and aromatic chalk-powder (gr. v.–viij.); or the latter may be given with a drop of laudanum, and ten or fifteen of tinct. catechu, three or four times in the day. The flannel binder in all these cases is as important for older children as it is for infants, and should be fitted closely to the abdomen, as already directed.

If, when the child is first seen, the derangement has become a confirmed diarrhœa, the above plan of treatment, as regards diet, must still be the same. The belly should be covered with cotton wadding under a flannel binder, and the child should be strictly confined to two rooms. The purging must be controlled by hæmatoxylon, rhatany, and opium, given several times in the day in the doses recommended on a previous page; and if the motions are sour-smelling, a few grains of aromatic chalk may be added. If the purging is obstinate, especially if ulceration of the bowels is suspected, nitrate of silver is a most valuable remedy. It is suitable to both infants and older children, and should be given with dilute nitric acid and tinct. opii in glycerine. For a child of six months old, one-eighth of a grain may be administered every four hours. For an older child, the quantity of the nitrate may be increased to one-fifth or one-fourth of a grain. The treatment of severe cases when ulceration of the bowel is present, is fully considered in another place (see page 666).

The raw meat diet is very useful in obstinate cases, and, if the diarrhœa be copious, should form the staple of the child's nourishment. Stimulants will usually be required, and should consist of the brandy-and-egg mixture given as often and in such quantities as may seem necessary.

When the purging has been arrested, the case must be treated as described for the early insidious form of the complaint. Afterwards, quinine and iron may be given, and the child should be sent, if possible, into a bracing air. A valuable tonic in these cases is the following, suitable for a child of three years old:—

℞. Pepsini porci ..... gr. iij.
Liq. strychniæ ..... ♏ ¼
Quiniæ ..... gr. ss.
Acidi nitro-muriatici dil ..... ♏ iij.
Aquam ..... ad. ℥ ij.
M. ft. haustus.
To be taken before each of the three principal meals.

Cod-liver oil is also a useful remedy, and should never be neglected in obstinate cases.

CHAPTER VI.

CHOLERAIC DIARRHŒA (INFANTILE CHOLERA).

Choleraic diarrhœa is the most dangerous form of intestinal flux to which children are liable. It occurs only during the summer months, runs a very rapid course, induces in a few hours a startling change in the appearance of the patient, and often ends fatally. The affection has derived its name of choleraic diarrhœa from its resemblance in many of its symptoms to Asiatic cholera; but it is not, like the latter disease, an epidemic malady, and appears to be essentially distinct in its nature, although in many respects so apparently similar.

Causation.—Choleraic diarrhœa is especially a complaint of warm weather, and summer heat must be looked upon as a powerful predisposing cause of the disease. Other agencies, however, must come in as exciting causes, for the affection is not common in country places, and indeed is rarely seen out of cities. Injudicious feeding, bad drainage, and the effluvium arising from decaying organic matter are probably auxiliary causes which have a notable influence in exciting this as well as the other forms of gastro-intestinal disorder. Infantile cholera, as its name implies, is a disease of early childhood, and is more common during the first six months than at a later period of infancy. It is said not often to be met with after the first dentition is completed; but older children are subject, like adults, to attacks of cholerine or summer cholera, which have all the characteristics of choleraic diarrhœa in the infant. Boys are said to be more subject to it than girls; and robust children are attacked by the complaint as often as the ailing and the feeble.

Morbid Anatomy.—An examination of the intestinal canal in fatal cases of infantile cholera reveals little to account for the alarming character of the symptoms by which the progress of the disease had been accompanied. A patchy redness of the mucous surface may be visible, but often this is very slight and incomplete. Indeed, it may be absent altogether, and instead of red, the mucous membrane may be paler and more bloodless than natural. The glands of Peyer's patches, and the solitary glands of the large intestine, often stand out from the surface like little translucent projections, and sometimes the mucous membrane is softened. The softening appears to be a secondary lesion, and to occur as a consequence of the profuse serous transudation, which is one of the main features of the illness. The same softened state of the mucous membrane is often seen in the stomach. If the course of the disease is very rapid, extensive destruction of the epithelial coating has been noticed in the gastro-intestinal canal. The organs generally are anæmic. The brain is especially bloodless, and is said to give evidence of fatty degeneration and œdema. The kidneys are congested, and, according to Kjellberg, may be sometimes the seat of acute parenchymatous nephritis.

Symptoms.—The outbreak of the disease may be sudden or gradual.

Sometimes it bursts out as a violent attack of vomiting and purging, which quickly assumes alarming proportions, and the child speedily passes into a state of collapse. In other cases it begins as an ordinary purging, but after a few days vomiting occurs, and the stools assume the peculiar watery appearance which is so characteristic of this fatal malady.

However it may have begun, the disease when established has very peculiar features. There is obstinate vomiting and very persistent diarrhœa. The child first throws up the contents of his stomach, and all fluid or medicine swallowed instantly returns. Next, the ejected matters consist of mucus, thin watery fluid tinged yellow, or even pure bile. The stools, which are at first feculent, thin, and offensive, soon lose almost all trace of fæcal matter, and consist of a copious flow of serous fluid, which soaks into the diaper, and when evaporated, leaves nothing but a faint yellowish stain upon the linen. The quantity of fluid discharged from the bowels is sometimes extraordinary. When thus serous, the stools are not especially offensive; they have not the horribly fœtid odour which is noticed in many cases of inflammatory diarrhœa—an odour which seems to cling to the diaper, and can be with difficulty washed away. The number of the stools varies. Sometimes twelve or fifteen are passed in the twenty-four hours. In other cases the bowels act less frequently; but usually, if the stools are separated by a longer interval, a larger quantity of fluid is discharged on each occasion, so that the abstraction of water from the body is very much the same.

As a consequence of the profuse drain both from the stomach and bowels, the patient's body wastes and dwindles with a rapidity which is surprising. After only a few hours, the eyes grow hollow and the nose sharp, the cheeks fall in, and all the features look pinched and drawn. If previously well nourished, the child's flesh loses all elasticity, and feels soft and doughy to the touch. The abdominal parietes are flaccid and sometimes shrunken. The skin is inelastic. Owing to the loss of water, the thirst is extreme. The child, if he can speak, asks constantly for drink. If an infant, he fixes his eyes upon any cup or vessel containing fluid, sucks his lips, and whines in a manner which is sufficiently expressive. In most cases, however, anything which may be swallowed is immediately returned.

The urine is excessively scanty, and if the diarrhœa is profuse, may seem to be almost suppressed. The tongue may be clean, or covered with a thin fur. Towards the end of the disease it is often dry and brown. The pulse is rapid and very feeble. It often reaches 150, but is regular in rhythm. The temperature is generally high. The heat of the surface may be natural, or even sub-normal, and often the extremities feel cold to the hand; but a thermometer placed in the rectum registers a high level, the mercury rising to 104°, 105°, or even a point still more elevated. The child is excessively restless. As long as he has strength to do so, he moves his arms and legs uneasily, and whimpers or cries feebly. Often he draws up the corners of his mouth as if to cry, but no sound is heard. He sleeps little, but lies in a drowsy state with eyelids only partially closed. The fontanelle is deeply hollowed, and in extreme cases, owing to the shrinking of the brain from abstraction of water, the bones of the skull can be felt to overlap.

In a very short time, unless some amendment occur, the child passes into a state of collapse. He lies perfectly quiet, as if dosing. His eyes are only half closed; his features are sharp, and his face livid and old-looking. The vomiting usually ceases at this stage, but the diarrhœa generally continues, although with diminished violence. The coma becomes

more and more complete; the conjunctivæ cease to show any sign of sensitiveness, and the child dies quietly, or in a faint convulsion.

In the comparatively rare cases which terminate favourably, the first sign of improvement usually noticed is a fall in the temperature; the next a cessation of the vomiting, so that fluids can be retained upon the stomach. Then the stools begin to present a better appearance. The serous discharge becomes again tinged with fæcal matter, and the craving for drink is less noticeable. The diarrhœa may then cease, or thin feculent stools may continue to be passed in small quantity for some days. In other cases the improvement in the stools is the earliest sign of amendment, and the vomiting continues for a time, even after the purging has ceased.

The duration of the illness is terribly brief. Often it may be measured by hours. Always at the end of the fourth or fifth day, the patient is either dead, or is evidently advancing towards convalescence. Death may take place in five or six hours from the first onset. In other cases the child survives for a longer period. Usually he dies in the course of the third day.

Diagnosis.—There is no difficulty about the detection of the disorder. The uncontrollable vomiting and diarrhœa, the intense thirst, the rapid shrinking of the tissues, the copious serous stools, the scanty secretion of urine, and the early collapse—all these form a group of symptoms which is very characteristic, and, indeed, can hardly be mistaken.

Prognosis.—When the disease is established, the prospect of recovery is faint. Early cessation of the vomiting is a favourable sign, and any return of feculent matter in the stools allows room for hope, however unfavourable the general condition of the child may appear. Also, a fall in the internal temperature, although the symptoms may not have visibly improved, is a sign of amendment which is not to be disregarded. If the child sink into a state of collapse, he almost invariably dies. At any rate, I have never known an infant to recover from such a condition. Indeed, in any case, during the first few months of life, the ratio of recoveries is excessively small.

Treatment.—On account of the persistent vomiting, which is one of the marked symptoms of the complaint, attempts to supply nourishment and support the strength of the child against the exhausting and continuous drain from which he is suffering, often meet with little success. Indeed, as long as the vomiting is frequent and distressing, and the purging severe, it is better to abandon all attempts to introduce food into the stomach. We should content ourselves with allowing the child to drink as much iced water as he shows an inclination to swallow; for stinting of liquid in these cases has been shown to be not only cruel, but injudicious. As soon as any diminution in the vomiting allows us to hope that food may be retained, we may begin by giving a teaspoonful of white wine whey (iced), and repeating this quantity every twenty minutes or half hour. If this be vomited, a less quantity should be given; but if this, too, be rejected, it is better to postpone, for the time, any further attempts to supply nourishment and return to the iced water. If the stomach can retain the whey, the child may be allowed to take it in considerable quantities, sucking it through the bottle like any ordinary food. If after a few hours there is no sign of sickness, a dessertspoonful of cream may be shaken up in the bottleful of whey. Milk in any shape, even breast-milk, must be strictly forbidden in these cases.

Koumiss has been strongly recommended as a food in this disease. Dr. Archibald M. Campbell, of New York, speaks highly of its value in

arresting the vomiting, subduing the thirst, reducing the number of the stools, and improving their appearance. He recommends that it should be given at first in quantities of half or a whole teaspoonful every ten minutes or quarter of an hour, and that the quantity should be gradually increased. While it is being taken, iced filtered water can still be used to quench thirst. If the white wine whey be employed, no other stimulant is required; but if koumiss be used, the child will require an occasional dose of pure brandy, of which five or ten drops may be given at one time.

On account of the early occurrence of collapse, the case should be watched with the utmost attention, and any sign of exhaustion requires to be combated by energetic stimulation. The child must be placed for five or ten minutes in a warm mustard bath; and afterwards brandy (ten to thirty drops) must be administered, and repeated at short intervals, until the warmth of the extremities is restored. It must be remembered that a high internal temperature is compatible with considerable coldness of the surface; and that it is of extreme importance to encourage the heart's action and improve the general circulation. Often the dose of brandy will have to be repeated every few minutes for a time. It is astonishing how large a quantity of spirit must be given in many cases to produce a sufficient effect even upon a young baby.

If the child is seen early, before exhaustion has come on, and the temperature is found to be high, it is well to reduce the pyrexia by placing the child in water of 75° or 80° Fahr. If, however, there is great feebleness, the mustard-bath must be used as already described.

Medicines given by the mouth are very disappointing in this disease. French authors speak highly of the value of nitrate of silver. If this salt be employed, it may be given in quantities of gr. $\frac{1}{12}$ to gr. $\frac{1}{8}$ several times in the day. A common prescription is a combination of bismuth with aromatic chalk powder. If used, the dose of bismuth should be a large one (gr. v.–x. for a child of three months old), but the medicine is usually vomited; and if retained, has never seemed to me to have the slightest effect in allaying the irritability of the stomach or arresting the purging. The use of the salicylate of lime has been proposed by Mr. Walter Kilner, and the value of the remedy has been very warmly praised by Dr. Hutchings, of Brooklyn, New York, in the treatment of these cases. This physician administered the drug in doses of from three to five grains every two or three hours. If a small dose was given without effect, a larger one was substituted; and the influence of the salt in controlling the purging, checking the vomiting, and reducing the temperature was very decided. The medicine was found, in most cases, to arrest the stools without modifying their character; although, in exceptional cases, a simple diarrhœa continued for a short time during convalescence. Another drug to which great value has been attached, is the bromide of potassium. It is said in some cases to produce a rapid improvement in the number and frequency of the stools.

Enemata are sometimes very serviceable. For a child twelve months old, three or four drops of laudanum in a tablespoonful of thin starch, with a quarter of a grain of sulphate of copper, may be thrown up the bowel. The injection can be repeated three times in the twenty-four hours, and will be sometimes followed by signs of evident amendment.

In my experience, by far the most valuable remedy is morphia administered hypodermically. The sulphate of morphia, as being less likely to be converted into apo-morphia in the blood, is recommended by Dr. W. Hard-

man for this purpose. The quantity employed need not be large; in fact, a small dose appears to be nearly as effective as a large one. For a child of a year old, one-thirtieth of a grain may be used, combined with five or six drops of ether; and the injection may be repeated in an hour's time if the symptoms continue. This treatment is best suited to cases which are seen early, before symptoms of exhaustion have set in. In such cases the effect of the sedative so introduced is to arrest the vomiting and purging almost immediately, without producing any signs of narcotism. The child afterwards requires energetic stimulation to help him out of the state of weakness into which he has fallen. An infant should be fed with white wine whey. An older child can take the brandy-and-egg mixture in frequent doses; and it is very important to keep the extremities warm. In many of these cases, after the arrest of the more pressing symptoms, very vigilant and intelligent nursing is required to enable the child to resist successfully the depressing effect of the illness. Often there appears to be a tendency to failure of the heart's action. After making a step or two towards recovery, the patient may fall back again into a state of asthenia, and die, without any return of the gastro-intestinal symptoms, or the occurrence of any inflammatory complication to explain the unfavourable change. This tendency must be combated by mustard-baths, stimulating frictions to the skin, and brandy given in frequent doses. A strong mustard-poultice, placed for a few minutes over the heart, is often of service; and the subcutaneous injection of ether may prove a valuable stimulant. In addition to the above measures, the belly must be covered with cotton wadding, and the air of the room should be kept pure, and frequently renewed.

In the attacks of choleraic diarrhœa or summer cholera which occur in older children, the use of morphia hypodermically is equally valuable. A sixteenth or twelfth of a grain may be used, and improvement follows very quickly.

A little girl, aged seven years, was seized at 1 A.M. with violent vomiting and purging. The bowels acted very frequently, without any straining, and the stools consisted, after the first few evacuations, of thin serous fluid. The vomiting continued. The child looked pinched and blue, and was excessively feeble. When seen at 4 A.M., the surface was cold, and no pulse could be felt at the wrist. The stools had the appearance of faintly-tinged water. The thirst was intense.

One-sixteenth of a grain of morphia was at once administered subcutaneously, and the child was put to bed with a hot bottle to her feet. The diarrhœa then ceased, and although the vomiting recurred three times afterwards, it was each time excited by the swallowing of milk. At 9 A.M. the temperature was 100.4°, and a few hours afterwards—eleven hours after the injection—it was noted: "Condition greatly improved; much stronger; some blueness about mouth; eyes sunken; tongue slightly furred, not dry; still excessively thirsty; complains of no pain; pulse fairly good, 138." After this note, the child only vomited once or twice, and the bowels only acted on two occasions, the stools each time being thin and offensive. The patient was soon convalescent.

The diarrhœa which sometimes succeeds to an attack of infantile cholera, must be treated as directed under the head of Inflammatory Diarrhœa.

CHAPTER VII.

DYSENTERY.

Dysentery must not be confounded with the acute catarrh of the sigmoid flexure and rectum which is so common in children, and also gives rise to severe tenesmus and pain. The affection, when it runs its ordinary course, is not, strictly speaking, a diarrhœa. Fæcal matter is passed rarely, and then only as small hard scybalous masses enveloped in mucus —stools which bear no resemblance to the slimy feculent motions which constitute a familiar symptom of inflammatory intestinal catarrh. True dysentery is a specific disease which often occurs in epidemics, although sporadic cases are occasionally met with. It is rarely seen in England, except in the chronic form—the result of a previous acute attack in children who had been resident abroad.

Causation.—Dysentery is common in tropical climates, especially in places which are badly drained, and therefore damp, and where the air is loaded with the emanations from decaying vegetable matter. On account of being thus endemic in ague-breeding districts, the disease has been thought to have some affinity with intermittent fever; but it has been shown that dysentery is not necessarily generated in malarious spots, and that it may occur in places where ague is unknown. Foul air, impure water, bad drainage generally, and rapid alternations from extreme heat to coolness of the atmosphere are the causes to which the disease is especially attributed. In a case which was under my care in the East London Children's Hospital—a little boy of five years old, in whom, after death, the mucous membrane of the whole large bowel was found to be converted into a purplish-black slough—the illness had begun suddenly during very hot weather, and was attributed to foul emanations arising from the emptying of the dust-bins of the street in which he was living. It is well known that amongst the poor these receptacles are charged with refuse of every kind, and are often most offensive from the presence of decaying organic matter. Faulty nutrition and chronic digestive derangements appear to be predisposing causes which may incline the child to be more readily affected by the injurious influences surrounding him. The disease is therefore said to be more common in hand-fed babies than in infants at the breast. The affection, when it occurs in epidemics, has a tendency to propagate itself. The emanations given out by the dejections of a dysenteric patient are said to possess peculiarly noxious properties, so that any one incautiously inhaling the effluvium is likely to take the disease.

Morbid Anatomy.—In the earliest stage of dysentery the mucous membrane of the colon and rectum is congested, and is swollen from inflammatory infiltration into its substance and the underlying areolar tissue. The colour of the membrane becomes rosy red, or may pass through the various shades of purple to slate gray of a very deep tint. At the

same time the solitary glands project from the surface, and are enlarged to the size of a millet seed or a small shot. The inflammation sometimes occurs in patches, which are separated by more or less healthy-looking membrane, and these run together so as to cover a considerable extent of surface. A false membrane may be found adhering to the inflamed area. This can be separated as a thin opaque film which dips down into the follicles of Lieberkühn. It consists of an inflammatory hyperplasia of the follicular epithelium.

If the disease pass beyond this stage, superficial ulcerations are seen. Sloughs form upon the surface, and separate, exposing ragged, irregular ulcers with swollen, abrupt edges. Dr. Parkes was of opinion that the ulcers began in the distended follicles. Dr. Maclean believes that they are produced by sub-mucous purulent effusion which detaches the mucous membrane. This becomes gangrenous and is thrown off. The sloughs vary in size. If the process is rapid, large sloughs may be detached, and sometimes casts of the intestinal tube are eliminated unbroken. Their tint is yellow or ash-coloured, or even almost black. The ulcers are circular or irregular in shape, and are large or small according to the extent of mucous membrane destroyed. The floor of the ulcer is usually formed of the sub-mucous tissue, but the lesion may extend to the muscular coat, or may even perforate the bowel as in typhoid fever.

The destructive process is most intense in the lower part of the colon and in the rectum ; but the inflammation may involve the whole colon, and even pass the ilio-cæcal valve into the lower part of the ilium. If the child survive, cicatrisation may occur. A fibrinous exudation is thrown out on the floor of the ulcer, and becomes gradually organised.

Lesions may be found in other organs. The mesenteric glands may be swollen, the abdominal organs may be congested, and abscess of the liver may occur. In a little girl, aged three years and a half, who died in St. Bartholomew's Hospital under the care of Dr. Andrew, two abscesses were found in the liver. The child had never lived out of England, but had suffered for two months from an attack of dysentery, succeeding to prolonged diarrhœa of ten months' duration. One of the abscesses was situated in the right lobe, and was as large as an orange. The second, no larger than a filbert, occupied the left lobe. In the neighbourhood of the abscesses the structure of the liver was healthy. The whole of the large intestine was extensively ulcerated.

The chronic form of dysentery is not always the consequence of unhealed ulcers. Still, in many cases ulceration is present. In advanced cases the intestinal tube may be atrophied, with complete disappearance of its glandular structures, and extreme thinness of its coats. In a less advanced stage, the areolar tissue, and even all the coats of the bowel, may be greatly thickened.

Symptoms.—The illness begins with slight fever, loss of appetite, and sometimes nausea. The child complains of uneasiness in his belly of a colicky character, but his sufferings do not seem to be very severe. Then a sudden feeling of tenesmus urges him to evacuate the bowels, and the contents of the rectum are discharged, more or less coated with tenacious mucus. The passage of the motion, however, produces little or no relief. The desire quickly returns, so that the child almost constantly requires the stool, and sits straining with extreme violence. Nothing, however, is voided but offensive mucus, with occasional minute scybala. The mucus may be streaked or mixed more or less intimately with blood. In bad cases, it resembles a rose-coloured jelly. All this time the griping

continues. The child often screams with pain, and may be found resting on his knees in his bed, with his head buried in the pillow. Still, there is little or no tenderness of the belly. The face is pale, with a distressed expression. The child cannot sleep. His tongue is white, and his skin dry. He seldom complains much of thirst, but eats little, either from loss of appetite, or from the increase of abdominal pain, which he soon finds is provoked by the taking of food. Sometimes, for the first few days, the stools may continue to be feculent. Then, as the griping pains and tenesmus increase, the dejections become more scanty and frequent, and consist of fæcal matter mixed with gelatinous mucus.

The disease does not always begin thus mildly. It may be ushered in by a severe rigor, or an attack of convulsions, with high fever, distressing griping pains, and almost constant tenesmus. There is burning pain at the anus, and the child, if permitted, will remain, as long as his strength allows, almost constantly seated on the night-stool. As in cases of acute inflammatory diarrhœa, the straining may induce prolapse of the rectum. The mucus passed from the bowels is bloody almost from the first; and sometimes pure blood, bright or dark and clotted, may be evacuated. However it may have begun, if the disease last beyond a week without improvement, sloughy matter begins to be discharged from the bowels. The stools, instead of consisting merely of offensive bloody mucus, begin to contain dark-coloured, shreddy matter, mixed with reddish, dirty water. The odour of these stools is intolerably fœtid, and grows more and more insupportable. The particles of slough generally get larger in successive dejections, and sometimes cylindrical portions of dead and putrefying mucous membrane may be discharged unbroken. It is comparatively seldom, however, that this stage is reached in the case of a child. The disease is so exhausting a one that death usually takes place before much sloughing of mucous membrane has had time to occur. Sloughing is rarely found in children under twelve years of age.

The abdomen usually becomes distended as the disease progresses, and there is often some tenderness on pressure over the colon. The weakness now becomes very great. The child lies back with a pinched, haggard face, sleeps little, and is very restless. His hands and feet are apt to be cold, although the internal temperature is high. He is thirsty, but cares little for food. He may be troubled with vomiting. His water is scanty and high-coloured; sometimes it is passed very frequently, but retention of urine is apt to occur, and require the use of a catheter. His tongue, very furred on the dorsum, becomes red at the tip and edges, and often dry.

In favourable cases the distressing symptoms gradually subside. The temperature becomes normal; the tenesmus grows less and less, and disappears; the stools lose their blood and contain much grayish mucus; they begin again to show signs of feculent matter; the insupportable dysenteric odour diminishes; the tongue cleans, and the appetite and spirits improve.

In fatal cases the abdomen is distended; the pulse is very rapid and feeble; the prostration is extreme; the face is dusky and haggard; the extremities are cold; the child grows delirious, or sinks into a state of stupor, in which he dies. Towards the end paralysis of the sphincter may occur, so that the outlet of the rectum is seen wide and gaping. In exceptional cases œdema of the lower extremities is noticed; and Dr. S. C. Busey states that this is sometimes associated with discolouration of the skin of the feet and legs.

A certain variety in the symptoms can be noticed in different cases.

The tenesmus is distressing in proportion to the degree to which the rectum may be implicated. If, as may happen, this part of the colon is only slightly involved, the straining may be insignificant, or even altogether absent. In such a case the dejections are more feculent, and contain altered bile mingled with the mucus and blood. The number of the stools is very variable. There may be from two or three to ten or twelve, or even more, in the hour. In the latter case, even if the quantity of mucus discharged on each occasion be scanty, the whole amount passed in the day and night may be very considerable. The temperature is elevated. The mercury in the evening is often found to rise to 102° or 103°, but sinks in the morning to below 100°.

If the child die, death usually takes place from exhaustion, the patient being worn out by pain, want of sleep, and the profuse discharge of a highly albuminous fluid from the bowels. Sometimes, however, the fatal termination may be reached in a different manner. The disease may appear to take a favourable turn, and the dysenteric symptoms may have even subsided, when the child is suddenly seized with convulsions, then sinks into a state of coma, and dies in a few hours. Dr. S. C. Busey has connected these cases with thrombosis of the cranial sinuses—a complication which is always to be feared in the infant, when his strength is profoundly impaired by exhausting disease.

After the subsidence of the acute symptoms, dysentery often passes into a chronic stage. The child remains pale and thin, and continues to lose flesh. His bowels are open several times in the day, and the motions, which consist of scybala and fleshy-looking lumps, are passed with straining. His tongue tends to be dry, and is often glazed, or is fissured with transverse cracks. He complains of frequent pains in the belly of a colicky character, and these are usually excited by taking food. The child is habitually thirsty, and is sometimes feverish at night. Such cases may go on for months, or in older children for years. Even in the most favourable cases, convalescence is usually slow, the bowels being costive and troublesome for a considerable time after the disease is at an end. The colon often remains torpid, while the irritability of the rectum continues; so that, although the apparent need of evacuation is urgent, and the straining distressing, small stools consisting of scybala embedded in mucus are alone discharged.

Diagnosis.—As long as the stools continue to be feculent, the inflammatory process may be judged to be as yet in an early stage. Afterwards, when gelatinous mucus, clear or blood-stained, is passed unmixed with true fæces, or containing merely hard small scybala, we may conclude that the inflamed area is still limited to the rectum and the lower part of the colon. If later, when the tenesmus and griping pains are severe, the mucus is again contaminated with thin feculent matter, it is probable that the inflammation has extended higher and has involved the upper part of the colon, and, perhaps, a portion of the ilium.

In the earliest stage there appears to be nothing special in the symptoms themselves to indicate that the disease is anything more than an ordinary attack of severe intestinal catarrh. Afterwards, when the affection has become more fully developed, the characteristic fœtor of the dejections at once reveals the nature of the illness. Intussusception of the bowel is also marked by the passage of blood-stained, non-feculent mucus, combined with great straining and severe colicky pain. The distinguishing points between the two diseases are elsewhere described (see page 674).

Prognosis.—The danger of the case is in proportion not only to the severity of the attack, but also to the time at which the patient comes under observation. Dysentery is a disease in which early treatment is of the utmost importance. If the child be seen during the first few days, or even before the end of the first week, he will probably recover under judicious treatment. Absence of severe depression of strength and spirits, placidity of expression, and a fair pulse are all signs of favourable import; and an early return of feculence in the stools, if combined with a diminution in the colicky pains and tenesmus, may be taken as an indication of approaching convalescence. On the contrary, early prostration, a haggard facies, a feeble, frequent pulse, great restlessness, hiccough, a dry tongue, a gangrenous odour from the stools, and, especially, delirium—all these symptoms should occasion the utmost anxiety.

If, after the cessation of the ordinary dysenteric symptoms, the child remain prostrate and stupid, lying in a drowsy state with eyes only partially closed, his pupils sluggish, his breathing irregular or of the Cheyne-Stokes type, we should fear the occurrence of cranial thrombosis.

Treatment.—If the child is seen early, he should be put into a bath of the temperature of 95°, and be kept there for ten minutes, or a less time if he feel faint. He should be then put into bed with hot fomentations to his belly, and take a draught composed of castor-oil in conjunction with rhubarb and laudanum, in some aromatic water. This combination is believed to have originated with the late Dr. John Scott, examining physician to the H. E. I. Company. It was kindly communicated to me by Dr. Chevers, who, in his own large Indian experience, has been accustomed to rely greatly upon this remedy if given sufficiently early in the disease. To a child of ten years of age the draught may be given in the following proportions:

℞. Tinct. opii ..... ♏ v.
Olei ricini,
Tinct. rhei comp ..... āā. ♏ xl.
Aquam cassiæ ..... ad. ℥ ss.
M. ft. haustus.

If after this draught the bowels act more than twice in the next twelve hours, an enema containing ten drops of laudanum in half an ounce of starch- or gum-water, may be thrown up the bowel. In the case of children, opium should be used with especial care, on account of the early prostration which is so apt to occur in this disease. If given at the first, its use should not be continued too long. Dr. Morehead speaks warningly against a too prolonged use of opium, which he says makes the dejection pasty and scanty, and is injurious to favourable progress.

If the practitioner fear the use of opium by the mouth, ipecacuanha is as useful a remedy in the young subject as it is in the adult. Six grains may be given to a child ten years of age; two, three, or four grains to a younger child. The dose must be mixed with as little fluid as possible, and is to be repeated every day at sufficient intervals for the child to be able to take nourishment; for the ipecacuanha must not be given until two hours have elapsed after food. Usually, twelve hours may be permitted to pass between successive doses of the drug. The diet should consist of meat-broths, thickened, if necessary, with boiled sago or arrow-root; and of boiled milk diluted with barley-water, and alkalinised with a few drops of the saccharated solution of lime. The child must be kept

as quiet as possible in his bed, and painful tenesmus must be treated with injections of opium and starch, and by hot applications to the belly and anus. All through the acute stage the child should be rigidly confined to his bed. The air of his room should be kept pure by open windows and the proper use of disinfectants; and all excreta should be disinfected before removal from the sick-chamber.

If the case is seen early, or is of a comparatively mild character, the above treatment will be usually effectual in checking its further development. In the very severe cases, or those which are seen after the end of the first week, when gangrenous sloughs are being passed, the belly should be covered, as in the former case, with hot applications or turpentine stupes. Ipecacuanha should be then given in one full dose (gr. vj.–viij. to a child of ten years of age), and the quantity can be repeated in eight or ten hours. If thought advisable, a few drops of laudanum can be given half an hour before the ipecacuanha. After taking the latter the child should be kept perfectly quiet, and must take no food or fluid. If he be very thirsty, however, he may be allowed to suck small lumps of ice. Dr. Maclean speaks very highly of the value of the remedy so administered. According to this physician, the straining and colic subside, the blood and slime disappear from the stools and are replaced by feculent matter, the skin becomes moist, and the patient falls into a quiet sleep.

The value of mercury in the treatment of dysentery is a question upon which very opposite opinions are held. While some writers warmly advocate its use, others as warmly denounce its employment. The tendency of the present day, however, appears to be to neglect mercurials in favour of ipecacuanha. Dr. Morehead was accustomed to prescribe a combination of calomel or blue pill, ipecacuanha, and opium, every four, six, or eight hours; and to give, in addition, a small, occasional dose of castor-oil. This treatment he considered especially applicable to the first few days of the disease, although it is also suitable at a later period. He relates the case of a child, three years of age, who had been ill with dysenteric symptoms for eighteen days. Two grains of ipecacuanha, three of extract of gentian, and one each of Dover's powder and blue pill, were given every three hours, with great benefit. When, after a few days, feculent matter reappeared in the stools, the opium was omitted from the prescription, and the other remedies were given for some days longer.

Whether mercury be given according to this method, or the child be treated with ipecacuanha alone, as is the more modern practice, an occasional dose of castor-oil is often indicated. If the abdomen becomes full and tense, and the dejections are scanty, a dose of the oil (two teaspoonfuls to a child ten years of age) may be given with advantage. If the tenesmus is distressing, an enema of starch and opium, in the proportions already recommended, may be used at sufficient intervals. If, towards the end of the disease, the child appears much enfeebled, the brandy-and-egg mixture should be given.

In the case of an infant, the treatment varies in some degree from that found useful in older children. Ipecacuanha is not to be recommended for patients under twelve months old; for, according to Mr. Scriven, infants of this age do not bear well the nausea and starvation which this treatment involves. For these patients calomel is a preferable remedy. To a child eight or ten months old half a grain of calomel may be given morning and evening, and an enema containing one or two drops of laudanum twice in twenty-four hours. Mr. Scriven speaks highly of lancing the gums in all cases of dysentery in teething infants. He disapproves of

farinaceous foods; and even milk—unless the child be at the breast—he considerably restricts in quantity, preferring to rely for nourishment upon beef-tea and chicken-broths. As in the case of other forms of bowel complaint, these meat-broths may be advantageously combined with an equal proportion of barley-water.

In no instance should the ordinary astringent remedies be used while the illness is acute; but when the disease passes into the chronic stage, they may be judiciously resorted to. In such cases, large doses of bismuth with aromatic chalk may be given; rhatany and catechu are often of service; and the pernitrate of iron is an especially valuable remedy. Enemata of weak nitrate of silver (half a grain to the ounce) are often of considerable value, the bowels having been previously cleared out by a copious injection of warm water. These injections should be large, and must be given very slowly. For a child ten years old a couple of pints may be used. Instead of a nitrate of silver injection, simple warm water may be employed, or a solution of alum (gr. xv. to the ounce) as recommended by Mr. Scriven. While these remedies are being made use of the child should take a daily dose of Dover's powder, if the straining and abdominal pain continue.

Cases which have resisted treatment by astringents will sometimes yield readily to ipecacuanha in doses of one grain three times a day, with an occasional injection of laudanum and ipecacuanha in warm starch if the tenesmus is distressing. At the same time the food should consist of strong meat-essence, well-boiled rice, pounded under-done meat, and boiled milk, if it agree. Eggs are often not well borne in these cases.

A remedy which is very useful in the chronic stage of dysentery is the perchloride of mercury given in quantities of ten or fifteen drops several times in the day. It may be usefully combined, as Dr. Ellis has suggested, with the tincture of cinchona. Sometimes the perchloride has been found to be more useful in very small doses frequently repeated, as five drops every two or three hours. In any case, if the dose is small it must be repeated more frequently in the day.

In all cases of chronic dysentery, great care should be taken that the belly is duly protected from alternations of temperature by a broad flannel bandage, that every attention is paid to promoting the action of the skin, and that the surface of the body is kept perfectly clean. A complete change of climate to a bracing sea-air is of the utmost service in completing the cure.

During convalescence from dysentery the child's appetite is often enormous. Great watchfulness must be therefore used that he do not eat a quantity of indigestible substances, such as new potatoes, unripe fruit, or great excess of farinaceous matters and sweets. He should live principally upon meat once cooked, eggs, fresh-made broths and milk, and wine, in the shape of port or sound claret, may be allowed him with his dinner.

CHAPTER VIII.

GASTRO-INTESTINAL HÆMORRHAGE.

Hæmorrhage may occur in the young subject both from the stomach and bowels. In gastric hæmorrhage the blood may be vomited directly from the stomach, or may pass down the alimentary tube and be voided dark, and more or less altered in appearance, with the stools. The presence of blood in the evacuations is, therefore, no proof that the source of bleeding is in the bowels. Nor, indeed, does blood ejected from the mouth always come from the stomach. Even blood which is brought up by evident retching, and intimately mixed with curdled milk, may not, and often does not, owe its origin to the gastric mucous membrane. Infants at the breast not unfrequently vomit blood which is drawn with the milk from the breast of the mother. Cracked nipples are often very irritable, and bleed easily. In such cases, the act of sucking may determine a hæmorrhage from the fissure, and a large quantity of blood may be swallowed by the child. At the end of the meal this is often vomited with part of the milk which has been taken, and is a cause of great alarm to the parents.

In older children who suffer from epistaxis, the blood which flows down into the throat from the posterior nares is almost invariably swallowed. If this be large in quantity it is sometimes vomited, and appears then to have been thrown out by the stomach. So, also, ulceration of the back of the throat and of the gums, such as is seen occasionally in scrofulous and badly-nourished children, may be a cause of bleeding. If at the same time the child be suffering from disordered stomach, and vomiting be frequent, the efforts of retching may determine a flow of blood from the ulcerated surface. The blood mixes with the contents of the stomach as these pass through the mouth, and gives the appearance of hæmorrhage from the deranged gastric membrane. I have known such a case to occur and be a cause of great perplexity.

Causation.—Real gastro-intestinal hæmorrhage may be due to many different conditions. There is a special form of hæmorrhage which is occasionally seen in new-born infants as a consequence of causes which have not even yet been fully made out. *Melæna neonatorum* occurs usually within a few hours of birth. It is said to be more common in girls than in boys, although this is not the experience of all observers, and sturdy, well-nourished children are as amenable to it as the feeble and the frail. The occurrence is fortunately very rare. Sometimes it has been known to follow a tedious labour, in which the child's head had suffered great compression. In other cases the respiratory function after birth had been established with difficulty. Often, however, the bleeding can be attributed to no such reason. Sometimes it appears to be the direct result of ulceration of the stomach and duodenum. Such a lesion has been occasionally discovered in the new-born babe, and has been ascribed to follicular gastritis by Billard; to an embolism of the umbilical vein

near the liver, and extending for some distance into its branches, by Landau; and by Steiner, to a fatty degeneration of the blood-vessels. An example of such a gastric ulcer was shown by Dr. Goodhart in 1881, at the London Pathological Society. A new-born infant had died from hæmatemesis thirty hours after its birth. The child's appearance was healthy. On examination of the body, after turning out the blood-clot with which the stomach was distended, a small, oval ulcer, one-eighth of an inch in length, was seen at the cardiac end of the stomach and close to the greater curvature. This sore was clean-cut, sharp-edged, and firm in texture. In its floor was a dark speck, which proved, on close inspection, to be an open vessel. It is, however, uncommon to find any distinct breach of surface. In the large majority of cases the hæmorrhage appears to be capillary, and nothing but a congested state of the vessels of the stomach is discovered on examination of the body.

Some writers, especially Grandidier and Ritter, have attributed the bleeding to a condition allied to hæmophilia; and certainly in cases where death results from profuse capillary hæmorrhage in the new-born child, some special and unusual tendency to bleed from slight causes must evidently prevail. In one of four cases published by Dr. Halliday Croom, a marked hæmorrhagic tendency existed in the father. In another, although no family predisposition could be detected, the child himself had an evident tendency to bleed, for the pressure of the forceps with which the infant was delivered had produced an extensive ecchymosis on either side of the head. In a child possessing this unfortunate tendency, any cause which interferes with the establishment of respiration will increase the pressure on the veins, and may thus determine an effusion of blood from the capillary system. Still, with regard to this supposed constitutional infirmity, it must be remarked that melæna neonatorum is said not to have been especially observed in families subject to true hæmophilia; and that of infants who survive, few show in after life any particular tendency to hæmorrhage.

In older children gastro-intestinal hæmorrhage may be due to either general or local causes.

Of the *general causes*, hæmorrhagic purpura is perhaps the most common. In this disease the bleeding occurs not only from the stomach and bowels, but also from the nose, mouth, and kidneys, and into the subcutaneous tissue. The tendency to hæmorrhage is only a temporary phenomenon, and ceases when by treatment or otherwise the condition of the patient has become improved.

In hæmophilia the tendency is permanent, and persists to the end of life. As in the former case, the bleeding is not confined to the gastric or intestinal mucous membrane, but may occur from any mucous surface and into the subcutaneous tissue.

In the malignant forms of all the eruptive fevers general hæmorrhage may also occur. In such cases the symptom indicates a profound contamination of the system, and is of most unfavourable augury.

The usual form of gastro-intestinal hæmorrhage met with in the child arises from purely *local causes*. Ulceration of the bowels, such as occurs in typhoid fever, in cases of long-standing intestinal catarrh, and as a consequence of tubercular or scrofulous disease, is a common source of bleeding. The same symptom is seen in the ulceration arising from dysentery. In intussusception a prominent feature is the passage of blood and blood-stained mucus from the bowel. The irritation of worms will sometimes induce bleeding from the mucous membrane; and intestinal derangements

which give rise to straining, especially if the bowel prolapse, are a common cause of admixture of blood with the stools.

There is one other cause of hæmorrhage which must be mentioned. This is polypus of the rectum. Polypi are said not to be uncommon under the age of ten years, and to occur more frequently in boys than in girls. These fibro-cellular growths spring from the sub-mucous tissue, and are covered by the mucous membrane. They are more vascular in the child than in the adult, with a greater tendency to bleed, and are attached by a slender pedicle which readily gives way. The polypus varies in size from a pea to a marble, and may be sometimes seen within the bowel, if near the sphincter, looking like a bright red cherry. It bleeds easily, both during the passage of a stool and also independently of defæcation, and if its seat is near the outlet, the effused blood may be mixed with mucus.

Symptoms.—In the case of the new-born baby, the hæmorrhage which is special to this period of life begins usually within a few days of birth—in the majority of instances within the first twenty-four hours. It may, however, be delayed. Of fifty cases collected by Dr. Croom, the bleeding took place :—in thirty, between the first and sixth day ; in eight, between the sixth and eighth ; in four, between the eighth and twelfth ; and in eight, between the twelfth and eighteenth day. The blood is sometimes ejected from the stomach as well as passed from the bowels. Sometimes, however, melæna occurs without hæmatemesis ; and less commonly, hæmatemesis without melæna. Of eight cases seen by Lederer, four had hæmorrhage from both stomach and bowels ; three from the bowels alone ; and one exclusively from the stomach.

The appearance of the blood may be preceded by great restlessness and pallor, a sunken belly, and sudden prostration. When the blood appears externally the infant seems to suffer no pain. He passes apparently an ordinary stool ; but this, on inspection, is found to consist either of dark treacly matter from admixture with meconium, or of dark pure blood. If, at first, dark and contaminated with the contents of the bowels, the blood soon becomes red and unaltered. In quantity it is often sufficient to soak the linen and the diapers. The dejections succeed one another rapidly, and after each passage the child is left cold and motionless, and seemingly exhausted. In rare cases, if the discharge is sudden and copious, he may be convulsed. After a time he revives somewhat, and cries feebly ; but if the flow be profuse, soon falls into a collapsed state. He lies quietly, with pallid face, cold extremities, an almost imperceptible pulse, and a sunken fontanelle.

After continuing for about twenty-four hours, the hæmorrhage, if the child survives, usually stops. In most cases blood ceases to be ejected from the mouth before the flow from the bowels is at an end. Sometimes, after a temporary intermission, the bleeding returns, and may continue, in diminished quantity, for several days longer. When the bleeding begins for the first time after the fall of the cord, hæmorrhage may also occur from the umbilicus. Pale watery blood oozes from the navel, and the flow persists in spite of all efforts to arrest it. In some cases the effusion of blood is confined to this region, but more commonly it is quickly followed by hæmorrhage from the bowels, and, in some cases, from the ears, the gums, the vagina, and into the skin.

If the hæmorrhage be profuse the child may not recover from the state of collapse into which he has fallen. In the favourable cases he gradually improves, but remains weakly and pallid for some time afterwards, with a tendency to intestinal catarrh.

In later infancy and childhood, gastro-intestinal hæmorrhage, arising from the causes which have been mentioned, usually occurs in the form of melæna. The bleeding is, as a rule, more profuse when it is excited by causes acting through the system generally than when it occurs in consequence of a purely local lesion. In hæmorrhagic purpura large quantities of blood may be passed per anum, bright red and clotted, or more or less altered and blackened. In this disease, as also in hæmophilia and in the malignant forms of the specific fevers, the tendency to hæmorrhage is a general one. The nose and gums bleed easily, the skin is spotted with petechiæ, or larger hæmorrhagic stains, and the urine is often discoloured.

When the bleeding occurs from local causes the effusion is scanty, as a rule, and is evacuated from the bowel, pure, or mixed with the ordinary fæcal dejections. In typhoid fever hæmorrhage is the exception in young subjects. In this and the other forms of intestinal ulceration the bleeding, when present, is seen in the form of small black clots at the bottom of the chamber-pan. In dysentery, and in cases of invagination of the bowel, the blood is brighter, and is passed pure, or mixed with mucus. It may amount, in the latter disease, to several ounces, but is rarely seen in so large a quantity. Usually only a few teaspoonfuls are passed at a time, and the discharge is only effected with excessive straining and pain. The irritation of worms is not often accompanied by bleeding, but in rare cases a bright red clot may be passed per anum. Catarrh of the lower part of the colon, especially if the bowel prolapse, may give rise to slight hæmorrhage. The blood is usually in the form of light-coloured streaks, but sometimes small red lumps may be evacuated.

In polypus of the rectum the blood is also bright red, and may be in considerable quantity—a tablespoonful or more—pure, or mixed with mucus. If the growth be small and above the sphincter, the discharge of blood is accompanied by no pain ; but if it be large, and especially if it be caught within the sphincter, it may give rise to much straining and discomfort. In such cases there may be frequent desire to go to stool, without the appearance of a dejection ; much mucus is passed from the bowel, and the fæcal masses may be grooved from the pressure of the growth during their passage. If the disease is allowed to go on long unchecked, the child becomes pale and cachectic-looking from constant loss of blood.

Diagnosis.—The special form of hæmorrhage of the newly-born (melæna neonatorum) is so rare a complaint that in every case where blood is ejected from the mouth or passed from the bowel in a very young infant, we should rather suspect the blood to be furnished from some extraneous source ; and if the child be at the breast, our first care should be to examine the nipple of the mother or nurse for fissures or signs of erosion. A true hæmorrhage in a young baby is at once indicated by pallor of the face, sinking of the fontanelle, and depression of temperature. If, after bringing up a quantity of bright blood, the child seem contented and happy, without loss of colour or any sign of depression or distress, it is unlikely that his own body is the source of the bleeding. If, on the contrary, blanching of the face, coldness of the extremities, and signs of general depression accompany or precede the passage of blood, there can be no doubt that the hæmorrhage is no misleading phenomenon. Still, it is often far from easy to ascertain its source. If the bleeding occur at only a short interval after birth, and succeed to a prolonged and difficult labour, or arise in a child in whom the respiratory function has been with difficulty established, we may suspect the phenomenon to be symptomatic

of a congested state of the viscera, aided, probably, by a special hæmorrhagic tendency in the child. If it occur some days later, and have been preceded by signs of uneasiness after taking the breast, some difficulty of deglutition or frequent vomiting, the effusion of blood is possibly due to a gastric or duodenal ulcer; but a positive diagnosis of this lesion cannot be ventured upon. If hæmorrhage occur solely from the navel, and be accompanied by an icteric tint of skin, the case is probably one of congenital deficiency of the bile-ducts. If previous infants in the same family have died after presenting similar symptoms, the probabilities are strong that this distressing malformation is present. This subject is considered elsewhere (see page 717).

In later infancy and childhood we should inquire about epistaxis, and examine the throat and gums for ulceration and signs of recent bleeding. If the apparent hæmatemesis be due to epistaxis, blood will be often seen trickling down the back of the pharynx. If the case be one of hæmorrhagic purpura, we notice the petechiæ on the skin, and can detect the general disposition to ready effusion of blood. In cases of hæmophilia the same tendency is probably a well-recognised peculiarity in the family, and information as to its existence is usually forthcoming. In the malignant forms of the specific fevers the accompanying symptoms are usually sufficiently characteristic of the nature of the illness; and, moreover, the existence of an epidemic in the neighbourhood is probably well known.

In cases where the hæmorrhage is due to a local cause, the source of the bleeding may be discovered from the symptoms by which the passage of blood has been attended. Small black clots lying at the bottom of a thin, dark-coloured water or pea-soup-like fluid, usually indicate ulceration of the bowel. Small red clots or streaks are commonly dependent upon catarrh of the lower part of the colon, with tenesmus. Red blood in larger quantity, pure, or mixed with mucus, and passed with great straining and pain, may be possibly due to an invagination of the bowel, or may be the consequence of a polypus of the rectum. In cases of intussusception other characteristic symptoms are present. If the blood be due to a polypoid growth, this may be often seen at the end of defæcation caught in the grip of the sphincter, and looking like a bright red ball. If the finger is introduced into the rectum, the polypus can be distinctly felt attached to the posterior wall of the bowel by a slender stalk.

Prognosis.—When hæmorrhage occurs in the new-born infant, the danger is always great; but the probabilities of a favourable issue depend partly upon the degree of strength of the child himself, and partly upon the opinion we have formed as to the source of the bleeding. A well-nourished infant of robust constitution can often bear an extraordinary loss of blood without sinking under the hæmorrhage. A weakly infant succumbs quickly. If we have reason to suspect an ulcer of the stomach or duodenum, the prognosis is exceedingly unfavourable. Also, if convulsions occur, if the bleeding continue beyond the first twenty-four hours, and if it return after apparent cessation, we have reason to fear the worst. Of Lederer's eight cases, five died. Of twenty-three cases collected by Rilliet and Barthez, eleven ended in death. Dr. Croom estimates that, taking all forms of the disease together, the mortality is about sixty per cent. In older children the danger of intestinal hæmorrhage depends upon the cause to which it is owing, and the severity of the condition of which it is the consequence. Rectal polypi are readily removed; indeed, sometimes they separate spontaneously and are discharged with a stool.

Treatment.—In cases of melæna neonatorum, the child must be fed with his mother's milk given with a spoon, or failing this, with ass's or goat's milk, diluted with an equal quantity of barley-water, with whey and cream, or with white wine whey. Pancreatised milk, prepared according to the directions given in the chapter on Infantile Atrophy, is also very suitable. Whatever may be the food, it should be given cold and in small quantities at a time. The infant must be kept perfectly quiet. An ice-bag should be applied to his belly, and his feet must be kept warm. He may take internally a grain of gallic acid, or a couple of grains of the extract of krameria, every two or three hours; or one or two drops of oil of turpentine may be given every hour. In addition, four or five ounces of the infusion of krameria may be thrown up the bowel. The strength of the child must be supported by white wine whey, or by a few drops of brandy given at short intervals.

In older children hæmorrhage must be treated according to the condition which has given rise to it. Polypus of the rectum is removed by seizing the growth with a forceps and passing a silk ligature tightly round the pedicle. But in early life the slender stalk often snaps when stretched, and the mere action of drawing the polypus below the sphincter often detaches it from the mucous membrane. Its separation is followed by no bleeding, and hæmorrhage ceases from that time.

CHAPTER IX.

ULCERATION OF THE BOWELS.

The subject of ulceration of the intestinal mucous membrane must, necessarily, be referred to in describing the various diseases in the course of which such ulcerations are liable to arise. Still, it seems desirable, in addition, to devote a special chapter to its consideration. It is not uncommon to meet with ulceration of the bowels in children who have not recently suffered from acute disease, and in whom no special cause for the intestinal lesion can be discovered. Such latent cases are not always easy of diagnosis, for ulceration of the bowels is not necessarily attended with diarrhœa. Purging, when it occurs, is dependent not upon the ulcerative process, but upon the intestinal catarrh which accompanies the breach of surface. When the catarrh is at an end the purging ceases, although the ulcers may be still unhealed. Typhoid fever in early life often runs its whole course without any looseness of the bowels, and this in instances where, from the length and severity of the attack, there can be little doubt that ulceration has been present. So, also, in cases of scrofulous or tubercular ulceration of the intestinal mucous membrane, the occasional attacks of purging are often separated by considerable intervals during which the bowels are sluggish, although, on *post-mortem* examination of the body, extensive breaches of surface are discovered in the intestinal tract.

Ulceration of the bowels may be acute or chronic. The acute form is seen in cases of typhoid fever, dysentery, and inflammatory conditions of the bowel which give rise to lesions of the mucous membrane, either by the separation of superficial sloughs or by ulcerative inflammation of the glandular follicles. If life be prolonged the ulcerative process may pass, in certain cases, into a chronic stage, and lead to serious interference with the nutrition of the patient. The chronic form of the lesion will alone be considered in the present chapter. It occurs in two principal varieties in the child, viz.: the simple ulceration from prolonged intestinal catarrh, and the scrofulous or tubercular ulceration, which so often accompanies a similar condition of the lungs.

Morbid Anatomy.—Simple ulceration of the bowels is seen principally in infants and the younger children. The part of the bowel affected is the large intestine and lower part of the ilium. The ulcers are very shallow, and can best be detected by inspecting them sideways. They may be seated on the summit of the longitudinal folds of mucous membrane, and are then elongated or sinuous. Others are seen between the folds, and are small circular breaches of the surface, which can often only be detected by careful scrutiny, as their bases are of the same tint as that of the mucous membrane surrounding them. The process by which they are formed appears to be as follows:—The follicles become enlarged and elevated above the surface like little pearly beads. Their contents then become purulent, and the follicles still further increase in size. Lastly, the roof of

the follicle is detached and the contents escape, leaving a clean-cut ulcer. Mixed up with the ulcers are other follicles—large, elevated, and semi-transparent—the contents of which have not yet become purulent. The ulcers are roundish or irregular in shape, and vary considerably in size. Their edges are well defined and congested, their floor uneven, and of a reddish or grayish colour.

Tubercular or scrofulous ulceration of the bowels is more common in children of three or four years old and upwards than in infants. This form of lesion is usually associated with scrofulous or tubercular disease of the lung, and almost invariably with caseous enlargement of the mesenteric glands. The ulceration appears to be chiefly of a scrofulous nature, the presence of the gray granulations being only an occasional and secondary consequence of the caseous degeneration of the follicular structures. The seat of the disease is usually the ilium, and the glands affected are the follicles of Peyer's patches and the solitary glands, especially those in the neighbourhood of the ilio-cæcal valve. Primarily, the destructive changes are limited to these parts. Thus, the follicles swell up from great multiplication of their corpuscular elements. They then undergo cheesy degeneration, soften, and form a number of closely-set ulcers, which unite at their borders and give rise to more or less extensive areas of ulceration. Their edges are soft, red, and uneven, and their floor red or grayish in colour. The ulcerative process does not confine itself to the area of Peyer's patches, but extends laterally along the course of the smaller arteries and veins by a similar process of caseation and softening, so as often to encircle the gut completely. The infiltration advances into the neighbouring tissues, and causes gradual disintegration and destruction. At the same time the ulcer deepens, but seldom passes beyond the muscular coat. As a secondary process gray granulations may appear, and miliary nodules are then seen in the tunica adventitia of the smaller vessels, especially the arteries and lymphatics. The serous surface at the site of the ulcer is opaque and reddened, and may also contain gray granulations. Sometimes adhesive peritonitis is set up, and neighbouring portions of intestine become glued firmly together. If in these cases rupture of the floor of the ulcer take place, the intestinal contents are extravasated, not into the general peritoneal cavity, but into a limited pouch formed by the adherent bowels.

