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THE

DISEASES OF CHILDREN;

A

PRACTICAL AND SYSTEMATIC WORK

FOR

PRACTITIONERS AND STUDENTS.

BY

WILLIAM HENRY DAY, M.D.,

AUTHOR OF HEADACHES; THEIR CAUSE, NATURE, AND TREATMENT,
MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON,
PHYSICIAN TO THE SAMARITAN HOSPITAL FOR WOMEN AND CHILDREN.

SECOND EDITION.

REWRITTEN AND MUCH ENLARGED

PHILADELPHIA:
PRESLEY BLAKISTON,
No. 1012 WALNUT STREET.
1881.

RJ 45
881 D

TO MY COLLEAGUES,

THE PHYSICIANS AND SURGEONS

OF THE

SAMARITAN HOSPITAL,

This Work is Dedicated,

WITH

EVERY SENTIMENT OF RESPECT AND ESTEEM,

BY

THE AUTHOR.

PREFACE.

THIS volume is the outcome of private and hospital practice, extending over a lengthened period. My aim has been to make the work useful, and to rely on clinical experience rather than on theories; which, even when proved, cannot always be brought to bear on points of practical interest.

I entertain the hope that the following pages may prove useful both to the student and to the practitioner. To assist the student, I have classified each disease and its varieties, after the method sanctioned by modern pathologists. To help the practitioner, I have carefully placed a descriptive heading before each chapter, to enable him to obtain readily the information he requires.

In arranging the list of prescriptions, concentration has been my aim. Certain broad principles are kept in view, as regards dose and combination, but the details can be varied at the discretion of the practitioner, according to the peculiarities of each case as met with in practice. I have invariably prescribed remedies in safe doses. Some medicines will be taken by children in large proportions and a cure effected when small doses fail. Thus belladonna may cure incontinence of urine, and relieve whooping-cough, when its physiological effects are fully produced. Arsenic will cure chorea in large doses, whilst it will frequently fail in small doses. Opium requires to be given with caution. Calomel, iron, ipecacuanha, and free purgatives are well borne by children, while strychnia and prussic acid require care in exhibition.

I have to thank my colleagues at the Samaritan Hospital for the opportunities they have given me of watching interesting cases

under their care, and of giving me many valuable hints. I have especially to thank Mr. Alban Doran for the assistance he has rendered me in the chapters on Invagination and Intussusception, and on other questions of surgical interest.

My warmest thanks are due to Dr. Milner Fothergill for much information and suggestion.

I have laid myself under great obligation to the writers of standard works, and if I have failed anywhere to acknowledge the debt, the omission has been purely accidental and unintentional.

To the Transactions of the Royal Medical and Chirurgical Society, of the Pathological Society, and of the Clinical Society, as well as to the works of Jones and Sieveking and Wilks and Moxon, I am greatly indebted.

10 Manchester Square;
April, 1881.

CONTENTS.

CHAPTER I.

PAGE

Introductory Remarks, ... 17

CHAPTER II.

Milk Diet and Hygiene, ... 26

CHAPTER III.

Acute and Chronic Disease, ... 51

CHAPTER IV.

Debility, ... 62

CHAPTER V.

Dentition, ... 67

CHAPTER VI.

Marasmus or Atrophy, ... 73

CHAPTER VII.

Fevers of Childhood, ... 78

CHAPTER VIII.

PAGE

TYPHOID FEVER, ... 83

CHAPTER IX.

SPECIAL ERUPTIVE FEVERS, ... 97

CHAPTER X.

MORBILLI OR MEASLES, ... 101

CHAPTER XI.

SCARLET FEVER OR SCARLATINA, ... 115

CHAPTER XII.

VARIOLA OR SMALL-POX, ... 137

CHAPTER XIII.

DISEASES OF THE MOUTH AND FAUCES, ... 148

CHAPTER XIV.

INDIGESTION, ... 164

CHAPTER XV.

DIARRHŒA, ... 174

CHAPTER XVI.

GASTRITIS—MELÆNA—DYSENTERY, ... 194

CHAPTER XVII.

CONSTIPATION AND COLIC, ... 200

CHAPTER XVIII.

PAGE
INTESTINAL OBSTRUCTION, ... 207

CHAPTER XIX.

INTUSSUSCEPTION—INVAGINATION, ... 210

CHAPTER XX.

DISEASES OF THE LIVER, ... 225

CHAPTER XXI.

ICTERUS OR JAUNDICE, ... 231

CHAPTER XXII.

PAINLESS ENLARGEMENTS OF THE LIVER, ... 237

CHAPTER XXIII.

DISEASES OF THE SPLEEN, ... 242

CHAPTER XXIV.

DISEASES OF THE KIDNEYS AND URINARY ORGANS, ... 248

CHAPTER XXIV (*Continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS, ... 264

CHAPTER XXIV (*Continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS, ... 274

CHAPTER XXIV (*Continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS, ... 287

CHAPTER XXV.

PAGE

DISEASES OF THE PERITONEUM, ... 294

CHAPTER XXVI.

ASCITES, ... 299

CHAPTER XXVII.

INTESTINAL WORMS, ... 302

CHAPTER XXVIII.

DISEASES OF THE NASAL CAVITIES, ... 310

CHAPTER XXIX.

CROUP—LARYNGO-TRACHEAL DIPHTHERIA OF SOME WRITERS, . . 322

CHAPTER XXX.

DIPHTHERIA, ... 336

CHAPTER XXXI.

LARYNGISMUS STRIDULUS, ... 357

CHAPTER XXXII.

PERTUSSIS OR WHOOPING-COUGH, ... 366

CHAPTER XXXIII.

ENLARGED BRONCHIAL AND MEDIASTINAL GLANDS, ... 383

CHAPTER XXXIV.

ASTHMA, ... 393

CHAPTER XXXV.

PAGE

EMPHYSEMA, ... 405

CHAPTER XXXVI.

BRONCHITIS, ... 413

CHAPTER XXXVII.

PLEURISY, ... 427

CHAPTER XXXVIII.

PNEUMONIA, ... 448

CHAPTER XXXIX.

TUBERCULOSIS, ... 472

CHAPTER XL.

PHTHISIS PULMONALIS OR PULMONARY CONSUMPTION, ... 500

CHAPTER XLI.

DISEASES OF THE HEART, ... 529

CHAPTER XLII.

DISEASES OF THE BRAIN, ... 557

CHAPTER XLIII.

EPILEPSY, ... 587

CHAPTER XLIV.

INFANTILE CONVULSIONS OR ECLAMPSIA, ... 606

CHAPTER XLIV (*Continued*).

PAGE

CONGESTION OF THE BRAIN, ... 618

CHAPTER XLV.

CHOREA OR ST. VITUS'S DANCE, ... 624

CHAPTER XLVI.

DISEASES OF THE SPINAL CORD, ... 637

CHAPTER XLVII.

INFANTILE PARALYSIS—ACUTE ANTERIOR POLIO-MYELITIS, . . . 647

CHAPTER XLVIII.

RHEUMATISM, ... 658

CHAPTER XLIX.

RICKETS OR RACHITIS, ... 669

CHAPTER L.

SYPHILIS IN CHILDREN, ... 684

CHAPTER LI.

ANÆMIA, ... 692

CHAPTER LII.

DISEASES OF THE EAR, ... 708

CHAPTER LIII.

DISEASES OF THE SKIN, ... 716

ERRATA AND ADDENDUM.

On page 365, second line from bottom, for "Aquam ad ℥j" read "Aquam ad ℥iij."

On page 379, second line from bottom, for "Aquam ad" read "aquæ āā."

On page 206, at bottom, add:

Typhlitis and Perityphlitis.—This disease consists in inflammation of the coats of the cæcum, and of the tissues above and around it. It may occur without apparent cause, or follow diarrhœa or constipation. Blows on the abdomen, exposure to damp and cold, impacted fæces, or foreign bodies in the cæcum may induce it.

The *symptoms* are pain and tenderness over the right iliac fossa, colicky pains in the abdomen, vomiting, constipation or diarrhœa, and febrile disturbance. The patient lies on his back, or right side, with his legs drawn up to relax the abdominal muscles.

The *prognosis* is generally favorable unless the disease leads to perforation of the cæcum and peritonitis. If abscess form, it may open into the bowel or externally through the abdominal wall, the chance of recovery being greater in the former than in the latter.

The *diagnosis* consists in sudden localized pain and tenderness in the right iliac fossa, with more or less swelling, vomiting, and constipation. It may be mistaken for hip-disease* or ovaritis in young girls who have begun to menstruate, or to the passage of a renal calculus.†

Treatment.—If pain and tenderness are acute, it will be advisable to apply three or four leeches over the cæcum, followed by warm and light poultices. Opium to relieve pain in small doses by the mouth, or what is preferable, a few drops of laudanum thrown into the rectum. When the pain is relieved, enemata may be used, or even a mild laxative, if there is no vomiting, but the greatest care is necessary in the use of aperients.

---

* Perityphlitis in Children, The American Journal of the Medical Sciences, by V. P. Gibney, M.D., 1881, p. 119.

† See Chap. XXIV, p. 275.

DISEASES OF CHILDREN.

CHAPTER I.

INTRODUCTORY REMARKS.

The study of children's diseases—Their special characters and peculiarities—Management during growth and development—Importance of attending to the constitutional rather than to the local state—Constitutional and hereditary disease.

THE diseases of children have a claim to be considered separately and specially. It is before mental training has worked its influence, and the body has undergone the wear and tear of adult life, that we are able to study disease in its most natural form. An opportunity is presented to us of seeing disease, as it were, unrestrained and free, running its course in a tender frame, keenly sensitive to exaltation and depression, without the complications and the thousand collateral circumstances which determine the form and character of the disease which is to assail it in subsequent life. All practitioners of medicine will admit that the diseases of children should be regarded in a distinct light from like diseases of adults, where too frequently disease acts upon shattered organs and worn-out tissues. The remarkable peculiarities which disease assumes in children, the course it follows, and the rapid transition from a state of danger to recovery, make this study very important.

Often obscure and difficult of detection, these diseases quickly attain force and intensity, and run on uncontrolled by any measures within our reach. It may be they have slumbered for a variable time in the system, occasioning little, if any disturbance to the general health that could be looked upon as positively foreboding evil to come; or it may be, from causes not readily discoverable,

they have a sudden and fierce origin. Now and then, after lasting weeks and months together, defying medicine and the highest medical skill, they take a turn in the right direction. Each stage of them is characterized by graver symptoms till a turning-point is reached, and then convalescence sets in slowly and steadily.

A life of physical activity when the renovation of the tissues is most vigorously proceeding makes great calls on the digestive functions, and these again, for the maintenance of their integrity, depend on sleep and repose when weariness sets in. Excessive mental exertion interferes with the growth of the body. The two cannot be actively carried on with impunity at the same time; the one is peculiar to childhood, the other comes naturally with the approach of maturity, and increases with the love of sedentary habits. When the organic processes are most active they are most easily upset, or hindered in their course, and in this respect alone they differ as much from similar functions in the adult as a thriving shrub does from a full-grown tree.

The children of the present day are reared differently, taught differently, and fed differently from those of half a century ago, and, as a consequence, the power of disease is greatly modified by such changes. These are very important considerations, and must be borne in mind if we would successfully lay smooth this uneven field of medical inquiry, for I think fault may often be ascribed to us in not adequately estimating the difference of power between similar diseases in the young child and the adult. It is necessary, then, that the diseases of early life receive a most attentive consideration, for if overlooked, or ill understood, the seeds of mischief are allowed to take deep root, and a degenerate maturity is encouraged. A large number of the children of the poor in London grow up to be tuberculous, and ultimately die of pulmonary phthisis, from disregard of their early illnesses on the part of their parents. Small children, imperfectly recovered from the eruptive fevers, are allowed to run about in the streets almost before the rash has disappeared; and the lung affection, which so constantly attends measles, is permitted to go on without any treatment at all. Suppurating cervical glands, otorrhœa ending in cerebral disease, dropsy, ophthalmia, etc., all follow in the rear of neglect and starvation. The functions of childhood are remarkable for change, development, and activity; the skin is sensitive to all external influences, diarrhœa and vomiting are easily provoked, and the ner-

vous system is very impressible. Hence an amount of cold or heat which would not affect a grown-up person would be fatal to a young child, for in proportion to the rapid changes which are going on there is a proportionate degree of risk. It is no easy task to adjust the balance and to keep it steadily equipoised. Disorder in one part is enough to disturb the whole machinery, and slight mischief having been set up in an unimportant part may rapidly extend its influence to another distant and vital part.

We have much to learn then, during the period of growth, change, and development. In a great measure children must be managed according to the strength with which they enter into the world. Some are born weak and fragile, and require the most delicate attentions to rear them through this stage. If the same measures are adopted as with stronger children they would either die, or grow up miserably wretched or unhealthy. No astonishment can be awakened at this if we consider for a moment the life many mothers lead during the trying period of pregnancy. Late hours lead to fatigue, to excitement, and to stimulating and improper diet, which are sure means of causing them to bear an unhealthy offspring. In London and other large cities these remarks are especially applicable. The calm quiet of country life, with regular and abstemious habits, alone conduces to a natural and tranquil state of mind and body. All this leads to sound and vigorous health in the mother, and as surely to health in the children she bears.

My colleague, Dr. Percy Boulton, has devoted much time and attention to the subject of physical development in children. What Professor Bowditch, of Boston, has done for Americans, Quetelet for Belgians, and Charles Roberts for English factory children, Dr. Boulton has done for well-to-do English children. The physical averages of factory children are as poor a standard of measurement as their mental averages are a criterion of brain capacity. It seems unnecessary to explain that syphilis, struma, and drink on the one hand; bad food, clothing, housing, and premature excessive bodily labor on the other; tend to stunt the growth of the working classes. An average of the weight and height of factory children is no standard for those more favorably situated in life.

Dr. Boulton has arrived at the following very valuable conclusions:

"Healthy children grow at the following rate per annum—

Slow growing,	2 inches a year
Average,	$2\frac{1}{2}$ " "
Fast growing,	3 " "

A child that grows 2 inches a year will be a short adult, $2\frac{1}{2}$ inches a medium, and 3 inches a tall adult. Weight should increase regularly with height, and there is no more certain forerunner of disease or unhealthy development than discrepancy in the weight for height ratio. Growth should proceed regularly and evenly, not by fits and starts. Delicate children grow most irregularly. Illness in a great measure checks their development, during which time they lose ground that either is never made up, or only by a bound which sadly taxes the strength."*

It is most important that we should have some standard to go by, and this is supplied us in the table of averages which Dr. Boulton has drawn up as the result of very numerous observations of his own amongst the children of healthy well-to-do people. He particularly mentions that his endeavor has been to exclude all dwarfs, giants, and evidently diseased and unhealthy children, which so seriously alter the averages of other observers, and believes that he has thus prepared a scale which may be regarded as a standard for children brought up under favorable conditions.

Table of Averages.

Height.		Weight.		Height.		Weight.	
Feet.	Inches.	Stone.	lbs.	Feet.	Inches.	Stone.	lbs.
3	0	2	8	4	1	4	$6\frac{1}{2}$
3	1	2	10	4	2	4	9
3	2	2	12	4	3	4	$11\frac{1}{2}$
3	3	3	0	4	4	5	0
3	4	3	2	4	5	5	$2\frac{1}{2}$
3	5	3	4	4	6	5	5
3	6	3	6	4	7	5	$7\frac{1}{2}$
3	7	3	8	4	8	5	10
3	8	3	10	4	9	5	$12\frac{1}{2}$
3	9	3	12	4	10	6	1
3	10	4	0	4	11	6	$3\frac{1}{2}$
3	11	4	2	5	0	6	6
4	0	4	4				

* Some Anthropometrical Observations, Harveian Society, March, 1880.

The first year of infant life is especially perilous from defective nutrition and want of proper care.* We are assured of this from the fact that the mortality is so much greater among the children of the poor than among those of the rich; in the manufacturing districts of the north, and in overcrowded dwellings, than in rural districts, where the mothers go to field work, and where three or four families are not compelled to reside in one small house. It is a mystery that children can be reared at all in some of our great cities and towns, on account of the impurity of the air they breathe, and the insanitary condition of the hovels they inhabit. Better accommodation must be provided for the poor if we would lessen the waste of infant life and the spread of zymotic diseases—a spread accelerated, no doubt, in these days by the rapid intercourse between one country and another.

Those accustomed to children will observe signs and symptoms about them of great weight and significance, which would pass unnoticed by others not possessing this experience. They detect the coming storm, and avert it by simple and appropriate treatment; and so a formidable disease may sometimes be annihilated by good judgment and forethought. There are few diseases occurring in later life that require so much sagacity to detect as the various disorders and ailments of young children, or so much discrimination, tact, and judgment in the successful management of them. I have elsewhere stated that constitutional symptoms always demand a large share of attention, and that we have often erred when we have trusted too exclusively to physical and local signs. At all ages and in both sexes, it is my belief that we are never likely to be so successful in controlling disease as when we mainly direct our treatment to the constitutional state.† This does not imply carelessness of, or indifference to, physical signs. In children the constitutional state should never be forgotten, for many a sound practitioner has lost his little patient, whilst watching the pulse

* It is stated on the authority of M. Kuborn, of Belgium, that the mortality for this period of life in the principal countries of Europe is as follows: "Out of 1000 children, there die in Sweden 153, in Denmark 136, in Scotland 156, in England 170, in Belgium 186, in Holland 211, in France 216, in Prussia 220, in Spain 226, in Switzerland 252, in Italy 254, in Austria 303, in Russia 311, and in Bavaria 372."—*British Medical Journal*, January 27th, 1877, p. 113.

† *Vide* a paper by the author On the Relative Value of Symptoms in the Diagnosis and Treatment of Disease. Transactions of the St. And. Med. Grad. Association, vol. ii, p. 78, 1869.

closely and listening with care to the respiration, when he might have saved life by leaving these symptoms to take care of themselves and looking to the general state as the sure index of danger. Neither the pulse, the skin, nor any light which auscultation and percussion afford, are such valuable signs of disease in children as they are in adults. Constitutional diseases are the consequences of impairment in the processes of nutrition and secretion. In children they are more frequently hereditary than acquired. A child is born with a predisposition to some particular disease, as tubercle, cancer, gout, etc.; but if the life it leads is conducive to sound health, the morbid tendency may never show itself. And this may afford an explanation of a constitutional and hereditary disease skipping one generation and appearing in the next.*

When the general and constitutional signs of disease are well established, they are sometimes cut short with the same suddenness with which they attained their severity. But when the physical signs of disease are also well developed, as in some cases of continued fever, bronchitis, and pneumonia, our prognosis becomes far more serious, and a tendency to sudden prostration, and even fatal collapse may steal on in a few hours.

---

* "The health of an individual depends not merely upon existing, but also on antecedent causes. Part of his health is transmitted from his ancestors, and may be a mere survival of hygienic conditions which have been extirpated. Part of our health also depends upon the external conditions of our upbringing when young, and part also on the influence, physical and moral, to which we are exposed all through our lives. As there is no individual who can be said to have all his organic functions in the most perfect action, so there is no community that can be considered in a perfectly healthy state, for the general health depends upon all the movements of the private health of the individuals. The health of a nation, physiologically considered, stands closely in relation to that of an individual. The nutrition and health of an individual depend upon the well-adjusted balance of the supply and waste of the particles which compose the body. These particles of the body, all through the life of man, are incessantly dying, and are being replaced by new particles continually springing into life. Every organ is thus undergoing, through its particles, a continued and rapid alternation of death and life. As the whole body is to one of these particles so is the whole body politic of a nation to the individuals of which it is composed. The death of an individual in a state is strictly analogous to the death of a particle in a single man, and the birth of an individual in a state is the analogue of the moulding of a new living particle into the body of a man. When an individual becomes diseased, there is some want of balance between the waste and supply of his organs—or rather of the underlying protoplasm which is incessantly changing from life to death. When the waste of the ultimate particles is greater than the power of restoration, disease attacks the individual."—Address of Dr. Lyon Playfair, On Sanitary Reform, delivered before the Social Science Congress at Glasgow, October 3d, 1874.

We cannot, in many complaints, so easily determine the extent and degree of local mischief in children as we can in adults; and even where we are pretty certain, we shall find it an admirable rule to trust to the general condition of these young patients, rather than to rely on the uncertain knowledge which doubtful local signs often create in our minds. It is often quite impossible to depend upon the testimony of children as to the seat of pain or suffering, and the medical attendant requires to exercise very great discretion and judgment before he draws any conclusion. Let the abdomen of a child be lightly pressed, and it will almost always, when interrogated, reply that it feels pain. Even the testimony of adults under such an examination may mislead us. In a case of fever it may be very important to be safe on this point, as I am satisfied I have seen leeches and counter-irritants applied when the local signs of pain or congestion, or inflammation have not existed.* The tumid and protuberant abdomen of a child is sometimes looked upon as an indication of disease, when it is in all respects healthy and natural. The contrast between the abdomen of a child and that of an adult is too well known to need comment here.

Now, there are a few points respecting the management of children in health which if known are not acted upon, and the neglect of them is followed by serious after-consequences. Health is dependent in large measure upon points which may appear very trifling, but which nevertheless if overlooked, from their apparent insignificance, may grow into open dangers.

Disease is early and easily implanted by the parents of children who set at defiance those natural laws upon the observance of which health and strength depend. A young child, like a young plant, requires suitable nourishment and judicious feeding, and without in any way pandering to every fancied ailment, I would urge a

* In the early part of my professional career I remember an old physician making pressure over the right iliac region of a fever patient whom he saw in consultation with me, and insisted that some lesion of the intestine was either present or threatening. The patient admitted that pressure hurt her, and accordingly the linimentum hydrargyri was ordered to be rubbed in night and morning over the supposed seat of mischief, and small doses of mercury and Dover's powder given by the mouth. I soon desisted from the use of mercury, but not before it had produced slight ptyalism. The progress of the case justified the opinion that the intestines had escaped the lesion to which they are so liable. I give this case in point, because delicacy of touch, the position of the patient when under examination, the weighing evidence from a set of symptoms rather than from one, are so essential in the diagnosis and treatment of disease.

constant scrutiny and watchfulness. Those children are the healthiest and strongest in every way who are allowed certain freedom in their amusements and outdoor exercises. The overfond and timid parent shuts up her child in one temperature to protect him from cold and damp, and this often to the ruin of his general health, because it is impossible to provide against the variability of temperature in this climate. Very young children should be kept warm, and yet not strangled with tight clothing. Plenty of pure air is most essential for health. When the weather is fine, they ought to be sent out in the air every day, and the windows of their nurseries and sleeping-rooms should be opened twice daily. In a climate like that of England, however, where we have seldom two days alike, great prudence is required before exposing children to any risk of cold, as the respiratory tract is so sensitive in early life. Cold alone will originate other evils; the mucous membrane of the stomach and bowels will also suffer, and delicate health becomes established, from which the child either sinks, or very slowly recovers. When infants are taken out of doors a nurse's arms are preferable to a perambulator, on account of the warmth she imparts to them.

If we consider the way in which the children of the poor are brought up in the country, we may learn a lesson from it. When born of healthy parents, they endure with impunity the trying changes of our climate, and resist diseases to which their poorer brethren in large towns and overcrowded dwellings would quickly succumb.* In the middle and upper ranks of life children are often injudiciously fed; their meals are increased in richness and frequency, when they should be of the plainest kind and moderate in quantity. When a child refuses food, my maxim is always to let it alone for a time. The appetite of a child is a good gauge of its powers of digestion, and if you force it to eat against its will the probabilities are that the food will disagree. In such cases the rule we ought to lay down for eating should be, "little and seldom," and not "little and often." The digestive organs require rest in

* "Given the benefits of an outdoor life in a pure atmosphere, and the child of the country peasant will thrive, and develop an abundance of blood and muscle, almost without meat at all. The children of the poorer classes in towns stand upon a very different footing, and the struma and other diseases fostered in close alleys are often greatly aggravated by the effects of an insufficient diet."—*The Lancet.* Editor's Remarks, April 20th, 1872, p. 550.

common with the brain and the organs of locomotion ; and yet as soon as derangement of them sets in, the habit is too frequently followed of administering food and medicine, by which they are kept in a perpetual state of irritation. Some time ago I was called to see a young child in the country, whose friends were alarmed because of a refusal to swallow food. The pulse and temperature were normal, there was neither pain, headache, nor diarrhœa. In the absence of any tangible symptoms I suggested to the medical man in attendance that he might be content to leave the case alone. In a day or two the appetite returned, and the child recovered her usual spirits without the aid of medicine.

Unless marked indications exist, I entirely disapprove of the pernicious practice of flying to tonics, alteratives, and aperients, as the case may be. Let the food be wholesome and nutritious, or the worst state of health may be engendered ; but medicines are foreign to the system, and should be avoided when possible, it being far better to trust to food than to physic. Convulsions, marasmus, abdominal and thoracic affections, are constantly to be ascribed to improper and insufficient food.

Parents and nurses seem unmindful of the necessity for adapting the diet to the age and strength of the child, by which they cause much unnecessary suffering, and frequently invite disease. Indigestion, that prevalent source of subsequent evil, is brought about in a great many cases by feeding young children with farinaceous food and different kinds of biscuits, which undergo fermentation, and produce distressing flatulence and disorder of the stomach and bowels. Such diet, in the absence of milk, is obviously unfit for the purpose of growth and nutrition, indigestion sets in, and the child's hunger seems never appeased ; the liver is said not to act, medicine is given, and there is an aggravation of the evil. It loses flesh, and is crying and whining during the day, till the bowels start off, producing temporary ease. There is the same restlessness and discomfort at night. The extremities become wasted, and the skin hangs in loose folds ; the bowels are irregular, and the stools are vitiated ; sometimes there is constipation, and sometimes diarrhœa, and many children succumb before they reach the age of one year, owing in a great many cases to the manner in which they are fed. Each woman has her own method of feeding her child, and it cannot be denied that some children grow up, and thrive even, under any system that the fancy or caprice of the mother may dictate.

CHAPTER II.

MILK DIET AND HYGIENE.

Composition of milk—Condensed milk, its properties and value—Use of milk in disease and constitutional weakness—Farinaceous foods—Dentition—Choice of a nurse—Constipation—Scotch oatmeal—Stimulants—Air, exercise and sleep—Cold bathing—Aperient medicines, their uses and abuses—Preparations of iron—Antimony—Sedatives—Opium—Bromide of potassium—Hydrate of chloral—General conclusions.

Milk contains all the necessary ingredients for the preservation of health, and at no period of life is it so valuable as during that of growth, when the functions of assimilation and digestion are most active. The rapid increase of growth in all the tissues, and the waste that also hourly goes on, demand that nourishment should be supplied at short intervals. We thus introduce into the stomach a fluid which does not tax the tender membrane in its work of absorption, and rare are the instances in which it is not tolerated.

The composition of milk is variable both in quantity and quality, according to the animal which furnishes it and the state of that animal's health at the time. It varies according to the amount and quality of the food, the time at which it is drawn, and a number of other circumstances. For instance, pasture-fed cows yield an alkaline milk, whereas the milk of the stall-fed is more or less acid, and therefore less digestible for infants. The principal ingredients in milk are casein, sugar, fat, and salts. So long as the carnivora live on a purely animal diet no sugar can be detected in the milk, but when the diet is mixed, as it is in the human species and amongst different herbivorous animals, sugar appears, and all the different ingredients undergo great variation.

Woman's milk is rich in milk-sugar and fat, but poor in casein.*

* "La Presse Medicale says that the researches of Dr. Condereau, of Paris, show that the milk of Esquimaux women contains a small proportion of salts, but is rich in sugar, and especially in fat, derived from the great amount of oily food which they consume to resist the cold in their native land."—*Medical Press and Circular*, February 13th, 1878, p. 142.

Mare's milk is poor in casein and fat, but extremely rich in milk-sugar. Ass's milk contains a much larger quantity of milk-sugar and salts than that of woman's, but more water and less casein and butter. Vernois and Becquerel estimate the casein of ass's milk at 35.65 per 1000, and the butter at 18.50; the casein in human milk at 39.24, and the butter at 34.61. After mare's milk, sheep's milk contains the most solids, then cow's, then goat's, then woman's. According to some authorities the casein is a combination of albumen and potash. The great difference between albumen and casein consists in this, that the latter is not coagulated by heat, which precipitates the former. Casein is coagulated by acetic acid, which is not the case with albumen. Casein seems to have also the power of combining with the phosphates of lime and magnesia, and rendering them soluble. The saline matter of milk, which is nearly the same as that of the blood, is largest in cow's and goat's milk; it seldom exceeds one per cent., and in poor milk it may be considerably lower. Cows fed on beet-root and carrot augment the sugar; the race of Alderneys are said to give more fat, and the long-horns more casein.

In the milk of the cow, goat, and sheep, the proportions of casein, butter, and sugar, are nearly the same, varying from three to five per cent. Milk, then, contains three classes of organic constituents; the albuminous, the saccharine, and the oleaginous, with those mineral ingredients so necessary for the consolidation and development of the infant fabric. In the human female the saccharine and oleaginous elements are present in large amount, but they are affected by the kind of food which is taken and the amount of outdoor exercise. Exercise is said to favor the secretion of casein, and the cattle which feed in exposed situations, and have to take great muscular exercise to procure their food, as in Switzerland and some other mountainous and barren districts, yield only a small quantity of butter, but a larger proportion of cheese. The very opposite takes place, according to Carpenter, when the same cattle are stall-fed.

Unless milk is perfectly fresh and reliable, it is very prone to undergo lactic acid fermentation, and thus, in becoming sour, a fungoid growth is developed which is highly detrimental to infantile assimilation. The milk so changed might not try the strong digestive powers of an adult, but for an infant or young child it would lay the foundation of delicacy, and invite those diseases

which are so ready to attack early life. We are too well acquainted with the cramp, spasm, and indigestion, which attack children who are brought up by hand, and who take their milk out of dirty bottles. The casein undergoes decomposition, and lactic acid is formed in large quantities.

Pure cow's milk should, when placed in a tall narrow glass vessel, be opaque, and of a perfectly white color, having no deposit, and without any peculiar smell or taste. Boiling should not change its appearance. It ought to yield from six to twelve per cent. of cream by volume. This is hastened by adding water, and the cream should rise in from four to six hours. Its specific gravity varies from 1.026 to 1.035. Some authorities give from 1.028 to 1.032, and say that if it falls below 1.026 it indicates that the milk is poor, or that water has been added. The specific gravity is therefore a most important test of the quality of milk. But it must be remembered that a large quantity of cream will lower the specific gravity, which rises again when the cream is removed. Dr. Parkes says, "The average specific gravity of unskimmed milk may be taken as at 1.030 at 60° Fahr., and the range is nearly 4° above and below the mean."

In the adulteration of milk, water is most commonly used, and as I have just said, is to be detected by the specific gravity. Iodine detects the presence of starch, which, like gum and dextrin, are added to give thickness. Annatto or turmeric is added for the sake of color. Chalk is added to give thickness and color, and to destroy acidity. Cream is adulterated with magnesia and arrowroot. Yolk of eggs is added both to cream and milk. When milk is boiled to preserve it, it may take up from the vessels that are used, lead, copper, or zinc.

When examined by the microscope, milk is seen to consist of a number of round spherical bodies with dark margins floating in a transparent fluid. When the milk is fresh and healthy, the globules are fairly uniform in size, they roll freely over each other, and do not collect together in masses. If they do become mingled, and granular bodies of different sizes are seen, whilst a few globular bodies preserve their distinct isolation, it cannot be called good milk. Such a specimen of milk, known as colostrum, is found in the human female after parturition, and if it does not disappear on the fifth or sixth day, the milk must be considered unhealthy and unfit for the child. Of course we may find in it,

pus, blood, epithelium in large amount, casts of lacteal tubes, seeds, fungi, etc.

The number of the globules determines the quality of the milk, and they are more numerous in cow's than in human milk.

The analysis of chemists differs so widely that in a work of this description it would be beyond the mark to give the results of their examination. The practical outcome of their investigations is enough for our purpose. It is beyond dispute that cow's milk is richer than human, and it must therefore be diluted in order to make it resemble the latter. Further, it contains less sugar, and accordingly a small amount should be added to make up for its deficient sweetness.

When the milk is acid it presents just the same appearance as it does when treated with acetic acid, which causes the casein to coagulate.

Seeing that the high price of ordinary pure milk may in time place it beyond the reach of the poorer classes, it is important to inquire whether some of the forms of "condensed milk" lately introduced may not be equally nutritious, and the milk be unaltered in its qualities, when deprived of the water it contains. These results have been accomplished by Mr. Gail Borden, of New York. He has invented a process for converting milk into a solid, which can be kept pure for a long period, and then by the addition of water be brought back again to its original flavor and consistency. About three-fourths of the water are removed, so that the milk is in a semi-liquid state, of the consistency of honey. Mr. Borden believes that neither "desiccated," powdered, nor "solidified" milk can be preserved for any length of time. They require hot water to dissolve them, whilst the condensed milk prepared by Mr. Borden will dissolve at once in cold water.

The condensed milk now known to the public has undergone no change except the removal of the water and the addition of sugar. One pound of the "condensed milk" is equivalent to three or four of the crude milk. It is roughly estimated that about eight million five hundred thousand pounds are manufactured annually in the eight or ten factories in the United States, or five hundred cases of four dozen one-pound cans daily.

The Anglo-Swiss Condensed Milk Company, carried on in the commune of Cham, is conducted under the Borden process. It was the first to introduce condensed milk for family consumption, and

it has been followed by the Irish Condensed Milk Company, at Mallow, near Cork, and the English Condensed Milk Company, at Aylesbury. The demand is already so great that neither company can meet it.

According to Mr. Willard, "Dirty milk, milk foul with the drippings of the stable, cannot be condensed into a clean flavored product." To be so prepared it must be uniformly good. He proceeds to make some interesting observations on the causes that change milk into an unhealthy condition, and alludes to the well-known researches of Hallier and Pasteur, who consider that this change is brought about by the presence of living organisms in the atmosphere of germs from cesspools and putrid animal matter, that are absorbed by the milk, in which they grow and multiply. He alludes to the fungi theory, and quotes the words of Professor Caldwell on the deleterious effects the micrococcus, the cryptococcus, and the penicillium exert on milk, which is peculiarly susceptible to emanations from decomposing and putrid matter. He points out that the germs floating about in the atmosphere, if inhaled by the cows, will infect the milk before it leaves the udder. He cites the statement of Mr. Foster, of Oneida, that cows inhaling emanations from putrid, decaying matter, yield milk unfit for making cheese. He mentions instances of the milk being tainted from cows passing through sloughs of decomposing vegetable matter. Particles of dirt adhering to the udder, and finally falling into the milk during milking, introduce germs which cause it to decompose and putrefy.* Perhaps the most important point is that noticed by Professor Low, of Cornell University. He observed in the hot weather a peculiar ropy appearance in the cream which had risen on the milk. Under a powerful microscope it was found to be filled with living organisms, and he traced this condition to the cows having slaked their thirst from a stagnant pool for lack of clear running water. This water was examined microscopically, and found to contain the same class of organisms. The blood of the cows also yielded the same results. He then obtained a specimen of pure and good milk, and put into it a drop of water from the stagnant pool, and in a short time an indefinite number

* "Infusoria are sometimes found in milk, and fungi (oidium lactis and penicillium) are so almost invariably if the milk has been kept."—Dr. Parke's Practical Hygiene, p. 244, 4th edition.

For some most important observations on the changes in sour milk, see Professor Lister's Introductory Address, delivered at King's College, October, 1877.

of these tiny organisms became developed in the milk. The cows were hot and feverish, as indicated by the thermometer. These observations are highly interesting at the present time, when poisoned milk has recently introduced severe epidemics of typhoid.

The exact way in which this impurity of milk mentioned by Professor Low was brought about does not materially affect the question at issue. Whether it depends on M. Pasteur's vital or germ theory of fermentation, or on the physical theory which supports the view that communicable diseases are owing to organic poisons neither independently reproductive nor indestructible, is of no moment. Whether the atmosphere contains living germs that induce putrefaction, or particles of dead organic matter which incite putrefaction, does not lessen the danger that milk consumers are exposed to.* Few questions can be of more vital importance to the community at large, than that which establishes the fact of the milk of the cows being rendered poisonous or injurious through the water they drink, or the food they eat.

Very little difference appears to exist between the composition of the condensed milk of the English Company and that of the Anglo-Swiss Company. There is indeed a great resemblance between them in every respect.

CONSTITUENTS OF CONDENSED MILK.

	English Company.	Anglo-Swiss Company.
Water,	26.1 to 29.0	25.3 to 27.1
Butter,	9.2 to 19.7	9.1 to 10.4
Casein (including albumen),	11.4 to 12.8	10.9 to 13.0
Sugar of milk,	13.1 to 14.3	14.0 to 14.7
Cane sugar,	35.3 to 38.1	36.1 to 39.0
Mineral matter,	2.1 to 2.4	2.0 to 2.4

Mr. Bartlett, in his paper on "Condensed Milk,"† from which I have borrowed this analysis, says that all the samples of condensed milk are remarkable for their freshness, and that although some were open for a fortnight in damp and warm weather, no trace of milk fungus could be detected. The best dairy milk, ex-

* See the Journal of the Royal Agricultural Society of England, 1872, vol. xv, p. 103, from which many of the foregoing observations are gathered. The American Milk Condensing Factories and Condensed Milk Manufactories, by X. A. Willard, A.M., of Herkimer, New York.

† Journal of Public Health, October 15th, 1873, p. 187.

posed for twelve or fifteen hours, became filled with myriads of elongated bodies of fungus spores, from which the condensed milk is preserved, doubtless by the moderate but sufficient heat incident upon condensing.

To sum up,—the chances of lactic acid fermentation are reduced in condensed milk, and this milk replaces human mother's milk better than that of the ordinary stall-fed cows of large towns, which is often, in addition to its natural unfitness for infant's food, weakened by admixture with water, and rendered unwholesome by adulteration. Several instances have been brought under my immediate observation.

Some patients tell me that their children never throve until they gave them Swiss milk, and the same testimony is repeatedly given by hospital out-patients. Under its use the secretions are kept regular and in good order; the unhealthy, slimy, and dark offensive motions of young children are not nearly so common. I cannot say that there is any real difference in the nutritive or digestive properties of Aylesbury over Swiss milk, but the latter is considered by some medical men to suit better than the former, and so far as my observations go, Swiss milk is the most widely known. Swiss milk contains rather less casein and rather more sugar, which may make it more digestible, and likely to keep longer. The great advantages of these condensed forms of milk are that they undergo few changes, and are unvarying in their qualities. They are particularly adapted, too, for hot weather, when cow's milk readily undergoes putrefactive change, and causes sickness and diarrhœa. Cases are to be met with, however, in which cow's milk suits best, and after children have passed the age of three months they do not thrive on the condensed forms of milk. This is partly to be explained on the ground that when cow's milk is employed we dilute it with water, and add sugar for the first two or three months, but we gradually withdraw the sugar and give the milk undiluted.