The simple form of ulcer may cicatrise and leave little trace; but this termination is less common in the more severe form which is due to a tubercular or scrofulous cachexia. Still, even in these cases cicatrisation may take place here and there, and on account of the transverse extension of the breach of surface, may lead to serious contraction of the channel of the gut.

Symptoms.—Ulceration of the bowels may be attended by few symptoms, and if, as sometimes happens, diarrhœa is absent, the nature of the illness may be completely overlooked. As a rule, the special symptoms of the intestinal lesion have been preceded by a prolonged attack of purging, which has caused serious interference with nutrition, and greatly reduced the general strength. Abdominal pain is not necessarily present, but often attacks of pain of a colicky character are complained of, and these are usually found to precede the passage of a stool. There may be no obvious tenderness on pressure of the abdominal wall, but, in many instances, deep pressure in the course of the colon seems to give rise to uneasiness. Still, even in cases where tenderness appears to be completely absent, some tension of the abdominal parietes will be noticed. Indeed, this

symptom is nearly always present, and careful palpation of the abdomen will rarely fail to detect it. The tension is not necessarily general. Often it is limited to the side upon which the ulceration exists, as if the muscular parietes contracted instinctively to protect the sensitive part from injury. The belly is usually more or less distended from flatulent accumulation, but this symptom varies in degree. Still, although fuller than natural, it appears normal to the eye ; and there is no loss of the natural markings such as is seen in cases of peritonitis. If the mesenteric glands are enlarged they may be often felt on deep pressure, and the superficial veins of the abdomen are then unnaturally visible.

The appearance of the stools is very characteristic. The bowels may not be relieved many times in the day. Sometimes they are even costive. In the latter case the stools vary in character. They may consist for the most part of light-coloured lumps, often covered with mucus, and sometimes showing a streak of blood. But every now and again a loose motion will be passed which at once discloses the nature of the case. The motions which are characteristic of the lesion are of two kinds. The first consists of a dark reddish-brown water, intensely offensive and putrid-smelling. It deposits a sediment of shreddy, flaky matter, often containing little black spots which are minute clots of blood, and sometimes small, pale, hard fæcal lumps. The second is a pale yellow homogeneous fluid of the consistence of cream or thin paste. It often has a curious mucilaginous appearance as the vessel containing it is tilted from side to side. This form of stool has, like the first, an offensive smell, but not, like it, an odour of putrefaction.

Hæmorrhage from the bowels is seldom copious. Usually it occurs as black clots, like little particles of soot ; but sometimes larger black lumps may be seen. If there be an ulcer at the lower part of the rectum the blood is redder in colour, and may be in larger quantity. The number of the stools varies from one or two to twenty, or even more, in the twenty-four hours. Their passage is sometimes preceded by slight colicky pain ; and if the lower part of the rectum is the seat of ulceration, there may be some straining at stool, and the bowel may prolapse. It is not common for an ulcer to occupy this part of the rectum ; but should it do so, some serious consequences have been noted. The irritation excited by the lesion just within the internal sphincter may cause spasmodic closure of the lower outlet, so that much difficulty is met with in evacuating the bowels. As a result of this obstruction, great enlargement and hypertrophy of the rectum may occur, and we find tympanitic distention of the belly, and many of the symptoms of impaction of fæces.

A child who is the subject of intestinal ulceration is not necessarily very thin. The degree to which nutrition is interfered with depends upon the amount of intestinal catarrh and consequent diarrhœa. If the purging is severe, wasting is rapid ; but if the bowels are not much relaxed, nutrition may go on well, and the child progressively increase in weight, although the character of the stools indicates that the ulcers are still unhealed. The appetite is often good, and the tongue clean ; and except for a certain pinched look of the face and distress in the expression of the child, he might be thought to be suffering from a very trifling complaint. Even in cases where the ulceration is of a scrofulous nature the same rule holds good, provided the lungs are healthy. Caseous enlargement of the mesenteric glands does not necessarily produce wasting ; and if the ulceration is not extensive, the temperature high, or the purging severe, the lesion may produce no noticeable impairment of the child's nu-

trition. The heat of the body is not always increased. I have known cases where characteristic stools, containing shreddy matter and blood-clots, continued to be passed for months, and where caseous glands could be distinctly felt in the abdomen on deep pressure, run their whole course and end in recovery, with a temperature which seldom rose above 99°.

Ulceration of the bowels is sometimes complicated with peritonitis. In cases of scrofulous or tubercular ulceration of the bowels, tubercular peritonitis is a common secondary lesion. But a simple ulceration may also be accompanied by inflammation of the serous lining of the abdomen without perforation of the bowels having taken place.

A boy, aged six years, was struck on the abdomen with a heavy piece of wood. The accident made him feel faint, and he vomited several times on that and the following days. On the day after the injury he complained much of pain in the belly, and from that time suffered from frequent colicky pains in the abdomen, and diarrhœa, which often obliged him to keep his bed. He was admitted into the East London Children's Hospital six months after the accident. At this time the boy was pale, but not very thin (he weighed thirty-two pounds twelve ounces). He complained of pain in the right side of the belly and over the epigastrium, and there was considerable tension of the parietes in these situations. The abdomen was rather distended, but was not tender. There was no fluctuation or dulness in the flanks, but much gurgling could be felt and heard on palpation. His tongue was furred in two lateral bands. The bowels acted four times in the day, the stools being pale, small, and solid. The boy had a pinched, distressed expression, and seemed languid and dull, but expressed himself as quite comfortable except for the occasional pains in the belly. There was no albumen in his urine. The lungs and heart were healthy. His temperature at 6 P.M. was 99.4°.

A few days after the lad's admission his temperature rose; he began to vomit, and the bowels became much relaxed. The stools consisted of dark brown liquid, or of fluid like pea-soup, with small hard fæcal masses. The vomiting continued, and the belly became swollen, tympanitic, and very tender. The child then rapidly wasted and became exceedingly prostrate. Delirium came on, and he sank at the end of a fortnight. During the last week his temperature varied between 99° and 102°.

On examination of the body there were signs of old peritonitis, due probably to the accident. In addition, much recent lymph was found coating the intestines. In the ilium several of Peyer's patches were found to be the seat of ulceration. The ulcers were shallow, with a grayish, uneven floor and thickened edges. There were no gray granulations anywhere.

This boy's condition when he entered the hospital illustrates very well the symptoms often found in cases of ulceration of the bowels, for there is no reason to suppose that he was then suffering from peritonitis. Abdominal pain of a colicky character going on for months, especially if combined with tension of the parietes, and a history of more or less persistent diarrhœa, is suggestive of intestinal ulcer, and the pinched, distressed look of the boy's face quite excluded the idea that these symptoms were due to any unimportant derangement, however persistent. It is an invariable rule, which should never be forgotten in clinical investigation, that in a child a haggard face means serious illness. However insignificant the symptoms and signs may appear, if a child look ill the case is not one to be neglected or lightly regarded. The intestinal lesion in this boy was probably the consequence of a chronic catarrh of the bowels of many months' standing; for from the time of the accident he continued to suffer from persistent

looseness of the bowels, with attacks of colicky pain. The return of the catarrh followed upon the action of an aperient which relieved his bowels of a large quantity of hard fæcal masses, and the irritation thus excited no doubt induced the second attack of peritonitis from which he died.

If there is any reason to suspect ulceration of the mucous membrane of the bowels, aperients are not to be recommended. Our whole efforts should be directed to promote the healing of the ulcers by quieting peristaltic movement. Therefore, however important it may seem to remove fæcal accumulation, we must remember that an aperient only sets up fresh irritation, and that its action may be followed by very serious consequences.

As a rule, the lower down in the colon the ulceration is seated, the more numerous are the evacuations and the more distressing the tenesmus and the pain. Still, even if an ulcer occupy the sigmoid flexure or rectum, there is not always diarrhœa; indeed, sometimes the fæcal matter presents itself only in the form of hard scybala mixed with very offensive muco-purulent fluid. In these cases, if hæmorrhage occur, it is usually more copious, and the blood more natural in colour, than when the ulcers occupy any other portion of the bowel. Constipation is most liable to be found in cases where the lesion is seated in the small intestine, the colon being healthy; but even in this form of the disease, any additional irritation which sets up catarrh and increases the peristalsis of the larger gut may give rise to diarrhœa. An ulcer of the duodenum would probably excite distressing vomiting and pain at an interval after food. Such a lesion in the child has never come under my notice.

Diagnosis.—If the symptoms of ulceration are well marked, there is little difficulty in ascribing them to their true cause. An abdomen full, without great distention or loss of the natural surface markings; increased tension of the parietes, with tenderness on deep pressure; diarrhœa, with colicky pain, the stools consisting of dark, putrid-smelling, watery fluid, depositing brown or yellow shreddy matter and small black blood-clots—this group of symptoms, when combined with a distressed expression of face, is very characteristic of intestinal ulceration. The chief difficulty in such a case would be to exclude tubercular peritonitis; for this additional lesion might be present without excessive tenderness, without fluctuation, and without any caseous lumps being detected on palpation. The belly, however, would be more distended and globular; the natural markings of the surface would be absent; the temperature would probably be decidedly febrile; and in most cases, if the child were laid on his side so as to allow of the fluid accumulating in one flank, some evidence of its existence would be perceived on turning him rapidly on to his back and immediately palpating or percussing the part which had been dependent. It is, however, fortunately, uncommon to find cases of chronic tubercular peritonitis in which the symptoms are so obscure. Usually semi-fluctuation is readily discovered, and caseous masses, or unequal resistence of the abdominal contents, can be noticed on examination.

If the ulceration be accompanied by constipation or solid stools, the case may be mistaken for one of fæcal accumulation. The colicky pains and small lumpy evacuations are very suggestive of this condition, and even if the stools are occasionally loose, the symptom is not unknown in cases of impacted rectum. A little reflection will, however, convince us that there is more in the case than a loaded bowel is capable of explaining. We find in most instances a history of previous continued diarrhœa; if tenderness be absent, there is still some tension of the abdominal wall; and the distressed expression of the child's face assures us of the existence

of serious disease. Moreover, an examination *per anum* detects no accumulation in the rectum, and a copious enema, although it may remove solid fæcal lumps, in no way improves the condition of the patient.

If we are satisfied as to the presence of the ulceration, we have still to decide whether the lesion is of a simple character, or is the consequence of a scrofulous or tubercular cachexia. The older the child, the greater the likelihood that the ulceration is not simply catarrhal. After the age of three years, the manifestations of the scrofulous diathesis become common; and at this age, chronic catarrh of the bowels seldom runs a sufficiently persistent course to set up ulceration unless aided by some vice of the constitution. If, however, the child have scrofulous or tubercular tendencies, a much less prolonged irritation of the mucous membrane will give rise to caseation and softening in the glandular follicles. The presence of enlarged mesenteric glands, chronic lung disease, or other sign of the scrofulous constitution, allows us to infer that the intestinal lesion is of a similar pathological character. The temperature is not greatly to be relied upon in these cases; for it is not necessarily elevated in cases of scrofulous ulceration, while it may be raised from accidental causes in the simple form of the lesion. Nor is the state of nutrition of much value as a guide; for this depends less upon the nature of the ulcer than upon the degree to which catarrh of the bowels may have reduced the strength, and interfered with the digestion and absorption of food. If the child show no sign of the scrofulous cachexia, if his lungs appear to be healthy, and if tubercular peritonitis can be excluded, we may infer the ulceration to be of a simple character, although his general strength be poor, and his nutrition unmistakably impaired.

If the ulceration be tubercular from a secondary formation of the gray granulation around the ulcer, and in other parts, nutrition is at once profoundly affected, and wasting goes on with rapidity. In such a case, all the symptoms of general tuberculosis are present, and the child often dies from tubercular meningitis. Still, it must be confessed that cases sometimes present themselves in which all the symptoms of acute tuberculosis are noticed without a single gray granulation being discovered in the body after death. The case may even terminate with head symptoms indistinguishable from those of tubercular meningitis, although the interior of the cranium appears to be healthy, and the most thorough search discovers no gray tubercle in the meninges of the brain. It is difficult to explain these cases. Fortunately, they are very exceptional.[1]

Prognosis.—In a case of simple ulceration from prolonged intestinal catarrh, recovery will often take place under judicious treatment if there be no complication, and if œdema have not occurred. The latter symptom, although it is far from indicating that the patient will certainly die, is yet of unfavourable import, as it shows a state of great weakness, and weakness in itself renders a child less responsive to the action of remedies.

If the ulceration be scrofulous, the prognosis is still less favourable; but here, if the strength is not greatly reduced, and if other organs are healthy, recovery may take place. Caseous enlargement of the mesenteric glands does not appear to add to the danger of the case; but if serious lung mischief is present, the concurrence of the two lesions leaves us little room for hope. If secondary tuberculosis occur, with formation of the gray granulation in the neighbourhood of the ulcer and elsewhere, death is certain.

[1] A case presenting these deceptive phenomena occurred some time ago in the Victoria Park Hospital, and was published by Dr. S. West, in the Lancet for September 30, 1882.

Treatment.—The utmost care is required in the treatment of these cases if the illness is to be conducted to a favourable issue. Our endeavours must be directed to quiet irritation; to prevent the occurrence of fresh catarrh; to reduce peristaltic action, so that the healing of the ulcers may not be interfered with; to support the strength of the patient, and to further cicatrisation by suitable medication.

The child should be kept in bed in a well-ventilated room, and his belly should be protected by a broad layer of cotton-wool confined by a suitable bandage. All discharges and soiled linen should be at once removed, and every means be employed to keep the air of the room fresh and pure. The diet must be regulated so as to convey nourishment without supplying material for fermentation. As long as catarrh persists, fermentable food is to be avoided; and even when the diarrhœa has been arrested, the capacity for digesting such a diet still continues small. Milk must be positively forbidden; and starchy matters can only be taken, if at all, in very small quantity. An infant must be fed with weak veal or chicken-broth and barley-water in equal proportions; whey, plain, or if the child be feeble, made with sherry (white wine whey), and cream; yolk of egg beaten up with whey or veal-broth; and Mellin's food dissolved in either broth or whey, and mixed with barley-water. The meals must be small and frequent; and it is advisable to make constant changes, so as to furnish a sufficient variety. If the purging be severe, no more than one tablespoonful, or even less, can be given at one meal; and all food must be given cold.

After the age of eighteen months, raw mutton or beef forms a very valuable remedy. This should be prepared as directed in the treatment of chronic diarrhœa, and may be eaten plain or diffused through broth or jelly. Uncooked meat so prepared is very nutritious and digestible; and even if not completely digested, the residue appears to be perfectly unirritating to the bowels. Still, it is well immediately before the meal to give a dose of pepsin (gr. iij.–v.) dissolved in a few drops of dilute hydrochloric acid, in order to aid the process of digestion. If the child be between the ages of one and a half and two years, and the purging be severe, little other food besides the raw meat, meat-jelly, and broth should be allowed for a few days, until the violence of the catarrh is reduced. Afterwards, or in older children at first, yolk of egg, well-boiled cauliflower or Spanish onion pressed through a fine sieve, and thin well-toasted bread may be allowed. In some of these cases, where the power of digesting starch seems reduced to a minimum, a good substitute for bread is the malted child's biscuit made by Messrs. Hill & Sons of Bishopsgate Street. If these are objected to, a loaf may be baked expressly for the child in which a proportion of finely-ground fresh malt is introduced—one part of malt to two parts of flour. It is well, also, in addition, to give a spoonful of Hoff's extract of malt directly after the meal. When the intestinal catarrh has been arrested, milk may be returned to, but should be given cautiously. In most cases, it is the curd of the milk which is digested with such difficulty; and I have found the pancreatised milk prepared with Benger's pancreatic solution, as directed elsewhere (see page 606), to be well borne when ordinary milk could not be taken. In other cases, skimmed milk seems to agree better than milk from which the cream has not been removed. Whatever be the age of the child, so long as he is taking milk a careful watch must be kept upon the digestive process; and any sign of flatulence or acidity, and especially any return of the purging, should be a signal for reducing the quantity of the milk, or even for omitting it for a

time altogether from the diet. If the child is weakly, or appears to be exhausted by the purging, stimulants must be given as required. White wine whey for infants, and brandy-and-egg mixture for children of all ages, are the most valuable.

With regard to medicines:—As long as there is purging, astringents with opium are indicated. It is well in these cases not to rely too much upon one form of remedy, for we shall often be forced to make frequent changes in the prescription in order to guide the disease to a favourable ending. If the stools consist of the homogeneous, pasty liquid matter which has been described, nitrate of silver is pre-eminently useful. One-eighth to one-fifth of a grain should be combined with a few drops of dilute nitric acid, and one or two drops of laudanum, in water sweetened with glycerine. This dose can be given three times a day. If from tenesmus, pain in the right iliac fossa, or the appearance of bright blood in the stools, there is reason to believe the large bowel to be the seat of the lesion, internal administration of the drug may be supplemented by the use of the salt locally. For a child two years of age, the lower bowel should be first cleared out by a copious injection of tepid water, and afterwards two grains of the nitrate dissolved in four ounces of water must be thrown up the bowel through a long tube. If tenesmus is urgent, five drops of laudanum may be added to the medicated injection; or, after the return of the nitrate, the laudanum, mixed with half an ounce of thin warm starch, may be thrown into the bowel. The astringent injection can be repeated for three or four nights in succession, and can then be given only on alternate nights, if the symptoms still persist. Instead of the silver salt, sulphate of copper (half a grain to the ounce of water) may be used for the injection, and is often of service. This treatment by injections is useful not only by applying the astringent directly to the affected part, but also by clearing away hardened lumps of fæcal matter, which are very apt to be retained and keep up irritation even when the stools generally are loose and frequent.

Another useful remedy is the extract of hæmatoxylon. Three to five grains may be combined with one or two drops of laudanum, and two to four drops of ipecacuanha wine in the compound chalk mixture, and given three times in the day. A combination of the extracts of hæmatoxylon and rhatany (gr. iij. of each) is often found of signal efficacy if the purging is obstinate; or gallic acid (gr. ij.–v.), with a few drops of aromatic sulphuric acid, may be used. Opium should be always added to the astringent, whatever this may be, in order to reduce irritability of the mucous membrane, and quiet peristaltic movement. Sometimes we find cases, which have resisted all other treatment, yield to bismuth given in large doses. For a child of two years old, fifteen grains of the carbonate of bismuth may be given with five grains of the aromatic chalk powder, every four hours; and a few doses of this combination is followed by really surprising improvement in many cases. If thought desirable, a drop of laudanum may be added to each alternate dose of this remedy, or a small injection of starch and opium may be given every night.

When purging has been arrested, the healing of the ulcers may be promoted by perfect rest, and the administration of the pernitrate of iron (℥ iij.–v.) with laudanum (℥ j.–ij.) in a teaspoonful of water sweetened with glycerine; or quinine may be given with pepsin and strychnia, as recommended during convalescence from inflammatory diarrhœa. For a considerable time it will be necessary to pay strict attention to the diet, and limit the quantity of farinaceous and saccharine foods; and long after convalescence is established, the child should continue to wear a flannel bandage round the belly as a necessary part of his dress.

CHAPTER X.

INTESTINAL OBSTRUCTION (INTUSSUSCEPTION).

Occlusion of the intestine in the child is rarely due to any other cause than intussusception or invagination of the bowel. Although any form of mechanical obstruction met with in the adult may conceivably arise in the young subject, such lesions are so uncommon in early life that when discovered they have been placed upon record, less for their practical usefulness, than for the interest they may possess as pathological curiosities. Thus, the bowel has been known to be strangulated by peritoneal bands, or by the vermiform appendix; to be obstructed by carcinomatous or lymphatic swellings; or to be narrowed by congenital strictures. The temporary impaction of fæcal matters which is sometimes found, is treated of elsewhere (see Constipation). A description of intestinal obstruction in the child practically resolves itself, then, into a description of intussusception, and the present chapter will be confined to this subject.

Causation.—Invagination of the bowel, although an uncommon accident at any period of life, is more often seen in the young child than in the adult. Babies seem to be especially prone to it, for a large proportion of the cases occur during the first twelve months of life. This comparative frequency of the lesion in infancy is attributed by Rilliet to the looser connections of the cæcum in the iliac fossa at this age, and also to the imperfect development of its muscular bands, which lessens its resistance to the penetration of the small intestine into its interior.

In infancy, intussusception consists either of an invagination of the small intestine into the larger, or of one portion of the colon into another portion. At a later period of childhood, the intussusception may involve the small intestine alone, without the larger gut being concerned in the invagination.

Infants and children in whom this accident occurs, are usually sturdy and well nourished; and the illness takes places suddenly, as a rule, without being preceded by a period of feebleness or a state of ill-health. Boys are more subject to it than girls. The causes which give rise to it are not always easy to determine. Drastic purgatives, indigestible food, violence of cough, external injury, and even rapid motion, as when a child is danced quickly up and down in his parents' arms, have all been quoted as exciting causes of the lesion. It is certainly curious to find that in many of these cases the symptoms of obstruction were immediately preceded by a fall or other accident. In a case which lately came under my own notice—an infant of ten months old—the first symptoms followed a fall from his mother's bed on to the floor. Indeed, the child, when first seen, had a severe bruise on the temple and cheek, testifying to the severity of the accident. Still, if causes such as these were alone capable of determining involution of the bowel, the accident would be surely more commonly met with than it is. In some recorded cases, intussusception has been preceded by intestinal catarrh; and it is conceivable that any sudden increase of peristaltic action may help to induce it.

Morbid Anatomy.—In intussusception, one portion of the bowel is forced or invaginated from above downwards into another portion immediately continuous with it. At the point of invagination, therefore, a swell-

ing is seen which consists of three thicknesses of gut disposed one over another. Firstly, the external investing tube; secondly, a portion continuous with this, which has been doubled inwards, or inverted within the first; lastly, the contained portion of the bowel whose entrance into the first constitutes the lesion. Of these, the middle layer, which is of course reversed or turned inside out, has its mucous coat, now on its exterior, in contact with the mucous coat of the investing portion of the gut; while its peritoneal coating, now innermost, is in contact with the peritoneal covering of the contained or invaginated portion of the bowel.

The intussusception is formed not only by the intestinal tube, but also by the portion of mesentery in connection with it. This being drawn in with the invaginated portion, presses the latter to one side. Consequently, the foremost opening of the contained segment is not in the middle line, but is twisted so as to rest against a part of the investing sheath. When once started, the invagination tends to increase by peristaltic action, the increase being always at the expense of the outermost portion, and may vary in degree from an extent of a few inches to several feet.

The consequences of the intussusception are occlusion of the intestinal canal, and obstruction of the circulation in the double layer of bowel which forms the invaginated portion. The two inner tubes become dark purple from congestion, and swollen; and some effusion mixed with blood is poured out between the opposed mucous surfaces, and also into the canal beyond the point of obstruction. Lymph is afterwards exuded, and the opposed serous surfaces become adherent. In some rare cases, the inflammation extends beyond the seat of disease, and causes general peritonitis; in others, ulceration and perforation take place in the investing sheath, owing to irritation of the end of the contained portion; and this is sometimes seen to protrude through the opening thus formed, into the cavity of the peritoneum. If the strangulation of the invaginated portion is complete, it becomes gangrenous, and, in favourable cases, may be detached, piecemeal or in mass, and discharged through the anus. Should this happen, if the adhesions already formed remain firm, the sheath or invaginating segment, being united at its free end with the part of the bowel immediately above the point of intussusception, still forms with it a continuous tube, although the intervening portion has been removed. Sometimes, however, the adhesions give way, and then extravasation may take place into the peritoneum.

In infancy, it is usually the small intestine which becomes invaginated into the colon. The end of the ilium, with the ilio-cæcal valve, is forced into the cæcum. This, as the intussusception increases, penetrates farther and farther into the colon, drawing behind it the ilium, and doubling first the cæcum, then the ascending colon, and afterwards more and more of the larger bowel the farther it extends. At last, it may reach the rectum, and be felt by a finger introduced through the anus. In such a case, when the abdomen is opened, the larger bowel seems in great part to have disappeared, and a tumour is found occupying, usually, the left side, often the iliac fossa. This is of a slate-gray colour, is elongated in shape, and doughy to the touch. By traction, the invaginated portion can be drawn out, although it is usually soft, and is apt to tear in the process. Before penetrating into the colon, the ilium may or may not pass through the valve; usually, it does not do so, and if a portion pass between the lips of the valve, it is seldom more than a few inches.

Sometimes, even in infancy, more often in older children, the intussusception occurs in the course of the small intestine, the colon taking no

part in the invagination. When this displacement occurs in a healthy child, it of course gives rise to symptoms of obstruction. It may, however, take place without producing symptoms. In examining the bodies of children, especially if they have died of intestinal catarrh, or of some form of brain disease, it is not uncommon to find portions of the bowel invaginated, often in several places, without any symptoms of this accident having been noticed during life. This form of intussusception usually occurs in the small intestine. It is supposed to take place immediately before death; for the bowel is merely invaginated, and is not swollen or congested, or altered in appearance in any way. Moreover, it can be readily drawn out by a very slight effort.

Symptoms.—There is some variety in the symptoms, according to the age of the child and the seat of the invagination. In infants the intussusception is almost always at the expense of the larger bowel. In older children it may be confined to the jejunum or ilium, without involving the colon. The symptoms noticed in infants, and those arising in older children, must be therefore considered separately.

In the case of an infant the ordinary history given by the mother is that the baby was in his usual health, when suddenly he gave a scream, turned excessively pale, and then cried violently, writhing and drawing up his legs as if in great suffering. The pain is not constant, for the child, after a time, ceases to cry, and lies back, looking pinched and pale; but in a short time the paroxysm returns, and he screams and writhes as before. When the pain first comes on, the infant vomits his last meal, and the vomiting is usually repeated, especially if food or medicine be given to him. In most cases, an aperient is at once ordered, and is returned directly it has been swallowed. The state of the bowels is important. If they are empty below the point of obstruction, they remain obstinately confined, and the straining efforts, which are usually made, merely expel mucus and blood. If the lower bowel contains any fæcal matter, this is discharged in a thin, loose state, shortly after the occurrence of the intussusception. The stool may contain blood, and the action of the bowels is usually followed, after a short interval, by further straining and the evacuation of mucus and blood. At this time, the temperature is not elevated; the belly is painless—indeed, during the paroxysms of colic, gentle frictions to the belly seem to afford relief; the abdomen is neither full nor tense, and between the attacks of pain, the child may be often found in his cot lying upon his belly. Sometimes the secretion of urine is greatly diminished, but this is a very variable symptom, and apparently has no reference at all to the seat of obstruction. Often, at this period, the most careful examination of the belly detects no localised swelling; but after a time, if the abdomen be carefully palpated during an interval of rest from pain, a distinct swelling may be perhaps detected by the fingers pressed deeply into the left iliac fossa. There may be some tenderness at this point if some hours have elapsed since the occurrence of the accident. Later, the mass can often be reached by the finger introduced into the rectum, for its tendency is to travel farther and farther down the bowel. The child sleeps but little after the invagination has occurred. If, at the first, he sleeps between the attacks of pain, he soon ceases to do so, and remains wakeful and restless, constantly whining and crying until exhausted. The temperature varies. Sometimes it is little altered from the normal level. In other cases, it begins to rise after a few hours, and may reach 102° or 103°. Directly symptoms of collapse are noticed, the temperature usually falls below the level of health.

The course of the illness is apt to vary according to the degree of strangulation of the invaginated segment, and the more or less completeness of the obstruction to the passage of the contents of the bowel. In rare cases, the passage is not completely occluded, so that fæcal matter can still make its way, although, of course, in small quantity, through the narrow channel. The constipation is then not obstinate, but the stools are scanty, and consist more of mucus and bloody fluid than of the ordinary constituents of an evacuation.

The symptoms continue without improvement. The pains return at intervals. The child, in some cases, turns away from his bottle; in others, he sucks greedily to assuage his thirst; but, whether he swallow willingly or not, the effect is the same, and he usually vomits almost immediately. If he vomit at other times, the ejected fluids consist of bile-stained mucus, and very rarely of fæcal matter. The face gets pale and more haggard; the eyelids close incompletely, and the eyeballs are sunken. Occasionally he strains, but only blood and mucus escape from the rectum. His belly is often tender over the seat of the tumour, and may become fuller and more tympanitic, with some tension of the parietes. Sometimes the sphincter is relaxed and open.

The symptoms of collapse come on early if the obstruction of the bowel is complete, and usually, on the third day, the child is found in the state described. Unless general peritonitis occur, there is seldom much pyrexia; indeed, the child, as a rule, feels cold and damp; and even if the internal temperature is higher than natural, the extremities feel cold. In this state, he remains until he dies. A convulsive seizure may precede death, and sometimes convulsions occur in the course of the illness, and are repeated several times. Before death, the invaginated mass may be perhaps seen to protrude for an inch or two outside the anus, as a dark-coloured, elongated lump. This, however, is not common. When the strangulation is complete, the disease seldom lasts longer than a week, and death often occurs in three or four days. If the obstruction is not complete, the progress of the case is longer; scanty loose motions may be passed at intervals, and the child often lingers for a fortnight or more.

If, by any means, the invaginated portion of the bowel can be returned, the vomiting ceases; the bowels discharge a copious, semi-fluid, offensive stool, and the child sleeps. On waking, he takes the bottle or the breast, and seems cheerful and contented, although necessarily languid and feeble.

In *older children*, the symptoms correspond, in the main, with those already described, but certain differences are noticed. Thus, the distention of the belly is usually greater after the age of infancy, and comes on earlier. It is sometimes extreme, and the coils of dilated intestine can be made out through the abdominal parietes. Also, vomiting is generally persistent, and is apt soon to be feculent. The child will take no food, but is excessively thirsty. The discharge of blood from the anus occurs less frequently the more advanced the age of the child. If the invagination occupy the large intestine, the strangulated portion of the bowel is approached near to the outlet, and hæmorrhage from the ruptured vessels is likely to take place. If, however, the intussusception is higher up, and is confined to the small intestine without implication of the colon, no hæmorrhage at all may be noticed. There is then, in most cases, obstinate constipation. When the stage of collapse comes on, the tongue becomes dry, and is covered with a brown fur; the belly is tympanitic; the eyes are sunken, and the face of the child is ghastly and death-like.

If separation and elimination of the gangrenous portion of the bowel takes place, this favourable change is usually noticed in the course of the second week. In these fortunate cases, the dark-coloured gangrenous segment of the intestinal tube is passed with much straining, and often a quantity of dark, offensive feculent matter comes away with it. The amount of this varies, and is often very considerable. The discharge is followed by symptoms of great relief. The child usually falls into a profound sleep from which he wakes greatly refreshed. His thirst is diminished, his appetite begins to return, and his whole aspect betokens great improvement. The gangrenous portion may not be expelled in one piece, but sometimes comes away in patches and shreds, mixed with foul-smelling fæces and blood. After the separation and discharge of the slough, recovery usually follows with great rapidity.

In the fatal cases, death results more often from collapse than from peritonitis. The child becomes weaker and weaker, and dies from asthenia. Sometimes death is preceded by a convulsive seizure.

The above is the course of the disease in infants and older children. Of the symptoms, the sudden occurrence of severe abdominal pain, the vomiting, the constipation, the discharge of blood from the bowel, and the discovery of a swelling by palpation of the belly or exploration *per anum*, are the most characteristic.

The pain is of an excruciating character, as is shown by the child's agonising cries, his restless, jerking movements, and the death-like pallor which spreads over his face. In a case recorded by Dr. Wilks, the infant actually fainted from the intensity of his suffering. The pain comes on in paroxysms, but these do not occur at regular intervals. Often, after the first access, the colic suddenly ceases, and the child appears to be easy. He may remain free from pain, showing no sign of illness, for some hours, but sooner or later the paroxysms return. This is most often the case with infants.

Vomiting is always present, and may vary from mere regurgitation to violent retching. It is often accompanied by hiccough. The vomited matters consist of food and medicine, or, if nothing has been taken, of mucus and bile. Occasionally, blood is thrown up from the stomach. Mr. Macleod has recorded the case of a male infant, aged six months, in whom this symptom was noted before death. The intussusception had occurred in the usual situation for this age.

Constipation is not a constant symptom. If the bowel below the point of obstruction contains fæcal matter, this is invariably expelled early. There is then no alvine discharge for the remainder of the illness. In less common cases a certain amount of diarrhœa may be present, if the strangulation of the bowel is not complete; for the swelling of the invaginated segment becomes reduced after a few days, and the calibre of the canal may be partially restored.

A discharge of blood and mucus is one of the most constant symptoms. The amount varies. In some cases, it may be scanty, nothing more than a stain of blood being seen upon the diaper when the napkin is changed. In other cases, the quantity may reach several ounces. It appears early. It may be seen at the time of the first effort of vomiting, and is seldom delayed longer than twelve hours. In infants, this symptom is almost invariably present, and may be taken to indicate a degree of constriction of the bowel stopping short of actual strangulation and complete arrest of circulation. In older children, as has been said, it may be wanting.

A distinct swelling in the course of the bowel, when discovered, is a valuable diagnostic sign; but often it is not present. The tumour gener-

ally lies in the left iliac region, and gives a firm, doughy sensation to the finger. It is movable, and varies from a walnut to a hen's egg in size, or may even be larger. When detectable by palpation of the belly, the tumour can often be reached by the finger introduced into the rectum; especially if at the same time pressure is made upon the invaginated mass by the other hand placed upon the abdomen. A rounded lump, feeling very much like the cervix uteri in a vaginal examination, may then be felt by the point of the finger. Sometimes the mass can be seen to protrude beyond the anus, but this is exceptional. Out of forty-nine cases collected by Dr. Lewis Smith, the protrusion occurred only in six.

Tenesmus is usually present, and is often distressing. It may cease as the child's strength becomes reduced.

The amount of fever varies. At first, the temperature is normal, but as inflammation occurs in the intussusception, the bodily heat increases, although it is rarely excessive. The symptom is said to be less marked in infants than in older children. The pulse, after the first few days, is very rapid, and as the strength declines, becomes excessively frequent and feeble.

The duration of the illness varies, as has been said, according to the completeness of the strangulation of the bowel, and also according to the age and strength of the child. In infants, it rarely lasts longer than a week, and death often takes place as early as the fourth or fifth day. In older children, the course of the disease may be equally rapid; but often it is more protracted, and cases have been recorded in which the lesion has become chronic, lasting several months. Separation and elimination of the gangrenous portion is never seen in infancy, and is rare even in more advanced childhood.

Diagnosis.—When a child who has been previously in good health, or has suffered merely from looseness of the bowels, is suddenly seized with violent paroxysmal colic and repeated vomiting, followed immediately, or after a few hours, by evacuations consisting of non-fæcal mucus and blood, discharged with great straining, we may conclude that he is suffering from occlusion of the bowels, due, in all probability, to intussusception. The discovery of an oval tumour, in the left side of the belly, will confirm us in our opinion, and if we can succeed in touching the mass, by the finger introduced into the rectum, the sign is a conclusive one. The conjunction of all the above symptoms is of importance, and the absence of any one of them is not to be disregarded. Thus, if we are called to a child who has been taken suddenly with pain in the belly, and vomiting, and whose bowels are obstinately confined, we must not conclude too hastily that an intussusception has occurred. The pain may be extreme and paroxysmal; the vomiting frequent and distressing; and the constipation may have resisted aperients and enemata, without obstruction of the bowels in any form being present. Peritonitis, which paralyses the bowel, and induces vomiting by reflex disturbance, may produce just such symptoms. On the other hand, a passage from the bowels may take place, although intussusception has actually occurred. The appearance of one loose fæcal stool, after the beginning of the illness, is common in intussusception, for the contents of the colon below the point of obstruction are usually expelled shortly after the occurrence of the invagination. If, however, the bowels continue loose, and fæcal matter is afterwards evacuated, whether by injection or otherwise, the symptom is not in favour of intussusception; for, even if the channel become pervious later, after swelling has partially subsided, it is rarely free during the first two or three days of the illness. In such a case we

should hesitate to ascribe the symptoms to invagination of the bowel, unless the other evidence in its favour points irresistibly to such a conclusion.

Again, severe colic in a young baby is often accompanied by alarming symptoms, in which all the signs of the most violent pain may be followed by great prostration. In the attack, the child utters piercing screams, and writhes his body exactly as he does in intussusception; indeed, in almost all cases of invagination of the bowel, we generally find that an aperient has been ordered, under the impression that the spasms of pain are the consequence of irritation of the bowels by undigested food, or flatulent distention. In every case, therefore, where intussusception is possible, we must weigh the evidence very carefully, as the recovery of the child may depend upon early and accurate diagnosis of his illness. In addition to simple colic and peritonitis, intussusception may be confounded with dysentery, with impaction of hardened fæcal masses, and with intestinal hæmorrhage from other causes.

In *simple colic* the pain, although often excessively severe, is not paroxysmal, with complete remissions, and usually ceases with the expulsion downwards of a quantity of gas. The skin is often hot, and the belly hard and swollen. There is no vomiting or tenesmus, or discharge of bloody mucus from the bowels. It is very important to attend to these points, for the administration of castor-oil or other aperient, which quickly cures an ordinary colic, cannot but be injurious in a case of intussusception, increasing the peristaltic action of the bowels, and aggravating the invagination.

Between *peritonitis* and actual obstruction of the bowels, the diagnosis is often very difficult. The form of peritonitis which is most apt to simulate intussusception, is that in which inflammation occurs suddenly as a consequence of ulceration and perforation of the vermiform appendix, with extravasation into the peritoneal cavity. In these cases, symptoms similar to those of obstruction may come on quite suddenly, and be very severe. But in peritonitis, the temperature is always elevated from the first; the abdominal parietes are distended and tense, and pressure in the right iliac fossa is painful. In intussusception there is no pyrexia at the first; the abdominal wall is lax and undistended; there is frequent tenesmus, and, after a few hours, blood and mucus are discharged from the bowel. This last symptom, added to the signs of intestinal occlusion, is pathognomonic. The mistake is most likely to be made when the symptoms occur in a child after the age of infancy, and hæmorrhage is not present, or is slow to appear. Still, even in these cases, the absence of fever, the laxness of the parietes, and the tenesmus should raise strong suspicions of the real nature of the disease. In all cases of doubt, a careful examination of the belly, while the child is under the full influence of an anæsthetic, will usually enable us to detect the presence of a tumour in the abdomen if invagination has occurred.

It is possible to mistake intussusception for *dysentery*, for the mistake has actually been made. In the latter disease, the dejections are often small, and consist of thick mucus, mixed more or less intimately with blood. They are discharged with great straining and pain. Even in severe catarrh of the lower bowel, which is often improperly called "dysentery," much mucus, and often streaks or spots of blood, can be observed. But these symptoms alone are far from being characteristic of intestinal invagination. We miss the abrupt onset, the frequent vomiting, and the lax, undistended condition of the belly. Moreover, the whole course of the two diseases is different, and true dysentery is usually an epidemic malady.

In cases of *impaction of fæcal matter*—an accident which constitutes a

real occlusion of the bowel—the symptoms of invagination may be closely simulated. Vomiting, colicky pain, tenesmus, and constipation may all be present, and on examination of the belly, a firm tumour may be detected through the abdominal parietes. But in fæcal accumulation, there is usually a history of hard and scanty stools for a considerable period before the attack ; the vomiting is much less severe, there is no bloody mucus evacuated from the bowels, and the tumour is more superficial, does not shift its place, and can be indented by firm pressure with the fingers. If this condition be suspected, a large purgative enema will cause the tumour and consequent symptoms to disappear.

Sometimes, in intussusception, the amount of blood discharged from the bowel is very copious. Still, the other symptoms of invagination are present, and it is only necessary to be aware that hæmorrhage may be occasionally profuse, to prevent this fact from casting any doubt upon the correctness of the diagnosis.

If attention be paid to the symptoms which have been pointed out as characteristic of intussusception, we shall be able, in most cases, to arrive at a correct conclusion. An examination *per anum* should never be neglected ; nor, in a doubtful case, should we omit to inspect the ordinary situations of rupture, for although strangulated hernia is rare in young subjects, it does, occasionally, occur.

Prognosis.—When we have satisfied ourselves of the presence of intussusception, the prognosis is excessively grave. In the young baby, in spite of a few recorded cases of spontaneous reduction of the invaginated portion of the bowel, and of others in which remedial measures promptly applied proved successful, any measures we may resort to must be undertaken with serious forebodings. The danger is in direct proportion to the urgency of the symptoms. If the acuteness of the case indicates tightness of constriction, the prognosis is most serious, whatever measures are adopted, and however quickly assistance is rendered. In almost all cases of successful reduction by taxis, inflation, or injection, the symptoms have not been very severe. To be successful, treatment must be early ; but delay is less fatal if the constriction be only moderate, than when strangulation is complete. If the infant is seen after the end of the third day, and acute symptoms have undergone no alleviation, a fatal issue to the illness can hardly be doubted.

In older children, whose superior strength enables them to resist for a longer period the prostrating effects of the obstruction, recovery by sloughing and discharge of the invaginated segment is possible, and may even take place when the child is *in extremis*, and after all hope has been abandoned ; but this is a result which in any individual case we can never dare to anticipate. Certainly, there are no indications by which so favourable an issue can be foretold. Even if the evacuation of the slough by stool shows that elimination has actually been accomplished, we must still not be hasty in declaring the danger at an end ; for the greatest care will yet be required during the period of convalescence to prevent the newly-formed adhesions from being injured or detached.

Treatment.—Accuracy of diagnosis, and especially early recognition of the nature of the complaint, are of great importance in this disease. If the real cause of the vomiting and colic are discovered at the beginning, remedial measures may be applied with greater hope of success. As it is, medical advice is seldom sought until the bowel has been irritated by one or more doses of aperient medicine, to the serious aggravation of the patient's condition and the lessening of his chances of recovery.

The only admissible remedy is opium. This should be given at once, and repeated as often as is necessary to lull the pain, and keep the child under the influence of the narcotic. It is best given by subcutaneous injection, and may be usefully combined with atropine. It is well to begin with small quantities, although it will be generally found that the system, even in infancy, is singularly tolerant of the drug. For a child of twelve months old, one-twentieth of a grain of morphia and a sixth of a grain of atropine may be used every half-hour until some sensible effect is produced upon the symptoms. This not only relieves the suffering of the patient, but also tends to prevent any increase in the invagination and to check the vomiting.

If the case is seen sufficiently early, the question of endeavouring to reduce the invagination by mechanical means must be considered. Mechanical interference is only allowable during the first few days of the illness, before exudation of lymph has caused adhesion between the serous surfaces; and will be useless if great tenderness on pressure of the invaginated mass indicates the presence of inflammation. The means employed may be taxis, insufflation of air, or the injection of water. Before proceeding to any of these measures, the child, unless a young baby, should be placed under the full influence of an anæsthetic. Taxis consists in kneading and otherwise manipulating the abdomen with the hand. This method is generally employed in conjunction with either of the others. The child is laid upon his back with the nates raised so that the body is inclined at an angle of 45 degrees. A large quantity of tepid water is then injected very slowly into the bowel by a Davidson's syringe capped with a long tube. Every now and again the abdomen must be kneaded with the hand so as to work the fluid along the bowel upwards towards the obstruction, and this process of taxis may be continued for several minutes. As much fluid must be used as the bowel can be made to contain. The best proof that reduction has been effected is sleep. As a rule, directly the child's more pressing symptoms are relieved, he sleeps at once. The return of the invaginated bowel is also sometimes marked by a discharge of blood and mucus, followed by a copious, offensive, semi-fluid stool.

Insufflation of air is best suited to cases where the intussusception has descended into the rectum and an enema returns at once. The air may be supplied by a common bellows, to the nozzle of which a caoutchouc tube has been attached, terminating in a long gum-elastic tube. Some lint must be wrapped round the base of this tube to enable it to fit closely within the sphincter. Air must be injected slowly, and at times the belly should be manipulated as in the former case. The process should be continued until the large bowel is thoroughly distended with air, if this prove possible. In a favourable case, the mass will be felt to recede from the left iliac region, and then pass altogether from the reach of the finger. If this happen, we may have great hopes of having achieved our object.

These measures can only have a chance of success during the first three days. Certainly, after the fourth we can do nothing but harm by distending the bowel with either air or water.

In addition to the above methods, attempts have been made to replace the bowel by a long sound passed into the rectum, and have occasionally succeeded. This method is, of course, only applicable to cases where the invagination is within easy reach of the outlet. An æsophageal bougie with a sponge fastened to its end forms a useful instrument for this purpose. If the above measures prove ineffectual, it becomes a question whether a surgical operation should be resorted to, or whether we should trust merely to complete rest and opium.

The operation of opening the abdomen and reducing the invagination with the fingers has been happily accomplished in some cases, and may offer a chance of success when other means have failed. Our decision as to its desirability will depend upon the opinion we have formed with regard to the tightness of constriction of the invaginated gut. As Mr. Hutchinson has pointed out, the imprisoned portion of the bowel may be tightly strangulated, or merely irreducible, with comparatively little constriction. In the former case, the course of the disease is very rapid, and the symptoms are severe; gangrene quickly supervenes, and death is speedy. In the latter, where the channel often remains pervious, although much narrowed, the course is more chronic, and the symptoms are less pressing. It is in these slower cases that the operation is especially likely to be successful. Unfortunately, the difficulty of judging of the degree of tightness of the constriction is very great. The severity of the symptoms is not always, in children, a trustworthy guide. Much depends in such a case upon the nervous impressibility of the particular patient; for a degree of strangulation which in one child will produce violent vomiting and early prostration, will, in another, be attended by much less serious and urgent symptoms. In young babies, unless the operation be performed within the first three days, and before the occurrence of collapse, we can have little hope of its success; but as, in such cases, the death of the child, if left alone, is certain, the operation is surely a permissible one. In older children, I am strongly of opinion that it should not be performed if, from violence of vomiting, severity of the general distress, and early occurrence of prostration, we have reason to believe the strangulation of the bowel to be complete. The gut would probably be found either gangrenous or adherent. In such cases there is always the last chance of sloughing and elimination, and this the operation would take away. On the other hand, if the general symptoms are comparatively mild, and especially if the intestinal channel is not completely occluded, the operation is distinctly called for after failure of other means of reduction.

In the early period of the illness, vomiting is often encouraged by repeated and unnecessary feeding of the child. At this time, it is best to give no food at all, and only to allow an occasional spoonful of barley-water to assuage the thirst. If old enough, the child may be allowed to suck lumps of ice. If the vomiting remits, some simple food—milk and barley-water for a baby, given cold with a teaspoon; and for an older child, strong beef-tea, essence of meat, and milk, also in small quantities at a time—may be allowed. When the strength begins to fail, brandy-and-egg mixture can be given.

If elimination of the gangrenous segment take place, the utmost care should be observed that for months afterwards the child eat sparingly of farinaceous and fermentable articles of food, so as to avoid injuring the young adhesion by flatulent distention. Potatoes, peas, and broad-beans should be forbidden. Farinaceous puddings and sweets should be greatly restricted in quantity. In fact, the child should be dieted much as if he had lately passed through an attack of enteric fever.

CHAPTER XI.

TYPHLITIS AND PERITYPHLITIS.

The cæcum and its appendix are liable to disease on account of the tendency to retention of foreign bodies and irritating substances in this part of the alimentary canal. In perityphlitis, the inflammatory process begins almost invariably in the cæcum, and spreads thence to the loose areolar tissue around it. In most cases, it is the consequence of ulceration and perforation of the wall of the cæcum or vermiform appendix.

Causation, etc.—The form of perityphlitis which is due to ulceration of the vermiform process seems to occur more often in early life than in later years. Therefore, childhood may be considered to be one of its predisposing causes. It has been noticed in an infant no more than seven months old; but this is very exceptional. Usually, the child is between four and twelve years of age. It is said to be more common in boys than in girls.

The determining cause of typhlitis is, no doubt, in most cases, constipation, with retention in the cæcum of hardened fæcal matter, constituting what Rokitansky named "typhlitis stercoralis." It has, however, been also attributed to cold and external injury. I have known it to occur during convalescence from typhoid fever.

Perityphlitis is commonly due to the passage into the appendix of a little concretion, which is retained and sets up inflammation and ulceration. Hardened intestinal concretions are often described from their appearance as cherry- or date-stones, but on examination are almost invariably found to consist of the earthy phosphates combined with inspissated mucus and ordinary fæcal matter. They may be formed around small foreign bodies, as a shot, a pin, or a spicula of bone. In size, they may resemble a pea or a date-stone. They have a smooth, shining, waxy-looking surface of a grayish or brownish colour. Their consistence is hard, and their structure often laminated. Sir William Jenner is of opinion that the retention of these calculi is due in many cases to malposition of the appendix. This process, owing to its length and the attachment of its mesentery, may be bent at an angle (instead of being directed upwards and inwards), so that hardened particles can slip readily into it but are prevented from returning. According to Dr. Sands, the appendix, before destruction of its coats, contracts adhesions to the peritoneum lining the iliac fossa; so that when perforation occurs, the fæcal matters, instead of entering the serous cavity, gradually pass into the loose connective tissue which lies outside the peritoneum.

In some cases, a typhoid or tubercular ulcer may lead to destruction of the wall of the cæcum, or the part of the intestine immediately adjoining, and be a cause of extravasation. When the escape of fæcal matter takes place into the loose tissue behind the cæcum, it sets up inflammation and abscess. An abscess once formed rapidly enlarges, and tends to point somewhere in the iliac region, or in the groin just above Poupart's ligament. The direction in which the pus travels, varies according to the exact seat of

the purulent collection. Thus it may pass along the inguinal canal into the scrotum, or along the psoas and iliac muscles to the upper part of the thigh. Sometimes it dips into the pelvis, and opens into the rectum. In other cases, if the ulcerated opening remain patent, the pus may pass through it into the cæcum; but often after a time the opening closes up so as to shut off all communication with the abscess.

Often, general peritonitis, more or less severe, accompanies the peri-typhlitis, from extension of the inflammation. If, instead of opening into the sub-serous tissue, the rupture takes place from the bowel or appendix directly into the peritoneal cavity, peritonitis is set up at once.

Symptoms.—An attack of typhlitis begins suddenly with pain localised in the right iliac fossa; the child vomits, and the bowels are confined. The pain is constant, and apparently severe. It is increased by pressure over the cæcum, by cough, or by efforts to vomit. The matters ejected consist of watery and bilious fluids, and the retching may be severe and distressing. At the same time, there is fever which varies according to the nervous impressibility of the child. Usually, the thermometer marks 101° or 102°. The expression of the face is anxious and distressed. On palpation of the belly, we notice a firm mass in the situation of the cæcum, and gentle percussion at this spot elicits a dull sound. On account of the tenderness, it is difficult to make a satisfactory examination of the iliac region, for the least touch causes severe suffering. The child lies on his back, inclining to the right side; he flexes his thigh, and cries bitterly if any attempt is made to straighten the limb. Sometimes a distinct swelling may be noticed at the seat of pain.

These attacks are often spoken of as "colic" or "inflammation of the bowels;" and after recovery, a tendency appears to be left to a recurrence of the illness, for it is not uncommon to hear that this is not the first time that the child has suffered from similar symptoms. As a rule, if the lesion remain simple, and be not complicated with ulceration of the wall of the bowel, its course is rapid; and in a few days, under suitable treatment, the pain and tenderness are no longer complained of, and the child is convalescent. In exceptional cases, the disease lasts into the second week, and the tenderness and swelling only slowly subside.

Perityphlitis may be preceded by the symptoms described above as being characteristic of inflammation of the cæcum; but more often—probably on account of the more limited area occupied by the morbid process—the stage of ulcerative destruction passes almost unperceived.

In the first case, the vomiting and constipation cease, and the more acute pain gives place to a dull aching, or even altogether subsides. Still, there is tenderness, and the swelling does not entirely disappear. The child does not seem well. His face retains an expression of distress, and he is dull and listless and unwilling to play about.

If the perforation occur without having been preceded by the symptoms of typhlitis, there is often nothing but a sense of dull aching or discomfort in the right iliac region, with occasional passing attacks of more acute pain. On these occasions, there is vomiting of short duration, and the child looks ill, and is feverish. This passes off in the course of a few hours, and the child remains as before—not quite well, but suffering from ill-defined symptoms to which little importance is attached. He is peevish and fretful, capricious in his appetite, subject to attacks of diarrhœa alternating with constipation, and often thirsty at night, with some increase in his temperature.

When perforation occurs, if extravasation take place into the perito-

neum, all the signs and symptoms of a localised peritonitis are at once observed. There is pain, swelling, and tenderness in the right side of the belly, with vomiting, constipation, high fever, a furred tongue, and a pinched, haggard face. The child lies on his back with his thighs flexed, and dreads the least touch. The inflammation may become general, and the child quickly die with all the symptoms elsewhere described (see Acute Peritonitis). If it remain limited, he may perhaps recover after a longer or shorter illness.

When the perforation takes place posteriorly, so that the extravasated matters pass backwards into the loose connective tissue behind the cæcum, the symptoms are less severe. In such cases, the child at first may continue to be about. He generally looks ill, has a more or less febrile temperature, a capricious appetite, and is listless and languid. He may suffer from pain in the iliac region—not very severe, but constant and wearing; or may be attacked by occasional pains of a colicky character, which are often excited by movement. At night, the child is restless, constantly altering his position, and sometimes crying out. At this period, the bowels are usually confined. On examination in the early stage, before any pointing of the abscess has occurred, there will often be noticed a fulness in the right iliac fossa, and this part is tender when pressed upon.

In most cases, the child, if he continue able to leave his bed, is noticed to walk with a limp. Soon, however, he ceases to be able to walk at all, and lies in bed on his back with his right thigh partially flexed. If he be assisted to stand, he is seen to rest his whole weight on the left limb, and to keep his right limb partially bent both at the hip and knee, and rotated outwards. With these symptoms, especially if there be any history of a blow or fall, disease of the hip-joint may be suspected. This opinion is often strengthened by the child's complaining of pain in the knee as well as in the groin, and by the suffering caused by any attempt at extension of the hip. If the tenderness is great, any rough manipulation of the limb, as in rotating the head of the thigh-bone, or communicating any concussion to the hip by striking the knee, may be a cause of pain in the groin.

As the disease progresses and suppuration occurs, the pallor and distressed expression of the patient are very noticeable. His pyrexia becomes more marked, and the evening rise is followed by depression, with sweating in the morning. He loses flesh fast, and his tongue becomes dry and brown. The constipation now usually gives place to diarrhœa, which may be copious; and the pulse is very rapid and feeble. Great pain is complained of in the belly which may be distended, or even tympanitic; and the swelling in the right iliac fossa increases in size, but becomes softer. Sometimes severe pains are complained of in the right knee and ankle, and œdema of the limb may occur from interference with the venous circulation.

If the course of the pus be downwards to the pelvis, so as to show no signs of pointing externally, these symptoms, coupled with the resemblance of the local condition to hip disease, may suggest a secondary tuberculosis. But a careful examination of the belly will usually detect considerable fulness and tension in the situation of the cæcum. If the pus discharge itself into the rectum or bowel, great relief is experienced, and the local swelling and tenderness undergo considerable diminution. Often, the course of the pus is towards the surface in the neighbourhood of the abscess. The skin then becomes darkish red or purple, and swollen. It gives a doughy sensation to the touch, and, on pressure, we may notice a

slight emphysematous crepitation. An incision into the softened skin allows the escape of brownish, offensive pus and bad-smelling gas.

These cases generally end fatally. If peritonitis occur, either from direct rupture or extension of the inflammation, death usually ensues in a day or two. If a fæcal fistula remain open, life may be preserved for a considerable time—often for years. In most cases, unless the abscess have pointed early, the child is so much reduced by pain and hectic fever that he does not long survive the opening of the abscess.

A little girl, aged thirteen years, had an attack of typhoid fever when eight years old. After that time she was subject to occasional attacks of "colic" and vomiting. Early in December she was ill with what was called "inflammation of the bowels with colic," but recovered for the time. In the middle of February her bowels became very much confined, and after four days' constipation, she had fæcal vomiting. An injection was given, and a large amount of fæcal matter was brought away.

When admitted into the hospital on February 21st, the child looked ill, and was very pale. The belly was distended and tympanitic, with some uniform tension of the parietes, but no tenderness or fluctuation. She complained of slight colicky pain at times. Her tongue was covered with brownish fur, and was inclined to be dry. There was no sickness. The bowels had been confined since the injection two days before. The temperature at 6 P.M. was 93.4°.

The bowels were unloaded by repeated doses of an aperient saline. Afterwards, small quantities of laudanum were given to relieve the colicky pains which still returned at intervals; and the child was kept quiet in bed, with hot applications to her belly. After this, the bowels continued to act twice a day, and the stools were normal.

On March 3d it was noted: "Face pale; expression distressed; abdomen not full or tender. The temperature since admission has varied, sometimes reaching 101°." A week afterwards the child complained of more pain in the belly, but this part was not swollen or tender. The bowels were a little relaxed. The child began now to lose flesh fast. She continued pale and very haggard-looking; but although she complained of occasional pains in the belly, there was no tenderness or swelling, and she never vomited. The diarrhœa, however, continued. On March 14th, she began to localise the abdominal pain in the right side just over the situation of the quadratus lumborum. The abdomen was natural in appearance, and not tender. The bowels were still loose, and the stools liquid and homogeneous, without blood or shreddy matter.

After a few days, a fluctuating tender swelling appeared just below the ribs on the right side, and in front of the mass of the quadratus lumborum. This grew larger, and there was much subcutaneous œdema around the swelling. The child looked ill, and wasted rapidly. Her temperature was between 100° and 101°. The swelling was opened by the aspirator, and an ounce of brownish, fetid pus was removed. The child, however, sank and died two days afterwards.

On examination of the body, a large abscess was found at the back of the cæcum, containing much purulent brown matter. The ilium just above the ilio-cæcal valve was distended, and an ulcerous opening was found in the wall just above its junction with the cæcum. A probe could be passed through this opening into the abscess. There was, besides, some slight but general peritonitis. The liver was fatty, and both it and the spleen were adherent to the diaphragm. Many of the mesenteric glands were enlarged.

This case of perityphlitis, although really the consequence of ulceration

of the small bowel, and not of the cæcum, illustrates very well the ordinary history and symptoms of the disease. The early attacks of colic, accompanied by vomiting, were no doubt owing to the occasional occurrence of inflammation in this part of the intestinal tube; but the ulcerative process probably dated only from the illness from which the child had suffered in the previous December. This was probably a more severe attack of localised enteritis. The treatment pursued in this case is not to be recommended for imitation. Repeated aperients under such circumstances as must have existed when the child came under observation, could only be injurious. It would have been more judicious to have left the bowels alone, or to have administered a simple enema.

Cases of ulcerative perforation of the vermiform appendix require special mention. This accident is, as has been said, more common in early life than after adult age has been reached. Often, the initial stage of the disease has excited no notice, and the first symptoms that arise are due to the extravasation of the contents of the bowel into the peritoneum. In most cases, all the symptoms of acute peritonitis ensue, and the child rapidly dies. The consequences of the extravasation are not, however, always so easy of recognition. In the chapter on Acute Peritonitis, mention is made of the occasional latency of the abdominal symptoms in cases where the peritoneum is inflamed. This is sometimes the case when the inflammation is set up by matters extravasated from the bowel; and we may find, as a result of perforation of the appendix, merely pain, vomiting, constipation, and some fever—symptoms which are not characteristic of peritonitis, but tend rather to suggest obstruction of the bowel. In fact, not once, but many times, such cases have been treated for obstruction, even to the extent of actual surgical interference. The obstinacy of the constipation, the persistency of the vomiting, and the colicky character of the pain, make the resemblance curiously close. Often, indeed, very careful examination is required to detect the real nature of the attack. It is of extreme importance to remember that traumatic peritonitis in the child may be ushered in by such symptoms; and in every case of supposed obstruction of the intestine, we should search carefully for some other cause for the illness.

Sometimes, on inquiry we find that on previous occasions the child had complained of slight abdominal pain, lasting for twenty-four hours, or perhaps two days, with tenderness in the cæcal region and a single effort of vomiting. These passing attacks may be accompanied by flatulence, constipation, or diarrhœa, and a feeling of distention of the belly. They are due, no doubt, as Dr. With has pointed out, to ulceration of the vermiform appendix, with commencing adhesive peritonitis. After perforation has occurred, the local symptoms may remain limited to the iliac region, or may spread to the whole abdomen. In the first case, if the disease be recognised and properly treated, the child may perhaps recover; in the second case, he usually dies. Ileus may occur before death.

Diagnosis.—Typhlitis is accompanied by such characteristic symptoms that its detection is not a matter of difficulty. A sudden attack of abdominal pain and tenderness referred to the region of the right iliac fossa, accompanied by vomiting, constipation, a pinched, anxious expression, and some fever, at once draws attention to the belly. On examination, the presence of an intensely tender swelling in the situation of the cæcum, together with the drawing up of the thigh on the affected side, sufficiently indicates the nature of the illness. If the occurrence of vomiting and obstinate constipation, combined with a localised swelling and severe abdominal pain, should suggest intussusception, we may remember that

in the latter disease tenderness and signs of local peritonitis are not early symptoms; that the tumour, if felt, is commonly detected on the left side of the abdomen; and that violent straining, with the passage of bloody mucus, is a very constant and prominent symptom.

If, after the signs of general constitutional disturbance have subsided, the local symptoms do not disappear, but more or less tenderness, pain, and swelling persist; or if, after disappearing, the acute symptoms return after only a short interval, and this recurrence happens several times, in either case we have reason to fear that the inflammatory process is going on to ulceration. The occurrence of peritonitis at this time will confirm our apprehensions, and indicate extravasation into the cavity of the peritoneum. If, however, the wall be perforated posteriorly, and an abscess form behind the cæcum, the symptoms are much less striking.

If the patient be not confined to his bed, he often complains of tenderness in the right groin, and halts upon the right leg. The case is then distinguished from hip disease by noticing that although the child keeps the thigh partially flexed, and is greatly distressed when any attempt is made at passive extension, the head of the femur may be rotated readily and without pain, if it be done with care; and that pressure upon the hip-joint on or behind the trochanter, causes no discomfort if the patient's whole body be not jolted at the same time. Often, the child, while lying on his back, will readily flex the thigh, and perform the movements of abduction and adduction. It is only extension which appears to be impossible, and any attempt to straighten the limb causes severe pain. It will be remarked, too, that while the history indicates shortness and acuteness in the illness, the symptoms, if they could be referred to the hip-joint, would suggest disease of considerable duration. Lastly, wasting of the muscles of the thigh, which occurs early in acute hip disease, is absent; the gluteal muscles on the affected side are not flattened, nor is the fold of the buttock lowered; the fold in the groin below Poupart's ligament is not obliterated; and distinct swelling and tenderness can be detected in the right iliac fossa.

Directly signs of pointing are noticed, any remaining obscurity in the case must disappear.

Ulceration and perforation of the vermiform process are very difficult to recognise with certainty, as the first symptoms noticed are often those due to the extravasation into the peritoneal cavity. Severe peritonitis coming on suddenly, especially if the pain and tenderness can be ascertained to have started from the right iliac region, is very suspicious of this accident. Essential peritonitis comes on gradually, and the ordinary forms of peritonitis from perforation are preceded by some severe acute illness. It is important to bear in mind that the phenomena resulting from perforation of the cæcal appendix may be far from characteristic of inflammation of the peritoneum; and in every case where symptoms arise pointing to sudden obstruction of the bowels (pain, vomiting, and constipation), accompanied by fever, we should carefully exclude this and other possible causes of such symptoms before committing ourselves to the diagnosis of intestinal occlusion.

Prognosis.—Simple typhlitis almost always ends favourably; but if perforation occur, and extravasation take place into the peritoneum, recovery rarely follows. If a retro-peritoneal abscess result from the perforation, the prognosis is less unfavourable; but here, too, the patient often dies from exhaustion, or from extension of the inflammation to the serous membrane. The most favourable course is that in which the abscess

discharges itself again into the bowel. Of the cases where it opens externally, a large proportion die. Perforation of the cæcal appendix is usually fatal.

Treatment.—In every case of typhlitis our chief care should be to quiet peristaltic action, and prevent any movement of the bowels, by the free use of opium. Whether the inflammation has had its origin in a collection of fæcal matter in the cæcum, or has been induced by other causes, the same necessity exists for keeping the bowels at rest until the inflammation has subsided. Therefore an aperient in any shape is not to be thought of for a moment. Even enemata would be injurious while the acute symptoms continue.

The child should lie in bed, with a small pillow under his right knee; and hot linseed-meal poultices should be applied to the right side of the belly, and be frequently changed. Opium should be given by the mouth. A child of eight years of age will take three drops of laudanum every four hours. If this be vomited, morphia (one-sixteenth to one-twelfth of a grain) can be injected subcutaneously in its stead. The vomiting is, however, usually checked by the opiate, and the second attempt to administer it in a draught is often successful. A good combination in these cases is that of the tinctures of opium and belladonna. The latter drug is not only of great service in most forms of arrested function of the bowels, but also by its antagonistic action tends to modify the narcotic influence of the laudanum without interfering with its power as a sedative. If this combination be used, five drops of tincture of opium may be given with twenty of the belladonna tincture three times a day to a child eight years of age.

If the child be very strong, and the tenderness severe, three or four leeches should be applied to the painful spot.

The diet must consist of milk and broth, given in small quantities at a time. The milk should be diluted with an equal quantity of barley-water, to separate the particles of curd and prevent their coagulating in a lump. It should be also alkalinised by fifteen or twenty drops of the saccharated solution of lime to the teacupful.

When the acute symptoms subside the bowels will generally act spontaneously. If they do not, an injection can be administered. Purgatives of any kind should be avoided for some time after convalescence is established. We can never be sure that some slight ulcerative process is not going on, and the only hope of the child in such a case would be the establishment of sufficient adhesions to prevent rupture and extravasation. Such adhesions, if formed, an aperient would probably destroy.

In cases where we have reason to suspect the presence of a retro-cæcal abscess, the same reason for the avoidance of purgatives exists. The child should be kept in bed, and hot applications should be applied to the painful part. He should be fed with nourishing food in small quantities at a time; and a suitable proportion of stimulant should enter into his diet. Minced mutton and chicken, strong beef-essence, yolk of egg, milk and toast should form the staple of his food. If the bowels are obstinately confined, or fæcal vomiting occur, an enema may be administered, but purgatives should be avoided. For medicine, quinine and a mineral acid, with small doses of strychnia may be given, and as the child grows weaker, ammonia and bark. Directly signs of pointing are noticed the pus should be let out at once.

If peritonitis occur, the treatment must be conducted as directed in the chapter treating of that subject.

CHAPTER XII.

ACUTE PERITONITIS.

Acute peritonitis may occur in childhood at any age. It may be present in the fœtus, usually as a consequence of syphilis, and is then a frequent cause of miscarriage. It may arise in the new-born infant as a result of pyæmic infection, and is invariably fatal. It may occur at a later period of infancy or in childhood, either as a primary disease, or as a secondary malady complicating the course of some other illness. The infective form of peritonitis which occurs in the new-born baby, and is accompanied by jaundice, is described elsewhere (see Jaundice). The present chapter deals only with the disease as it is seen in later infancy and childhood.

Causation.—As in the adult, inflammation of the peritoneum in children is often induced by traumatic causes. A blow or other injury to the abdomen will occasionally excite it, and it may arise as a consequence of puncture of a hydatid cyst. The commonest of these causes is the extravasation of fluids from the bowel into the peritoneal cavity, owing to perforation of the intestine. In typhoid fever, and in ulceration of the vermiform appendix or of the cæcum, this accident may happen, and a rapidly fatal issue to the illness usually follows. Dr. Robert Lee has referred to two cases in children, aged respectively eight and nine years, in whom perforation of the stomach induced the peritonitis. Sometimes a local inflammation of the peritoneum may become diffused, as when a typhlitis or perityphlitis, or an invaginated portion of the intestine sets up general peritoneal inflammation. Mr. Curling has recorded the case of a little boy, aged two years, in whom the bruising of an undescended testicle produced this result. Again, inflammation may extend from the chest to the abdomen. I can now recall several cases in which a pleurisy has been followed by general inflammation of the peritoneum. I have known this to happen in the first week of the illness, before the fluid had had time to become purulent; but in most cases it occurs later, as a result of the passage of purulent infective matter from the pleural cavity along the lymphatics of the diaphragm to the peritoneum. In order that this extension should occur, there must, no doubt, be present some special conditions conferring peculiar infective properties upon the purulent contents of the thorax. Dr. Burney Yeo has described the case of a schoolboy, between eleven and twelve years of age, who was attacked in the course of whooping-cough by pleuro-pneumonia of the left side of the chest. Nineteen days afterwards this was followed by general peritonitis, and the patient very rapidly succumbed. The same unfortunate accident happened to a little boy, eighteen months old, under my care in the East London Children's Hospital. The child had an attack of pleurisy. As the fluid did not become absorbed his chest was punctured and a quantity of purulent matter was evacuated. The operation had to be repeated several times, and at last, as the purulent fluid still continued to reaccumulate, a permanent opening was established in the chest-wall.

The boy seemed to be going on fairly well when extension of the inflammation suddenly took place to the peritoneum and he soon died.

Peritonitis is sometimes a complication of the blood diseases. It is said occasionally to occur in scarlatina, and erysipelas may induce it. Abercrombie has referred to an epidemic of the latter distemper which occurred amongst the children in the Merchants' Hospital in Edinburgh in the year 1824. The disease was of a mild type, but two of the children rapidly died, and on examination pus was discovered in the abdominal cavity. Peritoneal inflammation is also common as a consequence of abdominal tuberculosis, but the subject of tubercular peritonitis will be considered separately.

Besides occurring as a result of the above causes, peritonitis may arise as a primary disease in a child in whom no deviation from health has been noticed. It is sometimes seen in school-children of either sex, and has been attributed by Gauderon to chilling of the surface after violent exercise, and by Legrand to lying prone upon the damp earth.

Morbid Anatomy.—The pathological characters of peritonitis are the same in the child as in the adult. The vessels are injected, and the normal polish of the serous surfaces is lost, owing to inflammatory exudation. There is infiltration and thickening of the sub-serous tissue, with proliferation of cells in the epithelial covering of the membrane. The exudation poured out from the distended capillaries coagulates on the surface and forms a false membrane, which is at first thin and grayish in colour, afterwards thicker and yellow. It causes adhesion between neighbouring organs, and glues the coils of intestine to one another. There is besides effusion into the abdominal cavity. Its quantity varies. Sometimes it is copious. The fluid is usually opalescent, from proliferated epithelial cells, or may be distinctly purulent.

The longer the disease continues, the tougher and thicker the exudation becomes, so that it may form bands which pass from one organ to another, and in long-standing cases may constrict portions of the bowel and cause serious consequences. If the patient survive, the fluid becomes absorbed, and the exudation gets tougher and forms firm adhesions between neighbouring parts, as well as opaque fibrous patches upon the surface of organs, more or less thick and hard. When the peritonitis is at first partial, as may happen when the inflammation is due to perforation of the bowel, the exudations and consequent adhesions may confine the extravasated matters within certain limits, and thus localise the inflammation.

Pent-up collections of matter may also arise in the following manner: On account of gravitation the purulent fluid is apt to collect in certain spots, especially above and behind the liver. If the child do not die, the fluid, thus accumulated, may become shut off by adhesions so as to produce a local abscess. Abscesses arising in this way are usually seated near the diaphragm, often between that muscle and the liver or spleen. Such a collection of matter may eventually open into the chest and set up pneumothorax.

Symptoms.—In the child peritonitis may give rise to violent and acute symptoms, as it does in the adult. As a rule, it is the primary form—essential peritonitis, as it has been called—which is accompanied by these signs of serious disease. Also, when the inflammation follows upon a blow or other external injury in a child previously in good health, the symptoms are usually striking and severe. In the secondary form, when the child is already reduced by illness, the symptoms, although often sufficiently pro-

nounced, may yet be to a certain extent masked by the state of profound collapse into which the patient is thrown. In other cases the disease may be more or less latent, and indeed is sometimes not discovered until the body is subjected to examination in the dead-house.

In the severe primary form the child complains, often quite suddenly, of pain in some part of his belly—in either flank, above the pubes, or about the navel. At first comparatively slight, the pain soon gets more severe and general, and at the same time the belly becomes tender. Vomiting is almost always an early symptom. The child first ejects partially digested food, and then glairy and bilious matters. If the efforts to vomit are violent, they occasion great distress, on account of the pain and tenderness of the belly; and after each effort the child lies back with haggard, pale face, beads of sweat standing upon his brow. Fever is present from the beginning, and may be preceded by a sense of chilliness, or even distinct rigors. The degree to which the temperature rises varies, as it does in inflammation of the other serous membranes in the child. Sometimes it may reach 104°, or even higher, but at other times it remains little over 100°. The average degree of pyrexia is perhaps between 101° and 102°. At night the child is restless and sleeps little, often waking up and crying with pain in his belly. Sometimes he is disturbed by delirious fancies and talks wildly.

Almost from the first the child is unwilling to move, and he soon takes to his bed. There he lies upon his back, or inclining to one side, with legs and thighs flexed. His face is pale and distressed, his nose looks sharp, and the nostrils are thin and expanded. The slightest touch upon the belly is painful, and he seems to dread the least movement. If the coat of the bladder is involved, there is retention of urine. If the peritoneal coat of the bowel is inflamed, attacks of the most violent colic may come on at intervals, and throw the child into an agony of pain. On examination of the belly, this is seen to be distended with gas; it is motionless in respiration; there is some tension of the parietes, and the tenderness is excessive. Gentle percussion elicits a tympanitic sound over the anterior regions; but in the depending parts, where the fluid collects, the note is dull. Sometimes the fluid is sufficient in quantity, and sufficiently free, to give a distinct sense of fluctuation; but the absence of free fluctuation is no sign of the absence of fluid. There is often effusion between the coils of intestine and in the meshes of the exuded lymph; but this transmits the wave of fluid very imperfectly from one side of the belly to the other. As a general rule, perhaps, fluctuation is imperfect or absent. In these cases Duparcque has suggested that the child should be placed on his side for a few minutes. The whole quantity of fluid will then gravitate to the flank on the depending side. If the child be then quickly turned upon his back, dulness and fluctuation will be found at first at the site of the accumulated fluid, but owing to the second change of position will quickly disappear.

If the distention of the abdomen become great, it may cause serious distress by compressing the lungs and displacing the heart. In such cases there is dyspnœa, with some lividity of the face, and hurry of breathing. The tongue is furred on the dorsum, red at the tip and edges. The pulse is small, hard and frequent. The urine is high coloured, but not especially acid, and its passage causes no pain. The bowels are confined or relaxed. Constipation is the rule in adults, but in children it is common to find looseness of the bowels with watery and offensive stools. Still, even in the child, if the muscular coat of the bowel be involved, and there be no sub-mucous œdema to cause effusion into the intestinal tube, the bowels may be obstinately confined.

As the illness progresses the vomiting usually ceases, but the other symptoms become more and more severe. The tympanitis increases; the tongue becomes dry and brown; the eyes are sunken; the face is haggard and pale, often cyanotic. The child lies with his eyes half closed in a dreamy state. His pulse is excessively small and rapid; and death usually occurs by the end of the week.

In exceptional cases the disease ends in recovery, the fluid being absorbed or discharged through the navel or abdominal wall. I have met with one case in which purulent matter escaped in large quantity through the umbilicus, and the child recovered. If the pus be evacuated by this channel, the relief experienced by the patient is usually extreme. The volume of the belly is diminished; vomiting, if it had persisted, ceases; the tongue begins to clean, and some signs of returning appetite are manifested. M. Gauderon has referred to ten such cases, in eight of which recovery took place. The fistula left after the discharge of the purulent matter closes in about a month, sometimes at an earlier date. The disease is said sometimes to pass into a chronic state. Such a termination would excite suspicions of a tubercular origin for the peritonitis. There are few recorded cases of chronic peritonitis in the child, where an opportunity of examining the body was afforded, which do not make mention of tubercle in the abdominal cavity or in the lungs.

When the peritonitis is the result of perforation of the bowel, the occurrence of this serious accident is indicated by sudden severe pain in the belly, which becomes distended with gas and excessively tender. At the same time the child is reduced by the shock to a state of collapse. His face is haggard and ghastly looking; his eyes are deeply sunken; his pulse becomes very quick and small; his breathing is thoracic; his hands and feet are cold, but the temperature of the body, if taken in the rectum, is found to be 103°, 104°, or even higher. Sometimes he vomits, and the secretion of urine is suppressed. On examination of the belly it is found that the liver dulness has disappeared. Niemeyer gives this as a certain sign that peritonitis resulting from perforation of the bowel has taken place.

The above is the typical form; but often the symptoms are much less characteristic. Pain and tenderness may be little complained of, and, as Andral has pointed out, sudden increase of the prostration and the ghastly look of the face may be the only symptoms drawing attention to this new complication. Even when the pain has been severe, it often ceases completely for some hours before death. In most cases the child survives perforation but a very few days. Sometimes, if adhesion have previously taken place in the neighbourhood of the ulcer, so as to confine the extravasated matters to the immediate vicinity of the rupture, the peritonitis may be localised. An abscess then forms, which after a time makes its way to some point of the surface, and discharges its contents externally. Under these more favourable conditions the child may recover, but it is needless to say that such cases are exceptional.

Sometimes peritonitis in the child is entirely latent, and is only discovered on post-mortem examination of the body. In such cases the belly may be swollen, and the child may look ill and colourless; but pain may not be complained of; there may be no tenderness of the abdomen, no tension of the parietes, no fluctuation, or other sign to indicate the presence of this serious lesion. I have only observed this latent form in cases of secondary peritonitis. In the little boy, whose case has been before referred to, where peritonitis resulted from extension of the purulent inflammation to the belly from the chest, the abdomen was swollen, and a

watery diarrhœa began which resisted all treatment; but there appeared to be no pain or tenderness; the parietes were soft and flaccid; no fluctuation could be detected; and although on account of its fulness the abdomen was repeatedly examined, nothing was discovered to lead to the suspicion of the existence of peritonitis. On examination of the body some purulent fluid was discovered in the peritoneal cavity, and the bowels were more or less adherent from exuded lymph. It is important to be aware of the occasional latency of the inflammation, so that we may not exclude peritonitis, because the symptoms and signs are ill marked and little characteristic of the lesion. If in such a case the delirium, restlessness, and tendency to stupor are unusually prominent, the most experienced physician may misapprehend the nature of the illness and be disposed to suspect the onset of a meningitis. Duparcque relates a case in which this mistake was actually made, and the error was only discovered on examination of the body.

Diagnosis.—When the symptoms are well marked the diagnosis of the disease is easy. Swelling of the belly, which takes no part in the respiratory movement and is intensely painful and tender; vomiting; a pale haggard face, and a quick wiry pulse—these, together with the position of the child in his bed, with the thighs flexed, and his dread of movement or even of a touch, form a very characteristic group of symptoms.

When the inflammation is a consequence of perforation of the bowel, the complication is sufficiently clear. Even if the pain and tenderness are inconsiderable, the sudden occurrence of collapse with tympanitis sufficiently indicates what has occurred.

From tuberculous peritonitis the acute simple form may be readily distinguished by the more violent character of the symptoms and the more rapid course of the disease. In the tuberculous variety vomiting is rare, and the illness runs, as a rule, a very slow and chronic course.

In colic there is often constipation and vomiting, with severe paroxysmal pain in the belly; but between the attacks of pain there is no tenderness; the pulse is less rapid, small, and wiry, and there is none of the fear of movement which is so characteristic of peritonitis.

Rheumatism of the abdominal wall may be mistaken for inflammation of the peritoneum. The distinctive characters are given elsewhere (see page 159).

It is important to remember the occasional latency of the symptoms in peritonitis. Tension of the abdominal parietes on palpation, especially if partial, in a child above the age of infancy, must not be disregarded. It may, of course, be voluntary, and the belly be quite healthy; but if the abdomen is full, and the child looks ill, with a haggard, pinched face, we should consider the possibility of peritonitis, and make a very careful examination. In cases of chronic empyema we should be always on the watch for the occurrence of peritonitis. If the child, after a period of improvement, cease all at once to gain ground and begin to look pale and distressed, with an elevated temperature, a more or less distended belly, and a rapid, wiry pulse, we are justified in suspecting peritonitis although there be no tension, tenderness, or other sign connected with the abdomen to give support to this opinion.

It is well in all cases where a feverish child looks ill and has a distended belly, to make trial of Duparcque's plan of placing the patient for a minute or two on his side, so as to allow all the peritoneal fluid to collect in the depending flank. Turning him, then, quickly upon his back, evidences of fluid, if peritonitis be present, will be found at the site of accumulation.

Had this been done in the case of the little boy already twice referred to, the cause of the distention of the abdomen would not have escaped recognition.

When the inflammation affects exclusively the visceral peritoneum, the muscular coat of the bowel is usually implicated. There is then often obstinate constipation from paralysis of the affected portion of the intestine; there may be vomiting; and excessive tenderness of the belly is combined with paroxysms of colicky pain of agonizing severity. Such cases may simulate very closely obstruction of the bowels, and may be mistaken for intussusception. Some time ago I saw, with Mr. Izod, of Esher, a young lady, aged ten years, who had got up in her usual health on the morning of the previous Sunday. In the afternoon of that day, after running about in the garden (the day was very damp) she complained suddenly of pain in the belly. That night she slept fairly well, but complained of pain again on the next (Monday) morning. A pill was given to her, followed by a saline.

This acted on the bowels, but the pain was not relieved. She slept badly that night. On the Tuesday morning she was seen by Mr. Izod, who found a temperature of 102°. There was some tenderness of the belly, with frequent paroxysms of colicky pain. She had had no vomiting. Opium was given, but the pains continued, becoming more and more frequent and more and more severe. The bowels were confined all the week except on the Thursday, when they acted spontaneously twice, the stools being copious and lumpy, light coloured and rather offensive. I saw the child, with Mr. Izod, on the following Sunday—the eighth day. She was lying in bed hollow-eyed and livid. Every ten minutes a paroxysm of pain came on, during which she raised herself up in an agony and tried to get on to the floor. The belly was swollen and excessively tender, the slightest touch appearing to induce a fresh access of pain. The child had been kept for some time under the influence of chloroform, but when the anæsthetic was remitted the pain instantly returned. Hypodermic injections of morphia and atropine were given repeatedly; but large quantities of these narcotics appeared to dull the pain but slightly. The child died on the following day.

On examination of the body the small intestine was found healthy, except for a reddened and ulcerated patch in the middle of the jejunum. The large bowel was distended with liquid fæces. Its parietal coat was very red and inflamed, but there was no injection of its mucous lining. The parietal peritoneum was not inflamed. Its cavity contained much dirty serum, but no lymph.

If the inflammation, instead of being confined to the visceral peritoneum, spreads through the muscular coat to the mucous membrane (phlegmonous enteritis) there is, in addition to the above symptoms, a profuse watery diarrhœa. The diagnosis is then easy. If the mucous membrane is not implicated, there is constipation which may be obstinate. In such a case intussusception may be excluded by noticing the early occurrence of tenderness, of abnormal tension of the abdominal wall, and in most cases of fever. Moreover, there is no tenesmus; and the passage of blood and bloody mucus from the bowel, which is such a characteristic feature of intussusception, is absent. If, as in the case just narrated, an action of the bowels, spontaneous or otherwise, occurs some days after the beginning of the illness, there is evidently no complete obstruction of the intestinal channel; but unless the invaginated portion of gut be tightly constricted, secondary peritonitis is very unlikely to arise.

Prognosis.—The disease is fatal in the large majority of cases. In primary peritonitis from cold the chances are perhaps a trifle less unfavourable than in the other varieties. Restlessness and inability to sleep are bad signs. In partial peritonitis, if the inflammation remain localised, the child will sometimes recover.

Treatment.—Directly the existence of peritonitis is ascertained no time should be lost in resorting to energetic measures for its removal. The most perfect quiet in bed should be enforced, and the presence of too many attendants should be strictly forbidden. One good nurse can do all that is required. Turpentine stupes should be applied to the belly, and opium should be given by the mouth or by hypodermic injection. For a child ten years of age six or eight drops of laudanum may be given in a teaspoonful of water every four hours, or one-twelfth of a grain of morphia may be injected under the skin, and the operation can be repeated as required. It is best to produce drowsiness, with some contraction of the pupil. Children vary greatly in their susceptibility to this form of narcotic; but inflammation of the peritoneum, if the pain is great, may require larger quantities of the drug than one would be disposed to anticipate to produce a sufficiently sedative effect upon the patient. Thus, I have known a little infant of four months old, who was suffering from agonising colic, owing to inflammation of the peritoneal coat of the bowels, take three minims and a quarter of laudanum in the space of two hours, with but little remission of his suffering. The same infant some hours afterwards had a hypodermic injection of one-twelfth of a grain of morphia; and this powerful dose, although it contracted the pupils to the size of a pin's point, did not completely suppress all signs of pain. Energetic counter-irritation is of great value in these cases, and when the turpentine can no longer be endured upon the abdomen, it may be applied to the front of the chest or to the back. Cold applications are well borne in many cases, and seem sometimes to comfort more than hot flannels. Cold is employed by means of cloths wrung out of ice-cold water and frequently changed.

All purgatives are to be avoided. If it be considered necessary to relieve the bowels, this can be done by enema. If the peritoneal coat of the intestine is involved, constipation is often absolute; but it is best to make no attempt to excite a movement. Our object is to quiet peristaltic action and insure rest. Probably the chief value of opium consists in its influence in this direction. Any attempt, therefore, to oppose its action will be hurtful. If in these cases the paroxysms of pain are frequent and agonising, it is advisable in a robust subject to apply leeches freely to the abdomen. I believe this form of disease to be one in which the abstraction of blood is a distinctly valuable therapeutic means; and should not hesitate to employ ten or twelve leeches, or even more, if the attacks of colicky pain resisted the action of morphia. Even when the inflammation is limited to the parietal peritoneum, leeches may be employed in the case of a sturdy child, when the disease is primary, especially if the pain and tenderness can be referred to any particular spot. In many severe cases of peritoneal enteritis, where the pain is excessive, and morphia, even following the application of leeches, proves impotent to control the paroxysms of suffering, it is advisable to keep the child under the influence of chloroform.

If thirst be much complained of, it is best allayed by sucking ice; and the same measure is also useful in checking the tendency to vomit. The food should be concentrated. Strong beef-essence, milk in small quantities at a time, and yolk of egg can be given; and as the patient becomes weaker,

a teaspoonful of sound brandy in milk or water should be administered every few hours.

Tympanitis is a symptom which it is difficult to treat successfully. I have never seen benefit result from enemata of assafœtida or the passage of a long tube into the bowel. It is best relieved by free stimulation, and the external application of turpentine. If the child survive, and the abdominal distention continue after the inflammation has begun to subside, as a consequence of loss of tone in the bowel, gentle frictions to the belly, compression with a flannel bandage, and quinine and strychnia by the mouth are of service.

When peritonitis is the result of perforation of the bowel, warmth to the abdomen and the feet, the free use of opium, concentrated food, and energetic stimulation offer the best chances of success.

In every case where collections of matter can be discovered under the skin, either at the umbilicus or elsewhere, no time should be lost in aiding the escape of the pus by the puncture of a lancet.

CHAPTER XIII.

TUBERCULAR PERITONITIS.

The inflammation of the peritoneum which results from abdominal tuberculosis usually runs a subacute or chronic course. The disease is rarely acute; but it is important to be aware that an acute form is occasionally met with, and is very difficult to detect. Tubercular peritonitis may be the only indication of the tubercular disease to be discovered in the body, or may be accompanied by signs of distress from other parts of the system. It is rarely seen in young children, perhaps never in infants, and does not begin to be a common affection before the seventh or eighth year of life. After that age, however, it is frequently met with. The earliest age at which the disease has come under my notice has been three years.

Morbid Anatomy.—On opening the abdomen in a case of tubercular peritonitis we find the bowels covered more or less completely with yellowish, greenish, or gray coloured lymph. The consistence of this varies. It may be loose and soft in texture, or tough. Usually it is mixed up with thick cheesy matter. The lymph often lines the parietal peritoneum, and penetrates between the coils of intestine, which it glues firmly together. Sometimes the whole bowel is so matted together into a confused mass that it is quite impossible to follow out the course of the canal. More or less greenish or yellow purulent matter is held in the meshes of the exuded lymph, and more is seen to have gravitated to the deeper parts of the abdominal cavity. On clearing away the lymph from the surface of the peritoneum and contained organs, we find gray and yellow granulations studding the surface more or less thickly. With these are larger masses and even broad plates of cheesy matter, probably also tubercular in their nature. These are yellow or fawn coloured, and may be dotted with black points of pigment. Similar cheesy masses may be discovered lying in the adhesions formed by one organ with another—between the liver or the stomach and the diaphragm, and between the coils of intestine. The more chronic the case the larger and thicker are the caseous masses. When the case is acute, these are usually absent; but the serous surface is covered with lymph in the substance of which are scattered gray and yellow granulations varying in size from a pin's head to a pea.

The larger tubercular cheesy masses may cause the intestinal wall to give way, perforated from without. Extravasation of the contents of the intestine rarely takes place into the peritoneal cavity, owing to the existence of the firm adhesions; but in this way a new and unnatural communication may be formed either between two different parts of the intestinal tube, as was noticed by Messrs. Rilliet and Barthez, or between the bowel and the umbilicus, as happened in a case recorded by Henoch.

In the most chronic cases the adhesions may be very tough and fibrous, and even the lymph on the peritoneal surface may resemble connective tissue. The omentum, itself unusually firm in its texture, may be ad-

herent to the abdominal wall; and the mesentery may be tough and contracted.

Tubercular peritonitis is not always general. Sometimes it is partial, and is then usually confined to the upper parts of the abdominal cavity—the neighbourhood of the diaphragm, the liver, and the spleen. The liver itself is often enlarged from amyloid or fatty change, and has been found by some observers to be cirrhotic. The bowels are often the seat of tubercular ulceration, and the mesenteric glands are enlarged and cheesy.

Besides the peritoneum, tubercle is often found in other organs. In the more chronic cases it may be limited to the abdomen; but in the acute form the abdominal disease is almost invariably a part of a general development of tubercle over the body.

Symptoms.—Tubercular peritonitis always begins insidiously, and its symptoms may be far from being well marked. In some cases attention is diverted from the belly by the more striking phenomena arising from tubercle, and the consequences it involves, in other organs; but even if the tubercular granulations are limited to the abdomen, the early symptoms are often curiously insignificant when we consider the serious nature of the disease. In these cases of local tuberculosis the general nutrition may be good at first, and the appearance of the patient fairly robust; but as the illness progresses the child rapidly loses flesh, colour, and strength, and before death occurs may reach an extreme degree of emaciation.

In an ordinary case, the first sign noticed by the mother is that the child's belly looks large, and the next, that it is a little tender. The child is unusually listless and dull. He looks ill. He avoids exercises which cause a jolt or jar to his body, and shows a caution in all his movements which soon attracts attention.

A boy between ten and eleven years old was brought to me at the hospital. The lad had always been healthy and active, although there was a tendency to consumption in his family. For some weeks it had been noticed that he looked pale, often complained of nausea after food, was languid, lay about instead of playing, and cried if he was scolded. Then he began to suffer from pains in his abdomen, and excused himself on this account from running errands as he had been accustomed to do. Pressure on the belly, as in leaning against a chair or table, had not been noticed to be painful; but the boy said that if he leaned forward his "food" rose at once. After some days the abdomen began to be tender and painful. The child complained of feeling cold, and slept badly at night. He was thirsty, but cared little for food. The bowels were relaxed.

The above is a very good illustration of the mildness of the early symptoms, and the stealthy way in which the disease creeps on. The abdominal pains appear to be at first intermittent and of a griping character. The bowels are relaxed or confined. Often the disease is said to have begun with diarrhœa, and the attacks of looseness are sometimes separated by periods of more or less marked constipation. Nausea and vomiting are not such common symptoms in this form of peritonitis as they are in the simple variety, and the appetite may be preserved for a considerable time.

After some weeks the tenderness of the abdomen and its sensitiveness to the slightest jar or shock, as well as the increasing weakness of the patient, obliges him to keep his bed. But he will sometimes go about as usual, if allowed to do so, for a long time—long after the disease is fully established. He may then be noticed to take very characteristic precautions to avoid jolting his belly when he moves. Thus, he will steady it with his hand as he walks; and go backwards down-stairs, so that he may

more conveniently pass from step to step upon his toes. If the temperature be taken at this time, it will be found to be higher than normal; but the mercury seldom rises above 101° in the evening. In the morning it may be at the natural level.

If the belly is examined, it will be found to be distended and oval in shape, the projection being more marked about the umbilicus and epigastrium than below the navel. The skin has often a shiny look; the veins ramifying over the surface may be noticed to be full; and the natural markings of the belly have disappeared. On palpation there is often increased tension of the recti muscles, which contract instinctively to protect the tender peritoneum, and the resistance offered by the contents of the abdomen is very unequal. In some parts the parietes are easily depressed; in others a certain feeling of solidity is conveyed to the finger, and distinct, firm masses may be often detected here and there. These are usually tender, and frequently pressure upon any part of the belly causes pain. In some cases free fluctuation can be detected. If there be pressure upon the portal vein by enlarged glands or caseous masses, the amount of ascites may be large. It is then often accompanied by œdema of the lower extremities and abdominal wall, with dilatation of the superficial veins of the belly. It is seldom, however, that these symptoms are noticed. Usually the amount of effused fluid is small, and there is merely an imperfect sense of impulse conveyed from one side of the abdomen to the other; not a distinct tap of the wave of fluid, such as we feel in the ascites accompanying cirrhosis of the liver. If the amount of fluid be small, or its consistence thick, no fluctuation may be discovered; but in these cases it will be noticed that on percussing the belly the tympanitic note which prevails over the greater part of the abdominal wall changes in the flanks to dulness from the presence of fluid; and that if the child be laid on one side, so that the fluid may gravitate downwards, the note on the flank turned uppermost becomes clear.

Of these signs the most characteristic are: The enlargement of the belly, with its smooth, shining surface; the tenderness, the unequal resistance at different parts of the abdominal parietes, and the indistinct fluctuation. In some cases, however, many of these symptoms may be absent. The tenderness may be insignificant and the parietes perfectly flaccid; fluctuation may be completely absent; and nowhere may any sense of resistance be experienced by the hand pressing the abdomen. Thus, in a little boy of four years old, after three weeks of illness it was noted: "Abdomen large and smooth, with loss of natural markings; superficial veins of chest and epigastrium dilated; abdominal wall perfectly flaccid; no fluctuation to be detected; edge of liver felt one finger's-breadth below the ribs; edge of spleen not felt; several lumps about the size of a walnut can be perceived in different parts of the abdomen, but not very deeply placed. One of them is immediately below the edge of the liver. They seem tender on pressure, but there is no general tenderness of the belly. Chest healthy. Tongue dry and glazed-looking." The temperature that evening was 98.6°. The child died about a week after this note, of secondary tubercular meningitis. If, in such a case, the liver be much enlarged from fatty infiltration, a very incorrect opinion is likely to be formed of the nature of the illness.

As the disease progresses, the skin often gets very harsh and rough. The child looks haggard and distressed; he rapidly wastes, and his temples and cheeks grow hollow. He lies on his back, or turned partly on to his side, with his knees drawn up, and every movement is painful. The

tongue is dry, and is either thickly furred or is clean and shining, as if denuded of epithelium. The appetite is lost; the thirst is great, and the bowels are generally relaxed. Often, the motions consist of dark, watery, offensive matter, with a flaky deposit containing black clots of blood. Such a stool is very characteristic of ulceration of the bowels. Instead of diarrhœa, there may be constipation which may prove obstinate. Fatal obstruction, even, may ensue. Sometimes at this period the distention of the abdomen becomes very great, and the child is tormented with spasms of colicky pain. In other cases, the size of the belly diminishes, and hard, tender lumps are felt, apparently in firm contact with the under surface of the abdominal parietes. The temperature, which before was variable and often little raised above the normal level, now becomes higher, and in the evening may reach to between 103° and 104°. The emaciation of the child is great, and his weakness extreme.

When the disease reaches this stage, improvement rarely takes place; but at an earlier period of the illness it is not uncommon for the malady to take a favourable turn. The tenderness and tension of the belly then diminish and disappear; the appetite returns; the diarrhœa ceases; the nutrition of the child improves, and he begins to regain flesh. The favourable change may go on in fortunate cases to complete recovery, and although the belly for a long time remains large, there is no return of the serious symptoms. Often, however, after a longer or shorter interval, the child begins to fail once more; inflammation is lighted up again in his peritoneum, and this time the illness goes on uninterruptedly to the end.

In some cases, the course of the disease is very variable, and is broken by occasional periods of remission in which hopes of amendment are raised only to be disappointed by an early return of the worst symptoms. Often, the end of the disease is preceded by purpuric spots on the body, and by œdema of the legs, with no albumen, or with only a trace of it, in the urine. Death may be hastened by tubercular disease of other organs, especially of the lungs, and sometimes, as in the case referred to, the patient dies with all the symptoms of tubercular meningitis. In rare cases, perforation of the bowel takes place, or an abscess forms at the umbilicus or some other part of the abdominal wall.

This chronic or sub-acute form of the disease is always slow in its course, and usually lasts several months. It is the form the disease assumes in the large majority of cases. Occasionally, however, the peritonitis is acute. In all the cases of acute tubercular peritonitis which have come under my notice, the abdominal disease has formed part of a general tuberculosis. The child complains of pain in the belly, but an examination of the abdomen gives entirely negative signs. There is no tenderness of the parietes, or pseudo-fluctuation; no caseous lumps can be felt; and the belly, although full, may not exhibit any remarkable swelling. The child looks ill, and is languid; his appetite is poor, and his evening temperature is higher than natural. Often, his bowels are relaxed. These symptoms, as in all forms of acute tuberculosis, succeed to a period more or less prolonged, of general but indefinite malaise. After an illness lasting a few days or a week or two, the child dies, with or without the symptoms of meningitis. After death, his bowels are found matted together with recent lymph; there is, perhaps, a little thin purulent fluid in the peritoneal cavity, and the signs of general tuberculosis are discovered over the body. In most cases, the existence of the peritonitis is only revealed by *post-mortem* examination.

A boy, aged four years, was under the care of my colleague, Dr. Donkin,

in the East London Children's Hospital. The child was said to have been ill for two weeks. He had first complained of pain in the belly, which was full and distended, and his bowels were relaxed. The pain was attributed by the mother to wind, for it was relieved by hot grog. The looseness of the bowels ceased after a day or two, but the boy remained weak and listless; his feet swelled a little when he sat up, and his face was noticed to be puffy in the mornings. For two or three days before admission he had had a slight cough.

When the boy came into the hospital his face was a little puffy about the eyelids and bridge of the nose. The heart and lungs appeared to be normal. His belly was distended, but there were no dilated superficial veins; no dulness was noted on percussion in either flank; no enlarged glands or fluctuation could be detected; no pain or tenderness was complained of; and the liver and spleen were of normal size. There was a little œdema of the scrotum, but none of the lower limbs. His urine was scanty, but there was no albumen. Pulse, 88, regular; temperature, 98°; respirations normal. After a few days, as the temperature was natural, and the boy was up and about and seemed convalescent, there was a question of sending him home. Before this could be done, however, a sudden change took place in his condition. He became very drowsy, and was forced to return to his bed. He then began to vomit; his pulse was 80 and intermittent: his temperature rose again, and he seemed at times to be only half conscious. Three days after his return to his bed, the boy had an attack of convulsions; his temperature went up to 108°, and he died. On examination of the body, there was found a basic meningitis with many gray granulations in the cranium. Similar granulations were seen on the pleuræ. The peritoneum, both parietal and visceral, was profusely studded over with gray and yellow granulations, varying in size from a pin's head to a pea; and there was much recent lymph, which had matted together the coils of intestine, and fixed them with the omentum to the abdominal wall. There was no excess of fluid in the peritoneal cavity.

Such a case is very perplexing. The only symptoms pointing to the abdomen are the abdominal swelling and pain; but these alone, in the absence of tension and tenderness of the parietes, or other equally characteristic symptom, are insufficient to establish the diagnosis of peritonitis. Pain in the belly is a symptom so frequently met with in the child that its occurrence excites little remark; and a large belly in young subjects is not sufficiently uncommon to attract special attention. Still, if we are aware that the illness may run this rapid course, such symptoms, taken in connection with the general weakness, the slight œdema without albuminuria, and the terminal manifestations of cranial disease, may justify us in at least suspecting the existence of the abdominal complication.

Diagnosis.—In ordinary cases, the diagnosis of tubercular peritonitis is easy. Inflammation of the peritoneum developing slowly and insidiously, accompanied by rapid wasting and a very variable temperature, and preceded by general impairment of nutrition and abdominal pain, is very suspicious of tubercle. We must remember that tenderness and tension of the abdominal wall may be little pronounced, and that fluctuation is often absent, or, if present, is usually imperfect and indistinct. A definite tap readily transmitted through the fluid from one side of the abdomen to the other, although met with in rare cases of tubercular peritonitis, is yet not at all characteristic of this disease. Indeed, if such free fluctuation be present in a child who is lively and fairly active, it tells rather against than

in favour of the diagnosis. In doubtful cases, it is desirable to test the effect of a sudden jar upon the child. If he be made to jump down to the ground from a low chair, and experience no uneasiness from the little shock, it is improbable that the peritoneum is inflamed. A child with abdominal tubercular disease is invariably dull and listless from the earliest period of the disease. He looks ill from the first; and although he may be fairly stout, there are usually signs that his nutrition is already impaired. These symptoms are of great importance when combined with abdominal pain, swelling, and tenderness. Chronic digestive derangements are common in early life, and I have known children who have been habitually overfed with farinaceous food, to be subject for months together to attacks of abdominal pain, often of great severity. But such children are lively and active enough; although pale and often flabby, they do not look ill; they have not the careworn, haggard expression which is almost inseparable from serious disease at every period of life; and although the abdomen may be full and sometimes painful, the fulness is variable, often subsiding completely; there is no tenderness or involuntary tension of the parietes, and the temperature is that of health. Such cases are easily cured. Limiting the consumption of farinaceous matters, a gentle aperient, and an alkaline aromatic mixture, will soon put an end to the indisposition.

The acute form of tubercular peritonitis is often puzzling, especially if, as in the case referred to above, the abdominal symptoms are limited to some swelling and pain. In such a case, typhoid fever is often suspected, and the pyrexia, wasting, and increasing weakness may seem to give strength to this opinion. No evidence is to be derived from the state of the bowels; for whether confined or relaxed, either condition is perfectly compatible with enteric fever. Even if more distinct evidences of peritonitis occur, these may be attributed to perforation and consequent inflammation. Still, the absence of rash and of splenic enlargement, the comparatively moderate pyrexia, and the more haggard aspect of the patient are not in favour of typhoid fever; and if fluctuation can be detected in the abdomen, or slight œdema of the legs and face is noticed, this disease may be at once excluded.

Prognosis.—Tubercular peritonitis is not invariably fatal, and therefore we should not at an early period of the illness act as if the case were a hopeless one. Tension and tenderness are important symptoms, and if the child lies in one position, with his knees raised, apprehensive of the least movement, the sign is not of favourable import. A profuse diarrhœa or the passage of stools indicating ulceration of the bowels must be viewed with apprehension. If the tenderness is extreme, and solid tubercular masses can be felt underneath the abdominal parietes, recovery, although possible is very unlikely. Also, the presence of signs indicating tubercular disease of other organs is of course to be taken as of serious omen.

On the other hand, increased regularity in the stools, improvement of appetite, reduction of pyrexia, diminution or subsidence of abdominal tenderness, and return of cheerfulness are all encouraging signs. We must remember, however, that alternations of improvement and relapse are common in this disease, and that recovery, although not exactly uncommon, is, at any rate, an exceptional termination to the illness.

Treatment.—Absolute rest, hot applications to the abdomen, and opium internally, form the most useful means at our disposal for promoting the subsidence of the disease. The child should be put to bed, and his belly should be kept covered with hot linseed-meal poultices, frequently re-

newed. If the weight of these be complained of, and there is much pain and tenderness, great relief is often derived from smearing the surface with a salve composed of extract of belladonna and glycerine in equal proportions, and covering this with a thick layer of cotton-wool. The child should take a draught containing a few drops of laudanum every night, and if his stomach will bear it, cod-liver oil may be administered. Diarrhœa should be treated with full doses of bismuth and a drop or two of tincture of opium two or three times a day; or three or four grains of extract of hæmatoxylum may be combined with three drops of laudanum and three of ipecacuanha wine in a chalk mixture for a draught to be taken several times in the twenty-four hours. Purging will also be relieved by a small injection of starch and laudanum, given at night. If there be constipation, it is better to avoid aperients and trust to injections to relieve the bowels. When necessary, the accumulation can be cleared away by a good enema of soap and warm water.

The diet of the child should be regulated to suit his powers of digestion. Strong beef-tea and other broths, milk, yolk of egg, minced mutton or chicken, fish, bread and butter, and light pudding should be given. But great attention should be paid that excess of farinaceous matter is not allowed, as acidity and flatulence will increase the discomfort of the patient and be decidedly injurious. A stimulant is required as the strength begins to fail. The brandy-and-egg mixture of the British Pharmacopœia is the best form in which this can be administered.

CHAPTER XIV.

ASCITES.

An accumulation of fluid is sometimes met with in the peritoneal cavity in the child as a result of various causes, and it is not always easy to refer the symptom to its true origin.

Causation.—In childhood, as in after life, ascites may be the consequence of peritoneal inflammation; of obstruction to the flow of blood through the portal vein; and of causes which influence the systemic circulation.

In peritonitis the quantity of fluid is rarely great, and sometimes it is so small that it is with difficulty detected. Even in the subacute peritonitis which is the result of tuberculosis of the serous lining of the abdomen, there is rarely great excess of fluid. In both cases, the symptoms connected with the belly may be so little characteristic that the disease passes completely unnoticed, and is only discovered after death.

The circulation of blood through the portal vein may be obstructed by causes which act within the liver substance or affect the venous channel before its entrance into the organ. Cirrhosis of the liver may cause great impediment to the portal circulation; and there is every reason to believe that this form of disease is less uncommon in the child than was at one time supposed. So, also, hepatic induration resulting from congestion of the organ may be attended by the same result. A hydatid of the liver, if placed near to the concave surface of the gland, may cause sufficient interference with the flow of blood from the abdominal viscera to lead to serous effusion. In the rare cases in which the liver is the seat of a malignant disease, ascites may also occur; and I have known it to be produced by syphilitic gummata of the liver in a young baby.

Of causes lying outside the liver, the most common is the presence of a mass of caseous glands in the hepatic notch. This will press upon the portal vein as it enters the transverse fissure. Pressure may also be exercised upon the vein by malignant or lymphomatous growths of the mesentery, but these are very rarely met with.

Of the causes which act through the general circulation, heart disease takes the first place. It is common in cardiac lesions to find ascites combined with general œdema, and very often serosity is poured out, not only into the peritoneum and subcutaneous tissue, but also into the pleural cavity. Disease of the lungs seldom gives rise to ascites in young subjects; and in cases of Bright's disease, although general dropsy is common, abdominal effusion is more rarely seen. Extreme anæmia is sometimes attended by ascites, but this is not a frequent result of mere impoverishment of blood.

Symptoms.—In a marked case of ascites, the belly is distended and globular. As the child lies on his back the outline of the abdomen is more rounded than in the erect position, for the fluid gravitates and tends to collect in the flanks and swell them out. The skin of the belly is smooth and shining, and may be tense. The umbilicus is generally prominent, and often

the superficial veins of the abdominal wall are unnaturally visible. When the observer places his hands one on each side of the belly, a slight tap of the finger sends a distinct impulse through the fluid to strike against the hand in contact with the opposite wall of the abdomen. This sense of fluctuation is not stopped by pressure made in the middle line of the belly.

On percussion, the note is clear over the upper part of the belly, and dull in the flanks. The dulness varies according to the position of the child, as the fluid always sinks to the most depending part of the abdominal cavity. Consequently, the side turned uppermost always gives a resonant note. If the amount of fluid be very large, the dulness may be general, except, perhaps, over the region of the stomach and transverse colon. In such cases there is usually dyspnœa from interference with the action of the diaphragm; and this is often so distressing that the child cannot lie down in his bed. It may be accompanied by a certain amount of collapse of the bases of the lungs. The pressure of the accumulated fluid may also set up œdema of the lower extremities and genitals, and this quite irrespective of cardiac disease.

In ascites, although excess of fluid will excite discomfort and distress, there is seldom actual pain unless the peritoneum be inflamed. Still griping pains may be sometimes complained of. These are due probably to the interference with digestion set up by the congested state of the gastric and intestinal mucous membrane. For the same reason, looseness of the bowels is a not uncommon symptom. The appetite is often good; the tongue is usually clean; and, in non-inflammatory cases, the temperature is that of health. Often the skin is dry and the secretion of urine scanty, high-coloured, and perhaps albuminous.