Many families are in the habit of receiving their milk in deep jugs with narrow tops, and keeping it in small and confined larders, where it is liable to be impregnated with the effluvia of game, fish, etc. This odor has not the same chance of escape as when the milk is poured into shallow, broad vessels, where it can be kept cooler with a large evaporating surface.

Milk is an organic fluid quickly liable to putrefaction and fer-

mentation, and to become tainted and undergo change of taste and odor when left in the vicinity of cheese, tainted meat, and some kinds of fruit. Poisons are conveyed through the medium of the atmosphere, or through water, and it is no longer a disputed question that milk may also be a disseminator of disease. It can absorb deleterious effluvia, under the circumstances just alluded to, and become unfit for human consumption. When we remember how quickly, in hot weather, milk undergoes putrefaction and fermentation, losing its sweetness, and becoming rancid in the course of a few hours, we have the clearest proof that organic poisons may readily become absorbed by it Either by air or by water the poison of zymotic diseases is conveyed, and those persons engaged in milking, who have recently attended on the sick, may even propagate the disease by their hands or by their clothes.

Our experience of the milk epidemic of typhoid fever, in 1873, opens our eyes still further on another point. The poison of cholera finding its way into water, may be spread through milk in the same manner as typhoid ; and the atmosphere becoming contaminated with the poison of scarlet fever and measles, may be absorbed by the milk. In short, it is not within the scope of imagination to realize the manner or rapidity, with which the effluvia of contagious diseases may travel, charging the atmosphere with poison, and spreading death and desolation amidst the healthiest districts.

The milk of diseased cows decomposes quickly, and instead of the round oil-globules, which are the only constituents of healthy milk, colostrum with granular masses, and a large amount of epithelium, are to be seen under the microscope. Casts of the lacteal tubes may also be sometimes detected. It must appear self-evident that few points can be of greater practical importance than to ascertain the chemical and microscopical characters of milk in all cases where sick children are living chiefly on it.

I now come to consider, and that very briefly, what are the diseases in which milk is especially indicated as a medicine. As a diet we recognize its value, and assign to it the first position among all kinds of food. To bring up children healthy and strong milk in some one of the forms I have alluded to must be provided liberally. Constitutional weakness in children is greatly developed by scanty and impure milk; hence we have great mortality before the age of one year is reached. In some of our large manu-

facturing towns, as Manchester, Liverpool, Glasgow, etc., the mortality of infant life is appalling. The Registrar-General's return for the year 1871, shows that of 112,535 children born within the year, 19,301 died before they reached the age of one year. Regarding infant mortality, Dr. Carpenter, of Croydon, says that "ninety per cent. of the children which are put out to dry-nurse by wet-nurses, die after a few weeks of hand-feeding. This mortality is induced by the administration of improper food. It is shown by the Registrar-General's statistics that more than 20,000 children, under one year of age, die in England every year from convulsions; that is, *one* out of every 34 dies within the year, whilst in Scotland *one* only in 370 dies from such a cause. The great difference between English and Scotch feeding among the poor is the cause of this variation; the northern babies are not stuffed with farinaceous food before they are able to digest it; Scotch mothers scarcely ever feed their babies with anything else than that provided by themselves in the first few months of their lives, and the result is, that convulsions as a cause of death, are comparatively rare in the first year."*

We know that in some children, and even in adults, the digestive functions are so enfeebled that milk cannot be assimilated. The occasional aversion to milk is also well known, and the dislike to it cannot be overcome. I saw one child, six months old, who could digest about half a pint of milk daily, but if this quantity was increased severe sickness followed, and the attempt to give more with lime-water or plain water, or Dinneford's solution of magnesia, was of no avail. It was impossible to give it in any large quantity, and the diet was supplemented by veal broth, chicken broth, or weak beef tea. In some adults, severe discomfort, weight and indigestion, follow from the continued employment of milk, and it cannot be denied that ordinary cow's milk does tax or interfere with the digestive power in some cases if taken in any considerable quantity long together. It causes weight and heaviness and in some cases constipation, and where this is so, aversion or dislike is certain to ensue. Brandy, soda-water, lime-water, dill-water, etc., have been employed to overcome this objection, and in a great many instances the addition has been successful, and the coagulation or curding in the stomach has been prevented.

* Some of the Causes which produce Infant Mortality and Constitutional Weakness, by Alfred Carpenter, M.D., Public Health Journal, June, 1873.

In all those diseases that are of a consumptive or wasting character, and where emaciation is going on, milk is extremely valuable, suitable to the digestive organs, containing all desirable elements for the repair of the body, and best compensating for its waste.

In cases of extreme debility and marasmus, chronic dyspepsia, carcinoma and ulceration of the stomach, gastrodynia, etc., milk is our sheet anchor; solid food cannot be tolerated by the digestive organs, and if we had not a remedy like milk, our patients would literally die of starvation. I can call to mind one severe case of gastric pain (neuralgia of the stomach) in which milk was the only food taken for upwards of four years; nothing but a rigid adherence to this simple diet procured the patient ease, and gave him rest at night, instead of the agonizing suffering which he had endured for years. This patient had long ridiculed the idea of living on milk; indeed, it is only in confirmed states of ill health that patients can be brought to understand that milk is possessed of extremely nutritive qualities, and is sufficient to maintain life.

As life advances, and more especially towards its decline, when the tissues are undergoing degeneration, and the eliminating functions are becoming impaired (as in structural degeneration of the kidney), milk may temporarily arrest or lessen the activity of these changes and prolong existence. The skim-milk treatment of diabetes is fresh in our recollection, and whatever doubt may be thrown on its virtues as a therapeutic agent, there can be none as regards its nutritive and non-irritating properties.

In acute diseases of the febrile class, and nervous diseases generally, milk is a powerful restorative. In the diarrhœa of enteric fever and some other profuse discharges, hæmorrhages and loss of blood, and great lactation, we have in milk a valuable remedy. By increasing the general nutrition it has the effect of diminishing the discharges from the mucous surfaces.

Among children of well-to-do parents, and in the higher ranks of life, I have repeatedly seen the advantage of giving them a good supply of milk morning and evening, before going to bed and on getting up. The appetite has improved, and each meal has been relished and digested through the milk, which has acted like a tonic. These facts are, however, known to all of us, and similar instances occur in our practice every day.

This brings me to say that milk is constantly underrated by

parents and mothers, and credit is given to certain patented "corn-flours" to which they are not entitled. We may lay it down as a golden rule that unless food is easy of digestion it fails to be nutritive. Many of the forms of food advertised for children are said to contain a large percentage of earthy phosphates, and to be singularly rich in nitrogenous or plastic materials. They may be of service where milk is also freely supplied, but without it they are of questionable value, as they contain a large proportion of starch, which young infants are incapable of digesting. The salivary and pancreatic glands do not reach their functional development until the infant has attained the age of eight or nine months; and as starch requires to be acted upon by their secretions before it becomes converted into a soluble sugar, it follows that all farinaceous foods are incapable of digestion, and therefore worse than useless before that age is reached. The true function of the saliva is to convert starch into glucose or sugar, and unless it is so acted on by the salivary or pancreatic secretions, it either passes through the bowels unchanged or undergoes lactic acid fermentation, producing flatulence and spasm by the quantities of intestinal gases which are generated as a consequence.* Experiments have been conducted to prove that the saliva of an infant four or five months old has no action on insufficiently cooked arrowroot, sago, tapioca, and the so-termed "corn-flours," but the salivary secretion of an adult has considerable transforming power. Still chemists are of opinion that they are not suitable for any age.†

In very young children milk is the only nourishment required, so nicely adjusted are its component parts, but until we can con-

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* Some Experiments on the Digestibility of Starch by Infants, Journal of Public Health, August, 1872, p. 111.

† See Chap. XIV, On Indigestion.

It is important to allude to this fact of salivary secretion in infantile life, "For the first few months it appears that no saliva at all is secreted; and it is true under natural circumstances, from the character of the food, and the absence of masticatory organs, that it is not required."—Pavy, *On Food and Dietetics*, 1875, p. 527.

"The digestion of starch is accomplished by the saliva and pancreatic juice, both of which are rich in diastase. Diastase also exists abundantly in the liver, and in smaller quantities in the intestinal juice, in the blood, the urine, and apparently in all the intestinal juices. Diastase from all these diverse sources appears to act substantially in the same manner on starch, changing it by a progressive hydrolysis into sugar and dextrin."—*Lumleian Lectures on the Digestive Ferments*, by W. Roberts, M.D., F.R.S., April, 1880.

vince mothers and nurses that a child can grow and thrive on it, we must expect the substitution or admixture of other foods. Sometimes we are told the milk does not agree, and on inquiry we find that either the nurse or the mother, if suckling, is out of health, and the milk as a consequence is defective and ill-suited to nourish and sustain the child.* Every mother should know the importance of weaning her child at seven or eight months, because suckling beyond this time is likely to damage the health of both. If the mother can nurse her child so much the better. If delicate she should not suckle during the night, as it will disturb her rest and exhaust her. When, however, the mother's milk is scanty, she should not attempt to nourish the child entirely, but give warm milk and water out of a bottle. If she cannot suckle it, it should have equal parts of milk and water, and it is a good plan to boil it before putting it into the bottle. Let it be sweetened with half a teaspoonful of sugar, and see that the tube and bottle are well rinsed out, and kept perfectly clean. It is a bad plan to overfeed a child at one time; the sixth part of a pint of milk is enough for a meal, if the child is under a month old. If the milk disagrees, a tablespoonful of lime-water, or sometimes the same quantity of dill-water, may be advantageously added to each bottleful. Regular feeding is of great importance; till the child is two months old, once in two hours will be often enough, and afterwards once in three hours; of course if the child is very delicate, it may require to be fed oftener, but it is an error to put it to the breast every time it cries.

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* Much of the milk brought from the country is impure. Many children perish the first year of their existence from failure of the digestive organs to support them, and when brought up by hand or underfed they are prone to die of bronchitis, diarrhœa, whooping-cough, etc. As to farinaceous diet, much may be urged for and against it; it may cause children to look plump and fat, but if too long continued the blood becomes thin and anæmic, and exhaustion, and even fatal syncope, are not unfrequently met with in these children.

At the present day, however, farinaceous foods, as corn-flours, arrowroot, etc., are underrated, if not altogether condemned, by many persons as unfit for nutrition. Liebig and some other chemists advocate this view, which led to the employment of too nitrogenous a diet, and so an opposite error crept in. Facts must speak for themselves, and it cannot be denied that we see some young children whose flesh-forming power appears to be due to the nutrition of starchy food. Abundant instances of the kind are to be met with among the rural population of England. It is a point deserving consideration whether a too exclusively animal diet may not sow the seeds in early life of a uric acid diathesis, and develop gout and Bright's disease with advancing years.

In treating the ailments of suckling children, we ought to examine the milk of a wet-nurse very closely, for any error in diet on her part, or any indiscretion in drinking, will be certain to be felt by the child she is bringing up; mere emotion, anger, or disappointment will influence the lacteal secretion. Attacks of cramp, spasm, flatulence, emaciation, and diarrhœa in young children can constantly be traced to dyspepsia brought on by the milk, or the mental condition of the nurse, and all the medicines we may prescribe will prove but palliatives so long as this state of things is suffered to go on. In selecting a wet-nurse it is very important that she should be in good health and spirits, and free from constitutional taint. She should be fully grown, and as a rule, not less than twenty-two years of age. Leucorrhœa is an objection, and any evidences of strumous disease, as scars in the neck; then the most rigid inquiry should be instituted as to whether she be free even from the suspicion of syphilitic disease. The evidence of syphilis is somewhat difficult to find in the absence of any active manifestations, but it is always well to search for maculæ and ulceration about the fauces. A few cases in illustration of these remarks may be here quoted.

Case 1.—A lady consulted me in February, 1868, about her infant which was five months old. It was not thriving to her satisfaction, the skin and muscles being lax and flabby, the bowels frequently relaxed, and the motions sometimes consisting almost wholly of mucus, with an occasional streak of blood. There was also a good deal of redness and excoriation around the anus (*Intertrigo*). The nurse who suckled the child seemed a fairly healthy woman, but a microscopic examination at once showed that the milk was very deficient in the number of oil-globules, and therefore unfit for the purposes of nutrition. I recommended asses' milk to be given alone, as digestion was weak and cows' milk did not agree. The child gradually improved from that time, the bowels becoming regular and the motions healthy.*

Case 2.—An infant, seven months old, was subject to occasional

* The milk of the ass often suits with the delicate digestion of an adult; it is richer in sugar and soluble salts, and contains less nitrogenous matter and fat than cow's milk. Though it is therefore adapted in particular cases to some infants from the facility with which it is digested, its composition is not rich enough for a strong and thriving child. For further information on this point see Dr. Pavy, On Food and Dietetics, 2d edition, 1875, pp. 185–529.

attacks of vomiting, cramp, and flatulence. The motions were never two days alike, sometimes being hard and pebbly and light-colored, at other times loose and frequent. The child was always uneasy after food, unless an attack of diarrhœa or vomiting came on, when it usually became quiet or fell asleep. The child was fed on cow's milk, sweetened and diluted with water, and biscuits were generally added. It is quite clear that this method of feeding did not agree with it, indigestion being a marked feature of the child's sufferings. It was found that the milk was not good, and in addition to the biscuits which disagreed, and increased the amount of flatulence, the child was fed at irregular hours, and the stomach loaded. New and good milk was now procured, and a small quantity of dill-water was added, all biscuit food and farinaceous articles being solemnly forbidden. The child almost immediately began to improve, and at the end of two months had grown plump and strong without a sign of discomfort.

Case 3.—A lady requested me, in April, 1868, to visit her child, who was then six months old. The child was fat and plump, and always inclined for food, which he took greedily. When he was not eating he fell asleep. The only complaint made was that the bowels were habitually confined, and that in consequence, aperient medicines had to be constantly resorted to. The motions were very hard and pale, the child often crying when straining to empty his bowels. It was evident to me that the child was overfed, and I persuaded with some difficulty that he should be restricted to milk-and-water. In the shape of medicine nothing was ordered except a two-ounce enema of soap and water to be thrown into the bowel early every morning, and pressure to be applied at the anal aperture, that it might be retained a little time. This was enough to act as a gentle stimulus to the liver, and to regulate the bowels, without any other mode of treatment. Here was a child of sound and vigorous constitution, that would have thriven on that upon which another child would have starved, and when this simple regulation of diet was enforced, no further remedies were required.

Instances of this kind are repeatedly met with where constipation is the chief symptom. The child's bowels act once in two or three days, whilst the appetite is good, and the condition is in every other respect healthy. The motions are deficient in moist-

ure, and painful to pass through the anus, which becomes red and tender. The little sufferer screams in its straining efforts to evacuate the impacted mass. This nursery trouble may set in soon after birth, and add to the risk of teething. The liver in these cases does not act well, and the small intestines fail to furnish their due amount of secretion, and the rest of the intestinal tube becomes sluggishly passive in propelling its contents. Overfeeding causes this troublesome constipation as often as underfeeding induces diarrhœa and exhaustion. But the cause is not always ascertainable. In some cases I have been inclined to regard it as constitutional. It occurs occasionally where the mother's milk is healthy, and microscopically faultless.

The mother may be weak and languid, notwithstanding the good character of her milk, and if her health is not attended to the milk will become impoverished, and the child suffer in other ways. Mere constipation in the child is no evidence that the milk is at fault, but when given too frequently and abundantly it deranges the hepatic functions. In these cases of otherwise healthy children a saline aperient given at bedtime, and repeated early in the morning is a good remedy.* After a few doses the bowels begin to act more regularly, and the motions become soft. In alternation with the mixture the soap enema is an excellent remedy. As the nurse sits with the child in her lap before a fire, friction with the hand for a short time, morning and evening, over the abdomen acts as a capital stimulant to sluggish bowels. We now and then meet with another class of cases in which the motions are moist and of proper color, but considerably larger and firmer in consistence than we expect to find in infants of five or six months old. The bowels will not act without an enema or an aperient of some kind, and parents become alarmed if this goes on, as it often will in spite of any treatment, till dentition sets in. When there is no mechanical obstacle, as hernia, imperforate rec-

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* Formula 1:

R. Magnes. sulph.,	℥j
Tinct. rhei,	℥ss.
Vel syr. rhei,	℥ss.
Vel syr. zingib.,	℥ij
Tinct. cinnam. comp.,	℥j
Aquam anethi ad,	℥ij.—M.

One to two teaspoonfuls to be taken at bedtime and in the early morning. For a child five or six months old.

tum, or invagination, the fault may in most instances be attributed to the food. If the general health of the child should keep good, no harm will follow from this form of constipation. The aperient must be varied from time to time, and the enema used in change with it. When simple remedies fail, a teaspoonful of the decoct. aloes comp., or a grain or two of scammony or jalap, or even an occasional mercurial will rouse the torpid liver and inactive viscera, and promote the passage of bile and mucus. It sometimes happens that immediately a tooth penetrates the gum the symptoms improve and the constipation departs. In other cases the constipation is troublesome, and an enema has to be given every third or fourth day till the child can run about and take exercise.

Milk mixed with bread, as children grow older, is very excellent. For my own part, I have much faith in the familiar expression, "Bread is the staff of life;" and if we want to know its nourishing properties we have only to look at our village population. Many healthy children from the age of three months thrive on this diet, and grow up strong and healthy. Scotch oatmeal is another valuable article of diet; it is very nutritious, and regulates the action of the bowels better than anything else with which I am acquainted. It should be mixed with milk, and may be given to children from the age of one year.

Of course, differences of situation necessitate differences of treatment, and children of delicate parents, living in a vitiated atmosphere require a special diet. At seven months old the child may have milk, to which Robb's biscuits or Liebig's food may be added, or well-baked bread. The child should have plenty of warm milk in addition. At ten months old it should have weak broth or beef tea. When a year and a half old it may have pounded meat, with a little gravy, or meat cut up very fine. Much will depend upon the natural strength and constitution of the child; but solid animal food should not be given till it is two years old. Hospital patients have repeatedly told me that milk alone would not satisfy the hunger of their children, and before bottles came into fashion I have often seen strong and healthy children, at four or five months old, being fed with milk thickened with bread; whereas, among the very poor in rural districts, gruel has in many instances been the only article of diet. A delicate child would break down under this system of feeding, but in those who are thriving and breathing pure air it has no prejudicial effects. Whether the

child be strong or delicate, milk should be the chief article of diet till the age of two years; and the continuance of debility should be an indication to persevere with the milk pure and alone. It is a popular error among mothers that milk must soon give place to solid food, and yet those whose practice lies among children will often observe a child at eight or nine years of age, with a good appetite, eating meat three times a day, grow thin, pallid, and languid. These children have delicate digestions, the tongue is indented at the sides, the back coated with a whitish fur, and there are superficial abrasions of the mucous membrane, all indicating extreme feebleness of digestive power, amounting to slow starvation.* Place such a child on a diet of milk and he begins to thrive at once; his tongue gradually improves, his bowels are regular, and he gains flesh and strength with surprising rapidity. If you can induce the parents of such a child to give him a basinful of milk-and-bread for breakfast instead of tea, and let him have well-minced mutton or chicken once a day, and cod-liver oil, he will throw off his delicacy, and the rest will have enabled his digestive organs to gain strength.

When children have cut their incisor teeth they are liable to feverish discomfort and restlessness; they alarm the nurse and the mother by starting in sleep and exhibiting a spasmodic movement of the lips and eyelids. If we examine the mouth in such cases we shall generally observe that the gums are red and tender, and although other teeth are not appearing nor distending the gum, they are probably at no great distance. It is always well to puncture this inflamed gum with a lancet, and to give a freely acting purge. If the child is strong enough, let it contain a grain of calomel, for, much abused as this drug is, and told as we are on evidence that seems conclusive, that it does not increase the secretion of bile, I know not where to find any purgative or alterative medicine that acts so efficiently in many of the diseases of early life. Let it be given on an empty stomach, and do not deny the child if old enough, a drink of cold water, or of toast-and-water. This is, however, at best a critical period with children, requiring much care and watchfulness on our part. The nervous system is easily affected, and the digestive functions are readily upset, which would be less likely later on. The extreme frequency of convul-

* See Chap. XVI, On Indigestion.

sions in early life should always be borne in mind whenever the system is out of order, and the medical attendant should never lose sight of the liability to them in young children, however well a case of illness may be progressing.

The balance between health and disease is so delicately adjusted in early life, that a very slight disturbing cause will incline it to one side or the other. Health and disease hold close relationship, and we are often perplexed to know where one ends and the other begins. Where medicines are necessary, it is very important that they should be prescribed in as agreeable a form as possible. A medical man will often get much credit by ordering his medicines pleasant to the taste; and there are very few drugs really necessary for children which cannot be given in a pleasant form. Some practitioners there are, however, who seem never to have considered this matter, and as a consequence, many of their medicines are thrown aside by the mother or the nurse, who, rather than hear the shrieks of the child, gives up the effort to administer them. I think a certain degree of tact and judgment is required in prescribing for young children.

The habit of giving young children wine and beer is a very bad one; their digestive organs require no stimulants to aid the process of digestion, as is the case in after-life, when the stomach loses its tone and becomes enfeebled, and where a glass of wine is necessary before the patient can either fancy or digest his food. Some of the strongest and healthiest children I have ever seen have been those whose diet has been the plainest, and where stimulants, cheese, and pastry have been ranked with objectionable nursery drugs, as gray powder, cordial mixtures, and teething powders. In illness, and especially in acute disease, where time is valuable, stimulants may be demanded; and in my own experience, I have several times known young children recover from acute diseases in consequence of their administration. The following is a typical case:

Case 4.—A healthy child, ten weeks old, was suffering from troublesome catarrh, in February, 1870. The child was restless and could not suck comfortably, owing to the obstructed state of the nostrils. Bronchitis, confined to the upper tubes, ensued, and alarming prostration set in. The cough was very harassing from the accumulation of phlegm, and there was great flatulence and irregularity of the bowels. The mother, at my request, reluctantly

consented to give up suckling. The child was fed on ass's milk, of which he took two pints in the twenty-four hours, mixed with four small teaspoonfuls of brandy. He was also fed with a little beef tea three or four times a day, with a few drops of brandy. This last soon appeared to irritate the bowels, and was, therefore, discontinued. In the shape of medicine, he took half a grain of carbonate of ammonia in syrup of tolu and water every four hours. The temperature of the room was kept at 70°, and, what I have found of great value in the pulmonary affections of young children, the chest was covered, back and front, with cotton-wool; and this was allowed to remain on during the critical state of the child's illness. Beyond attention to cleanliness, the child's clothes were not removed during the illness. This is a great point to look to in dangerous disease. The fatigue and exhaustion that result from frequently dressing and undressing a young child are not considered, and the repose and rest, which are valuable aids to treatment, are altogether overlooked. The temperature ran as high as in genuine fever, but on administering suitable food and medicine it fell, and the child rapidly improved. I have known this high temperature cause much alarm among medical men; but it must not deceive us, especially with children, who, from mere gastric disturbance, will, in the course of a few hours, become burning hot.

There is nothing more important than air and exercise for children * When shut up in the house they become fractious and irritable, losing their color and appetite, and becoming very wayward and difficult to manage. The natural disposition of a child may be greatly determined by being habitually shut up in a room, and deprived of proper air and exercise. In the house it soon tires of its amusements, but when carried in the open air fresh objects continually meet its eye and engage its attention; digestion is improved and healthy sleep promoted. Children who live in London and other large cities exhibit in a most remarkable degree the salutary effects of country air, and, when they have been kept from

* "Life and health walk hand in hand. Health is nothing but integrity of life; disease is nothing but an offence and abbreviation of it. Gymnastic exercises will not under all circumstances be successful, but, *cæteris paribus*, it will be in creating fine men. . . . . Exercise, whether pleasing or not pleasing, is equally advantageous. The same degree of perspiration, the same muscular action, is produced; the same results of sound repose, strength, and health necessarily follow."—*Physical Education*, Macmillan, pp. 347 and 353, September, 1873, No. 165.

falling into ill health by the tenderest and most judicious care, they revive under the influence of change with a rapidity that is truly astonishing. In densely populated places foul and impure gases are breathed into the system, and carried into the blood, which only the pure oxygen of the country can remove.

If eating a heavy meal on going to bed, or indulging in tea and coffee after a good dinner, tend in some adults to cause sleeplessness, melancholy dreams, throbbing headache, and cardiac pulsation, sending children to bed exhausted and with empty stomachs will also equally cause discomfort. Such children dream, and are restless in their uneasy sleep; they toss the clothes off, and are peevish and tired when they are roused to dress and get up in the morning. If jaded by long walks and the strain of school, interrupted digestion is indicated by fatigue, and they are sent to bed too exhausted to obtain refreshing sleep. Children should have a light meal half an hour before retiring to bed; a sandwich or a slice of bread and butter will in most cases suffice to satisfy the craving stomach and allay the fainting empty feel. If food, however nutritious, is given them at this time, when they are too exhausted, and the nervous force which should have been reserved for the stomach has been expended in active locomotion, we only aggravate the evil. The feeble stomach as much resents the presence of food as the weak eye resents the light. Let us bear in mind that a child requires more sleep than a grown-up person, because tissue change is much more energetic, and the organs demand more rest for their repair and growth. The digestive system, too, requires the frequent administration of suitable food, that the absorbent process, with its varied chemical changes, may be actively carried on.

Cold-bathing is another aid to health, and the sooner this is begun the better. It is the foundation of much subsequent good health. With a good circulation there is nothing more calculated to keep the skin in a healthy state; for on it depends to a very great extent the regularity of every function in the child. When early practiced, children will grow up to revel in the luxury of cold water, coming out of it with a skin at first mottled like the slate-gray lines that permeate hard soap; and subsequently under friction, gradually becoming red, as the blood passes more quickly through the capillaries. The tonicity of these vessels is increased, and that relaxation and debility which render them helpless to

contract on exposure, is in a great measure guarded against. When the latter condition exists, children are very liable to cold and affections of the respiratory organs. A cool, elastic, and firm skin is an indication of health, and often by it alone the medical attendant is able to decide on the state of his little patient.

Daily intercourse with disease can alone teach us how to prescribe. Aperient medicines should be delayed as long as possible, but if they must be resorted to they should be of the simplest kind; and whenever I can, I always endeavor to avoid bulky powders. Frequently they are not properly mixed, and as often they are not swallowed, and so we are disappointed in our cases. The aromatic syrup of senna is not difficult to administer, and the syrup of rhubarb is enough to move the bowels of young children, regularly and efficiently, if continued a little time, and there be no necessity for promptitude in our measures.

Honey or treacle spread on bread is a favorite laxative with some persons. The syrup of roses may be given with an equal quantity of castor oil, and there are few children who will not take it. Infants of a few weeks or months old will suck readily a teaspoonful of a mixture made with castor oil, white sugar, and carbonate of magnesia, with two minims of oil of dill to the ounce (Form. 23). It is a good combination where there is costiveness and painful flatulence. Dinneford's solution of magnesia is a safe and useful antacid and aperient for young children, dispelling flatulence, and gently stimulating the peristaltic action of the bowels. An equal quantity of syrup of rhubarb may sometimes be advantageously combined with it. In feverish states, with constipation, young children will take a mixture containing a grain or two of nitrate of potash with a few grains of sulphate of magnesia, when sweetened (Form. 8). In hot and excited states of the system we may order with most excellent effect, a purgative and alterative lozenge composed of one grain of calomel and two grains each of scammony and jalap. It is well to order it to be given the last thing at night, as it then empties the bowels fully and effectually early in the morning. It causes copious and full evacuations, freely unloading the liver and small intestines; and in cases of feverish excitement, it has acted in my hands like a charm *

How frequently do we see the ill effects of aperient medicines,

* See Chap. XVII, On Constipation, where this subject is more fully considered.

adopted and had recourse to on any accession of real or fancied ailment. If the medicine employed is simply of a laxative character, and the child is in even tolerably fair health, the mere evacuation of the intestinal contents can do no harm, and the child is none the worse if not the better for the experiment. But many are not satisfied with this mild class of remedies, and they select some cathartic purge which throws the intestines into violent commotion, unduly stimulating and exciting the mucous follicles, and irritating the whole intestinal tube. The stomach, liver, and pancreas, are disturbed in their quiet functions, and the furred tongue is a sign of weakness and temporarily deranged stomach, from the unnecessary employment of medicine. Such medicines are enough to enfeeble and suspend digestive power, and to create as much disturbance as a mass of indigestible matter in its passage from the stomach through the bowels.

Children are often brought to us, looking pale and languid, with a dark areola under the eyes and a furred tongue. We ascertain, perhaps, that the trustworthy nurse considers them bilious, and gives them gray powder once or twice a week. They have very little appetite; the bowels do not act for want of power; they complain of being tired and are glad to go to bed. These are the cases which run into anæmia; enlarged glands spring up about the neck, and if there happen to be a strumous taint, we get abdominal or pulmonary disease. The syrup of the hypophosphite of iron, with or without quinine, is very valuable, and Parrish's chemical food (Syr. Ferri Phosph. co.) will effect, in such cases of pure debility, a marked improvement in the health and appearance of children. The syrup of the iodide of iron, in cases of anæmia with a disposition to swollen cervical glands, is a well-known but overrated remedy. I am very doubtful if it possesses any real value. We may employ it in many cases of chronic cough and debility, with or without a few drops of ipecacuanha wine; where we have any reason to suspect a tubercular origin we may give it very early. The Vinum Ferri is a slightly astringent preparation. We may sometimes prescribe with good effect a steel powder, consisting of one grain of sulphate of iron and three grains of sugar. Children take it with a relish, either in water, sherry, or ginger wine. It is a cheap tonic, and is very available for hospital patients. A most excellent preparation is reduced iron (Ferrum Redactum); it is a valuable remedy in anæmia, chorea, and

general debility. A grain or two may be given on bread-and-butter twice or three times a day. It has the advantage of being tasteless, and a very small dose is required. Then there is the iron lozenge (Troch. Ferri Redacti), which no child will refuse to take. Each lozenge contains one grain of reduced iron, mixed with refined sugar and gum acacia; one may be taken after each meal.

It is not advisable, as a rule, to prescribe for children preparations of iron with quinine, as the bitter being objected to, the medicine runs the risk of not being regularly administered. Iron, too, is much more valuable as a tonic than quinine; it is less stimulating, is a good blood restorer, and strengthens and invigorates the nervous and circulating systems, on which the regular performance of all the bodily functions depends. These forms of iron regulate the bowels by the gentle stimulus they impart to the muscular fibre of the intestines, and the alteration they effect in the constituents of the blood. Dissatisfaction is sometimes felt at the apparent inertness of these agents, but this often arises from their being discontinued too soon, or not given regularly. We labor under great disadvantage in all chronic forms of illness, as the necessity to give medicines according to the rules laid down by the medical attendant does not seem of sufficient importance, and where cases are tedious and protracted, friends and nurses are apt to grow negligent and indifferent. In acute forms of disease they are more regularly given, and hence they often obtain a credit which is not their due.

Antimony is a medicine seldom required in the ailments of young children. It is so depressing that unless the disease is urgent, as in croup, and a few other diseases, we may dispense with it and choose ipecacuanha, which is not so lowering, frequently as effective, and much more manageable.

Emetics are often required for infants and young children, who vomit readily, the act being accomplished without the straining and distress which are experienced in adults, because the stomach is not so conical in form as in later life, but is more elongated, and resembles rather a dilatation of the intestines. Emetics should be withheld from children with head affections; in peritonitis or acute abdominal diseases, or where there is great debility; but in the early stage of many disorders, as in croup, they promote the free action of the skin, and at a later stage favor the expulsion of false

membrane from the trachea. In whooping-cough, pneumonia, bronchitis, and the early stages of the exanthemata, emetics are of great utility in reducing the force and fulness of the pulse, in lowering the tension of the vascular system, and in promoting secretion. The thick and tenacious secretion which clings to the glottis in whooping-cough becomes thinner and more easily detached by their action, whilst the hyperæmia of the bronchial mucous membrane is lessened. Emetics are serviceable during the invasion of acute tonsillitis; in some forms of acute indigestion and dyspepsia they are also useful by exciting the liver to freer action, and removing morbid secretions from the stomach. An emetic repeated twice or three times a day, followed by a little warm water to insure its complete effect, is preferable to one large dose.

Sedatives are remedies not to be recklessly employed in the diseases of young children. The sooner ignorant minds are made aware of the dangers they incur in giving these medicines without medical advice, the more chance is there of rearing strong and healthy children. The influence of the profession should be brought to bear upon the indiscriminate sale of soothing or teething powders, and the public should be cautioned against them. Under the prevalent and frequently erroneous notion that children are suffering from their teeth, a poor woman, to keep her child quiet, or to get a night's rest herself, gives it a teething powder to send it to sleep.* Where there is great excitement of the nervous and vascular systems sedatives are sometimes employed with great advantage. Hyoscyamus, hydrocyanic acid, and the compound tincture of camphor are so important to us that we should find it difficult to get on without them. Tincture of opium, however,

* "In November, 1874, four children died at Romford after taking 'teething powders,' and death was preceded in all of them by stupor, drowsiness, and insensibility. These dangerous symptoms set in soon after the powders were given, and were clearly due to an overdose of opium. Dover's powder appears to have been the form in which opium was administered."—*British Medical Journal*, Nov. 14th, 1874, p. 622.

"In 1846 I also was distressed to find the use of opiates among children very prevalent in manufacturing districts. In this case the motive was not criminal, for the practice had arisen in ignorance of its bad effects. But it was not difficult to trace a large amount of direct and indirect mortality to this pernicious custom. Among children the administration of opiates, under the names of quieters and soothers, is nearly as destructive to health as the excessive use of alcoholic stimulants among adults. The craving for both arises from those depressing physical causes of disease which abound in cities."—Dr. Lyon Playfair, On Sanitary Reform, Social Science Congress, Glasgow, Oct. 3d, 1874.

requires to be given with the utmost caution. In administering tincture of opium by the mouth it is well to observe the rule of giving the sixth or fourth of a drop to an infant under three months, and to repeat it as occasion may require; half a drop for a child of six months, and a full drop for a year, adding a drop for every year of the child's age. I once prescribed six minims in an ounce and a half of demulcent mixture for a child fourteen weeks old, one teaspoonful to be given three times a day. This was enough to make it so sleepy and heavy, that the mother said she could not keep it awake. When roused, it opened its eyes, and then fell off to sleep again. Instead of having six motions during the day, it had three. Fortunately we can often get on without the internal exhibition of laudanum, which is a remedy we regard as certainly dangerous to young children if incautiously given. A child will, however, take a dose of calomel with far greater impunity than an adult, and be infinitely less likely to run any risk from salivation. Bromide of potassium, and hydrate of chloral, are now recognized to be of great value in the treatment of children's diseases.

To sum up these points, it is to be observed that I have laid stress—

1. On the peculiar forms which disease assumes in childhood, as distinguished from the forms of the same disease prevalent in adults;
2. On the rapidity with which functional sometimes passes into organic mischief, during the period of bodily and mental development; so that no ailment should be considered too trivial to receive attention;
3. On the great importance of looking to constitutional symptoms rather than to local derangements, because the primary disturbance may be of greater moment than the secondary effects;
4. On the necessity of looking to diet, and adapting the quality and quantity of the food to the age and natural strength of the child;
5. On the importance of selecting medicines, when medicine is absolutely demanded, from that class which will support the bodily powers and assist in maintaining each function as nearly as possible at a normal standard.

It is my object in the following pages to carry out these general principles, and to show how they are to be adapted to particular diseases, and what exceptional treatment each disease seems to warrant.

CHAPTER III.

ACUTE AND CHRONIC DISEASE.

Importance of distinguishing between acute and chronic disease—Acute diseases brief in their duration—Chronic diseases slow in their progress—Illustrations of both forms—Collapse—Asphyxia—Hæmorrhage. TREATMENT OF ACUTE DISEASE: *To endeavor to prevent its passing into the chronic form—Use of alcohol—Emetics—Purgatives—Inhalations.* TREATMENT OF CHRONIC DISEASE: *To be guided by its duration, and the character of the constitution, whether strumous, syphilitic, or cachectic—Importance of rest and fostering physical growth—Country residence—Sea air.*

DISEASES may be advantageously divided into two great classes, the acute and the chronic. Although we recognize a connection between them and an interdependence, there exists, notwithstanding, a wide difference. The importance of defining the line of demarcation cannot be over estimated. Between the duration of acute and chronic disease there is another distinction. An acute disease like hæmorrhage or cholera may terminate in a few days or hours, whilst a chronic disorder, as asthma or rheumatism, may continue through the greater part of life. An acute disease is, so to speak, an emergency, and immediate measures are necessary to meet it. Chronic disease being, by its very definition, slow in its progress, gives us time to consider; during which time emergencies may arise of a character generally but not always to be described as subacute. The management of the acute is comparatively simple, the management of the chronic is often a complex affair. There is the treatment both of the chronic condition and the different intercurrent maladies which arise in its course. Since these secondary maladies are often more prominent than the chronic morbid mischief which underlies them, the primary state may be overlooked. The character of the disease itself gives the main lines by which we must travel, and which may be fairly clear; but when secondary complications arise, they furnish contingencies which tax to the utmost alike our acquired knowledge and our individual skill. This involves the true comprehension,

not only of the acute mischief, but also of the chronic condition which lies beneath and influences it. An apparently simple inflammation of a joint in a healthy child becomes a wonderfully different condition in a child who is naturally strumous; so that the state of constitution has to be recognized in every child, whether its ailment be acute or chronic. Indeed, constitutional debility and the strumous and syphilitic diatheses are practically chronic diseases. The manner in which they influence complications is only too well known; and the fatal result of a simple acute affection, not in itself severe, may be entirely due to some chronic morbid condition underlying it.

The terms *acute* and *chronic* are, after all, somewhat arbitrary. They seem to imply two sets of diseases perfectly distinct, and having no exact relation the one with the other; but in reality there are intermediate stages or degrees of disease which these two terms do not include. Subacute is a term used to signify the duration of disease when it is neither actually acute nor chronic, but something between the two—a relic of the acute affection, with a duration shorter than the chronic.

Indeed, acute and chronic are terms used as much to convey an idea of the duration of the morbid affection as of its intensity. Diseases called by either name, may belong essentially to the same great family. Acute pneumonia may become chronic pneumonia, acute pericarditis chronic pericarditis, acute rheumatism chronic rheumatism, and acute nephritis may terminate in the chronic form with albuminuria. Many other illustrations might be furnished. "In a general way, we call diseases that spring up in the system suddenly, or in a brief space of time, or that are rapid in developing their characteristic phenomena, or are of short duration, *acute;* and those which have the reverse characteristics of slowness of increasing, mildness of manifestation, and longness of duration, *chronic*. These distinctions, however, are obviously not of an essential or fundamental kind, as they have reference not to the nature of the phenomena so much as to the mode of their manifestation and their degree. Indeed, nearly all the diseases termed acute present themselves in the chronic form; so that we may almost say that we have two marked varieties under every individual nominal disease, namely, an acute and a chronic variety."*

* Nature and Art in the Cure of Disease, by Sir John Forbes, 1857, p. 62.

Some *local* diseases are essentially of a chronic character, as the usual forms of hip joint disease and mesenteric disease; the circulation is depressed and low, and changes proceed slowly; whilst in many *constitutional* diseases, as fevers, inflammations, etc., the tendency is, to produce lesions and such changes in the secreting functions of organs that they become temporarily or permanently deranged, and health does not return till the natural secretions are once again restored, and the parts involved have resumed their normal state.

The term *acute* may be applied to a class of affections which are largely inflammatory or zymotic, including the whole list of febrile and eruptive diseases. The condition may also arise from severe shock as after surgical operations, and the patient may actually sink in consequence, or it may be caused by exposure to great heat or cold, or sudden and severe prostration, as in bronchitis during winter; or in the severe gastric disturbance caused by the presence of indigestible food in the stomach.

First, as regards pyretic affections. The rapidity with which the rise of temperature comes on is in itself instructive. Where the evidences of any acute specific disease are wanting, and there are no obvious lesions to account for the rise of temperature, the practitioner is apt to assume that he has got a case of typhoid fever to deal with. The oncome of typhoid, however, is usually insidious, and a period of prostration precedes the pyrexia. But it is so in some other diseases. It is so in nearly all diseases marked by a period of incubation, though not in all; for a child may be exposed to the infection of scarlet fever, and feel quite well till a sudden rise of temperature comes on. Thus, I have known a child convalescent from pneumonia with a normal temperature at 9 A.M., get a rise of four degrees at 1 P.M., and forthwith symptoms of scarlet fever to be developed, passing regularly through each succeeding stage. The premonitory symptoms of typhoid fever are not sufficiently well marked to enable us always to foretell what is in store for us. The absence of one symptom alone may be embarrassing, because it renders incomplete the chain of evidence we require to establish our diagnosis—there is a missing link. We have often to wait for some days, say eight or ten, till fever-spots have appeared, or there is such a combination of symptoms, as elevation of temperature, quick pulse, diarrhœa, and tympanites, which leave no doubt as to the nature of

the case. Whereas, on the other hand, acute indigestion is essentially a very acute disease; the rise of temperature, of pulse and respiration, being exceedingly rapid in young subjects. This very rapidity in itself should put the practitioner on his guard; such rapid rise in temperature, pulse, and respiration, is very rarely seen except in catarrhal conditions attacking children of highly nervous temperament. In these children the different nervous centres are highly mobile and unstable, and great perturbations are readily excited by slight provoking causes. To this subject we will refer further on. The same holds good of rapid variations in the pulse. A very rapid pulse quickly produced is suggestive rather of a fright or start than of any actual lesion. What has been said of the temperature and pulse holds good of the respiration, but a great inequality between the two is of ill omen, a rapid pulse with slow respiration denoting a grave condition. I may here observe that children in whom the neurosal temperament is highly marked are exceedingly liable to disturbances in their health, and to fluctuations in temperature. I may quote one instance among many. A child is excitable, nervous, and weak; one of those restless children that are never still. It contracts a slight catarrh, and the only physical sign of the mischief is a little alteration in the breathing; but dulness is nowhere to be detected. Any agitation excites cough of a spasmodic or irritable character, and sleep is restless and disturbed. The pulse is quick, the respiration hurried, the countenance is placid; the temperature in the evening runs up to 103° or more, and falls in the morning, perhaps for a few days, to 101° or 100°, and then resumes its normal state. If the child so attacked was not of this neurosal constitution, slight catarrh would not send up the temperature in this way, or manifestly affect the constitution. I have known several instances of this in rickety and feeble children who have been allowed to get into an exhausted condition. In such children the temperature may be persistently high for days together; the pulse 160, and respirations 60 to 80. Yet there have been no physical signs to account for it, no cough, no vomiting, no stupor. General tuberculosis is sometimes at the root of this condition, but in other cases the health gradually improves and the symptoms pass off.*

* "The physician is liable to be misled by placing too much reliance on the phenomena of temperature. They are not infrequently interfered with by complications

We have other instances of acute diseases in children, as severe pain from abdominal trouble, colic, gravel, etc.,—a degree of pain which may even produce shock and unconsciousness.

Acute headache is very ominous in a young child, and may be the commencement of meningitis or convulsions, or precede pneumonia, or some eruptive disease.

Collapse is an acute condition brought about by the loss of blood or violent exertion, by intense mental excitement, by overpowering heat, by acute diarrhœa, by the excessive use of stimulants, and by the continuance of bronchitis or pneumonia, which has so affected the nervous centres and the cardiac ganglia as to almost paralyze them, and to inferfere or even arrest the normal changes in the lungs. In the latter condition I have known the cerebral circulation so damaged as to lead to convulsions and death.

When a large quantity of blood is lost by hæmorrhage, the heart is almost paralyzed in its movements from the withdrawal of its normal stimulus, and it can only propel, at each contraction, a small portion of blood—not enough to sustain the vital functions.

Asphyxia, again, may be classed as an acute condition; it is a common mode of death in many diseases, as in *laryngismus stridulus*, *croup*, and in *bronchopneumonia*, in which pus and mucus may fill up the small branches of the air tubes and cells, so that the respiration fails and the heart ceases to beat. In the latter condition we have recourse to poulticing, and the free administration of stimulants to raise the faltering circulation. It may also be induced by drinking boiling water from a kettle, or from getting a bead or button into the trachea.

Again, in hæmorrhage, which may be active or due to acute disease, when arising from the rupture of an artery as in the lung,

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and accidental events. As an illustration, a young girl had passed through typhoid fever, convalescence being declared in connection with other symptoms, by the laws of thermometry belonging to the decline of fever or defervescence in this disease. Suddenly hysterical symptoms were manifested, and the temperature rose to 105° The physician, a man of learning and larger experience, was naturally alarmed. In a few hours, however, the temperature declined, and recovery took place without further impediment. The expressive comment made by the physician was, 'This is not the first time I have been fooled by temperature!' With regard to the information furnished by the thermometer, as well as other diagnostic symptoms, it is to be borne in mind that there are exceptions to rules which are generally applicable."—AUSTIN FLINT. The temperature may be raised, like the respiration or the pulse, by excitement or nervousness, especially in delicate girls or young children of mobile temperament.

the quality of the blood evacuated and the symptoms induced are quite different from the passive form of hæmorrhage, which sometimes takes place from the stomach and bowels, or from the kidneys where the blood has become thin and disorganized by some poison, as that of typhoid fever; it is a state allied to congestion in its early stages, when the smaller vessels become large and rupture through long-standing debility, or some impediment to the pulmonary circulation in consequence of heart disease. For the management of this active form of hæmorrhage, saline aperients, low diet, tartarated antimony, and the most absolute rest are needed; whilst in passive hæmorrhage we should have recourse to the mineral acids, tannic or gallic acid, or even astringent forms of iron.

Treatment of Acute Disease.—The chief point is to arrest it as quickly as possible, so that it may not run into a chronic form; and this may often be attained when the case comes under treatment early, and the constitution is sound. Hence we may sometimes cut short acute diseases in the young when we cannot do so in the old, because in the latter, there is not only the constitutional debility belonging to advancing age, but tissue-change also. The remedies we employ are as a rule (at least at an early stage) antiphlogistic and eliminative, such as venesection, and the use of calomel and antimony. In the violent pain of acute disease, as enteritis or colic, larger doses of opium are borne than are safe under other circumstances. But they should be reduced or withheld entirely as soon as the pain ceases.

To approach a young child in acute disease is a difficult matter, and requires much care and tact, unless it is so ill that its sensibilities are blunted, and it takes no notice of anything that is going on. To examine it, to feel the pulse, to listen to the chest, or to look into the throat, are wellnigh impossible in some cases, and the information so gained is at such a cost that it is scarcely worth possessing. The fretfulness and peevishness of some children is most trying to contend with in severe cases. The children put themselves in such a temper by obstinate refusal to take medicine, that in cases where coercion has to be used, it is as a rule better to abandon the medicine, at least for a time.

With regard to the use of alcohol in acute disease, perhaps there is no one point of greater importance than this. Many acute affections in young children may be conducted safely through each stage without any necessity for its administration. If there is

cerebral exhaustion through failing circulation, it may have the effect of stimulating the cerebral cells, in fact, of sending more blood to the brain, and thus tranquillizing the system and promoting sleep. If, however, there is great exhaustion, and the stomach is irritable, and cannot retain food, gas is often generated and distension takes place, which interferes with cardiac movement. Now, alcohol under some circumstances is clearly indicated, as when there is great excitability and restlessness, high temperature, rapid pulse and respiration. Here a full dose of alcohol will often produce the most beneficial effect. It is as useful here as the chronic use of it in imperfect nutrition is to be deprecated.

In the treatment of acute disease we ought not to traverse but to follow Nature's processes. A great deal may, however, be done to expedite the different stages of the malady. In acute indigestion, for instance, where the child vomits and subsequently is purged, the attack usually wears off quickly. Where these processes are not spontaneously instituted, we can usually do much good by administering an emetic, with a grain or two of calomel, followed in two or three hours by several grains of jalap or scammony, according to the age and strength of the child. Also in acute catarrh, a dose of ipecacuanha wine with a few drops of antimonial wine will often shorten the whole attack; not only as to the first stage of vascular turgescence and dryness of the bronchial lining membrane, but also that of the secondary stage of free secretion and expectoration, especially if the measures appropriate to that stage are then resorted to. These measures are stimulant expectorants and tonics. Probably inhalations of steam, simple or medicated, will tend to shorten both stages. In diarrhœa, due to irritant material in the bowel which the system is itself attempting to remove, but without success, a few grains of rhubarb by its first action as a purgative will effectually dislodge the irritant matter; while its secondary action as an astringent tends to prevent any persisting diarrhœa so set up.

Chronic disease may take on an acute form; it may assume acute manifestations, and it should be our aim, if possible, to prevent this. The tendency of this condition is to produce slow degenerative changes, and death from failure of the vital powers. In chronic affections after scarlet fever and nephritis, acute symptoms may spring up indicating pericarditis or pleurisy. Bronchitis, again, of an acute and sometimes of a subacute character,

frequently comes on in the strumous or syphilitic diathesis. Strumous children are liable to suffer from acute suppuration of their cervical glands, or mischief in their joints, or affections of their bones. It is often set up by an acute malady, or by a period of insufficient food. In congenital syphilis, condylomata or syphilides may be excited by some intercurrent cause, notably vaccination, or even shock. Both in syphilis and struma we may have acute periods of anæmia and malnutrition. Under these circumstances, if the child be exposed to the poison of specific disease it will most likely have it in a very severe form of an asthenic type. Or a family of children with congenital taint may be at the seaside when two or three days of severe cold may be experienced; one child of the number has bronchitis or pneumonia, to which it may succumb, whilst the other children are unaffected by the changes of temperature.

Acute disease is very common at an early period of life; thus infants are often carried off by convulsions when there exists any derangement of the alimentary canal through feeble digestion, or improper food. "Defective nutrition in the early stages of life, in the nursery, unrecognized by those who have the management of children, is the probable explanation of one of the problems of practice. Healthy parents, still young, constitutionally well endowed, living under favorable social circumstances, not unfrequently have children who, although apparently healthy at first, sicken and die of phthisis and of other diseases as they grow up."*

General debility or uniform depression of the bodily powers, is a chronic disease under which acute disease may be readily excited. In this chronic state we have, as it were, to steer a defective ship through a tempestuous sea, in which it may be wrecked, unless great skill and judgment are exercised in its management.

Chronic disease is exceedingly fatal in more than one way, for either imperfect nutrition of tissues having begun, the disease goes on without the prospect of repair for an indefinite period, and during this time an acute disorder is very likely to be awakened; or if not, nutrition gradually fails, and death takes place sooner or later from exhaustion. After death, pathological changes present themselves, which show that they must have so impaired the vital processes as to render the constitution very prone to fall before the assault of any acute disorder.

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* Nutrition in Health and Disease, by J. H. Bennett, M.D., 1876, p. 227.

Acute disease, then, is very apt to supervene on chronic. When the great glandular organs of the body are impaired, and the liver or kidneys are diseased, and the elimination of morbid products is interfered with, there is in the one case the absorption of biliary elements into the blood, and in the other the retention of urinary ingredients which may deprive the patient of life, gradually or rapidly.

The effects of deficient or improper food in inviting *chronic disease* among children is well known, and the evidence is overwhelming on the point. The careful feeding of children is more important than their education, for if this is neglected the mental organization must suffer. If the body is not properly nourished, the brain circulation is weakened, and the intellectual powers become feeble and imperfectly developed; they do not acquire the vigor of the robust child whose digestive functions have received attention, and plenty of good food has been given at proper intervals during the day; robust children grow and thrive better, they accomplish their school-work better, and they obtain more refreshing sleep. I have repeatedly seen children who are languid, weakly, and irritable, with such a history as the following: The last meal of tea and bread-and-butter is given about five or six o'clock, they retire to bed an hour or two later, and get no other nourishment till breakfast next morning. The consequence is, that in three hours after the last meal they are drawing on their reserve, the stomach is empty, and they are so exhausted that they begin the following day quite unable to perform its duties properly. Physical and intellectual strain are both ill-borne at such times.

Deficient animal food for growing children, especially boys who follow athletic sports, is a fearful mistake; a farinaceous diet will not supply its place. Too long fasting at any age produces exhaustion, irritable brain, and enfeebled digestion; the appetite becomes impaired, and when food is taken, it is repugnant and distasteful. Malnutrition having been established, anæmia, general debility, tuberculosis, phthisis, etc., are gradually and certainly induced.

Delicate boys often refuse to eat the fat of butcher's meat, declaring that they would rather take cod-liver oil. Now cod-liver oil is not attractive to the palate, but these children can digest it

when they are unequal to the assimilation of the other animal fats.

Treatment of Chronic Disease.—This is altogether different from that of the acute form. The method is to be watchful; the sentinel has to give notice of an attack, rather than to invite it. The position is one of defence. If our treatment is to be successful we must be guided to a very great extent by the character and duration of the disease, as well as the constitution of the patient and his hereditary or acquired tendencies. In the strumous diathesis we want more iron, more lime, and more fat. In syphilis we essentially want mercury. In cachectic conditions this remedy should be combined with iron, cod-liver oil, and good food. In both cases pure country air and the seaside are important. In a nervous diathesis, quiet, avoidance of excitement, and little schoolwork, are indicated. In a bilious child the great point is to look to the digestive organs—not to allow more food to be taken than can be digested, or a bilious seizure is certain, and consequent depression, which renders the child susceptible to all external influences.

Some remedies seem to bring diseases quickly to an end, notably in chronic disease; they arrest it, and prevent the next stage of tissue change. In this way we can cure ague by quinine and arsenic; certain skin affections, as itch, by sulphur; and syphilis by mercury; but the same principle does not hold good in the acute diseases, which terminate of themselves in recovery. Thus we do not actually cure typhoid fever or the exanthemata; we can watch the different stages of the special malady, and sometimes even prevent complications, or render them milder; but we do not actually cure the disease. By not losing sight of this great principle we may often modify and render milder a disease which might otherwise be virulent and fatal.

How important it is that in many *chronic* affections the child should sleep thoroughly so as to get plenty of rest, the value of which cannot be overestimated. "The value of rest and placidity in fostering the generation of that highly organized animal tissue which forms so large a portion of our staple food is well known to the stockkeeper and grazier. A homely illustration may be found in the fact, that in infancy the child who sleeps much mostly thrives; and *mutatis mutandis*, the observation is equally true, that the wakeful, restless child, seldom displays the evidence of

active nutrition; and, doubtless, all will admit that in infancy development is in its highest state of activity, and that the healthy infant passes the greater portion of its life in a state of rest and sleep. Growth—the renewal of some parts, and the fresh development of others, seems thus to claim as its helpmates sleep and rest."*

A good physical development is the first thing to be aimed at. The quick, bright, intelligent, but slight town child, the delight of its parents and their friends, does not possess the potentialities of the strong, bulky, slow-witted, often loutish-looking child, we see in the country. The one is eating its cake, is living its life, the other is storing up force. Slow, apparently indeed dilatory, comes the intellectual development of the typical country child; but its potentialities are far beyond those of the other child. In Westmoreland this fact of slow development is recognized in the saying that "Westmoreland lads have no sense till they are twenty-one."

There is a direct antagonism between mental precocity and physical growth. With these facts before us it is quite clear that where we have bright, quick town children, with a defective physique, a small thorax, and a flat abdomen, it becomes eminently desirable to develop a totally different condition. No matter at what cost to their immediate prospects these children should be sent into the country to grow into healthy animals. The more marked the characteristics of town birth, the more necessary is it to adopt such a plan. If permanent life in the country for several years is not attainable, a month in spring, and two or better three months in autumn, should be spent in the country. The duller, the quieter, the less exciting the country residence the better for strumous children. For very delicate children, it may be advisable for the spring months to select a warm and comparatively low-lying sea-residence. In the autumn, however, it is well to choose a place where the air is bracing, if by the seaside, where there are downs; in the country, where there are hills. The more nearly the life then led approaches that of the ordinary country child the better. After a substantial breakfast the children should be sent out for a walk; if at the seaside, where they must take a bath, this walk should not be too long, so as not to exhaust

* On Pain and the Therapeutic Influence of Mechanical and Physiological Rest, etc., by J. Hilton, F.R.S., The Lancet, 1860, vol. ii, p. 103.

them before taking it. A child should never take a bath in the sea in a condition at all approaching exhaustion If an inland residence is preferred, the walk may be made longer, provided it does not go to the length of fatigue and loss of appetite. The midday meal should be substantial, and there is no objection to a sleep after it, especially if the child feels drowsy. A prejudice prevails against sleeping in the day, which is by some persons carried to extremes. The intention is that the child shall eat, sleep, and grow. If such treatment of town children were more thoroughly carried out, we should hear less of imperfect physiques, of an early breakdown after much precociousness; and town children would, so treated, approach more closely to those reared in the country. Precocity is eminently undesirable, and, if possible, to be avoided.

We must, too, never overlook the fact, that acute and chronic disease with their complications, depend upon a variety of influences and associations. The anatomical relations may guide functional complications, and even determine lesions of structure. The scrofulous, the rheumatic, and the anæmic states, severally influence the liability of certain organs to suffer in different ways, because the state of the secretions, the degree of vascularity, and the morbid changes of the blood, dispose to diseased action. Vital resistance is as great in the strong as it is defective in the delicate.

CHAPTER IV.

DEBILITY.

Definition—Symptoms and treatment—Liability to lead to organic disease.

Under the head of debility in children, or constitutional depression, I shall enumerate a group of symptoms which is very commonly met with, especially among the out-patients of our hospitals. It is a condition sometimes the forerunner of disease, and then the signs which characterize this altered health are lost in the disease which springs up. I think I am justified in attributing importance to this condition, under the title or designation of

debility; for promptly recognized, it assists us to attach significance and weight to the earliest indications of a departure from the normal standard of health.

By debility, I mean functional impairment, atony, weakness, or preternatural slowness in the performance or working of the vital processes, leading, when neglected or overlooked, to debility (and it may be to structural change) in one or more of the great central organs of life or tissues of the body. This may be considered by some as involving an unnecessary addition to our medical nomenclature; but debility or weakness, as commonly employed, is used to indicate symptoms attendant on various diseases, and has no isolated and individual recognition that seems to me commensurate with its importance.

The loss of blood, or free purgation, or deficient food, or any causes that reduce the vital powers of the patient, will induce debility in a simple and uncomplicated form—a deviation from that equalized condition of all the bodily and mental functions we term health. As the constitution tardily recovers from the shock it has sustained the functions of the vital organs are sluggishly carried on, and if repair is not uniform in all of them, the balance is disturbed, and after some hesitancy disease breaks out where we least expected it. In our early contact with some forms of illness we are unable to make any other diagnosis than that of debility.

When symptoms referable to one organ more than to another become apparent, we leave a general plan of treatment for that which is determined of the prevailing symptoms. When it has reached this stage or change, the debility I am attempting to describe has no longer an independent existence.

I claim for this a separate and special classification among the ailments of children, where debility is observed in its purest and unmasked form, before degenerative lesions are common, as in after life, to account for failing strength, increasing debility, and structural alteration.

There are very well-defined symptoms belonging to this state, alike in many instances, and varying in extent and character in others, the debility being a marked feature of the complaint throughout. There is powerlessness and lassitude of the whole system; every function may be said to have received a shock; a temporary pause in the uniform working of the bodily functions has taken place. The child does not usually complain of anything,

but hangs and droops about, and ceases to take an interest in his amusements. The vivacity of childhood has departed; in some cases he has a shy and timid look, is afraid of your approach, and cries without provocation. In most cases there is neither discomfort nor pain; the bowels are said to be regular, but the evacuations are scanty from the small amount of food that is taken. On inquiry we shall generally find that the bowels act sometimes every day, and sometimes once in two or three days. Among private patients, where there is no difficulty in testing the statement, I have been led to regard the latter period as the most common. The tongue is clean and moist, it may be pallid, but indicates no active disturbance. Very frequently there is a film on the tongue of a thin silvery whiteness, or the coating is thicker and yellowish, but the front of the tongue is never involved, the tip and sides showing a natural hue. Sometimes it presents a smooth and dusky aspect, as we might expect in a languid state of the circulation. The pulse is weak, small, and usually slow; sometimes it is rather accelerated, but this is owing to the agitation and nervous excitement so readily induced by the examination. The thermometer indicates no elevation in temperature. On the other hand the skin often feels very cool, and the mother tells you that her child does not take sufficient exercise to keep him warm. He is often noticed to be lying across a chair or sofa in a passive state of indifference, dropping off into a calm, quiet, and prolonged sleep. It is the quiet sleep of fatigue, and not the restless sleep of exhaustion. If awakened he readily falls off to sleep again, and is glad to go to bed early, when the same drowsy sleep returns and lasts till morning.

In April, 1869, a lady brought to me her little girl, four years of age, who was a very intelligent and pleasing child. I was left to find out her ailment as well as I could, her mother saying "she really did not know what was the matter with her, but she was certain she was not well." When a year old the child suffered from palpitation, and two years afterwards she had whooping-cough. She appeared well till eight weeks before I saw her, since which time she had been ailing in health. She was said to be "very languid, constantly yawning, and wishing to go to bed early in the day." Her face flushed on being asked a question, and when a stethoscope was applied to her chest she burst into a fit of tears, which her mother said was not natural to her; the tongue

was furred at the back, and the urine was rather high-colored; the lower eyelids were dark, and the expression languid, but no complaint whatever was made of pain; the bowels were rather confined. I advised that the child should be tempted to take nourishment frequently, milk and eggs being given in the way that were most agreeable to her. She was not to suffer fatigue from running about, but to be driven in an open carriage when the weather was fine, or to be wheeled about the garden. Aperient medicine was strictly forbidden. Thirty minims of the Syr. Ferri Phosp. Comp. in two teaspoonfuls of water were ordered three times a day. Improvement soon set in, and on the 12th of May she had nearly recovered her usual activity, the appetite had returned, the tongue was quite clean, and the bowels acted regularly every day.

A careful physical examination in these cases reveals nothing important about the chest or abdomen. The two most common attendant symptoms are headache and pain at the epigastrium, both being signs of debility in the brain and stomach respectively. So far as we can learn, the headache seems to be a heavy oppressive weight across the centre of the forehead, and it is very persistent, giving the child a dull and painful appearance. In many of these cases the aspect is desponding and inanimate, and the cheerful expression of childhood has vanished; the eyes are heavy and have a hollow look, but there is nothing approaching intolerance of light, nor squinting, as we observe in threatening cerebral disease, though it is not to be forgotten that the brain may be involved if these symptoms are allowed to go on without treatment. The pain in the stomach is of the same dull aching character, rather discomfort than actual pain, and is limited to the root of the ensiform cartilage or its immediate vicinity. It is the uneasiness of slight gastralgia, or the gnawing sensation we have all experienced when the stomach is empty, and we are waiting for a meal to appease it.

There may be aching of the limbs, muscular fatigue, and pain in the course of the spine.

The sympathetic system shares in the general constitutional depression, and is reduced below its normal standard. The appetite required to insure the perfect digestion and assimilation of food and nourishment is impaired, and the emotions are susceptible and heightened to a degree which readily excites disturbance of both

mind and body. The face may change from the pallor it exhibits in repose, to frequent blushing, and there may be palpitation of the heart, all induced by slight correction or fatigue, or the overtaxing of the digestive functions even with the ordinary diet of health, when half paralyzed by fear or emotional excitement.

There is no very striking symptom which indicates this derangement in the health. It is to the totality of them we must look for a diagnosis. This must be arrived at by a careful process of exclusion. The indications of the disease are negative, and it is the failure in the discovery of any specific cause for the debility which indicates its pure and uncomplicated character. There is nothing, so to speak, that is apparent or tangible, and hence it is that a depraved state of health creeps on unnoticed, and is not discovered till some very prominent symptom arrests attention. There is no cardiac affection.

Such cases as these make us cautious in giving an opinion. In the absence of any discoverable disease, we are doubtful whether this unaccountable debility may not be the harbinger of mischief to start up hereafter. Disease may be hidden, to come forth by and by. In the diseases of adult life, a cause is often discovered. Not so in the cases I am describing; the debility is uncomplicated, and it must be seen and treated before it has merged into actual disease.

These cases usually terminate well if promptly and skilfully treated, but a continuance of this condition may lead to protracted disease, and subsequently to death. For example, deficient nervous power, as shown by headache, may lead to cerebral exhaustion, and to coma and convulsions, in the same manner that congestion and inflammation of the brain may terminate. These are opposite states of the system, leading to the same consequences, but requiring a different mode of management.

The weak and enfeebled stomach of young children, causing instant rejection of food by vomiting, is often checked by a simple tonic, and sympathy is so strong with the cerebral functions, that when the stomach has recovered its power, the brain is lulled into quietude. If it did not so yield to treatment, the symptoms would pass on and implicate the brain in the manner just described. To equalize all the forces of the body is the surest method of maintaining its efficient working. It is the loss in either that invites disease.

When the debility has weakened the digestive and nervous functions, and induced loss of appetite, muscular pains, deficient and high-colored urine, and torpid bowels, a plan of treatment the opposite of that which is stimulating and generous, may suffice to bring about a return of strength and animated feeling.

These cases of pure and simple debility, when neglected, cause chorea, epilepsy, convulsions, paralysis, etc., and finally lead to those changes in the blood which originate anæmia, tuberculosis, and every form of diathesis that lowers health and provokes disease.

CHAPTER V.

DENTITION.

SYMPTOMS: *In healthy children there is often an absence of suffering—In the rickety and delicate, abdominal or cerebral disease may spring up—Temporary and permanent teeth—Order of their appearance—Diarrhœa—Convulsions—Eczematous affections of the skin.* CAUSES OF DIFFICULT DENTITION: *The rickety constitution—Vaccination.* TREATMENT: *Depends upon the strength and constitution—The strong and vigorous to be treated differently from the feeble and rickety—Aperients—Carminatives, bromide and iodide of potassium, hydrate of chloral—Lancing the gums—Care in diet.*

DENTITION is a subject which requires careful consideration, for it is important that we should form definite ideas concerning the part it plays in affecting the health and exciting convulsive and other diseases. Whilst the dangers of dentition have undoubtedly been exaggerated by some authorities, and the friends of the child are apt to become anxious during this period, there is, it must be remembered, a real degree of risk in certain temperaments. Every thoughtful practitioner ought to be on the watch for indications of disease, which the process of teething is capable of exciting.

In perfectly healthy children the teeth appear one by one in regular succession with little or scarcely any suffering; in other instances, as in the rickety, their advent is contemporaneous with the commencement of delicate health; and in another class they are the harbingers of abdominal or cerebral mischief. The evolution of the teeth tests the vigor of the child, and the more tardy and lingering the process, the less is its strength and vitality.

The teeth begin to appear in healthy children between the seventh and eighth month, and the process is completed between the twenty-fourth and thirtieth month.* The two middle or central incisors in the lower jaw first appear; then in the course of a week or two the two middle incisors in the upper jaw; next come in another month or six weeks the two lateral incisors in the upper jaw, followed by the two lateral incisors in the lower jaw. Then about the twelfth or fourteenth month the first four molars appear, generally those of the lower jaw first; but they do not follow any definite order in their appearance. After the lapse of another three or four months the four canine teeth succeed, and between the twentieth and thirtieth month the four posterior molars pierce the gum, thus completing the number of twenty-four teeth. These are called *temporary* teeth. The *permanent* teeth are thirty-two in number, and they make their appearance as the former are shed.

The *permanent* teeth belong to that important period of childhood—the *second* dentition. These teeth begin to appear between the seventh and eighth year, and at this time there are forty-eight, twenty deciduous, or perfectly developed teeth, and twenty-eight permanent teeth in various stages of development. The evolution of the first true molars is, according to Mr. Saunders, an evidence that the child has attained the age of seven years.

The following table is of assistance:

Central incisors	developed at	8 years.
Lateral incisors	"	9 "
First bicuspid	"	10 "
Second bicuspid	"	11 "
Canines	"	12 to 12½ years.
Second molars†	"	12½ to 14 "

* "If a child pass over the ninth month without teeth, you should carefully inquire for the cause. It may be that an acute illness has retarded dentition. It may be (but this is very rare), that there is some condition of the gum which interferes with the advance of the teeth. It may be (and this is infinitely the most common cause of late dentition) that the child is rickety; fail not then, when called to a child in whom the teeth are late in appearing, to look if it be rickety, for, if you do fail to look for rickets, you will most likely attribute to the irritation of teething symptoms which are the consequence of the rickety diathesis—the late dentition in rickets being in itself merely a symptom of the general disorder. The rickety deformities may be very trifling, and yet the teeth considerably retarded in their development."—*Lectures on Rickets*, by Sir William Jenner, Bart., M.D. Medical Times and Gazette, vol. i, p. 334.

† Carpenter's Physiology, 8th edit., p. 1106.

Symptoms.—The symptoms and disorders that accompany the first dentition vary in different cases. A perfectly healthy child may not suffer in the least degree, one tooth appearing after another without causing any local or general disturbance; but, in many instances the excitement is considerable; the mouth is hot and swollen; the cheeks are flushed; the child is fretful and sleepless; it resents the slightest interference; the appetite fails; thirst is present, and often sickness and diarrhœa as well. One of the earliest symptoms attending dentition is an increase in the activity of the salivary glands, and saliva is seen to be constantly drivelling from the mouth; but this moisture may be present for some weeks before the teeth appear. In some cases the constitutional disturbance is even greater than that which I have described; the mouth is hot and dry; aphthous ulceration is seen on the gums and inside of the cheeks; the tongue is thickly coated, and the child can no longer suck. Convulsions and spasmodic movements are very common in teething children. Frequent contractions of the muscles of the eyes, the lids of which are only partially closed, and the eyes turning upwards beneath the upper eyelids, so that the white sclerotic is only seen, give a terrified expression, and is alarming to the parents. Rolling of the head, twitching of the facial muscles and of the limbs, flexion of the toes and fingers, and a peculiar smile are often observable at such a time. In this state of excitement almost any sympathetic disorder may spring up, as bronchitis, convulsions, meningitis, diarrhœa, and eczematous and erythematous affections of the skin. Some of these affections are quickly fatal, and others tedious and difficult of cure. In rickety children dentition is delayed. They are feeble in constitution, the appetite is capricious, sleep is disturbed, and the bowels are relaxed.

During dentition, children are very liable to diarrhœa, the mucous membrane of the bowels is irritable and sensitive, and if the food given is not easy of digestion, or if the weather be cold, it is easily induced. What share teething exerts in causing diarrhœa it is impossible to say; but there is a close connection existing between these states. When diarrhœa is present we do not hastily attempt to check it if the teeth are piercing the gums, and the mouth is uneasy; still, if the drain continues or is excessive the child becomes exhausted, and the possibility of convulsions must not be overlooked.

Diarrhœa may be in some measure due to enfeebled digestion caused by pain and restlessness, and general disorder of the system. Billard attributed it to an increased development of the intestinal follicles and glands, which is noticed at the period of dentition.* A year of delicate health may elapse before a tooth is seen, and then one may slowly appear without causing pain. Convulsions in a case under my care preceded the appearance of each tooth.

Children who suffer from difficult dentition will be often observed to roll the head from side to side, and to raise the hand to it, or put the fingers in the mouth. Sickness and febrile disturbance are noticeable; the child becomes languid and wastes, the muscles are flabby and the joints relaxed, the motions are offensive, and dark, green, or slimy. Slight ulcerations of the mouth are common, the child is peevish and irritable, it experiences pain on taking food, and does not obtain sound sleep.

In some rickety children during dentition, sickness and vomiting are the chief symptoms, and the child is drowsy and inclined to sleep at any time during the day. If the head is hot, and the veins distended about the scalp, the pulse quick, and the temperature runs up to 101° or 102°, we may with reason dread the supervention of convulsions or meningitis. Convulsions in several children of the same family are often to be met with. In one instance a mother had lost three children from convulsions during dentition; the fourth child was the subject of laryngismus stridulus, and at two years old it had only seven teeth. Laryngismus stridulus frequently attends dentition in rickety children, the seizure passing off as the teeth appear, and the general condition improves. Eruptions on the face and scalp have been usually attributed to dentition—the "tooth-rash" of vulgar talk.

The *causes* of difficult and delayed dentition are an acute disease, the rickety constitution, struma, marasmus, and tuberculosis. All these disorders retard the development of the teeth, by lowering the general health.

In some cases we may trace the failure of health from the time of vaccination when it is performed at the third or fourth month; this in many instances seriously interferes with the development of the teeth, and disposes to reflex nervous irritation.

The mortality under the age of two years has been variously

* On the Dangers of Dentition, by J. Finlayson, M.D., Obstetrical Journal, 1873-74, p. 591.

estimated by different writers, some ascribing half the deaths, others a third, and others again, a sixth, as due to difficult dentition.

The *treatment* of dentition will depend upon the general symptoms that are present, and the constitution of the patient. The practitioner must exercise his own judgment as to the treatment he will adopt, and not blindly attach himself to any routine plan. The strong and vigorous child who is feverish and thirsty, with a hot and tender gum, a full pulse, and constipated bowels, will demand quite a different mode of management from a puny and rickety child whose teeth are delayed. In strong children a grain of calomel with two or three grains of rhubarb will be required to clear the bowels. A saline mixture, as the citrate of potash, should be given to abate the pyrexia, and if the child is excited and sleepless, a few drops of tincture of henbane may be added, or a draught at bedtime containing hydrate of chloral and bromide of potassium, should be given. The child's head should be kept cool, and whatever determines to cerebral congestion should if possible be prevented. "Affusions of the head with cold water, performed every hour or two, are, it is true, a not very tender, and by parents not much admired, remedy; it is, however, very useful against all convulsions in children, and therefore against those occurring during dentition."*

In the rickety, a mild aperient is occasionally required, such as bicarbonate of soda and rhubarb, to regulate the bowels, and to correct the secretions. A teaspoonful of castor oil may be advisable now and then, and if the bowels are over active, a grain of Dover's powder at bedtime is often of great service. If there is vomiting and flatulence some carminative will be necessary. A mixture containing hydrocyanic acid with solution of magnesia and sal volatile often answers exceedingly well.† In cases where there is much restlessness and disturbance of the nervous system,

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* Vogel, Diseases of Children, 1874, p. 106.

† Formula 2:

R. Acid. Hydrocy. Dil.,	℥ss.
Spt. Amm. Arom.,	℥ij
Syrupi,	℥xx
Liquor. Magn. Carb.,	ʒj.—M.

To be taken every four hours.

bromide and iodide of potassium with sal volatile will often abate sickness, and relieve head-symptoms if present.*

The *gum-lancet* is occasionally required. If the tooth is nearly through, but still hidden, and the gum is red and tightly stretched over the tooth, then a proper incision will give much ease, and the slight bleeding will relieve the capillary vessels. It is both mischievous and cruel to have recourse to the practice if dentition is going on naturally. This practice of lancing the gums is a very old one. It appears inconsistent with the state of medicine in the present day to suppose that puncturing the gums would be so frequently resorted to if it had no advantages. "May not some diseases be rendered milder, and their favorable termination more certain or probable by measures calculated to relieve the turgescence of the gums? If so, those who totally disregard the state of the gums, are not less in error than those who use the gum-lancet when it is not required."† The cases where incision is required are probably few, but there are undoubtedly some which do benefit by the operation, and where convulsions have been prevented by having recourse to it. When the gum has yielded to the advancing tooth a child often experiences instant relief and comfort. So far from causing the infant pain, I have repeatedly lanced the gum without the child evincing the slightest indication of feeling pain from it, but of obtaining speedy relief. I have never seen hæmorrhage or ulceration of the gums follow, and in properly selected cases it certainly has its advantages.

Finally, care in diet is of the greatest importance whilst a child is teething. Improper food will easily bring on acute indigestion and febrile excitement, demanding the use of salines and aperients till the system is again tranquil.

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* Formula 3:

R.	Potass. Bromid.,	gr. ij
	Potass. Iodidi,	gr. ½
	Spt. Amm. Arom.,	♏ij
	Syrupi,	♏xx
	Aquam ad	℥j.—M.

To be taken every four hours. For children a year old.

† Diseases of Children, by J. Lewis Smith, M.D., 1869, p. 307.

CHAPTER VI.

MARASMUS OR ATROPHY.

Nature and definition of—Deficient food the most common cause—Mortality among infants—In treatment the primary object is to remove the cause—Care in feeding—Cod-liver oil—Raw meat juice—Digestive ferments—Liquor Pepticus and Liquor Pancreaticus—Saline essences of pepsin and pancreatin—Acid glycerin of pepsin—Artificial digestion.