Other symptoms may be present, according to the disease of which the peritoneal effusion is the consequence. If there be peritonitis, the temperature is generally elevated, and, in ordinary cases, there is tenderness of the belly with abnormal tension of the wall. We must not, however, always expect such definite signs. As described elsewhere, peritonitis, like pleurisy and pericarditis, may be completely latent, accompanied by none of the characteristic phenomena by which its presence is usually revealed. In peritonitis the amount of fluid is small, as a rule; and fluctuation is often far from being distinct. A scanty secretion may gravitate into the pelvis and thus escape detection on superficial examination; or may be retained in the coils of intestine by adhesion of the coats of the bowel to one another. Evidence of fluid may, however, be often obtained by placing the patient for some minutes on his side, according to the plan advocated by Duparcque. The effusion will then gravitate into the undermost flank. Afterwards, by turning the child quickly on to his back and examining the region lately depending, dulness and signs of fluctuation will be often discovered before the fluid sinks away again from the surface. Another plan is to place the child upon his elbows and knees; the fluid then gravitates to the umbilical region and gives the usual evidence of its presence.

In cases of hepatic cirrhosis, the peritoneal effusion is usually copious, and fluctuation very distinct. The spleen, in these cases, is often enlarged; signs of digestive disturbance are noted; the skin, in advanced cases, has an earthy tint, or may even be jaundiced; the veins of the abdominal wall, especially in the umbilical region, are unnaturally prominent; and signs of dilated hæmorrhoidal veins, even in young subjects, may be sometimes detected.

When the ascites is due to cardiac disease, there is general anasarca; the lips are bluish and the complexion livid; the jugular veins are full

and pulsating, and often fill from below; the breathing is oppressed. The urine is scanty and albuminous; effusion into the pleural cavities may be perhaps discovered, and an examination of the heart at once reveals the cause of the obstructed circulation.

Diagnosis.—A large belly is no sign of ascites. The abdomen in a young child is always relatively large as compared with the rest of his body; and if the child be the subject of rickets, or be injudiciously fed, or suffer from looseness of the bowels, the disproportionate size of his belly is still further exaggerated. Flatulence is the commonest cause of abdominal distention in the child, and the increase in size from this reason is sometimes so great as to excite serious alarm in the minds of the parents. It is very common in rickety children who habitually suffer from derangement of the bowels and consequent fermentation of food. In this distress, the flatulent distention is rendered more conspicuous by the relaxed state of the abdominal muscles and the shallowness of the pelvis. Often, in these cases, on palpation of the belly, an indistinct sense of fluctuation may be felt between the hands, placed on either flank. This is conveyed through the distended bowels. It is distinguished from the impulse conveyed by a wave of fluid by the effect upon it of pressure made in the middle line of the abdomen. If fluid be absent, the tap of the finger will then at once cease to be felt by the hand placed on the opposite side of the belly.

Enlargement of the abdominal organs may also determine the distention of the belly. Congestion, amyloid and fatty degenerations, hydatid disease, and hypertrophic cirrhosis of the liver; a spleen enlarged from amyloid disease, rickets, or ague; a kidney the seat of sarcoma or hydronephrosis; cancerous or lymphomatous growths from the omentum or abdominal glands—in all these cases the size of the belly may be increased.

The only test of ascites is the presence of fluctuation. This, if the amount of fluid is small, can often be obtained by placing the patient in such a position that the fluid may gravitate to the surface and thus be brought within reach of the fingers. It is not enough, however, to detect the presence of ascites. We have to ascertain, if possible, the cause to which this excess of fluid is owing. If the symptoms of the determining disease are well marked, the diagnosis may be easy. If, however, the symptoms are obscure, the case may present great difficulty, and often it is impossible to arrive at a positive conclusion.

A little girl, aged seven years, of healthy parentage, was a patient in the East London Children's Hospital. The child had passed through measles and whooping-cough, and between two and three years previously had had an attack of scarlatina which was followed by dropsy; but this had been completely recovered from. There was no rheumatic tendency in the family, and the girl herself had never suffered from rheumatic pains, but she was said to be subject to bilious attacks.

Six weeks before her admission she had begun to complain occasionally of feeling cold, and used to come back from school saying she had a headache. She also occasionally complained of pains in the right side of the abdomen, and sometimes vomited. After these symptoms had continued for a fortnight, the pains became more severe and paroxysmal, and the belly began to swell. From that time she lost flesh. Her appetite had been pretty good, and the bowels usually regular; but she had had two or three attacks of diarrhœa, lasting on each occasion twenty-four hours. For two or three days before admission she had had attacks of shivering.

When first seen, the girl was in fair condition, and, although pale, had

no distressed expression of face. Her lips were pink. There was no yellowness of the sclerotics. The skin was a little dry, but not harsh or rough. The belly was very full and tense-looking. Its girth was 27½ inches. It fluctuated freely, and the veins of the parietes were unusually visible. The lower edge of the liver could not be felt; its upper border was in the fourth interspace. The spleen was estimated by percussion (the child lying on her right side) to reach from the seventh to the ninth rib. There was no tenderness of the belly. The heart's apex was between the fifth and sixth ribs, and the precordial dulness reached upwards to the second rib. On auscultation, a distinct rub was heard with the systole and between the two sounds at the mid-sternal base. The lungs were healthy, except for a little sub-crepitant rhonchus at the bases, which disappeared in a great measure after a cough. The child was thirsty, but had little appetite; her tongue was clean and rather red. Pulse, 128; very intermittent, weak and soft. Her bowels acted regularly every day, and the motions had a natural appearance. The urine was very clear and pale. It was acid; had a density of 1.015, and contained no albumen or bile pigment. The temperature on the morning after admission was 103°.

During the next three weeks the temperature continued to be febrile; the physical signs in the chest became more developed, and the child passed through a well-marked attack of pericarditis with effusion. As the pericardial fluid became absorbed, the ascitic effusion began also to disappear and the abdomen to diminish in size. In four weeks from the time of admission, the child was convalescent and was discharged. About a month afterwards she was readmitted with an attack of well-marked enteric fever. It is curious that during this illness the ascites and pericarditis both returned; but they subsided again, as before, during convalescence from the fever. Eventually, the girl recovered her health completely.

The cause of the ascites in this case is not very clear; but the absence of all symptoms pointing to the liver, combined with the natural size of the spleen, seemed to exclude cirrhosis. The history suggested peritonitis, and although the characteristic features of this disease were absent, such absence is occasionally observed. Taking into account the previous symptoms, the high temperature, the occurrence of pericarditis as if from extension of the inflammation, and the completeness of recovery, this view would seem to furnish the most probable explanation of the child's illness.

In some cases, fluid may be present in the abdomen from other causes than ascites. Thus, a large hydronephrosis which almost completely fills up the cavity of the belly, may be accompanied by free fluctuation, evidently due to fluid; and it may not be easy to distinguish this condition from a copious peritoneal effusion. On careful examination, however, it will be usually found that in hydronephrosis the swelling of the abdomen is not quite symmetrical, but that the flank on one side shows a greater prominence than on the other. The resistance is also greater over the site of the greatest bulging; and although, as the child lies on his back, the umbilicus is absolutely dull, a spot can often be discovered in the less prominent flank where a clear percussion-note is obtained. Lastly, tapping the swelling will withdraw a fluid containing urea.

Prognosis.—In cases of ascites, the child's prospects depend less upon the amount of fluid effused into the abdominal cavity than upon the cause of the phenomenon and the general symptoms by which the effusion is accompanied. Causes which affect the system generally, or impede the flow of blood through the portal vein as a consequence of obstruction to

the general circulation, are especially to be feared. Thus, ascites from tubercular peritonitis, or from heart disease, is a symptom of serious import. In all cases, the prognosis depends chiefly upon the pathological condition which has occasioned the escape of serosity. If this cannot be discovered, we must judge of the prognosis by remarking the state of the child's strength, his temperature, and his pulse; and by noting the degree of efficiency with which the skin and the other emunctories of the body are performing their functions. The skin in particular is an important guide. If the temperature is not elevated, the urine non-albuminous and of normal density, and the skin of natural tint, and neither dry nor harsh, we may speak favourably of the child's chances of recovery.

Treatment.—The treatment of ascites is dependent upon the illness in the course of which the symptom has arisen. If peritonitis (simple or tubercular) be present, the special measures recommended in the chapters relating to those diseases must be resorted to. If the ascites form a part of general dropsy dependent upon heart disease, it will be relieved by the diuretics, purgatives, and cardiac tonics and stimulants which are found efficacious in that serious condition.

In cases of ascites of obscure origin, or dependent upon disease of the liver, iron and other tonics have often a marked influence in reducing the amount of fluid in the peritoneum and improving the general condition of the patient. The exsiccated sulphate of iron is well borne by children, and may be given three times a day, in doses of five grains, to a child of three or four years of age. The tincture of the perchloride of iron with quinine is also useful; but whatever form of chalybeate is used, the dose should be a large one. Violent purgatives are to be avoided, but constipation must be treated by suitable doses of compound liquorice powder, compound jalap powder, or, if at the beginning of the treatment, by a grain of calomel followed by a saline. The action of the skin must be maintained by a daily tepid or warm bath; and the child should be dressed in woollen underclothing from head to foot.

If the accumulation of fluid be copious, paracentesis should be performed without hesitation; and it is now generally held that promptness in the performance of this operation is to be preferred to delay. The diet of the child, as in all forms of chronic disease, should be arranged according to the state of his digestion; and a watch should be kept over his capacity for digesting starch, sugar, and all forms of fermentable food. An excess of such matters would encourage flatulence and colicky pains, and must therefore be avoided.

CHAPTER XV.

INTESTINAL WORMS.

Of the many varieties of parasitic worms which infest the alimentary canal in childhood, three only are of special practical importance from giving rise to disturbance or distress. These are :—The small thread-worm, the long round-worm and the tape-worm. There is one other, the large thread-worm (tricocephalus dispar), which is also occasionally met with ; but the creature seems to give rise to no symptoms, and is only discovered by its presence in the stools.

Description.—The *small thread-worm* (oxyuris vermicularis), often called seat-worm, belongs to the order nematoda. To the naked eye, these worms have the appearance of fine white threads. Both female and male specimens exist together, the former being the larger. In both sexes the anterior part of the body is of fusiform shape. It is narrowed towards the head, which is abruptly truncated and provided with three tubercles. The male is one-sixth of an inch in length. Its intestinal tube extends the whole length of its body, and terminates in the anus at about the middle of the tail. The tail is arranged in a spiral form. The penis is minute and hook-shaped. The female measures nearly half an inch in length. Its body ends in a long tapering tail, which is three-pointed at the end. Under the microscope its uterine ducts can be seen to contain a multitude of ova. The eggs are long and unsymmetrical. They may be readily hatched by exposing them to the sun in a moistened paper envelope, as in the experiments of Vix and Leuckart. When this is done, tadpole-shaped embryos escape at the end of five or six hours, and rapidly develope into slender worms. It appears from the researches of Leuckart and Heller that the embryos can escape from the ova in the human body. Heller states that their liberation takes place in the stomach under the influence of the gastric juice. From the stomach the creatures pass into the duodenum and upper bowel, growing rapidly as they descend the alimentary canal ; and by the time they reach the cæcum have arrived at sexual maturity.

According to Dr. Cobbold, the cæcum is the customary habitat of these parasites ; but they have a tendency to migrate, especially into the sigmoid flexure and lower rectum, and can often be seen moving about in the folds of the anus.

The *long round-worm* (ascaris lumbricoides), often called *lumbricus*, is a large nematode worm of a yellowish red colour. The female is fifteen inches, and the male ten inches in length. The body is cylindrical, tapering to either extremity, but more rapidly towards the head. The mouth is triangular, having three lips. It is armed with numerous (about two hundred) microscopic teeth. The alimentary canal is simple, without division between stomach and intestine. The tail is conical and pointed. In the male it is curved like a hook towards the ventral aspect of the body ; in the

female it is straight. The eggs, which are excessively numerous in each female specimen, are oval in shape, and have a thick, firm, elastic, brownish shell, which is usually nodulated on the surface. In these ova, the embryos develope very slowly, for Davaine kept some alive for five years without perceiving any attempt of the immature tenants to escape from the shell. These embryos have a curious tenacity of life, for they cannot be destroyed by frost or complete desiccation. It has been doubted whether the eggs can be hatched, and the embryos escape and pass through their developmental stages to maturity, in the alimentary canal of the subject infested with them. It appears, however, from the researches of Heller that this is possible.

The lumbricus inhabits the smaller bowel, but is migratory in its habits, and has a peculiar tendency to wander. The worms have been consequently found after death in very curious places. They have been seen in the nasal passages ; in the larynx and bronchi ; in the ducts of the liver and pancreas ; in the gall-bladder, and even in the cavity of the peritoneum, and in the interior of abscesses communicating with the abdomen. The worm has no power of penetrating the living tissues, but can pass through an ulcerated surface. Thus, it has been known to pass through an ulcerating lesion of the vermiform appendix, and set up peritonitis by entering the cavity of the abdomen.

The *tape-worm* is a flat, jointed worm which belongs to the order cestoda. Several varieties of this parasite may be found in the human subject. The most common is the *tænia medio-cannellata* (the beef tape-worm). The *tænia solium* (the pork tape-worm) is also met with. The *bothriocephalus latus*, another species, is not common in the British Islands, although it is less rare on the continent of Europe. There are other varieties, but these, as they are very seldom seen, need not be here considered.

All these worms are flat, segmented creatures, destitute of mouth or alimentary canal. They grow from the head, which developes a continuous linear series of new joints by a budding process. The joints are quadrilateral in shape. They are at first immature, but as their distance from the head increases, they become larger and more developed. Strictly speaking, the tape-worm is not a single parasite, but a community of individually distinct creatures, of which only the lower or older members (proglottides) are sexually complete. These contain each their own organs of generation, both male and female.

Between the T. medio-cannellata and the T. solium, the difference is chiefly in the shape of the head. In each, the neck is tapering and thread-like, and about an inch in length. This passes gradually into the anterior part of the body, which is sexually immature, and is not distinctly jointed. By degrees the transverse lines, which mark the imperfect divisions of the young segments, become more defined and more widely separated, so that, while the more recent segments, or those nearest to the neck, are much wider than they are long, the older joints, as they become more and more mature, grow to be much longer than they are broad. Each mature segment (or proglottis) is about half an inch long by a quarter of an inch broad. It contains an elongated, tubular uterus, branched on either side ; and the male and female organs of generation open by a common perforated papilla, which is placed at the border below the middle line, on one side or the other, but not in regular alternation. In a worm eight feet long, the total number of joints has been reckoned at about eight hundred ; but it is not until near the four hundred and fiftieth segment from the head that the joints begin to be sexually mature. The head is globular, and

about the size of the head of a small pin. In the T. solium, it forms in front a short cylindrical proboscis (rostillum) having four projecting suckers decorated by a crown of twenty-six hooklets. In the T. medio-cannellata there is no crown of hooklets or proboscis; but the suckers are large and prominent, and there is usually a fifth smaller one in the ordinary position of the rostillum.

These worms often grow to a great length and may measure many yards. They infest the small intestine and may number one or more in the same subject. The eggs, which are very numerous, lie in the uterine ducts of the mature segments; and each contains an embryo which, in the case of the tænia solium, is furnished with three pairs of hooklets.

The mode of development of the creature is as follows:—The tænia, unlike the other worms which have been described, does not pass through all the stages of its growth from the ovum to maturity in the body of the same individual, for the embryo does not develope directly into the perfect worm. There is a transitional stage which requires to be completed in the body of an intermediary. This agent is usually an animal. Thus, when a ripe joint filled with ova is eaten by an animal, it passes into the stomach. There, the eggs are ruptured, and the embryos (pro-scolices) escape. These embryos have a tendency to perforate the tissues of the animal by whom they are harboured. They may thus make their way into the cellular tissue of a muscle, into the liver or the brain. Thus sheltered, they pass through a metamorphosis, and become the cysticercus or bladder-worm. The cysticercus cellulosæ of pork consists of a cyst-like body, with a head and neck like those of the fully-developed worm. These are usually inverted within the body. As long as the cysticercus is unmolested it undergoes no further change; but when the flesh of the animal is eaten imperfectly cooked, so that the vitality of the cysticercus is uninjured, the creature at once adapts itself to its new situation, and attaching itself to the wall of the small intestine, developes in the course of a few months into the perfect tape-worm.

The bothriocephalus latus, in its general appearance, resembles the two varieties of tænia just described, but is rather larger and may grow to a greater length. The mature joints are broader than they are long, and the sexual openings are placed, not at the side of the segment as in the tænia, but in the middle of the joint, where they appear as rosette-shaped patches. This tape-worm, like others, has an intermediate or larval stage; and it had long been suspected that its ciliated embryo found shelter in the body of some aquatic animal. Dr. Braun, of Dorpat, has lately found the early asexual form of the bothriocephalus encapsuled in the intestine of the pike, and also in some of the muscles, in the liver, and in the spleen of the same fish. Dr. Braun gave these organisms experimentally to dogs and cats, who were put on a strict diet and allowed only distilled water for drink. As a consequence, segments of the bothriocephalus began quickly to appear in the fæces of the animals.

Causation.—The means by which thread-worms gain access to the human body, is by the direct passage of the ova into the mouth. The eggs are often introduced clinging to fruit, cresses, and various articles of food. But they may also be directly conveyed to the mouth by the patient himself. It has been said that the embryo is liberated from the egg in the child's stomach by the action of the gastric juice upon the ovum. It has been also stated that each individual female worm contains in itself a multitude of eggs which pass out in large quantities with the stools. The embryos are probably not liberated from the ova in the bowels; but if the

ova are re-introduced into the alimentary canal by the mouth, they become exposed to the action of the gastric juice in the stomach, and their contents may be set free. According to Dr. Cobbold, children frequently carry the ova under their nails ; for the irritation to which the presence of the oxyures gives rise, obliges them to seek relief by scratching. In this way the eggs may be transferred directly to the mouth.

The ova of the lumbricus appear to be imported through the medium of impure water. This parasite is said to be especially common in low-lying, marshy districts.

In the case of the tape-worm, it is through the eating of imperfectly cooked flesh infested with the cysticercus that an individual becomes the unwilling harbourer of the parasite. The tænia solium is derived from measly pork ; the tænia medio-canellata from beef. In children who suffer from a chronic looseness of the bowels, and are consequently fed with pounded raw meat, tape-worm is occasionally met with.

Symptoms.—The most varied symptoms have been ascribed to the presence of worms in the bowels. Most of these are doubtless due to the intestinal derangement from which the patient is commonly suffering. That they are not a necessary consequence of the visits of these parasites is shown by the fact that it is not rare for the creatures to be found in the stools of children who have not previously exhibited any sign of discomfort or distress. In these cases, the worms are usually few in number, and can be readily got rid of by the administration of an ordinary aperient. It seems necessary for the extensive propagation of the entozoa that a catarrhal condition of the bowel should be present. In the secreted mucus the embryos find a favourable medium for development, and if, as often happens, the flux be profuse, great difficulty may be experienced in freeing the patient from these irritating pests. It is in such cases only that severe general symptoms are found ; but these, as has been said, are to be rightly attributed, not to the parasites, which may be looked upon as accidental complications, but to the unhealthy state of the alimentary mucous membrane, which hinders digestion and impairs the nutrition of the body. These symptoms are described elsewhere (see page 121), and need not be here repeated. There are, however, many special symptoms which are attributed directly to the presence of worms ; and as they are not necessarily the consequence of the intestinal derangement referred to, and often cease when a number of worms have been expelled, it is possible that they are really due to the irritation set up by the creatures in the bowels.

Most of these special symptoms will be referred to in describing the particular symptoms produced by the several species of worm. It may, however, be stated in this place, that every variety of nervous symptom, from headache, and other disorders of sensation, to spasm, paralysis, and convulsions, has been found associated with the presence of worms in the alimentary canal. Some of these have been looked upon as pathognomonic. Thus, Dr. Underwood held that an attack of convulsions, accompanied by small pulse and hiccough, was an almost certain sign of worms. Monro was of opinion that unequal dilatation of the pupils pointed positively to the same conclusion. Others have relied upon the rapidity and irregularity of the pulse as furnishing sufficient grounds for the diagnosis. It cannot be denied that these symptoms may be noticed in children suffering from intestinal worms, and may possibly be produced by them ; but similar symptoms are found in cases where careful observation fails to discover any sign of the creatures or their ova in the stools.

There is one symptom which, although not positively distinctive of the

irritation of worms in the bowel, renders the presence of the parasites highly probable. This symptom is a peculiar appearance of the tongue. In all cases where the bowels are the seat of a mucous flux, the tongue gives evidence of this condition. It is flabby, and indented at the edges by the teeth. The increased secretion of mucus in the mouth gives to the tongue a slimy, gummy appearance. The lingual surface is covered with a thin coating of gray fur, and the fungiform papillæ at the sides of the dorsum peer through the fur as round or oval spots, which are more or less red, according to the degree of irritability of the stomach. In cases where worms are present, I have often remarked a peculiar fawn colour of the fur covering the dorsum, and the slimy appearance of the organ has been especially noticeable.

A child may be infested by more than one variety of worm at the same time. It is not uncommon to find round-worms together with thread-worms; and sometimes round-worms and tape-worms are present at the same time in the same subject. Thus, a little boy, aged one year and eight months, was under my care for tape-worm, from which he had been suffering for three months. This child, on one occasion, passed a large round-worm and many joints of the tænia in the same stool.

In the case of *thread-worms*, the patient seldom complains of abdominal pain, but the irritation set up in the rectum by the presence of the entozoa gives rise to a troublesome itching of the fundament, which in sensitive children may cause an extreme degree of suffering. This irritation comes on towards the evening, and at night may be so distressing that sleep is greatly interfered with. In some cases, in addition to the itching, shooting pains may be complained of in the same part. Catarrh of the rectum is not uncommon in such subjects. There may be looseness of the bowels, and the evacuations are often discharged with straining efforts. They may be followed by prolapse of the rectum. The stools often contain glairy mucus, and sometimes blood in streaks, or even clots of considerable size. Difficulty in emptying the bladder may be a consequence of the irritation, and the child sometimes holds his water for many hours together. Itching of the nose, a leaden tint of the lower eyelid, and swelling of the upper lip, are also very common symptoms when thread-worms are present.

The worms are readily detected as white moving threads in the stools, and may be seen in the folds of mucous membrane about the anus. They may pass or be conveyed into the vagina in little girls; and can often be discovered in the bed-clothes. A microscopic examination of the stools usually discovers a multitude of ova.

The *lumbricus*, on account of its large size and its habits of nocturnal activity, is a cause of considerable irritation. This worm is said frequently to give rise to nervous disorders in the child; and cases have been recorded in which severe headache, photophobia, choreic movements, convulsions, and even profound coma have ceased on the expulsion of a number of these creatures. It is difficult to say what share the worms take in the production of such symptoms. Probably some additional cause is in operation, for in rickety children, whose tendency to convulsions and other forms of nervous disturbance is one of the most characteristic consequences of that phase of general malnutrition, I have not noticed that the presence of the long round-worm is especially liable to be accompanied by eclamptic seizures. Probably, in most cases where nervous symptoms are associated with intestinal worms, the nervous disturbance is quite independent of any irritation produced by the worms in the bowels. It is common enough for children who are suffering from undoubted disease of the nervous centres

to be infested with lumbrici. Thus, in cases of tubercular meningitis, one or more long worms are often expelled by the action of aperients; but it is needless to say that in such a case no amelioration in the symptoms follows the expulsion of the parasites. So, also, children under my care suffering from chorea have passed lumbrici, but I cannot call to mind a single case where any improvement in the disease has directly followed the appearance of the worm in the stools.

If, however, the nervous symptoms supposed to be produced by lumbrici must be looked upon as somewhat problematical, there are other phenomena which can be referred with much greater certainty to the irritation set up by the entozoa. Severe abdominal pains of a colicky character are not uncommon in children who suffer from these creatures; and looseness of the bowels, occurring chiefly at night, is occasionally produced by this agency. I have seen several cases of this kind where a diarrhœa, after persisting for months, ceased immediately that the worm was got rid of.

A little boy, aged four years and a half, was said to have been troubled for three months with persistent looseness of the bowels. The purging was never very severe, but was always worse at night. The motions were said to be very slimy, and after a dose of oil, usually contained threadworms. The child often complained of colicky pain and tenesmus. He had been slowly wasting from the time the purging first began. The occurrence of nocturnal looseness of the bowels, combined with the appearance of the tongue, which was very flabby, slimy, and drab-coloured, with large fungiform papillæ at the sides of the dorsum, made me suspect the presence of a long-worm. I ordered a powder containing one grain and a half of santonine and half a grain of calomel to be given every night for three nights, and to be followed each morning by a dose of castor-oil. After the first powder the child passed a long-worm, and the diarrhœa ceased from that time. He then rapidly regained flesh.

As a rule, lumbrici become active at night, and may pass upwards into the stomach, or downwards into the colon and rectum. They have been known to issue spontaneously from the mouth of a child during sleep, or to appear from the bowel without being discharged in a stool. Their presence in the stomach may give rise to nausea and retching. Sometimes they pass into the common bile-duct and cause jaundice, by obstructing its channel. If jaundice rapidly developes in a child who is known to be troubled with this parasite, we should think of the possibility of this rare accident having happened. Sudden dyspnœa has been known to arise. In some instances, at least, this has been discovered to be due to the actual penetration of the worm into the air-passages. Thus, Andral has known death to occur from this cause; and Arronsshon has reported the case of a little girl, aged eight years, who, after suffering for two hours from distressing dyspnœa and cough, suddenly, after a violent paroxysm of cough, ejected a long-worm and was immediately relieved. In other cases, the difficulty of breathing has been attributed to direct pressure upon the larynx and trachea by a number of worms in the gullet, or to reflex action, propagated from the intestine; but these explanations are neither of them very satisfactory. It has been so much the tendency to attribute every kind of discomfort arising in cases where worms are present to the irritation of the parasitic creatures in the bowels, that probably sufficient care has not been always taken to exclude other and less obvious causes of the symptoms.

Lumbrici are sometimes present in very great quantities. The largest number I have known to occur together in one child has been twelve; but they are sometimes much more numerous, and may even amount to several

hundreds. When thus multiplied, the worms may form bundles, which impede the passage of the contents of the bowel, and are said in some cases to give rise to the symptoms of obstruction.

The *tape-worm* is often found in children and sometimes in infants. One child who came under my own observation began to pass the joints at the age of fifteen months. Other observers have met with the worm in still younger subjects. These, however, are exceptional cases, but in older children, of five or six years and upwards, the affection is as common as it is in the adult. In these patients, little disturbance appears to be excited by the parasites. Pallor and loss of flesh are often complained of; but these symptoms, as in the case of the other species of parasite, appear to be due less to the worm than to the mucous derangement of the bowel with which its presence is usually associated. Headache and discolouration of the lower eyelid also often occur, and may be attributed to the same catarrhal condition. Often, however, the digestion remains good, and the child, except for occasionally passing segments with the stools, is to all appearance well.

Diagnosis.—No symptoms are to be relied upon in the diagnosis of intestinal worms. The only sign from which we can draw any positive inference, is the appearance of the creatures or their eggs in the stools. Therefore, if from any cause we suspect their presence in the bowels, we should at once adopt appropriate treatment, and order the evacuations to be carefully searched for signs of the parasites. A microscopic examination of the matters discharged from the bowels will often discover the presence of the ova.

Treatment.—With the exception of the tænia, worms are usually expelled readily in young subjects; but it is less easy to prevent their frequent reproduction. In all cases where children continue to be infested for long periods with the oxyures or lumbrici, the bowels will be found to be the seat of a chronic mucous flux. There can be little doubt that in such cases the ova lodge in the abundant secretion and find in it a congenial medium for development. Therefore, in all such cases, the special means adopted for relieving the bowels of their unwelcome tenants must be conjoined with other measures for arresting the chronic derangement of the mucous membrane and restoring the intestinal canal to a healthy state. These measures consist in the adoption of a careful diet, from which sweets and farinaceous matters are in great part excluded; in the frequent use of mild aperients to clear away mucus accumulated in the alimentary canal; and in the administration of alkaline and other remedies to check hyper-secretion from the mucous membrane. This subject is referred to elsewhere (see page 127).

Thread-worms are most effectually and easily removed by the use of enemata. For this purpose, lime-water, or an infusion of quassia, or a solution of common salt (a teaspoonful to four ounces of water), may be employed. In using these agents, the bowel should first be cleared out by a copious injection of warm water. Afterwards, five or six ounces of the special enema should be administered, and be retained for a few minutes by pressing the anus before it is allowed to escape. In obstinate cases, santonin (one grain to a child of four years old) should be added nightly to a dose of the compound liquorice powder or other mild aperient; and five grains of tartarate of iron, with one or two drachms of the compound decoction of aloes, diluted with water and sweetened by a few drops of spirits of chloroform, may be given two or three times a day.

Looseness of the bowels in these cases is readily arrested by a dose of

castor-oil. The nocturnal itching may be greatly relieved by the application to the fundament of an ointment composed of equal parts of unguentum hydrargyri and lard, as recommended by Dr. R. Liveing; or by the use of a salve made by rubbing up one drachm of finely powdered camphor with an ounce of lard. In all these cases, the greatest cleanliness must be observed, and after each action of the bowels the parts should be well washed with soap and warm water.

In the case of *lumbrici*, santonin is especially indicated. The remedy is best combined with a dose of calomel. Thus, for a child of five or six years old, two grains of the former may be given with half a grain of the subchloride of mercury every night for two or three nights, and be followed each morning by a purgative dose of castor-oil. Employed in this manner, the drug rarely fails to bring away the round-worm, if one of these creatures is hidden in the bowels. Santonin is a remedy which should not be given in too large doses. In some children it causes vomiting; in others it produces giddiness, with impairment of vision, so that all objects seem tinted with a green or yellow colour. Usually, it increases the amount of urine and gives a yellow tinge to the secretion.

For children who, on account of vomiting or other toxic effect of the medicine, cannot take santonin without discomfort, some alterative remedy must be used. Cowhage (the hairs of the mucuna pruriens) may be prescribed in doses of thirty to sixty grains, given twice a day in treacle or glycerine. Dr. W. Roe speaks highly of the sulphites, especially the bisulphite of soda, and recommends ten or fifteen grains to be given three times a day in water sweetened with spirits of chloroform and flavoured with tincture of orange-peel. Neither of these remedies has any laxative action. Each should, therefore, be always followed by a purgative dose of aloes, senna, castor-oil, or other mild aperient. Oil of turpentine is another useful vermifuge. It can be given in a morning dose of two drachms (for a child of six) combined with an equal quantity of castor-oil.

It is not advisable, in ordinary cases, to continue the use of anthelmintics if the first doses have been given without effect. It must not be forgotten that all the symptoms of worms (*i.e.*, of irritation of the bowel) may be present although special remedies fail to produce any sign of the creatures in the stools. If, therefore, after a few trials, no lumbricus is discovered, we should attribute the symptoms to the general intestinal derangement, and take the necessary steps to bring the disorder to an end.

The successful treatment of *tape-worm* in the child is often a matter of no little difficulty. Probably the softer mucous membrane in the young subject adapts itself more readily to the action of the suckers than is the case in the adult, for in my experience it is comparatively rare for the head to be discovered in the evacuations. The joints can be readily expelled, but the head too often remains behind. In all these cases, great care should be taken in the examination of the stools. All the visible joints should be first removed. The fæcal matter should then be diluted with water and emptied slowly from one vessel into another, with every precaution that the liquid excreta is thoroughly searched by the eye as it passes over the side of the utensil. The sediment remaining should be then again diluted and strained through a fine sieve. By this means, the head, if it have passed from the bowel, can scarcely escape notice.

Various kinds of vermifuge are relied upon in the treatment of these parasites. Kousso, kamala, filix mas, turpentine, and a decoction of the fresh bark of the pomegranate root have all their advocates. Filix mas,

which is the favourite remedy for the adult, is uncertain in the case of children. For young subjects, it is best combined with kamala. A drachm of powdered kamala is made into an emulsion with mucilage, and then triturated in a mortar with a drachm of fern-oil, adding water slowly to make a three-ounce mixture. It is important that the remedy be given fasting. The child should be allowed to take nothing but a little water after his mid-day dinner. The draught should be given on the following morning, divided into two portions, of which the second half must be taken at an interval of three hours after the first. Kamala has an aperient action of its own. This method of treatment, therefore, seldom requires the assistance of a purgative, as is necessary in the case of male fern-oil given alone. After the two draughts have been swallowed, the patient should still continue his fast until the worm comes away in the stool. I have found children bear this method of treatment well, and it is often effectual. If the draught excite vomiting, it should be repeated, preceded by a small dose (℥ ij.–iij.) of laudanum to quiet the irritability of the stomach.

Kousso is preferred by some. The remedy is given in doses of two or three drachms divided into two portions, and given at an interval of half an hour in milk. The draught should be taken in the early morning, and should be followed in an hour after the second dose by a spoonful of castor-oil. The principal objection to this method of treatment is the large quantity of the drug which it is necessary to swallow in order to produce any satisfactory effect. The same objection applies to the decoction of pomegranate bark. If these remedies fail, turpentine should always be tried. This oil may be given in one large dose, or in smaller quantities frequently repeated. In the large dose it may be administered as recommended for the lumbricus. In smaller quantities, Dr. H. Davies recommends half a drachm to be mixed with honey and given in a draught with mucilage and water every six hours. Every second morning he orders a powder of calomel and the compound scammony powder.

In all cases where there is much derangement of the bowels, and large quantities of mucus are passed in the stools, a rigid diet, from which starchy matters and sweets are carefully excluded, should be enforced for at least a week before the special treatment is undertaken. This precaution greatly increases our chances of success.

Part 10.

DISEASES OF THE LIVER.

CHAPTER I.

JAUNDICE.

JAUNDICE is common in early life. This symptom may be found in children as a consequence of the same causes which produce it in the adult. There is in addition a special form of jaundice seen in new-born babies which is called *icterus neonatorum*. It will be therefore convenient first to describe jaundice as it occurs in the new-born baby, and afterwards the symptom as it is met with in older children.

Icterus neonatorum, or infantile jaundice, must be distinguished from the yellowish discolouration of the skin which succeeds in many cases to the intense cutaneous congestion of the first few hours or days of life. This staining is not dependent upon the secretion of bile, and is not a jaundice at all. It does not colour the conjunctivæ or the urine, but resembles the staining of the skin which follows a cutaneous bruise. The face of the child who is born after a difficult or tedious labour, is often at first deep red, with a tinge of violet; and the skin over the body is coloured with an erythematous redness. At the same time, or soon after, pressure upon the surface sufficiently firm to empty the blood-vessels shows a yellow tint of the skin. As the redness fades, the yellowness appears to increase, and soon remains the sole discolouration. Beginning, as a rule, on the second day, it usually persists for about a week, and is commonly over by about the tenth day, or a little earlier, although in exceptional cases it may last longer. By some writers, the term *icterus neonatorum* is confined to this false jaundice, and the same authors apply the name *icterus infantum* to the true disease. This practice is calculated to give rise to unnecessary confusion. In the following pages the terms icterus neonatorum and icterus infantum will be applied indifferently to indicate a staining of the skin by the pigments of the bile.

Real icterus manifests itself in the child as it does in the adult, by a yellow tint of the skin and conjunctivæ, light-coloured stools, and often by discolouration of the urine. It may be the result of some comparatively trifling derangement, and is then readily recovered from; or may be the consequence of a serious malformation or grave organic lesion, and is then almost invariably fatal.

The milder form of jaundice—which may be called the benign variety—appears to be predisposed to by difficulty and delay in the process of parturition. A first-born child, exposed to serious and prolonged pressure before birth, and who, in consequence, is born in a state of semi-asphyxia, is often found to become jaundiced. Again, according to Kehrer, premature birth, or other cause of weakness in the infant, is apt to be followed by the same result. Exposure to cold and damp, and, according to some writers, a vitiated atmosphere, can also produce it.

Many theories have been advanced to account for the frequency of this symptom in the newly born. Virchow attributed it to a duodenal catarrh, and plugging of the common duct with mucus; and in children who have been exposed to cold this is no doubt a common cause of the derangement. Frank thought it was the consequence of an accumulation of meconium. Cohnheim believed it to be due to a sudden increase in the bile secretion after birth—an increase too great for the bile-ducts to carry away; but he has advanced no evidence in support of his theory. Many writers have referred the symptom to the disturbance in the hepatic circulation consequent upon the change in the conditions of life incident to birth. The circulation is too full, according to Hewitt and Weber, so that the distended vessels compress the bile-ducts; it is too empty, according to Frerichs, the circulation through the umbilical vein being suddenly cut off, and the tension of the hepatic capillaries diminished, so that the secreted bile makes its way into the blood-vessels.

There can be no doubt that the sudden transference of the chief supply of blood from the umbilical to the portal vein must at first produce considerable disturbance in the hepatic circulation. Weber has pointed out that if the functions of the umbilical vein are arrested before the establishment of respiration, as when a child is born partially asphyxiated, great congestion and œdema of the liver are the consequence. Birch-Hirschfeld has shown that the vessels in the notch of the liver are surrounded by a dense layer of connective tissue, and that this areolar sheath is continued into the organ along the branches of the portal vein. He has noted that in cases of difficult parturition, where the liver is the seat of great venous obstruction, this areolar sheath is œdematous. It becomes pulpy and gray in colour from infiltration of fluid, and a great accumulation of round cells takes place into its meshes. This pulpy condition of the cellular layer is seen also around the umbilical vein, and may even extend into the gall-bladder. It is evident that the swollen tissue must compress the bile-ducts, and Birch-Hirschfeld has shown that this is actually the case. The bile-ducts are distended, and it is difficult to force bile out of the gall-bladder into the duodenum. In these cases he has detected early signs of jaundice where death has occurred during the first day, and reports cases in which life had been further prolonged with a gradual increase in the icteric symptoms. In these mild cases, the presence of the bile-pigment cannot be always demonstrated in the urine; but, according to this authority, the bile acids can be detected in fatal cases in the pericardial fluid.

When the icterus is a consequence of the condition above described, it is seldom very severe. In the mildest cases the conjunctivæ are only faintly tinted with yellow; the appearance of the urine and the motions is normal; and the staining of the skin is only noticed on the face, the front of the chest, and the back. The derangement is then only a passing one, and the skin resumes its natural colour in three or four days. In a higher degree, the yellowness may extend to the belly and upper arms. The con-

junctivæ are yellow ; the urine is high-coloured, and stains the linen ; but even in this case, the stools may retain their normal tint, which at this age is naturally a golden yellow colour. In this degree, the symptoms generally last a week. In other cases, the jaundice is general, and may involve even the hands and feet. The urine is then distinctly icteric ; the conjunctivæ are very yellow ; the tears are tinted with bile, and the stools are clay-coloured. In some cases, Seux has noticed an ophthalmia to come on a few days after the onset of the jaundice, with a copious and deeply-stained purulent secretion. As a rule, the child seems to suffer little inconvenience from his derangement. He takes his food well and has no pain. Often, on palpation of the belly, the liver will be noticed to be increased in size, and the lower border may be felt at the level of the umbilicus. It is curious that, although the urine is coloured yellow, the most careful examination of the water is unable to detect the presence of biliphæin. MM. Parrot and A. Robin have, however, discovered in the icteric urine yellow amorphous irregular masses, varying in size from a red blood-corpuscle to a vesical epithelium, and differing in chemical tests from the colouring matter of the bile. They have also noticed the presence of sediments containing uric acid, urate of soda, and oxalate of lime ; hyaline, epithelial, and fatty cylinders ; white globules, and cells from the urinary passages.

When death occurs in infants who suffer from this benign form of jaundice, the fatal termination is owing usually to other causes. There is a variety of the complaint, to which attention has been directed by Seux, where the icterus is accompanied by all the symptoms of intestinal catarrh —diarrhœa, a quick pulse, and some heat and tenderness of the belly. There is, however, rarely vomiting. In the favourable cases the diarrhœa ceases before the jaundice disappears. If the looseness of the bowels persists, it is a dangerous derangement at this early age, and the infant often dies.

Although usually a symptom of comparatively little moment, icterus neonatorum may be the indication of very serious disease. The *grave form* of jaundice may be the result of three different conditions. There may be a congenital malformation of the gall-ducts ; the ducts may be compressed by syphilitic inflammation and growth (the syphilitic peripylephlebitis of Schüppel) ; or the icterus may be the consequence of umbilical phlebitis and pyæmia.

Infantile jaundice from *atresia of the bile-ducts* is fortunately not a common disease. Several varieties of malformation have been recorded : the gall-duct has been found converted into a fibrous cord ; the common duct has been known to be obliterated, or absent, or excessively narrowed ; sometimes all the ducts have been wanting ; in other cases, the gall-bladder has been rudimentary and the ducts absent. The liver itself is normal in appearance, or greatly enlarged ; usually, it is of a deep olive or nearly black colour. It has also been noticed to be cirrhotic, and its substance has been found to be denser than natural. The microscope shows an overgrowth of the areolar tissue, chiefly in the capsule of Glisson ; and broad bands of connective tissue surround the dark green islets of liver-cells. This incipient cirrhosis appears to be a constant accompaniment of obliteration of the bile-ducts, and continues to advance as long as the child survives. In animals, ligature of the ducts has been shown by Dr. Wickham Legg to lead to marked hepatic cirrhosis and consequent portal congestion.

This rare and distressing form of malformation is sometimes found to

affect several children of the same parents. This tendency to appear in successive children of the same family was noticed by Cheyne in 1801, and has been commented upon by other writers. The jaundice to which retention of the secreted bile gives rise may be present at birth, but usually is not visible before a week, a fortnight, or even longer. When it first appears, the discolouration has a faint yellow tint, but the colour gets quickly darker. The conjunctivæ are yellow; the stools soon become colourless and offensive; and the urine is high-coloured and leaves yellow or greenish brown stains on the diaper. At first, nothing abnormal is noticed about the belly; but after a day or two the liver begins to enlarge, and may reach a great size in a short time. The spleen may be also felt to be larger than natural. There is some swelling of the belly, and ascites may be present; but the abdominal distention is usually due to the increase in size of the hepatic and splenic viscera, and to flatulent accumulation resulting from the decomposition of food. Dr. Wickham Legg mentions swelling of the hæmorrhoidal veins among the occasional symptoms. The child usually takes food well, but wastes quickly. The bowels are often costive. The jaundice is not constant in degree. The tint of the skin varies, and on some days the infant is much more deeply stained than on others. Before death, in some cases, the abnormal colouring almost completely disappears, as very little bile is formed, owing to the destruction of the secreting tissue of the liver. The stools do not always lose colour very rapidly; sometimes for days, or even weeks, meconium or coloured stools may be evacuated; but the colour is usually described as a dark green, and is due possibly to altered blood.

A frequent symptom of this congenital defect which demands especial attention, is hæmorrhage from the navel. This phenomenon is not a constant symptom, but occurs in the majority of cases, and is of very serious augury. The hæmorrhage generally begins a few hours or a day or two after the fall of the navel-string (most commonly between the fifth and the ninth day after birth), and usually occurs first in the night. It is not a violent bleeding. Blood oozes gently but continuously from the umbilicus. It appears to be capillary, and the colour may be bright red, or dark and venous. This form of bleeding may be combined with hæmorrhage from other parts, such as cutaneous ecchymoses, epistaxis, hæmatemesis or melæna, and bleeding from the mouth. The hæmorrhage, combined with the interference with digestion due to the absence of bile and impaired action of the liver, rapidly exhausts the patient; and he usually dies within the week—often in a few hours. Dr. Legg suggests that the umbilical hæmorrhage is a consequence of the cirrhosis and resulting portal congestion; for the blood is hindered in its passage through the liver, and is forced to seek some other way of escape. It therefore passes from the left portal vein to the ductus venosus, and thence to the umbilicus, where the vessels, newly closed, cannot resist the increased pressure, and give way. The same mechanism (portal congestion) will explain the frequent coincidence of hæmorrhage from other parts supplying the portal vein with blood.

Cases of jaundice conjoined with umbilical hæmorrhage are rapidly fatal, When this symptom is absent, although the child almost invariably dies, life may be preserved for a much longer period. Recorded cases show that the infant may live five, six, or seven months, and even then, as in Lotze's case, where the child lived into the beginning of the eighth month and died of a broncho-pneumonia, may succumb to an accidental complication. This malformation is said to be twice as common in boys as it is in girls.

A male infant, deeply jaundiced, aged three months, was brought to the out-patients' room of the East London Children's Hospital and was at once admitted by my colleague, Dr. Radcliffe Crocker, into the wards. The child was born of healthy parents, none of whose other children had been similarly afflicted. He was said to have been a robust, healthy-looking infant at birth, and shortly afterwards to have passed two dark stools. Since that time, however, his motions had been hard and white, like lumps of chalk, and the bowels had acted only once a day. The jaundice had first appeared when the child was a week old, and had progressively increased. The infant had been suckled for a month, and was then fed on Swiss milk. He often vomited, not always after taking food, and was capricious about his bottle, sometimes refusing to suck. His water had always been dark, leaving yellow stains on the diaper.

When admitted, the child was fairly nourished. His skin was deeply jaundiced, and his conjunctivæ were yellow. There was a papular eruption (strophulus) all over his body. The liver could not be felt at this time on account of the child's struggles, but was found a few days afterwards to project two fingers' breadths below the ribs. The boy lived a month after his admission, wasting gradually, and often crying as if in pain. Then aphthæ appeared in his mouth, and he sank and died. There were no hæmorrhages. His jaundice persisted, although it varied curiously in intensity; and before his death the tint of the skin was several shades lighter than when he entered the hospital. The liver remained about the same size and felt firm and smooth. The spleen was not enlarged. After death the liver was found of a dark olive colour, and its consistence seemed to be increased. The gall-bladder was rudimentary, and the hepatic and common ducts were absent.

When *syphilitic inflammation of the liver* gives rise to jaundice, the organ is enlarged and deeply coloured of a brownish yellow tint, and shows under the microscope a great proliferation of young cells in the capsule of Glisson, and in the interlobular spaces. In a case recorded by M. D'Espine, of Geneva, the same proliferation was noted round the hepatic cells in the interior of the lobules. Moreover, the small bile-ducts were thickened and filled with epithelial cells. There was no obstruction in the larger ducts, and the gall-bladder contained thick and dark-coloured bile. The spleen was greatly enlarged and very firm.

In this case the jaundice was severe and appeared at birth. On the ninth day bleeding occurred from the umbilicus, from the bowels, and into the skin; the belly swelled; the liver and spleen were notably enlarged; the temperature became subnormal; the child wasted rapidly, and died on the twenty-third day in convulsions.

Jaundice from *umbilical phlebitis* has been called by Schüller "icterus malignus." This variety appears to be dependent upon an infective process. The poisonous matter is probably the same as that which causes puerperal fever in the mother, and may be conveyed by bacteria, for two forms of micro-organisms have been found in the blood of infants so affected, the one spherical and the other rod-shaped. Whether these two different forms imply two different kinds of infection is not known, but Birch-Hirschfeld asserts that the rod-shaped bacteria are especially observed in cases where the general infection is severe and the disease violent from the first, with a strong tendency to hæmorrhage. These cases are accompanied by inflammation of the umbilical artery, with or without phlebitis of the umbilical vein. In sixty cases collected by this observer, umbilical arteritis was found in thirty-two, umbilical phlebitis

in eleven, and inflammation of both vessels in three. An examination of the liver reveals profound degeneration. These changes seem to indicate that the infection must reach the liver by the umbilical vein. They may, however, be found in cases where the artery alone is notably diseased; but there are reasons why the morbid appearances should be more conspicuous in the umbilical artery. After birth, the remnant of the umbilical vein is alternately emptied and filled again on account of the varying pressure on the hepatic vessels induced by the action of the heart and lungs. This constant flux and reflux in the vein tends to promote infection of the system, but is unfavourable to the local development of the morbid process. It is found in these cases that the intensity of the jaundice bears no relation to the severity of the vascular inflammation, but that it is in direct proportion to the degree to which the pathological changes have advanced in the liver. It is probably, therefore, the consequence of the swelling of the connective tissue surrounding the portal vein and its branches in the liver, which compresses the bile-ducts.

In these cases, the jaundice comes on a few days after birth, and by the end of the week is well marked. The urine is intensely yellow; but the stools may be of normal tint, although usually costive. The onset of the jaundice is accompanied or quickly followed by fever, which soon becomes high. There is often vomiting of yellow or greenish matter. The child looks excessively ill. His face is livid, with pinched, haggard features, and he refuses the bottle or the breast. His tongue is dry; his hands and feet are purple; his abdomen swells and is tender; fluctuation, more or less distinct, is noticed; and blood or blood-stained pus oozes from the navel. Sometimes the spleen enlarges, and petechiæ are noticed on the skin. Death may be preceded by convulsions and coma.

When jaundice occurs *after the age of infancy*, it is due to the same causes which give rise to the symptom in the adult. Of these, no doubt, duodenal catarrh extending into the bile-ducts is, of all others, the most frequent. On this account, the symptom is usually a trifling one, and is quickly recovered from. It is accompanied by some temporary enlargement of the liver, which can be felt to project several fingers' breadths below the ribs; but except for some delicacy of digestion, little discomfort is experienced. In exceptional cases, the derangement may be the consequence of plugging of the common duct with inspissated bile, and this accident has been noticed in an infant of three months old. Again, a lumbricus has been known to penetrate into the common duct and produce such impediment to the flow of bile as to give rise to jaundice. Icterus may be also due to acute yellow atrophy of the liver; but this is fortunately a very rare disease in childhood. Of other causes, atrophic cirrhosis of the liver, phosphorus poisoning, and miasmatic influences have been recorded as producing jaundice in early life.

Diagnosis.—In examining a new-born infant for signs of jaundice, it is often necessary to force the blood out of the skin by firm pressure with the finger before the natural tint of the integument can be observed. In inspecting the eyes for yellow staining it is advisable to use no force in attempting to open the lids with the finger, but rather to wait until the child opens his eyes spontaneously. A baby, when the eyelids are touched, squeezes them together instinctively. In such a case our utmost efforts will often succeed only in exposing the palpebral mucous membrane, and this will quite conceal the globe of the eye from view.

The diagnosis between false jaundice and true icterus neonatorum, if the latter be of the benign variety and little pronounced, is very difficult—

often quite impossible. In neither case is the conjunctiva stained or the urine yellow. The colour will sometimes help us, for the tint of the jaundiced skin is often more distinctly yellow than the brownish stain left after severe cutaneous congestion. In all cases where the conjunctivæ and urine are tinted, however slightly, we may conclude that the case is one of true jaundice. The condition of the stools is of less moment, for jaundice may be present without the motions being clay-coloured.

In cases where the jaundice persists and becomes deeper and deeper, we have every reason to suspect the existence of some congenital malformation, especially if a previous child of the same parents has died shortly after birth with symptoms of icterus neonatorum. If the liver and spleen become enlarged, the temperature remaining low, this suspicion becomes almost a certainty; and the occurrence of bleeding from the navel is, in such a case, practically conclusive. The partial disappearance of the jaundice is no proof that our apprehensions are unfounded, for the yellow tint of the skin may become distinctly lighter, or even quite disappear before the end.

The *pyæmic* form of jaundice is readily detected. The general appearance of the child, the high temperature, the dry tongue, the swelling and tenderness of the belly, the discharge of blood and pus from the umbilicus, and the early death, sufficiently indicate the nature of the disease.

If the jaundice is accompanied by signs of inherited syphilis, or if, without these, we can discover a history of syphilis in the father, or of previous miscarriages on the part of the mother, the probability of a syphilitic origin to the jaundice must be taken into consideration.

Prognosis.—So long as the jaundice is accompanied by no signs of discomfort, little anxiety need be excited by the symptom; but if diarrhœa or vomiting occur, the injurious effect of exhausting discharges upon a newly born infant must not be overlooked. Little information is to be gained by inspection of the stools, for in cases of serious malformation they may remain normal in appearance for a considerable time. If, in any case, the motions become clay-coloured, and the staining of the skin and urine shows no sign of subsiding, there is cause for apprehension. A slight enlargement of the liver (*i.e.*, a projection of one finger's breadth below the ribs) is immaterial; but if the organ continue to increase in size, and if the spleen also begin to swell, the infant's condition is becoming a serious one. It must not be forgotten in these cases to examine the anus; for the appearance of any swelling of the hæmorrhoidal veins, as indicating great obstruction to the portal circulation, is an unfavourable symptom of no little importance.

If we are satisfied that the case is one of congenital deficiency or malformation, we can have little hope of a favourable issue, although life may be prolonged for several months. The appearance of umbilical hæmorrhage is a very fatal sign, and is usually followed by rapid sinking of the patient.

If the jaundice is due to syphilitic disease, it is hardly likely to end otherwise than unfavourably; and in cases of umbilical phlebitis and pyæmia, we can hold out no hope of recovery.

In older children, icterus, unless it be due to phosphorus poisoning or some profound hepatic lesion, is in most cases a mild derangement which soon passes away.

Treatment.—Ordinary benign jaundice in the new-born baby requires little treatment. Emetics, although strongly recommended by some writers, are in most cases useless, if not injurious. A gentle purge, such as castor-oil, followed by two or three grains of bicarbonate of soda with a quarter

of a drop of tincture of nux vomica, given three times a day, will soon restore the child's tissues to their natural colour. I now invariably give nux vomica with an alkali in these cases, and believe that in catarrhal jaundice at all ages the former drug has a distinct influence in aiding the child's recovery. If purgatives are prescribed, the aperients used should be those which, like castor-oil or aloes, act low down in the alimentary canal. Senna and other drugs which influence the duodenum and upper part of the bowels may increase the irritation of this part of the intestine, and are unsuitable to cases of jaundice—at any rate to those cases where there is reason to suspect the existence of duodenal catarrh. Mercurials, too, should be given with judgment. It is not advisable to continue acting upon the liver by repeated doses of mercury. One dose of gray powder or of calomel may be allowed, but the remedy need not be afterwards repeated. With regard to diet:—The infant may still continue to take the breast. If he be bottle-fed, no alteration need be made in his food unless vomiting occur with signs of acid fermentation. If these symptoms of gastric catarrh are noted, the diet must be regulated according to the rules laid down in the chapter on Infantile Atrophy.