Atrophy consists in the decrease of size of a tissue, or of the whole body, with consequent impairment of function. It is the opposite state to that known as hypertrophy. When adipose tissue atrophies, the fat-cells diminish in size, owing to the gradual loss of their contents, and emaciation results. The elementary constituents of any other tissue, or organ, or set of organs may become similarly affected, and so produce diminution in size, and a proportionate impairment of function. It is not the same process as degeneration, although degeneration is always sooner or later accompanied by atrophy. Degeneration consists in the deterioration of the *quality* of a tissue, and does not (at all events at first) necessarily imply diminution in its size. On the contrary, the size may be temporarily increased, as, for instance, in fatty degeneration of the liver.

Atrophy is a common disease among infants and young children, as the out-patient practice of any London hospital amply testifies. It has its origin in defective nutrition, and is rather to be regarded as a state of extreme debility and lowered vitality than as a specific and independent affection.

"Experience has taught us that patients often die without offering, in the post-mortem examination, the slightest modification in the anatomical condition of their organs. In the course of our physiological experiments, we often see dogs arrived at the very last stage of emaciation, although the appetite continues unimpaired till the last moment. They sink from sheer exhaustion, while the lacteals are gorged with chyle; and, when opened, their bodies offer no trace whatever of pathological alteration."*

Causes.—Whatever interferes with the nutrition of an organ is followed by its atrophy. If the food given to an infant be un-

* Lecture on Experimental Pathology, by Claude M. Bernard, Medical Times and Gazette, 1860, vol. i, p. 209.

wholesome or deficient, the digestive organs are sooner or later deranged, and the processes of assimilation are disturbed. The nutritive changes in growing tissues are far more active than in the mature; consequently any interference with the nutrition of an infant is followed by far more rapid and serious consequences than in the case of an adult.

It has been pointed out by Dr. Murchison that emaciation may arise from functional derangement of the liver, as when the bile is impeded in its passage into the bowel, and the assimilation of fatty and albuminous matters is interfered with, or from derangement of the glycogenetic function of the liver.* It may also arise from stricture or obliteration of the thoracic duct; by which means the chyle elaborated by the mesenteric glands fails to reach the general circulation. Atrophy is also caused by whatever occasions any great waste of nutritive material. Thus, prolonged hæmorrhages, long-continued suppuration, excessive vomiting and diarrhœa, by depriving the body of large quantities of nutritive matter, lead to general atrophic changes.

As to some other *causes* of atrophy, the most frequent are any circumstances that bring about defective nutrition in infants and very young children. A child may have been born healthy, but the mother is suddenly unable to suckle it, and from that moment it ceases to thrive. No artificial food can effectually take the place of the mother's milk, the child wastes and becomes emaciated, diarrhœa and vomiting ensue, and it dies exhausted. In another class of cases the child is incessantly sick, and life is frequently arrested by an attack of convulsions. Hundreds of infants die annually in London and other large cities because the food given to them is either unwholesome, indigestible, or insufficient, their digestive organs are too feeble to assimilate it, or the mother is working hard, and in delicate health at the same time, and so has not sufficient breast-milk to nourish her infant. We continually see pale and feeble women bringing up their children by the breast when a year old, and they tell us with some surprise that since their milk diminished the children have not thriven. The blood, in these cases, gets into a thoroughly impoverished state, and the mammary glands can no longer secrete milk sufficient in quantity, or good in quality.

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* Croonian Lectures on Functional Derangements of the Liver, The Lancet, 1874, vol. i, p. 467.

It has been pointed out that food rich in starchy products is a common cause of atrophy in young children when given to them before the salivary and pancreatic glands have reached their full development. Before the seventh or eighth month the starch is not converted into glucose or sugar, and hence one cause of indigestion and defective nutrition.*

The mortality among infants brought up by hand is enormous.† The deaths during the first two months are four times the number during the third month.‡ Where infants are imperfectly fed, nutrition takes a wrong direction, and if they do not flag or die early, then some morbid deposit in the shape of tubercle may be infiltrated into the different organs, or some inflammatory affection set up.

Sometimes young children, without any ascertained cause, suddenly become fretful and irritable, and lose flesh and strength; the face grows pale, and the body-heat diminishes; in these cases they sleep badly, there is uneasiness in the bowels; the motions are dark and offensive, and death gradually follows.

"In chronic atrophy the last traces of adipose tissue disappear from the face; the integument everywhere becomes loose and corrugated, and, in addition, various contractions of the muscles take place, as a result of cerebral irritation, especially that of the frontal, next of the corrugator supercilii, and the levator alæ nasi et labii superioris muscles, by which the face acquires a senile appearance, and, on account of which, the French Pædiatricars, in a very ungallant manner, call it a Voltairean face."§

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* See Chapter II.

† "In England, out of 100 children born; while for the whole period of one year 15.2 per cent. children will die the first month, 1.7 the next, and so on. In France, out of a million births, 29,121 die in the first week, 22,128 in the second, and 22,236 in the sixteen days following."—*On Infant Feeding*, by C. H. F. Routh, M.D., 1876, p. 64.

‡ "According to the English Life-Table, of 1,000,000 children born, 149,493 die before they reach the age of one year; and of these 149,493 deaths, 46,503, or nearly a third, die during the first month of life. The annual rate of mortality per 1000 among infants, according to this English Life-Table, is equal to 571.3 in the first month of life; declining, however, to 91.6 per 1000 in the eleventh month. The annual rate among infants aged one month and under one year does not exceed 114.6 per 1000; whereas among infants from birth to one year of age it is equal to 165.6. It is evident that in dealing with the mortality among infants during the first year of life it is necessary to take account of the age in months at insurance, for the rate of mortality among infants aged six months is but one-fifth of the rate which prevails during the first month of life."—*Infant Insurance and Mortality*, Brit. Med. Journal, vol. i, 1875, p. 785.

§ Vogel, Diseases of Children, 1874, p. 15.

In the *treatment of Marasmus and Atrophy* we must seek to remove whatever influences appear to have induced the disorder. If the mother has not milk enough to support her infant, a wet-nurse should be procured, or it must be brought up by hand, and every care ought to be bestowed on feeding, according to the age and digestive capabilities of the child. Into this question I have already entered.* Cod-liver oil may be given to young infants after food in these cases, with the greatest advantage; it will have the effect of improving the appetite, promoting sleep, correcting the secretions, and increasing weight. When it does good, sickness is not induced; indeed, I have seen many infants cease to be sick on taking the oil. Half a teaspoonful of steel wine may be added to the oil in suitable cases. If cod-liver oil cannot be borne an equal quantity of glycerin may be given with good results. It is usually taken with relish. Inunction of cod-liver oil is also of service. *Raw meat juice* in some cases of atrophy and wasting proves highly nutritious and digestible. The directions for preparing it are given in another place.†

Cases will sometimes occur in which the digestive functions are completely in abeyance. All foods are rejected by the stomach or passed undigested by the bowel. In such cases as these, as indeed, in all where the alimentary tract is in a high degree of irritation, the principle of physiological rest will be found to be of great value. We must give the digestive organs as little to do as possible; as they cannot perform their functions effectually, we must relieve them of this, by introducing artificially digested food, and thus reduce their work to that of mere absorption. This can be effected by "peptonizing" the food before it is given. There are several valuable preparations of the digestive ferments in the market, while many are practically inert. Amongst the most effective may be mentioned Benger's preparations, the "Liquor Pepticus" and "Liquor Pancreaticus;" Savory and Moore's two saline essences of Pepsin and Pancreatin, Bullock's Acid Glycerin of Pepsin (which, on account of its sweetness, is readily taken by children), and others. The strength of these preparations is very similar. Dr. W. Roberts has called attention to this subject in his Lumleian Lectures on the Digestive Ferments. He says: "Any extract of pancreas may be used for

* See Chapter II.

† See Chap. XV, On Diarrhœa.

the preparation of artificially digested food, but the most suitable are those prepared with dilute spirit or chloroform-water. The extract sent out by Mr. Benger, under the name of 'Liquor Pancreaticus,' is an almost faultless pharmaceutical preparation. It is made by extracting perfectly fresh and finely chopped pancreas, with four times its weight of dilute spirit. By some ingenious devices, Mr. Benger has succeeded in overcoming the mechanical difficulties of the manufacture, and has produced an extract which possesses the diastatic and proteolytic properties of the pancreas in a highly concentrated degree. It is a nearly colorless solution, with very little taste or smell beyond that of the spirit used to preserve it."* The following are Dr. Roberts's methods of artificially digesting milk and milk-gruel:

"*a*. Peptonized Milk.—Fresh milk is diluted with water in the proportion of three parts of milk to one part of water. A pint of this mixture is heated to boiling, and then poured into a covered jug. When it has cooled down to about 140° Fahr., three teaspoonfuls (f℥iij) of the Liquor Pancreaticus, and twenty grains (about half a small teaspoonful) of bicarbonate of soda (in solution) are mixed therewith. The jug is then placed under a 'cosey' in a warm situation for one hour. At the end of this time the product is again boiled for a couple of minutes. It can then be used like ordinary milk.

"*b*. Peptonized Milk-Gruel.—Half a pint of well-boiled gruel is added, while still boiling hot, to half a pint of cold milk in a covered jug. The mixture will have a temperature of about 125° Fahr. The Liquor Pancreaticus and the bicarbonate of soda are then added in the same proportion as in the preceding process (*a*). The jug is placed under a 'cosey' and kept warm for an hour and a half. The contents are then boiled for a couple of minutes, and the product is ready for use. By this second method the use of the thermometer is dispensed with."

In cases of great debility and exhaustion it may become necessary to feed the child per rectum.

The following is Dr. Roberts's plan of preparing nutritive enemata: "A nutritive enema should be prepared in the usual way—of milk, or of milk with beef tea or eggs, or of milk-gruel.

* Lumleian Lectures, On the Digestive Ferments, by W. Roberts, M.D., F.R.S., The Lancet, April, 1880, to which the reader is recommended to refer for further particulars.

To half a pint of the warm enema a tablespoonful of the Liquor Pancreaticus, and thirty grains of bicarbonate of soda should be added. The enema can then be administered at once."

Two ounces is quite sufficient at one time, for if more be used it may not be retained.

CHAPTER VII.

FEVERS OF CHILDHOOD.

Definition of fever—Its causes and symptoms—Action of the fever-poison on the blood and nervous system—Termination by critical change or crisis—General management of fevers, prophylactic and curative—Simple febricula—Febris ephemera—Febris continua simplex—Its definition, causes, symptoms, and treatment.

The term fever is employed to signify an accelerated state of the circulation, with thirst, loss of appetite, elevation of temperature, prostration of the mental and bodily powers, and derangement in the secreting functions. These changes are the consequences of external causes, which the system is unable to resist. The causes may be sudden or slow, powerful or mild; they may temporarily impede its actions, and eventuate in a speedy restoration to health; or they may induce a combination of phenomena which destroy the life of the patient.

All diseases which exhibit febrile symptoms at their commencement must have a close resemblance to one another, and do not then admit of a diagnosis, which is easy at a later period, when the development of particular symptoms enables us to fix the exact nature of the affection, and in many instances to trace its origin. Different individuals are variously affected according to peculiar circumstances, and the state of the general health at the time of attack. Thus exposure to cold and moisture in one person produces only a feeling of malaise and general constitutional disturbance; it does not fix upon any particular organ, and terminates without complication. In another person, as the general disease advances, there is a determination of the complaint to some organ; or in a third person the local disease may proceed as rapidly or even more so than the general disorder; and this is exemplified in some cases of pneumonia occurring in young and

vigorous subjects. Then there is a class of cases in which the local disorder precedes the constitutional, and the inflammatory symptoms increase and become more developed, whilst the symptomatic fever and general derangement follow later.

Increased heat and accelerated circulation constitute fever, and without them the patient cannot be said to labor under it. In the early stages they may be absent, as during the period of depression and lassitude, when the vital energies are prostrate, and before the system has shown any reaction. But quickly come remarkable changes and manifestations, as uneasiness, restlessness, shivering, coldness along the spine, involuntary tremors, rigors or convulsions, and exacerbations. And to these succeed lesions of the organic functions, in disturbed respiration, circulation, digestion, and nutrition; the attitude is altered, the expression changed, and the intellectual powers enfeebled or destroyed. The symptoms are owing to changes in the quality and constituents of the blood, which becomes altered in color and consistence, the serum increased, and the crassamentum thickened or loosened. Then follow changes in the quality and amount of the secretions; they become putrid and offensive to the tissues in which they are in contact, and lead to local inflammations and changes of structure. The fever-poison enters the blood and paralyzes the nervous system—it affects all the solids and fluids of the body, and tends to the disturbance of its several functions. It is well that we should bear in mind the liability of the mildest form of fever to change its characters and become developed into a dangerous type at some period of its progress; and hence it is that very mild cases of typhoid (remittent) pass off in a few days, whilst in others they become severe, protracted, and even fatal. From constitutional infirmity or improper diet, alarming symptoms may arise at any period of the fever, or if the blood is surcharged with the contaminating elements of tissue metamorphosis, which the excretory channels cannot eliminate, coma or delirium may set in unexpectedly and destroy the patient's life. Thus it becomes a trite maxim, which observation daily indorses, that "where there is fever there is danger."

All fevers have a tendency to terminate by critical change or crisis, as it has been termed, if the vital powers are not too much exhausted. This is seen in ague and some idiopathic fevers, in

which a free sweating, or evacuation from the bowels, is followed by favorable symptoms.

In the management of fevers in general there are prophylactic and curative measures to be borne in mind. If the causes which produced the fever can be ascertained they should be removed, and the patient placed under the most favorable hygienic conditions. Such measures should be resorted to as support the constitutional powers and encourage the due performance of the different functions of the body. Excess of food, by inducing vascular plethora and general excitement, will predispose to fever, whilst moderate exertion of the mind and body, and the inculcation of habits which neither overexcite nor depress, will enable the child of delicate physical organization to resist the infectious effluvia or other epidemic influences which strike down the robust and strong. In districts where the soil is low and heavy, and there are many trees, children should not be exposed to the night or morning air on an empty stomach, and if it can be managed their apartments should be at the top of the house. In the autumn season of the year an occasional dose of quinine and a mild aperient will be advisable in unhealthy localities. In short, a due regulation of the digestive and secreting functions should be observed, and all causes that morally or physically depress the system should be carefully avoided. When the impression of fever has been made, its full development may sometimes be prevented by a careful diet, rest in bed, laxative medicines, and cooling drinks; by the employment of a warm bath, or determining the blood to the external surface. Although these measures may not arrest the fever, they will control the premonitory stage, and render the subsequent disease milder and shorter in its duration. We shall treat of the serious complications that arise in the course of the specific fevers under their respective heads.

Simple febricula, or feverishness, is the term I would employ to express a slight degree of febrile action. It may be classed as a mild grade of inflammatory or continued fever terminating in twenty-four hours, or lasting over a few days. The affection is not peculiar to children and may occur to adults. The mildest variety is generally caused by fatigue and exposure to the sun in hot weather, or by prolonged mental excitement, or by continuous study in close rooms. I have met with several instances of this kind and almost invariably in the summer season of the year,

when the weather has suddenly changed, and become hot and relaxing. In May, 1877, three children, aged respectively five, seven, and eight years, were brought to me in the Out-patient Department of the Samaritan Hospital on the same day, with temperatures varying from 101.6° to 104.4° (rectum). May 14th.—The youngest child had the highest temperature. She had been ailing for a week, refused food, and was extremely thirsty and fretful; there was a shrill croupy cough, and the hands and body were very hot; pulse 140, respirations 50 per minute; the tongue was whitish and moist, and one or both cheeks flushed both morning and evening; there was no diarrhœa, and the urine was clear. I thought the case very like typhoid fever, or acute tuberculosis; rather the latter affection. I ordered half a grain of quinine in a powder with sugar night and morning, and a mixture of citrate of potash and bromide of potassium three times a day. On the 17th she was no better, refusing beef tea and scarcely taking any milk; there was constant cough and the bowels were inclined to be loose. The temperature in the rectum was 104.2°, pulse 140, respirations 50. On admission as an in-patient two days later (19th), although no change had been made in the treatment, the temperature at 8 P.M. was 98.2°, and it never exceeded 98.6° during the month she remained in the hospital. On a careful examination of the thorax some slight mucous râles were detected when the child coughed or cried, but there was no dulness anywhere. The urine was cloudy and contained *phosphates* in abundance. A mixture of phosphoric acid and quinine was prescribed, and a week later the child was running about the ward, eating an ordinary diet, and left the institution on the 16th of June quite well. In the absence of local or specific disease, we must classify these cases as "simple febricula" or "pyrexia."

This fever is also the consequence of local irritation and temporary obstruction to the digestive functions. If the source of irritation resides in the stomach from an undigested meal, an emetic gets rid of the offending mass, and subdues the fever at once. If digestion has advanced to the stage of imperfect chylification, the separation of nutritive elements does not properly take place, and absorption of well-selected elements does not ensue; whilst there is retained in the intestinal canal matters which also become sources of irritation till an active aperient washes them out of the system. Hence the rapidity with which

this simple variety of fever departs, leaving behind it no ill effects. Worms in the intestinal canal, excessive secretion of bile, indulgence in stimulants may induce it. However simple the fever may be, it is marked by a coexistence of symptoms, and is not characterized by any single one. It depends on a variety of exciting causes, and is not specific, nor does it present anything of a definite character like those cases of fever arising from contagion, in which there is a change in the healthy proportion of the constituents of the blood. During the period of the first dentition the infant is liable to pyrexia, which passes off with the appearance of the tooth through the distended gum; or it may have convulsions, which may depart quickly or return from time to time, and even end fatally if the process is slow, and the constitution is intolerant of the irritation through excitability of the nervous system. When the fever arises from the various causes which excite gastric or intestinal disorder, it may be called symptomatic fever, for there is neither shivering, brown tongue, nor active cerebral disturbance, which belong to the exanthematous fevers. Still caution is necessary, as severe fevers often set in with very mild symptoms. It is doubtful whether such cases ever lead to a fatal termination. The temperature from slight sources of irritation in these cases may rise to 105° Fahr. in the evening (as high as is common in typhoid fever) and fall to the normal point next morning. In fact, a high temperature in children is often a delusive indication when not viewed in connection with other symptoms.*

In this symptomatic fever (for I still cling to the term in the short variety of the affection) the lassitude and general weakness are slight, because the nervous centres are not severely depressed, whereas in the specific fevers they are sometimes involved to a great extent, and the cerebral functions are destroyed or seriously in-

* "Cases of ephemeral fever, without any very serious foundation (*bedeutungsvolle Begründung*), are particularly characteristic of the period of childhood. Therefore, in children's diseases, even when we find a very high temperature, we must be very careful in drawing conclusions from the first (or a single) observation. At this age also more or less high temperatures may occur at stages (*Punkten*) in the course of a disease, in which we generally find very moderate or normal temperatures in the adult. And even in *convalescence*, especially after muscular exertions, very considerable elevations of temperature are sometimes met with in children."—Wunderlich, *On Medical Thermometry*, New Syd. Soc., 1871, p. 208.

volved, as when effusion takes place, or the concentration of the special poison partially or completely paralyzes them.

Treatment.—This consists in the first instance in giving cooling drinks, and, in the shape of nutriment, nothing beyond milk and seltzer water. A few alterative doses of gray powder and rhubarb, or a brisk purge, will bring down the temperature and soon set matters right. Sometimes an emetic acts like a charm. The cause has only to be removed, and, if not long in operation, the child is quickly restored to its usual health. There is no serious congestion or irritation of any particular organ, and consequently the depurating functions are only temporarily impaired. As soon as the fever begins to decline (or before, if there is much moisture on the skin) quinine given three times a day will be found of great service. In those cases where there is a febrile paroxysm morning and evening, I am in the habit of giving quinine before it is expected to come on, and when it is fully developed I recommend a simple saline mixture, cooling drinks, and cold sponging. Where there is much cerebral excitement it is well to give the quinine in hydrobromic acid.

CHAPTER VIII.

TYPHOID FEVER.

Definition and various meanings—Infantile remittent fever and typhoid fever synonymous terms—Symptoms, course, and progress—Complications and sequelæ of typhoid fever—Treatment—Diagnosis of typhoid fever from meningitis—Acute tuberculosis—Symptoms dependent on the severity of the fever poison—Epistaxis—Hæmaturia.

Typhoid or *enteric fever* is distinguished by the prevalence of gastric and intestinal symptoms. It has received the name of intestinal fever, pythogenic fever, and muco-enteritis. Most German writers call it abdominal typhus (typhus abdominalis). In addition to these terms, there is the well-known name of infantile remittent fever.

I must disavow at once any belief in infantile remittent fever as caused by a separate and distinct poison, or that the disease differs in its nature or causes from that of typhoid. I can conceive few greater blunders in practical medicine than to consider this a

separate and distinct affection, not following the same course as typhoid fever, and not leading to the same complications. To me it seems, however, that there is a condition to which this term may be applied without causing confusion; it should be limited to the mildest cases, which usually run a quick course, and do not develop into the severe and unmistakable typhoid.

The term may be vague and ill-defined, but it conveys to the minds of many persons a form of mild fever arising from miasmatic influence like typhoid, and attended with much gastro-intestinal disturbance. In these milder cases we have no characteristic rash, and the short duration of the fever in some children does not allow of its being classed under the name of a specific disease. The pyrexia is due to a depraved condition of the alimentary canal, of long or short duration, and when this is corrected the disease quickly departs. To such cases as these the term typhoid fever could not with propriety be well applied.

I would not, however, mix it up with simple febrile disorder, nor with fever symptomatic of worms, dentition, and visceral derangement, which pass away as quickly as these conditions are remedied;* but it is something more chronic and intractable, lasting only a few days in some instances, whilst in others it has the duration and all the attendant complications of the genuine typhoid state. To these milder forms, caused by the imbibition of a small dose of fever poison, I wish especially to draw attention. If we will accept the term with this understanding it cannot mislead us.

In the nomenclature of diseases, drawn up by the Royal College of Physicians of London in 1869, infantile remittent fever is rightly mentioned as synonymous with enteric fever, and among most medical men I presume its close relationship to this fever is now settled. Writers in France, Germany, and Italy acknowledge the same classification. They speak of infantile remittent fever in children as being the same as typhoid fever in the adult, but inasmuch as they give it this name they certainly recognize some distinctive feature. We hear members of our profession, especially country practitioners, speaking of remittent fever in children as a distinct disease, and I have found the prejudice so great, and the belief so strong, that it has not been possible to convince them of the identity of the two affections. My main object will be to show

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* *Vide* Febris Ephemera.

that this remittent fever, in its severe forms, is intimately connected with the course and complications of typhoid fever.

Typhoid fever frequently sets in insidiously, initiated by chilliness or slight rigors, frequent and soft pulse; then ensue febrile symptoms and thirst, with diarrhœa and abdominal tenderness; to this succeed tympanites and gurgling in the right iliac fossa. The skin becomes hot, and there is occasional sweating. From the seventh to the fourteenth day an eruption of rose-colored spots appears over the abdomen, there is headache and prostration, followed by stupor and delirium. After death there is discovered disease of the agminate and solitary glands of the ileum, and enlargement of the mesenteric glands. When death takes place early, the morbid changes are chiefly found in the small intestines, spleen, mesenteric glands, and bronchial mucous membrane. The heart may contain coagula, and its muscular substance be soft and pale, with or without incipient molecular decay.* The spleen is generally enlarged in the first or second week, but returns to its normal size by the third or fourth week.

Whether we call this disease in children typhoid, or remittent fever, it comes on very gradually in some cases, and sets in with severity in others. It follows a course in children similar to that in adults. In the mild form the child is off his appetite and out of sorts for some days; he complains of thirst, is fretful and irritable, and ceases to be cheerful or to take pleasure in his usual amusements; his nights are disturbed and unrefreshing; the bowels are confined, and the motions dark and unhealthy, so as to need aperient medicine, or they may be loose and offensive from the onset. Then succeeds heat of surface, followed by perspiration and a lowering of temperature. During the first week the abdomen may be natural in shape, and free from tenderness; but there soon follows some amount of tympanites, and pain over one or both iliac regions, when pressure is applied with the hand. In the evening there is a febrile exacerbation, with accelerated pulse and breathing, the lips become dry, and the tongue is coated on the dorsum with a whitish-yellow fur. There may be two exacerbations in the twenty-four hours, but commonly there is only one. It is from the recurrence of these exacerbations that the term "remittent" is derived. During the night the child becomes

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* Vogel on Diseases of Children, p. 177.

more restless and disturbed; he is wandering and talkative, and the cerebral functions may be sufficiently disturbed to produce delirium; in the morning he looks pale and exhausted, but improves during the day till evening returns, when he is again feverish and drowsy, and this may happen for several successive nights. Sometimes there is a morning exacerbation (about 10 or 11 A.M.), and this has scarcely subsided before the evening paroxysm sets in. He now loses flesh rapidly, and is dull and indifferent to all that goes on around him. During the second week, but seldom before the tenth day, fever-spots make their appearance on the abdomen, though they are frequently altogether absent or few in number. The eruption is of a light-rose color, scarcely elevated above the surface, disappearing on pressure and quickly reappearing when the pressure is removed. All the symptoms increase in severity, and the pulse may reach 140 to 160; the tongue is more heavily furred, or brownish in the centre, red at the tip and edges and contracted; the urine is scanty and high-colored, but sometimes it is clear throughout the fever, and alkaline without the slightest turbidity; diarrhœa is continuous, and the motions are of a yellow-ochre color, and of a thin pea-soup consistence. In exceptionally severe cases blood and mucus may be present, and when so they indicate more than usual ulceration. About the beginning of the third week, in favorable cases, the symptoms begin to decline and a general amelioration takes place; the bowels act more regularly and become more natural, thirst diminishes, and the pulse loses its frequency, the tongue is more moist and clean, and the evening paroxysm diminishes. The child resumes a more cheerful and healthy appearance, but he is left weak and emaciated. When the disease sets in with great severity from the onset, it is accompanied by headache and vomiting, the child rolls his head to and fro on the pillow, and is only half conscious when roused to answer a question, or awakened out of sleep. Many of the symptoms are similar to those just described, except that they are proportionately more severe, especially the evening exacerbations of the fever. There is difficulty in forming a diagnosis at the beginning of the illness, as the vomiting and cerebral symptoms may lead to the inference that the brain is the organ primarily at fault. The drowsiness is sometimes extreme, and when there is the additional symptom of constipation we may be reasonably mistaken in fixing the true seat of mischief. But soon the vomiting ceases, and by

the second or third day the peculiar heavy aspect of fever is recognized, and the child sinks into a state of stupor or indifference. The skin becomes hot and dry, and the temperature runs up to 103° or even to 105°. When it reaches the latter height at an early stage of the illness we may generally rest satisfied that the symptoms are not attributable to meningitis. Fever-spots may now be looked for, but their presence does not seem to bear any relation to the mildness or severity of the fever, and they are sometimes absent altogether. The pulse is always frequent, and if it continues so is to be regarded as an important symptom. In some children, whose nervous irritability is more marked, it will exceed 140, and remain so as long as the fever and temperature continue high. It may run up to 180 and be too rapid to be counted. "An intermittent pulse seldom occurs in children, and I do not remember to have ever met with a dicrotic pulse in children under ten years of age."* This remark requires some qualification. An irregularly intermittent pulse is common in the neurosal affections of children when there is no valvular disease of the heart.

About this time (second week) there is often hacking cough and hurried respiration. There is constantly to be recognized some rhonchus or coarse crepitation over the posterior surface of the lungs, even if auscultation reveals nothing in front. If the disease has lasted long we shall almost invariably detect these signs, or even crepitant rhonchus with a low degree of pneumonia. If the abdomen has been hitherto soft and free from tenderness, a sense of discomfort and pain is complained of at this stage, and there is tympanites with gurgling, and the bowels act five or six times in the twenty-four hours; the tongue is more thickly coated, and there is a red streak in the centre, and in the course of the next few days it is glazed, smooth, and red, whilst the gums are dry. During the second week the stupor becomes more profound, or active delirium appears, and the child is noisy at night and attempts to get out of bed; he is unconscious of all that goes on around him, and the evacuations are passed involuntarily. Epistaxis is not uncommon. In a few cases the bladder becomes distended, and the urine dribbles away. On examination it may be found albuminous. There may be even convulsions and noisy delirium, but the insensibility is not so profound as that generally met with in brain affections, and the morbid stupor of fever is characteristic.

* Vogel, On Diseases of Children, 1874, p. 180.

In fever we do not as a rule witness the strabismus and irregularity of the pupils, nor the screwing up of the eyelids as in cerebral disease. The child may be noticed to pick his lips and nose, and make them bleed, and there may be subsultus. By this time there is great emaciation, and the child is so reduced that it seems beyond the hope of recovery.* By the seventeenth day, or the close of the third week, some signs of amendment in returning intelligence are observed, and the pulse becomes less frequent, whilst the tongue begins to be moist, and the sordes disappear. If no improvement sets in the vital powers become more and more depressed, the typhoid condition increases, and the child sinks from exhaustion. This is most likely to happen about the fourteenth or fifteenth day, but it may be protracted to the fourth or fifth week, or, indeed, indefinitely prolonged, according to the complications that are present in each particular case. When death takes place during the first week of the fever it is generally due to cerebral disturbance or some other serious complication, as epistaxis or intestinal hæmorrhage. The latter condition is rare in children.

Of the sequelæ of typhoid fever in children we may mention diarrhœa, inflammation of the parotid gland, and tuberculosis. Dr. Clifford Albutt has pointed out that the mesenteric glands are often so injured by typhoid fever that nutrition is very much impaired; and it is under these circumstances that tuberculosis is apt to show itself, whilst the period of convalescence renders the constitution liable to measles, scarlatina, and whooping-cough. The mortality is only 5 to 10 per cent.†

In proportion to the severity of the fever convalescence is rapid or slow. In severe typhoid there is great emaciation and muscular prostration, lasting many weeks, and the child is greatly reduced in flesh and strength, but bedsores are seldom seen.

Meigs and Pepper say that typhoid fever may attack children

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* "Whether the muscular wasting in fever is the cause of an increased temperature, or the increased temperature melts down the muscular structures, may not be positively affirmed, but there exists no doubt as to the fact. After a severe pyretic affection, the muscles of the limbs are often wasted to an extent quite surprising when compared to the adipose layers. The lax and shrunken hand betokens the diminution in the bulk of the interossei and other muscles. In hectic fever the muscles seem sometimes to have almost entirely disappeared at death, the patient being, as it is called, 'only skin and bone.'"—Dr. Milner Fothergill, "On the Typhoid Condition," *Edinburgh Medical Journal*, September, 1873.

† Meigs and Pepper, Diseases of Children, 1874, p 832.

under two years of age, or as early as the eighteenth or twentieth month, but it must be acknowledged that the disease is rare under five years of age. A case is recorded by Dr. Dunbar Walker, seen in consultation with Dr. West, of "enteric fever in a child fifteen months old,"* and Dr. Wiltshire also mentions having seen, with Dr. Walters, of Reigate, "a well-marked example in an infant aged six months."†

The morbid appearances when the disease ends fatally are chiefly seen at the lower end of the ileum, the most entensive mischief being found near the ileo-cæcal valve, where there is shown a tendency to destruction of the mucous membrane, and ulceration or even sloughing, or perforation of the peritoneal coat. The glands of Peyer's patches take on the appearance of vesicles or pustules, and subsequently they burst and produce an ulcer, with oval or irregular outline, having thin and undermined edges. The ileum is the chosen seat of these ulcers, but they may be seen scattered through all parts of the intestine, large as well as small. It is common to meet with enlargement and softening of the mesenteric glands, and in severe and rare instances they may take on suppuration.

Treatment.—During the gradual approach of the disease, when there is thirst and loss of appetite, the child must not be tempted to take food which it cannot digest. Thirst should be relieved by small draughts of cold water, or toast and water, about a tablespoonful at a time, and a simple saline mixture of citrate of potash, or a mixture of nitrate of potash with a few grains of sulphate of magnesia, if the bowels are confined (Form. 8). For the first few days scarcely anything but cold water is required. If the secretions are dark and offensive, an alterative powder of hydrargyrum cum creta with a few grains of rhubarb will be necessary, or the syrup of senna and rhubarb, or even castor oil, should there be discomfort or pain in the abdomen. When there is tenderness of the abdomen, a warm poultice is comforting; and if there is pain Dr. West recommends a few leeches, which I have never found necessary, and I should try other means before resorting to them. The excitement and restlessness at night may be greatly relieved to the advantage of the patient by bromide of potassium alone, or in combination with hydrate of chloral. They have proved of such value in my hands in all cases of wakefulness from

* Brit. Med. Journal, vol. i, 1879, p. 347. † Ibid., vol. i, 1879, p. 427.

nervous exhaustion that I recognize them as valuable calmatives in fever. Dr. West speaks highly of a combination of tartar emetic and opium. "A draught containing five minims of laudanum, and a quarter or a third of a grain of tartar emetic, will be a suitable anodyne for a child of five years old, and may be repeated night after night with almost magical effect."* One drop of laudanum, or something less, for each year of the child's age, in restlessness and excitement, will often induce refreshing sleep; and it may be repeated, should circumstances appear to demand it, without giving rise to any bad effects. If there be much heat of scalp and the vessels are full about the temples, and the conjunctivæ injected; if the delirium is wild and the excitement fierce, then we ought certainly to shave the head, and apply four or six leeches. These symptoms often succumb to the local abstraction of blood, and life has thus in many cases been saved. The head symptoms that occasionally supervene in an advanced stage of the disease are very ominous, and require counter-irritation; they are often attended with squinting, and there is some amount of obscure meningitis with effusion, which may ultimately terminate in acute hydrocephalus.

The temperature of the room should not exceed 65°, and all unnecessary articles of furniture and luxury should be removed; the clothing should be light, the head shaved or the hair cut short, and the head elevated on the pillow.

During the second week, when the vital powers require support, milk, beef tea, and chicken broth will be needed; and, if there is diarrhœa, milk, arrowroot, and rice-water, flavored with cinnamon, must be substituted for animal broths. Milk is apt to be overrated in fever, for where the bowels are loose and irritable, and the stomach weak, as we expect to find it in the first week or two of the fever, the milk is too heavy to be digested, and the curd, acting as an irritant when the fluid portion is absorbed, provokes diarrhœa, and even keeps it up if present. It should therefore be diluted with seltzer water, or lime-water, and in many cases it may be replaced by beef tea, or, what is better, barley-water, beef tea being apt to induce and keep up purging. When diarrhœa is troublesome, a grain or two of Dover's powder at bedtime, or a starch enema with a few drops of opium, or bismuth will check the irritation. A grain of acetate of lead with acetic acid every

* West on Diseases of Children, 1859, p. 392.

three or four hours is sometimes of service (Form. 29). A mixture containing rhatany root* is an excellent remedy after each evacuation, and the child may be allowed a little port wine in arrowroot.

Stimulants are not often required under ten years of age if the child can digest sufficient nourishment, but cases occasionally occur where life has been saved by a free exhibition of them. A teaspoonful of brandy every three or four hours in water or thin arrowroot will restore the tone of the nervous system, and support the faltering circulation. Alcohol proves serviceable by dilating the cutaneous capillaries, and encouraging perspiration.

In the shape of medicine, a few drops of dilute hydrochloric acid with spirit of chloroform, as in the case of adults, will be useful† if there is no abdominal pain or discomfort; and in low febrile conditions, where there is no diarrhœa, quinine with phosphoric acid is an excellent measure.‡

Diagnosis.—The cerebral complications of typhoid fever in children are most important.§ Like the bowels and the lungs, the brain is liable to be attacked in the course of typhoid fever, and young patients more than those of mature years, are very prone to be carried off by cerebral complications. The febrile process once established creates disturbance and excitement in the nervous

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* Formula 4:

℞ Tinct. krameriæ, ... ℥iij
Liquor opii sed., ... ♏xij
Spt. chloroform, ... ♏xx
Syr. zingiberis, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful after each action of the bowels. For children from five to eight years of age.

† Formula 5:

℞ Acid. hydrochl. dil., ... ♏xl
Spt. chloroform, ... ♏xx
Syr. rosæ, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful every four hours. For children from five to eight years of age.

‡ Formula 6:

℞ Quiniæ sulph., ... gr. iv
Acid. phosph. dil., ... ℥j
Syrupi, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful three or four times a day. For children from five to eight years of age.

§ See the abstract of a paper on this subject read before the Harveian Society by the author. Brit. Med. Jour., Feb. 14th, 1875, p. 122.

system at a time when its active growth and rapid development are ill calculated to bear this extra strain. If simple inflammation of the brain comes on now and then in healthy children, I think it may occur during the progress of typhoid fever in rare and exceptional cases. The blood is changed, the nervous system is excited or depressed at one stage or another, and the functions of assimilation are perverted or destroyed, and effete matters from the decomposed tissues are not properly eliminated from the system. Setting aside the injurious effect which the circulation of poisoned blood at an elevated temperature must have on the nervous centres, there seems no satisfactory reason why the cerebral changes should be restricted to congestion of the vessels, or simple vascularity of the membranes.

Now, it should be fully understood, and experience confirms the truth of the statement, that vascularity of the cerebral membranes is by no means infrequent in persons dying from typhoid, where the brain has escaped altogether during the progress of the disease. If the lungs are involved, as they frequently are in typhoid, and there is any amount of pneumonia, or interference with the pulmonary circulation; if the heart grows feeble, from increasing exhaustion of the patient, and its cavities become in any way oppressed, then congestion of the brain or its membranes will be frequently found after death; the cause has been mechanical, and we may term the condition one of "passive congestion." No relation can be established between the cerebral symptoms and the amount of vascularity which the membranes of the brain reveal. If we judge from the character of the delirium, or the convulsions, and the general insensibility of the patient, that these symptoms indicate excessive congestion or inflammatory action, we shall be deceived, and errors of diagnosis will certainly lead us into errors of practice.

The diagnostic symptoms of meningitis and typhoid fever are plainly drawn in our textbooks; but those who have seen much of the cerebral and abdominal diseases of young children must admit the frequent difficulties that beset their path. The worst cases of all for diagnosis are those in which a strumous child is seized with tubercular disease in the abdomen with diarrhœa and other intestinal symptoms; there is nothing to call attention to the brain till coma or convulsion sets in. Still, the approach of meningitis is slower and more insidious; it is less severe than

typhoid fever, and at an early stage very rarely presents the high temperature of the latter affection, which is a diagnostic sign of great value.