If the jaundice be due to malformation, no treatment can be expected to be of service; but if hæmorrhage occur from the navel, attempts should be made to arrest a symptom which experience has proved to be so speedily fatal. The perchloride of iron may be used locally, followed by a compress; but in most cases, the surgeon has to fall back upon the operation known as the "ligature en masse." The child should be laid upon his back, and two hare-lip pins must be passed through the integuments at the root of the navel, carefully avoiding the peritoneum. A ligature is then twisted tightly round the needles in the form of a figure of eight.

If syphilis be present in the child, treatment for this constitutional condition should be adopted without loss of time. In cases of pyæmic jaundice, attempts must be made to relieve the distressing symptoms. Warmth should be applied to the belly; and if there is great tenderness about the umbilicus, extract of belladonna diluted with an equal quantity of glycerine, can be applied to the skin round the navel. Stimulants must be given as required.

CHAPTER II.

CONGESTION OF THE LIVER.

Congestion of the liver, although a common derangement in the child, is yet often suspected when not actually present. Many symptoms attributed to a "torpid," "inactive," or congested liver, and treated with gray powder, are really due to a disordered state of the stomach dependent upon an improper dietary, and may be readily relieved by the exercise of a little judgment in the child's food and general management. A liver morbidly congested gives rise to a very definite group of symptoms, as will be afterwards described.

Causation.—The amount of blood circulating in the liver may vary considerably within normal limits. During digestion it is increased for the time; and if the child be habitually overfed, or be frequently indulged with highly spiced and stimulating food, the hyperæmia lasts longer and is more intense than if he eat more moderately or of a plainer diet. Want of exercise and too close confinement to the house will increase the injurious effects of this unwholesome regimen. The other principal causes of morbid congestion of the liver are:—Any cause which interferes with the return of blood from the liver. The commonest of these is disease of the heart interfering with the return of blood from the lungs. The pulmonary circulation suffers primarily; and secondarily, the impediment spreads to the vena cava and the portal vein. Congestion of the liver is also a consequence of the ague poison, for malarial fever is as common a cause of hepatic congestion as it is of splenic enlargement, and a swollen hyperæmic liver is a familiar symptom in tropical climates. Again, chilling of the surface is one of the most frequent agents in the production of liver congestion, and enlargement of the organ from this cause is a usual accompaniment of catarrhal jaundice.

Morbid Anatomy.—A congested liver is enlarged in all directions, and is very thick; its resistance is increased, and the peritoneal coat is tense and shining. When cut into, the organ bleeds freely, and the section shows a spotted or "nutmeg" surface from dilatation of the intra-lobular veins. Often, the colour of the parenchyma surrounding the central vein of the lobule is yellowish from interference with the escape of bile from the ducts; for jaundice is not unfrequently associated with this hepatic congestion.

If the hyperæmia of the organ is a chronic condition, further changes take place after a time. The enlargement of the intra-lobular hepatic veins induces atrophy of the liver-cells in their immediate neighbourhood. Surrounding these cells are others which are stained deeply with bile, and at the circumference of the lobule the cells are often filled with oil. The atrophied cells may completely disappear; and eventually a new formation of fibroid tissue takes place in connection with the inter-lobular vessels. The fibroid growth shrinks, and a condition akin to cirrhosis is set up; the organ becoming granular on the surface and the capsule thickened.

Symptoms.—If the liver be much congested, we generally find that there is some pain in the right hypochondriac region; that it is tender when pressed; and that coughing or a deep inspiration is distressing. The child is often unwilling to lie on either side—on the right because of the direct pressure; on the left because of the weight of the congested organ causing an uneasy dragging sensation. On palpation of the belly, the edge of the liver is felt several fingers' breadths below the ribs, and on percussion we generally find that the upper limit of dulness, instead of beginning in the fourth interspace, begins in the third or on the third rib. Sometimes, especially if there is jaundice, the distended gall-bladder can be felt as a pear-shaped tumour below the inferior edge of the liver.

Dyspeptic symptoms from hyperæmia of the gastric vessels generally accompany a congested liver. The tongue is furred; there may be headache; nausea may be complained of; the bowels may be relaxed, and the stools light-coloured and offensive. The urine is dark, and may throw down a copious deposit of lithates. The skin is often sallow; and if the congestion be accompanied by duodenal catarrh, there will probably be jaundice.

If the congestion is due to cardiac disease the child is harassed with dyspnœa and cough from interference with the pulmonary circulation; his digestion is deranged, and there is often, in addition, œdema of the lower limbs, with albuminuria.

A congested liver is, as has been said, frequent in cases of ague. Often, until this condition is remedied, quinine has but little influence over the attacks. This subject is discussed elsewhere (see Ague).

Diagnosis.—A congested liver is increased in size, and pressure upon it produces some uneasiness. Mere light-coloured offensive stools are not in themselves a sign of hepatic hyperæmia. It is common for a child who is being fed upon large quantities of farinaceous food, or who, owing to a catarrhal condition of his stomach and bowels, is for the time incapable of digesting a milk diet, to evacuate more or less semi-solid pasty or putty-like matter from the bowels. But the stools in such a case consist of undigested food, and are not indicative of arrested biliary secretion. If such a condition be treated, as it often is, by repeated doses of gray powder or other form of mercurial, the aperient action of the medicine produces on each occasion a dark biliary stool, but the effect of the drug having passed off, the evacuations continue to be as pasty as they were before. This condition, as is elsewhere explained, must be treated, not by cholagogues, but by measures which rectify the gastric and intestinal derangement (see p. 640).

To justify the diagnosis of hepatic congestion we must require enlargement and tenderness of the liver and a sallow complexion, as well as digestive disturbance and light-coloured stools. We must not, however, conclude too hastily that the size of the liver is abnormal. The organ is apt to vary in size in young subjects from natural causes, and in some children whose chests are exceptionally short may project for a finger's breadth or so below the ribs without being congested or otherwise diseased. Besides, it is important not to mistake a liver merely displaced for a liver morbidly enlarged. The organ may be pushed down by fluid accumulation in the pleura, or by emphysema of the lung; and I have known an extensive pericardial effusion to produce the same effect. In rickety children with deeply grooved chests, the liver and spleen, although not enlarged, may be felt more distinctly than natural, being forced downwards somewhat from their original position. It is therefore important to ascertain by percussion the upper limits of the liver dulness as well as the exact level of the inferior margin. Again, a liver, although enlarged, may lie

completely under cover of the ribs, and its abnormal condition may thus escape notice. It may be pushed upwards by fluid accumulation and growth in the belly ; or may be placed higher than it otherwise would be through the shrinking in the chest of a collapsed or indurated lung. Therefore, in an examination of the organ, we must remember these sources of error, and ascertain all its limits before coming to a conclusion.

A good example of a congested liver is seen in the following case : A little boy, aged three years, of healthy parentage, was brought to the East London Children's Hospital with the history that for five weeks he had been noticed to be languid and chilly, with little appetite and with some swelling and tenderness of his belly. The bowels had acted two or three times a day, the motions being light-coloured, thin, and scanty. The child was restless and fretful, sleeping uneasily, and often starting and twitching in his sleep.

The boy was the subject of moderate rickets. His ribs were beaded, the ends of his long bones large, and his chest was flattened laterally. He had cut all his teeth and his fontanelle was closed. The skin was harsh and dry, and was tinted all over the body of an earthy yellow colour. The belly was large, and the lower edge of the liver reached to nearly the level of the umbilicus. Its substance was natural, without any increase in firmness. Its edge was not thickened. The spleen could not be felt.

The patient was treated with mercurial purges followed by salines, and an alkali with bitter infusion was given to him three times a day. In a fortnight after this treatment had been begun, the liver had become much reduced in size. Its upper border was at the fifth rib, and its lower border could be felt two fingers' breadths below the ribs. It was evidently pushed downwards by the rickety deformity of the chest, and was no doubt now of natural size. As the liver became smaller, the child's appetite improved ; his skin lost its earthy yellow tint, and the colour and consistence of the stools became natural.

In this case, all the symptoms pointed to congestion of the liver ; and palpation of the belly detected enlargement of the organ without any alteration in its consistence.

In warm climates, it is important to exclude hepatitis. In suppurative inflammation of the liver, the pain and tenderness are greater than if the liver be merely congested ; the general disturbance, although considering the serious nature of the disease *proportionately* slight, is greater ; the child looks ill, which is not the case in uncomplicated congestion, and there is fever.

Prognosis.—Congestion of the liver is in itself a trifling ailment. Any danger connected with the case is dependent upon the general condition of the child, or the existence of serious disease of a vital organ.

Treatment.—If the congestion is dependent upon overfeeding and insufficient exercise, we should be careful to regulate the diet, and allow only food which is digestible and unstimulating as well as moderate in quantity. The child should be restricted for a day or two to bread and milk with mutton-broth or a little boiled fish for his dinner. His belly should be protected by a flannel band, and the action of the skin should be promoted by a warm bath before going to bed. The medicinal treatment should begin with a few grains of gray powder combined with half a grain of powdered ipecacuanha and two to five of jalapine. This should be given at bedtime, and in the morning the child may take a dose of liquid magnesia or other saline aperient. Remedies which act upon the skin and kidneys are useful in these cases. We may give two or three times a

day a mixture composed of solution of acetate of ammonia, sweet spirits of nitre, and a few grains of the bicarbonate of soda or potash. Chloride of ammonium (gr. iij. to gr. vj.) is also recommended. It may be made palatable by extract of liquorice, chloric ether, and glycerine.

The same treatment is useful if the hepatic congestion can be attributed to a chill. In these cases, especially if there is jaundice, we should be careful not to employ senna and other purgative drugs which act principally upon the upper part of the intestinal canal, in order not to increase the irritation of the duodenum ; but should keep the bowels regular by aloes or the saline aperients.

If the congestion of the liver occur as a consequence of heart disease, it will be relieved by measures directed to strengthen the cardiac action and lessen the general hyperæmia from which the patient is suffering. If it arise in the course of an attack of malarial fever, it must be reduced as rapidly as possible by saline and mercurial purges (see Ague).

Children who are habitually indulged and injudiciously fed, especially if they are accustomed to warm stuffy rooms, may suffer from frequent attacks of hepatic congestion, and their livers may seem to be permanently enlarged. In such cases, it is useful to send them to a watering-place where they can drink regularly of some natural saline aperient, and take daily and sufficient exercise in the open air. After a short course of the waters, iron and quinine can be given with benefit.

CHAPTER III.

CIRRHOSIS OF THE LIVER.

Cirrhosis of the liver, although not one of the more common diseases in the child, cannot be said to be very rare. In some children, even at a very early age, there appears to be a peculiar tendency to the formation and proliferation of fibroid tissue. Sometimes the fibroid overgrowth is a general one; sometimes it is more local, and is limited to particular organs —the lungs, the liver, or the kidneys. Fibroid induration of the lungs occurring as a result of catarrhal pneumonia and pleurisy, is a sufficiently familiar experience; but a similar pathological change in other internal organs is much less frequently met with.

Causation.—The causes of hepatic cirrhosis in early life are obscure. Intemperance in alcohol, to which the disease in the adult is usually attributed, is of course exceptional in the case of a child. It is possible that, as some writers are disposed to believe, this vice may be one of the sins of the fathers which are visited upon their offspring, and that cirrhosis in the child may be due to intemperance in the parent; but this, at present, at any rate, is no more than hypothesis. Congenital deficiency of the bile-ducts is often—always, according to Dr. Wickham Legg—accompanied by an early stage of hepatic cirrhosis. Syphilis may sometimes produce it; and MM. Cornil and Ranvier have described an interstitial hepatitis as accompanying cases of general tuberculosis. Hepatic cirrhosis has been seen at a very early age. Weber has found the atrophic form in a new-born infant; and in cases of malformation of the bile-ducts, it is always an early change, as death usually takes place in the course of a few months. The hypertrophic form is sometimes, also, met with in very young children. Wettergren has seen it in a boy of five; and Dr. S. West has reported a case in a boy of six. It is curious that in each of these instances the child had been in the habit of drinking largely of coffee.

Morbid Anatomy.—Cirrhosis of the liver may be atrophic or hypertrophic, and these two conditions have very distinct pathological characters.

In atrophic cirrhosis (the hobnailed liver, cirrhosis of Laennec) there is abnormal development of new fibroid tissue which permeates the organ, following the branches of the portal vein. The new development appears to originate in a chronic inflammatory condition of these vessels. It produces great thickening of the capsule of Glisson, the prolongation of which envelopes the portal branches, and extending from it into the interlobular spaces, forms meshes which embrace portions of the hepatic substance. These portions vary in size, but all comprise several lobules. The process consists in a rapid proliferation of embryonic cells which undergo conversion into cicatricial fibroid tissue. After a time, contraction takes place in the new material, and the liver becomes small and shrunken, with an irregular granular surface and a dense substance. Its enveloping capsule is

much thickened. On section, the surface is of a dirty yellow colour, and is seen to be divided into irregular meshes by the fibrous network.

The contraction of the dense interstitial tissue compresses the lobules so that the liver-cells become flattened and atrophied, and causes great obstruction to the portal circulation. Consequently, the whole portal system is congested. Its blood, unable freely to escape, has to find a new channel; and a collateral circulation becomes gradually established by enlargement of the principal veins in the suspensory ligament passing to the umbilicus.

The nutrition of the liver, and the formation of bile, are kept up by the development of new vessels, which permeate the new fibrous tissue and convey blood from the hepatic artery to the intra-lobular vessels. The smaller biliary ducts are but little affected by the changes which take place, so that there is seldom retention of bile or jaundice. In this form of cirrhosis, the organ is somewhat enlarged in the early stage, but afterwards becomes very small and contracted.

In *hypertrophic cirrhosis*, the liver is usually larger than in health, and may be increased to twice its natural size. It is smooth on the surface, with a normal thin edge, and on section, its substance is orange yellow or green in colour. The fibroid overgrowth in this case follows the ramifications of the biliary ducts. It begins round the intralobular branches of the ducts, and envelopes each lobule so as to insulate it from its neighbour. It forms a less regular meshwork than the preceding variety, and is a more diffused growth, which in some parts is thick and dense so as completely to destroy the hepatic tissue; in others, is comparatively scanty and ill-developed. The affected ducts become largely dilated and their epithelium is increased. New ducts are also developed, and can be seen by the microscope embedded in the new fibroid tissue. In this form of the disease, the obstruction is chiefly in the ducts, so that there is no necessary interference with the portal circulation.

These two forms of the disease, from their anatomical origin, have been called portal and biliary cirrhosis.

There is a third form which is very rarely met with. It has only been noticed in some cases of inherited syphilis in the infant. The disease is here primarily intralobular, and developes within the lobules round the individual liver-cells. This form, as it is only discovered after the death of the child, and probably gives rise to no symptoms, need not be further referred to.

Symptoms.—On account of the different pathological conditions in the atrophic and hypertrophic varieties of hepatic cirrhosis, the symptoms in the two forms are not precisely similar. In both we find signs of interference with general nutrition, but as the morbid change affects chiefly the portal circulation in the one variety, and the biliary conduits in the other, the later phenomena differ greatly in the two cases, and are usually characteristic.

In atrophic cirrhosis, the early symptoms are merely those of indigestion, flatulence, and general discomfort. The child is often peevish and fretful; he is restless, sleeping badly at night; and his complexion is sallow or pasty-looking, with dark discolouration of the lower eyelids. He is noticed early to be flabby, and sometimes is evidently losing flesh. His bowels are often costive. These symptoms may continue for a long time without change. The urine is apt to be thick with lithates, and may contain crystals of uric acid, or even a deposit of uric acid sand. It is often very acid.

Sooner or later, more distinctive symptoms begin to be noticed, and in hospital patients it may be only from this point that the child's illness is

dated by the parent. The occurrence of ascites, with swelling of the belly, is usually the first symptom complained of, and there may be some wandering pains in the side. When the child comes under observation, we usually find dilatation of the superficial abdominal veins, distinct fluctuation in the abdomen, and often a slight enlargement of the liver and spleen. There is little or no jaundice, but the skin after a time begins to have an earthy tint, and feels dry and rough to the finger. Sometimes there is a little œdema of the feet. The ascites is found to vary greatly in amount, and the general condition of the child is subject to rapid variation. On some days he seems much better than on others, and may be then lively, playful, and although easily tired, even active if allowed to be on his feet. As the disease progresses, the liver shrinks and ceases to be felt, but the spleen in most cases continues to increase in size. If the ascites is great, it is often difficult to feel the spleen even when the child is laid on his right side. In such cases, it may be often readily detected by placing the patient on his hands and knees. The weight of the organ then brings it well forward within the reach of the fingers. Hæmorrhages occur in the child from the gastro-intestinal mucous membrane as they do in the adult; and the motions may be dark and sooty from blood, or pure blood may be passed by stool. Vomiting of blood is also sometimes met with. In many cases, we find a tendency to hæmorrhage from other parts. The nose and gums may bleed, and ecchymotic spots may be noticed on the skin. As the symptoms increase, the digestive derangements become more and more disturbed. The child is much troubled with weight in the epigastrium, and abdominal pains. He often feels sick; sometimes he vomits; his tongue is furred; he is thirsty, and his appetite is capricious or is lost. He gets thinner and thinner; the dingy hue of his skin becomes more and more marked; even at this early age, hæmorrhoidal swellings may be noticed, and the distention of the superficial abdominal veins is increased.

When the disease reaches this period, life is very near its close. Often there is general dropsy, but the child may sink and die without the appearance of any fresh symptoms; or diarrhœa may come on and prove rapidly fatal. In other cases he dies from hæmorrhage, or from an intercurrent inflammation, such as pleurisy or pneumonia. Unless a complication be present, there is never any fever. The progress of atrophic cirrhosis is slow, especially in the earlier stages. If hæmorrhage occurs, it is usually a sign that the illness is approaching its termination.

In the *hypertrophic variety of cirrhosis*, the initial symptoms of gastro-intestinal derangement, pallor, and wasting, are the same as in the other form; but the after-course of the disease varies from the previous type. While in atrophic cirrhosis the more characteristic phenomena are dependent upon the obstruction to the portal circulation, in the hypertrophic variety the symptoms are due to interference with the biliary system of ducts. Jaundice, rare and faint if it occur at all in the previous form, is here an early and characteristic symptom. The skin, conjunctivæ, and urine soon become deeply tinged with orange yellow, and the motions are light-coloured or chalky. The liver is generally enlarged, and the spleen in most cases can be felt of unusual size; but there is little dilatation of the superficial veins of the abdomen. Pain may be complained of over the liver. The bowels are relaxed or inclined to be costive. There is no ascites.

As the disease progresses, the jaundice increases in intensity, and the symptoms generally undergo temporary exacerbation. At these times, rapid enlargement of the liver is noticed; there is slight fever; the child is peevish

and fretful, crying with pain in his side, and his condition appears to be changing quickly for the worse.

The illness often closes with all the signs of malignant jaundice, due, probably, to acute degeneration of the hepatic cells. The pulse undergoes curious alterations in frequency, sometimes beating rapidly, at others slackening to 60 or 70. The tongue gets dry and brown, and sordes appear on the teeth. The child refuses food, and seems to care only to be left alone. He sleeps much, and is drowsy and stupid when awake. Petechiæ are often seen on the skin ; the gums may bleed, and blood may be vomited from the stomach. The drowsiness soon deepens into stupor ; and the child lies with his eyes closed, insensible to all that passes, often grinding his teeth continuously. There is no pyrexia. The wasting is now rapid, and the patient sinks and dies without recovering consciousness. Sometimes death is preceded by convulsions.

Although these two types of the disease differ in the distribution of the fibroid overgrowth in the liver, they may be both present together. In such cases the liver is enlarged, and we find jaundice combined with ascites and swelling of the abdominal veins. The hepatic disease may be the only lesion of the kind present, or may be accompanied by similar changes in the lungs, the kidneys, or the spleen.

Diagnosis.—So many cases are now on record of hepatic cirrhosis occurring in children that the diagnosis should be no more difficult in them than it is in the adult. It is probable that many cases of ascites, the origin of which is obscure, may be attributed correctly to this condition of the liver. If in such a case fibroid disease of the lungs can be detected, it renders a similar condition of the liver highly probable. A swollen fluctuating abdomen, an enlarged spleen, dilatation of the superficial veins of the belly, piles, a dry, faded, earthy skin—these symptoms occurring in a child who is not feverish, but who has a history of previous failure of health and of wasting, should make us strongly suspect the existence of the atrophic form of cirrhosis. The absence of fever is an important element in this group of symptoms. If hæmorrhages occur from the stomach and bowels, or elsewhere, the temperature still remaining normal, the symptom is strongly confirmatory of our opinion. The chief difficulty in these cases arises from the occurrence of a febrile complication ; but this is a source of perplexity common to most forms of chronic disease in the child. If there be fever when the child first comes under observation, it is advisable to withhold a positive opinion until time has been allowed for the pyrexia to subside.

In the case of hypertrophic cirrhosis, the occurrence of gradually increasing jaundice, with an enlarged liver and pains in the side, but without ascites, piles, or dilated parietal veins of the belly, the child being the subject of chronic digestive derangement and wasting, is a characteristic grouping of symptoms. If the illness end with convulsions, coma, a typhoid condition, and the symptoms of malignant jaundice, the case may be mistaken for one of acute yellow atrophy, especially if, as may happen, the liver is not notably enlarged. The latter is, however, an acute disease, and comes on very abruptly, with few or no premonitory symptoms ; while hypertrophic cirrhosis is essentially a chronic illness, with a long history of failing health. Moreover, acute yellow atrophy is so rare in the child that it may be practically excluded from consideration.

Prognosis.—When the disease reaches the stage at which signs of serious impairment of nutrition are noticed, evidenced principally by a dry, earthy-looking skin, the prognosis is very unfavourable ; and if

hæmorrhages occur, the end may be judged to be near. At an earlier period, when the spirits are fairly good, even although there be considerable ascites, we may take a less gloomy view of the case. The more serious symptoms are sometimes found to clear away completely—for a time, at any rate, even if they subsequently return.

In the case of hypertrophic cirrhosis, rapid alternations in the rapidity of the pulse, or drowsiness and nervous symptoms, are of very unfavourable import.

Treatment.—It is so seldom possible in the child to ascertain the existence of hepatic cirrhosis in the earlier stage, that treatment at this period is confined to attention to the digestion, and to the efficient performance of the various organic functions. When the more characteristic symptoms begin to be noticed, there are two forms of treatment which may be adopted. The patient may be treated with alkalies and aperients, or with tonics. On account of the gastric derangement, an alkali with a vegetable bitter is usually prescribed, and this mode of treatment answers very well in most cases. For a child of ten years old we may give eight or ten grains of bicarbonate of soda with infusion of chiretta or calumba; and the addition of a few drops of the tincture of nux vomica increases the efficacy of the mixture. Most cases, however, do better under the use of iron and quinine. Ten or fifteen drops of the tincture of perchloride of iron with a grain of quinine given three times a day, and continued for a lengthened period, often seem to have great value in reducing the ascites and improving the general condition of the child. Mild aperients should also be made use of, and laxative doses of the Carlsbad or Hunyadi Janos waters are well borne in these cases. A good form of iron is the exsiccated sulphate, which agrees well with children. It must, however, be given in full doses; and two to five grains, according to the age of the child, may be taken after each meal in a teaspoonful of glycerine. The diet should be liberal. It is well to allow meat twice a day; and farinaceous foods may be used, having due regard to the state of the stomach and the child's power of digesting them. The action of the skin should be promoted by a daily warm bath, and the patient should be dressed from head to foot in flannel or some warm woollen material.

The ascites is not benefited by the ordinary diuretics, but Dr. Basham's chalybeate diuretic, in which the iron is kept in solution by the acetic acid,[1] I have sometimes thought to be useful.

If much fluid accumulates in the peritoneal cavity, and causes distress by interfering with the action of the diaphragm, the effusion must be removed by tapping the abdomen. The operation is accompanied by no danger to the child, if the aspirator or a fine trocar be used. It should be performed early and repeated as often as is necessary. Hæmorrhages, unless they are copious, need not modify the treatment, but sufficient bleeding to manifestly weaken the patient must be combated with gallic acid, dilute sulphuric acid, and other styptics. Severe dyspeptic symptoms are best treated with bismuth and alkalies.

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[1] ℞. Tinct. ferri perchloridi ..... ♏ x.
Acidi acetici diluti ..... ♏ x.
Liq. ammoniæ acetatis ..... ʒ ss.
Aquam ..... ad. ℥ ss.
M. ft. haustus. Sig. To be taken three times in the day.

CHAPTER IV.

AMYLOID LIVER.

Amyloid, albuminoid, or lardaceous degeneration is a common lesion in the child, and the liver is often found to be enlarged from this cause. The liver, however, may not suffer alone. The spleen commonly, and the kidney frequently, are also affected; and often there is a similar condition of the lymphatic glands.

Causation.—The degeneration is always secondary to a general cachectic condition. It occurs sometimes in syphilitic children, and may be a consequence of scrofula and tubercle. The commonest cause is, however, the existence of chronic suppurations and purulent discharges. In fibroid induration of the lung, where there is a copious secretion in the dilated bronchi, amyloid disease is a familiar symptom; and in cases of empyema in early life, if a chronic fistulous opening become established, lardaceous degeneration of organs very generally follows.

Morbid Anatomy.—The amyloid liver is uniformly enlarged, heavy, and excessively dense. Its edge is thin and resisting; its peritoneal coat very smooth and tense. The section is dry and homogeneous looking, of a gray colour and a glistening bacony appearance. No blood oozes from the cut surface. If, as sometimes happens, there is concurrent fatty degeneration, the knife after the section may look greasy. The seat of the disease in the liver has been disputed. According to Meckel and Virchow it affects the liver-cells, while Wagner and others are of opinion that the amyloid change is confined to the capillaries, and that the cells are merely atrophied. According to Rindfleisch, the morbid process begins in the arterial zone of the hepatic lobules, half way between the centre of the lobule and the circumference, and implicates the arteries, the capillaries, and the hepatic cells. It then spreads to the centre and afterwards to the circumference of the lobules. Kyber, too, declares that he has recognised the change in unmistakable liver-cells which he had isolated by pencilling. According to this pathologist, the trunk and larger branches of the hepatic artery are never affected, the morbid process being confined to the smaller hepatic arteries; but the change may be detected in the hepatic and portal veins, and even in the vena cava. The affected arteries and capillaries are diseased in various degrees. When the amyloid process is advanced in a vessel, its coats become thickened and pellucid; and the affected hepatic cells lose their normal shape, their granules, bile-pigment, and nuclei, and become irregular and glassy looking. The addition of iodine solution stains the affected parts of a reddish brown colour, and sulphuric acid turns them first violet and afterwards blue.

Symptoms.—Although the enlargement is perfectly painless, the organ may produce inconvenience by its weight. It causes distention of the belly; but as there is no compression of the bile-ducts or of the branches of the portal vein, there is no necessary jaundice, ascites, or prominence of the superficial abdominal veins. All these symptoms may, however, be found.

The mesenteric glands, like other internal organs, frequently participate in the amyloid degeneration; and if the glands occupying the hepatic notch are enlarged, they may compress both the bile-ducts and the blood-vessels at this spot. In such a case, the skin, conjunctivæ, and urine are jaundiced; there is some effusion into the peritoneum, and the veins of the abdominal parietes are dilated. Even in the absence of jaundice, the stools may be light-coloured if the disease is advanced, owing to impaired function of the hepatic cells.

On palpation of the belly, the liver is found to project several fingers' breadths below the margin of the ribs. Often its lower edge is on a level with the navel; sometimes it reaches to the crest of the ilium. Its substance feels firm and resisting, and its edge remains thin and sharp. There is no tenderness on pressure. In at least half the cases, the spleen, too, is enlarged, and can be felt several fingers' breadths below the ribs on the left side.

Digestive disturbances may be noticed. There may be loss of appetite and vomiting; and sometimes an obstinate watery diarrhœa comes on, due to amyloid degeneration of the intestine, or to tuberculous or scrofulous ulceration. The child is usually languid and easily tired. After exertion he is apt to look weary and haggard; but if kept quiet, his face, although pallid, shows no signs of distress. Often his fingers and toes are clubbed.

A constant symptom of amyloid disease is anæmia, and the poorness of blood is marked in proportion to the intensity of the degeneration. Consequently, in severe cases, the skin and mucous membranes are pallid, and some œdema of the legs and feet may be noticed. Still, no doubt, the kidneys in many cases participate in the amyloid disease, and the anæmia and dropsy may be partially dependent upon the renal mischief. Albuminuria and casts may then be seen in the urine, but, as is elsewhere explained, these are not necessary symptoms of albuminoid kidney.

Diagnosis.—Mere enlargement of the liver is at once detected by palpation of the belly. It must be remembered that a hepatic swelling often presses up the diaphragm on the right side, and may cause dulness and weak breathing at the base of the right pulmonary region. Such signs (dulness and weak breathing) may be mistaken for signs of a pleuritic effusion, more particularly as the signs are detected all round that side of the chest—in front as well as behind. A distinction may be made by noticing that in the case of an enlarged liver the dulness reaches up to a higher level in front than it does at the back (in pleurisy it is higher behind); that the dulness does not pass abruptly into resonance, as it would do in the case of fluid, for the thin border of the lung overlies the upper margin of the liver and produces a modified tubular or tympanitic note at that point; and, lastly, that there is no alteration of the percussion-note in the dull area when the patient lies on his left side. A dull note replaced by resonance on change of position is characteristic of fluid; and if the quantity of fluid be small, with little thickening of the pleura, this test of the effect of gravity upon the percussion-note will usually give satisfactory results in the child.

A liver enlarged from amyloid degeneration is smooth and particularly firm and resisting. It often feels hard like wood. Its edge is thin and not rounded, and pressure upon it produces no uneasiness. Such a liver, unaccompanied by jaundice or ascites, and found in a cachectic, pallid child who has a syphilitic history, or has been the subject of bone disease or other form of prolonged suppuration, is in all probability albuminoid. If the spleen is also enlarged, and there is albuminuria with hyaline casts, there can be little doubt of the correctness of this opinion. Absence of splenic

dulness does not exclude albuminoid disease, for an amyloid spleen is not always bigger than natural. In half the cases the size of the spleen is not increased.

Hepatic enlargement from congestion rarely occurs in cachectic, anæmic children; and a fatty liver is soft and yielding instead of hard and resisting; moreover, it is not accompanied by enlargement of the spleen or albuminuria.

Prognosis.—The presence of amyloid degeneration of the liver in any cachectic child must necessarily be considered as an additional element of danger. There is, however, reason to believe that this form of disease is of less serious augury in the young subject than it is in the adult, provided that the source of irritation and suppuration can be removed. It is undeniable that in cases in which enlargement of the liver and spleen exactly resembling amyloid disease complicates old-standing necrosis of bone in scrofulous children, removal of the bone disease by a suitable operation is often followed by a return of the liver and spleen to their normal dimensions, and, to all appearance, by complete recovery of health. Mr. Barwell has recorded some remarkable cases of this kind. In one of these the urine was also albuminous and contained casts of tubes; but after the operation the urine gradually became normal, and the diseased organs eventually returned to their normal size. It may be objected that in such cases the enlargement is not due to amyloid disease. That it is so cannot of course be proved, as the crucial test of dissection is wanting. It can only be said that the organs diseased are those commonly diseased in albuminoid degeneration; that the symptoms and physical signs are such as are found in cases of this form of illness; and that the causes which are acknowledged to be powerful in producing albuminoid lesions have been in operation.

Treatment.—The treatment of amyloid degeneration consists, in the first place, in attending to the cause of the disease, and removing any long-standing suppurations and exhausting discharges which may be increasing the cachexia and adding to the weakness of the patient. If necrosis of bone or suppuration of a joint be present, the aid of a surgeon is required. Fibroid induration of the lung, or a chronic fistulous opening in the chest-wall, must be treated as directed in the chapters referring to these subjects. We must do our best, in the next place, to remove any secondary complications which may be helping to reduce the strength of the child. The bowels must be attended to; diarrhœa, if present, must be arrested, and if there be any reason to suspect scrofulous or tubercular ulceration of the intestinal mucous membrane, suitable remedies must be employed, as is elsewhere described. Vomiting must be checked by bismuth, dilute prussic acid, and the sucking of ice.

For the liver itself, the preparations of iodine are very generally recommended; and as there is always more or less anæmia, iron may be judiciously combined with this treatment. I prefer giving the drugs singly, and have often prescribed (for a child of five years of age) five drops of the tincture of iodine to be given freely diluted before food, and five grains of the exsiccated sulphate of iron in glycerine directly after each meal. If the intestinal mucous membrane be healthy, this preparation of iron does not irritate, and given in sufficiently large doses, is of great value in the treatment of cachectic conditions in the child. If ulceration of the bowels be present, it is less suitable. The syrup of the iodide of iron so often disagrees, promoting acidity and flatulence, that I have long since abandoned its use. Iodide of potassium, combined with the citrate of iron,

may be employed; but the iodide should be administered in appreciable doses. It should be rarely given in smaller quantities than one grain for each year of the child's life. I cannot remember ever seeing any uncomfortable symptoms, such as are common in the adult, produced by this remedy. Gardiner's syrup of hydriodic acid (♏ xv.–xxx.) is also applicable to these cases. Dr. Warburton Begbie speaks highly of the effects of muriate of ammonia in the adult. It may be given to the child in ten-grain doses freely diluted.

The dropsy, being the consequence of the anæmia, must be treated with iron; and the chalybeate diuretic of Dr. Basham, recommended elsewhere,[1] is here also of service. If the bowels are healthy, an occasional dose of the compound jalap powder will further the removal of the subcutaneous effusions.

The child must be put on a liberal diet suited to his age and powers of digestion; and if the kidneys are not implicated, he will be benefited by stimulants. The St. Raphael tonic wine is useful in these cases. A suitable climate adds greatly to the patient's chances of recovery. Dr. Begbie recommends a lengthened sea voyage; and there is no doubt that conditions under which the child, warmly clothed, can pass the chief hours of the day in a fresh, bracing air, are the most favourable to permanent improvement. German writers speak highly of the sulphurous springs of Aix-la-Chapelle, and the waters of Ems and Weilbach, in their influence upon this form of hepatic enlargement.

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[1] See page 730.

CHAPTER V.

FATTY LIVER.

Fatty liver may be of two kinds. The one consists in a mere abnormal deposition of fat-globules in the hepatic cells without any injury or degeneration of the cell-wall. This is called fatty infiltration. The other is fatty degeneration, in which the nutrition of the liver-cells is interfered with. They undergo a retrograde metamorphosis, and fat granules appear in them. Each of these varieties may be found in the child. They are most common in infancy and the earlier period of childhood.

Causation.—Fatty infiltration of the liver may arise in the child from two causes:—From overfeeding with farinaceous foods, and from various forms of exhausting disease. In the first case, the hydrocarbon is supplied from without, and being in excess, is deposited in the liver in the form of fat. Deposition of fat under such circumstances may be looked upon rather as a physiological than a pathological process. It is often a merely temporary phenomenon, and ceases when the diet is changed. In the case of exhausting disease, such as tubercle, scrofula, intestinal catarrh, syphilis, rickets, etc., the fat is reabsorbed from the subcutaneous and other fatty tissues. According to Oppenheimer, in infants dying during the second or third week of entero-colitis, the liver, although of normal appearance to the naked eye, is the seat of a real fatty *degeneration*. Fatty granules are seen in the hepatic cells along the whole course of the portal vessels, and the degeneration is preceded by the formation of an abnormal plasma in the cells which completely obscures the nuclei. In other structural diseases of the liver, fatty degeneration may occur as a secondary lesion.

Morbid Anatomy.—The size of the liver is not altered unless the fatty change is carried to a high degree. In that case all its measurements are increased and its edge is blunted. The surface is lighter coloured than natural, and may have an oily, shining appearance. The hepatic substance feels soft and doughy to the touch, and the section is yellowish red or yellow. In extreme cases the blade of the knife looks greasy after the section. By the microscope granules and globules of fat are seen in the hepatic cells. The oily drops are larger in proportion to the stage to which the infiltration has advanced; and if the process be carried to a high degree, the cells may each be filled by one large drop of oil. The cells at the circumference of the lobules near to the intra-lobular veins are first and principally affected. Those towards the centre are much more healthy. Therefore, on closely inspecting a lobule, the part immediately surrounding the central vein will be found much redder in colour than the periphery. The fat consists of olein and margarine, with traces of cholesterine.

Symptoms.—If the organ is not enlarged, and the degree of fatty infiltration is slight, symptoms may be absent altogether. Even if the liver is enlarged, there is little to draw attention to the belly. Some tenderness may be noticed in the right hypochondrium when this is pressed, and in

exceptional cases the child may complain of a feeling of heaviness on that side. Cases where the size of the liver is notably increased from this cause are usually those of phthisical children. There may be some digestive derangement from interference with the portal circulation, but there is never jaundice or ascites. The fatty liver is not always easy to feel, as it yields readily under the finger, and is easily depressed from the surface. Consequently, like the softened spleen in typhoid fever, its edge may elude the touch. It is of the utmost importance, in consideration of cases such as these, to lose no opportunity of practising the sense of touch and accustoming the finger to appreciate slight differences in resistance.

In fatty degeneration of the liver, there is no increase in size of the organ, and the disease, occurring as it does in the course of some exhausting illness, gives rise to no symptoms which can reveal its presence. It is therefore seldom discovered during life.

Diagnosis.—A liver enlarged from fatty infiltration differs from other forms of enlarged liver. Instead of being firm and resisting, its substance is soft and yielding; and the edge, instead of being sharp and thin, is rounded and blunt. Such a liver found in a case of tubercular or scrofulous phthisis, or in the course of some other exhausting disease, unaccompanied by jaundice, ascites, or dilatation of the superficial veins of the abdomen, is in all probability fatty. Thus, in a little girl, aged three years, the subject of a chronic hydrocephalus, who died in the East London Children's Hospital from acute tuberculosis, the liver on the child's admission was found to reach as far downwards as the level of the umbilicus. Its edges were rounded and its substance seemed to be normal. There was no sign of jaundice; the superficial veins of the belly were not visible, nor could any fluctuation be detected in the abdomen. The spleen was also enlarged. After death, the liver was found to be greatly increased in size. Its consistence was softer than natural, its colour a fawn brown, and some yellow miliary nodules were seen on the surface. Its section had a greasy look. The spleen, which was also enlarged, was studded with tubercles.

Prognosis.—A remarkably fatty liver occurring in the course of a lingering illness implies serious interference with nutrition; but the prognosis depends more upon the primary disease than upon the state of the liver.

Treatment.—The indications for treatment must be derived from the primary disease in the course of which the fatty condition of the organ has arisen. If a child is known to be taking extravagant quantities of farinaceous food, measures must be taken at once to put a stop to such excess; but many other symptoms besides fatty liver may be the consequence of such a dietary. This subject is treated of elsewhere (see Gastric Catarrh).

CHAPTER VI.

HYDATID OF THE LIVER.

Hydatid of the liver is sometimes found in childhood. The disease seldom occurs earlier than the fourth year of life, although Cruveilhier has quoted a case in an infant twelve days old, and M. Archambault has seen it in a child aged three years and a half. Between the fourth and eighth year it is sometimes met with, but is still rare. After the eighth year it is more common. The earliest age at which the disease has come under my own notice has been five years and a half.

Causation.—The hydatid growth becomes implanted in the human liver as a result of the introduction into the stomach and intestines of the ova of the tænia echinococcus. This creature is a parasitic worm inhabiting the alimentary canal of the dog and wolf. The tape-worm is a quarter of an inch in length, and has four joints, the last of which (the proglottis or sexually mature segment) contains the ova. The ova are excreted by the animal in whose intestines they have found a lodgment, and contaminating water or articles of food, become introduced into the human body. It is probable, also, that the ova and scolices may be sometimes conveyed to the child directly. In the dog, the presence of the worm in the bowels, and the passage of the eggs and embryos in large numbers through the anus, causes considerable irritation, which the animal endeavours to relieve by licking. If directly afterwards he apply his tongue to the face and mouth of the child, the parasite may pass at once to the child's tongue and be swallowed. How it travels from the alimentary canal to the liver is not clear.

Hydatid disease is endemic in Iceland, where the children are often affected. The enormous number of dogs maintained on the island has been supposed, with much probability, to be the explanation of the frequency of the disease.

Morbid Anatomy.—Hydatid tumours are more common in the liver than elsewhere in the body; but from the intestine they may pass not only into the liver but also into the spleen, the mesentery, the wall of the abdomen, and even into the substance of the heart and brain. The liver may contain one sac or several. The sac itself consists of a firm fibrous capsule in close adherence to the liver substance, and is very vascular. Inside the capsule there is a clear gelatinous bladder (the envelope of the vesicle) composed of numerous fine concentric strata. This is the mother sac. It contains numerous large and small vesicles floating in a clear fluid, or adherent to the investing envelope. Some of the larger of the daughter vesicles may contain smaller sacs still of a third generation. These are seldom larger than the head of a medium-sized pin. The mother sac itself varies in size from a pea to a marble, an orange, or a child's head. The fluid it contains is non-albuminous and holds in solution salts, principally the chloride of sodium. On careful examination of this fluid, the hooklets

of the embryos (scolices) of the tænia echinococcus may be often recognised by the microscope.

The scolices themselves may be sometimes found. These are from one-twentieth to one-sixth of a line in length. The head, which resembles that of the tænia, has four suckers and a trunk. The latter is encircled by a double crown of hooklets, the number of which varies, according to Kuchenmeister, from twenty-eight to thirty, or from forty-six to fifty-two. The head is separated from the body by a groove, and at its posterior end is a depression into which a cord is inserted. This attaches it to the inner wall of the sac. The shape varies according as to whether the head is stretched out or retracted. On the body, elongated lines are seen passing backwards from the head. These are intersected by transverse striæ. Besides these markings, a number of rounded calcareous corpuscles can be detected. The scolices lie in groups on the inner wall of the cyst, and can be seen through the vesicular wall as delicate white particles. Sometimes the mother sac contains scolices but no daughter vesicles. Sometimes it contains neither vesicles nor embryos.

The sacs may be seated at any part of the liver, but are more common in the right lobe than in the left. The liver is generally enlarged by them, and may appear uniformly swollen if the sac is deep-seated. If superficially placed, the cyst raises a bump or tumour at the corresponding part of the surface. When it lies close under the peritoneal coat of the liver, this membrane becomes thickened and may form adhesions with parts around. The pressure of the sac upon the parenchyma of the organ causes destruction and atrophy of the hepatic tissue. The larger blood-vessels and bile-ducts are seldom affected ; but occasionally the ducts may be obliterated, or a communication may be formed between the sac and a large duct or blood-vessel. In such cases the death of the cyst usually follows.

After a time changes generally take place in the mother sac. It may rupture from over-distention, and only a few shreds of the original vesicle may be left amongst the daughter cysts. Sometimes the sac suppurates, or is converted into semi-solid atheromatous matter composed of phosphate and carbonate of lime, cholesterine, and a substance resembling albumen. In other cases adhesions may be formed with neighbouring parts, and the cyst may burst into the stomach or bowels, or through the diaphragm into the pleura or lung. Accidental injuries have caused rupture of the cyst and extravasation of its contents into the peritoneal cavity. In rare cases the hydatid sac has been known to open externally through the abdominal parietes or a lower intercostal space. After escape of the fluid by any of these means, suppuration of the cyst may still take place, and pyæmia is one of the consequences which may result. Sometimes, although rarely, the increase in thickness of the capsule, which may acquire a cartilaginous consistence, so interferes with the development of the echinococcus that death ensues and a spontaneous cure is effected. This, however, is not likely to occur except in hydatids of small size which have not been detected during life.

Symptoms.—When the cyst is small and is planted deeply in the substance of the liver, it may give rise to no symptoms at all. In most cases, however, the liver becomes enlarged, but not uniformly. A tumour is felt at one part of the organ which may project upwards into the chest or downwards into the belly. The swelling is painless as a rule, and may give rise to no uneasiness, but a feeling of weight. It is smooth, round, often elastic, and may convey a distinct sense of fluctuation. Sometimes, however,

as in a case to be afterwards narrated, it feels firm and solid like a fibrous growth. In exceptional cases a sense of vibration, first described by Piorry as the "hydatid fremitus," is felt by sharply percussing the finger allowed to rest upon the tumour. This vibration, according to Dr. Sadde, denotes the presence of daughter vesicles. Therefore, if vibration is absent, we should expect to find few or no hooklets. Occasionally, pain has been noticed from mere distention, as in a case mentioned by Frerichs, where the pain ceased after puncture and removal of a quantity of watery fluid from the cyst. As a rule, pain, if present, indicates inflammation and suppuration of the sac.

As the tumour seldom interferes with the channels of the bile-ducts or portal vessels, jaundice and ascites are rare, and dyspeptic symptoms are seldom observed. In ordinary cases, therefore, the nutrition of the child is not interfered with, and there is no fever. The patient is brought for advice merely on account of the unusual size and unilateral hardness of his belly. In young subjects the projection, as a rule, is readily detected by the eye, and if seated near the convex surface of the right lobe, as it usually is, forms a swelling which protrudes downward from beneath the lower ribs.

A little boy, aged five years and a half, was brought to me at the hospital on account of the size of his belly and occasional pains which he complained of in the right hypochondrium. He had, besides, some cough in the morning. On examination of the abdomen, a prominent swelling was discovered in the hepatic region, bounded above by the ribs, and below by a line drawn just below the level of the navel. Its transverse measurement was three and a half inches. The liver dulness began above one finger's breadth below the nipple, and its lower edge could be felt just below the lower border of the tumour. The swelling was smooth, elastic, and gave a semi-fluctuating sensation to the finger. There was no hydatid fremitus. When pressure was made upon it, the child flinched and said it was sore. There was no jaundice, ascites, or prominence of the superficial abdominal veins. The swelling was punctured with the pneumatic aspirator through the abdominal parietes, and about an ounce of purulent matter was evacuated. No hooklets could be detected. Ten days afterwards the cyst had refilled. It was again punctured, and a quantity of perfectly clear fluid escaped. The cyst did not again refill, and the size of the liver was greatly reduced when the child left the hospital.

Sometimes the tumour, instead of becoming visible in the belly, may press upwards the right side of the diaphragm and the base of the lung, and project far into the right side of the chest. In such a case the lower ribs on that side are pushed outwards, and the physical signs very much resemble those of a pleuritic effusion. Even if the tumour project but slightly upwards, the respiratory sounds are usually very weak at the right posterior base of the chest, and the percussion-note may be a little higher pitched, with increased sense of resistance.

If, instead of projecting from the convexity of the organ, the hydatid sac protrudes from the under aspect of the liver, pressure signs may be observed in connection with the biliary and vascular conduits. It is in these cases that jaundice, ascites, and œdema of the feet may be noticed.

If spontaneous suppuration take place in the hydatid sac, the symptoms vary in severity. They may be grave or trifling. In some cases a slight rise in the temperature of the child occurs; he looks a little poorly; coughs, and complains of pain when his belly is manipulated, but nothing is noticed to excite the alarm of the parents. In other cases he shivers,

and his temperature undergoes the rapid alternations peculiar to suppuration ; the swelling increases in size, and, if left alone, either points at some part of the surface, or sets up adhesive inflammation with a neighbouring organ and bursts into it. The proof that such an abscess is the result of a hydatid cyst is the finding of hydatid membranes or hooklets in the evacuated pus.

If the cyst be not interfered with, it will probably in time destroy the life of the patient by bursting into some neighbouring organ. Bohn has related the case of a child eight years of age, in whom the sac burst into the bowel. The patient recovered ; but a favourable issue to so severe a complication must be rare. The cyst usually bursts into the cavity of the chest—into the pleura or the lung. Death is a frequent consequence of either accident. In the latter case pneumonia is set up, and the patient dies worn out by the profuse discharge.

Hydatid of the liver may be complicated by a similar development in the spleen, in the folds of the mesentery, or beneath the peritoneum. It is important to be aware of this possible distribution of the echinococci, as the presence of various tumours in the abdominal cavity may tend to embarrass the diagnosis. Sometimes the lungs as well as the liver are affected. These various cysts often appear to be of different ages, and in that case may arise from absorption of embryos at different periods of time. It has been suggested that germs generated by the elder hydatids may be carried along by the current of blood and deposited in other organs ; but in this case they could hardly be conveyed from the liver to the spleen or mesentery against the direction of the blood-current.

Diagnosis.—The diagnostic features of a hydatid tumour of the liver are :—A localised swelling of the organ, smooth, elastic, and painless, accompanied by no signs of jaundice, ascites, prominence of the superficial abdominal veins or swelling of the feet, and giving rise to no pyrexia or impairment of the general health of the child. If the characteristic fremitus can be detected on percussion of the swelling, the evidence is complete.

If suppuration have occurred in the sac there may be some fever, and the child looks ill and pale. Pain may be complained of in the right hypochondrium, and the tumour may be tender when pressed upon.

If the tumour feel solid to the touch, as was the case in a child who was under my care in the hospital, the diagnosis would rest upon the slow growth and painless condition of the swelling, and the general absence of symptoms. I have never met with a sarcoma or soft cancer of the liver in a child, but it is possible that this disease might be mistaken for a hydatid cyst. The growth, however, would be more rapid in such a case, and we should expect to find some impairment of the general health. In any case of doubt an exploratory puncture with a fine trocar and canula will remove all hesitation. If a non-albuminous, clear, or slightly turbid fluid escape, especially if hooklets can be discovered in it by the microscope, the diagnosis of hydatids is clear.

If a large cyst project upwards into the chest and compress the base of the lung, it is often mistaken for a pleuritic effusion. The error is one which is easily fallen into, for in both cases there is complete dulness, with increased sense of resistance and weak breathing, all round the right side of the chest. A distinction may be made by observing that in the case of a hepatic cyst the upper line of dulness is curved with the convexity upwards, and that the dulness, therefore, reaches higher in the mid-axillary line than at either the front or the back of the chest. In pleurisy an

exactly opposite condition is found. The upper margin of dulness is concave, being less elevated in the infra-axillary region than at the back. If there is any suspicion that the disease is not pleurisy, an exploring trocar, allowing of examination of the fluid, will soon set the matter at rest. The fluid drawn from the chest in pleurisy coagulates on boiling, while the hydatid fluid, as has been said, is non-albuminous.

In the rare cases where jaundice and ascites are produced by a hydatid cyst placed near the concavity of the liver, no localised swelling can be detected, and a diagnosis is hardly possible unless we can satisfy ourselves by puncture or otherwise of the presence of a similar cyst in other organs.

Prognosis.—If the child is seen before injury has been inflicted upon neighbouring organs by bursting of a hydatid sac into them, the prognosis is favourable; for the slight operative procedure necessary for the evacuation of the fluid and destruction of the cyst and its contents is usually well borne. If the sac has been evacuated into a neighbouring organ, the situation is a very serious one, and most of these cases prove fatal.

Treatment.—Although many internal remedies have been administered in the hope that the drug might pass from the blood to the interior of the cyst, and so destroy the life of the hydatid, it is now admitted that such an object is not to be attained by physic. Our only means of curing the patient is to puncture the cyst and evacuate its contents. If this be done with a fine trocar and canula, there is little risk of escape of the fluid into the peritoneum, and consequent peritonitis. It is best to employ the pneumatic aspirator, so as to prevent the entrance of air into the sac. After the withdrawal of its fluid contents, the hydatid cyst collapses and its membrane shrinks away from the investing capsule. The resulting space is rapidly filled by exuded serum, and the hydatid quickly dies. Sometimes the operation requires to be repeated. It is usually unnecessary to employ irritating injections after emptying the sac, but if the cyst continually refills, it may be desirable to do so.

A healthy-looking, well-nourished girl, aged twelve years, was under my care in the Victoria Park Hospital, for a swelling in the right side of the belly which had been first noticed two months previously.

On examination it was seen that the lower ribs on the right side were distinctly prominent, and that the intercostal spaces at that part were widened. The liver dulness began at the lower border of the fourth rib, and the inferior edge of the organ could be felt just below the level of the umbilicus. Immediately below the ribs, a solid-feeling tumour was discovered. This gave no elastic sensation to the finger, and was not at all tender when pressed upon. It descended somewhat on deep inspiration. Below it the substance of the liver could be felt of normal density, conveying to the finger a very different sensation to the solid resistance of the tumour. Posteriorly, the hepatic dulness began at the lower angle of the scapula, and complete dulness one interspace lower down. The respiratory sounds were weak at the right base behind, and some friction was heard in the infra-axillary region and at the base in front (the child had had pleurisy eighteen months before). There was no jaundice or ascites, and the superficial veins, although more visible than natural over the front of the chest, were not dilated in the epigastrium or on the abdominal wall. The heart's apex was in the fifth interspace in the nipple line. Its sounds were healthy.

An exploratory puncture was made in the tumour with a hypodermic injection syringe, and some colourless fluid containing chlorides but no albu-

men was withdrawn. No hydatids could be discovered in the fluid by the microscope. Some days afterwards the tumour was again punctured with the aspirator through the eighth interspace, and twenty ounces of a clear, straw-coloured fluid were withdrawn, having the characters above mentioned. Its specific gravity was 1.008. No hooklets could be seen under the microscope. A solution of iodine (half a drachm of the tincture to half an ounce of water) was then injected into the cyst, and the child took a draught containing five drops of laudanum.

The operation was followed by no rigors, sickness, or other sign of discomfort; but the temperature rose every night to between 101° and 102°, sinking in the morning to nearly the normal level. A fortnight after the first operation, the tumour being rather more prominent than on the child's admission, the cyst was again punctured, and twenty-three ounces of thick greenish pus were drawn off. In another fortnight the operation was repeated for the third time, removing eleven ounces of greenish pus. This was quite sweet, and under the microscope showed hooklets and signs of hydatid *débris*. On each of these occasions the cyst had been tapped through the chest-wall; but ten days after the last operation, the cyst having again refilled, the needle of the aspirator was introduced through the abdominal parietes and twenty-three ounces of pus were evacuated. The operation set up some local peritonitis; but this was quickly reduced by poulticing and the administration of six drops of laudanum three times a day.

After the last operation the cyst did not fill again, and when the girl left the hospital a month afterwards, there was slight curving of the spine with the convexity to the left; the right shoulder and angle of the scapula were a little depressed; the edge of the liver was felt one inch above the umbilicus, and its upper border was on a level with the nipple. Its substance felt normal to the touch, and there was no distention or tenderness of the belly. Six months afterwards, when the child was seen again, the liver had returned to its normal size; the spine was perfectly straight; the shoulders were on the same level, and no indication was left that the girl had ever been ill.

Injection of iodine after the evacuation of the contents of the sac is not necessary to the success of the operation. It is usually found that simple emptying of the cyst is sufficient to destroy the life of the hydatid and that irritating injections are useless. In every case the child should be kept very quiet for a day or two after the puncture, and a firm bandage should be applied to the belly. It is well, also, to give a little opium at night, as was done in the case above narrated.

A sufficient time should be allowed to elapse after evacuating the fluid before repeating the operation. The cyst will often seem to be filling up again for a time; but, if left alone, it frequently subsides without further interference and gradually becomes obliterated.

Dr. Fagg has reported several cases of hydatid tumour of the liver in children which he had treated by electrolysis in the manner recommended by Dr. Althaus. The operation was performed by passing two electrolytic needles into the cyst, one or two inches apart. The needles were then attached to two metallic wires both connected with the negative pole of a galvanic battery of ten cells. A moistened sponge formed the termination of the positive pole; and this was placed on the patient's skin, at a little distance from the points of entrance of the needles. Its position was changed from time to time during the operation. After the current had passed for about ten minutes, the needles were withdrawn and adhesive plaster was applied to the seats of puncture.

The operation was usually followed by a little febrile disturbance and some pain; but no immediate effect upon the size of the tumour was discoverable. Indeed, the children were sent away from the hospital in much the same state as when they were admitted. But examination, after a period of months, usually detected considerable diminution in the dimensions of the cyst. The operation appears, therefore, to be attended by no danger; but its results are too slow in making themselves manifest to render it suitable for adoption in private practice. With regard to the modus operandi of the procedure, Dr. Fagg suggests that the gradual subsidence of the tumour may be due to slow oozing of the hydatid fluid through the punctures made by the needles; for hydatid fluid alone, unaccompanied by ova or scolices, appears to be innocuous when extravasated into the peritoneum.

If suppuration have occurred in the sac, and the matter withdrawn be putrid and offensive, the cyst must be washed out frequently with a weak antiseptic solution; opium should be given to allay pain and irritation; and quinine in full doses, with nutritious diet and stimulants, will be required.

Part II.

DISEASES OF THE GENITO-URINARY ORGANS.

CHAPTER I.

THE URINE.

On account of the difficulty of collecting the urine in very young children, it is seldom possible to estimate the average quantity passed in the twenty-four hours. It is not always easy to obtain the quantity necessary for examination of its chemical characters.

In health, the water is clear, light-coloured, and of low specific gravity; but it is subject to frequent variations on account of the readiness with which the child responds to every disturbing agency. The quantity secreted is dependent upon certain conditions, such as :—The degree of blood-pressure in the renal arteries; the facility with which the urinary tubules discharge their contents; and the state of the nervous system generally. Also upon the condition of the other emunctories of the body, the quantity of fluid taken, and lastly, upon the state of health of the individual. Consequently the water passed varies greatly in amount. Sudden copious secretion may be a temporary symptom in many cases of digestive derangement; in particular, attacks of severe abdominal pain are often terminated by a copious flow of almost colourless urine from the bladder. Also, an epileptic seizure, an attack of ague, or a fit of convulsions in the child may be followed by a profuse secretion of limpid urine. Various articles of food seem to have a direct action in promoting secretion from the kidneys. In some children barley-water has this effect; and the nurse complains that while taking it, the child is almost "constantly wet." Again, certain diseases are accompanied by an increased flow of urine. Diabetes mellitus, and diabetes insipidus are in rare cases seen in children. The former, however, uncommon at any age under puberty, is almost unknown under five years of age. The latter is sometimes an accompaniment of gastro-intestinal disorders, but ceases usually when the digestive organs have been put into a better condition.

Diminution in the quantity of water passed is the result of many different causes, and usually attracts more attention than the opposite condition. The skin in some children acts very freely; and in warm weather a large proportion of the fluid may leave the body by this channel. In such a case the urine may be very scanty. One morning in July a child aged

ten months was brought to me on account of the small quantity of urine she was passing. During the preceding twenty-four hours she had passed water but once, and then in very small quantity on the evening before the visit. The weather was very warm, and the child perspired profusely, but except for slight costiveness was and seemed perfectly well. I quieted the alarm of the mother, advised that the child should be given plenty of fluid, and ordered a gentle aperient to relieve the bowels. After this, the mother was soon made happy by seeing a more copious secretion of urine. The amount of water is also diminished by diarrhœa and vomiting, which derangements, as in the preceding case, divert a certain quantity of water from the kidneys. When the reduced secretion is due to a watery flow from the bowels, it may be unnoticed by the attendants ; but when the symptom is an accompaniment of vomiting, the small quantity of water passed from the bladder is often a cause of anxiety. In cases of extreme prostration from deficient nourishment in infants, the secretion of urine is scanty and may be completely suppressed. Indeed, Dr. Parrot attributes the cerebral symptoms which sometimes occur in such cases, and are called "spurious hydrocephalus," to toxic causes, the blood being charged with excrementitious matters which it cannot get rid of. In the febrile state, the urinary water is diminished in quantity, and is increased again as the temperature subsides. There is, however, no reduction in the solid constituents of the urine, and the specific gravity is consequently raised. Besides the above causes which act through the system generally, other and local causes which interfere with the secreting function of the kidneys may have the same result. Thus, congestion of the kidneys from disease of the heart or liver, and Bright's disease, may reduce the quantity of water to a very small amount.

Variations occur not only in the quantity of water passed from the kidneys, but also in the amount of solid matters excreted. Thus, in febrile diseases the urine is not only more concentrated from deficiency of water, but it is richer in urea and uric acid, although poorer in chlorides. In health the quantity of urea passed by a child is relatively greater than it is in the adult. According to Uhle, children between three and six years of age pass in the twenty-four hours one gramme of urea for each kilogramme of their weight. This fact is important as indicating the active metamorphosis of the protein compounds of the body which occurs in early life.

It has been said that the water of a young child in perfect health is quite clear. In the normal state it is also slightly acid. Very slight causes will give rise to an increase in the amount of acid secreted, and the water is then apt to be thick with lithates. As in older persons, the turbidity generally occurs as the urine cools on standing ; but sometimes it is turbid while still warm, and may even be passed thick from the bladder. Infants, especially, sometimes alarm their mothers by voiding water thick and milky-looking from a profuse secretion of urate of soda. The appearance of a deposit of lithates may be due to two causes :—To increased secretion of the salts, and to excess of acid in the water. Young children who are habitually overfed continually pass water loaded with lithates ; and if they are taking inordinate quantities of fermentable material in their food, the amount of acid is also greater than normal. Thus, both the causes which conduce to turbidity of urine are present. During convalescence from acute disease in a child, when it is our object to further the return of flesh and strength by an ample supply of nourishing food, and at the same time to avoid overburdening the digestive organs by an excess of nutritive material, the state of the water offers a very good index as to whether the

necessary quantity has been exceeded. If the child is eating too much, his water becomes at once thick with lithates, and warns us to make some reduction in the quantity, or alteration in the quality of his meals.

Besides lithates, young children, and even infants, may pass free uric acid in their water. This subject will be considered afterwards (see Calculus of Kidney).

The urine in infants is sometimes noticed to be very offensive. This is due to a catarrhal condition of the bladder, and denotes rapid decomposition of the urea. Another symptom sometimes complained of by the mother is that the water is very dark in colour and causes stains on the diaper. This may be the consequence of the presence of bile-pigment in the urine.

Albumen is often found in the urine of children, but must not be looked upon as in every case indicating disease of the kidneys. It is seen in many inflammatory complaints and fevers, as in pneumonia, diphtheria, measles, typhoid fever, etc. In such cases it is probably dependent either upon an altered condition of the blood, when it is an expression of the general disturbance of the system induced by the illness, or upon an infectious nephritis, which is found, according to M. Bouchard, in many forms of acute specific fever. Again, a casual admixture of blood or pus with the urine may give rise to the presence of albumen, as in cases of irritation of the urinary passages by calculous concretions. Passive congestion of the kidneys, such as takes place in many cases of heart disease and in some forms of bronchitis, may be a cause of the same symptom, and the albumen may be accompanied by epithelial and blood casts. But in these cases the presence of the albumen, and even of the casts, is no indication of organic disease of the kidneys. We are only justified in inferring the existence of renal disease when we find by the microscope hyaline or granular casts in conjunction with the albuminuria. A transient albuminuria is sometimes met with, and appears to be a result of some bodily derangement quite independent of renal disease. It may be found in school-boys who are preparing for examination. Dr. Kinnicutt attributes it in many cases to a transient oxaluria or lithuria. It has also been seen in ague districts as a consequence of malaria. Intermittent albuminuria—albumen being abundant one day, absent the next—is usually due to an admixture of secretions, and should lead us to suspect a habit of masturbation.

As in older persons, the urine of children and even of infants may contain *blood*. This may be poured out from any part of the urinary passages. When the source of the blood is the urethra or bladder, the two fluids are passed separately without mingling together. Thus, in a case of vesical calculus, the child passes first water and then a little blood from the bladder. When the two fluids are intimately blended, we are justified in concluding that the blood comes from the kidney. Renal hæmorrhage is not very uncommon in young subjects, and may occur in large or in small quantity. When in large quantity—in quantity sufficient to give a dark red colour to the whole volume of urine—the blood may be usually ascribed to one of two causes; either to hæmorrhagic purpura or to irritation of the kidney by calculous concretions. In the first case there are signs of hæmorrhage from other mucous passages and into the skin. In the second, the child may complain of no pain, and appear, except for the hæmorrhage, to be perfectly well. In smaller quantities, often enough merely to give a smoky tint to the urine, hæmaturia is seen in acute Bright's disease, in hæmorrhagic measles, in scarlatina, diphtheria, and small-pox; sometimes,

also, in ague. Even after suppression of urine in young children suffering from inflammatory diarrhœa, the renal secretion, when the function of the kidneys is restored, may contain blood. In fact, wherever albumen is present in the urine blood may be present as well. In all such cases the blood-corpuscles may be recognized by the microscope. Occasionally, especially in scarlatina before the appearance of albuminuria, the urine may contain the colouring matter of the blood, but without any of the corpuscles being discovered by microscopical examination.

There is a form of hæmaturia which is common in some parts of Africa, especially in Egypt and the Cape of Good Hope. The hæmorrhage is due to the presence of the Bilharzia hæmatobia (genus Hematoda). This parasite is found in the portal and mesenteric veins, and in the kidneys and urinary passages. According to Dr. James F. Allen, almost every boy in Natal suffers or has suffered from this parasite, for the embryos develope in water and abound in the running streams. The girls, who stay more at home and drink filtered water, commonly escape. The creatures enter the system by the stomach from drinking the water, or by passing directly into the bladder through the urethra while the boy is bathing. Amongst the natives of South Africa a practice is said to prevail, before entering the water, of tying a piece of tape round the end of the penis to prevent the entrance of the parasite.

The hæmorrhage appears to come from the bladder. After micturition a little blood is passed from the urethra. The quantity is often only a few drops, but may reach several ounces. It occurs on each occasion at the end of the flow of urine. Its passage is nearly always accompanied by a rigor, and sometimes by pain and irritation referred to the bladder. On examination of the urine it is found always to contain blood, more or less albumen, and a quantity of mucus. In severe cases its reaction is alkaline, and it contains triple phosphate crystals. Under the microscope the ova of the bilharzia are seen entangled in the blood-clots and free among the blood-corpuscles. They are $\frac{1}{170}$ inch long, ovoid in form, and have a spike at one extremity. If the ovum is broken under the microscope, by pressure of the two glasses against one another, the living embryo may be seen to emerge from its shell. It is ovoid in shape, like the egg, is pointed at one extremity, and projecting from the sides are innumerable cilia, which seem to be always in motion.

The result of the constant loss of blood soon manifests itself. The boy, although tall, is pale and narrow-chested. He has little appetite, is listless, and shows no energy, either mental or physical. Children are said to begin to suffer from the parasite at a very early age; but soon after puberty the hæmorrhage ceases and the patient recovers. It appears never to be fatal.

Dr. Allen states that internal treatment of every kind, although it may destroy the parasite in the blood, fails to influence the local symptoms or arrest the hæmorrhage. To do this local treatment is necessary. He advises the injection into the bladder of a saturated solution of santonine in absolute alcohol. Of this, a quantity varying from half a drachm to two drachms must be used when the bladder is empty, and must be retained as long as possible. The injection sets up a mild cystitis, which should be treated with hyoscyamus and infusion of buchu. If the larger quantity of santonine be used, the patient feels drunk from the remedy affecting the brain, and the cystitis lasts three or four days, instead of merely one or two; but no other ill effects are noticed. The injection may have to be repeated several times, but is invariably successful in the end.

Afterwards santonine should be given by the mouth to destroy any embryos remaining in the blood.

Besides santonine other local applications have been suggested. Iodide of potassium and the liquid extract of male fern are both well tolerated by the bladder. Dr. John Harley recommends a drachm of the fern extract to be diluted with barley-water and injected into the bladder. Iodide of potassium may be used of the strength of fifteen or twenty grains to the fluid ounce. Dr. J. Wortabet speaks in favour of the internal administration of oil of turpentine, and records a case in which a complete cure was effected by drachm doses of this remedy.

Retention of urine is not very common in young children. It may, however, be induced by mechanical causes. Thus, some little boys have a very long prepuce, with a narrow opening, through which the urine is forced with difficulty. This extra-urethral stricture forms a great obstacle to the complete emptying of the bladder, and may be a cause of serious injury to the health. Cases are occasionally met with in which dilatation of the bladder, ureters, and pelves of the kidneys have been induced by such long-continued retention and pressure. Another common consequence of the straining efforts which usually accompany the attempt to evacuate the bladder is prolapsus ani. Retention of urine may also result from the presence of a calculus, which, becoming impacted in the urethra, prevents the passage of water from the bladder. I have even known such an accident to lead to rupture of the membranous part of the urethra, and extravasation of the urine. Again, irritation of the rectum by worms may be a cause of spasmodic retention of urine. Violent blows upon the lower part of the abdomen may produce a temporary paralysis of the bladder and retention. Lastly, in some cases of febrile disease, such as typhoid fever, we occasionally find distention of the bladder from atony of the muscular coat.

Incontinence of urine, or enuresis, as it is called, is a much more familiar symptom in young children than retention. Involuntary passage of the water may occur in the night or in the day; and sometimes the child is unable to control his bladder either by day or by night. This distressing infirmity is far from uncommon. It may date from birth, or may be acquired later. When acquired, its first occurrence has been attributed to fright; but it is a popular impression that all nervous derangements are excited by some shock to the nervous system, and too much importance must not be attached to this explanation. In cases where it is not due to manifest weakness of mind or pure laziness of body, and where no disordered condition is present to which the incontinence can be attributed, we may sometimes, by careful examination, detect some external source of irritation which requires removal. Thus, the urine may be habitually too acid, and deposit crystals of uric acid; there may be phimosis, allowing of accumulation of irritating secretion beneath the prepuce; the urethral orifice may be narrowed externally; the prepuce may be wholly or in part adherent to the glans; or again, great irritation may be excited in the neighbourhood by thread-worms in the rectum. In a sensitive child irritation at some distance from the bladder may act as the exciting cause. Thus, enuresis may be the consequence of chronic disease of the hip-joint, and may cease when, by rest and proper mechanical appliances, the irritation of the joint has been subdued. Sometimes the most careful investigation fails to discover any such exciting cause. The incompetence is then attributed to general irritability of the nervous system, or to "spinal irritation."

The mechanism of the phenomenon is well understood. Owing to causes which may or may not be capable of explanation, there is excessive irritability of the muscular fibres of the bladder. Under normal conditions the bladder is closed by the contraction of the sphincter vesicæ, whose office it is to resist the action of the fibres forming the muscular coat. If necessary, the involuntary contraction of the sphincter can be reinforced by the exercise of the will. In the more common form of incontinence, where the involuntary passage of urine takes place at night only, the irritability of the muscular coat is exaggerated, and the resistance of the sphincter is relatively deficient. There is no atony of the sphincter, but on account of the increased pressure against which it has to contend it requires to be strengthened by voluntary agency. During sleep the agency of the will is removed, and the sphincter can no longer effectually resist the action of the irritable muscular fibres, so that the contents of the bladder are discharged. In cases where, in addition to the abnormal excitability of the muscular coat there is a certain degree of atony of the sphincter, the patient has little control over his bladder even during the daytime. Micturition is frequent, and when the desire to pass water manifests itself, it can hardly be resisted even for a few seconds.

This derangement has been classed amongst the neuroses, with epilepsy, chorea, and other similar affections. According to Trousseau, it is often found in families prone to epilepsy, and may thus be a hereditary failing. It cannot, however, be always attributed to a faulty condition of the nervous system. In many instances it appears rather to be due to the active reflex sensibility which is normal to the healthy child. These are the cases in which the enuresis is manifestly the consequence of some external source of irritation, and ceases when this is removed. We know how promptly, in health, the nervous system of a child responds to reflex stimuli, and we constantly have occasion to observe the perturbation into which the whole system is thrown by the action of some external irritant. No doubt the class of cases in which the power of controlling the bladder returns "of itself," more or less suddenly, are cases of this kind. As the child grows older, the extreme sensitiveness of his nervous system to external impressions becomes dulled. The only variety of enuresis which can be classed justly amongst the true nervous affections is that in which the incontinence is hereditary, or occurs in families subject to epilepsy or other form of neurotic disease,[1] or is apparently a consequence of nervous instability without any external cause being discovered to which the faulty action can be attributed.

Enuresis, when acquired after infancy, is generally observed first between the third and fourth years. It is seen as often amongst the strong and robust children as amongst the thin and delicate; but is, perhaps, more common in boys than in girls. The more obstinate forms of this infirmity are, however, more common in the female sex, probably because in them the complaint is less often the consequence of external irritation. In ordinary cases the accident occurs only at night, and even then not every night. Often for a week or more the bed remains dry. Then it is wetted regularly for several nights in succession, and sometimes the accident occurs on the same night several times. It is usually during the early hours, or later towards daybreak, that the child's bladder seems to be least under control; and it is at these times that the incontinence is

[1] It must not be forgotten that nocturnal incontinence of urine may be the only sign of the occurrence of true epileptic attacks in the night.

usually manifested. After continuing for a variable time the infirmity may disappear without treatment. The periods of second dentition and of puberty are popularly supposed to be sometimes marked by this favourable change.

In the treatment of enuresis our first care should be to search for any source of external irritation. If this can be found, its removal forms the first step to a cure, and indeed the case may require no further treatment. Thus, the removal of an elongated prepuce; the separation of adhesions between the prepuce and the glans; the expulsions of thread-worms, or suitable medicines by which too great acidity of urine has been remedied—all of these measures have been followed by immediate relief from this distressing complaint. Sometimes, however, such measures have to be supplemented by others, directed to lessen the abnormal irritability of the muscular coat of the bladder. In all such cases care should be taken that the child drinks little towards evening, and empties his bladder completely before he goes to bed. Moreover, if the incontinence occur in the early hours of the night, the nurse should be directed to take up the child and see that his bladder is properly relieved before herself retiring to rest.

Of medicines which diminish irritability, belladonna takes the first place; but it is important to be aware that this remedy, to be effectual, must be given in full doses. Children have a very remarkable tolerance for belladonna, and will often take it in surprising quantities before any of the physiological effects of the drug can be produced. In obstinate cases of enuresis the medicine should be pushed so as to produce dilatation of the pupils with slight dryness of the throat. In children of four or five years of age it is best to begin with twenty-five or thirty drops of the tincture of belladonna given three times in the day, and to increase the dose by five drops every second or third day, of course watching the effect. Ergot is another remedy which is often very successful. For a child of the same age twenty drops of the liquid extract may be given several times in the day. Bromide of potassium, benzoic acid (dose, five to ten grains), and benzoate of ammonia, digitalis, borax, cantharides, camphor, and chloral, have all been recommended as specifics in this complaint. Sometimes a combination of several drugs seems to be more effectual than one given alone. I have lately cured a little girl, aged four years, who had resisted all other treatment, with the following draught given three times in the day:—

℞. Tinct. bellad..... ℥ j.
Potas. bromidi..... gr. x.
Inf. digitalis..... ℥ ij.
Aquam.....ad. ℥ ss.
M. Ft. haustus.

When the incontinence continues in the day as well as at night, strychnia should be combined with the sedative so as to give tone to the feeble sphincter. In these cases, too, cauterization of the neck of the bladder with a strong solution of nitrate of silver (℈j.–℥ j. to the ounce of water), has been found successful.

Besides drugs, other measures have been employed in obstinate cases. Thus, abstinence from animal food, including meat-broths, has been found to succeed in cases where drugs and other treatment had failed. In some country places in England a popular remedy consists in wrapping the feet

of the patient at night in cloths wrung out of cold water. I have never used this remedy, but it is said to be an effectual one.

Electricity has been lately employed with advantage in these cases. One electrode in the shape of a spinal disk, connected with the positive pole of the battery, is applied to the lumbar region of the spine. A second electrode is placed above the pubes or in the perinæum. A weak current is then passed for several minutes once a day. It is said that under this treatment immediate improvement is noticed, and that a complete cure follows within a fortnight.

CHAPTER II.

CHRONIC BRIGHT'S DISEASE.

Bright's disease, both in the acute and chronic stage, is seen in the child. The acute form is, however, the more generally met with on account of the frequency with which scarlatina occurs in early life, and the tendency of this specific fever to be complicated by acute renal disease and dropsy.

Causation.—It is no doubt to scarlet fever that the large proportion of cases of acute Bright's disease in the young child must be referred. Still, it is not very uncommon to meet with acute renal dropsy in children who are without any history of scarlatina, who show no signs of desquamation of the skin, and in whom no cause for the symptoms but recent exposure to cold can be detected. The practice of short-coating infants of a few months old, regardless of the state of the weather, which prevails in this country, is no doubt often answerable for this as for other catarrhal disorders in early life. A child of a few months old, who has been recently short-coated, is taken out on a cold damp day almost naked from his waist downwards; for his scanty skirts afford little protection to the lower part of his body. A day or two afterwards he is noticed to be pale and puffy-looking about the face; he vomits, and his belly and legs begin to swell. At the same time his urine is scanty, high-coloured, perhaps smoky, and throws down a precipitate of albumen on boiling. This is not a rare instance, but occurs sufficiently often to be a not unfamiliar experience to most medical practitioners. It has been suggested that there is a connection between eczema and kidney disease in children; and eczema of the genitals has been said to be often followed by fatal renal symptoms; but I cannot corroborate this statement by my own experience.

The form of Bright's disease met with during the first two or three years of life is generally the acute variety. Infants, however, as well as older children, may suffer from the disease in a chronic form; but no doubt this is in many cases a relic of a previous acute attack. Certain diseases may lay the foundation of chronic renal mischief, viz., scarlatina, measles, small-pox, scrofulous disease of bone and of other tissues causing prolonged suppuration, ague, diphtheria, and (in infants) intestinal catarrh.

Either the contracted granular kidney (interstitial nephritis), the large fatty kidney (chronic parenchymatous nephritis), or the amyloid kidney may be met with in early life; but the first is rare at this age, although it appears to be sometimes set up by obstruction to the escape of urine, either from impacted calculus or some other cause; and the fibroid interstitial growth may then be profuse.

The large fatty kidney is more commonly met with than the preceding. This lesion is usually the result of acute Bright's disease, and commonly dates from an attack of scarlatina. It may, however, be chronic from the first and arise as a consequence of long-standing suppuration.

The amyloid kidney is far from rare. Children, especially those who

are subjects of the scrofulous cachexia, are very liable to suffer from profuse purulent discharges. If the discharge is continued for a long time together, it will often lead to amyloid degeneration of organs in which the kidneys as well as the liver and spleen are involved.

Morbid Anatomy.—It is unnecessary in a special treatise, such as the present, to enter minutely into the pathological changes to be met with in the kidney in cases of chronic Bright's disease. These changes are the same in the child as they are in the adult, and are described at length in all the text-books. It may be sufficient to recall to the reader's memory the principal points connected with each of these three varieties.

The *contracted granular kidney* is, as its name implies, considerably reduced in size. Its capsule is thickened and adherent; its surface is nodular, and its colour a deep red. On section we find the cortex thin; the medulla atrophied, and the substance dense. The essence of the disease consists in a great hyperplasia of the connective tissue of the organ. This fibroid overgrowth passes inwards from the surface along the course of the intertubular vessels, and involves more or less regularly the whole depth of the cortex. It thickens the Malpighian capsules, and compresses the capillary tufts and the convoluted tubes. The small arteries are thickened and their calibre reduced. As the increase of fibrous tissue is not evenly distributed, but is much greater in some spots than it is in others, the amount of injury to the kidney substance varies; and while some tubes are much atrophied and shrunken, others escape almost entirely. The convoluted tubes are often denuded of their epithelial lining, and are sometimes seen under the microscope to be stuffed with fatty débris or with hyaline casts. In some places the denuded tubules dilate here and there into cysts; in other places they atrophy and may be converted into mere threads. The straight tubes in the pyramids are comparatively little altered. The shrinking of the kidney and its granular appearance are late changes, and are due to the contraction of the new fibroid material.

In the *large white fatty kidney* it is the tubular structure which is principally involved—especially the convoluted tubes in the cortex. The kidney is larger than natural, and its capsule can be readily detached. The cortical part of the kidney, to swelling of which the increase in size is due, is perfectly smooth on the surface and pale in colour. No ramifying capillaries are to be seen, but here and there red specks from extravasation of blood dot the anæmic surface.

On section the cortex has the same pallid tint, and contrasts curiously with the cones of the pyramids which still retain their healthy colour. By the microscope the convoluted tubes are seen distended to twice their natural size; and their epithelial lining is swollen and granular looking. The tubes often contain granular débris and fibrinous exudation, and, sometimes, extravasated blood from a ruptured Malpighian body.

After a time the epithelial cells in the tubes become disintegrated and are removed, and sometimes increase of the interstitial connective tissue takes place as in the preceding variety. The kidney then shrinks and may become granular on the surface, but still continues very pale in colour.

Amyloid disease in the kidney is usually associated with the same degeneration of the liver and spleen. If the degeneration is marked, the organ is increased in size and has a waxy, pale, and slightly translucent appearance. The amyloid change begins, as a rule, in the vessels of the Malpighian tufts, but soon spreads from these to the vessels (both afferent and efferent), the vascular plexuses (both intertubular and interlobular),

and the urinary tubules. This condition is often combined with other forms of renal degeneration.

Symptoms.—The symptoms of *acute Bright's disease* have been already considered in the chapter on Scarlatina.

The *chronic disease* in its earlier stages, and until it gives rise to dropsy, is accompanied by few symptoms, and, indeed, is probably often overlooked. The child is pale, dull, and listless. He complains of his head, and is capricious in his eating. Sometimes he passes large quantities of water, which—especially if the disease be of the granular variety—may be of normal density, and contain no albumen. Even when dropsy occurs, albuminuria may be absent or trifling.

A little boy, aged one year and ten months, with sixteen teeth, began gradually to get poorly. He grew pale, seemed heavy and sleepy, and vomited often after his meals. After this state of things had continued for a month his face became puffy, his eyelids swelled, and general œdema appeared over the body and limbs. When taken into the East London Children's Hospital, no disease of any organ could be discovered ; the liver and spleen were of natural size ; the heart was healthy, and the temperature was normal. There was no sign of peeling of the skin. For some days no urine could be collected, for the quantity was scanty, and the child passed it all in his cot. At last some was obtained, but no albumen was discovered, nor could any casts of tubes be seen. Purges and diaphoretics soon dispersed the œdema, and the child then took iron and cod-liver oil. The sickness continued for some weeks after the œdema had disappeared. The urine was examined several times, but no albumen was ever found.

The dropsy in this case was not the result of anæmia and weakness, for the child was not at all emaciated, and his mucous membranes were fairly red. The œdema had all the characters of kidney dropsy. It began in the face, and was distributed very generally over the body. A similar form of dropsy without albuminuria or casts is sometimes found as a sequel of scarlet fever.

In some cases Bright's disease appears to be quite latent until œdema occurs.

A little boy, aged twenty-one months, with twelve teeth, came into the hospital, under my care, with slight dropsy which had lasted for a week. The child had never had scarlatina or measles ; and had been a fairly healthy boy, although for some weeks his bowels had been relaxed, and the discharges offensive. He had suffered, shortly before admission, from ulceration of the mouth, which, however, had been soon recovered from. He coughed, and his appetite was poor.

When the child was first seen, the œdema, although slight, was general. The urine was scanty and alkaline, and contained one-sixteenth of albumen. There was a deposit of triple phosphate crystals, with many large and small hyaline casts, and some granular casts. The temperature at first was normal, but after a few days rose to 101.4° ; the child began to cough ; he was then violently convulsed, and died a few hours afterwards.

On examination of the body the lower part of the right lung was found to be consolidated. The left kidney was absent. The right measured three inches in length by two and three-quarters in breadth. The capsule was adherent, and on removing it small portions of renal substance were torn away with it. The surface of the organ was very granular and irregular. On section the tint was paler than natural ; the pyramids were less

red than in the healthy subject, and the cortex was thinned. The whole kidney felt very dense, and its substance seemed unusually tough. Unfortunately, the organ was not examined microscopically, but there can be little doubt that this was a case of granular kidney, and that it was of some standing, although in so young a child.

Sometimes the only sign of the chronic disease may be the marked pallor of the complexion, with frequent attacks of headache and vomiting, lasting for several days, or a week or more at a time. Sometimes, as in the adult, the sight becomes affected from albuminous retinitis. Such cases, without a careful examination of the urine, may be mistaken for cerebral tumour. Indeed, a history of frequent attacks of headache and vertigo, accompanied by vomiting, and of gradual failure of the sight, is very suspicious of a tumour of the brain. In all such cases, therefore, it is very important to make a careful examination of the water for albumen, and to search the deposit frequently for casts of tubes. The skin is generally dry and rough, and is often markedly inelastic, so that when pinched up into folds it remains wrinkled, and does not smooth out quickly, as a healthy skin would do. This is especially the case in infants and the younger children. Purpura is sometimes found to be an accompaniment of the renal mischief; but whether it is excited by the nephritis, or, as Dr. Gee suggests, arises with it as a consequence of some bodily condition common to both, is uncertain. Purpuric patches may be seen on the skin, and blood may be passed with the urine and stools.

Usually, acute exacerbations occur from time to time. These mostly follow a chill, and are accompanied by scanty secretion of urine, puffiness of the face, and œdema of the limbs. The water is then albuminous, and may be smoky, or even red, from admixture with blood. The headache is often severe, vomiting may be distressing, the dropsy may be marked, and convulsions may occur, with drowsiness or coma. Sometimes the attack is complicated with pericarditis or pleurisy, as it is in the adult. When the acute symptoms subside, the amount of albumen gradually diminishes, and after a time may quite disappear from the urine. There may be then little left to show that the kidneys are not healthy, but repeated examinations of the urine will perhaps disclose a slight deposit, with fragments of granular or hyaline casts.

In cases of acute renal dropsy, it is common enough to hear that the child had had scarlatina some months or years previously, followed by dropsy; that he had completely recovered to all appearance; but that lately, having been exposed to cold, he had begun to vomit and the œdema had reappeared. In such a case it is reasonable to conclude that the restoration of the kidneys was not so complete as had been supposed. Sometimes the acute exacerbation is preceded by pallor, wasting, vomiting, general weariness, and a look of ill-health. The child passes water much more frequently than natural in the day, and at night may wet his bed.

A boy, aged fourteen, was in the East London Children's Hospital, under the care of my colleague, Dr. Donkin. The patient had had measles and scarlatina. He was said to be very dull at his lessons. His secretion of urine was large, and he seemed to have a difficulty in holding it. A month before his admission the boy had had a rash over the body which had lasted a fortnight. He had then begun to vomit his food, complained of pain all over, looked pallid and weakly, and was manifestly losing flesh.

When admitted, he was pale and thin; seemed very fretful, and looked ill. His temperature was normal. His urine was acid, had a specific

gravity of 1.015, and contained no albumen or sugar. The boy coughed a little, but nothing positive was noted about his chest. There was no sign of peeling of the skin.

After being in the hospital for about three weeks, during which time he had decidedly improved and had gained flesh, the lad was allowed to go out into the garden. The same evening his face looked puffy, and his legs were found to pit on pressure. His temperature that night was normal. On the following day the œdema was marked. He vomited several times; complained of severe headache, and seemed very stupid and stubborn. His temperature rose that evening to 100°. His water was smoky, contained a sixth of albumen, and had a flocculent deposit which showed under the microscope many granular casts. On the third day his temperature was 101.8° both morning and evening, and he had a series of convulsive fits, followed by drowsiness which lasted for twenty-four hours. His temperature then became normal again, and the œdema began to decline. His water was discoloured with blood for several days, and the albumen and casts only slowly disappeared; but before the boy's discharge, his urine, except for a slight haziness with the cold nitric acid test, had again become normal.

In this case the history and the previous symptoms, as well as the rapidity with which the renal phenomena followed the chill, pointed to some chronic affection of the kidneys, although no albumen was found in the urine on the lad's admission into the hospital. Perhaps in many of these cases careful and repeated examination of the water would be more successful in finding albumen. A great deal depends, too, on the way in which the examination is conducted. Boiling the urine and afterwards adding a few drops of nitric acid is a very coarse test; and if the proportion of albumen is small, it may easily escape detection by this means. A far more delicate test is that of floating cold urine from a pipette upon the surface of strong nitric acid placed in the bottom of a test-tube. Albumen should never be excluded until the urine has been tested by this process, and allowed to stand for a quarter of an hour in order to give the light, cloudy disk of albumen time to form upon the top of the acid. Still, it cannot be denied that, however carefully the examination may have been conducted, it will often be impossible to discover the presence of even a trace of albumen between the attacks of acute disease. The child, however, is not well. He often remains pale and thin, loses all appetite, and is nervous and excitable. His dislike to eating is a source of great anxiety to his parents, and, indeed, it is often most difficult to persuade him to take even a minimum quantity of food.

The water may be secreted in fair amount, often, indeed, is copious; but its specific gravity is low. It is usually very acid, and sometimes uric acid sand is seen at the bottom of the chamber-pan. Perhaps on this account there is often a difficulty in holding the water, especially at night. There can be little doubt that, although giving rise to no very characteristic symptoms, the kidneys are not healthy, and that their depurative functions are imperfectly performed.

A case which I saw some time ago, in consultation with Mr. E. Stanley Smith, affords a good example of the insidious progress of granular kidney disease in the child.

A little boy, aged nine years, of excitable, nervous temperament, inheriting a tendency to epilepsy on his father's side, and to phthisis on his mother's, was said to have been poorly for eighteen months. His indisposition had begun with an attack of "fever" in which the temperature

rose every night to 102° or 103°; he had severe headache, and was at times slightly delirious. He was ill for a week. Since that time he had had similar attacks, but milder in character. He was said often to look pasty and sallow in the face, and to seem languid and inclined to mope, although when pretty well in health he was lively and active, and his spirits were high. When poorly, his urine would contain a trace of albumen; it was always very acid, and often contained large quantities of uric acid sand. No casts were ever seen at that time. The boy was wasting slowly, although his appetite was good. He slept badly, and was always restless at night. His bowels were usually costive, and after an aperient he passed much mucus. He stammered at times, and the muscles of his face would often twitch. The specimen of his urine shown to me was very acid and of specific gravity 1.024. It contained no trace of albumen; but there was a copious deposit of uric acid sand. After I had seen the boy he did not improve. The albumen became more frequent, and granular casts and blood-corpuscles began to be discovered. On one occasion, a hyaline cast was seen. There was never any trace of œdema, and his heart and pulse were normal.

In this case the feverish attacks were no doubt attacks of acute gastric catarrh. Apart from this symptom, which may have been only an accidental feature in the case, and had probably no other influence than that of aggravating the tendency to flatulence and acidity, there can be little doubt that the boy was suffering from granular kidney. It seems probable that there is a connection between the passage of red sand and the kidney degeneration, for I have noticed the association in other instances. Certainly, in a case where a child *habitually* passes large quantities of uric acid crystals, I should be disposed to fear the occurrence of Bright's disease; and the occasional presence of a trace of albumen would add strength to my apprehensions.

The after-course of this boy's case is interesting. He was sent to the south of France, and passed a considerable time at Cannes. Dr. G. C. Bright, under whose care the boy was placed, informs me that on arriving at Cannes the urine contained one-eighth of albumen, and that its sediment showed numerous granular casts and much renal epithelium. After a stay of nine months the water had ceased to contain albumen or casts, although there was still an occasional deposit of uric acid sand. Its density was habitually 1.025.

In this boy there was no hypertrophy of the heart; and no abnormal tension of the pulse was ever noticed. Although the albumen ceased for a time to be present in the urine, it is impossible to suppose that all structural lesion of the kidneys had disappeared. This is no doubt another instance of renal disease without albuminuria, or rather, with intermittent albuminuria, for that albumen and casts will eventually reappear can scarcely be doubted. It is curious that a sister of the patient suffered from similar symptoms.

When the kidney is the seat of amyloid degeneration there is no necessary albuminuria, and even increased secretion of urine is not an invariable symptom. Dr. M. Litten has published the details of four cases which place the truth of this statement beyond a doubt. In a case which was under my own care—a little girl seven years of age—general œdema had been present for two years, succeeding to an attack of scarlatina. The child suffered from angular curvature of the spine of some standing. Her liver and spleen were much enlarged, and felt very dense and resisting. Enlarged mesenteric glands could be detected in the abdomen on deep pressure. The average quantity of water passed in the twenty-four hours was twelve ounces.

It had a copious deposit of lithates. There was never any albumen, nor could any casts be discovered under the microscope. Its density varied from 1.020 to 1.025.

In this case, where the liver and spleen were evidently the seat of amyloid degeneration with probable enlargement of the same kind in the mesenteric glands, it is difficult to suppose that the kidneys had entirely escaped any participation in the disease. Probably only an early stage of the degeneration is characterised by absence of albuminuria and a scanty secretion of urine. As the disease becomes more advanced, the quantity of water secreted is more copious; it contains albumen—at first in small quantities, afterwards in considerable amount, and the specific gravity of the fluid is high. Renal epithelium with hyaline, granular, and often fatty casts, may be seen by the microscope in the deposit.

There is a form of renal disease from which children of various ages are prone to suffer, which appears to be in many cases a temporary ailment, but which produces very definite symptoms. The disorder is indicated by pallor, weakness, wasting, constipation, sometimes by sickness, and in every case by a remarkable absence of the natural elasticity of the skin. This loss of elasticity is a very characteristic symptom. When the skin of the abdomen is pinched up, it remains wrinkled, or only slowly recovers its smoothness. On examining the water no albumen is found, but the quantity is small and its specific gravity is low. Evidently sufficient solids are not discharged by the kidneys; and the retention of effete matters in the system, owing to this renal inadequacy, is apparently the cause of the symptoms. A case has been already referred to in the chapter on enteric fever, in which a child convalescent from that disease passed for many days no more than eight or ten ounces of urine in the twenty-four hours, with a specific gravity of 1.015. He was excessively feeble, stupid, and lethargic; his skin was markedly inelastic; and it was only after the secretion of water had increased, and its density had risen, that his physical and mental weakness passed off, and the normal elasticity of his skin was restored. It was calculated that this boy secreted by the kidneys, in the twenty-four hours, no more than two and three-quarter grains of solid matters for every pound of his weight—a quantity which is of course considerably below the average amount.

The quantity of urea passed daily in childhood is proportionately greater than it is in adult life. In the East London Children's Hospital I caused the urine of thirteen selected cases, in which kidney disease could be excluded, to be collected for the twenty-four hours; and calculating roughly from the specific gravity, it appeared that the average quantity of solid matters passed from the kidneys in this time was five grains for every pound of the child's weight. The ages of the children were between four and ten years. In the adult the daily quantity has been estimated by Dr. Parkes to be three and a half grains per pound weight. My experiment was of course a rough one, making no pretensions to mathematical accuracy; but the conclusion arrived at was, no doubt, sufficiently near the truth to be useful as a guide in practice.

I believe quite young children sometimes suffer from a temporary deficiency in the secretion of urea, although, as it is impossible to collect the whole quantity of urine passed, I can bring forward no positive evidence in support of this statement. Some time ago I saw a male infant seven weeks old, who was brought up at the breast of a very healthy mother. He had been perfectly well for the first four weeks after his birth. He had then begun to vomit sour fluid and curd, and at the same time his bowels had become obstinately confined. This state of things had con-

tinued for three weeks, the infant becoming thinner, and his bowels only acting after an aperient or enema. On the morning of the visit he had just been relieved after five days' constipation. The child was thin but did not look ill. No sign of disease could be observed about any part of his body, and the belly was not retracted. The skin was excessively inelastic. It lay on the abdomen in loose wrinkles, and when pinched up, the folds remained exactly as they were left without smoothing out. No urine could be obtained for examination. An aperient powder was given, and small doses of the infusion of senna with glycerine were ordered three times a day. After two months the elasticity of the skin had partially returned, and eventually it was perfectly restored. The return of elasticity in the skin was accompanied by progressive improvement in the condition of the child. The vomiting ceased soon after treatment was begun; but the costive state of the bowels remained a trouble for a considerable time.

The above case represents a form of derangement which is sometimes met with in the infant. It is not an ordinary case of gastric catarrh, such as is common in early infancy, for in this disorder the elasticity of the skin is in no way interfered with. Nausea and vomiting, constipation, a dry, inelastic skin, and slight albuminuria, form a combination of symptoms constantly met with in cases of deficient renal secretion in children whose water can be tested, and also in adults, according to Sir Andrew Clark. It seems, therefore, at any rate possible that diminished functional activity of the kidneys may produce similar symptoms in the infant. Kjellberg has observed a frequent connection between intestinal catarrh and parenchymatous inflammation of the kidney in the young child, and mentions as one of the characteristic symptoms of the kidney complication a dry, tough skin without elasticity. In every case, therefore, where we find this condition of the skin in a young subject, we should examine very carefully for signs of renal disease.

Diagnosis.—In examining for albumen a specimen of the urine passed after the first meal in the day should be taken, and the fluid should be afterwards set aside in a conical glass in order that solid particles, if any, may subside. The deposit should be taken up carefully with a pipette, and placed in a shallow cell made by cementing a thin ring of glass on to the ordinary microscope slide. This, covered with a thin glass, should be carefully searched for casts of tubes.

The complete absence of albuminuria and casts is no sufficient indication that the kidneys are perfectly healthy. It seems probable, from the cases which have been narrated, that a certain amount of disease may exist in the kidneys although the urine presents the characters of health; and it is now an established fact that considerable amyloid degeneration may exist in the organ without its presence being betrayed by any abnormal condition of the urinary secretion. In all cases where renal disease is suspected, although no albuminuria can be discovered, it is well to cause the whole amount of water passed in the twenty-four hours to be collected. A calculation can then be made from the specific gravity of the fluid, by means of Professor Haughton's tables,[1] which will give a rough estimate of the quantity of urea being excreted in the course of the day and night. If at the same time we ascertain the weight of the child, the amount of solid matters passed for each pound of his weight can be easily calculated. A healthy child should pass daily between five and six grains of urea per pound of his weight.

[1] Given in the Medical Times and Gazette for October 27, 1864.

If albuminuria and casts can be detected, it is not always easy to decide upon the nature of the kidney lesion. The presence of amyloid degeneration of the liver and spleen renders the same condition of the kidney very probable. A chronic form of Bright's disease succeeding to an acute attack, such as an attack of scarlatinous nephritis, is usually due to the fatty kidney (chronic parenchymatous nephritis); but this form of Bright's disease may also, like the contracted granular kidney, begin insidiously. If albuminuria and casts are present without dropsy, the kidney is probably granular.

The constant passage of red sand from the kidneys is to be regarded with anxiety, for in such cases Bright's disease may be developed after a time, as in the case of the child before referred to.

Prognosis.—When Bright's disease is established in the child, *i.e.*, when albumen and casts are constantly present, the prognosis is very unfavourable; for such a condition, if it do not destroy life unassisted, must greatly increase the danger of any intercurrent malady. Such children, if attacked by pneumonia or pleurisy, are very likely to die. In the case of amyloid kidney the prognosis is, perhaps, less unfavourable than in the other forms of Bright's disease; for it seems possible that, if the chronic suppurative process which has excited the structural change can be removed by operation or otherwise, all the symptoms of kidney derangement may disappear. That such a happy termination to the illness is possible, is proved by a case published by Mr. Barwell, in which, after the removal of a scrofulous joint, albuminuria and casts ceased after a time to be found in the urine, and the child grew up into a strong, healthy woman. From this case we may learn that the existence of amyloid disease of the kidneys is no bar to the successful issue of operative procedures; but that on the contrary, surgical interference in such cases is urgently called for.

Mere renal inadequacy, without albuminuria or history of acute Bright's disease, is probably in most cases a merely temporary condition which, under suitable treatment, may be rapidly recovered from. But if a child habitually pass large quantities of uric acid sand, or if he have more than one attack of acute Bright's disease, even although the urine have been normal in the interval, and return to a healthy state after the symptoms have passed away, we should regard the possibility of his ultimately developing manifest disease of the kidneys as one not to be entirely excluded from consideration.

Treatment.—In cases where we find deficient secretion of urea, without albuminuria or signs of organic renal disease, we should take care to unload the bowels by free purgatives, unless, as in the case before referred to, the child be just convalescent from typhoid fever. In ordinary cases gray powder and jalapine may be given in doses suitable to the age of the child. He should be made to drink freely of some harmless fluid, and thin barley-water sweetened and flavoured with vanilla is very useful as a mucilaginous diuretic. The aperient should be repeated as often as seems desirable to ensure complete relief to the bowels; and in addition the patient may take a mixture containing citrate of potash with tincture of nux vomica, or a few drops of tincture of rhubarb. The child should not be allowed too much animal food. Fish is better for him than butcher's meat, and he should take plenty of milk and green vegetables. If broth be allowed it must be perfectly fresh, and not be made from "stock." If there be anæmia in these cases, iron can be given after a time.

If a child be the subject of undoubted renal disease, it is of the utmost importance to attend to the working of functions the impaired action of

which will increase the labour of the kidneys. The skin should be encouraged to act by a daily tepid bath, by warm clothing, and by careful avoidance of the causes of chill. The patient should be dressed from head to foot in flannel or other warm woollen material, and should take regular exercise in the open air. The bowels, if inclined to be costive, should be kept relieved by aperients; and small doses of senna, or podophylline and belladonna, or a nightly dose of Hunyadi Janos water, as recommended in the chapter on constipation, are very useful. The patient should eat sparingly of flesh meat; but milk and fish are suitable, and a due proportion of farinaceous and vegetable matters should be included in his diet. If the amount of albumen is great, it may be advisable to put the child for a time upon a diet consisting merely of milk and bread. Certainly in such cases animal food should be taken with caution, and should not be allowed every day.

Climate is a matter of very great importance in cases of chronic renal disease. If possible, the child should be removed for the winter to a neighbourhood where the air is fairly warm and dry. Here he can pass his time out of doors without risk of chill, and the beneficial influence of such a change is often very remarkable. The albumen and casts may quite disappear from the urine, and for the time, at least, the health may seem to be completely restored.

Of medicines, iron is the best remedy, and the perchloride the best preparation. This salt has a distinctly diuretic action, especially if well diluted with water. Its influence in promoting the renal secretion is increased by the addition of dilute acetic acid and solution of acetate of ammonia, as suggested by the late Dr. Basham (see page 730). The draught may be sweetened by glycerine or by a few drops of spirits of chloroform.

If an attack of acute Bright's disease come on, with elevation of temperature, œdema, and head symptoms, relief may be speedily obtained in the majority of cases by free purgation and packing in a blanket bath, as recommended in cases of scarlatinous nephritis (see page 46). The influence of energetic purgation, too, is most striking; nothing relieves head symptoms so quickly as a good sweeping aperient. A useful form is the combination of compound jalap powder with compound scammony powder. Enough should be given to produce four or five copious evacuations. Elaterium is too uncertain in its action to be suitable for children.

If the albuminuria persist after an attack of the acute disease, iron should be given directly the temperature becomes normal. The drug may be usefully combined with strychnia and arsenic. A child of eight years old may take three times a day twenty drops of the liq. ferri perchloridi with two of liq. strychniæ and four of liq. arsenicalis in a large wineglassful of water sweetened with glycerine. This medicine should be given directly after food, lest it cause nausea. Gallic acid has been recommended, but on account of its tendency to constipate often seems to do more harm than good. The first necessity in these cases is to promote free excretion from the bowels. If this function be interfered with, no medicine can be of much value. On this account iron often seems to act better if given in the form of the sulphate with sulphate of magnesia and dilute sulphuric acid; but the other form is equally, if not more, serviceable, if care be taken to keep the bowels free. In obstinate cases fuschine (the chlorohydrate of rosaniline) is said to hasten the disappearance of the albumen after an acute attack. This drug may be given to a child in doses of from two to five grains. It tinges the urine of a reddish colour. Recently,

chloral hydrate has been given with the same object. It can be prescribed to a child of five years of age in doses of three or four grains three times a day.

A fatal ending in uncomplicated cases of chronic Bright's disease from exhaustion and dropsy must be rare in the child. I cannot remember having met with such a case except in connection with amyloid disease, and there the general distribution of the degeneration furnishes other reasons for the condition of the patient. Chronic kidney disease is usually fatal in young subjects through the occurrence of some inflammatory complication. Pleurisy and pneumonia in such cases are excessively dangerous. They must be treated with stimulants and counter-irritation. The chest and back should be repeatedly dry-cupped ; the bowels should be freely acted upon, and the strength of the patient must be supported by suitable quantities of unsweetened gin.

If the dropsy in any case be copious, it must be treated as recommended under the head of Scarlatinous Nephritis (see page 46). Pilocarpine is sometimes useful in these cases. Occasionally it may be necessary to puncture the legs with Dr. Southey's trocars.

CHAPTER III.

CALCULUS OF THE KIDNEY.

The occasional passage of red sand from the bladder in childhood is not an uncommon occurrence. As a rule, little pathological significance is to be attached to it. Uric acid is very liable to be formed if food is taken largely in excess of the requirements of the system. It is not even necessary that the food be nitrogenous to produce this result; for as Dr. Garrod has observed, it is a mistake to suppose that an animal diet must tend more to the formation of uric acid than a vegetable one. It must be remembered, however, that the presence in the urine of a deposit of lithic acid or its salts is no proof that any excess of the acid is formed and secreted. The increase is often only apparent. When the urine is scanty from deficiency of water, the uric acid may appear to be in excess. Again, great acidity of urine may cause a deposit of uric acid. The neutral lithates are more soluble than the acid lithates, and these than uric acid. Therefore, if the urine is full of neutral salts, any cause which will remove a part or the whole of the base will throw down a precipitate. The addition of acid will do this. Thus, if very acid urine be secreted into the bladder when this already contains a neutral or alkaline urine, the acid abstracts the base from the neutral salts and a deposit is formed at once.

The uric acid appears in the urine in the form of crystalline grains, or, if very abundant, as a red sandy deposit. In infants and young children there appears to be a special tendency to uric acid deposits; and these may be thrown down in the kidney itself before the urine has passed into the bladder. The so-called uric acid infarctions of the kidney, forming yellowish red streaks running in the direction of the pyramids, may be found after death in the youngest infants—in them, indeed, more frequently than in older children. These infarctions consist of amorphous urate of ammonia mixed with crystals of uric acid, and occupy the straight tubes of the pyramids. They do not, any more than the sandy deposits in the urine, indicate the existence of kidney disease. They are due to excessive feeding, or, in young babies, to the increased metamorphosis of tissue elements which must take place after birth in consequence of the newly-inaugurated processes of digestion, respiration, and generation of heat.

A deposit of crystals of uric acid may be formed at any part of the urinary apparatus. The urinary tubules often contain such collections. A particle of crystallised uric acid is deposited in the cortical part of the gland. It may remain in this spot, or may pass further down the urinary apparatus into the straight tubes or the pelvis of the kidney. In either case it is apt to become enlarged by successive additions to the original nucleus. Great irritation is often caused by the passage of these fragments, and even minute crystalline particles, if with sharp angles, may so scratch and wound the delicate membrane lining the fine tubules of the

kidney and calices of the pyramids, as to be a cause of hæmorrhage. In spite, however, of the frequency of sandy deposits, the urine in childhood does not, as often as might be expected, contain an admixture of blood. At least, an intimate blending of the blood with the urine, such as is known to be characteristic of renal hæmorrhage, is in the child comparatively rare.

Besides uric acid, oxalate of lime concretions are not uncommon in children. These are dependent upon the same causes as the preceding. According to Schenck, uric acid is converted by oxidation into oxaluric acid, and this is readily decomposed by both acids and alkalies, splitting up into oxalic acid and urea. The oxalic acid at once combines with the base of any lime salt which may be present, and is precipitated as the insoluble oxalate of lime. This process may take place in any part of the urinary passages, and if crystals of oxalate of lime are found in warm urine before the fluid has had time to cool, it may be inferred that they have been formed inside the body, and we should think of the possibility of calculus.

Besides uric acid and oxalate of lime concretions, small calculi of the urates of ammonia and soda may be formed. Often the concretions are compound, and contain a nucleus of uric acid round which oxalate of lime or urate of ammonia has been deposited. If the concretion be encrusted with phosphates, it is a sign that irritation has been set up in the bladder or pelvis of the kidney.

Causation.—Some children have a greater tendency than others to the deposition of uric acid in the urinary passages. This tendency often runs in families, and is then commonly associated with the gouty constitution. The form of scrofula which is connected with a stout, heavy build, and much flabbiness of flesh, is also said to be distinguished by a similar tendency. In both of these cases there is no doubt an inclination to gastric disturbances and the generation of acid in the stomach. The actual deposition of uric acid crystals in the form of sand and gravel is apt to be excited by excessive or unwholesome diet—especially of indulgence in the more fermentable articles of food. Thus, large quantities of farinaceous substances, particularly where the starch is imperfectly cooked, and of fruit or sweets, may give rise to the formation of acid in the digestive organs. Too close confinement to the house, especially in cold damp weather, may in some subjects load the urine with uric acid or its compounds. Indeed, any influence which interferes with the assimilative processes, such as fear, grief, and other depressing passions of the mind, over-fatigue of the body, temporary febrile ailments—all these causes may determine a precipitation of uric acid in the urinary passages. According to Dr. Garrod, concentration of the urine from deficiency in the amount of water excreted by the kidneys is a common cause of gravel in early life. In these cases the habitual passage of red sand is compatible with every evidence of good health. Amongst other cases he refers to that of a boy aged five and a half years, whose urine from day to day contained either uric acid crystals or deposited a copious red sediment almost immediately after it was voided. The whole quantity of urine passed in the twenty-four hours was only sixteen ounces, with a specific gravity of 1.031. Directly the child was made to take more fluid, so as to increase the quantity of water passed from the kidneys, uric acid ceased to be discoverable in the secretion.