We cannot, therefore, invariably separate typhoid fever in young children, characterized by a distinctly remittent type, from cerebral meningitis, especially when the child is under five years of age. The symptoms of one disease or the other must predominate before we can decide with which we are dealing. Usually the bowels are constipated in the cerebral disorder, and vomiting comes on without cause, whether the stomach contains food or not; the belly is normal or retracted, the pulse less frequent, and liable to irregularity in force and frequency. Above all, the temperature in meningitis is generally elevated towards the decline of the complaint, and only runs high at an early period in exceptional cases. The ophthalmoscope is another aid to diagnosis in obscure cases.*

If the symptoms are mixed together in various degrees, and there is irritation of the digestive organs, and cerebral congestion or inflammation, then, if with severe diarrhœa there are thin, ochrey, and slimy stools, heat of skin, loss of appetite, thirst, and flushed countenance, we say this is a case of fever; but if there supervene in a few days uneasy gestures, strabismus, loss of consciousness, picking of the lips and nose, retching or vomiting, then we infer that the brain has been attacked in course of the fever, and the symptoms are the result of exhaustion or overexcitement.

Our *diagnosis* must mainly rest on the order in which these symptoms have occurred. We must not dwell too much on the fever process, and set down the vomiting and carebral symptoms to gastric disturbance, whilst the brain has been slowly and imperceptibly going wrong, and is, perhaps, the chief source of trouble.

If the physician is called to see the case early, and an exact account of the mode of invasion has been furnished, his judgment will seldom lead him wrong, if he carefully weighs the evidence on both sides, and notes the absence or prevalence of fever in the same house.

Acute phthisis or tuberculosis may be mistaken for typhoid fever. A quick pulse, hurried respiration, circumscribed flushing

* See Chap. XLII, "Diseases of the Brain—Simple Meningitis and Tubercular Meningitis."

of the cheeks, emaciation, delirium, mucous râles in the chest, and high temperature are common to both affections.*

In some adults suffering from typhoid fever we witness the evening flush on the cheek with great regularity and persistence. In other cases, with all the symptoms precisely similar, the face is pallid, and without the faintish blush. This points to a recurrence of the febrile condition with greater force, and often indicates, as the disease advances, serious local changes, either in the intestines, thorax, or brain. So far it is a symptom of grave import when it recurs at a late period of the fever. The periodical flushing is not peculiar to fever as fever. It belongs to the nervous system, and may ensue from many causes. The nervous system is highly impressible in children, and their diseases have a great tendency to remission. Witness the flushing of the face and heat of head in some of the cerebral affections of young subjects, coming and going like an attack of ague. Or, again, in dentition, nothing is more common than for the child to wake up restless, with hot head and flushed cheeks. Common gastric disturbance will cause the same symptoms, which vanish with an active purge. Fever affects the nervous system through the poisoned state of the blood, and the depression, the reaction, and the subsidence all depend upon it.

We know that this is the true explanation of the dangerous congestions and inflammation of the liver, lungs, or brain, that are liable to occur in the progress of fever, adding to our difficulties, and taking us out of the prescribed course to meet such serious complications by local depletion, diuretics, stimulants, and so forth.

May we not fairly come to the conclusion that there are degrees, nay, even varieties of fever originating from a common cause, and that, whilst it is the exception to meet with a case where there is any difficulty in recognizing the variety before us, we sometimes see cases in which the symptoms are not sufficiently defined to enable us to say what form of fever we have to deal with. Thus, the remittent character of the disease is very well marked in some cases, but to this are added symptoms which some authors have enumerated as belonging to a distinct affection they call gastric fever, and subsequently symptoms which we regard as belonging to typhoid fever. It appears certain that infantile remittent fever,

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* See Chaps. XXXIX, XL, "On Tuberculosis," and "On Phthisis Pulmonalis."

well developed, embraces both these types, or rather that identical symptoms frequently supervene.

There is, however, a caprice in fever which should put us on our guard. The fever-poison, assailing the system for weeks, works such changes in the blood and tissues of the body, that we can never be certain we have landed a case of fever in safety, so long as there is much departure from the standard of general health. Some of the worst cases of epistaxis, hæmaturia, and bleeding from the bowels have occurred when patients have become convalescent from fever, with clean tongue, regular pulse, and good digestion. If we have reason to think that the tone and quality of the blood have suffered much, either from the fever itself or the remedies employed to reduce it, we should as early as possible begin such treatment as shall gradually replace the solid constituents that have been destroyed. The hæmorrhages are not altogether confirmatory of the typhoid character of the disease. Any causes that tend to bring about an impoverished condition of the blood may produce the complication. In scurvy and purpura, and fevers of a low type (in all of which serious hæmorrhage may occur), the changes in the chemical composition of the blood are nearly identical. Intestinal hæmorrhage occurs in typhoid fever without ulceration; it is met with in cases described by some writers under the vague head of gastric fever. Sometimes, though rarely, a patient succumbs to hæmorrhage in typhus also, and it would seem that the fever-poison—whether *typhus* or *typhoid*, but more especially the latter, and in the more severe remittent forms which merge into the continued type—leads to the same issue.

In one case you will find rose-colored maculæ on the chest and abdomen, and the tongue red and papillæ elongated. There is no tenderness of the belly and no diarrhœa. In another case the fever is of a very low type, partly from the severity of the poison, and partly from the age and constitution of the patient. The teeth are dry, the tongue is covered with sordes, but there is no diarrhœa. On inspection after death ulceration is found in the lower part of the ileum. We meet with another case in which there is a plentiful eruption of rose-colored spots, but there is no diarrhœa; on the contrary, there is constipation, and the bowels are difficult to move. In another case there are fever-spots and severe headache. In another, delirium at night, severe bowel irritation, and rose-colored spots. These cases, and they are not

infrequent, tend to show that the symptoms are not always alike. We cannot say that a case of fever is not typhoid because there exists no diarrhœa, and we cannot predict that there exists no ulceration because there is constipation. We are accustomed to think that if the bowels are quiet in fever the patient has a good chance of doing well, that the intestinal canal is at all events free from any lesion; but what I think is a surer sign of the mucous membrane being healthy is a normal state of the evacuations, without the offensive odor that is present whenever there is ulceration. However well cases may be progressing the general health is liable to break down unexpectedly by further contamination of the blood, and the entry into the veins of infectious particles from the ulcerated glands in the intestines. Mere quietude of the bowels is not, as I have just said, any proof that the glands have escaped. Perfect uniformity in the order of symptoms does not occur; diseased action is not uniform. It would be neither a safe nor a scientific hypothesis to lay down the rule that all diseases possess a uniform phalanx of symptoms. This is modified and influenced by a variety of circumstances. There is a simple form of fever, and a severe form of fever. Both, so far as our present knowledge goes, are intimately allied, but one is transient and slight, and the other is severe and dangerous.

To go a step further in the same direction, it would appear that the cases described under the head of gastric fever and typhoid fever are one and the same in their nature, progress, and termination. The stomach may be more involved at one time than at another, as evidenced by the prominent papillæ of the tongue, and the gastric disturbance and vomiting, but it is the same fever notwithstanding.

Let it also be borne in mind that constitutional power varies as much as it influences the course of a disease. Vitality is stronger and resistance is greater in some persons than in others. The degree of local change discovered after death is often slighter than is proved to have been present in cases that have recovered. Because some diseases end fatally, we are not necessarily to find tangible evidence of the cause of death on dissection. To some constitutional idiosyncrasy—apart from organic change or the effect of specific poison on the blood and nervous system—we must often ascribe the tendency to sink; so we must also regard as a

mystery that tenacity of life which remains, when all hope of saving it has apparently passed away.

CHAPTER IX.

SPECIAL ERUPTIVE FEVERS.

Their classification and general symptoms—Vaccinia—Varicella—Character of the eruption—Diagnosis from small-pox—Treatment.

The special eruptive fevers of childhood are vaccinia, or cow-pox; varicella, or chicken-pox; variola, or small-pox; rubeola, or measles; scarlatina, or scarlet fever. They are all due to the reception of a poison into the system, which, after a variable period, sets up tolerably uniform constitutional symptoms. There are shivering and rigors, or even convulsions, cold along the spine, loss of appetite, headache, languor, and disturbed sleep; then reaction comes on, followed by fever, heat of skin, and the specific eruption. These are the chief symptoms which mark the onset of the exanthemata. They often prevail as epidemics, and these present very opposite characters in the degree of vascular action and the power of resistance. Though some epidemics are mild, they are as a rule more severe than those of sporadic occurrence, and the severity of the attacks and their complications depend on age and constitution; upon hygienic conditions, and the season of the year. If the health is lowered by previous illness they attain greater force, and the mode of early treatment may determine the result. They pursue a determined course, and active interference is sometimes more injurious than when the unaided powers of nature are left alone, for in this way it is possible to invite various affections more dangerous than the original malady. The exanthemata generally attack persons only once in life, and that at an early period. Scarlet fever is the most likely of these diseases to happen a second time, and it is the occasional accompaniment of measles. Small-pox and measles may also be united in the same individual; and a severe attack of whooping-cough may set in before the latter has departed.

Vaccinia, Cow-pox, or Vaccination.—The virus of cow-pox when introduced into the system produces a specific disease, only modi-

fied by its passage through the cow, or one of the lower animals. Vaccination so induced is protective against variola or small-pox. Cow-pox is a vesicular disease, occurring chiefly on the teats and udders of cows; it is natural to them, and as a disease of spontaneous origin, occurs almost exclusively to the milch cow, and follows a uniform and definite course. About the fourth day of invasion a few red and tender pustules appear on the teats and udder, which change into vesicles, and pass through the same stages as in man. From the friction used in milking, the vesicles burst, and the lymph which exudes sets up similar sores on the milker's hands, and in this way the disease is conveyed to other animals in the dairy who were previously well and healthy.

After successful vaccination there is nothing certain to be observed till the third day, when a small red nodule is noticed; on the fifth day an oval or circular vesicle is seen, depressed in the centre, and containing a little lymph. There may be as many spots as punctures a day or two before, but in many cases we cannot say they are due to the virus. On the eighth day the vesicle is increased and threatens to burst, the centre is depressed, and there is a large quantity of transparent fluid. The vesicle is at its highest state of perfection; the skin for some distance around it is inflamed of a rosy hue, and the subjacent areolar tissue is hard, tender, and painful. The child is fretful and feverish, and his nights restless and disturbed. On the tenth or the eleventh day the areola has extended, and the greater part of the arm may be erythematous. If the vesicle has not been opened it now bursts, and the centre dries into a hard dark scab, and falls off about the twenty-first day, leaving a deep circular depression or cicatrix, with several pits or dots, having a whitish or more pearly look than the rest of the arm. In children who are young and of full habit an eruption of roseola sometimes takes place on the body and extremities, having a papular or vesicular appearance; it occurs about the ninth or tenth day, and lasts about a week. Vaccination does not follow the same course in all cases, the vesicle being developed earlier in some cases than in others, and instances of retarded cow-pox are sometimes met with, particularly when dry lymph is employed. When the health is good, children should be vaccinated early, but when they are delicate it should be postponed till they are stronger. "It is enough to state that one-fourth of the deaths of small-pox in England occurs under the age of one year.

Of 20,590 deaths from small-pox which occurred in England in the six years 1856–61, 5000 were in children under one year of age."*

There is no exact rule to go by as to the time of taking the lymph, as the vesicle varies in its progress to perfection, but it should not be taken later than the eighth day; sometimes it is ripe on the fifth or sixth day, and this happens when the arm has become inflamed from the moment of inserting the vaccine.

In vaccinating children some precautions are necessary to be observed. No child who is out of health, or has recently had scarlatina or measles, or has a chronic skin eruption, should be vaccinated. If boils or a pustular eruption follow vaccination they will demand alterative medicine, tonics, and good air. These sequelæ are occasionally intractable, and the ulceration on the arm may prove most rebellious to treatment. I have often witnessed the inflammation so great as to require the constant application of lead lotion under oil-silk, or warm fomentations. Wasting of the deltoid, and paralysis of the arm, followed vaccination in a case I saw in 1873. Sloughing and protracted ulceration of the shoulder ensued in the case of a child, four months old, brought to me in June, 1880. "A case of fatal pyæmia after vaccination" is recorded.†

I am not an advocate for vaccinating children before the third month, but it is done by some medical men as early as the sixth week.

I prefer vaccination from arm to arm, but where this cannot be done the vesicle should be punctured with a lancet, and the lymph collected in an open capillary tube, drawn up by capillary attraction. One end of the tube must be placed within the vesicle, taking care to avoid contact with the blood or pus. When it is full, the ends of the tube are to be closed by holding them in the flame of a spirit-lamp or candle.

In deciding upon the spot for vaccination, the arm just below the shoulder is usually selected, and there is no better, for the part is hidden by the dress of women whether high or low dresses are fashionable. If there should be a growing nævus, or other ugly mark on the skin, it may be selected as a fitting spot for the operation, and in many cases it lessens the disfigurement, or destroys it altogether.

Varicella or Chicken-pox.—This disease has also received the

* Vaccination, by Dr. Seaton, Reynolds's System of Medicine, vol. i, p. 489.

† See The Lancet, 1860, vol. ii, p. 263.

A. Vander Veer M.D.

name of swine-pox or bastard-pox. It is both contagious and infectious, and the eruption consists of small vesicles about the size of a hemp-seed, which never become pustular. It was formerly confounded with small-pox, just as small-pox and measles were mixed up together and not recognized as distinct diseases. It is a disease of childhood and has never been known to occur a second time. The period of incubation lasts from ten to twelve days according to Dr. Murchison and Dr. Squire. Some authorities make it longer.* There is slight febrile disturbance, and the disease ends without any ill consequences, in the course of four or five days. The child is poorly and off his appetite; there is lassitude and flying pains about the limbs, and the sleep is disturbed. Small red pimples appear, which change into vesicles containing a thin transparent fluid, or slightly turbid serum. On the third day they mature and burst, and dry up on the fifth without leaving any mark as in variola, or having an inflammatory areola. The eruption comes out irregularly, and new vesicles may be seen just making their appearance as the old crop are fading away. It is first observed on the body and back, then extends to the face and scalp, and lastly is seen scattered over the extremities. When the vesicles are pricked they collapse, and there is no swelling or distinct elevation of the skin. Children of all ages are liable to the complaint, but it is not so common after the seventh year. It cannot be communicated by inoculation; it is no protection against small-pox, and vaccination has no power to prevent the disease.

The *diagnosis* from modified small-pox rests on the fact that the eruption of varicella is most marked on the back, the face often entirely escaping, and that owing to the eruption coming out in an irregular manner, all stages may be met with at the same place on the same day, whereas in small-pox the rash is either all papular, vesicular, or pustular.

The *treatment* required is confinement to bed, a light fluid diet, and a saline and antimonial aperient. If any of the vesicles are umbilicated, and likely to leave a scar on the face, they may be touched with collodion. For any subsequent weakness that remains during convalescence, a little quinine or the syrup of the iodide of iron will be found necessary.

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* See Clin. Trans., 1878, p. 240, Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases, by Charles Murchison, M.D.

CHAPTER X.

MORBILLI OR MEASLES.*

VARIETIES OF MEASLES: 1. *Morbilli mitiores*—2. *Morbilli graviores*—3. *Morbill sinei catarrho*—*Symptoms of each form*—*Character of the eruption*—*Its lingering nature in some cases.* MORTALITY, CAUSES, AND COMPLICATIONS: *Not always attributable to unhealthy localities*—*Frequency of bronchitis and pneumonia*—*Rapidity with which the lung becomes hepatized in some cases*—*Intestinal irritation and diarrhœa*—*False croup*—*Congestion of the brain*—*Pharyngitis and aphthous ulceration of the mouth*—*Swelling of the cervical glands*—*Case in illustration.* SEQUELÆ: *Cancrum oris*—*Strumous ophthalmia and ulceration of the cornea*—*Otorrhœa*—*Suppuration of the cervical glands*—*Chronic diarrhœa*—*Phthisis.* TREATMENT: *Importance of maintaining a warm temperature and good ventilation in the sick-room*—*Utility of cupping where pulmonary engorgement and cerebral congestion are present*—*Value of stimulants in the typhoid stage of the disease*—*Bulimia.*

Measles is a more prevalent, but a less dangerous disease than scarlet fever, and the greatest proportion of children that fall victims to it are under the age of five years. In scarlet fever the same rule as to age applies, though not to the same extent. Although measles is essentially a disease of early life, it may occur almost at any age, and few persons at one time or another escape it, whilst scarlet fever frequently spares people altogether.

The period of incubation is much longer than in scarlatina, and extends from ten to fourteen days, during which time the patient is apparently quite well. The eruption generally appears on the fourth day of the fever. In my own family, three children, who were laid up with it at the same time, exhibited a short febrile stage, the eruption appearing on the second and third days of the fever, and cases are unquestionably to be met with where the catarrhal symptoms and the eruption are coincident.†

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* "Measles and scarlet fever were long regarded as varieties of small-pox. Measles was first distinguished from variola by Abu Dschafar, and other Arabian physicians in the twelfth century; but measles and scarlet fever continued to be looked upon as one disease, which was designated '*morbilli*.' An Italian physician, Philip Ingrassias, of Palermo, in the middle of the sixteenth century, first described scarlet fever, which he called '*rossalia*,' as distinct from morbilli or measles."—*Clinical Lectures on Medicine*, by Dr. Murchison. A Case of Rötheln, or German Measles, Lancet, October 29th, 1870, page 595.

† Some degree of confusion and even error are apt to arise in calculating the duration of the incubation period, some authorities reckoning from the time the poison is received into the system, and the first appearance of symptoms, whilst others calculate from the same period, till the eruption shows itself. If the former method of calculation is adopted it will reduce the incubation period to ten or eleven days. See Clin.

Three varieties of measles are described:

1. *Morbilli mitiores.*
2. *Morbilli graviores.*
3. *Morbilli sine catarrho.*

1. *Morbilli.*—The disease sets in with symptoms resembling the approach of a severe cold, or with a convulsive seizure. These are pallor, loss of appetite, and shivering; the child is languid and heavy, and lolls where it can; headache, drowsiness, and restless sleep, with wandering and screaming at night, are noticeable warnings. These symptoms are so severe in some children that it is difficult to prevent them from falling out of bed. About the third, or more frequently the fourth day after these premonitory signs, the eruption appears. At first it is not unlike fleabites, and may be seen on the forehead, face, thorax, and neck; in one case under my care the eruption in the first instance seized the left cheek and neck, and twelve hours elapsed before the eruption appeared on any other part of the body; there is scarcely any on the arms and legs at the beginning, but in the course of twenty-four hours it extends to the trunk and extremities, and may be noticed on the back of the hands, the papules being darker, smaller, and less coherent. The eyes are suffused and watery, and the conjunctivæ injected in most cases; but this is not necessarily so, and the eyes in the worst forms may have a dull look and be free from irritation; or the lids may stick together, and the eyes remain closed during the activity of the eruptive stage. The mucous membrane of the nose and fauces is congested, and there is frequent sneezing; the cervical glands are felt to be enlarged. The skin is hot, and the temperature may run up to 104° or 105°, but in ordinary cases it will rarely be found to exceed 102°; the pulse may range from 140 to 160, while the respiration is hurried and short. The bowels are generally costive, though there may be diarrhœa, and the urine is turbid and contains urates; the tongue is covered with a thick creamy fur, which shows points of redness as it is removed, and the whole may become red and moist by the eighth or tenth day from the commencement of the symptoms. Pharyngitis, pain in swallowing, thirst, and loss of voice are frequently present, and the irritation extending into the lungs causes loss of sleep and

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Trans., 1878, p. 238, Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases, by Charles Murchison, M.D.

restlessness.* Remissions and exacerbations are common, as in some other diseases of children. Vomiting is occasionally present at the commencement of the disease, but it is far less frequent than in scarlet fever, and is not so generally confined to the early stages. In one case, however, a child fourteen months old vomited thirty times a day, and before the eruption appeared I dreaded some cerebral affection. "Vomiting occurred during the first stage, sometimes almost as late as the eruptive period, in thirteen, and was absent in twenty-three cases, of which I have preserved records."† The little patients may bring up bile from the violence of the retching, and epistaxis from the fulness of the nasal vessels is not unfrequently met with. There may be no thoracic complication in the shape of cough or bronchitis for the first two or three days of the eruption, but when it becomes more marked and developed, and is raised above the skin in blotches, the cough is incessant and irritating, and both small and large crepitation are heard throughout the chest. I have noticed the upper lobes of both lungs frequently attacked, and where the lower were not the first to show signs of mischief, and that, too, in cases which were not tuberculous. This is owing to the extension of the inflammation down the larynx and trachea to the bronchi. When the eruption is at its height, and the bowels are free, the pulse usually begins to fall in frequency, and the temperature declines, but the symptoms do not generally decrease on the appearance of the eruption; they often increase, and the breathing becomes accelerated and embarrassed. On the seventh day of the fever the eruption begins to fade, and by the tenth day the child may be downstairs and well, having scarcely any cough, or in any way complaining. In some cases there is only occasional loose cough, without any physical signs. The eruption, too, is variable. On the morning of the third day of the fever it may be copious on the face, and the papulæ may be distinct and elevated above the

* A delicate boy, aged six years, came under my care in March, 1877, and on the fourth day of the fever the temperature was 104.8°, pulse 176, respirations 28; and on the seventh day, when the eruption could scarcely be defined, the temperature reached 105°, pulse 200 running, respirations 60; there were extensive râles through the front and back of the chest, yet the urine was copious, clear, acid, specific gravity 1022, and at no time of the illness did it throw down the slightest deposit, or deviate from health. As an instance of rapid recovery and convalescence, this little boy, who was near death on the 28th of March, and in a critical state for a week after, was running about the ward with scarcely any trace of catarrh on the 11th of April.

† On Diseases of Children, by Lewis Smith, M D., Philadelphia, 1869, p. 461.

surface; by the evening the eruption may run together, and assume a large vermilion patch on the cheek. The constitutional symptoms run high, with considerable fever, thirst, and wandering; next day the eruption may assume a more purple hue, to be again followed by increasing brightness of color. Sometimes it is confluent, resembling scarlet fever, and the spots are dark and purplish from rupture of the capillaries, and remain for a length of time, and do not disappear on pressure. Sometimes the rash begins to fade as early as the fifth or sixth day, and from above downwards in the order in which it has first appeared. During the next two or three days the cuticle desquamates in furfuraceous scales. About this time diarrhœa is not uncommon, and if the weather is cold and great precautions are not observed, capillary bronchitis or pneumonia may supervene. If on the seventh day of the fever there is an increase of temperature, and the pulse and respiration are also more frequent, we may reasonably take alarm, because the symptoms have become aggravated at a time when they ought to be better. In such cases I have known the eruption copious and dusky, with the features swelled, and the lips dry; in a recent case under my care there was albumen in the urine from renal congestion, wandering at night, and diffused bronchitis.

2. *Morbilli Graviores—Malignant Measles.*—The symptoms here are more severe from the first; the eruption comes out irregularly, lasts longer, and has a dark-claret hue, which has received the name of black measles. It is slightly raised above the skin, and has the appearance of petechiæ. Some authorities do not consider this a distinct species, holding that the darker color of the eruption is due to imperfect decarbonization of the blood from pulmonary complication. The disease beginning as morbilli mitiores may pass into this grave variety. The constitutional symptoms are of a typhoid character, the pulse is frequent and small, the aspect heavy and bloated; the tongue is dry and glazed in the centre, and sordes collect on the teeth; the motions are dark and putrid, or there is severe diarrhœa. The lungs are early involved in capillary bronchitis or pneumonia, and death takes place in many instances by asphyxia or coma. There is dry and constant cough, and the child is drowsy and indifferent. Râles are heard over the posterior surface of the lungs, and air enters them imperfectly. I have known them so loud, and the mucus so great in the tubes, as to give rise to physical signs bearing a close resemblance to the gurgling of a

cavity, and yet in a week after the whole lung has been resonant, while scarcely a trace of bronchial irritation remains. The blood in these cases is dark and fluid, and the fibrin and solid parts are deficient.

3. *Morbilli sine Catarrho.*—This is by some regarded as merely a mild form of measles without the occurrence of pulmonary symptoms; just as there are also cases in which the eruption fails to come out, and which, with all the other symptoms marked, must be classed as irregular forms of measles. The fact is, however, many cases of so-called morbilli sine catarrho are really cases of rötheln, or nothing more than varieties of erythema.

The mortality of measles is estimated at 1.15 per cent., but the fluctuation is considerable from year to year. It is essentially a disease of early life, for it seldom recurs, and, unlike scarlet fever, the deaths appear to be greatest between one and two years of age. After the age of five years the mortality undergoes great diminution. The returns of the Registrar-General give the greatest number of deaths before the completion of the first year; the absolute mortality is greatest among male children, but as more boys are born than girls the proportional death-rate is almost equal in both sexes.

Causes.—The disease is due to a specific poison, and it may be inoculated by the blood of a person suffering from it, or the secretion from the nose and air-passages.* The poison is more powerful in some epidemics than in others, which is perhaps due to atmospheric changes; those in the winter months are proverbially more severe than those in the summer months, from the liability to more pulmonary mischief. The cause of death among the poor is in many instances pneumonia, brought on by want and exposure, and inattention to temperature. An epidemic does not always seize upon unhealthy localities where dirt and destitution abound, or where the water-supply is deficient, but where unrestrained intercourse is permitted to take place between healthy and diseased children.†

* Drs. Braidwood and Vacher, of Birkenhead, have found that glycerin breathed on by a patient suffering from measles during any of the eruptive days, exhibited numerous spherical sparkling bodies, like those found in vaccine, but larger, and others elongated, with sharp cut ends sparkling and colorless. Such particles were not found in glycerin breathed on by healthy children, nor even by those suffering from scarlatina or typhus. Trans. Path. Soc., vol. xxix, p. 422.

† Outbreak of Measles, Brit. Med. Journal, Dec. 1st, 1867, p. 574.

Of the complications of measles, the chief are bronchitis and pneumonia, and these most frequently commence in the first stage of the disease when the eruption is at its height; or when the patient has suffered exposure to cold; or in its decline, even when the most assiduous precautions have been followed. When it does arise during the first four or five days of the fever, the rash often disappears, and the pulmonary symptoms proceed to a fatal termination. The lung speedily runs into hepatization, and there may be scarcely any cough to direct our attention to it. Wherever there is any thoracic mischief the chest should be examined at each visit, for the slight bronchitis which almost invariably accompanies measles may creep down into the air-passages, and extend to the smaller bronchial tubes and the vesicular tissue of the lungs. The occasional absence of cough and dyspnœa should not mislead us, when we remember how much the thoracic organs may be involved with little disturbance of their functions. But broncho-pneumonia implicating the minute structure of the lungs will soon cause acceleration of the pulse, and produce some lividity of the features. When these symptoms are present it would be inexcusable to overlook the physical examination of the chest.

Another complication of measles during its progress is an attack of colitis, in which the motions contain mucus and blood, accompanied by pain and drawing up of the extremities. The solitary glands are inflamed and tumefied, a condition which may run on to superficial or deepseated ulceration, and the child may perish from diarrhœa and exhaustion. If it occurs after the eruptive stage in the decline of the complaint, it is more difficult to arrest, and may cause death after some weeks. Thus the same tendency to irritation of the pulmonary mucous membrane is apt to extend itself to the intestinal canal, and if, from constitutional weakness, the child's strength is greatly reduced by a slow and imperfect recovery, then phthisis may supervene after many weeks or months.

Croup is another disease which occurs as a complication of measles. A case is recorded by Mr. Royes Bell, of a boy, seven years of age, in which there occurred on the second day of eruption a croupy cough. The paroxysms of suffocation became so frequent that tracheotomy was performed, but the child died of ulceration of the trachea fifteen days after.* From my own observation I should say that inflammatory croup or catarrhal laryngitis

* Case of Measles complicated with Croup, the Lancet, vol. i, 1879, p. 295.

was not uncommon. It is characterized by soreness of the larynx, and a loud, shrill, ringing cough. The child may cough up a little thin phlegm, but no false membrane is ever formed as in membranous laryngitis. The aspect is never so distressed or anxious, nor is the voice so subdued, or the cough so hoarse. If diphtheria is epidemic when measles prevails it is a frequent complication, and even without this complication the mucous membrane of the mouth and pharynx sometimes takes on an aphthous and ulcerated condition about the eighth day, when the decline of measles is ordinarily looked for.*

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* On the 17th of April, 1877, at 10 o'clock A.M., I saw, with Dr. Cleveland, of Maida Vale, a male child, eighteen months old, who, on the seventh day of measles, was seized with swelling of the cervical glands on both sides so as to obliterate the ramus of the jaw. I saw him on the eighth day, when the temperature was 102.4°, the pulse 126, respiration tranquil; the mucous membrane of the cheeks and lips, the sides of the tongue, pharynx, and tonsils, were covered with a yellowish fibrinous exudation, which was firmly adherent to the mucous membrane in some places, but easily separated in others. The child could swallow and speak distinctly, but there was irritation in the larynx and a little mucus in the upper bronchial tubes as revealed by auscultation. A spray of carbolic acid was used (1 in 50) with the effect of dislodging a considerable quantity of mucus from the air-tubes, which gave great relief (see Chapter XI, "On Scarlet Fever"). At 9 P.M. he was intelligent and clear, the glands were less swollen, the throat was less oppressed, and the breathing easier, but the temperature was 104.8°; the pulse small and running 180, respirations 50; the face was flushed, the tongue dryish; he was disposed to sleep, and could swallow well.

On the 18th, 10 A.M., the temperature was 104°. He had been restless and uneasy all night; there was much discharge from the mouth and nostrils.

On the 19th, 10 A.M., temperature 102°. His general appearance was better, and his bowels had acted very freely from the mixture of chlorate of potash, quinine, and dilute hydrochloric acid ordered on the preceding day. At 3.15 P.M. temperature 102°; was cheerful and observant, refused beef tea, but took milk without much forcing. 10 P.M., temperature 103°, pulse slightly better, discharge from mouth and nose less; the spray had been used twice; glands on right side of face less swollen.

20th, 10 A.M., temperature 100.8°. He appeared wonderfully better, sitting up in bed and looking bright, but in the evening he was more feverish, and the temperature was 101.2°.

21st, 10 A.M., temperature 101°. Less cheerful, being listless and indifferent; there was great difficulty in getting him to take nourishment. Brandy and milk given every three hours. The swelling and inflammation in the throat had increased, but the discharge was less, pulse running and rather feeble. 10 P.M., temperature 103°, pulse still feeble and quiet; seemed sluggish when left alone and violently irritable when disturbed to have food given him; some soreness in swallowing, but took milk without much pressing.

22d, temperature 101.8°. Looked brighter, and glanced about quickly; had taken a pint of milk during the night, and thirty drops of brandy every three hours; the pulse was feeble and he was much inclined for sleep. At another consultation (3 P.M.) the temperature had reached 103.3°, pulse 128, feeble, respiration quiet, the tongue was

In three or four instances in my own experience, congestion of the brain and effusion into the ventricles and base of the brain carried the children off.

Among the *sequelæ* are cancrum oris, and a severe and troublesome form of strumous ophthalmia, leading in many cases to ulceration of the corneæ and permanent damage of the organs of vision. Otorrhœa is another common affection, so is suppuration of the cervical glands; chronic diarrhœa, phthisis, croup and enlargement of the mesenteric glands are also among the consequences of the disease. When whooping-cough follows, it has probably been contracted beforehand.

Except in the malignant form, measles may be considered a favorable disease if the febrile symptoms are moderate, and the

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partially covered with a creamy exudation at the sides, inside of cheeks and lips, and there was a small, irregular, dirty ulcer below the inferior incisor teeth; the pharynx was red and swollen, and an attempt at examination dislodged from the air-passages a good deal of muco-purulent secretion; the nasal passages were also discharging a watery, glairy secretion, but in no way offensive; the urine was clear and non-albuminous. As there had been some purging from the chlorate of potash and quinine mixture, Dr. Cleveland gave five minims of tincture of the perchloride of iron in a little syrup of orange-peel every four hours; a poultice was applied to the throat.

23d, 10 A.M., temperature 101.3°. The mouth was less swollen; he swallowed well and drank milk freely. At 10 P.M. the temperature rose to 103.4°, the glands and throat were more swollen, and he was restless and averse to nourishment.

24th, 10 A.M., temperature 101.4°, pulse 136, respirations 40. The lungs were clear and resonant throughout, and there was neither difficulty in swallowing nor embarrassment in respiration; a large white aphthous patch covered the hollow of the hard palate and the tongue; the neck was much swollen, but no sign of suppuration. The iron and chlorate of potash mixture was resumed. 10 P.M., temperature 102°. General appearance dull and feeble; would take nothing but milk with a little brandy in it.

25th, 10 A.M., temperature 100.8°. Throat much less swollen, and general appearance brighter; was interested in his playthings, and talked a little; discharge from nose less, but slimy saliva was discharged from the mouth. Had taken a quart of milk and two eggs, and occasionally half a teaspoonful of brandy in twenty-four hours.

27th, 10 A.M., temperature 99.8°. Nasal discharge had ceased; the mouth was much cleaner, and the secretion diminished; cervical glands much reduced in size, but the pharyngeal redness continued. 10 P.M., temperature 101°; pulse good; sleeps well.

29th, 10 A.M., temperature 99.4°. Had wonderfully improved, and sat up for a short time near the fire; glands again smaller in size, and no difficulty whatever in swallowing. Has complained for two days of tenderness about the wrist of right arm, and today both arms seem affected with rheumatism.

May 2d. Had had pains in the parts last alluded to, but he ran about the room, and was removed to his mother's home, some two miles distant; temperature 99°.

May 12th. No complaint of pain now; the ulcer on the inside of the lower lip had not healed, but the glands of the neck were natural, and he was in every respect convalescent.

eruption comes out well. Notwithstanding the activity of the eruption, it is to be viewed with apprehension if the skin is hot and dry, and the respiration hurried. If the fever increases after the appearance of the rash, and the pulse becomes quick and small, the patient's condition is alarming; and if pneumonia or whooping-cough, or constant diarrhœa be present, the danger is proportionately greater.

Treatment.—The temperature of the room should not be less than 70°, and all draughts should be carefully excluded. In mild cases it is only necessary to confine the patient to bed, and to maintain warmth and a gentle action of the bowels. For the first three or four days the diet should consist of gruel, milk and water, thin beef tea, or chicken broth. Barley-water flavored with lemon, linseed tea, and the inhalation of steam will be grateful to the sore and inflamed mucous membrane. If the febrile symptoms are considerable, a diaphoretic mixture* with a little antimonial wine every four hours, or a saline aperient,† will be necessary to encourage the action of the skin and bowels. Sometimes a warm bath, if the skin is dry, to promote perspiration, will be found serviceable. When symptoms of exhaustion are threatening, the carbonate of ammonia, with a little spirit of nitrous ether, may be given, and alcoholic stimulants, if they seem to be demanded, such as brandy or sherry beaten up with egg; and raw-beef juice has proved useful in cases that at one period of the illness appeared hopeless. If the cough is very troublesome, and the patient can obtain no rest at night, a little ipecacuanha wine with morphia, or the compound tincture of camphor may be prescribed when the lungs are not overloaded with mucus (Form. 77). Hydrate of chloral, with syrup of tolu, or these combined with bromide of

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* Formula 7:

℞ Liquor. amm. acet., ... ℥j
Vin. antim., ... ♏xl
Syr. tolutani, ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A tablespoonful every four hours. For a child five or six years old.

† Formula 8:

℞ Magnes. sulph., ... gr. xl
Potass. nitrat., ... ℥ss.
Syr. limonum, vel syr. tolut., ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A tablespoonful every four hours. For a child five or six years old.

potassium, will allay excitability and promote sleep, whilst a warm bath is soothing and hastens the process of desquamation.

When the pulmonary symptoms are severe, and there is drowsiness, blood should not be taken from the arm, but cupping between the scapulæ may be resorted to if the pulse is small, firm, and hard, and the rash well out. After this the air will enter the lungs more freely, and the duskiness of the eruption will be exchanged for a more general redness. In the malignant form of the disease, where there is a typhoid condition, the strength must be supported from the first, and eggs, beef tea, milk, coffee, etc., must be regularly given. Brandy or wine should be mixed with an egg or milk, and given, notwithstanding any delirium that may be present. If the breathing is hurried, or there is dulness or crepitation in the lungs, and especially if there is any difficulty in expectoration, carbonate of ammonia, spirit of chloroform, and senega will be necessary (Form. 69, 70). If the eruption is dusky, or disappears too suddenly, and there is any oppression in breathing, mustard poultices should be applied to the chest, the feet plunged into warm water, and wine and diffusible stimulants freely given.

When the child begins to recover, and during convalescence, it cannot be too much insisted on that all chance of cold should be carefully avoided, as neglect of this rule may, by weakening the general health, invite some of the troublesome sequelæ we have alluded to, and among them tuberculosis ; for measles seems to have the power of especially rousing into activity the various forms of scrofulous disease. Warm clothing and flannel worn next the skin are most important, and sea-bathing and cold sponging are very valuable, if used in proportion to the strength and constitution of the child.

When measles has been severe, and has reduced the general strength by causing some degree of subacute pneumonia, or chronic intestinal disorder, it is sometimes followed by a voracious appetite, and a sensation of hunger approaching to bulimia. This is also noticeable as a sequel to some other diseases of children where digestion is imperfectly performed, and the absorption of the chyle does not ensue owing to disease of the mesenteric glands. If, because of this insatiable appetite, food is injudiciously given, the digestive organs are never rested, but grow weaker and weaker, whilst the body slowly wastes. In these cases the complexion is

wan and pale, and nothing does any real good. The tongue is commonly covered with a light fur in the centre, and the papillæ are prominent, the epithelium peels off in places, and it presents a sore and ragged appearance. These children swallow their food as soon as it is in their mouths, and thus overtax the feeble mucous membrane. The rational treatment consists in restraining the child's consumption of food, and giving at first an exclusively milk diet, and, later on, beef tea, eggs, etc. Medicinally, a few grains of chlorate of potash, with dilute hydrochloric acid, will be useful.* Quinine, steel wine, and, above all, cod-liver oil will be found of the greatest service during convalescence.

RÖTHELN, OR GERMAN MEASLES (RUBEOLA NOTHA).

Usually a mild affection, resembling common measles—Premonitory fever seldom exceeds twenty-four hours—Eruption brighter than in measles, less diffused than in scarlatina—Cervical glands slightly enlarged—Symptoms and treatment.