Symptoms.—The passage of the ordinary lithates is no more a cause of irritation in the young child than it is in the adult. A baby may pass water thick and milky from the presence of urates without showing that he is sensible of any unusual sensation while voiding the contents of his

bladder. When, however, free uric acid is discharged with the urine, we usually notice signs of discomfort. Water is passed more frequently and in smaller quantities. The child screams and strains during its passage, and, if old enough, complains of pain in the urethra. In these cases we shall often find red gritty matter on the infant's diaper, or red sand at the bottom of the chamber-pan. Sometimes, this irritation is a cause of wetting the bed at night, and therefore the water should always be examined for uric acid crystals in cases of nocturnal incontinence of urine.

While still in the kidney these concretions may give rise to few or even no symptoms. Sometimes the only sign of their presence is a more or less copious admixture of blood with the urinary water. If the concretions are of some size, the hæmorrhage may be accompanied by attacks of pain in the kidney. Hæmaturia in children, especially in infants, is usually to be attributed to this cause. In the case of infants a stain of bright blood is noticed on the wet diaper. In older children the blood is intimately blended with the urine, and the mixture may have a deep red colour if the hæmorrhage be copious. The urine is acid, deposits albumen on boiling, and often crystals of uric acid can be discovered with the abundant blood-corpuscles under the microscope.

A little girl, aged four years, the ninth child of healthy parents, was admitted into the East London Children's Hospital. No history of gout could be discovered in the family. Of the other children, four had died, one from whooping-cough, the others of brain disease, nature unknown. The patient herself had always been a healthy child, with the exception of an attack of varicella in infancy, until twelve months before admission. At that time the mother had begun to notice that the child's water contained blood. At first this had only occurred about once a week ; but the frequency of the hæmorrhage had gradually increased, and during the previous fortnight blood had been passed every day. The morning urine, passed after the night's rest, had, however, been always uncoloured until a week before admission ; since that time the passage of blood had been continuous.

At first the mother had noticed no other symptoms, but after the hæmorrhage had continued for several months, the patient had begun to complain of pain in the left side and back, at first only occasionally, but latterly several times in the day. The child cried bitterly, and attempted to relieve her distress by bending her body backwards across her mother's knee, with her head and legs hanging down.

On admission, the girl was in good condition and had a florid complexion. Her weight was twenty-two pounds ten ounces. Her liver and spleen were of normal size, and the heart and lungs were healthy. The abdomen was unusually compressible. The aorta and iliac arteries could be felt pulsating on deep pressure, and both kidneys could be felt. They were not tender when touched, and seemed in every way normal. She passed water more frequently than was natural, but there was no pain in micturition. Her skin was not harsh, acted fairly well, and there was no sign of œdema. The urine was dark with blood, of specific gravity 1.024, threw down a copious precipitate on boiling, and showed an abundance of blood-corpuscles under the microscope. After a few days stellate crystals of uric acid were also discovered in the sediment.

The child was kept in bed, and was given a mixture containing carbonate of potash. The amount of blood in the water gradually decreased, and in five days had quite disappeared. The urine then became perfectly normal, and ceased to contain albumen or blood-corpuscles. There were

never any signs of casts, of purulent matter, or of mucus. No pain was noticed during her residence in the hospital, and she was soon discharged. About a month afterwards she was readmitted with the same symptoms, but they quickly disappeared as before with rest and alkalies. Her temperature was always normal.

This case is a good illustration of the symptoms produced in children by renal concretions in the kidney. It would be difficult to attribute the hæmaturia to any other cause. The significant fact that the bleeding occurred for the most part after exercise, and that until the amount of blood became excessive, the water was clear in the morning when the child first rose from her bed, were strong arguments in favour of urinary concretions. The patient, besides, was in good condition, and of a healthy appearance, and although her kidneys could be felt on palpation, no increase in their size could be detected. Lastly, crystals of uric acid were found in the sediment.

Examination of the urine in these cases often gives a negative result. Calculus may exist in the kidney without giving rise to symptoms of any kind. Between the attacks of hæmaturia the water may contain neither blood nor albumen, and unless sand or crystals of uric acid be actually passing, it may redden litmus paper but faintly.

Sometimes the irritation produced by the presence of the calculus in the pelvis of the kidney may set up pyelitis. The stone then usually becomes enlarged by deposition of phosphatic salts upon its surface.

A child was admitted into the East London Children's Hospital, suffering from tubercular meningitis. After death, which took place in two days' time, besides the morbid appearances usual in such cases, the left kidney was found to be extensively diseased. The organ was much enlarged and contained about two ounces of creamy pus. In the interior it was hollowed into cavities, and its proper substance was almost replaced by caseous matter. A calculus of the size of a cherry-stone was impacted in the upper part of the ureter. Above this, the ureter and pelvis of the kidney were much dilated. In this case, no doubt, the stone had first, by the irritation it produced, set up pyelitis, and had then become impacted in the ureter, preventing the escape of the purulent matter.

When the concretion passes from the kidney into the ureter, and downwards into the bladder, there is always pain; but the child suffers far less than an adult would do under similar circumstances. Sometimes an attack of abdominal pain in a child, attributed, as all such pain is apt to be, to abdominal derangement and colic, is followed by symptoms of stone in the bladder. It is therefore desirable in all cases where pain, more than ordinarily severe, appears to be suffered, to examine the state of the child's water, and inquire of the nurse whether sand or gravel has been seen at the bottom of the chamber-pan.

If the stone becomes impacted in the ureter, serious consequences may ensue. The irritation of the foreign body in this situation may set up inflammation, and give rise to thickening and contraction immediately above the seat of the impediment. Higher up the ureter becomes greatly distended, and the pelvis of the kidney may suffer dilatation. In some cases the pressure of the secreted fluid, accumulating in the channels above the obstruction, may flatten out the kidney into a thin-walled cyst. This is one form of hydronephrosis.

When the stone has entered the bladder, urgent symptoms begin to be noticed. This affliction is more common in boys than in girls; probably for purely mechanical reasons. The urethra in girls is short, straight,

and, when the child stands upright, almost vertical. In boys it is long and sinuous with a double bend. In the bladder the stone produces great irritation. Priapism is common; and there is usually pain, which is increased by exercise. During micturition the boy cries with pain, which he refers to the end of the genital organ, and endeavours to relieve by squeezing and rubbing the part with his fingers. The flow of urine often stops suddenly, from the stone being carried by the flow of water into the neck of the bladder, and there forming an impediment to the escape of the urine. Consequently the water is voided with effort, and the straining may give rise to prolapse of the rectum. Actual retention may occur, the stone being tightly grasped by the sphincter vesicæ, and impacted at the beginning of the prostatic urethra. A little pure bright blood may be passed at the end of micturition, and the urine often gives evidence of severe catarrh of the bladder. Any of these symptoms occurring in a boy should make us inquire very carefully into the cause of his complaints. It must not, however, be forgotten that very similar symptoms may arise from different reasons. Dr. West has pointed out that in cases where the prepuce is abnormally long, with a narrow opening, its edges may become very sore on account of the difficulty and delay with which urine is forced through the orifice; and this may give rise to much pain in micturition.

Diagnosis.—On account of the frequency with which uric acid concretions are found in the urine of children, it is evident that the delicate membrane lining the tubules of the kidney is liable to be exposed to injury from the sharp edges of the crystalline masses. Consequently, hæmorrhage in such cases is no matter for surprise. The wonder, indeed, is that it is not a more common symptom of uric acid sand in young persons. That it is not so is probably due to the fact that the uric acid is commonly deposited from the urine in the bladder itself, and not at a higher point in the urinary apparatus. Sir Thomas Watson has recorded his opinion that many of the obscure cases of hæmaturia in the adult may be referred to renal calculi. In the case of children it may be laid down as a rule that renal hæmorrhage occurring in a child otherwise healthy, and accompanied by no symptoms, nor by hæmorrhage from other parts of the body, is, in the majority of cases, to be attributed to the irritation of crystalline masses in the tubules, calices, or pelvis of the kidney.

Not long ago I saw a little boy, aged ten months, who for six weeks had been passing water mixed largely with blood. Sometimes for a few days together the water would be clear, but the hæmaturia speedily returned. The specimen brought with the child was bright crimson in colour, and consisted of blood and urine intimately blended together. It had a slightly acid reaction. Many blood-corpuscles were seen under the microscope, bu no crystals of uric acid could be detected, although the medical attendant had occasionally found them in the sediment. The child had been brought up by hand and fed upon cow's milk and water. He had no teeth, could not stand, and showed signs of being under-nourished. The bowels were confined habitually; otherwise he seemed to suffer no discomfort, and was said never to be peevish or fretful.

As the infant was evidently insufficiently fed, I rearranged his diet, ordering one meal in the morning of oatmeal (one teaspoonful) with cow's milk, two meals of Nestle's milk food, and two or three meals of Mellin's food with cow's milk diluted with a third part of barley-water. I also prescribed a mixture containing the infusions of senna and gentian, so as to act gently upon the child's bowels.

Some months afterwards I heard that the bleeding had continued for a

few weeks longer ; that the child had then seemed in great pain for a day and a night ; but that after this the water had become clear, and had ever since been perfectly free from blood. The nutrition had begun to improve immediately upon the change of diet.

There can be little doubt that the hæmaturia in this case was the consequence of irritation of the kidney by a small angular concretion ; and the pain spoken of was, in all probability, an attack of renal colic, caused by the passage, or attempted passage, of the little calculus down the ureter. In cases such as this, the concretions must be looked for carefully in the urine passed at the end of a fit of colic. They are often no larger than a mustard-seed, or even a small pin's head.

Prognosis.—The occasional appearance of free uric acid in the urine of infants and children is of no consequence whatever. The frequent passage of sandy particles is of greater moment, for in these cases we are justified in fearing the formation of a stone in the bladder. A mere passing hæmaturia should not have too much importance attached to it ; for it is probable that a certain oozing of blood may occur in the kidney, as a consequence of irritation from small crystalline fragments, which may be afterwards washed away. Repeated hæmorrhage from this source is, however, to be regarded with anxiety ; and if there are signs of pain in the renal region preceding or accompanying the flow of blood, we have reason to fear the presence of a calculus, and further ill-consequences are to be anticipated.

Treatment.—The frequent appearance of uric acid crystals, or of sandy deposits, or even the habitual presence of urates in a child's water, should make us inquire very carefully as to the food he takes, and the general conditions under which he is living. Such a child should live plainly. He should take meat once a day with vegetables, and a light custard or batter pudding. For his other meals he should have milk and bread-and-butter, with occasionally the yolk of an egg or a little bacon for his breakfast. Care should be taken that he does not overload his stomach, and the quantity of farinaceous food he eats should be duly proportioned to his power of digesting it. Sweet things should be given to the child with caution ; and all cakes and biscuits between meals should be strictly forbidden. He should take exercise freely in the open air. His skin should be kept in good order by complete washing every day, and in the colder months he should be dressed from head to foot in some warm woollen material. Great attention should be paid to the ventilation of his bedroom, and in the winter he should be dressed and undressed in a well-warmed room. In the case of an infant, vigilance should be exercised that the child does not take too large a quantity of food at one time, and that he is not burdened by too much farinaceous matter to his meals. Cleanliness and plenty of fresh air must be always insisted upon.

In addition to the above measures, care should be taken that the patient drinks sufficient fluid to freely dilute the renal secretion. Remembering that a concentrated state of the urine is alone sufficient to give rise to sandy deposits in the urine, the child should be made to drink half a tumbler of water, fasting, one hour before food, twice a day. This simple precaution, in many cases, will at once put an end to any appearance of sand. An infant may be given thin barley-water from his bottle with the same object.

For medicine, alkalies, such as the citrate of potash, should be given, and the treatment must be continued for several weeks. If hæmorrhage occur, perfect rest in bed must be enforced. These cases seldom require

styptics, but if thought advisable, a few grains of gallic acid may be given with dilute sulphuric acid twice a day.

If, from attacks of pain or frequent hæmorrhages, it becomes evident that the child has a calculus of the kidney, citrate of potash should be given in sufficient doses to keep the urine slightly alkaline; and this treatment should be persevered with in the hope of dissolving the concretion, or at any rate of reducing its size sufficiently to enable it to escape by the ureter. If great irritation and pain are produced by the continued presence of the calculus, and the health and strength of the child seem to be seriously affected, the question of nephrotomy should be considered.

In an attack of nephritic colic, the child should be kept under the influence of morphia, and hot fomentations must be applied to the abdomen.

CHAPTER IV.

TUMOURS OF THE KIDNEY.

Tumours of the kidney are occasionally seen in children, and generally occur in the form either of a sarcomatous growth or of a hydronephrosis.

Sarcoma of the kidney constitutes the ordinary form of renal cancer met with in the child. It occurs usually at an early age (the cases which have come under my notice have been all under three years old), and is usually confined to one side of the body. In the kidney, as in other organs, the growth often reaches a very large size.

Morbid Anatomy.—The sarcoma is usually of the round-celled variety; but the tumour often contains, in addition to sarcoma tissue, striated muscular fibre scattered or arranged in bundles. Under the microscope these tumours are found to have a fibrillated structure, some fibres being slightly spindle-shaped, with an indication of a nucleus; others, more elongated, with signs of transverse striation; others, again, well-developed, with distinct striation. But even in the best developed fibres no sign of a sarcolemma can be seen. In some cases the new muscular and sarcomatous tissue is dispersed through the kidney substance, and the tumour is then really a tumour of the kidney. In other cases the new tissue seems to be separated from the kidney substance proper, although lying within the capsule; or it divides the organ into two parts without, as in the other case, infiltrating its substance. It has been suggested that these growths may be derived from the remains of the Wolffian body.

Symptoms.—No pain seems to attend the development of these tumours, and at first there is little interference with the general health. Consequently, the earliest sign to attract the attention of the attendants is the unusual size of the child's belly; and the mother often complains that the belly feels harder on one side than it does on the other.

On examination, in such cases, we find a globular swelling occupying one side of the abdomen. The swelling is usually little movable, and does not descend, or moves very slightly, in inspiration. Its borders are rounded, and there is no edge felt, as is the case with the spleen. Its substance is soft and elastic, so as to convey an imperfect sense of fluctuation. Below, the fingers can be pressed between the lower border and the brim of the pelvis; above, the tumour passes beneath the liver, or on the left side is continuous with the splenic dulness beneath the false ribs; externally, the swelling reaches backwards into the loin, and there is seldom any intestinal resonance to be detected between it and the spine.

As the tumour grows the only inconvenience felt is the weight of the mass in the abdomen. The appetite is good, often exceptionally keen, and nutrition is fairly performed. The urine is usually normal, although in some cases it may contain albumen and blood; and towards the end it may be scanty, with infrequent micturition.

After a time, as the size of the growth increases, secondary derange-

ments from pressure begin to be noticed. The earliest sign that the growth is interfering with neighbouring parts is usually an enlargement of the superficial veins of the abdominal wall from pressure upon the vena cava. This is often followed by œdema of the lower limbs and scrotum. Sometimes the liver enlarges from passive congestion; and dyspnœa may be induced from pressure upwards of the diaphragm by the renal mass. When these signs are noticed nutrition becomes affected, and the end is not far off. The child gets thinner, and soon wastes rapidly. His appearance becomes cachectic; aphthæ develope in the mouth, and he sinks and dies. Before death the emaciation may be extreme.

These symptoms are well illustrated by the case of a patient in the East London Children's Hospital, under the care of my colleague, Dr. Donkin, through whose kindness I had several opportunities of examining it.

A little girl, aged two and a half years, was brought to the hospital on account of a swelling of the belly. The mother stated that she had noticed three months before that the belly was large and hard on one side, and that a doctor had said there was a tumour of the abdomen. For a month the child had been languid and fretful, picking her nose, and moaning in her sleep. Now and then she had complained of abdominal pains, and once or twice she had vomited. The bowels were disposed to be costive, and the water was occasionally milky (from lithates).

The child was full-grown for her age and well-nourished. She did not look ill. The abdomen was large and full, especially on the right side, and the superficial veins were distended. On palpation of the belly a large, oval, smooth mass was felt on the right side, reaching from the liver to the level of the brim of the pelvis. The fingers could be passed under the lower border of the tumour, and above could be pushed a little way between the upper border and the liver, the edge of which could be distinctly felt overlapping the upper part of the mass. Anteriorly, the swelling reached beyond the middle line of the belly, and its limits could be distinctly felt rounded and resisting. Posteriorly, the tumour passed backwards into the renal region, and its boundaries in this direction could not be ascertained, although when the child lay on her left side the resonance of the intestine could be made out posteriorly. In front the colon could be detected lying on the surface of the swelling.

The whole tumour was very slightly movable; its surface was smooth; its substance elastic, and it felt like a tense bag of fluid. There was no ascites; no enlarged glands could be felt in the groins or elsewhere; the edge of the liver reached two fingers' breadth below the ribs; there was no enlargement of the spleen. In order positively to exclude fluid, an exploratory puncture was made into the tumour, but nothing but a little blood was withdrawn. The temperature remained normal after the puncture.

For a fortnight after the child's admission there was little change in her condition. Then, however, her temperature rose; she vomited, and began to look ill and careworn, and a pneumonia developed in the base of the right lung. The urine became intensely acid; it was loaded with urates, and deposited large amounts of uric acid on standing; there was also a trace of albumen. The liver enlarged; the veins of the abdominal wall became engorged with blood; œdema occurred in the lower limbs; the face got dusky; general convulsions came on, with epistaxis and bleeding from the ears, and the child died in a few minutes.

On examination of the body a round-celled sarcomatous tumour, the size of a fœtal head, was seen occupying the lower two-thirds of the right

kidney, infiltrating its tissue. It was covered by the renal capsule. Its substance was of soft pulpy consistence in the centre, harder and firmer towards the circumference. There was one large hæmorrhage into its lower part. The tumour pressed upon the inferior vena cava, which was distended by a large decolourised thrombus, perforated in the middle by a channel of the diameter of a goose-quill. The thrombus reached from the level of the tumour upwards to the right ventricle of the heart. The liver and spleen were both much congested.

This case may be considered a typical example of a renal tumour. The only doubt possible was as to the nature of the swelling, and this the exploratory puncture removed at once. Fluid being thus excluded, the rarity of any other form of solid growth made the diagnosis of sarcoma comparatively an easy one.

Sarcomatous tumours of the kidney generally grow rapidly, and the course of the disease is seldom protracted. Death often occurs within a year of the swelling being first discovered, and in the longest case life is rarely prolonged beyond eighteen months.

Hydronephrosis is almost invariably in children a congenital affection. It is often associated with some form of arrest of development, such as club-foot, harelip, imperforate anus, or absence of the prostate gland. Both kidneys are more often affected than one alone, and the most common cause is impervious ureters or an imperforate urethra. According to Dr. Englisch, the obstruction may take its rise in the valvular folds, situated at the upper part of the ureter, or at its lower part ; and in five cases he referred the cause of the obstruction to a curving of the mucous membrane at the orifice of the urethra into a diverticulum.

In rare cases the disease is acquired during childhood from impaction of a calculus in the ureter. The other causes of acquired hydronephrosis, viz., retroflexion and prolapse of the womb, etc., do not come into play until a more advanced period of life.

Whatever be the cause of the retention, the essence of the disease consists in accumulation of urine in the pelvis of the kidney. The pressure of this fluid produces very serious consequences. Every degree of dilatation of the parts is seen according as to whether the fluid can partially escape or is wholly retained. In every case the renal pelvis is greatly dilated, but there are many degrees of alteration of the kidney substance, from mere flattening and toughening of the papillæ to actual conversion of the organ into a membranous sac filled with fluid. If the obstruction is low down in the ureter, this tube is also dilated and its wall thickened. The fluid has a low specific gravity, and contains the elements of urine although in feeble proportion ; *i.e.*, urea, uric acid, urates, and often crystals of oxalate of lime. Its reaction is faintly alkaline. Its colour is clear amber or turbid, and may be yellow from pus or reddish from blood. Sometimes it contains epithelium, and in rare cases the consistence is increased to a thick fatty fluid.

Symptoms.—Although almost invariably congenital, the hydronephrosis is often not noticed until several months or even years have elapsed from birth. The mother then observes that the abdomen is enlarged, and that the chief swelling is limited to one side of the belly. Her attention being thus directed to the child's abdomen she finds that this progressively increases in size, and a medical practitioner is consulted.

The tumour is a painless one and forms a soft elastic swelling in the situation of the kidney. The cyst sometimes reaches a large size, and may cause great inconvenience by its weight, or interfere with respiration

by pressing upwards against the diaphragm. The lumbar region on the affected side is then seen to be prominent as the child lies on his face, and fluctuation is transmitted freely from the front to the back. In a case recorded by Dr. Hillier—a child three years and a half old—the swelling filled the whole abdomen, and five pints of clear non-albuminous fluid were withdrawn by tapping. Sometimes an escape of some of the retained fluid occurs from time to time, and the size of the tumour may thus undergo marked variations. If the accumulation be due to an impacted calculus, attacks of nephritic colic may occur, with bloody urine. If both kidneys are affected, and the escape of fluid is entirely prevented, the child may die with symptoms of uræmia. Such a condition is of course incompatible with life, and if it be a congenital one, the child is generally stillborn.

Diagnosis of Renal Tumours.—We have first to satisfy ourselves that the tumour is due to enlargement of the kidney, and then to ascertain the nature of the swelling. In order to arrive at an accurate diagnosis, a careful examination of the abdomen is of course indispensable ; so that if the child is fretful and unmanageable, crying and contracting his abdominal walls, he should be put under the influence of an anæsthetic.

A rounded mass in which no edge can be detected, situated in the region of the kidney, and little affected by respiration ; one which does not dip into the pelvis, but passes upwards to the liver or spleen and backwards into the lumbar region—such a tumour is in all probability an enlarged kidney. Renal tumours may be confounded with tumours of any other abdominal organ, or indeed with a swelling anywhere within the abdominal cavity.

On the right side the renal enlargement must be distinguished from a tumour of the liver. The latter rises and falls with respiration, and will be noticed to lie close up under the ribs so that the fingers cannot be passed between its upper border and the diaphragm. Moreover, a hepatic tumour is rarely covered by a coil of intestine ; and on careful manipulation the edge can usually be detected. This, of course, at once excludes the kidney, for a kidney, whether enlarged or not, is rounded in all directions.

On the left side a splenic tumour must be excluded. Enlargements of the spleen are very common in children, but they can never be mistaken for a kidney by a careful observer. An enlarged spleen lies very superficially ; its position is markedly influenced by respiration ; it is freely movable ; it has a distinct edge towards the middle line, in which the notch can usually be felt, and its upper border passes upwards beneath the ribs.

On either side the renal tumour may be mistaken for a mass of enlarged glands, a psoas abscess, fæcal accumulations, and, in girls, ovarian enlargements.

Enlarged glands lie very deeply against the spine, and have to be felt for with care. They are only slightly movable. Still, palpation alone may be insufficient to distinguish a swelling of this kind from an enlarged kidney. By attention, however, to the general symptoms, we may usually arrive at a conclusion. A kidney only slightly enlarged from sarcoma produces no impairment of the general health ; while caseous glands, sufficiently large to be detectable by the touch, are associated with a history of ill-health or of more or less interference with nutrition. The patient has usually suffered from attacks of diarrhœa, and may perhaps have signs of chronic ulceration of the bowels. In such a case he would look ill even although the bowels were not actually loose.

A psoas abscess, like a renal tumour, occupies the region of the loins and extends forwards into the belly. It is, however, placed more deeply

than a tumour of the kidney, and cannot be so easily felt. Little information is to be derived from the presence of fluctuation in the swelling; for this is difficult to ascertain in a psoas abscess, and a sarcomatous kidney conveys a sense of pseudo-fluctuation which is often very deceptive. A far more important distinction is that furnished by the actual position of the mass, for a renal tumour reaches far higher in the abdomen than an abscess. Moreover, the latter is distinctly tender on pressure, while the kidney tumour is quite painless. Lastly, in psoas abscess, although there may be no curvature of the spine, careful examination will often discover the existence of disease of the vertebræ (see page 185).

Other abscesses in the neighbourhood of the kidney can usually be detected by their causing enlargement behind in the renal region. According to Sir William Jenner, this is rarely the case with a simple swelling of the kidney.

Fæcal accumulation may be, perhaps, mistaken for a renal tumour; but a mass sufficiently large to give rise to hesitation must be very rare in the child. Fæcal lumps lie very superficially, and can be indented with the finger. Besides, they can be cleared away by a copious injection.

Ovarian tumours are sometimes found in little girls. These dip down into the pelvis, and the fingers cannot be passed beneath their lower border. Moreover, they are rarely covered by coils of intestine. These are all pressed away towards the lateral regions of the groin.

Having ascertained the existence of a renal tumour, it is sometimes very difficult to decide upon its nature. If the tumour be double, or be accompanied by signs of severe nephritic colic, it is probably due to a hydronephrosis. So, also, if the swelling is noticed to be diminished in size after a copious flow of urine, it may be attributed to the same condition. Usually the doubt can be only removed by an exploratory puncture of the swelling. If fluid be withdrawn containing urea, there can be no further hesitation as to the nature of the tumour.

The distinction between hydronephrosis and ascites is described in the chapter treating of the latter disease (see page 703).

Treatment.—In cases of sarcoma of the kidney we can do nothing but attend to the general nutrition of the patient. In the case of hydronephrosis:—If occasional reductions in the size of the tumour have been noticed to follow a copious discharge of urine, friction and shampooing of the abdomen, such as proved successful in a case reported by Dr. W. Roberts, may be made use of. In other cases occasional tapping may greatly relieve the patient. Dr. Day reports a case in which nephrectomy was successfully performed by Mr. Knowsley Thornton, and the child recovered. A cure may, however, be effected by a less serious operation. It appears from a case recorded by Dr. Tuckwell, and Mr. H. P. Symonds, of Oxford, that persistent drainage of the sac may sometimes lead to its shrinking and contraction. In the case referred to—a boy eleven years of age—an incision was made into the sac in the lumbar region, and a large drainage-tube was introduced through the opening. Antiseptic dressings were employed, and at the end of thirteen weeks from the operation the tube was finally removed. The child recovered perfectly, and six months afterwards no sign of the tumour could be discovered on examination of the belly. Operative interference in these cases should not be undertaken unless a healthy state of the urine indicates that the opposite kidney is free from disease.

CHAPTER V.

VULVITIS.

Vulvitis, or vulvo-vaginitis (for the catarrhal inflammation of the mucous membrane often penetrates for some distance into the vaginal canal), is very common in little girls. The complaint may be seen at a very early age, even during the first few months of life; but is more common in children of five years of age and upwards. M. Parrot has described a variety of the derangement which he calls "aphthous vulvitis," and states that it is met with most frequently in children between the second and fourth year.

Causation.—Catarrhal vulvitis is especially common in children of scrofulous constitution, and appears to be excited by want of cleanliness and insanitary conditions generally; also by local irritation in the neighbourhood, as by ascarides in the rectum. In very rare cases it may be the consequence of sexual violence. Certain forms of the complaint appear to be contagious and capable of being communicated from one child to another by sponges or towels; and Dr. Atkinson, of Baltimore, has stated his belief that the discharges from a purulent ophthalmia may be conveyed to the vulva, and set up a similar inflammation in that situation.

Vulvitis is sometimes a secondary disease. Thus, it may come on after some of the acute specific diseases. Parrot has seen aphthous vulvitis succeed most commonly to measles, next to whooping-cough. He has also met with it after varicella, erysipelas, pneumonia, and diphtheria. In only a few cases was it apparently a primary derangement.

Symptoms.—In catarrhal vulvitis a purulent discharge may be noticed to issue from the vulva. At first it is scanty, and is seen on the child's body linen. On inspection of the parts the mucous membrane is found to be red, and the larger labia to be a little swollen. The discharge is yellowish or greenish in colour. It is usually fetid, and in many cases is very profuse. In hospital out-patients, who are often neglected in the matter of cleanliness, the opening of the vagina is often found bathed with a thickish, yellow, offensive matter. If the catarrh is not quickly cured, it may lead to considerable swelling of the labia, and the mucous membrane may become excoriated. In these cases there may be some pain in walking; and if the catarrh extends to the orifice of the urethra, there may be smarting in micturition. There is not usually any enlargement of the inguinal glands; but in bad cases, occurring in unhealthy, neglected children, irritable sores may form on the inner surface of the labia, and the glands may then become slightly swollen, and a little tender. I have never seen suppuration of these glands. If left untreated, spontaneous recovery may take place, or the discharge may become chronic, and persist for months or even years. The swelling in these cases subsides, but thin purulent matter, small in quantity, continues to be secreted. I have

thought, in some of these chronic cases, that irritation has been kept up by a habit of masturbation.

Aphthous vulvitis, according to Parrot, attacks the labia majora, and sometimes the smaller lips and the clitoris. From these parts the aphthous inflammation may spread to the genito-crural folds, the groins, the perinæum, and the borders of the anus. It begins by an eruption of small, rounded, or semi-spheroidal elevations of the epidermis, of a grayish white colour, and often depressed in the centre. The little patches closely resemble the aphthous spots on the buccal mucous membrane, and are surrounded by a red, slightly-swollen ring. In number they are five or six to fifteen, and may be placed singly or in groups; sometimes they are confluent. After a period varying from thirty-six hours to three days, the patches give place to ulcers which have a gray or yellowish base, and a red border. They cause considerable irritation, which it is difficult to prevent the patient from relieving by the use of the fingers. At the height of the disease the edges of the sores are raised, and the parts around, especially the minor labia and the clitoris, are swollen and bright red. Under suitable treatment the swelling soon subsides, and the ulcers heal; but in unhealthy subjects the lesion may take on a gangrenous process. When this occurs the constitutional symptoms are severe, and the gangrene may spread extensively, and present all the features described elsewhere (see Gangrene of the Vulva, page 170).

Diagnosis.—Vulvitis is a very common derangement amongst the children of the poor, but may be found in any condition of life. Knowing its frequency, we must be on our guard against accepting any suggestion (such as some mothers are very ready to make) that their child has been tampered with by a person of the opposite sex. If this have really taken place, we should expect to find ecchymosis and recent abrasions of the external genitals. The hymen is rarely ruptured, on account of the smallness of the passage.

The aphthous spots are distinguished from mucous patches by the absence of all signs of constitutional symptoms in the child. The ulcers are distinguished from venereal sores by the absence of any hardening at the base. Moreover, the latter are never grouped or confluent, as is almost invariably the case with the aphthous ulcers.

Treatment.—The utmost cleanliness must be observed. The parts should be bathed frequently or syringed with warm water, and afterwards a little pledget of cotton-wool, soaked in a mild lead lotion, should be passed between the labia. If the catarrhal inflammation seem to have extended into the vagina, the lotion may be injected with a syringe. If there be great irritation of the parts, a weak solution of perchloride of mercury (one grain to eight ounces of water) may be used instead of the lead. If the case be obstinate, the parts should be well dabbed with a weak solution of nitrate of silver (gr. vj.–x. to the ounce of distilled water).

Dr. Gaillard Thomas recommends for all obstinate cases the careful syringing of the vagina with warm water, and the use afterwards of a lotion composed of one ounce of black wash to the pint of water. The lotion must be injected with a syringe twice a day, and on each occasion the passage must be previously cleansed by careful injection of warm water. Dr. Thomas attributes the chronic course of many of these cases to the imperfect application of remedies. He urges the importance of instructing the mother in the use of the syringe, directing her to introduce the nozzle of the instrument well into the vagina, so that the upper part of the passage is reached

by the fluid. In all instances where the child is anæmic or of scrofulous aspect, iron wine and cod-liver oil should be given internally. Care must also be taken that the bowels are regularly relieved, and that objectionable habits are no longer continued.

In the aphthous form of vulvitis, Parrot recommends the use of the powder of iodoform once a day thoroughly after careful washing. He then applies a covering of lint. Parrot states that this application quickly cures the sores, and prevents the occurrence of gangrene.

Part 12.

DISEASES OF THE SKIN.

CHAPTER I.

DISEASES OF THE SKIN.

In childhood the skin shares the general susceptibility of the whole system, and is very liable to disease. At this period of life the surface of the body is delicate and readily irritated by the presence of accumulated dirt and dried secretion. Amongst the poor, neglect and want of cleanliness are common causes of cutaneous affections in the young. Moreover, in the young subject, gastro-intestinal derangements are especially liable to be accompanied by the various forms of erythema; and childhood appears in itself to increase the susceptibility to the parasitic diseases of the skin. In a work treating of disease in early life, a consideration of the various eruptions to which childhood is liable must not be entirely neglected; but attention will be confined to the more common forms of skin disease met with at this period of life, and the subject must necessarily be discussed somewhat cursorily, and chiefly with a view to diagnosis and treatment.

The *papular* eruptions do not require very extended notice. *Lichen* is very rare in the young subject. The form called *lichen urticatus* is the most common; but this eruption appears to be more a modification of nettle rash than a true lichen, and will be afterwards referred to under the head of urticaria.

Prurigo is occasionally met with in dirty, neglected children in the form of slightly projecting papules, which give rise to considerable irritation; but in early life the rash seems to induce a less intense form of itching than that which is a cause of so much suffering to older persons. Mr. Hutchinson has described a prurigo of infants which appears often to be a sequel to or modification of chicken-pox; and he is disposed to believe that an abortive varicella is often the original cause of the outbreak. The papules are hard and rough, and may be mixed up with wheals of urticaria. In some cases they are large, and resemble half-developed wheals of nettle-rash, "with perhaps even some tendency to vesication." The itching arising from the eruption is often greatly relieved by the use of warm baths, medicated with the liq. carbonis detergens, in the proportion of two teaspoonfuls to the gallon of water. This bath should be used twice a day. The skin may be afterwards anointed with a salve composed of one ounce

of storax, two drachms of white wax, and half an ounce of olive-oil. If the child is feeble or delicate, cod-liver oil and iron wine should be prescribed, and the diet should be regulated on the principles elsewhere recommended (see Infantile Atrophy).

Strophulus is a common eruption in infants, and usually arises as a consequence of laboured digestion. It is met with in two principal forms—a red and a white variety. Red strophulus consists of small red papules of the size of a large pin's head. These papules often occur in groups, and occupy the face, the trunk, and sometimes the limbs. They cause some itching. In white strophulus the colour of the papules is pearly white. Each papule lasts a few days, and the rash usually comes out in successive crops. It is not accompanied by any general symptoms, and the only treatment required is attention to the digestive organs, and some necessary modification in the diet.

Of the vesicular and bullous group, *herpes* and *pemphigus* are both far from rare. Herpes of the lip is as common a symptom of croupous pneumonia in the child as it is in the adult. Herpes of the pharynx is described elsewhere (see page 580). Herpes zona is comparatively rare in the child, but is sometimes seen, and then differs little from the same eruption in the adult except that it is much less frequently followed by intercostal neuralgia. It requires no treatment.

Pemphigus is occasionally met with in the child. In new-born infants a syphilitic form of the disease is not uncommon, and usually indicates profound contamination of the system. Syphilitic pemphigus is referred to elsewhere.

Pemphigus attacks ill-nourished children, and may be found to occur during convalescence from acute febrile diseases such as scarlatina. It is also apt to be met with as a frequently recurring complaint in children of fairly robust appearance, and in such cases it is difficult to know what is the cause of the repeated returns of the bullous eruption. In the more common variety of the disease the eruption begins in the form of small red spots. On these spots the cuticle rises rapidly into a bleb, which increases in size until it is as large as a marble or a walnut. The bladders thus formed are tense, and filled with fluid, and their base is surrounded with a red zone of inflammation. The fluid is at first clear, but soon becomes opaque. The blebs may last unbroken for some days, but usually they burst very early, and give place to thin yellowish brown scabs on a purplish ground. The eruption comes out in successive crops. Many blebs do not appear at one time, but the repeated succession of crops covers the body with bladders, crusts, and stains from the various stages of the affection being simultaneously present on the skin. All parts of the body may be affected, even the lips and the ears, but the palms and soles usually escape. The appearance of the eruption is accompanied by some constitutional disturbance, which is often found to vary in severity according to the extent of surface involved in the disease. There may be some fever. In a boy aged eight years, who was admitted into the East London Children's Hospital with extensive pemphigus, the temperature during the first three days was over 101° both morning and evening, and for a fortnight afterwards it rose sometimes in the evening to 99.8° or 100°. Thirst, restlessness, and loss of appetite are also noticed, and there is sometimes diarrhœa. The eruption at first may be accompanied by some itching, but after the bursting of the blebs the resulting sores cause pain and smarting.

An occasional form of the disease is that called *pemphigus solitarius*,

where a single bleb rises on the hand or foot, often on one finger, and quickly attains a great size. Sometimes the bleb involves the whole of the hand. Mr. Naylor described a variety of pemphigus which he called "*pompholyx diutinus in children.*" This form begins like ordinary pemphigus as a small red spot, which becomes a bleb and rapidly enlarges. After the bladder has ruptured the sore still continues to spread, and becomes covered with a thin wrinkled crust with a narrow raised rim, the remains of the bleb. The disease appears to be a purely local one, and the general health is quite unaffected. Dr. R. Liveing has doubts if this affection be a true pemphigus.

The sore of pemphigus, like other sores, may assume a gangrenous form in unhealthy, cachectic children. The resulting condition is very much that already described as a consequence of gangrenous varicella (see page 49).

The duration of the disease is apt to be prolonged, and sometimes the eruption returns very rapidly after apparent cure. The nature of the affection can hardly be mistaken, for the large blebs or blisters surrounded by healthy skin are pathognomonic. Blebs are often seen in the course of other forms of skin disease, such as scabies, eczema, erysipelas, etc. In the latter malady the extensive reddened, brawny surface on which the bladder is seated will be a sufficient distinction. In the case of the two former complaints the characteristic appearances peculiar to these disorders will be observed. The bullous syphiloderm is distinguished from pemphigus by the presence of other signs of the constitutional disease. In infants bullous eruptions are commonly of syphilitic origin.

The best treatment for pemphigus is arsenic. The remedy should be given in full doses, for a child of six years and upwards will take doses as large as those usually prescribed for an adult. If the irritation and discomfort of the skin and general nervous disturbance prevent sleep, opium is useful, more especially as in the opinion of experienced observers the drug has a direct curative influence upon the disease. It is especially serviceable in the early acute stage. The sores on the skin must be kept very clean and treated with some mild application, such as a lead lotion or zinc ointment.

Ecthymatous pustules are very common in early life. In children of all ages, irritation of the skin is very apt to be followed by the development of large flattened pustules seated on a broad base and surrounded by a red zone of inflammation. Their favourite seats are the face, hands, and feet. The subjects of the complaint are often under-nourished, and it is therefore very often seen amongst the children of the poor ; but in all ranks of life any derangement or other cause which determines a temporary reduction of strength appears to have a predisposing influence in inducing the eruption. Such children are usually pale and flabby, and in them any slight scratch may be followed by a festering sore which continues unhealed as long as the debility from which the patient is suffering remains unrelieved. Quinine has a specific influence in removing this troublesome affection. After the alkaloid has been taken for a few days or a week the pustules disappear, the sores heal, and the child is well. In all these cases the diet should be attended to and any error of feeding corrected. A little wine is often of service, and the child should have plenty of fresh air and exercise.

A mild form of *psoriasis* is met with in children. The eruption usually occurs in the form of psoriasis guttata, the little patches being scattered about, not very thickly, on the trunk and limbs. The patches are usually

small, of a pale red tint, and are more or less scaly on the surface. They may be attended with slight itching. Psoriasis is seldom obstinate at this period of life, and usually yields without difficulty to arsenical treatment. Sometimes, however, the perchloride of mercury seems to be more useful than arsenic. As a local application the unguentum picis, or a mild chrysophanic acid ointment (gr. x. to the ounce of lard), may be made use of.

The *parasitic* diseases of the skin will be described afterwards. In the present chapter reference may be made to the form of disease called *alopecia areata*, which is not unfrequently seen on the heads of children of five years of age and upwards. The disease is characterised by the loss of hair in spots on the scalp. At these spots the hair-bulbs atrophy, and the hairs, growing loose, are shed without undergoing any other alteration in structure. In this way bald patches are formed, in which the scalp is completely smooth, white, and hairless. At the circumference of the patch the hair grows thickly as on the unaffected parts of the head. The number of patches may be one or more, and they may spread so as to unite and almost denude the head of its hair. At one time the disease was thought to be parasitic, but it is now allowed by most pathologists to be a simple atrophy of the hair-bulb; and the hairs examined microscopically are found to resemble in every respect those which are cast off in the natural process of decay.

The disease usually tends to spontaneous cure. The bald patches become eventually covered with a fine down which grows thicker and darker until at last the spot ceases to be recognised. In some cases the new hairs remain colourless and give a curiously variegated appearance to the head. In others the hair is only partially reproduced, so that in places the scalp may remain permanently bald.

The only treatment for this condition is energetic stimulation with irritating applications, such as tincture of iodine, cantharides, etc. Dr. Thin recommends sulphur ointment.

The above varieties of cutaneous eruption may be dismissed without further notice. There are, however, other forms of skin disease which from their frequency or importance require a more detailed description. The following chapters will therefore be devoted to the consideration of the erythemata, eczema, molluscum contagiosum, the parasitic diseases, and sclerema.

CHAPTER II.

THE ERYTHEMATA.

In the erythematous group of skin affections the rash presents itself in the form of slightly raised patches of redness. These patches are of variable size and shape, give rise to little or no constitutional disturbance, and run a very rapid course. In all cases the redness shows a smooth surface, without scales, and disappears on pressure, returning when the pressure is removed.

The varieties which will be described are :—Erythema simplex and its varieties ; erythema nodosum ; urticaria, and roseola.

ERYTHEMA SIMPLEX.

The simple variety of erythema appears to be in many cases the consequence of digestive disturbance. The rash is seen in the form of patches, often of some considerable size. The colour is red, bright or inclining to be dusky ; and the affected part is in most cases sensibly elevated from exudation of serum and leucocytes into the cutis and subcutaneous tissue. The duration of the rash is variable. In the commonest form, which is called *erythema fugax*, absorption of the exuded matter takes place very rapidly, and in the course of a few hours the redness has completely disappeared. This form is common in the face of a child who is fed injudiciously, and suffers in consequence from fermentation and acidity. The patches are of very irregular shape and are imperfectly circumscribed. They are often accompanied by some irritation or a sense of tingling. There is little swelling of the skin ; indeed, the affection appears to be little more than a cutaneous hyperæmia. When the erythema occurs in small raised blotches it is called *erythema papulatum*. The rash then consists of flattened red spots of the size of a large pin's head or a pea. Their margin is well defined and they are accompanied by some little irritation. A common seat of the eruption is the extremities, and it is rare on the trunk and face. The rash lasts a few days, then begins to fade, and assumes a bluish tint before it finally disappears. If there has been much swelling a slight desquamation is left on the skin.

A common form of erythema in infants is that known as *erythema intertrigo*. In this variety the redness appears between the folds of skin in fat babies, and seems to be due to the friction of adjacent surfaces upon one another. It is seen in the neck, armpits, groins, and inner parts of the thighs. If the redness does not quickly disappear the surface becomes moist and slightly excoriated. It is then often called *eczema* intertrigo. In severe cases linear ulcerations may be seen to occupy the bottom of the folds. In this stage the disorder can no longer be considered as a mere erythema. The ulcers have sharp, inflamed edges, and pour out a sero-

purulent fluid in considerable quantities. A variety of erythema intertrigo is the superficial dermatitis which is common in children who suffer from diarrhœa. The irritation of the discharges from the bowel produces a more or less extensive erythema of the buttocks and perinæum, which, however, quickly disappears under treatment.

There is one other form of erythema which requires mention, viz., that which is produced by the action of belladonna upon the system. This form of erythema resembles very closely the rash of scarlatina. In some children it is induced very readily, and is not to be taken as an index of the susceptibility of the system to the action of the drug. The readiness with which it is produced seems to depend more upon the sensitiveness of the skin than upon any intolerance of the drug special to the individual child. As a rule, young subjects can take large quantities of belladonna without inconvenience; and in some cases we find the characteristic rash developed in a child in whom much larger doses are required to produce any dilatation of the pupil.

Diagnosis.—These varieties of erythema simplex can scarcely be mistaken for any more serious disease. If the patches are of some size, they are distinguished from erysipelas by the want of sharp outline, the lighter colour of the redness, the absence of any brawny sensation to the finger, the normal temperature, and the entire absence of constitutional disturbance. Erythema papulatum may perhaps be sometimes confounded with measles, but it is distinguished by the larger size of the blotches, the want of crescentic arrangement, the limitation of the rash to the extremities, and the absence of catarrhal symptoms and fever.

Treatment.—In ordinary erythema little treatment is required. Any digestive disturbance must be remedied, and it is well to act upon the bowels with a moderate dose of rhubarb and soda. If the rash persists after twenty-four hours, a mild diaphoretic may be administered, such as liq. ammoniæ acetatis with spirits of chloroform, diluted with water.

In erythema intertrigo the part should be bathed with warm water and carefully dried. Afterwards, a piece of lint wetted with unboiled white of egg, or a weak lead lotion, should be inserted between the folds of skin and the affection is quickly at an end. If there is constipation, a mild aperient—castor-oil, or rhubarb and soda—should be administered. If ulceration have occurred, the part should be washed frequently so as to prevent accumulation of secretion, and the same application should be made use of. The erythema, which is excited by the irritation of fæcal discharges, quickly yields to frequent bathing with warm water, careful drying, and dusting with lycopodium, or with a powder composed of oxide of zinc diluted with three times its weight of starch.

ERYTHEMA NODOSUM.

Although erythema nodosum is usually included amongst the varieties of erythema, it is right to say that the affection is looked upon by some observers as a specific illness which ought properly to be classed with enteric fever and the other varieties of acute specific disease. By others the complaint is supposed to have a distinct connection with the rheumatic constitution, and there is no doubt that it often attacks the subjects of rheumatism.

The appearance of the rash is often preceded by pains in the limbs and lassitude. The spots themselves are large oval patches or swellings

of a rosy red tint, and measure from one to three or four inches in their long diameter. They usually occupy the front of the legs and are accompanied by some tenderness. At first they are hard, but after a day or two become softer, and may even give a sensation of semi-fluctuation to the finger. At the same time the colour grows more and more purple until it finally disappears, leaving a yellow discolouration of the skin. The patches are almost always present on both legs, and sometimes attack the forearms as well, or even other parts of the body. Their number is usually eight or ten.

Each swelling goes through the changes characteristic of a bruise, always turning first purple, then yellow, and lasts for two or three weeks. The duration of the complaint is, however, often much longer; and convalescence may be considerably delayed by the appearance of successive crops of the nodose patches.

A little girl, aged twelve years, was a patient in the East London Children's Hospital. The girl had been suffering for nine weeks from successive crops of large red blotches which occupied the forearms and legs. There were also a few on the belly. They began as small red spots, which grew larger and became elevated and swollen. Their colour afterwards became purple and they then faded away like a bruise. The child was said to have had a similar attack two years before. She had complained for a fortnight of pains in the joints, and her knee had been swollen for a week or ten days.

While the patient remained in the hospital various joints were in turn swollen and painful. After the knee had recovered the right wrist became affected, and later the articulation of the jaw on the right side was painful. Afterwards, the pain and swelling returned to the wrist. There were no signs of cardiac mischief; and the temperature was always normal in the morning, rising at night to between 99° and 100°. She was said never to have had rheumatic fever. Her urine was normal.

The child took iodide of potassium, quinine and iron without benefit, but improved directly the treatment was changed to drachm doses of oil of turpentine. Under this remedy she quickly recovered her health. The medicine produced little aperient action on the bowels.

According to M. Germain Sée, erythema nodosum is apt to be complicated by disorders of the respiratory apparatus, especially pleurisy and broncho-pneumonia.

Diagnosis.—Erythema nodosum cannot be mistaken for any other form of eruption. The large oval soft swellings seated upon the front of the legs, their tenderness on pressure, and the successive changes of colour, such as is characteristic of a bruise, which the swellings undergo in their progress to recovery, can leave little doubt as to the nature of the complaint. In purpura bruise-like patches are often seen, but the spots are much smaller, are not elevated, are accompanied by no tenderness, and are not altered in colour by pressure of the finger. Moreover, that disease is often accompanied by hæmorrhages, which are never seen in uncomplicated erythema nodosum; and the large bruise-like patches on the skin are mixed up with small deep-red petechiæ. It must be remembered, however, that the two diseases may occur together, for erythema nodosum is an occasional complication of purpura.

Treatment.—The patient should be kept in bed and be treated with quinine; and the bowels should be kept regular with mild aperients. No local treatment is required unless the tenderness of the patches and the pains in the limbs form a subject of complaint. In that case the limbs

may be wrapped in cotton-wool. In the more chronic cases where successive crops of swellings appear, oil of turpentine may be given, as in the case narrated above, in doses of one or two drachms three times a day. The child may have meat once a day, but no potatoes or sweets should be allowed while the pains continue troublesome.

URTICARIA.

In urticaria, or nettle-rash, the erythematous eruption appears in the form of wheals which produce the most distressing irritation. The complaint may be acute or chronic, and sometimes continues with varying intensity for months or even years. In the acute form, nettle-rash is a common consequence of indigestion and acidity, and is often excited by special articles of food, such as shell-fish, mushrooms, etc. Insanitary conditions have been said to have an influence in promoting the disorder. Whether this be so or not, the affection is no doubt common in neglected children amongst the poor. In such cases it may, however, be the consequence of uncleanliness, for in subjects with delicate skins external irritation alone will set up the complaint. Thus, the eruption may be produced by pediculi, and is a not uncommon complication of scabies and eczema. In the chronic variety nettle-rash appears to be in many cases a disorder of purely nervous origin; for the eruption is often quite uninfluenced by modifications of diet, while it yields readily to large doses of quinine, as will be afterwards described.

Symptoms.—In its common form the rash consists of a number of small elevations which rapidly increase in size and become white in the centre with a red border. These wheals are of various sizes and shapes. The smaller may be of the diameter of a pea; but the larger may measure one or two inches in breadth and reach a considerable elevation above the surface. Sometimes the spots assume an elongated form like thick streaks; or, again, may appear as a bright red more or less diffused erythematous blush. In any case they give rise to a stinging irritation which necessitates repeated frictions for its relief. The itching, however, is increased by the means used to relieve it, and the act of rubbing and scratching the skin produces a fresh crop of spots. The course of each individual wheal is very short, for the spots come and go with great rapidity. Any part of the body may be affected. The wheals may appear on the face, the hands and feet, the limbs, and the trunk; and the rash is usually roughly symmetrical. Sometimes the eruption is not limited to the skin but affects the mucous membrane as well. Thus, the tongue or throat may suddenly swell up and produce alarming symptoms; but the swelling subsides again as rapidly as it arose.

In acute urticaria there may be well-marked constitutional symptoms. The rash may be preceded by fever, a furred tongue, vomiting, a quick, feeble pulse, and in some cases a distressing feeling of prostration. These symptoms are greatly relieved when the wheals appear. An acute attack of nettle-rash lasts from a few hours to several days. Even in this short time, it varies much in intensity, and is usually greatly aggravated at night.

In the chronic form, the disorder continues for months. Its course is always very variable, and is subject to occasional remissions, so that it more resembles a series of acute or sub-acute attacks. In this form the eruption may be confined to certain localities (urticaria conferta), or may

be general and affect all parts of the body indiscriminately. The wheals are sometimes mixed up with small papular projections, and the complaint is then called *lichen urticatus*. Another variety of the chronic complaint is that called by Dr. Sangster *urticaria pigmentosa*. The wheals are here very persistent, and leave yellowish pigmented spots on the skin.

Diagnosis.—Urticaria is readily recognised. The characteristic wheals resembling exactly the sting of a nettle, the irritation to which they give rise, and the rapidity with which they come and go, leave no room for hesitation. The severe constitutional symptoms which sometimes precede the acute attack might conceivably arise from so many causes that no opinion should be hazarded until the eruption appears and explains what was obscure. The beginning of the exanthemata may be marked by similar phenomena, and the metastasis of mumps to the testicle or breast is occasionally preceded by like symptoms.

Treatment.—In acute nettle-rash it is important to attend to the condition of the digestive organs. If there be any nausea, a mild emetic, such as a dose of ipecacuanha wine, should be administered; and the child should live plainly for a day or two, without sweets or excess of starches in his diet. For medicine, an aperient dose of rhubarb and soda will usually put a speedy end to the attack. The itching, while the eruption continues, will be greatly relieved by dabbing the surface with a solution of cyanide of potassium (one drachm to the pint), or with the lotion referred to by Sir Thomas Watson, composed of a drachm of carbonate of ammonia and the same quantity of acetate of lead dissolved in eight ounces of water. A warm bath at bedtime in some cases is found very soothing.

In chronic urticaria excess of fermentable food is to be avoided; but the most careful dieting will often produce no beneficial effect upon the eruption. In the majority of cases, whatever be the cause of the persistence of the disorder, it will be found to yield readily to full doses of quinine. I have used this remedy for many years, and have not yet met with an instance of its failure to put an immediate end to the complaint. The dose should be large, and may be roughly calculated at one grain and a half for each year of the child's age. The remedy is administered once in the day, at bedtime. As an illustration of the prompt action of the alkaloid so administered, I may quote the case of a little girl, two years and ten months old, who had suffered from chronic urticaria for two years. The rash had varied in intensity from time to time, but had never disappeared entirely; and the child was said to be in a state of constant suffering from the distressing itching to which it gave rise. A few powders, each containing three grains of quinine, were ordered; one to be taken every night on going to bed. After two or three powders the rash completely disappeared, and two years afterwards I heard that it had never returned.

ROSEOLA.

Roseola, or the rose rash, is a form of erythema which is often seen in early life, and although a very trifling complaint, is yet on account of the resemblance it bears to measles of some clinical importance.

The rash is especially common in the spring and the autumn, and this partiality to certain seasons of the year has given rise to the names of roseola æstiva and roseola autumnalis. Like the other forms of erythema the complaint is not contagious. It is common for one child of a family to be the only one attacked, although mixing freely with the others, and

exposed to exactly the same conditions. The rash may occur several times in the same individual, for it is in no way self-protective; indeed, the contrary seems to be the case, and its tendency rather is to recur.