Rötheln, or German measles (scarlatina morbillosa—hybrid measles),† is reckoned as a mild affection, and frequently fails to come under the notice of the great bulk of the profession. It is still, however, of importance, and possesses a few special peculiarities with which we ought to be acquainted. Formerly some observers regarded the disease as a modification of measles and scarlatina. I am disposed to think that doubtful cases of erythema or urticaria are sometimes mistaken for measles or scarlatina; for it is certain that in practice we encounter cases of febrile excitement in young children attended with an obscure rash which it is impossible to classify under any recognized exanthem. It is probable

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* Formula 9:

R. Potass. chlorat.,	gr. xx
Acid. hydrochl. dil.,	♏xl
Syr. hemidesmi,	℥ss.
Aquam ad	℥iv.—M.

A tablespoonful three times a day. For a child five years old.

† It is clear that the name of "hybrid measles" or "hybrid scarlatina" is both objectionable and confusing, because it is calculated to lead the observer to suppose that the disease is a modified form of measles or scarlatina, or in other words a combination of the two disorders. Copland (Med. Dict., p. 652) speaks of rötheln under the head of rose-rash, and terms it red-rash, or false measles. The leading features appear to be the absence of catarrhal symptoms, the slight amount of fever, and the enlargement of the cervical glands.

that Vogel,* under the title of rötheln, describes the same disease as the one under consideration, though he says the duration of the eruption, which is considered the most characteristic symptom, lasts only one, or at most two days, whereas Murchison and Liveing say that it continues four days. These writers both speak of the occasional presence of catarrh, whilst the German author notifies its uniform absence. But probably different epidemics vary a little in their symptoms, as we find is the case with common measles.

The disease presents some symptoms allied to, but many unlike, the common form of measles. The eruption is said to partake of the character both of measles and scarlatina, yet it is now regarded as specific and distinct from both. The swelling of the throat and tonsils, and the white coated tongue, followed by redness and enlargement of the papillæ, resembles scarlatina; while the catarrh and congestion of the air-passages liken it to measles. But it is *less severe* than either of these fevers.

In severe cases the complaint is ushered in with shivering and febrile disturbance, headache, pains in the limbs, sore throat, redness of the pharynx and tonsils, and in some instances nausea, and even vomiting. In addition to these symptoms, the respiratory organs are sometimes slightly affected, and there is catarrh, short cough, sneezing, and coryza. There is not this complete set of symptoms in all cases, but some are usually present. The remarkable feature of the affection is, that the premonitory fever, instead of lasting three or four days as in common measles, seldom con-

* "The exanthema differs in no respect from that of morbilli; small round spots of the size of lentils cover the entire body, occasioning, in most instances, a considerable amount of itching. At some places these spots stand so closely together that they coalesce and form irregular figures. They also rise somewhat above the level of the normal integument, and the finger, in lightly passing over them, perceives an unequal hardness. *The eruption, however, differs very much from measles in respect of its duration.* It completely disappears by the end of the first, or, at the longest, by the end of the second day, and the desquamation that succeeds it is very insignificant, barely noticeable. The same is true of the catarrhal symptoms. Although, along with an intense eruption of the exanthema on the face, the eyelids swell up, and the conjunctivæ are somewhat injected, still *bronchial catarrh is uniformly absent*, which, in morbilli, on the contrary, is a pathognomonic, never-failing symptom. Scarcely any precursory stage was noticeable in most of our cases, and the indistinct febrile phenomena disappeared so completely after the first day, with the fading of the exanthema which soon followed, that by the third day it was totally impossible to keep the children in bed, and they quickly recovered without the first sequelæ."—*Diseases of Children*, 1874, p. 495.

tinues more than twenty-four hours, when the rash makes its appearance, and hence, if this be true, we have a means of diagnosis which is distinct and valuable.

The eruption first appears on the thorax and arms, but often on the face and neck; it is characterized by small, red, elevated patches, or distinct and minute round papules. They sometimes coalesce and run together, forming large and irregular patches, and when the patches unite, the body becomes universally red, and the eruption resembles that of scarlet fever, being brighter than that seen in measles. When the rash disappears the skin may desquamate in branny scales, so we cannot attach much importance to desquamation as a diagnostic feature. "The eruption is copious in a direct ratio to the severity of the general symptoms."* With the appearance of the eruption the throat affection is apt to increase, and the swelling in rare instances becomes so great that the patient is unable to swallow. The cervical glands, too, become inflamed and enlarged.† "The protracted duration of the eruption is certainly one of the characteristics of the malady, though no doubt a more or less variable one, and of little or no value as a means of early diagnosis. In the case under my care in the hospital the eruption lasted from five to seven days, a longer time than is usual either in measles or scarlet fever."‡ It appears to me that not much reliance can be placed upon the duration of the eruption, or to the extent of the desquamation, as in one case of ordinary measles under my care in April, 1877, the skin was desquamating at the end of a month, the eruption though faded was distinct at the fourteenth day, and after washing, it was quite bright on the extremities, neck, and shoulders.

Another very important feature of rötheln is that it never produces measles or scarlatina in others, so that, from this point of view, it is entitled to be regarded as a distinct and independent

* Case of Rötheln or German Measles, by Dr. Murchison, Lancet, Oct. 29th, 1870, p. 595.

† In the cases described by Dr. Julius Pollock, the cervical glands were a good deal enlarged, the tonsils swollen and red, and where the rash faded a mottling of the skin remained, in most cases for several days. The period of incubation varied from 6 to 8 or 14 to 16 days.—Lancet, May 12th, 1877, p. 681. Dr. Squire gives the period of incubation from 14 to 21 days. Mr. Parker Douglas says that the glands behind the sterno-mastoid were affected in his cases, that coryza is not invariable, and that a mottling of the skin is left which persists for a few days.—Lancet, May 26th, 1877, p. 784.

‡ On Rötheln, or German Measles, by R. Liveing, M.D., Lancet, March 14th, 1874. See also Diagnosis of Skin Diseases, p. 44.

disease. It has a tendency to propagate itself, and epidemics of it have been recorded, but it is doubtful whether the disease is so contagious as the other exanthemata. It affords, moreover, no protection against the two diseases to which it bears a close resemblance, for some children who have suffered from it previously, and others subsequently, had both scarlatina and measles; and those suffering from it have not, in a single instance, communicated either of these latter diseases to others.

The disease, though highly contagious, appears to be more epidemic than measles or scarlatina, and is a milder affection than either. One attack is protective against a recurrence of the disease, but not against a subsequent attack of common measles.

The idea has been started that rötheln is common measles modified by a previous attack, but the fact that rötheln frequently precedes measles is conclusive against this view.

Albuminuria and dropsy are rare complications; these diseases may result from the temporary renal congestion of ordinary measles, but their absence distinguishes them from the sequelæ of scarlatina.

I would again repeat that the type of the disease varies with the particular epidemic; a fact which is too apt to be lost sight of; and which explains the slight differences in the descriptions of authors.

The *treatment* consists in confinement to bed, a febrifuge mixture to encourage diaphoresis (Form. 7, 12), and, if catarrhal symptoms arise, demulcent and sedative remedies (Form. 65, 66, 74) as the case may appear to demand them.

CHAPTER XI.

SCARLET FEVER OR SCARLATINA.*

VARIETIES OF THE FEVER AND THEIR CLASSIFICATION: 1. SCARLATINA SIMPLEX—*The premonitory or incubation stage—2. The stage of eruption—3. The stage of decline and desquamation.* 2. SCARLATINA ANGINOSA: *Character of the throat affection and its relation to the eruptive stage—Increased severity of the constitutional symptoms—State of the tongue, pulse and temperature—Alteration in the cardiac sounds.* 3. SCARLATINA MALIGNA: *State of throat and tonsils—Constitutional symptoms of an adynamic type.* 4. SCARLATINA SINE ERUPTIONE: *Absence of the specific eruption and mildness of the symptoms—Tendency to anasarca and dropsy.* PATHOLOGY: *Relation to enteric fever—Coexistence of the two diseases—Dr. Klein's researches on the minute anatomy of scarlet fever.* CAUSES AND CONSEQUENCES: *Predisposing and exciting causes—Pathology and morbid appearances—Mortality—Sequelæ of scarlet fever—Liability to anasarca and acute desquamative nephritis—Congestive or uræmic headache.* TREATMENT AND GENERAL MANAGEMENT OF THE DIFFERENT VARIETIES: *Aconite and its mode of action—Liquor ammoniæ—Sponging the body in high temperature—Delirium and coma—Scarlatinal dropsy—Effusion into the serous cavities—Treatment of the throat affection—Preventive measures.*

SCARLET FEVER, or scarlatina, may be defined as a contagious and infectious fever, attended with a scarlet rash on the body, and with inflammation of the throat and fauces. Three varieties are described:

1. *Scarlatina simplex.*
2. *Scarlatina anginosa.*
3. *Scarlatina maligna.*

Scarlatina has three well-defined stages: 1. The premonitory or incubation stage. 2. The stage of eruption. 3. The stage of decline and desquamation.

1. *The incubation stage* lasts from the day of infection till the commencement of the febrile symptoms, and is usually short. It may extend from three to five, or even eight days. In some instances the period may continue only a few hours.† There is no

* "The term 'Scarlatina' is said to have been the vernacular name for the disease on the shores of the Levant, and was first adopted in a medical work by Prosper Martianus, another Italian physician, who, about the middle of the sixteenth century, also described the disease as distinct from morbilli. Epidemics of scarlet fever were first described in this country by Sydenham in 1676, and about the same time in Scotland by Sir Robert Sibbald, physician to Charles II, and in the middle of last century by Fothergill and Huxham."—Clinical Lectures on Medicine, by Dr. Murchison, Case of Rötheln or German Measles.—*The Lancet*, Oct. 29th, 1870, p. 595.

† Of 75 cases collected by Dr. Murchison, the latent period was less than twenty-four hours in some, and in none did it exceed six days.—Clin. Trans., 1878, p. 257.

exact rule to go by as to the duration of this stage; one child will resist infection for a longer period than another, or the infection, will be slower in disturbing the constitution. Some children are more susceptible than others; and the character of the epidemic may differ in severity. A child may be feeling out of sorts for days, languid, depressed, and "off his appetite," but the illness excites no apprehension if scarlet fever be not prevalent at the time. When chilliness, thirst, quick pulse, and increased temperature of the skin succeed, the parents become anxious. Diagnosis is even now impossible, but if there is nausea or vomiting, and the tonsils and fauces are inflamed during the prevalence of an epidemic, we can scarcely mistake the character of the fever. As the case progresses the breath becomes intensely hot, the skin pungent and burning; and, towards the evening, or during the night, the cerebral functions may be so disturbed as to lead to convulsions or delirium. At this stage the characteristic eruption will appear, and it is seldom delayed beyond twenty-four hours.

2. *The eruptive stage* is marked by small red points upon the face and neck, which extend to the trunk and limbs, especially the inside of the thighs, and the flexures of the joints. In the course of twelve, or at most twenty-four hours, the eruption assumes a general erythematous appearance, and the little patient becomes as red as a "boiled lobster." The rash, however, is often variable in severity, and mixed in its character, so that a young practitioner might be excused for overlooking the nature of the case, when distinct large or small red spots are disseminated over the white normal surface of the body. When the spots are small, scattered, and dusky, there is ground for alarm. When there is a well-developed eruption it relieves the internal organs from excessive oppression by the fever-poison. The eruption is brightest in healthy and strong children, whereas in the feeble it is limited, and the spots approach a claret hue. The eruption of scarlatina, as well as the constitutional symptoms, attain their height by the second day; the eruption begins to decline on the fourth, or at the latest on the fifth day, when the throat becomes easier, and tranquil sleep returns.

The throat of scarlatina is never so painful as it is in severe tonsillitis, where the swelled tonsils almost occlude the pharynx from tumefaction and threatening suppuration.* The tongue is

* The diagnosis of the throat affection is considered in Chapter XXX, On Diphtheria.

very characteristic in most cases, but, like the eruption, does not invariably assume the same appearance. When the eruption is brightest and inflammatory fever runs high, the dorsum and centre are covered with a white creamy fur, and the elongated papillæ project through the deposit, giving the tongue the appearance of a white strawberry. The temperature frequently runs up to 105° or 106°, and some of the worst, and even fatal cases in children, have not exceeded it. It has, however, been known to exceed 112° in fatal cases. The fever and the rash appear to hold a close relation to one another, and they subside simultaneously, leaving the patient weak and languid. In the decline of the disease, the urine frequently contains albumen, and the child is pale and thin. About the third week after apparent and complete recovery from mild scarlet fever, anasarca and albuminuria may set in.

3. *The stage of desquamation.*—The skin begins to peel where the eruption first made its appearance, and if it has been copious, the old epidermis may exfoliate in large scales, or come away from the fingers like a glove; the process is a very slow one, and if precautionary steps are not taken may extend over many weeks. The mucous membrane also participates in this process, by the escape of phlegm from the fauces, and epithelium from the renal passages. The motions at this period are also putrid and offensive, and indicate the profound effect of the fever poison on the two chief excretory channels.

1. *Scarlatina Simplex.*—The disease begins with the usual symptoms of fever: thirst, quick pulse, hot skin, headache, pain in the back and limbs, restlessuess and disturbed sleep. On the second day of the fever, a bright-red scarlet efflorescence appears, having many red points, which are not elevated above the surface of the body. In some parts these small points run together, and cause the redness to be general; whereas in other parts they do not coalesce. The eruption is first seen on the face, neck, and abdomen, and especially over the thorax and bends of the joints. On exposing the back and loins it may be often seen most distinctly. The eruption disappears on pressure, and returns at once when it is removed. About the fifth day the rash declines, and by the eighth it fades and disappears. The cuticle begins to peel and separate about the fifth day from the parts first affected, and this process may continue for many weeks. The hands and trunk may be seen to throw off small or large scales; and, whilst it lasts,

there is great irritation and itching of the skin. At the commencement of the disease, before there is any rash on the body, or the throat is sore, there is pain and difficulty in swallowing. On looking into the throat the tonsils are noticed to be swelled and inflamed, and lymph may be seen adherent to them; there is diffused redness of the soft palate; the uvula is also red and elongated, and the pharynx inflamed. The tongue is covered with a thick white fur, and the papillæ may be seen through it. Sometimes in the course of two days the fur disappears, and leaves the tongue of a strawberry hue, or it is red and strawberry-looking from the first. The appearance of the rash is not attended by any subsidence of the fever, the skin being hot and burning, and the temperature elevated, with wandering and delirium at night; there is probably no disease in which the temperature runs so high. Vomiting is a common and early symptom. I have constantly observed it before the rash, and in this way anticipated the disease. The pulse is frequent, full, and compressible, and ranges from 120 to 140 in a minute. The urine is scanty and high-colored, containing urates at an early stage, and commonly albumen later on. During the fever the amount of urea and uric acid excreted by the urine is increased, while that of the chlorides is decreased.* The rash does not always appear on the second day; it may be delayed in some cases till the third or fourth day, or commence on the first day of the fever. In the mildest cases there is little else noticeable than a general erythema of the skin; there is no pain in swallowing, nor inflammation of the tonsils or pharynx, or, at any rate, the reddening of the throat is so slight that it may well escape attention. The eruption comes out and continues the usual period, followed by desquamation.

2. *Scarlatina Anginosa.*—Here the throat is more severely affected, and the submaxillary glands are frequently enlarged and tender, so that the patient has pain on opening his mouth or in swallowing; the tonsils are covered with a fibrinous or sloughing exudation; one tonsil may be more affected than the other, or neither may be implicated in this way. On the first day of the fever, before the rash appears, I have seen the right tonsil excavated by a deep, ragged, ashy-looking ulcer, and the tongue loaded with a creamy fur at the back. I have also noticed a similar

* Clinical Essays, History of Scarlet Fever.—Dr. Richardson, Asclepiad, vol. i, p. 114.

ulcer on the fifth day of eruption, and general inflammation of the pharynx and uvula, whilst the fur is cleaning off the tongue. Mucus collects about the fauces and throat, causing troublesome hawking and spitting, as well as heavy breathing, and the inflammation extends to the nose or runs along the Eustachian tube to the ear. In one case the whole external ear assumed an erysipelatous redness, and there was much deafness. The patient recovered without any otorrhœa, and with unimpaired hearing. As in the former variety, the eruption comes out on the second day of the fever, when the throat usually becomes easier; the eruption may appear first on the arms and chest, for the reason probably, that protected parts are least likely to be chilled. The rest of the throat may now be swelled, and the left tonsil may present two or three small ashy sloughs, like the right. The pulse may reach 120 or 140, and the respiration become accelerated. The urine at this stage is turbid, often high-colored, and contains a large quantity of lateritious sediment. In some cases the swelling of the throat increases, and the voice becomes husky and weak, though the pulse may have fallen in frequency. On the third day of the fever the eyelids may be swelled, and the conjunctivæ so inflamed that the patient cannot open the eyes; it leads sometimes to ophthalmia tarsi, and repeated small abscesses in the lids. By the fifth day the extension of the sloughing may have ceased, though fresh portions of grayish slough may fix on the uvula, and on any sound part of the tonsils. The skin now becomes cooler, and the temperature falls, the puffiness of the face subsides, and the tongue cleans. The cutaneous irritation at this stage is extreme, and in some cases prevents the patient from obtaining any rest or sleep. Severe febrile symptoms may arise in less than twenty-four hours after infection. In 1869 I was summoned to a young person who the night previous was in good health, and walked and drove out. At my visit, at 9.30 P.M., I found her with high fever, hot and burning skin, great thirst, and loaded tongue; pulse 120, very weak, tremor in the legs, and prostration of strength. Both tonsils and uvula were much swollen and inflamed, and on the right tonsil was a patch of yellowish-looking lymph. There was pain, and difficulty in deglutition, but no hoarseness or enlargement of the glands in the neck. She had been very sick in the early part of the day, and brought up clear bile. The following day the face was much flushed, and a copious eruption of scarlet fever came out

on the chest, abdomen, shoulders, and loins; the skin was hot and perspiring; temperature in axilla 104°; in mouth 105°; pulse 120, firmer and fuller. She could speak more distinctly, though the swelling of the throat was greater, and the lymph on the tonsils was increased. She was in all respects more comfortable since the eruption had appeared, and sickness had entirely subsided. For the next two days the patient remained in the same condition, when the throat became easier, and she could speak with ease and clearness. From this time recovery was rapid, and the convalescence uninterrupted.

In some cases this variety of scarlet fever is attended with more severe constitutional symptoms than those I have enumerated; sleep is disturbed, and exhaustion sets in early; the pulse is frequent and feeble, the secretion of urine nearly suppressed,* and effusion takes place into one or more of the chief cavities of the body.

Scarlatina Maligna (Cynanche Maligna of Cullen).—This is the most alarming variety of all. The disease concentrates its virulence on the throat and tonsils, where dark, offensive exudations form, with deep ashy-looking ulcers and sloughs. The pharynx, uvula, and part of the hard palate are sometimes seen covered with a gangrenous deposit, and a bright-red line of demarcation is visible. Similar ulceration may also be seen on the inside of the cheeks in severe cases; the nostrils also become inflamed, and furnish a thin, irritating discharge, which inflames and excoriates the lip. The salivary glands are also inflamed and swollen. The fever at an early stage of the disease assumes an adynamic type, and the constitutional depression is severe. There is wandering and drow-

* I saw in consultation a little boy, in 1878, who on the fifth day of the eruption passed only two teaspoonfuls of urine in twenty-four hours, containing a considerable quantity of bile pigment and a trace of albumen, so that there was ample proof of very defective elimination. The patient was weak, restless, and wandered at night; the throat was severely affected, and there was a difficulty in getting him to take nourishment. A poultice was applied to the loins, and next day a free secretion of urine took place, in which neither bile nor albumen could be detected. Mr. Naughtin, of Baker Street, informs me that he attended a child, aged six years, in 1875, who did not pass urine for seven days, and she was delirious the whole time. The suppression came on ten days after the eruption had disappeared, and it seemed traceable to eating heartily of indigestible food. There was no vomiting. The first urine passed after this long interval was about a teaspoonful, and approached the color of ink. As the quantity increased the color became normal, and the patient experienced no subsequent inconvenience.

siness, or great irritability and restlessness; the pulse is feeble and rapid, or irregular; the tongue dry, brown, and chapped, and sordes may be seen on the lips, teeth, and gums. The temperature runs high; in a fatal case under my care it reached 108°. Sometimes the patient dies before the abortive eruption comes out. There is no uniformity in the time of its appearance or in its characters; it is often dark and in irregular patches, or it may be pale and bright at first, and then change soon to a claret hue, some spots being larger than others, and there are also observed in some cases petechiæ, which prove that the blood is much changed. The disease in many cases proves fatal on the third or fourth day. How far this variety differs from the others in its real nature is still an undetermined question. Is not the disease the same in all cases,—a distinct fever, brought about by a specific poison, but from constitutional predisposition, locality, physical conditions, or extreme susceptibility of the organism, assuming a mild or a severe form? Epidemics vary in their severity, and produce varieties of type, but a number of collateral circumstances must be ranged side by side, before we can admit any essential difference in the nature of the disease.

There is a form of latent scarlet fever (*scarlatina sine eruptione*) which is of so mild a character that the disease is not suspected till the general health shows signs of failure. I have seen children on various occasions suffering from anæmia and general debility, with or without albuminuria, who have had some desquamation of the skin without the specific eruption. In one case, a little girl, who was said to have escaped the disease when her brother was laid up with it, came under my treatment for symptoms of general debility. Her urine was scanty and non-albuminous, and there was not any sign of anasarca, but I could not avoid associating her state with the probability of infection. She may have had some sore throat and feverish disturbance, but they were not noticed by the mother, though her skin was rather harsh, and the epidermis inclined to peel at the tips of the fingers. Cases of anasarca occasionally come under our notice which have had their origin in the poison of scarlet fever without any eruption. The absence of eruption, and the slightness of the illness, have caused the child's state to be overlooked, and the necessary precautions for avoiding cold and exposure have not been taken. These patients are capable of communicating the disease to others.

As regards the pathology of the disease, I may here give the views of Dr. John Harley,* who describes scarlatina as essentially a disease of the lymphatic system. How far these views may be correct appears to me one of those perplexing questions which further observations only can determine. Dr. Harley gives the post-mortem appearances in twenty-eight fatal cases, and the morbid changes described appear in many of them to resemble the first stage of enteric fever. The glands of Peyer (glandulæ agminatæ) were purple, swollen, and vividly injected, and the mucous membrane of the small intestine was of a pale or bright rose color. The solitary glands were also prominent, and of a yellowish color, "so that the lower third of the ileum appears as if sprinkled with grains of sago"—presenting eminences like hempseeds. This appearance, which French writers call "Psorenterie," was observed in most of the cases. The solitary glands or follicles of the large intestine were also swollen and purple, and the cæcum, where they exist in the greatest number, is sometimes severely congested and inflamed. The spleen in some of the cases was greatly enlarged, and as firm as liver, the mesenteric glands were likewise turgid, and enlarged to the size of a pigeon's egg, and the mesentery has been found converted into a thickened lobulated mass, resembling a bag of large or small marbles. The right cavities of the heart were often distended with blood, and contained colorless clots of entangled fibrin, adherent to the chordæ tendineæ, and continuing through the auriculo-ventricular opening. These wormlike clots extended into the pulmonary artery, the superior cava, and larger vessels of the neck, as far as the cranial cavity. Branches may also be sent into the lungs, from which they may be withdrawn eight or nine inches long. The same may be seen in some cases of surgical pyrexia where a clot is forming in the heart. Oppression and severe pain in the cardiac region, orthopnœa, a rapid and feeble pulse with an alteration in the heart's sounds, indicate that a deposit is taking place.

The left side of the heart in the twenty-eight cases alluded to was generally found empty and contracted; there was only one case in which a fibrinous clot was found in each cavity—in this case there was a fibrinous clot on both sides. The tendency, according to Dr. Richardson, is to the formation of clot in the right

* Med.-Chir. Trans., vol. lv, p. 103. The Pathology of Scarlatina.

cavities, and from what we learn in some other diseases where the temperature is unusually high, it is what we should expect.

The lungs were deeply congested in some of the twenty-eight cases, and points of ecchymosis were seen on their pleural surface, and also in the parietal pericardium. Pericarditis and pleuro-pneumonia are occasionally present. Hæmorrhage from the bowels was the cause of death in one case, and scarcely any part of the mucous membrane was healthy; there was bright-red villous exudation, and the thin vascular membrane came away exposing the bowel, which was blotched and spotted with ecchymosis. General inflammation of the mesenteric glands and those of the pleura are constantly observed, and profuse diarrhœa with light slimy stools as we observe in typhoid fever, are features of clinical interest. Out of the twenty-eight cases, more or less albuminoid or fatty degeneration of the kidneys existed in six. Most of the patients died from the third to the sixth day, but kidney change occurred in no case before the fifteenth day. The bile was found normal only in five cases out of twenty; in the remaining fifteen it was much deranged; the specific gravity was low (1014) in thirteen cases, and the solid matter less than a third of the normal amount; the biliary acids were deficient, but the coloring matter was never absent.

The minute pathological anatomy of scarlatina, according to the most recent researches of Klein, consists mainly of changes in the kidneys, liver, spleen, and lymphatic glands of the throat. In the kidneys there is a proliferation of epithelium cells, and changes in the walls of the bloodvessels. Later on, there is a development of round cells which constitutes a true interstitial nephritis, due to an embolic process. In the liver there is also a growth of round cells and thickening of the walls of the bloodvessels, with an infiltration of the interlobular and intralobular connective tissue. In the cervical glands, there is inflammatory swelling and multiplication of the lymphatic nuclei, and in places, large giant cells containing several nuclei. There is also a hyaline thickening of the arterioles.*

During the last few years many writers have noted the association of scarlet fever with enteric fever, or one has so rapidly followed the other, that they have been naturally regarded as holding some relation to one another. The cases recorded by Dr.

* Trans. Path. Soc., vol. xxviii, p. 430.

Harley show that scarlatina coexisted with enteric fever in a few of them, and that rose spots were distinguished on the abdomen and chest, when there was a general scarlet rash on the body. Papules were also seen distinctly on the pallid skin after the scarlet blush had faded away. The account given leaves little room for doubt. Diarrhœa is common to both diseases in their decline, and the evacuations are alike in character. The tongue in typhoid fever often presents a red angry appearance with enlarged papillæ, as we observe in scarlet fever. We have much evidence to show that mixed cases do exist, and that the two morbid conditions cannot be separated in a few instances where the febrile process is prolonged. The fact of diarrhœa being present in the latter stages of the disease is fully explained by the state of the intestinal glands, and we must, I think, agree with Dr. Harley that this morbid change is one of the strongest proofs that a pathological relationship does exist between the two diseases, which accidental intercurrence fails to explain.

Whatever the resemblance of the pathological states may be, in some cases, such as Dr. Harley relates, the two diseases in their local and general signs present on the whole a striking contrast. If a child goes on well for the first week or ten days of scarlet fever he commonly gets over the attack, but in typhoid fever the disease is lingering and slow, and this security cannot in most cases be felt till some weeks have elapsed. There are crises and relapses which expose the child to danger till convalescence is permanently established. The violence of this short fever is not so alarming as in some others, and cannot be speedily cut short. It is less alarming in scarlet fever than in almost any other complaint. "Delirium," says Dr. Gairdner, "is apt to subside of itself, and may be safely neglected; it will disappear as soon as the crisis is fully established." He quotes the opinion of Heberden, who also entertained the view that there "was no disease in which the patient was more apt to be delirious, and with less danger, than in scarlatina."* Such remedies as antimony and opium are out of the question, and shaving the head to meet the delirium would only be necessary in exceptional cases. When delirium arises the little patients should be carefully watched and tended, but excessive interference is bad practice, and does an infinity of harm.

* Clinical Medicine, by Dr. Gairdner, 1862, p. 193.

Causes.—These are due to the influence of a specific and highly contagious poison. The poison retains its power for a considerable length of time, and the clothes worn by patients suffering from it, as well as carpets, curtains, etc., absorb it. There can be no doubt whatever that medical men sometimes convey it from patient to patient, and so carry it to their own families. Infection is as great at the beginning as during the time of desquamation, but it is worthy of notice, that some persons are more susceptible to infection than others, and that a severe disease though apt to produce its like, may also result from a mild one.

Children at the breast are rarely affected by scarlet fever, but such cases are recorded; the disease is more prone to occur about the second and third year, though there is very little difference up to five years of age, and after this period the deaths undergo a remarkable diminution, but nothing like that observed in measles. Then with regard to the proportion of deaths in the two sexes: more males are said to die under the age of ten, and after ten more females; but as the population in any given district may vary considerably between the two sexes the distinction is not easily recognizable.

As to the influence of meteorological conditions most writers agree that the disease is most prevalent in the autumn, and least in the spring; next follow the summer months, and lastly the winter.

The average annual mortality in England alone from this terrible scourge is estimated at from 20,000 to 22,000. It is greater in towns and cities than in rural districts, and stands highest on the list of communicable diseases. Then follow whooping-cough, measles, and small-pox in the order I have placed them. Although scarlet fever rarely happens a second time, numerous well-authenticated cases are placed on record. When it does happen that a child is seized with a recurrence of the disorder, it is exceptional, and so mild in its nature and progress that it never proves fatal.

Concerning the recurrence of scarlet fever many examples are to be found. A case occurred in the London Fever Hospital under the care of Dr. Broadbent, where the patient had a second attack after being convalescent from a first attack, and whilst the skin was still desquamating.*

A similar case of recurrence, two months after the first attack,

* British Medical Journal, April 1st, 1876, p. 411.

came under the care of Mr. Elkington at the Birmingham and Midland Hospital for Sick Children.* The child, 3½ years of age, was admitted on November 22d, 1875, suffering from a large abscess in the left thigh. There was a history of scarlatinal eruption and sore throat six weeks previously, and the patient was still desquamating. The temperature on admission was 104°. On the 23d the abscess was opened antiseptically, and two ounces of thick creamy pus were evacuated. A drainage-tube was inserted, and for the next eleven days all went well, the temperature keeping normal and the abscess closing quickly. On December 5th the patient had headache, sore throat, and vomited several times; temperature 105°. A rash, resembling scarlatina, was visible on the chest, arms, and neck, and there was great congestion of the throat and tonsils. On the 6th the rash was fully developed over the whole body, accompanied by intense thirst and restlessness. Morning temperature 103°, evening nearly 106°, with delirium. From this time the progress was favorable, the rash fading, and the skin desquamating like an ordinary case of scarlatina. On the 13th the temperature was normal.

There are no more obstinate and troublesome sequelæ from any of the diseases of childhood than those which follow scarlet fever. Otorrhœa and deafness, enlarged glands in the neck, ophthalmia, ozæna, eruptions of the scalp, acute rheumatism, and chorea are the diseases commonly met with. Hypertrophy of the tonsils and persistent anæmia are frequent consequences. However slight the symptoms may be, troublesome sequelæ are apt to ensue, and this is the more likely to happen if the patient quits the sick-room too soon, or the health has been delicate before the attack.

In 1862 I attended a girl, seven years of age, who was seized with the most severe type of the disease, in which the glands of the neck were greatly implicated, and the delirium was so fierce and continuous that her life was despaired of. She made a tedious recovery through having an abscess on the right side of the neck, which pointed over the mastoid process, and led to exfoliation of the temporal bone. Otorrhœa continued more or less, and pieces of bone came away. Twelve years elapsed before the local trouble was cured and the wound healed, but now the hearing is perfect and the health re-established after years of extreme medical care and nursing, which only the wealthy and affluent could procure.

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* British Medical Journal, April 1st, 1876, p. 411.

My experience leads me to think that tuberculosis can be more frequently traced to scarlet fever than is generally supposed. Of all the sequelæ anasarca is the most common,—an infiltration of serous fluid into the subcutaneous areolar tissue,—which is prone to occur in some parts more than in others. If, during the period of desquamation, the patient is exposed to cold from incautiously venturing out too soon, and a chill is received, the escape of the fever-poison, instead of taking place through the skin, is directed to the kidneys, and this sets up irritation and acute desquamative nephritis. It does not induce this in all, as I have on several occasions seen puffiness of the lower eyelids at the end of three weeks, and swelling of the glands in the neck, whilst desquamation was going on without albuminuria. With the kidney affection there is headache, pain in the loins, sickness and diarrhœa, and a large quantity of albumen in the urine, which may be clear when first passed, or turbid and loaded with urates. It may vary from day to day, and sometimes contain a considerable quantity of cayenne-pepper-looking crystals of uric acid; but the albumen may remain undiminished, particularly if animal food is indulged in, or there is any other error in diet. Effusion into the pleural, pericardial, and abdominal cavities is common, and the temperature is apt to run high.* All these symptoms may improve without any diminution in the quantity of albumen.†

A serious consequence of scarlatina is the headache of uræmia, which I have elsewhere fully considered.‡ At the end of three or four years, and long after every trace of dropsy has disappeared, the child so manifestly declines in health and spirits that the attention of parents is at last awakened to his altered condition. He is unable to pursue his studies at home or to continue at school, and he has no inclination to join in the pleasures of his playmates.

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* *Vide* Chap. XXIV, On Acute Desquamative Nephritis, and Œdema of Lungs, Chap. XXVIII.

† "The percentage of kidney complications in scarlet fever varies from five to seventeen. Frerichs has described a rare form of dropsy without any disease of the kidneys occurring after scarlet fever, which he believes to be due to paralysis of the cutaneous nerves by exposure to cold during desquamation, and I have lately seen one such case, where repeated examination of the urine revealed no change, whilst there was very acute dropsy of the skin, without any effusion into cavities, which lasted twelve days." —Steiner on *Diseases of Children*, by Lawson Tait, p. 341.

‡ Headaches, their Nature, Causes, and Treatment, by W. H. Day, M.D., 3d edit. Toxæmic Headache, chap. ix.

A severe and continuous frontal headache ensues, and the child loses his vivacity and interest in everything. The veins are full about the head and lips, in some cases, and there is a set color on the cheeks. The urine is scanty and contains albumen, with renal casts and epithelium; it varies greatly in some cases, the deposit thrown down some days being very considerable, and at other times barely perceptible. Indulgence in animal food is prone to cause renal congestion in these cases, with an aggravation of the head symptoms, and there is associated with it sometimes dilatation and hypertrophy of the left ventricle, increased tension in the pulse, perceptible to the finger, but more accurately estimated by a sphygmographic tracing. For the treatment of this complication the reader is referred to the chapter on albuminuria.

Treatment.—The treatment of mild cases consists in confinement to bed, a mild aperient, and cooling drinks. Rest in bed and judicious nursing will carry most children safely through the attack. With regard to purgatives and active remedies, they have less influence over this disease than some other febrile affections, and the pulse will continue quick, and the temperature high in spite of them. If the bowels are costive and the stomach loaded, an active purgative may be necessary. I give preference to purgative remedies, especially at the onset of the disease. But at the commencement of the disease, and in its early stages, if it is at all severe, the chief indication is to promote a free action of the skin till the child is bedewed with perspiration. If this could be obtained, it would be the best remedy at our command, by favoring the excretion of the morbid poison before it had time to damage any internal organ, and produce those changes in the blood which sometimes lead to fibrinous deposition in the heart. A hot-air bath may be speedily constructed, as in croup, and it should be so arranged that the child's face is exposed to the pure air, which should circulate freely through the room. In hot weather, during the rising of the fever, free ventilation of the sick apartment is not apt to induce cold, but when desquamation has set in there is great susceptibility.

I am here constrained to point out the value of the action of aconite in reducing fever and inflammation, from the influence it exerts in bringing down the temperature and lessening blood pressure. From what we know of its power in subduing fever in some cases of surgical pyrexia it is unquestionably a remedy of great

value, and if we consider the tendency which the blood has to coagulate in its passage through the central organ of the circulation, it might be advantageously resorted to in the early stages of this disease. It brings down the pulse, and promotes a free action of the skin, and encourages the loss of heat by evaporation. In some cases it reduces fever and inflammation, as in tonsillitis, without promoting perspiration. I fully agree with Dr. Fothergill, that the specific action of aconite is exerted on the vascular system, by paralyzing the vasomotor nerves and lessening the contractility of the vessels. If then it has the power of dilating the vessels, and by drawing the blood towards them diminishing the tension in an inflamed part, it ought to be employed where this condition is present. All who have given the remedy a fair trial in catarrh, sore throat, and inflammation of the tonsils, will be willing to admit, that it converts with marvellous rapidity, a dry and burning skin into one that is moist and sweating, and in this way it relieves the restlessness and constitutional disturbance. Aconite is of most service and can be more advantageously employed when the pulse is hard, and the action of the heart strong and violent. My own experience of the action of aconite is, that it lessens the frequency and increases the fulness of the pulse; it reduces the hardness and incompressibility. Half a minim in a teaspoonful of water for a child should be given every hour, but should the pulse become weak or irregular, or there be any sign of weakness or prostration, it ought to be discontinued. The indication for giving aconite is elevation of temperature, for where it is present there is fever or inflammation; when the temperature is normal or nearly so, it should not be employed, but when it shows indications of rising, and the pulse though not more frequent becomes more resisting, it may be prescribed. During scarlet fever, or after it, when kidney complication has arisen, aconite may be given, for if it does not shorten the fever it soothes the nervous system, and by promoting free perspiration controls the inflammation that attends it, and moderates the throat affection.* When the throat is dusky and much swollen, and the

* It is doubtful whether aconite will shorten the fever of acute specific diseases, as scarlet fever, measles, etc., but it has a beneficial influence in these diseases, soothing the nervous system, and favoring sleep, by inducing free perspiration. Whether this remedy can lessen the severity of the fever, or diminish the duration of the acute specific diseases, is doubtful; but there is no doubt it can control and subdue the inflammatory

symptoms assume a typhoid character, aconite would be too depressing, and the local disorder is best treated by the application of nitrate of silver or the diluted tincture of the perchloride of iron. Internally, the iron and chlorate of potash mixture recommended in diphtheria will be found invaluable. (Form. 54.)

Some years ago Dr. Richardson advocated the value of liquor ammonia, from its power in holding the fibrin of the blood in solution, and keeping it in a fluid state. A few drops of the Liquor Ammoniæ in water, with or without the addition of the Liquor Ammoniæ Acetatis, is the form he recommends to be given. Both these remedies tend to eliminate carbonic acid by the breath and skin, but they require caution in their administration, lest the free ammonia interfere with oxygenation, and break up or damage the red corpuscles of the blood.

In *Scarlatina anginosa*, if there is reason to think the digestive organs are loaded, and the tongue is heavily furred, an emetic should be given at the onset. A grain or two of calomel and an active aperient may be ventured upon, if the pulse is full and strong, and the inflammatory fever runs high. Milk and soda water to drink frequently, ice to suck, beef tea and chicken broth will be demanded. Warm linseed poultices, or even two or three leeches, to the throat will be advisable, if there is swelling about the jaws, or pain in swallowing. Effervescing medicines, such as carbonate of ammonia and lemon-juice, are refreshing and agreeable to take.

Sponging the body with vinegar and tepid water (one in four), or iced water, if the temperature runs high, should be practiced three or four times a day. I prefer this milder practice to cold effusions, or cold wet packing, which, so far as my experience goes, are only to be adopted in exceptional cases. The treatment by cold water has proved curative in this variety of scarlet fever when cerebral symptoms are present, and coma threatens; no other remedy except cold having the power to reduce the hyperpyrexia, as in those cases of rheumatism, where a dangerous rise of temperature takes place.* This plan should be adopted when all other

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affections which often accompany them, and which, by their severity, may endanger life. Thus aconite will moderate, but neither prevent nor shorten the course of the inflammation of the throat in scarlet fever, and the catarrh and bronchitis in measles, and in this indirect manner lessen the height of the fever.—Dr. Ringer's Handbook of Therapeutics, 4th edition, Aconite, p. 435.

* See Chap. XLIII, "On Acute Rheumatism."

remedies fail, and the skin is extremely hot, the pulse full, and there is drowsiness, convulsions, or delirium. It is better to immerse the patient in tepid water first, and gradually cool it by the addition of ice. The effects of the bath on the temperature should be carefully watched, the patient not being kept in it for more than ten minutes at one time. If there is delirium and a tendency to coma, the scalp may be shaved, and cold lotions applied to the head. In this form of the disease, depression soon sets in, and port wine, beef tea, champagne, and soda-water will be required.

For the throat affection, if the patient is old enough to manage it, a gargle of chlorate of potash and dilute hydrochloric acid will correct the unhealthy exudation that hangs about the throat, but in the case of very young children this cannot be used, and then mopping out the fauces with a solution of nitrate of silver (gr. x to the ℥j) twice a day will be effectual in most mild cases, or a weak solution of chlorinated soda may be substituted.

The inhalation of the steam of hot water as long as the throat is sore, is a safe and excellent practice, and according to Dr. Gairdner, supersedes almost all other local applications.* The inhalers used for this purpose, however useful and easy of application for adults, are somewhat alarming and difficult for very young children. The steam-draft inhaler brought before the notice of the Medical Society of London, by Dr. R. J. Lee, is well adapted in these cases.†

When the exudation is of an ashy color and inclined to extend, the solution of perchloride of iron, applied on a sponge with forceps, will exert an excellent effect. It should be used night and morning at least, and after two or three applications, the throat will assume a more healthy appearance, and the fetor of the breath will diminish. In very young children, it is necessary to apply the solution lightly, and to limit its application to the diseased surface, for if any roughness is employed, and great care is not taken, the healthy parts are irritated, and the soreness and inflammation increased. The diluted solution for children is generally strong enough ;‡ but this may be left to the discretion of the

* Clinical Medicine, Scarlet and Enteric Fever, p. 196.

† Medical Society Proceedings, vol. iv, p. 201.

‡ Formula 10:

℞. Liq. Ferri Perchlor., ... ℥j
Glycerini.
Aquæ, ää . . . . . ℥ss.—M.
Fiat solutio.

practitioner, as where the throat is dark and much implicated, I should not hesitate to employ the pure solution (Liq. Ferri Perchlor., B. P.).

In cases, however, where the jaws are stiff from the swelling, or the child resists obstinately, or is exhausted, it is perhaps better to desist from local interference with the throat. If a case of this difficulty presents itself, the carbolic acid spray is one of the best applications. When foul secretions collect about the fauces, and cannot be thrown off by any efforts of the little patient, the spray ought to be employed. It both cleanses and disinfects. As it is of the utmost importance that the patient should breathe as pure an atmosphere as possible, it is evident that if the air becomes contaminated before it reaches the lungs (as it will do if the throat is covered with decomposing secretions) the child's life is placed in still greater jeopardy. The vulcanite spray producer, as sold by surgical instrument makers, is of great service in all inflammatory or irritative affections of the throat, larynx, and bronchi. It is easy of application, and causes neither pain nor inconvenience. The vulcanite end must be introduced between the teeth and above the tongue, because a young child will not open its mouth when bid. Then with gentle pressure on the hand-ball, a steady and uniform stream of carbolic spray can be kept up and maintained, if compression is made about once in every second. It acts directly on the diseased tissues, and gradually penetrates deeper than any gargle or other similar mode of application; causing neither pain nor irritation to the inflamed and sensitive throat. I give preference to carbolic acid, but other medicinal agents may be used. In cases of throat affection due to the exanthemata, I have seen excellent effects follow the use of the spray vaporizer—the respiration and the power of swallowing rapidly improving, and patches of slough and exudation expectorated. In young children I have on several occasions known life saved by it, and it is a remedy to be held in remembrance. Three or four inhalations may be used in the space of twenty-four hours, and the strength of the liquid may vary from one in twenty to one in forty. For fear of fatiguing the child, each application should not exceed three or four minutes. Soon after its use, I have known a child, previously on the verge of coma and breathing rapidly, wake up lively, and from that time improve, till a repetition of the same application was demanded by a relapse of the symptoms.

Meigs and Pepper recommend a decoction of strong green tea and alum, or sage tea and alum, or lime-water, or honey of roses and borax.* Sir T. Watson a solution of chloride of soda.† Dr. West one part of hydrochloric acid to six parts of honey, by means of a dossil of lint or a camel's-hair brush, two or three times a day.‡ For the coryza, any of the astringent washes used for the throat, or a solution of nitrate of silver—gr. j or gr. ij to ℥j of water, thrown up the nostrils every four hours.§

In *Scarlatina maligna* the treatment must be of a supporting character from the first, and ammonia, bark, iron,‖ port wine, and brandy are required to be given freely. There is here a tendency to failure of the heart's action, either from debility and exhaustion, or from fibrinous deposit in its cavities.

Sir Thomas Watson recommends in scarlet fever a chlorine drink, now well known to the profession. It is composed of eight grains of chlorate of potash, one drachm of hydrochloric acid, and one pint of water. A child ten years of age may have it rather more diluted, and take half the quantity during the day. The chlorine possesses disinfecting properties, and the solution renders the foul secretions which collect upon the fauces less noxious and hurtful, and the tongue becomes clean and moist.¶ Or the following mixture may be used: Put an ounce of chlorate of potash and the juice of two moderate-sized lemons into an ordinary wine bottle, and fill up with water. A wineglassful may be given, or taken, two or three times a day by the patient and by those in attendance.

For the dropsy that follows scarlatina, warmth and a milk diet are to be adopted. An occasional aperient of compound jalap powder in the morning, and small doses of tincture of digitalis with acetate of potash during the day should be given, if the urine is scanty and high-colored, or contains any blood. If there is pain in the loins, a vapor-bath or a poultice, applied every night

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* Diseases of Children, 1874, p. 754.

† Principles and Practice of Medicine, vol. ii, p. 909, 4th edit.

‡ Diseases of Infancy and Childhood, p. 732. § Ibid.

‖ Formulá 11:

R. Amm. carb.,	gr. viij
Tinct. cinch. comp.,	℥ij
Syr. aurant.,	℥iij
Aquam ad	℥iv.—M.

A dessert or tablespoonful every four hours. For a child four or five years old.

¶ Principles and Practice of Medicine, 4th edit., vol. ii, p. 910.

should be employed.* When the urine is clear, though albuminous, and the febrile symptoms have departed, the tincture of perchloride of iron (Form. 53) should be given, and if the child loses flesh, and there is no sickness or diarrhœa, cod-liver oil will be a useful adjunct. For the effusions that are liable to occur in the pleural or pericardial cavity, diuretics and tonics are to be employed, and all those remedies which encourage the action of the excretory organs, and improve the quality of the blood at the same time. When an attack of scarlet fever and its consequences have passed away, the patient should wear flannel next the skin, and go to the seaside for change of air. However well a child may be going on, after a severe case, a month or six weeks ought to elapse before it goes out of doors, and even then the weather should be considered.

For many months after an attack of scarlet fever, and it may even be for an indefinite time, there will be observed in some cases, especially those marked by anæmia, a faint and persistent trace of albumen, with no other morbid change in the urine, as tube casts or renal epithelium. This condition awakens some anxiety, though it may continue for twenty years without any manifest impairment of the general health. When anæmia is present, I strongly advocate the steady use of the tincture of the perchloride of iron, and in some instances, where renal congestion is easily provoked, the addition of gr. $\frac{1}{24}$ of perchloride of mercury three times a day. When the diet is carefully regulated and cold avoided, perfect recovery may take place, but there will be no chance of this, unless stimulants are prohibited, and milk and white fish take the place of meat.

Now, as to some precautionary measures in arresting the spread of this disorder. Isolation of the patients suffering from scarlet fever is one of the chief circumstances to be borne in mind in order to prevent its extension. The apartment in which the sick person

* See Chap. XXIV, "On Acute Desquamative Nephritis." In the Practitioner for August, 1876, Dr. de Havilland Hall has recorded an interesting case of acute desquamative nephritis following scarlet fever, in which the patient, a boy nine years of age, passed no water for fifty hours after admission, and from his mother's account very little had been passed previously. The entire absence of any of the symptoms of uræmia in the case was attributed in part to the fact that all articles of nourishment, except a little milk and a free supply of water, were withheld. The only medicinal treatment was a dose of Pulv. Jalapæ Co. and a drachm of bitartrate of potash as a drink.

is confined should be well ventilated, and curtains, carpets, and all unnecessary articles of furniture should be removed. The bed linen and that worn by the patient should be changed daily, and placed at once into a deep common hip bath, under water, so that the desquamating epidermis may be less likely to propagate infection. I recommend a weak solution of carbolic acid to be thrown into the bath, and two or three saucers containing it to be put in the sick-room and various parts of the house. I also insist on the importance of adding disinfectants to the evacuations, and getting rid of them directly. With these precautions I have often known the disease not to spread. Infection persists so long as there is the least trace of desquamation, and to insure safety, isolation should be enforced for at least a week after the last particle of exfoliated cuticle has been detached.

Dr. Wm. Budd's* directions for limiting the spread of the disease are well known to the professsion His paper is so full of interest, and his directions so eminently practical, that I shall quote the chief precautions which he enforces.

1. The room is to be dismantled of all needless woollens or other draperies, which might possibly serve to harbor the poison.
2. A basin charged with chloride or carbolate of lime, or some other convenient disinfectant, is to be kept constantly on the bed, for the patient to spit into.
3. A large vessel, containing water impregnated with chlorides or with Condy's fluid, should always stand in the room, for the reception of all bed and body linen immediately on its removal from the person of the patient.
4. Pocket handkerchiefs are proscribed, and small pieces of rag are used instead for wiping the mouth and nose. Each piece after being once used is to be immediately burnt.
5. As the hands of nurses of necessity become frequently soiled by the specific excreta, a good supply of towels, and two basins, one containing water with Condy's fluid or chlorides, and another plain soap and water, are always to be at hand, for the immediate removal of the taint.
6. All glasses, cups, or other vessels, used by or about the patients, are to be scrupulously cleaned before being used by others.

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* Scarlet Fever and its Prevention, Brit. Med. Journ., 1869, vol. i, p. 23.

7. The discharges from the bowels and kidneys are to be received, *on their very issue from the body*, into vessels charged with disinfectants.

Dr. Budd considers that by these means the infectious power of the germs is destroyed as they emanate from the skin, the surface of which is so extensive, that the poison escaping by it is far greater than that which is cast off by all the other surfaces of the body combined. An impalpable powder armed with the subtle poison of scarlet fever, floats in the atmosphere and conveys infection to any person who may be within the sphere of its influence. To prevent the escape of these particles from the body and carrying the poison far and near, Dr. Budd strongly advises anointing the body and scalp with olive oil impregnated with camphor twice a day. As soon as the skin begins to peel (and this is sometimes as early as the fourth day) the oiling should be commenced, and continued till the patient is well enough to take a warm bath, when the whole body and head should be well scrubbed with disinfecting soap (Calvert's or McDoughall's). The baths are to be repeated every other day until four have been taken, when, if the patient has new clothes, and there is no throat or kidney complication, he may return without risk to his family in a week or ten days. After this the sick-room should be well fumigated, and the bedding or curtains exposed to a high temperature (240° or 250°), which is said effectually to destroy the power of the specific poison. The principles advocated by Dr. Budd apply to all contagious fevers, as small-pox, measles, typhus, etc., and the method employed has proved so successful in his hands, that, during a period of twenty years, he had not known the disease to spread beyond the sick-room.

"Hanging rags steeped in disinfectant solution about the room is not to be commended, but a sheet moistened with a strong solution of chloralum, carbolic acid, or Condy's fluid, and suspended outside the door of the room, is very necessary to complete the isolation of the patient. . . . Care must also be taken in using different disinfectants that they do not counteract each other; for example, carbolic acid decomposes Condy's fluid."*

The prophylactic powers of belladonna, which have been vaunted for preventing an attack of scarlatina, are so fanciful that I do not attach importance to the statements that have been made in favor of it.

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* Handbook of Hygiene, by Dr. Wilson, second edition, 1873, p. 304.

CHAPTER XII.

VARIOLA OR SMALL-POX.

THREE PRINCIPAL VARIETIES GENERALLY DESCRIBED: 1. *Variola discreta or distinct small-pox*—2. *Variola confluens or confluent small-pox*—3. *Variola hæmorrhagica.* 1. *Variola discreta has three distinct stages*—(1) *The stage of incubation*—(2) *The stage of eruption*—(3) *The stage of desquamation.* 2. *Variola confluens ushered in with more severe constitutional symptoms, and irregularity in the appearance of the rash*—*Contents of the pustules and occasional implication of the cellular tissue beneath*—*Danger of the secondary fever and affection of the throat and salivary glands.* 3. *Variola hæmorrhagica or black small-pox, met with during the prevalence of a severe epidemic*—*Varioloid or modified small-pox; its symptoms and general character.* CAUSES: *Small-pox due to a specific poison from a person infected with it, and communicable by inoculation.* PROGNOSIS AND COMPLICATIONS: *Mortality and morbid appearances found after death.* TREATMENT: *Importance of keeping the apartments cool and well ventilated*—*Value of disinfectants*—*Use of emetics and purgatives in the early stages*—*Remedies for the relief of itching and local irritation*—*Management of restlessness and delirium*—*Local inflammation and collection of matter*—*Applications to the throat and fauces*—*Frequency of boils*—*Diarrhœa*—*Prevention of pitting*—*Ophthalmia.*

SMALL-POX is a highly contagious febrile disease, following a definite and uniform course, which after a latent period passes through the stages of pimple, vesicle, pustule, and scab. Since the introduction of vaccination this disease has become comparatively rare; and if this preventive measure is efficiently carried out there is every reason to hope that it will gradually become exterminated. In this country it is compulsory to vaccinate by the third month, and as very young children are especially subject to the disease, and it spreads with alarming force, the law cannot be too stringently observed where the health is good. Older persons who have been successfully vaccinated are in a great degree exempt from the disorder, and they may enjoy immunity from it if revaccinated when growth is completed, or when an epidemic prevails. When a person who is unprotected by vaccination is exposed to the contagion of small-pox, he may contract the most malignant form, according to the state of his health and the type of the disease that prevails. Three varieties of small-pox are usually described:

1. *Variola discreta, or distinct small-pox.*
2. *Variola confluens, or confluent small-pox.*
3. *Variola hæmorrhagica.*

1. *Variola discreta*, or the milder type, has three stages like

other exanthematous affections. (1.) The stage of incubation. (2.) The stage of eruption. (3.) The stage of desquamation.

1. *The Stage of Incubation.*—Fourteen days usually elapse between the time when the poison is received into the system and the appearance of the eruption.* Two days preceding the eruption the constitutional symptoms are marked by a rigor, severe headache, loss of appetite, and thirst, but they are sometimes overlooked, and in a few instances I have seen children brought for an opinion about the character of a small-pox eruption which covered the face, and caused but little derangement in the general health. There is usually the history of a day's malaise before the spots appear, and where a child is seen during this doubtful period, there is always such rise of temperature as warrants rest in bed, and a cautious diagnosis. Generally some symptoms of gastric disorder precede the outbreak of the exanthem, as a thick-coated tongue, vomiting, and irregularity of the bowels; pain in the back and loins, constantly observed in adults, cannot be ascertained in young children, as if the question is put they are certain to complain of it. At this time the accompanying febrile excitement is always shown by the clinical thermometer. Then disturbances ensue in the nervous and vascular system; the skin feels hot and pungent, and there is headache and restlessness—headache is a constant and severe symptom. Sometimes there is delirium or convulsions, and a torpid or even comatose condition, from which it is not easy to rouse the child. The pulse is quick and full, 120 to 140, and towards evening the febrile exacerbations become greater, and the temperature rises to 104° or 105°, the eyes are suffused and heavy, and then the eruption makes its appearance, which occurs earlier in severe than in mild cases. Sometimes a roseolous rash precedes the characteristic eruption, which has received the name of "roseola variolosa," and then it may be impossible to diagnose it from measles.

The eruption first shows itself on the face, in the form of small red elevated papules resembling measles. Soon an elevation takes

* In three cases mentioned by Dr. Murchison, the incubation-period, dating from the time the poison entered the system till the first symptoms appeared, was thirteen days in two cases, and eleven days in one case, so that the latent period is subject to variation, as it is in all of the infectious diseases. Of eighteen cases, the shortest incubation-period was five days in one case, eleven days in five cases, and thirteen days in one case.—Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases, Clin. Trans., 1878, p. 238.

place in the centre by the development of a small tubercle, and by the second day, it attains the size of a pin's head, and imparts a feeling of small shot to the finger. On the third day, it is as large as a lentil and extends over the rest of the face and neck, to the shoulders, trunk, and extremities. The eruption is darker and most abundant where the parts are exposed or uncovered, and on protected parts, as the body or feet, it is of a light rose color. About the fifth day, a small vesicle containing a clear fluid forms on the top of each pimple—it is tense, like a small blister, but soon becomes depressed in the centre, with an inflamed areola or base surrounding the elevated pimple. All the points, or papules, do not pass through the same process of change, as some of them never reach the stage of maturation, but pass away in the course of a few days, especially on the legs and feet. The excitement and inflammatory fever now quickly subside, the pulse is reduced in frequency, the secretions become more natural, and the cerebral disturbance passes off. On or about the sixth day, there is soreness and swelling of the throat with difficulty in swallowing, and the rash and small circular white spots may be seen on the fauces. This does not occur in all cases. The throat is sometimes free, though the attack is a severe one. The face and eyelids swell, so that the features of the patient are no longer to be recognized. On or about the eighth day, the central depression disappears, and the contents of the vesicles become purulent, the redness of the areola is more extensive, and the face more swelled and bloated.* In cases that pursue a satisfactory course, a brown spot forms in the centre of the pustule, which attains its full size by the ninth day, the areola around the base becomes less inflamed, and the puffiness of the features disappears. At the same time the face and hands begin to swell. The pustules now rupture and the escape of their contents dry up into scabs, which fall off in the course of four or five days, beneath which the skin is of a pur-

* "Each well-formed pustule, when carefully dissected, will be seen to consist of two compartments, the upper one being the larger. These compartments are both filled with pus, and communicate with each other at the marginal borders. This septum is a layer of false membrane, deposited in the derma at an early stage of the disease, which, by removing the surface-layer of the pustule, is brought into view, presenting a bright red or purple color, and is highly infecting. But the mature surface is multilocular, and when a transverse section is made, presents an appearance that has been compared to a severed orange."—Vogel, *Diseases of Children*, 1874, p. 499. Translator's remarks.

plish color, which lasts for a considerable length of time. The bursting and desiccation of the pustules begin first on the face, and gradually pass downwards to the trunk and extremities. Scratching the surface prevents children from giving the pustules a chance of drying up without bursting. The swelling of the hands and feet passes off, and the patient is convalescent by the seventeenth or eighteenth day. If the case is a severe one, and the child has not been vaccinated, a permanent depression or scar is left in the skin marking the situation of each pustule. This becomes covered with a new epidermis, and the cicatrices appear very marked in children, but as they grow older, the skin being thin and elastic, the depressions are not so apparent. About the eighth day, when the vesicle has become pustular, a secondary or suppurative fever appears; the face is more swelled and inflamed, the pulse is quick and weak, the tongue inclined to dryness, and the temperature considerably elevated.

The urine is scanty and high-colored* and the bowels constipated, so that the little patient becomes restless, or even delirious at night; the surface itches to such an extent that the child scratches and tears open the pustules unless the greatest precautions are taken.

2. *Variola Confluens or Confluent Small-pox.*—This variety of the disease is more severe than that just described. It sets in with more severe rigors, with fever, headache, and delirium. The secondary fever is also of a typhoid character, and there may be coma and jactitation. The rash does not appear with the regularity of the milder affection; a red erythematous blush appears on the skin, and on the second day, small red points may be seen, and the pustules are not distinct but run together and are flat. They often contain a thin, brownish, ichorous discharge, instead of purulent matter. The cellular tissue beneath may be involved in severe inflammation and sloughing, and the swelling of the face and salivation begin early in the disease. The secondary fever is much more dangerous than in the first form, and quickly assumes a

* The urinary secretion in the eruptive and suppurative stages may contain traces of albumen, which indeed is common to these periods in some other of the exanthemata. Becquerel states that it is normal during desquamation, but in the putrid form of the disease "it is decomposed and ammoniacal," and may sometimes contain blood. But this is simply due to the hæmaturia, which we have seen to be common when the poison is of a very malignant character, and is part of the same condition which produces ecchymoses of the conjunctivæ and petechiæ on the skin.

typhoid character. The eruption is dark and livid, and petechiæ are common, as well as hæmorrhages from the mucous surface of the bowels or bladder. The exhaustion increases, and the patient perhaps dies convulsed, or in a state of coma. In cases of recovery the cicatrices are deeper, and the deformity greater. In one case of extreme severity that came under my care some years ago, the outline of the nose was completely effaced, and the eyelids infiltrated with serum and covered with pustules. The fauces, mouth, and nose were similarly affected, and the tongue was so swelled that it could not be retained within the mouth. The neck and cervical glands were swollen, and viscid saliva was constantly pouring out of the mouth. This distressing condition had only lasted a few hours, when, in making an ineffectual attempt to swallow a little fluid that had been put into the mouth, the patient was seized with suffocative symptoms, and died instantly.

3. There is yet another variety termed *Variola hæmorrhagica* or *black small-pox*, which is occasionally met with in severe epidemics. Bright red petechiæ occur upon the skin about the size of a pin's head coincident with the appearance of the papules, which become darker and of a purple hue on the third or fourth day of the disease, when a spot of purpura or of hæmorrhage occupies the pustule. White pustules may be seen on the fauces and palate. Hæmorrhage from the mucous surface of the vagina, bowels, and urinary passages (hæmaturia) distinguish the disease. The mind is collected, and death occurs on the third or fourth day of the disease. Congestion of the chief internal organs is seen in the lungs, mesenteric glands, and spleen, and ecchymoses, like the petechiæ on the skin, are scattered over the intestines. Soft clots are found in the right side of the heart, while the left is empty. These cases are rare, but they occur in every severe epidemic, and when once seen cannot readily be mistaken, though they may be overlooked, in consequence of death happening before the rash is well developed.

Varioloid or modified small-pox is the term used when the disease happens a second time, or the patient has been protected by vaccination. The fever lasts only a day or two, and the eruption appears in the morning, the general health being slightly deranged the day before. A few scattered pimples appear on the forehead, face, and nose; some of them become vesicles, and others shrivel up, whilst on different parts of the body they present various

stages of imperfect development. The rapid fall of temperature on the second or third day as the rash appears, distinguishes it from typhus and from measles. Unless the rash is extensive there is no secondary fever.

The cause of small-pox is due to a specific poison from a person laboring under the disease, or from clothes left off by the sick and worn by the healthy. It is conveyed by the atmosphere and is caught from vehicles in which diseased persons have ridden. It may be communicated by inoculation or by the scabs from the sick. "Most likely it is communicable from the moment when the initiatory fever begins. It may be given by the breath of the patient before the eruption has appeared on the surface of the body. It continues infectious so long as any of the dry scabs resulting from the original eruption remain adherent to the body; a single breathing of the air where it is, is enough to give the disease. The dead body for several days after death, has been known to communicate the disease, and in all probability it would produce the disease for some months afterwards."*

Small-pox seldom attacks the same person a second time, not one per cent. being liable to a recurrence of it. The disease may attack the fœtus in utero.

As to the prognosis of the disease, it is favorable in the vaccinated, if three or four good vaccination-marks remain, if the disease is mild and distinct, and if the children are strong and healthy. It is unfavorable if vaccination have never been performed, or if there be only one or two faint marks of a single vaccination; if the symptoms assume a confluent form, and the pustules are dark and flattened. A sudden disappearance of the rash, with prostration of the strength, and a rapid feeble pulse, are indications of danger; and where they are present the typhoid state continues, and leads to death by syncope, convulsions, or coma. Inflammatory affections of the brain, pneumonia, and suppuration of some of the viscera, are among the modes of fatal termination.

Death most commonly occurs in small-pox after the primary fever, and seldom before the twelfth day—the most frequent complications are meningitis, and affections of the thoracic organs, severe diarrhœa, and lesions of the intestinal canal, and, according to Vogel, gangrene of the mouth is sometimes present.†

* Reynolds's System of Medicine, vol. i, 2d edit., p. 242.

† Diseases of Children, p. 491.

The mortality from this disease increases with age; while it is very fatal at the extremes of life.* Much will depend upon the age and constitution of the child, and whether it has been previously vaccinated or not. Where it is neglected, the child gets a severe attack, and, if it recovers, bears through life the most disfiguring cicatrices. In the case of a mother and child, who came under my notice some years ago, the former, who was protected by vaccination, had only a few small spots on her face, and made no complaint of her health beyond slight lassitude and disordered digestion; whilst the latter, who was four months old, and suckled by the mother, had her face covered with the eruption, and the body and limbs were also much involved. The child recovered, but to this day the face is frightfully pitted by the numerous cicatrices.

Of the morbid appearances found in those who have died of small-pox, evidences of inflammation are met with in the intestinal canal, the bronchial tubes, and various parts of the brain, in consequence of a deteriorated state of the blood, which is found liquid, dark, and uncoagulated. Universal congestion of the internal organs is also present, and the liver, spleen, and kidneys contain a great deal of blood. The brain and membranes are congested, and the sinuses full of blood. Pustules or false membrane may be seen in the mouth, tongue, fauces, and pharynx, and throughout the œsophagus to the rectum, beneath which the membrane is inflamed and vascular. Evidence of inflammation in the interior of the heart and pericardium is also to be noted, and a change in the muscular structure leading to granular or fatty degeneration.

Treatment.—There is no disease in which it is more necessary to keep the apartment cool and ventilated. In the winter season of the year there should be a fire in the room, and the windows opened from time to time, and so managed that the patient may not be exposed to draughts of cold air. In the summer, when the weather is hot or sultry, the windows should be opened at the top, and curtains and carpets be removed. Disinfectants, in the shape of carbolic acid, Condy's fluid, or chloride of lime, should be placed in saucers and put in the room and passages of the house. All these important precautions ought to be strenuously enforced.

Before the eruption makes its appearance the treatment should

* "According to Dr. Marson, patients of all ages die at the rate of 50 per cent. in the confluent, and 8 per cent. in the semi-confluent, and 4 per cent. in the discrete variety."—Hooper's *Physician's Vade Mecum.* Dr. Guy and Dr. Harley. Article, Variola, p. 305.

be directed to moderate the fever and subdue the nervous excitement. To attain this object an emetic may be given, followed by a mixture of sulphate of magnesia with nitrate of potash (Form. 8), or infusion of senna, to control the fever and open the bowels freely. If the child is strong and there is constipation a grain or two of calomel, followed by a draught of sulphate of magnesia and senna, should be ordered. In mild cases a dose of castor oil, or a draught of rhubarb and magnesia, will be sufficient to clear the bowels of any irritant matters.

If the disease happens in hot weather, and there is much thirst and soreness of the throat in swallowing, weak tea and milk with toast will be sufficient nourishment for a day or two, and grapes, strawberries, and iced lemonade may be taken freely. Raspberry vinegar is an excellent drink and relished by all patients.

During the period of eruption and maturation the measures to be employed are much the same; and, if there is restlessness and irritation of the skin, it is a good plan to use a warm bath, to which oatmeal or carbonate of soda is added. If itching and irritation of the face are severe it should be smeared over with olive oil, or olive oil to which carbolic acid (1 in 40) is added, or glycerin, or zinc ointment. Pork lard melted in a saucer and applied to the face allays irritation in a remarkable manner. If the strength appears deficient it must be supported by suitable nourishment, as beef tea, chicken broth, and so forth. When the fever subsides a stimulating diaphoretic may be given.* If the child is restless at night bromide of potassium or hydrate of chloral at bedtime should be employed, for if the patient cannot obtain sleep he will become exhausted and the restlessness will increase. Opiates, however, must be used with great caution. For the delirium which arises in the course of small-pox, care should be observed in noticing whether it is due to a plethoric state, with a full pulse and active

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* Formula 12:

℞. Liquor amm. acet., ... ℥ss.
Spt. æther. nitr., ... ʒj
Syr. rosæ, ... ʒiij
Aquam ad . . . . . ℥iv.—M.

A tablespoonful every four hours. For children five years of age.

Formula 13:

℞. Amm. carb., ... gr. viij
Liquor amm. acet.,
Syr. aurant., āā . . . . . ℥ss.
Aquam ad . . . . . ℥iv.—M.

A tablespoonful every four hours. For children five years of age.

cerebral excitement, or whether the child is weakly and delicate, and the pulse quick and running, so that each beat is not appreciably distinct. In the former case cold sponging or ice to the head may be required; in the latter case stimulants and nourishment, with quinine if the temperature be high, are the only remedies to subdue it.

Local inflammation must be treated on general principles. Where collections of matter form, whether in the cellular tissue or under the scalp, they should be opened early to prevent their spreading, and cavities may be washed out with carbolic acid lotion (1 in 40) or nitrate of silver (gr. x to the ℥j). The discharge from the pustules in severe cases is very irritating and causes much discomfort. To meet this the linen cannot be too frequently changed, and oxide of zinc and starch in equal proportions, or calamine powder and oxide of zinc, or flour, or some of the toilet powders in use, may be dusted over the body from a common dredger. For the vomiting, which sometimes occurs, iced water or prussic acid is useful; and if the child is old enough an effervescent mixture, and a poultice to the epigastrium. If the throat is much swollen two or three leeches may be applied, and afterwards a poultice. Mopping out the throat with a weak solution of nitrate of silver, or the infusion of roses with sulphuric acid, is also to be recommended.

Boils frequently result from small-pox, and they are tedious to heal. The discharge exhausts the patient and prolongs his convalescence. When this complication has arisen quinine and bark will be required to support the strength. The mineral acids with tincture of gentian often answer well, and the wounds should be dressed with some stimulating ointment. If sloughing takes place a carrot or a linseed poultice should be applied, and the free use of carbolic acid or Condy's fluid should not be omitted.

When the eruptive fever has passed away, and there are languor and clammy skin, the mineral acids with bark or calumba will be serviceable.* When the strength begins to fail tonics and stimu-

* Formula 14:

℞. Acid. nitric. dil.,
Acid. hydrochl. dil., āā . . . . . ℥ss.
Tinct. cinch. co., vel tinct. calumbæ, ... ℥iij
Syrupi, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.
A tablespoonful three times a day. For children five years of age.

lants will be needed. Quinine and ammonia are the best, and wine and brandy according to the exigencies of the case.

In the hæmorrhagic variety of the affection, the free use of stimulants, and supporting measures of all kinds are demanded. In the shape of medicine some styptic preparations of iron, as the tincture of the perchloride, should be given to restrain the hæmorrhage.

When diarrhœa is excessive it should be checked by krameria,* small doses of laudanum, or the Pulvis Cretæ c. Opio.†

The prevention of pitting is no insignificant part of the treatment. The parts affected, particularly the face, should be protected from the air, and the lymph let out from the distended vesicles by a needle, and absorbed by cotton-wool. The top of each pustule is to be lifted up, and a thin point of nitrate of silver applied to the base. The remedy to be successful should be applied on the second or third day of eruption, and, though it causes some pain, it soon passes off, and diminishes the swelling and tumefaction of the pustules, and prevents cicatrices. Of the application of mercurial ointment to prevent pitting, Rilliet and Barthez state, that it was successful even in cases of confluent small-pox, and that when applied on the first or second day it prevented the development of the eruption, and caused an abortion of the pustules. To protect the skin, collodion may be applied, or, still better, the flexible collodion made of collodion, castor oil and Canada balsam.

The plan adopted at the Small-pox Hospital is as follows:

"Wait until the pustules have discharged, and the discharge has begun to dry, then put on some of the best olive oil, or a mixture of one-third glycerin and two-thirds of rose-water. Some of this may be applied once or twice a day, for a few days, until the scabs begin to loosen. Cold cream and oxide of zinc, or olive oil and lime-water, form good applications; or if the discharge is

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* Formula 15:

℞. Tinct. krameriæ, ... ℥ij
Tinct. opii, ... ♏xij
Spt. chloroform., ... ♏xvj
Syr. zingib., ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A tablespoonful after each action of the bowels. For children five years of age.

† Formula 16:

℞. Pulv cretæ c. opio, ... ℈ij
Tinct. catechu, ... ℥ij
Aquam menth. pip. ad . . . . . ℥ij.—M.

Two teaspoonfuls after each action of the bowels. For children five years of age.

thin and excoriating, calamine mixed with olive oil. The patient should be warned not to allow the scabs to dry and remain some time on the nose and other parts of the face, particularly on the forehead and near the end of the nose. When this takes place, the dry scabs themselves leave deep marks in the skin, worse than the eruption of small-pox itself. The pain of removing the dry scabs is sometimes considerable, and the patient can hardly be prevailed to take them off, or allow others to do so. In common the pits from the eruption are not deep at first, just after the patient has got well, and we may deceive ourselves by thinking our efforts to prevent disfiguration have been attended with considerable success. The disease leaves a peculiar brown stain on the skin at first, which soon wears off, but the pitting is more perceptible a twelvemonth or so after the patient has got well.*"

If ophthalmia is severe two or three leeches to the temples may be necessary, and in milder cases a solution of nitrate of silver (gr. j to gr. iv to the ℥j). When the eyelids are swollen and œdematous, and the lips stick together by a tenacious secretion, they should be bathed frequently with warm water and a little Ung. Cetacei, or diluted yellow oxide of mercury ointment (Hyd. Oxy. Flava gr. viij, Vaseline ℥j) applied to the edges of the eyelids night and morning. When ulcerations of the corneæ ensue, it has been recommended to touch them with a sharp point of nitrate of silver, or a collyrium of sulphate of zinc and opium may be used.† Meigs and Pepper speak highly of a collyrium of borax and sulphate of zinc.‡

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* Small-pox, by J. F. Marson, Reynolds's System of Medicine, 3d edit., vol. i, p. 252.

† Formula 17:

℞. Zinci sulph., ... gr. ij
Vini opii, ... ♏xx
Aquam rosæ ad . . . . . ℥j.—M.
Fiat collyrium.

‡ Formula 18:

℞. Sodæ biborat., ... gr. xij
Zinci sulph., ... gr. j
Aquæ camph., ... ℥j
Aquam destill. ad . . . . . ℥j.—M.
Fiat collyrium.

CHAPTER XIII.

DISEASES OF THE MOUTH AND FAUCES.

STOMATITIS AND ITS VARIETIES: *Stomatitis simplex, or simple inflammation of the mouth—Symptoms—Causes and treatment—Stomatitis follicularis (Vesicular stomatitis—Aphthous stomatitis)—Symptoms—Causes and treatment—Stomatitis fungosa—Aphthæ—Le Muguet—Thrush or white mouth—Diffuse inflammation of the mouth—Symptoms and treatment—Value of chlorate of potash—Ulcerative stomatitis—Character of the ulceration—Local and constitutional causes—Treatment—Chlorate of potash—Bark—Iron—Cod-liver oil—Local application of nitrate of silver—Hydrochloric acid—Gangrenous stomatitis—Gangrene of the mouth—Cancrum oris—Symptoms—Pathology and treatment—Caustics—Chlorate of potash—Wine—Mercurial salivation—Rare in children—Treatment—Gingivitis—Acute tonsillitis—Hypertrophy of the tonsils—Simple pharyngitis—Retro-pharyngeal abscess—Cynanche parotidea, or mumps.*

INFLAMMATION of the mouth is a troublesome and painful disease in infants and young children. Although extremely common during the period of dentition, it may occur at almost any age. In one variety the inflammation does not extend through the mucous membrane, or, at the worst, it produces a number of small, circular, irritable ulcers, with a red margin surrounding a depressed centre, whilst in another the ulceration involves the gums and the mucous membrane more deeply, and in a third, swelling and gangrene attack the cheek, and destroy the life of the sufferer.

Stomatitis simplex, or inflammation of the mouth, is a mild affection, causing trifling constitutional disturbance, and, except under neglect, rarely leading to ulceration. It is common among the infants and suckling children of the poor during the first year of life, involving a portion, or sometimes nearly the whole mucous membrane of the mouth, particularly if the food is taken through bottles and the hygienic conditions are bad. It is rare among the children of the upper classes, unless the nipples of the nurse are sore, or the milk is faulty. In the out-patient department of our hospitals it is very frequent. In its mildest form it is an erythema, but occasionally minute vesicles are seen on the affected membrane, and the lips swell with an herpetic eruption upon them. Sometimes the salivary glands are very active, and saliva dribbles from the mouth. The symptoms are heat and dryness of the mouth, restlessness and feverishness, flatulence and diarrhœa; the mucous membrane presents patches of redness

raised above the surrounding surface, which are seen on the inside of the cheeks and the angles of the mouth; they may also be observed on the hard palate and gums, having a yellowish patch of lymph in the centre, with a red margin.

The causes are gastro-intestinal disorder and uncleanliness, and eating indigestible or irritating articles of food. It is seen in scarlatina and measles, or during dentition, when the gums are irritated by the pressure of teeth, and then the disease is local instead of general. In these cases the gums are often red and spongy, and bleed on being touched.

The disorder usually yields to a regulated diet, a dose of castor oil, or a powder of rhubarb and carbonate of soda. If it does not improve under this treatment, a mixture containing a little magnesia, or the Liq. Magn. Carb. will be useful. Lime-water should be added to the milk, and the mouth cleansed after each meal with a piece of soft rag dipped in warm water. If the gums are swollen and distended by the teeth, they should be lanced. Occasionally the disorder is kept up till the nurse is changed, and the method of feeding is altered. In one well-marked and obstinate case which came under my notice, the mouth did not take on a healthy appearance till feeding with a spoon was substituted for the bottle and the nurse.