The causes of the complaint appear to be digestive derangement and slight chills. The eruption occasionally complicates other diseases. Thus, it may come on in the pre-eruptive stage of small-pox, and is apt to occur in vaccinated children, and in rheumatic subjects.

Symptoms.—The appearance of the rash is usually preceded by slight signs of disturbance. The child's eyes look heavy, his appetite is poor, his tongue is furred, and sometimes he vomits. In rarer cases the bowels are slightly loose. It is said that at this time there may be slight elevation of temperature. The pre-eruptive stage lasts usually for a few hours. The rash then appears as bright rose spots, which come out very rapidly, and soon cover large surfaces of the body. The size of these spots is very much that of the eruption of measles; and sometimes, as in that disease, they assume a crescentic arrangement, so that except for the much brighter colour of the rash the general appearance of the child is that of one suffering from measles. There are, however, no catarrhal symptoms of any moment; the throat is seldom reddened, and there is no cough.

The rash lasts a few hours or a day or two, and then subsides. Usually, if it has appeared quickly, it fades with some suddenness; but if it has come out slowly, spreading gradually over the body, it disappears in an equally leisurely manner. Sometimes the eruption appears in the form of small circular spots which remain isolated or joined irregularly; and in some cases the rash bears a close resemblance to that form of scarlatina in which the spots remain discrete, so as to be separated by skin of healthy colouring. During the eruptive stage the temperature rarely rises above the normal level.

A little girl of eight years old, the only daughter of very careful parents, was said to have been perfectly well without any sign of catarrh or other disturbance until noon on March 18th. It was then noticed that her eyes were heavy, but she ate her dinner as usual. In putting the child to bed in the evening it was found that she had some red spots on the shoulder. During the night she sneezed once or twice. On the morning of the following day the face and body were covered with a crescentic rash which bore a close resemblance to the eruption of measles. It differed only in colour, for the tint was peculiarly bright and rosy. On the cheeks the rash was confluent, and it was rather papular on the jaws. There was very slight injection of the conjunctivæ, but the fauces were not reddened. The child did not cough or snuffle, and there was no rhonchus or other abnormal sign about the lungs. A painless, movable gland, the size of a filbert, was felt just below the occiput. The bowels were not relaxed. There was no special thirst or loss of appetite. The temperature at 2 P.M. was 99°. Pulse, 100.

The next day (March 20th) the rash was fading fast. The temperature was normal. No catarrhal symptoms.

Sometimes the roseolous eruption comes and goes with great rapidity, lasting only a few hours. In such cases it usually readily recurs. The spots sometimes group themselves in rings. This arrangement is held to constitute a special variety—*roseola annulata.*

Diagnosis.—Roseola, when it assumes the crescentic form, is distinguished from measles by the absence of lengthened prodromata; by the colour of the rash which, instead of being yellowish-red or dull red, is of a bright rose tint; by the normal or only moderately elevated temperature,

and by the absence of cough and coryza. These points are well illustrated by the case above narrated. It is more difficult to distinguish the complaint from rötheln ; for in both disorders the eruption appears early with only slight prodromata, and the temperature soon becomes normal. In rötheln, however, there is a sensible elevation of the temperature during the first day or two ; the soreness of throat, which is almost absent in roseola, is a marked feature, and the eruption is dull red with none of the bright rosy tint of the roseolous rash. Still, in spite of these differences the resemblance between the two complaints is sufficiently close to make it probable that roseola is often called rötheln, and that the patient is supposed to have had an attack of "German measles."

The diagnosis between roseola and scarlatina is given elsewhere (see page 42).

Treatment.—The treatment required for roseola consists in keeping the child quiet, and attending to any digestive derangement which may be present. Usually no medicine is necessary.

CHAPTER III.

ECZEMA.

Eczema, one of the commonest of skin diseases in early life, and often one of the most obstinate, is characterised by an eruption of papules, vesicles, and sometimes of pustules. The rash forms more or less extensive patches of redness. These secrete a thin gummy fluid which dries into scales and crusts. The disease is accompanied by much irritation, and in severe cases the constant itching interferes with sleep and keeps the unfortunate patient in a state of constant restlessness and distress. It may attack children of all ages, and in infants especially (eczema infantile) is apt to assume a sub-acute form which persists for months or even years with varying intensity, and is very difficult of cure.

Causation.—Infants attacked by the disease are usually of sturdy build without other sign of ill-health. In such cases it is by no means easy to discover any cause to which the complaint can be attributed. Often one child of the family is alone affected, although the conditions of life appear to be the same in the case of the patient as in that of his more fortunate brothers and sisters. Sometimes, if the child is at the breast, we can detect by careful inquiry the existence of dyspepsia in the mother, or of some error in diet which affects the quality of her milk. In hand-fed babies excess of starchy food may seem to be inducing an acid state of the alimentary canal which may promote and maintain the cutaneous eruption. In some cases a gouty or rheumatic family tendency may exist, and it appears extremely probable that this constitutional disposition is often to blame for the occurrence of eczema in young children. It has certainly seemed to me that infantile eczema is more common in such families than in others where no such proclivity exists. Again, we not unfrequently find, especially in scrofulous subjects, that the eczematous rash appears as a sequel of one of the acute specific fevers. Thus, it may come on after measles, scarlet fever, or small-pox. The disease is, however, often met with in cases where no error in management can be discovered, where the animal functions appear to be satisfactorily performed, where the child has not lately suffered from fever, and where no family tendency to gout or rheumatism can be found to prevail.

Dentition is often supposed to be an exciting cause of the cutaneous affection, and no doubt a limited amount of eczema is often present in teething infants. But it is common for the rash to appear at the fifth or sixth month, before teething troubles have begun ; and the eruption not unfrequently lasts long after the whole crop of milk-teeth has appeared through the gum.

In older children irritants to the skin, such as profuse sweating, etc., may produce the disease ; and at this age excess of fruit and other errors of diet may lead to the disorder. Scrofulous children are very liable to it.

Symptoms.—Eczema usually begins as a bright red patch, on which a crop of papules very quickly appears, or the surface becomes covered with a number of minute, clear vesicles. There is great itching of the inflamed portion of skin ; and the friction to which the part is subjected very rapidly destroys the normal appearance of the rash. The papules are torn by the nails, and the vesicles also become ruptured and exude a thin fluid which dries into scales. The parts affected are usually those where the skin is delicate and soft, such as the folds of the joints, the genitals, the perinæum, the lips and cheeks, the inner sides of the thighs, and the backs of the legs, especially just above the ankles. It is, however, also common on the scalp ; but here the disease usually assumes the pustular form, and thick scabs are seen, under which there is a purulent fluid. In some children this variety is often accompanied by pediculi.

The constitutional disturbance is seldom great ; there is rarely any noticeable rise of temperature, and the appetite is little impaired. In very acute cases, however, the burning sensation to which the inflammation gives rise may produce great distress. The child's sleep is disturbed, and all his functions may be deranged by worry and want of rest.

Several varieties of the disease are common in children. Those which will be described are :—Eczema simplex, eczema rubrum, eczema capitis, eczema tarsi, and eczema infantile.

Eczema simplex is the commonest form of the disease. It attacks children behind the ears, at the orifices of the nostrils, on the cheeks, and indeed on any part of the body. The rash occurs in patches of redness on which papules or vesicles very quickly appear, and later pustules are generally seen. In the latter case the disease is often called *eczema impetiginodes.* The red rash exudes a gummy fluid, which dries into thin reddish or brownish crusts. When these are removed, the surface is seen to be red and moist, or covered with fine scales. On hairy parts, a few pustules are almost always seen as well. The pustules are larger than the vesicles, and are situated at the orifices of the hair-follicles ; for the hair can be seen to pass through their centre. They soon burst, and discharge their contents. The fluid dries and forms thick crusts, which are sometimes turned up at the edges. There is some infiltration of the skin at the affected part, and a good deal of itching and heat is complained of by the patient. The pustular form is most common in scrofulous subjects, but may occur in others who suffer from no such constitutional predisposition.

In *eczema rubrum* the inflammation and redness are very great, and the surface of the patch is seen to be studded with deeper red points, which correspond to the orifices of the cutaneous follicles. The secretion forms thick scabs under which small excoriations are seen—the consequence of rupture of the vesicles. This variety is especially frequent at the folds of the joints, such as the groins, the arm-pits, and at the backs of the knees. It causes much itching.

Eczema capitis occurs in the pustular (eczema impetiginodes) or the scaly form. The exudation to which the eruption gives rise becomes entangled in the hairs and mats them together, so that it can with difficulty be removed. In neglected cases it is not uncommon to find the head covered with a kind of cap or large scab, composed of the hair matted into a mass by dried exudation. This feels soft and boggy to the touch, from the quantity of contained purulent fluid which wells up through any opening in the scab. The odour is most offensive, and usually in such cases pediculi abound. Superficial ulcerations and small subcutaneous abscesses may sometimes be seen on the scalp when the crusts are re-

moved; and the glands of the neck and those at the back of the head often become inflamed and swollen. In very chronic cases the hairs may fall out, but they grow again when the disease is at an end.

In infants the scaly form is the more common. The scalp may be seen to be covered with scabs, but exudes only a limited amount of secretion.

A variety of eczema capitis has been described as *impetigo contagiosa*, being supposed by some authorities to be conveyed from one child to another by actual contact. There is no doubt that we often find several children of the same family suffering from impetigo of the scalp at the same time, but the contagious nature of the eruption is not universally recognised. It is, indeed, denied by many good observers. Dr. Tilbury Fox, who believed in the communicability of this form of the disease, states that contagious impetigo always begins as little watery heads.

In *eczema tarsi* the disease affects the edges of the eyelids. This form is common in scrofulous children and may be combined with strumous ophthalmia and conjunctivitis. A number of pustules appear at the orifices of the hair-follicles. These burst quickly and form scabs. The eruption is attended with considerable itching and some swelling of the edges of the lids. The margins of the eyelids are scaly from small crusts which cling round the shafts of the hairs as these issue from the follicles. The hairs are often glued together by the secretion, and at night-time the edges of the eyelids are also very apt to stick together. When the scabs are removed, small ulcers are often to be detected on the skin beneath. Eczema tarsi is a very chronic complaint. It is often accompanied by much weakness of the eyes and lachrymation. If allowed to go on it eventually causes obliteration of the Meibomian glands and hair-follicles, and the eyelashes are apt to fall out, or if they remain, to grow irregularly and in very inconvenient directions.

Eczema infantile is a very obstinate form of the disease. It usually appears before the end of the sixth month, and attacks infants who in other respects seem to be in perfect health. It begins generally on the cheeks and spreads thence to the neck, chest, arms, and body generally. At first it is not uncommonly complicated by wheals of urticaria. In any case the disease is accompanied by intense itching which evidently causes the utmost distress to the child, and often it is necessary to secure his hands, so as to prevent his increasing the irritation by constant friction. Even when this is done he will rub his cheeks against the pillow of his cot until the skin is completely excoriated, and often wears the hair from the back of his head by constant movement of the occiput upon the pillow to relieve the irritation. The parts affected are intensely red, and are rough and scaly from drying of the secretion poured out by the ruptured vesicles, and pustules. In severe cases the child hardly sleeps at all on account of the constant itching. The course of the disease is seldom uniform; usually it undergoes curious alternations of improvement and relapse. An attack of acute gastric catarrh will often cure the skin affection completely for a time, but the eruption returns as badly as ever when the gastric derangement is at an end.

A sturdy little boy, aged five months, had suffered for a month from an attack of acute eczema infantile, which occupied the whole of the head, face, sides of the neck, and the greater part of the chest. The irritation was extreme. The child had worn the whole of the hair from the back of his head by friction of the occiput against the pillow. This infant had an attack of acute gastric catarrh with violent and repeated vomiting. The eczema at once began to fade, and in the course of three days had almost

completely disappeared. Directly, however, the vomiting had ceased and the appetite had begun to return, the cutaneous eruption reappeared, and in a day or two was as bad as before.

This form of eczema often continues for years, and may persist throughout the whole of childhood. In such cases, however, the eruption generally clears away completely from the head and face, but remains as a patchy rash, more or less extensively diffused over the body and limbs.

Diagnosis.—Eczema as a rule is a disease which is readily recognised. The diagnostic characters of the eruption are :—A red, inflamed, and rather infiltrated surface which gives rise to extreme itching, and presents many scales or crusts, and a more or less punctated appearance, *i.e.*, the reddened skin has a dotted look from small points of a deeper red covering the surface of the patch. It is very important with regard to treatment to exclude scabies, for this parasitic eruption has often the general appearance of eczema ; indeed, a true eczema is often present on the body excited by the irritation of the acarus. In all doubtful cases the characteristic furrow produced by the itch insect should be diligently searched for, for this, if discovered, is pathognomonic. It must be remembered that in *young* children scabies rarely affects the hands and wrists, but is more commonly found about the buttocks, the belly, the feet, and the ankles. Ecthymatous pustules seated upon the soles of the feet are very strong evidence in favour of scabies.

Sometimes patches of *psoriasis*, especially if the silvery scales have been removed, bear a great resemblance to eczema in the dry or chronic form. In such cases we should carefully examine all the patches discoverable about the body. In eczema the patches are brighter in colour and less well defined at the edges, the scales are thin and loosely attached, itching is a marked feature, and the parts affected are usually the flexures of the joints and other regions where the skin is delicate and disposed to be moist. In psoriasis the patches are well defined and paler in colour, the scabs are thicker and more adherent, and itching is of moderate intensity. Moreover, psoriasis attacks by preference the outer parts of the limbs where the skin is comparatively thick and coarse.

Syphilitic eruptions in the infant are readily distinguished from eczema by their more coppery tint, the absence of itching to any notable degree, and the presence of hoarseness, snuffling, and other well-marked signs of the syphilitic cachexia.

Eczema capitis can scarcely be confounded with *tinea tonsurans* or *favus* by any careful observer. There are no broken or brittle hairs, such as are so characteristic of the former disease ; and the bright yellow cup-shaped crusts of favus have no resemblance to the scabs of impetigo of the scalp. It must be remembered, however, that a real eczema capitis may occur as a complication in a late stage of tinea tonsurans, but in such a case, when the eczema is cured, the broken hairs of the parasitic disease can be discovered on careful examination.

I have known acute eczema in the early stage to assume a crescentic, slightly papular form, which has been mistaken for measles ; but the absence of pyrexia and of cough or lachrymation will serve in such a case to exclude the exanthem.

Treatment.—In cases of eczema we must not confine ourselves to local applications to the inflamed surface. Often the general health of the child will also require attention. Eczematous eruptions are common in children of scrofulous constitution or debilitated frame. In such patients the local remedies must be aided by general tonic treatment, if any permanent

benefit is to be obtained. In scrofulous children the general treatment recommended for that cachectic state should be adopted, and if the child is thin and spare, cod-liver oil will be found of service. Iron-wine is also a valuable remedy.

In obstinate cases arsenic may be usefully combined with the iron, and as children bear arsenic well the drug can usually be given in the same doses as are found beneficial in the adult. There is, however, no advantage in cases of arsenic in pushing the dose to the utmost limits of toleration. It is seldom necessary to exceed five drops of Fowler's solution three times a day.

If any tendency to acidity and flatulence is noticed, the alkalies are sometimes of service, and the quantity of fermentable matter allowed in the diet should be restricted. Too much importance, however, need not be attached to the subject of diet in the treatment of eczema. If a case is obstinate and resists ordinary remedies, I have not found the prohibition of sweets and fruit of much value in promoting a cure. Other observers, however, seem to have met with more success. In cases of flabby (not plethoric) children, Mr. B. Squire advocates an almost total deprivation of the fat-forming elements of food. He allows milk diluted with twice its bulk of water; dry toast, or dry biscuits; lean beef or mutton with all the fat carefully removed; white fish broiled; green vegetables (but not potatoes, turnips, carrots, or other vegetable roots), and cooked fruit unsweetened. Mr. Squire states that great improvement is seen in these cases within ten days of beginning this diet.

In all cases the digestive organs should be attended to, and any derangement remedied as quickly as possible. Constipation must be relieved, looseness of the bowels arrested, and it should be our care to see that the animal functions generally are in good order.

In cases of acute eczema tonic treatment is not always the best suited to cause the disappearance of the eruption. The disease sometimes attacks sturdy, florid children, with a good colour and plethoric habit. These cases should be treated with a mercurial purge, followed by saline laxatives to keep up a gentle action upon the bowels for several days. The child should take no meat, but should be put upon milk, broth, light puddings, and bread-and-butter. Again, in cases where there is an evident tendency to rheumatism, or a strong gouty element in the family history, guaiacum often has a very marked influence in curing the disease. The simple tincture is the best preparation; it should be given in doses of twenty minims three times a day (to a child of ten years old).

The *local* treatment is of great importance in the treatment of eczema. When the eruption is very acute, stimulating ointments should not be used, but the part should be kept moist with a simple water-dressing, or be bathed frequently with bran-water made by pouring boiling water upon bran and allowing it to cool. Dr. R. Liveing recommends the application to the affected surface of a powder composed of three drachms each of oxide of zinc and starch, and thirty grains of camphor. Over this is to be placed a warm linseed-meal poultice.

In a later stage alkaline warm baths are useful. Dr. Buckley recommends that for this purpose the carbonates of soda and potash and the biborate of soda be used; two to four teaspoonfuls of each to the gallon of water. To these two to four teaspoonfuls of dry starch are added. This bath should be used without soap, the child being merely soaked and bathed in the medicated water. After ten minutes or so he is removed, dried without friction, and then well dusted over the body with lycopo-

dium powder. Much washing is to be forbidden in cases of acute eczema, as it is said to injure the process of repair. Dr. Buckley only allows it when the accumulation of exuded matter prevents the ointments from reaching the diseased surface.

A useful form of bath is made by medicating the water with Wright's liq. carbonis detŭrgens in the proportion of two drachms to the gallon. This can be given at first every night for half an hour; afterwards on alternate nights. Local patches of eczema are often benefited and in many cases quickly cured by keeping the part constantly moist with a lotion composed of two drachms of the liq. carbonis deturgens to ten ounces of water. To be effectual, however, the moistened rags in contact with the affected surface should never be allowed to get dry.

Zinc and lead are two of the most valued applications for eczematous patches. In the moist variety a salve composed of oxide of zinc and the solution of the subacetate of lead—a drachm of each to the ounce of vaseline—is very useful. In the dry, scaly form of the rash this ointment is made more efficacious by the addition of twenty to thirty grains of the ammonio-chloride of mercury and a drachm of the liq. carbonis deturgens. If itching be very distressing, the following application, taken from the pharmacopœia of University College Hospital, is of great service:—

℞. Calamine (zinci carb.) ..... gr. xl.
Zinci oxidi ..... gr. xxx.
Glycerini ..... ♏ xx.
Aquam rosæ ..... ad. ℥ j.
M. Sig.—To be painted with a brush on the affected part.

In *eczema capitis* the crusts must be first carefully removed. This is best done by covering them at night with a thick layer of lard and placing over this a large linseed-meal poultice. In the morning the softened crusts can be picked off with forceps or bathed away with warm water. When completely cleansed the scalp must be anointed with ammonio-chloride of mercury ointment diluted with an equal proportion of lard; or we may use the salve composed of oxide of zinc and subacetate of lead already referred to. Children who have this form of impetiginous eczema in a severe degree are usually of strumous constitution and require tonic treatment. In obstinate cases of eczema of the scalp the disease can often be cured by tarry applications. Half an ounce of common tar, oil of cade, or oil of birch (olei rusci) may be added to two ounces of glycerine of starch. This can be painted over the head twice a day. In very chronic cases one thorough application of undiluted liquid tar will sometimes produce a complete cure of the disease.

Eczema of the nostrils is usually cured very quickly. The crusts must be first removed from the nostrils by softening them with an oiled plug and afterwards bathing with warm water. Unguentum hydrargyri ammonio-chloridi can then be applied freely to the interior of the nostril with a folded morsel of linen rag or lint.

In *eczema tarsi* it is often necessary to pull out the eyelashes, and in obstinate cases the operation is almost always necessary. The scabs must be carefully removed with fine forceps or the head of a large pin, and the edges of the lids be afterwards smeared with any of the ointments which have been recommended. A mild mercurial salve, perhaps, answers the best.

Eczema infantile is often a very obstinate complaint, and from the dis-

tress it occasions to the infant and through him to his mother or nurse, whose sleep is necessarily broken by the wakefulness of her charge, is one upon which it is important to make some immediate impression. When the disease is very acute and the skin red and intensely irritable, a rapid improvement is produced by large doses of quinine. I was led to employ the remedy in these cases from noticing its striking influence upon chronic urticaria in young children. In eczema a dose of two grains given at bedtime to a child of six or eight months old, and repeated every second night, reduces, in a remarkable manner, the general redness, soothes the irritation, and consequently greatly relieves the child's distress. He begins to sleep better at night, and in the daytime is less irritable and fractious. Perchloride of mercury, given internally in small doses, is also a valuable remedy. A child of eight months old may take ten or fifteen drops of the solution (P. B.) three times a day, and the eruption often seems to improve greatly under its use. Thirty or forty drops of the infusion of rhubarb with a few grains of bicarbonate of soda, given regularly two or three times a day, will often also be followed by considerable benefit.

As in older children, the simple tincture of guaiacum is a remedy which sometimes produces very rapid and decided improvement. I have seen the fiery redness of the general surface fade, and the itching almost entirely cease under a week's use of this remedy given in doses of ten minims three times a day. When it succeeds, guaiacum seems to take all the acuteness out of the complaint, and reduces the eruption to a common vesiculo-pustular rash which yields readily to ordinary applications.

The alkaline bath recommended by Dr. Buckley, and the bath medicated with the liq. carbonis deturgens (see page 794), are both very useful. They, the latter especially, have great influence in relieving the itching, and the calamine and zinc application already referred to may be used with the same object. Too frequent washing of the infant is bad in these cases, and the mother should be cautioned against disturbing the treatment by the too energetic use of soap and water.

Vaccination of the child is said in some obstinate cases to produce a complete cure of the disease, and many observers have borne testimony to the occasional value of this method of treatment. In successful cases the eczematous rash clears away completely in from one to four weeks after the operation.

A method of treatment by covering the affected surface with some impermeable material, such as caoutchouc cloth, so as completely to exclude the air, has been found useful in many cases. According to E. Bessener this plan is especially applicable to cases of eczema of the scalp where there is much secretion. The india-rubber sheeting must be adapted accurately to the head, so as to fit like a skull-cap, and must be kept scrupulously clean, being regularly removed for washing and drying. By this means speedy improvement is said to be effected even in obstinate cases, so that the eruption will quickly yield to the ordinary ointments.

CHAPTER IV.

MOLLUSCUM CONTAGIOSUM.

Molluscum contagiosum is a disease more common in childhood than in after-life. It is often seen in London children, especially amongst the poor, but appears to be less prevalent in country districts, or even in other large towns in England. The contagious nature of the disease is now well established. It may be communicated by one child to another, or by a sucking infant to its mother's breast, and Dr. R. Liveing states that he has seen nine children of the same school all affected with molluscum at the same time. In addition to being contagious the disease may also arise spontaneously.

Morbid Anatomy.—The exact seat of molluscum contagiosum is still a matter of debate. Many observers hold the view that the little tumours have their seat in the sebaceous glands of the skin. This was long ago denied by Virchow, and after this authority others have supported the opinion that the bodies consist of a morbid growth of the cells of the cutis. Sections of the tumours show that some are simple cyst-like bodies, others are lobulated and surrounded by a fibrous capsule from which fine septa pass between the lobules. The subject has been lately investigated anew by Dr. Sangster, who concludes, as a result of his observations, that molluscum contagiosum is a disease of the epidermis in which three layers take part. The external portion is formed by the cells of the rete, for on careful vertical section of the earliest specimens procurable the rete is seen in direct continuity with the lobular expansions of the new growth. The cells probably undergo simple hyperplasia, and those placed at the border are elongated and vertical. Next to these is a granular layer composed of polygonal cells more or less infiltrated with fat-globules. In the centre are roundish bodies, translucent and watery-looking, which are called "molluscum corpuscles." All these are arranged in masses which lie in the meshes of a granular reticulum. The tumour is covered by the more superficial layer of the corium, and at its base is a network of fine vessels.

Symptoms.—Molluscum contagiosum appears in the form of small, white, hard, translucent swellings which gradually increase in size until they reach the dimensions of a pea, or even a nut. Their form is circular, with a flattened top, and at this part is seen a minute depression, which is supposed by those who recognise the sebaceous origin of the tumours to be the mouth of the sebaceous cyst. The smaller growths are usually sessile; the larger are pedunculated. A milky-looking thickish juice can be squeezed out of the central depression, especially if a puncture has been previously made with the point of a lancet.

There is no itching or uneasiness connected with the growths in their ordinary state, but sometimes one will inflame and be converted into a pustule. When left alone the tumours gradually dry up, leaving some

thickening at their site. The older ones are usually succeeded by a fresh crop.

Their seat is usually the skin of the face, the eyelids, or the neck, but they may be also seen on the chest, abdomen, genitals, and inner part of the thighs.

Diagnosis.—These tumours must not be confounded with the molluscum fibrosum, which is altogether a different disease. These are small bodies of solid, somewhat gelatinous structure, and consist, according to Rokitansky, of a protrusion of the corium, "which is pushed forwards by accumulation of young, gelatinous connective tissue in one of its deepest meshes." They have no umbilication like the contagious molluscum, and no milky juice can be obtained from them by pressure.

Treatment.—The smaller tumours must be touched with nitric acid or other strong caustic. The larger must be divided with a lancet and the contents squeezed out. A little caustic can be afterwards applied.

CHAPTER V.

THE PARASITIC DISEASES.

The varieties of parasitic disease of the skin which will be described are:—Scabies, due to the irritation of the acarus scabiei or the itch-insect; and certain vegetable parasitic fungi, viz., tinea tonsurans and tinea favosa.

SCABIES.

The symptoms to which the acarus scabiei gives rise are due to the irritation produced by the insect as it burrows in the skin. The female acarus works its way into the epidermis and forms a narrow tunnel called "cuniculus." The intense itching thus occasioned forces the child to relieve himself by scratching; and the consequences are seen in the wheals, papules, vesicles, and even pustules which in a typical case are mixed up together in a manner which is very characteristic of the complaint.

The cuniculus or furrow appears as a whitish curved line, which when newly formed may be easily overlooked; and in children, especially in infants, who are well tended and frequently washed, may escape notice altogether unless narrowly searched for. In hospital patients they are readily discovered as they become darker and more distinct from small specks of dirt. The furrow is about the eighth of an inch in length, but may be longer, and to the naked eye closely resembles the scratch of a pin. Viewed with a lens it has a dotted look, and sometimes at one extremity a small white object can be detected, which is the female insect. With care this may be extracted with the point of a pin.

In infants the furrows are rarely seen on the wrist and between the fingers as they are in older children and in the adult. In these young subjects they must be searched for on the abdomen, the waist, the buttocks, round the ankles, and on the soles of the feet; but in babies in well-to-do families, where cleanliness is properly attended to, the sign may elude the closest inspection. In young children after the age of infancy they are also usually seated on the buttocks, feet, and ankles. It is only in children of five or six years and upwards that they are often to be detected between the fingers. The scalp and face are rarely attacked.

The itching to which the presence of this parasite gives rise is of the most distressing character, and at night may be extreme. The child will be seen to dig his nails into the skin in his efforts to obtain relief. As a consequence we find reddened linear scars from small furrows made by the nails; and as another result of the violent scratching, can usually discover small papules, often excoriated and tipped with a minute crust of dried blood, little vesicles, and even large deep-seated pustules. These latter are often seen on the soles of the feet. In very delicate subjects a real eczema may be set up either by the irritation of the nails or of the applica-

tions used for the destruction of the parasite; and large wheals of urticaria are far from uncommon.

Diagnosis.—The simultaneous appearance of a variety of eruptions on the body of an infant is a very suspicious feature; and if with a lens we can succeed in discovering the characteristic furrow, no doubt can remain as to the nature of the complaint. In the case of an infant, the hands of the mother or nurse will be always found to be affected. Therefore in every case of doubt a careful inspection should be made of the hands of the attendant. In searching for the furrow in young children attention should be always especially directed to the buttocks, abdomen, and the soles of the feet. In older children the furrows may be seen between the fingers and on the wrist as in the adult; and as at this age, especially in boys, cleanliness of these parts is often neglected, the cuniculus seldom fails to be discovered.

Treatment.—Scabies can only be cured by local treatment which kills the parasitic insect, and the favourite and most efficacious remedy is the application of sulphur ointment to the skin. It must be remembered that in children, in infants especially, the skin is delicate and sensitive to irritants. Therefore, while care is taken to make effectual use of the salve so that the acarus may be destroyed, we should avoid maintaining the cutaneous irritation by too prolonged or too zealous application of the ointment. At nighttime the child should be first thoroughly washed over the whole body with a strong soap, and be then well bathed with warm water, so as completely to soften the skin and lay open such furrows as may be present by destroying their roofs. He should then be well dried, and an ointment made of half a drachm of precipitated sulphur to the ounce of lard must be rubbed into the skin of the whole body except, of course, the head. It is important that the salve be rubbed into the skin and not merely smeared over the surface. In the morning the skin should be again thoroughly washed. This one application will cure the disease in most children. It is advisable, however, to rub a little of the ointment into the parts which seem to have been especially affected for two or three nights longer. We should then pause to watch the effect of the treatment. Itching often continues for some time after the parasites have been destroyed, as a consequence of the various forms of eruption set up by the acarus. In cases where it is doubtful whether the disease be cured or not, Dr. R. Liveing recommends an ointment made with the balsam of Peru (℥ ij. to the ounce of lard).

If it be thought desirable to disguise the sulphur in the ordinary ointment, this can be done by a drop of creasote or oil of bergamot. Dr. Liveing prefers the precipitated to the sublimed sulphur, as being in a finer powder, and less irritating to the skin.

Instead of sulphur, an ointment may be used of liquid styrax (one part) and lard (two parts), or of powdered stavesacre and lard (℥ ij. to the ounce); but these are distinctly inferior to the sulphur. Ointments containing carbolic acid have also been made use of. It is advisable to well scald the underclothing of the patient, and after recovery to bake the outer garments, so as to insure the destruction of stray insects.

TINEA TONSURANS.

Tinea tonsurans is peculiarly a disease of early life. This affection is practically confined to children, and in the form of *ringworm of the scalp* is one of the most obstinate and contagious of complaints. The disease is due to the presence of a fungus—the tricophyton tonsurans—which grows

in the internal root-sheath within the follicle, and the fine mycelium filaments penetrate into the hair between the fibres. These filaments are composed of cylindrical, tube-like bodies united in chains. At the surface of the hair the spores of the tricophyton are collected into little globular masses called *conidia*, and in very old-standing cases these are also seen to fill almost the whole thickness of the hair. As a consequence of the presence of the parasitic fungus the hairs are greatly thickened ; their colour changes to a dull gray tint, and their brittleness causes them to break off short at a point immediately above the follicle out of which they issue. The fungus is seen not only in the substance of the hair, and coating their shafts, but also as a more or less continuous layer on the surface of the scalp. Through this covering the free ends of the stubbly hairs can be seen as black points. Later, as the parasitic matter accumulates, the stumps of hair become completely ensheathed in the mycelium coating so that their situation is only shown by a projection of the surface of the layer. Bazin has compared the appearance thus produced to that of a surface covered with hoar-frost.

In very old-standing cases, acute inflammation may be set up in the hair-follicles. This may lead to complete destruction of the hairs, so that the part of the scalp affected remains partially bald.

Symptoms.—On the scalp ringworm is seen in more or less circular patches. These in the earliest stage are slightly raised above the surface, and cause considerable itching. The hairs are not broken off, and have almost a natural appearance ; but they will be found to be very brittle, so that they generally break if an attempt is made to extract them. As the disease proceeds the patches become distinctly circumscribed, and of a pale fawn or slate-gray colour. Their surface is covered by a thick scurf formed of epithelial scales mixed with the fungoid growth. This scurf gives a frosted appearance to the patch, and adheres to the shafts of the hairs as these emerge from the follicles. The patches are not entirely covered by the short bristly hairs, for in many places these have fallen out, leaving the surface bare. Those which remain are short and twisted. They look as if cut off about a line or two above the surface of the scalp ; and are thickened, dull in colour, and sometimes loose in their sockets. If the scurf has accumulated to a great thickness, the ends of the hairs may be completely concealed from view.

The number of patches existing at the same time varies. Sometimes they are very numerous ; indeed, in certain cases, the disease takes on a diffuse form, in which little groups of scaly patches with bristly stumps of hairs are seen scattered over the surface of the head.

When the tinea is seated on the skin of the body it is called *tinea circinata*. This is also a very common form of the disease, and is generally found on the face and neck, although it may occupy any part of the body or limbs. It is seen as a slightly elevated, roundish patch, of a light red colour, and of the size of a small pea. This begins to extend at its edges, and as the circumference spreads, the central part fades and becomes less prominent, so that the circular patch is converted into a ring which continues to enlarge. With a lens the surface affected is seen to be covered with branny scales ; and fine vesicles are noticed at the margins. If two adjacent rings happen to touch one another, morbid action at the point of contact undergoes no further extension. In this way curiously irregular shapes are often produced. In the central part of the ring the skin, although of comparatively healthy appearance, has yet a yellowish tint, and a roughened look from small scales. These spots cause a great deal

of irritation, and the fungus is no doubt often conveyed by the child's nails from the body to the scalp.

The general health of children affected with ringworm is often unsatisfactory; and the complaint seems to attack, by preference, weakly and scrofulous subjects. The latter, especially, have seemed to me to be peculiarly prone to the disorder.

Diagnosis.—In cases of ringworm of the scalp the chief diagnostic point is the appearance of little rounded, scaly patches, on the surface of which the hairs are thick, dull in colour, and broken short off just above the follicles. If one of these short hairs be removed with a pair of fine forceps, and placed with a drop of liq. potassæ under the microscope, the characteristic masses of spores and mycelium filaments will be readily distinguished. If the hair-stump be allowed to soak in the drop of potash solution for an hour or two before inspection, the parasitic fungus will be more readily detected.

At an earlier period than this the complaint is less easy to recognise. It is, however, of great importance to detect the affection in its early stage. It often happens that when one child of a family suffers from tinea tonsurans one of his brothers or sisters is brought for examination, because he has been noticed to have some irritation of the scalp. If, in such a case, ringworm be present, we shall find one or two small rounded patches, roughened with fine scales; and shall notice that although no stumpy hairs are to be seen, and the hairs have a natural appearance, they are yet unusually brittle, so that they break off when an attempt is made to pull them out with the forceps. From the first, therefore, in ringworm the hairs are brittle; and at an early period of the disease the circular shape of the patch on the scalp, and the brittleness of the hairs growing upon it, are the two points of chief diagnostic value.

An important question, and one upon which our opinion is often required, is that of whether in a given case the child is well. To settle this point correctly requires a very careful examination of the scalp. If any diseased stumps of hairs remain the complaint is not entirely eradicated. The child is therefore still a source of infection to others, and is himself liable to a relapse. Even a bald patch from which the hairs have been carefully extracted is not to be considered well. Often after an interval the stumps will shoot up again, the diseased bulb of the hair having been left in the follicle. It is not until the part lately the seat of the ringworm is seen to be covered with a fine downy growth, in which no single stump of the old crop can be detected, that it can be said, confidently, to be free from disease.

In some cases a difficulty is occasioned by the presence of eczema which has invaded the scalp towards the end of an attack of ringworm. When this happens the evidences of ringworm may be quite concealed by the complication. We must therefore withhold a positive opinion until the eczema has been cured.

Tinea circinata is distinguished by its annular shape, and in cases of doubt by examination under the microscope of a scraping from the skin of the patch. The spot selected for this purpose should be a part of the ring towards the inner margin. This should be gently scraped, and the scaly matter removed is to be placed under the microscope, with a drop of liq. potassæ. The jointed mycelium will then be recognised, and a few spores will usually be seen.

Treatment.—In cases of ringworm of the scalp, the measures to be adopted, and the probable efficacy of the treatment, vary considerably, ac-

cording as the disease is of recent or remote origin. Recent cases can usually be quickly cured, but chronic cases resist treatment with singular obstinacy.

Treatment will also vary according to the age of the patient. Ringworm can only be cured by local applications, and the measures to be adopted consist of the use of two classes of remedies, viz., those which irritate the skin and destroy the fungus, by exciting inflammation in the follicle, and those which kill the parasite without producing inflammation. Of these two classes the first is not suitable to very young patients. Blisters and violent caustics are dangerous remedies in the case of infants; and on account of the pain they excite are not to be used carelessly even on older subjects.

In *infants* and *young children* it will be usually sufficient to wash the head thoroughly with soap and hot water every night, and after careful drying to paint the patch with tincture of iodine. After a few days the application can be changed to the unguentum hydrargyri ammonio-chloridi (P. B.) diluted with an equal proportion of lard; or equal parts of this salve and the unguentum sulphuris may be made use of. Either of these must be well rubbed into the affected parts of the scalp. Another useful application is the glycerine of carbolic acid diluted with a third part of glycerine. This may be painted on the patch with a stiff brush, or rubbed in with a piece of sponge tied to the end of a pencil.

In *older children* the treatment varies according to the acuteness or chronicity of the disease. In either case it is important to keep the hair cut closely to the scalp in the neighbourhood of the patches. The disease is most infectious in its earlier stages, and becomes much less liable to be communicated when undergoing treatment. Of course care will be taken that towels, pillows, etc., used for the patient are not shared by the other children. As an additional precaution Dr. R. Liveing recommends that the carbolised glycerine, pure or diluted with an equal proportion of glycerine, should be well rubbed into the scalp every morning.

In a recent case, if the diseased patch be of small extent, it should be blistered by the liq. epispasticus. Afterwards, when the sore has healed, the oleate of mercury ointment (five per cent.) should be well rubbed into the patch every night. It is useful to vary the application every week or ten days. Therefore, in addition to the preceding, a salve composed of sulphur ointment (half an ounce) with white precipitate (twenty grains) may be used, or the ointment [1] recommended by Mr. Alder Smith, made by adding one part each of pure carbolic acid and unguentum hydrargyri nitratis to four parts of the unguentum sulphuris, may be employed. A favourite remedy in recent cases is the preparation known as "Coster's paste," made by adding two drachms of iodine to one ounce of the colourless oil of tar. Mr. Morant Baker prefers to substitute creasote for the oil of tar. The application is to be painted thickly on the patch with a camel's-hair brush.

If under treatment the patches become very sore, so that the rubbing in of the ointments causes too great pain, Mr. Alder Smith recommends simply smearing the surface of the patch with the carbolic ointment during the day and poulticing with bread-and-water every night. These measures are often followed by a rapid cure. The penetration of the

[1] In mixing this ointment no heat is to be applied. The two salves are first to be amalgamated, and the carbolic acid is then to be rubbed in. The strength of this application can be varied according to the age of the child by increasing the proportion of carbolic acid and nitrate of mercury.

remedy into the hair-follicles is aided by previous removal of the hair-stumps. This epilation is done with a forceps made for the purpose. Care must, however, be taken in extracting the hair, as on account of its brittleness it is very apt to break off, leaving the bulb still in the follicle. It is also important to pick or wash off the fine crusts of scurf which, as long as they remain, are greatly in the way of efficient treatment. If the scab is difficult to remove it should be well greased with cold cream or saturated with olive-oil, and poulticed. It then becomes quite soft and can be easily picked off.

In *old-standing cases* the above remedies are still of service, and careful epilation should be practised. Sometimes the long duration of the disorder seems to be due to ignorance or neglect; the remedies not having been applied effectually, or care not having been taken to remove the scurf before applying the salve. The energetic use of oleate of mercury ointment (five per cent.) is recommended by Mr. Alder Smith as a useful remedy even in chronic cases. After careful washing of the head the oleate, freshly made, is well rubbed into the whole scalp with a sponge mop. In the use of this application it is well to refrain from charging the mop too liberally with the remedy, lest the ointment run down the face and neck. At night, too, a linen cap should be worn on the head; and a thin towel is often necessary, applied as a turban, to prevent irritation of the face by the oleate. Any smearing of the skin elsewhere than on the scalp with the salve will produce a copious eruption of small pustules and much swelling. Every night the general application is to be repeated; in the morning the inunction is to be limited to the diseased patches. While this plan of treatment is being carried out the head must be washed only once a fortnight; but scabs or yellowish incrustations must be frequently removed by the forceps. If the oleate set up inflammation in the patch a speedy cure is usually effected.

The beneficial effects observed as a consequence of inflammation set up in the patch has led to the employment of special irritants with the express view of producing this result. Mr. Alder Smith, who has devoted much attention to this method of treatment, states that very long-standing cases can sometimes be cured by this means. He selects a small patch and applies to it croton-oil in moderate quantity with a small stiff camel's-hair brush. After a few hours he applies a poultice and keeps it on the head all night. If severe inflammation has not ensued by the next day the process is repeated, and sometimes three or four applications may be needed. The object is to set up artificial "kerion," *i.e.*, to produce a swollen, boggy, freely-discharging surface from inflammatory swelling and effusion in the tissues around the follicles. When kerion is produced no more croton-oil need be applied, but the part must be frequently fomented with warm water. After a few days the stumpy hairs become loose and fall out, and when the inflammation has subsided a smooth, shining, slightly-raised red surface is left "utterly destitute of all hairs and stumps and practically well." Eventually, the spot becomes again covered by new healthy hairs.

This plan of treatment is only admissible in the older children, and the application should be confined to a limited surface if the patch is a large one. While in progress the carbolic glycerine or oleate should still be applied to other parts of the scalp. By this means Mr. Alder Smith states that he has had successful results in apparently incurable cases, and has never seen any internal irritation or erysipelas set up by the use of this powerful irritant.

In obstinate cases of ringworm of the scalp constitutional treatment is also required. Often the patients are anæmic, scrofulous, or ill-nourished subjects, and cod-liver oil and tonics will be of service in improving their general health.

Ringworm of the body (*tinea circinata*) is quickly cured by the application of a strong irritant. I am in the habit of painting the ring lightly with glacial acetic acid. This application causes some smarting for a short time, but usually cures the disorder at once. Sometimes a second application to parts of the ring is required after five or six days. Other applications which may be used are the strong tincture of iodine, and a solution of nitrate of silver (ʒ j. to the ounce).

TINEA FAVOSA.

Tinea favosa, or favus, is much less common in England than the preceding. Like it it is a contagious disease, and is most frequently seen in scrofulous or neglected and badly-fed children. It is said to be common in some countries in mice and rats, and instances have been known in which the disease has been conveyed from these animals to the children of the family.

Favus is due to the presence of a cryptogam—the *achorion Schoenleinii*. The mycelium and spores of this fungus may be seen without difficulty if a portion of the crust be put under the microscope, moistened with a drop of liq. potassæ.

Symptoms.—Like tinea tonsurans, favus may occur on any part of the body, but is usually met with on the head. It begins in small scaly patches which cause much itching. In this early stage the disease bears a close resemblance to the ordinary ringworm, especially as the hairs growing on the diseased spot quickly lose their lustre and get dull in colour. They do not, however, as in ringworm, become brittle, so that there is no difficulty in pulling them out with the forceps.

After a time small yellow crusts of about the size of a pin's head appear on the patch round the hairs. These crusts are at first convex, but afterwards as they enlarge become cup-shaped. They are of a sulphur-yellow colour, and vary from a split pea to a mass of the diameter of half an inch. Usually one or two hairs pass through the centre. At first the favus crusts are placed singly, but they may afterwards become confluent, so as to form irregular-shaped masses, more or less extensive, and without the characteristic cup-shaped depression. The smell of the head covered by the crusts is very unpleasant and somewhat resembles that of mice. On the removal of a favus crust a depression is seen which is red and may be ulcerated. This, after a few days, disappears and the surface becomes again covered by a new crop of cup-shaped crusts. When the crusts become detached and fall off spontaneously the skin is merely seen to be stained of a dark red or violet colour. As the disease goes on the hairs lose their natural tint, and grow loose in their sockets so as to be pulled out with ease. Their shafts are found on inspection to be irregular in their diameter at different points, and their roots are atrophied. They become fewer in number, and if the disease persists may disappear altogether, leaving the part completely bald.

On the body favus, like tinea tonsurans, forms rings, but these always remain small, seldom exceeding half an inch in diameter, and have not the characteristics of tinea circinata. In other respects they bear a close re-

semblance to that disease. Afterwards, however, the characteristic crusts make their appearance at the edges and on the surface of the rings.

Diagnosis.—When the disease is well developed on the scalp, the cup-shaped crusts, and their sulphur-yellow colour are very characteristic. It is in the early stage before the crusts appear, and in the later stage when the crusts have lost their peculiar features, that the disease is liable to be mistaken. In the early stage the round, itching, scaly patches closely resemble common ringworm, but a distinction is supplied by the want of brittleness of the hairs in favus. In this disease the hairs can be pulled out of their follicles with ease, while in tinea tonsurans, if an attempt be made to extract the hair, it almost invariably snaps short off close to the scalp. In the later stage when the crusts have lost their distinctive character, especially if, as often happens, they have become complicated with a secondary eczematous eruption, the diagnosis is again less obvious, but the history of the case, and a careful microscopic examination of the crusts, which reveals the mycelium and spores of the cryptogam, will indicate the nature of the case.

Treatment.—The crusts must be removed by saturating them with olive-oil, and then poulticing, or by constantly applying a strong sulphurous acid lotion under a cap of oiled silk. When the scalp is quite denuded of crusts and scabs the hair must be cut close to the skull, and steps can then be taken to remove all the hairs from the diseased surface. This is a work requiring much time, trouble, and patience; for each hair must be carefully extracted by the forceps, taking care to pull in the direction in which the hair is growing. When this has been done, the special remedy must be well rubbed into the scalp. Any of the applications recommended for tinea tonsurans may be made use of, but one of the most effectual is the oleate of mercury ointment (five per cent.). This must be used carefully and with precaution that the ointment does not run over the face.

If the child be badly nourished or anæmic, strengthening medicines and good nourishing food will be of service in aiding his recovery.

CHAPTER VI.

SCLEREMA.

Sclerema, a disease which consists in a hardening of the cutaneous cellular tissue sometimes met with in young infants, is rarely observed in England, but appears to be less uncommon on the continent of Europe. The affection was first completely described by Underwood and Denman. Shortly afterwards Andry of Paris applied Underwood's description to a totally different lesion. This observer had frequently noticed at the Hospice des Enfants-Trouvés of Paris a condition in which the surface of the body becomes indurated as a consequence of subcutaneous œdema. This disorder answered in many respects to Underwood's description, so that by a not unnatural confusion Andry adopted Underwood's term for his own account of œdema of the new-born infant. After his time the error, thus begun, was perpetuated by successive writers until Parrot, to whose labours the pathology of infantile disease is so much indebted, showed clearly in his work on "Athrepsie" that two very different conditions had been hitherto confounded under the same title. In the present chapter the true sclerema will be first described; afterwards a short account will be given of "œdema of the new-born infant."

TRUE SCLEREMA.

True sclerema (induration of the cutaneous cellular tissue) is confined to new-born infants. This lesion is not to be confounded with the scleroderma which attacks older children and adults. It occurs only, according to Parrot, in feeble infants and those wasted by bad feeding and unwholesome conditions generally. According to Underwood it appears as a feature of the last stage of atrophy from digestive derangements.

Morbid Anatomy.—The lesion consists in a curiously condensed state of the skin. This tissue is thinned as if from compression of the several layers. The rete Malpighii and corium have sensibly lost thickness, and the coils of the former layer can hardly be detected, so intimately are they amalgamated into a compact mass. In the adipose layer the fat-lobules are atrophied; their globules are wasted; and the connective-tissue bands are more numerous and thicker than in the normal state. According to Underwood, the induration of the cellular tissue may reach the sheaths of the muscles and even affect their fibres. There is never any subcutaneous œdema in the true disease. The blood-vessels, especially those of the papillæ, are so narrowed that their lumen is obliterated. These pathological changes form a very distinct condition—different on the one hand from œdema of the new-born, and on the other from scleroderma of older children and adults. They are the consequence, according to Parrot, of desiccation of the tegumentary tissues owing to the draining away of fluid by the copious watery discharges from the bowels. There must, however, be

some other cause for the pathological change, for in this country it is common enough to find young infants reduced by bad feeding and profuse watery diarrhœa to a state of extreme emaciation ; but sclerema is a lesion so rare that when discovered it is regarded as a clinical curiosity.

A form of sclerema called *adipose sclerema* is sometimes met with. This is different pathologically from the preceding. It is due to a solidification during life of the subcutaneous fat. According to Dr. Langer the melting point of infant's fat is 113° Fahr., or a higher point than the temperature of the body ; while adult fat becomes perfectly fluid at a temperature of 96.8° Fahr. Hence, in the healthy child during life, a large proportion of its fat is not quite fluid but merely soft. If, from any reason, such as collapse, or the rapid withdrawal of heat which sometimes occurs in young infants as a consequence of depressing illness, the temperature of the body falls to 89.6°, this degree of cooling, according to Dr. Langer, is sufficient completely to solidify all the fat in the panniculus adiposus.

Symptoms.—The more special symptoms of sclerema are preceded by great impairment of nutrition and rapid wasting. The induration begins to be noticed at the end of the first week of life, or on the ninth or tenth day, or in some cases in the course of the second month. According to some writers it is especially in infants born fairly healthy and robust, and whose nutrition has become rapidly impaired that the cutaneous symptom is most likely to occur.

The induration generally begins in the lower limbs and spreads thence to the loins, the back, the chest, and eventually to the whole body, face included. In some cases the face is said to be attacked early, and the induration to spread from this part to the body. The affected skin, completely losing its natural softness and suppleness, becomes hard and unyielding, and pressure with the finger meets a resistance like that of horn or hardened leather. The folds and lines of the skin disappear, and partly from rigidity, partly from its close connection with the underlying tissues, it can no longer be pinched up between the finger and thumb.

When the whole body is thus affected the induration prevents any bending of the joints, so that the limbs are stretched stiffly out, and it is even said that the body may be supported in a horizontal position in the air by a hand placed under the loins. The rigidity of the face, especially of the lips and cheeks, makes sucking impossible, although the induration of this part is usually less advanced than that of other regions of the body. But for this, and for the little feeble respiratory movement of the abdomen and chest, the infant might be thought to be dead. Indeed, the tightly-compressed lips, the closed eyes, the mask-like face, the immobility of the frame, and the peculiar coldness of the surface, resemble death more nearly than life.

The lowness of the temperature is one of the striking features of this condition. The diminution of heat of the skin gives a marked sensation of coldness to the hand, and even in the rectum the temperature may fall far below the normal level. The body is not only cold, but seems incapable of being warmed ; and even the occurrence of pneumonia has no appreciable effect in raising the temperature. The pulse and respiration fall in frequency. The former may be as low as sixty in the minute, the latter fourteen. The respiratory movements are hampered and feeble, and the cry is weak and almost inaudible.

The course of the disease is very rapid. The induration proceeds apace. By the third day, according to Underwood, the skin has become intimately adherent to the tissues beneath. By the fourth the induration

has become general over the body. The child usually dies on the seventh day or soon afterwards.

ŒDEMA OF NEW-BORN CHILDREN.

Œdema of new-born children is also a very rare disease in this country. The subcutaneous tissue is infiltrated with yellowish serosity which permeates between the adipose lobules, but never passes between the muscles or sinks below the level of the subcutaneous tissue. The fat is converted into a yellowish brown mass. In some cases there is congenital atelectasis.

Symptoms.—The disease begins, according to Valleix, before the third day of life, and the infants affected are almost always prematurely born or feeble. At first the child is noticed to be drowsy, and its skin is then found to be livid and very cold to the touch. The œdema is first noticed in the feet and thence spreads upwards to the thighs. The hands are next attacked, and later the œdema appears in the genitals and the back. There are, however, exceptions to this order. Valleix states that he has known the œdema to appear first in the cheek; and sometimes the hands begin to swell directly after the feet have been attacked. The swelling is usually greater on one side than on the other, and tends always to sink to that on which the infant is lying. The affected parts pit with difficulty on pressure, but are swollen, and feel doughy and hard. The skin at first has a purple colour, especially at the extremities, and before death may have a jaundiced hue. It does not become adherent to the parts beneath as in the case of sclerema, and there is not the same stiffness of the joints. The temperature is low and may fall to 86°. It is little raised by the external application of warmth to the body. The child lies in a drowsy apathetic state, and scarcely attempts to cry. The pulse is small and very feeble; the breathing slow and interrupted; convulsions may come on, and the prostration may be increased by a watery diarrhœa. Death may be hastened by intercurrent attacks of bronchitis, pneumonia, collapse of the lung, gastric or intestinal catarrh, etc. In some of the cases parenchymatous nephritis and albuminuria have been observed.

Diagnosis.—The two diseases, sclerema and œdema of the new-born, are very dissimilar, although they appear to be produced by much the same conditions, and certain symptoms are common to both. In each case we find a lowering of the temperature, a fall in the pulse and respiration, and a rigidity of the surface of the body. In each case the weakness is profound; and the infant lies motionless, refuses to suck, and more nearly resembles a dead child than a living one. There are, however, important differences in the two diseases. In sclerema the skin is tense and hard, and adheres firmly to the tissues beneath it; the joints are extended and stiff, and the whole body is rigid as if petrified or frozen. The firmness and rigidity increase day by day, and death occurs at the end of the first or the beginning of the second week.

In œdema the parts affected are firm and swollen, but can be made to pit on deep pressure. The swelling is partial and is most marked on the side upon which the child is lying. The skin can be moved over the parts beneath it; and the stiffness of the joints is but little pronounced, never prevailing, as in sclerema, to a sufficient degree to resist the force of gravity. The disease, also, is of longer duration than is the case with sclerema, and although very dangerous on account of the weakness of the

child, is not invariably fatal. The two diseases may exist together, or sclerema may succeed to œdema, as in a case reported by Parrot.

Treatment.—In cases of true sclerema little can be done. On account of the impossibility of sucking, the infant should be fed with white wine whey by means of the syringe feeder (see page 15). By this means a sufficient quantity of food can be introduced at intervals into the back of the throat when it is readily swallowed. In order to maintain the warmth of the body, the child should be wrapped in cotton-wool, and should be surrounded with hot water-bottles.

In the œdema of new-born infants the child, if he cannot suck, may be fed with the syringe as directed above. He should take white wine whey, milk and barley-water, and other varieties of food suitable to this period of life (see page 603). Warmth must be maintained as in the former case, and gentle frictions to the surface of the body are of service in helping to disperse the œdema.

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