Stomatitis follicularis (*vesicular stomatitis—aphthous stomatitis*) is common with children during the first dentition. Large and distinct pearl-like vesicles of a round and elevated form resembling herpes, take place on the inside of the cheeks, lips, sides of the tongue, and more rarely on the gums. When they rupture, a little glairy fluid is discharged, leaving a round and superficial ulcer with a red margin and a yellowish-gray base. The complaint arises from inflammation of the mucous follicles, symptomatic of some intestinal disorder and acidity of the primæ viæ. It occurs during teething, or after whooping-cough or measles, in fact, it may follow any exhausting complaint. There are several of these ulcers which do not usually run together, except the disorder is severe; and although most frequent on the mucous membrane of the cheek, they are sometimes noticeable on the tonsils and soft palate.

Symptoms.—The constitutional disturbance is slight, and there is nothing to notice beyond trifling feverishness, loss of appetite, thirst, and irritability; sometimes there is not even this assemblage

of symptoms, and the chief feature is pain with soreness of the mouth, which prevents the child from taking nourishment. The complaint is of common occurrence in delicate children, and is without danger. The ulcers pass away under treatment in the course of a few days, but are prone to recur from time to time, as in adults when the digestive functions are deranged. It is important to bear in mind that the disease does not always follow the same mild course. After the bursting of the vesicles the superficial ulceration that remains may be coated with a similar exudation to that which occurs in thrush, and to be even associated with the formation of false membrane, as in diphtheria. Such cases sometimes follow severe attacks of measles.

Treatment.—An alterative dose of gray powder, soda, and rhubarb is useful, and tonics—bark, with a few grains of chlorate of potash—will bring about a cure. If the mouth is very painful, and prevents the child from taking food or sucking, a weak solution of nitrate of silver may be brushed over the excoriated parts daily, or they may be touched with a piece of alum ; a lotion consisting of one ounce of glycerin of borax to five ounces of water is also a simple and useful application.

Stomatitis Fungosa—Aphthæ (Underwood and Dewees)—Le Muguet (French)—Thrush or White Mouth—Diffuse Inflammation of the Mouth.—This complaint is met with at all ages, but it is most common in infants and young children, as the result of improper or artificial feeding. The mouth is hot and dry, and the salivary secretion is diminished. Small white conical patches form on the inside of the cheeks, angles of the mouth, and sides of the tongue. After two or three days these elevated patches present a curdy or soft cheesy exudation of false membrane, and may be seen on the pharynx, tonsils, or hard palate, and if removed the surface bleeds until it is covered by fresh exudation. The patches assume a grayish ragged appearance, leaving an unbroken smooth surface, or a superficial excoriation, which increases the difficulty of swallowing and sucking. The disease may extend into the œsophagus or the air-passages, and cause cough and expectoration, which reduces the child's strength, and may end in exhaustion and inanition. It is most frequent in infants of two or three months old. The constitutional symptoms are gastric disorder and diarrhœa, with all the symptoms of muco-enteritis; the motions are greenish, mixed with curdy masses of milk, and in this way the disease extends

through the whole alimentary tract. The anus is often red and excoriated from the acrid nature of the bowel discharges, and there is erythema of the buttocks and perinæum of the child, and if of the male sex, the scrotum is sore, excoriated, and inflamed. Febrile excitement is not uncommon, and the pulse is accelerated. It occurs in delicate children who are badly fed and clothed, and is looked upon as a serious sign; but it is simply the local indication of a feeble constitutional condition. It comes and goes, and when seen as the accompaniment of acute or long-standing chronic disease, is of evil augury. The exudation has been seen in the stomach in Peyer's patches, and in the cæcum. "Under the microscope the curdy exudation of thrush has been found to consist of thickened epithelium cells, mingled with numerous minute cryptogamic sporules or seeds, from the midst of clusters of which, long threadlike, jointed, and branching plants arise, intertwining with one another. It was discovered by Berg, of Stockholm, and Grubz, of Vienna, at the same time, and has been named the *Oidium albicans*."*

Like the former variety, it is chiefly met with among the children of the poor, and those brought up by hand or suckled too long.

The predisposing causes are attributable to general or local disease, but the exciting cause is owing to a parasitic fungus, as we have just seen in the mucous membrane. This vegetation is probably derived from some mouldy article of diet, which may spread and be conveyed to the nurse's nipple, and from the latter to the child's mouth.

Treatment.—In most cases a dose of castor oil and a proper regulation of the diet will be all that is needed; but in every case I would recommend the chlorate of potash, which is a specific; and a few grains administered three times a day will have a marvellous effect in curing the disorder. The mouth should be washed out after each meal, and a local application of the glycerin of borax be employed; or the affected part may be brushed over with a solution of nitrate of silver (gr. v ad f℥j). Sir William Jenner recommends a solution of sulphite of soda (℥j ad f℥j), from the destructive influence which the sulphurous acid has on the fungus.

Ulcerative Stomatitis (*Ulcero-membranous stomatitis*, Rilliet and Barthez) is a mild and frequent disorder, but in no way dangerous

* Reynolds's System of Medicine, Art. Thrush, vol. iii, p. 8.

to life. It is more frequent in hospital than in private practice. It would seem to be an aggravated form of the membranous affection, which either advances to ulceration, or in milder cases is absorbed without proceeding any further. The affected membrane in the first instance is white or dirty gray, or black, and the surrounding membrane swollen and inflamed. The plastic exudation is thick, and is more or less adherent to the tissue beneath, and, if raised, exposes a superficial bleeding ulcer. Even when the exudation is gently removed blood oozes from the exposed surface. The affection is seen to occupy the inside of the cheek, and to extend to the gums of the front teeth, which are swollen and spongy, bleeding on the slightest touch, and, by their retraction, causing the teeth to become loose in their sockets. The cheek and lips in contact with the affected parts likewise become the seat of irregular ulceration, which may prove very obstinate, or degenerate into a more severe form. In mild and favorable cases, the ulcers being superficial rapidly diminish in size and heal quickly, the saliva becomes less in quantity, and the gums take on a healthy appearance. But in some cases the ulcers destroy the gum, and extend deeply, and are very intractable to treatment. They may involve the whole mucous membrane of the mouth, running together and extending to the hard palate; and when the disease is so general, the submaxillary glands are hard, swollen, and painful. The breath is offensive, and the salivary secretion is increased. The subjects of this complaint are delicate children, who have been badly fed and cared for. It is common between the ages of five and ten years, and it often prevails as an epidemic. The scrofulous children of the poor are frequent victims, particularly if their health has been further reduced by eruptive diseases or pneumonia, or if they possess bad teeth. In one case under my care there was an obstinate irregular ulcer on the gum, which had receded from a carious tooth, and it resisted all remedies till the decayed stump was removed, when it took on healthy action. There is generally some febrile disturbance, which continues for a day or two.

In the case of a female child, nine months old, who was shown to me in May, 1877, by Dr. Wynn Williams, the ulceration occupied the inside of the lower lip in three distinct patches, the largest being the size of a threepenny piece. The ulceration was not deep nor surrounded by induration of the mucous membrane, which

presented no variation from the tint of health. There sprang up from the base of the ulcerated surface long whitish points, like the fungoid excrescences of an open wart. When first seen by Dr. Williams the affected part presented a pealike hard body, feeling like a wart. The child was suffering from bronchopneumonia, chiefly of the right lung, of one week's duration, and the lip became affected on the third day of the attack. The face was pallid, and the lips dusky and separated, the respiration was short and shallow, 60 per minute; the morning temperature 103°, the pulse 112; in the evening the temperature reached 104.2°, and the pulse 120. There was no ulceration in any other part of the mouth, nor any aphthous exudation.

When the exanthematous fevers have altered the quality of the blood, or a young child is struck down by some acute disease with a high temperature, the mucous membranes are prone to suffer, and especially the mouth.

Treatment.—This consists in attention to the general health; the diet should be regulated and the digestive functions attended to. In the shape of medicine the chlorate of potash is a specific here, as in other varieties of ulceration of the mouth in children. A grain three or four times a day in water for a child a year old, and one additional grain for every year of the child's age up to ten grains will be a suitable dose. A drop or two of the dilute hydrochloric acid, and the addition of the tincture of cinchona, or the ammonio-citrate of iron will soon bring about a cure in ordinary cases. Cod-liver oil, quinine, and the syrup of the iodide of iron will be useful. If the ulceration is obstinate, the application of a solution of nitrate of silver to the ulcer, or the hydrochloric acid is desirable. I have often known the gums to take on healthy action at once after an application of nitrate of silver (gr. v ad ℥j), and to be well in a week when chlorate of potash has been given at the same time. As in the sore throat of scarlatina, brushing over the affected part with the tincture of iron and glycerin is a good application.

Gangrenous Stomatitis (*Cancrum oris*).—This is a serious and rare* constitutional affection, attacking children whose blood is

* "I have only seven times had the opportunity of witnessing it; but so fatal, that in six out of these seven cases the patients died. The larger experience of other observers shows an equally unfavorable result, since 20 out of 21 cases that came under the notice of MM. Rilliet and Barthez had a fatal termination, and a recent French

deranged, and is a far more important disease than any of the varieties we have hitherto considered. It may follow the eruptive fevers (particularly measles), typhoid fever, and tuberculosis.

"In by far the majority of cases it succeeds to some acute illness, by which the health of the child has been greatly undermined. The disease of all others which seems most to predispose to this affection is measles. Of ninety-eight cases collected by M. Tourdes, in forty-one, or nearly half the cases, it followed measles. In nine, it followed intermittent fever; in nine, typhoid; in seven, it is put down as due to calomel; in six, it followed pertussis; in five, scarlet fever; in five, enteritis; and the remaining followed various diseases. Again, of forty-six cases collected by MM. Boulez and Caillault, in thirty-eight it followed attacks of measles."* Most authorities agree that the disease is most often seen between two and five years, but it may occur to any children up to twelve or thirteen. Like the former disease, it is more frequent in hospital than in private practice. The disease is regarded by most observers as beginning in the mucous membrane of the mouth, with the formation of thick yellow patches of membrane, which terminate in ulceration. A hard swelling also forms, surrounded by a tense infiltration of the cellular tissue of the cheek. The symptoms begin with fetor of the breath, and a discharge of saliva; the inside of the cheek is tense, hard, red, and shining, and it is usually limited to one side. In the centre is a bright-red spot, and the mouth is opened with difficulty. An irregular excavated ulcer forms, which is covered with an ashy loose slough. The teeth become loose, and occasionally drop out, whilst the alveoli are laid bare, and sometimes become necrosed. As the disease advances, the swelling of the cheek increases, and the central spot becomes a gangrenous eschar or slough, and blackened shreds of tissue are cast off. The disease is usually limited to one side of the mouth.

Treatment.—The only reliable means of cure consists in the application of strong hydrochloric acid, or nitric acid, and it is obvious that if such a remedy is to be of service, it must be active

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writer (Tourdes, Du Noma, etc., 4to, Thèse de Strasbourg, 1848) who has collected from different sources 239 cases, which did not all occur in children, states that 176 of the number, or 75 per cent., terminated fatally."—*West's Diseases of Infancy and Childhood*, 4th edition, p. 532.

* Reynolds's System of Medicine, Art. Gangrenous Stomatitis, vol. iii, p. 17.

and applied thoroughly whilst the patient is under the influence of chloroform. It may be necessary to repeat the application from time to time, and the mouth must be washed frequently with Condy's fluid, or a weak solution of chloride of soda. If the cheek is tender on the outside, a poultice or fomentation will be advisable. Castor oil, chlorate of potash, iron, etc., will be needed (Form. 9, 10).

Mercurial Salivation.—Mercury, when injudiciously administered, may produce ulceration of the gums, loss of teeth, fetor of the breath, and salivation, leading to the various forms of stomatitis and gangrene of the mouth; but such cases are very rare, and we look for the influence of the drug in the greenish stools of infants, rather than in the excessive action of the salivary glands.* In addition to these symptoms there may be swelling of the submaxillary glands and superficial ulceration upon the gums, which may extend to the cheeks and tongue, giving rise to an ulcerous or gangrenous form of stomatitis. The constitution sympathizes in the irritative febrile disturbance, and weeks may elapse before the affected parts resume a healthy state. Children so affected lose flesh and strength, and are peevish and irritable. They are disinclined to take nourishment if the mouth is sore and painful, and that which is swallowed is imperfectly assimilated from the quantity of altered saliva which finds its way into the stomach. "Nearly 30,000 children of all ages have come under my care during my connection with the Children's Infirmary and the Children's Hospital, and I have administered mercury to any of them who seemed to require it, but hardly ever saw salivation follow its employment before the completion of the first dentition; and never observed that medicine, at any age, produced any affection of the mouth sufficiently serious to cause me a moment's anxiety."† When given in a single or moderate dose it would appear to be eliminated by all the secretions, and not a trace can be detected in any organs or tissues. When, however, it is continued recklessly or intentionally for days together, the power of elimination gradu-

* In some cases of ptyalism, the parotid and salivary glands are said to be swelled and hyperæmic, and the fluid dribbling from the mouths of children may reach many ounces in twenty-four hours. In adults it has been estimated in severe cases at seven or eight pounds. "Lehmann and other observers have found it at first more mucous, cloudy, of greater specific gravity, and richer in solid constituents (young and old epithelial cells) than normal saliva."—*Niemeyer's Practical Medicine*, vol. i, p. 443.

† West's Diseases of Infancy and Childhood, 4th edition, p. 539.

ally fails, and it accumulates in the body, lessening the amount of fibrin in the blood, and increasing the activity of all the glandular organs. "The chief channel of escape seems to be the kidneys, but it is very certain that, at least in some cases, the drug is freely excreted by the salivary glands as well as by the intestines."*

Chlorate of potash and sulphate of magnesia are both useful remedies, the former acting upon the mucous membrane of the mouth, and the latter stimulating the action of the bowels. For the soreness of the mouth, a solution of nitrate of silver (gr. v ad f℥j) should be applied twice a day, and every time after taking food, which should consist chiefly of milk; the parts affected should be gently wiped with a piece of soft rag dipped in the lotion of borax before mentioned. The employment of sedatives may be required to allay pain and procure sleep.

Gingivitis—Inflammation of the Gums—Disorders Accompanying Dentition.—Dentition in most healthy children is attended with redness, heat, and swelling of the gums, which are also tender, and there is dryness of the mouth in some cases, but often a free flow of saliva. There is pain in suckling, when the child attempts to grasp the nipple, which it speedily releases, and cries, and is fretful. When children are strong and full of flesh there is considerable disturbance of the system, and the cutting of each tooth is attended with heat and flushing of the face, sleeplessness, and fever. Cerebral disturbance, and even inflammation or convulsions, are occasionally observed; skin diseases and eruptions about the scalp are common. In rickety children dentition is retarded, and there is no derangement worthy of notice. Some children pass through dentition with little, if any, constitutional disturbance, one tooth after another appearing in regular succession, without pain or irritation of any kind. But it is not so in every case; there are many instances in which dentition is painful, and every new tooth either provokes a short attack of inflammatory fever, diarrhœa, salivation, or even a convulsion. The gums are red, hot, and swollen, and the child is perpetually putting the fingers in the mouth, and is unable to suck and grasp the nipple; aphthous ulceration takes place, the child is feverish, cannot sleep, and is extremely restless and fretful; sometimes laryngismus or inflammation of the air-passages (bronchitis or pneumonia) springs up,

* Treatise on Therapeutics, by H. C. Wood, M.D., 1876, p. 368.

or cutaneous eruptions, as lichen or strophulus. In some children the fretfulness and disturbed sleep are very trying to the parents, and not without anxiety to the medical attendant; the child grows pale and fractious, though the gums have been lanced and the teeth are appearing. It sleeps for a short time, then wakes up flushed and excited, and cannot rest again. The child is uneasy, and puts the fingers to the mouth, cries at any sudden noise, and will not leave the nurse's arms. The nervous excitability is great, and unless the child gets rest, it grows pallid and exhausted, refusing food, and often vomiting the little that is taken, the hands and head are hot, the pulse is quick, and the temperature elevated.

Treatment.—In ordinary cases a simple aperient, and rubbing the gums to and fro with a piece of white sugar will suffice; but if the gum is tense and painful, and the tooth distends it, a free incision will give immediate relief. The lancet should be made to incise the gum in the direction of the alveolar process, although a second and shorter transverse incision is sometimes advisable. If the child is strong, a grain of calomel, and a saline mixture (Form. 8) will be necessary to open the bowels and remove any intestinal disturbance. If in spite of the gums being freely incised, and the mouth moist, the nervous irritation and sleeplessness continue, and the nurse and attendants are worn out with the restlessness of the child, sleep must be procured, and the nervous irritation allayed. For this purpose, a mixture of bromide of potassium and hydrate of chloral is advisable at bedtime, and it should be repeated if tranquil sleep does not ensue, while the bromide may be given during the day.

*Tonsilitis—Cynanche Tonsillaris—Quinsy—Causes—Symptoms—Treatment.**—This disease sets in with rigors and febrile symptoms, pain in the head, limbs, and back, to which succeed heat and dryness in the throat. Any attempt at swallowing is extremely painful, and the patient feels as though there was a lump in the throat. The voice is thick and guttural, and the tongue is covered with a creamy fur. The pharynx presents a deep reddish tint, and one tonsil is noticed to be more swollen than the other, the disease being usually limited to one side; a patch of lymph is seen coating the affected tonsil, and the act of swallowing causes

* The diagnosis from the throat affection of diphtheria and scarlet fever is considered in their respective chapters.

a darting pain through the ear on the affected side, and throbbing; there is a free discharge of saliva, and liquids return through the nose. The neck below the ramus of the jaw is tender and swollen in some cases, and as the complaint progresses the inflammatory fever increases, till the stage of suppuration is reached, which ordinarily happens in five or six days. The disease may end in resolution, the inflammation and infiltration of the affected tissues gradually subsiding, or it may go on to suppuration, leaving a deep, ragged, excavated ulcer, or it may terminate in chronic inflammation and enlargement. When suppuration takes place there is fluctuation, but the tonsil may be infiltrated with blood and serum, and the palate be much swollen without the formation of any pus.

Delicate children are occasionally liable to the complaint from cold and exposure to draughts of air when the body is heated, as when coming out of a hot and close room *

Treatment.—If there is much tenderness below the jaws, and the little patient feels pain in separating them, two or three leeches will be useful, and a poultice applied afterwards. At an early period, before any matter has formed, a few punctures with a bistoury guarded with a piece of lint will relieve the tension, and drain the infiltrated tissues; the mouth must be continually washed out with warm water. At an early period, if there is much febrile excitement, a diaphoretic containing antimony (Form. 7) or aconite should be given.

In some inflammatory affections of the throat in children, as in tonsillitis and general pharyngitis, half a minim of the tincture of aconite may be given to a child in a teaspoonful of water every hour, or even half hour, with great advantage. But its effects must be watched lest it should depress the circulation too much, or render the pulse unsteady. The remedy will generally convert the dry and hot skin into a sweating one, and control the febrile excitement and restlessness; the pulse loses its hardness, and falls in frequency, the temperature is reduced, and relief follows in a short time. The tonsils become less swollen and congested, and

* Of 1000 cases of tonsillitis treated by Dr. Morell Mackenzie at the Hospital for Diseases of the Throat, there were only 36 cases from 10 to 15 years of age, and 184 from 15 to 20. The most common period is between 20 and 30; after 25 there is a remarkable fall. Young children are very little subject to the disease, and before the age of five it is seldom seen (Diseases of the Throat and Nose, 1880, p. 49).

the mucous membrane of the throat more moist and natural. "If caught at the commencement, a quinsy or sore throat rarely fails to succumb in twenty-four to forty-eight hours."* Guaiacum is another remedy which has long enjoyed a great repute in the treatment of this affection. Dr. Morell Mackenzie thinks it far superior to aconite. It may be given in the form of powder, four or five grains in a little jam, every six hours, or the Trochisci Guaiaci of the Throat Hospital Pharmacopœia may be ordered.†

A grain or two of calomel to stir up the functions of the liver will abate the headache. The patient must be fed with milk and soda-water, tea, lemonade, and thin water arrowroot, the tartrate of potash drink to keep the bowels free, and beef tea to support the strength. Tonsillitis is soon succeeded by prostration, and quinine and other tonics may be called for at an early stage of the affection.

Hypertrophy of the tonsils may follow acute tonsillitis, but more commonly it is seen in delicate children who are anæmic, rickety, or strumous, or afflicted with a syphilitic taint. The disease begins as a chronic affection during the first two or three years of life.‡ The tonsils project in the middle line of the fauces, narrowing the aperture, and interfering with swallowing and speaking. Children so affected sleep heavily at night, with the mouth open, and are restless. They are liable to catarrhal attacks and deafness. If they are young, and the tonsils do not meet, local treatment by nitrate of silver and perchloride of iron may keep the disease in check. As the age advances, and the general health improves, the enlargement under treatment subsides, but in too many cases excision of a portion of the enlarged glands must be resorted to. Cup-shaped depressions in the lower part of the chest-wall are frequently observed in children suffering from enlarged tonsils, when they nearly meet, and narrow the entrance for the admission of air to the lungs. These depressions, due to imperfect expansion of the lungs, disappear after excision of the tonsils, by permitting a freer entrance of air to the imperfectly

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* Handbook of Therapeutics, by S. Ringer, M.D., 8th edit., p. 441. For fuller information on the action of aconite, see Chap. XI, On Scarlatina.

† A Manual of Diseases of the Throat and Nose, vol. i, p. 57, 1880.

‡ Of 1000 cases, Dr. Morell Mackenzie met with 265 under the age of 10 years, and of these 84 occurred from 1 to 5, and 181 from 5 to 10 (op. cit., p 61).

expanded vesicles.* The well-known pigeon-breast sometimes arises from chronic enlargement of the tonsils.

Simple pharyngitis, or inflammatory sore throat, is an affection of the tonsils, soft palate, and pharynx, unaccompanied by ulceration or exudation, and is common among children during cold and changeable weather. It is either a simple idiopathic affection, or it occurs as the accompaniment of measles, scarlet fever, bronchitis, pneumonia, croup, and laryngitis. It is much oftener a secondary than a primary disease. The mucous membrane of the parts just alluded to is swollen and slightly red, and a mucous or sero-purulent secretion is seen upon them, particularly the back of the pharynx, which has a red, roughened, and granular appearance. The mucous membrane in the secondary affection is often dusky and purple, and the tonsils are more swollen than when the complaint is idiopathic, and arises from cold and exposure, or from swallowing boiling liquids.

Symptoms.—The complaint begins with disturbed sleep and restlessness; there is febrile excitement, as heat of skin, flushed face, headache, thirst, tenderness over the pharynx, and difficulty in swallowing. The appetite is gone, and the child refuses to take food. The pulse and respiration may be increased in frequency, and the temperature reach 100° or more. In very young children there is often croupy cough and bronchial irritation. In one case under my care the tracheal irritation was certainly secondary to the pharyngeal affection, and it travelled down into the bronchi and produced suffocative bronchitis and death. The disease is not dangerous in itself, but from the complications to which it may give rise.

The *treatment* consists in applying a piece of linen rag (twice folded) dipped in tepid water to the throat under a piece of oiled silk. If this does not give comfort, and there should be swelling and irritation of the cervical glands, a warm linseed poultice is the best application. In young children I have occasionally mopped out the pharynx twice a day with a solution of nitrate of silver (gr. v ad f℥j), and seen great advantage follow it when the disease has not invaded the trachea. In recent and acute cases, the temperature of the apartment should be warm, and the atmosphere moist. Milk and water, weak tea, and mucilaginous drinks should

* Two Observations on Children, by Norman Moore, M.D., St. Bartholomew's Hospital Reports, 1874, vol. x, p. 130.

be given as a diet. A refrigerant and saline aperient is usually needed (Form. 8), and diaphoretics and mild sedatives of various kinds are useful (Forms. 7, 12, 76) to calm excitement, subdue irritation, and determine to the skin.

Retropharyngeal abscess consists in the formation of matter between the vertebral column and the posterior wall of the pharynx; it is most frequent in infancy and early life. Children of a strumous or tubercular constitution are most liable to the complaint, and caries of the cervical vertebræ, or inflammation of the submucous areolar tissue may provoke the disease.

"The cause is mentioned in twenty cases of the primary form, collated by Dr. Allin, as follows: Exposure to cold, ten cases; lodgment of bone in pharynx, eight cases; blow with a fencing foil, one case. In the last case, the button of a fencing foil passed through the right nostril into the pharynx."* Sometimes no cause can be ascertained.

Many writers describe the disease as secondary when it follows the eruptive fevers, as measles and scarlatina, the inflammatory state of the pharynx involving the cellular tissue beneath, and leading to suppuration. It is then regarded as of idiopathic origin. "When thus occurring, it is similar, both as regards cause and nature, to lumbar abscess. In a few recorded cases the abscess has been a sequel to erysipelas." (Lewis Smith.) It has also been traced to inflammation of the lymphatic glands, between the pharynx and vertebræ. (Fleming.)

Symptoms.—The disease generally sets in with fever and restlessness, furred tongue, heat of mouth, difficulty in deglutition, and the impossibility of assuming a recumbent posture. There is also in some cases a stiffness of the neck, and pain in moving the head. As the complaint advances the respiration becomes labored, and food cannot be swallowed without pain. Occasionally there is croupy cough. The early symptoms in a strumous-looking child, two years of age, which came under the care of Dr. Oxley, at the Liverpool Infirmary for Children, were stiffness of the neck, labored breathing, and a croupy sound on inspiration, but the little patient was able to swallow and cry. Eleven days afterwards a firm elastic swelling nearly filled up the throat. This was punc-

* Diseases of Children, by Lewis Smith, M.D., 1869, p. 319.

tured with a bistoury, and a large quantity of pus evacuated. The child recovered.*

The abscess can generally be detected on obtaining a view of the pharynx and fauces, when it is seen to push forward the posterior wall of the pharynx against the velum palati, or, if lower down, obstructing the larynx and involving the respiration. The pus may even extend downwards into the pleural cavity, and excite dangerous mischief within the walls of the thorax.

When dyspnœa threatens there is danger of suffocation, and coughing or swallowing increases the paroxysms; the head is thrown back and the patient sits upright, with the tongue protruding from the mouth; the pulse is frequent and small, the aspect is livid, and death occurs from apnœa. In some rare instances the abscess has burst and deluged the trachea and bronchi, causing death by suffocation.

In the case of a child three years of age, recorded by Dr. C. Elliot, of the Bristol Children's Hospital, slowly increasing dysphagia was the leading feature, followed by convulsions and death. Nothing could be detected on examination but some redness of the fauces and slight enlargement of the tonsils. There was no dyspnœa. Beef tea and brandy were introduced into the stomach through a gum elastic catheter. After death "an abscess containing about two ounces of pus was found situated in the upper and posterior wall of the pharynx." There was no disease of the bone, and the larynx and tonsils were healthy.†

Diagnosis.—The disease may be mistaken for croup, but the peculiar cough of the latter should distinguish it, and the insidious manner in which retropharyngeal abscess creeps on; it is much slower in its development, and the respiration is not involved till a late period. The complaint is quicker in its progress when it follows the exanthemata than when it arises from disease of the spine.

Treatment.—When the abscess is detected it should be opened with a bistoury, in the median line, without delay, and the finger will sometimes detect fluctuation when an inspection of the fauces fails to discover anything wrong. For a day or two after the puncture the tumor should be occasionally pressed with the finger to squeeze out any accumulation of matter, and if the case goes

* Brit. Med. Journal, 1874, vol. ii, p. 371.

† Ib., 1879, vol. i, p. 663.

on well recovery will take place in two or three weeks. If the abscess is detected early and opened the majority of the cases will recover, but if due to disease of the spinal column they are generally fatal. After puncture, cod-liver oil, the syrup of iodide of iron, quinine, nourishing diet, and pure air will complete the cure.

Cynanche parotidea—parotitis or mumps—is a contagious and common disease in children, often occurring as an epidemic in schools, or other places where a large number of young persons are living under the same roof. Sporadic cases are occasionally met with, and boys are far more frequently attacked than girls. The disease consists in inflammation of one or both parotid glands, sometimes, however, attacking one side of the face only, and terminating in resolution; the testicles of boys, and the breasts and ovaries of girls, occasionally sympathize in the swelling, especially when the affection begins to decline. Ordinary mumps is usually excited by exposure to cold, and runs its course in four or five days. When one member of a family suffers the others also become affected, though some authorities (with whom I cannot agree) assert that the complaint is not infectious. When the blood is contaminated by typhus, and some other fevers, inflammation of the parotid may terminate in suppuration.

According to Virchow the disease commences in the gland ducts rather than in the interstitial tissue of the parotid. When it arises from simple catarrh, the tendency to suppuration is much less than when it originates in catarrhal inflammation of the gland ducts.

The *symptoms* are febrile disturbance and headache; there is stiffness and pain in opening the jaws, and swelling takes place between the cheek and the ear, extending down the neck along the ramus of the jaw to the submaxillary gland. The face is sometimes flushed and the child is very restless, and even wanders at night.

Treatment.—If there is much swelling two or three leeches may be necessary, and a poultice applied afterwards, but warm fomentations and a piece of flannel carried under the chin usually suffice to bring about a cure. A saline and cooling aperient is desirable to relieve the feverish symptoms and open the bowels. The diet should be exclusively fluid, consisting of milk, thin arrowroot, tea, etc. If the gland remains enlarged after the acute symptoms have subsided it leads to no bad consequences, and disappears in the course of time.

CHAPTER XIV.

INDIGESTION.

STATE OF THE DIGESTIVE ORGANS IN INFANCY AND CHILDHOOD: *Influence of dentition on the digestive process—Chymification—Chylification—Absorption—Defecation—Sympathetic disturbance in other organs—Digestion of different principles of food, starch, sugar, and fat—Sugar will not replace fat—Nitrogenous elements of food—Influence of weaning on digestion—Emotional indigestion—Solid meat not required till molar teeth appear.* SYMPTOMS: *Symptoms of the different varieties of indigestion—Vomiting—Pain—Intestinal irritation—Eczematous eruptions—Anorexia—Vitiated appetite—Bulimia—Pyrosis.* CAUSES: *Atrophy—General debility or inherited weakness—Improper or deficient feeding—Excess of animal food.* TREATMENT: *Alkalies—Calumba—Bark—Mineral acids—Nux vomica—Citrate of iron and quinine.*

THE functions of the digestive system in infancy differ in a remarkable degree from those of adult life when the organs concerned have reached a higher state of development. The calls for nourishment to meet the changes that are perpetually going on in the child are frequent, and too much care and importance cannot be devoted to this early period, when the stomach is so constantly occupied in preparing the food that is introduced into it for absorption and nutrition.

Children may be compared to small birds whose circulation and respiration are very rapid, while the machinery of life is in active motion; in fact they live fast. These tiny creatures are continually pecking up food to compensate for the incessant waste in their physical economy. But the balance between waste and repair is soon overcome in favor of the former, and small birds are short lived. In children, owing to the further development of the organs, the process of repair is in excess of waste and leads to growth.

Indigestion is most common in infancy, and decreases with growth and the completion of the first dentition, when the stomach in healthy children becomes capable of bearing a mixed diet. The digestive organs in early life will only assimilate the simplest diet, and any deviation from it will be followed by discomfort, and symptoms which make up the sum total of indigestion.

In the predental period of infancy the food reaches the stomach almost as soon as it is introduced in the mouth without mastication. When once it is in contact with the gastric mucous mem-

brane, a secretion is poured out; and the two combining form a substance called chyme, and the process is termed *chymification*. The next step consists in the action of the muscular coat of the stomach walls, forcing the fluid mass through the pyloric orifice into the duodenum, where mixing and becoming incorporated with the biliary and pancreatic secretions it is transformed into a creamlike substance termed *chyle*, and this process is called *chylification*. The villi which are scattered over the surface of the small intestine absorb the nutritive elements, and convey them into the lacteals, and so into the circulation through the receptaculum chyli. Those portions of the food which are useless, or resist absorption, are conveyed along the remaining tract of intestine and finally thrown out of the body as excrementitious matter, and this process is termed *defecation*. In a state of health these processes are carried on without our consciousness, and a sense of comfort and satisfaction only is felt. Where digestion is imperfectly performed, either from defective health, or from the quality of the food that has been taken, then indigestion results, and the symptoms that ensue are oppression, pain, weight, and distension. The food is either rejected by vomiting, delayed in the stomach, or passed on into the bowels, causing diarrhœa, or some other form of irritation in these viscera.

We have here to consider what happens in infants and very young children in these cases. There is deranged action in the stomach itself, an alteration in the character of the secretion, and irregular or unhealthy muscular action. But indigestion once established does not limit the resulting disturbance to the stomach itself; it involves by sympathy other and distant organs, and there is not an important viscus in the whole body that does not share in the general derangement, so much so, that it frequently distracts our attention from the stomach, and deludes us into looking at the sympathetic disturbance as the primary evil.

In children, as in adults, the stomach may have lost its vigor and tone, and therefore be incompetent to fulfil its functions; but in the vast number of instances indigestion originates from the quality and quantity of food that is introduced into it. The mucous membrane is readily irritated, and resists the offence, just as any other organ of the body becomes irritated by some abnormal stimulation, and finally fails under the excitement, even

though there may be no discoverable alteration or gross structural change.

Hence, then, it is proverbial in early life that the stomach being delicate and susceptible to any disturbance, we should be most careful to select a proper diet, to consider the quality of food that is supplied, to measure the capabilities of the digestive system, and to deal with them accordingly.

We have no need to pursue more than cursorily the question of mastication, because it is the digestion of infancy we are now mainly concerned with, and yet it is necessary to allude to the development of the teeth. There are two sets of teeth, the *deciduous* and the *permanent*. In infancy there is a period of several months before any teeth are developed, and when therefore the function of *mastication* is not required. In the early months of life there is no secretion of saliva. (Pavy). The mother provides the necessities of living in the form of milk, which her child consumes till growth and development fit it for an independent existence. By the time when the mother should wean her child at seven or eight months, the teeth begin to appear, and by the end of the first year in healthy children there are usually as many as twelve. There is no longer need for a fluid diet exclusively, but among the lower classes, prolonged lactation to diminish the risk of repeated pregnancies, is carried far beyond the limits of health in the mother or her offspring. Children of fifteen or sixteen months old may often be seen clinging to the breast for their only sustenance in the out-patient department of our hospitals.

When the child is once permitted to sustain itself another difficulty is presented. In many instances it is either provided with food which is improper, or it devours it too hastily, and so the troubles of indigestion are established. Food imperfectly masticated resists the solvent action of the gastric juice, and irritation of the digestive organs arises.

Regarding the process of *insalivation*, the secretions of the parotid and submaxillary glands are poured into the mouth, as well as that of the lingual and other smaller glands. Parotid saliva, in man at least, is watery, and acts as a solvent; submaxillary saliva is more viscid, and contains more of the active principle, ptyalin, which converts starch into glucose or grape-sugar.

Digestion of Starch.—Starch is a non-nitrogenous principle, entering largely into the composition of some foods. Whilst it

remains in this condition it resists absorption till the digestive system exerts its influence upon it. The first conversion is into dextrin, which much resembles starch, and then into sugar, which is easily absorbed. The action of the saliva converts starch into sugar when the process of mastication is properly carried on. As the food passes out of the stomach, the secretion of the pancreas and the glands lining the mucous membrane of the intestines exert their action upon the remaining starch, and further transformation into sugar takes place, and the bloodvessels convey the latter into the circulation, whilst the unchanged starch-granules mix with the evacuations and are carried out of the system. Starch is not naturally a part of the food of very young infants when the digestive functions are imperfectly developed. Sugar is the form that suits them.*

Digestion of Sugar.—This is principally the cane sugar which exists as a juice in many plants. It is so readily soluble that the digestive functions are in no degree taxed when it enters the stomach, by which it is readily absorbed into the circulation, undergoing a change into grape-sugar.

In some forms of dyspepsia, and especially in that of children, lactic, butyric, and other acids may be present as secondary products, arising either by their respective fermentations from articles of food, or from decomposition of their alkaline or other salts; and the tendency is immensely increased by saccharine articles of diet.

The envelopes of the fat-cells are dissolved by the gastric juice, and their contents set free These run into droplets, and are passed on into the small intestines, where they are acted upon by the bile, and the pancreatic secretion. By the agency of these the greater part of the fat is emulsified, and therefore rendered capable of absorption; partly split up into fatty acids and glycerin, and partly saponified. The absorption of fat appears to be of a physical rather than of a chemical nature.

State of Digestion at the Time of Weaning.—In even healthy children this seldom takes place without causing some disturbance in the constitution, and the symptoms that arise are generally those that indicate disorder in the functions of digestion. The change of food when the mother ceases to suckle her child is fraught with risk for some time, the child is fretful and sleepless, has flatulence,

* See Chap. II, p. 36, where this subject is more fully considered.

diarrhœa, or vomiting, and forthwith it declines, looks pinched and careworn, has a weak cry, and the skin shrivels from the absorption of the subcutaneous fat, redness about the arms and thighs is observed, and the changed aspect is remarkable. Not that this abnormal condition ensues in all cases, for many healthy infants bear the change without manifesting either local or constitutional disturbance.

Indigestion is constantly associated with wasting in children; when they are so suffering, the food that is swallowed is at once rejected; they lose color and strength, the muscles waste, and the limbs become attenuated. The child refuses the breast or takes it greedily; then begins to whine and cry, and can obtain no ease till the milk is rejected, because the digestive powers are unable to assimilate it. In addition to these symptoms others arise, as heat about the mouth, with pain and acid eructations; the motions are often slimy, offensive, and of a dark-greenish hue, or they are pebbly, and there is constipation. When the child is fed on milk or has a wet-nurse the motions may be pale and almost like the milk that is swallowed, which passes through the bowels unchanged; or the motions are variable in character (diarrhœa alternating with constipation), being loose and thin at one time, and sticky and clay-colored at another, with green spots like bits of spinach among them.

Vomiting, so frequently present in these cases, is a reflex action of the nervous system, and is a common symptom of indigestion, or irritability of the stomach in infancy and childhood. It is also symptomatic of disease of the brain, of the lungs, of the various exanthemata, and diarrhœa depending on poisoned blood. It is a symptom that invariably excites alarm when it arises without any discoverable cause, and cannot be attributed to overfeeding or mechanical irritation. It usually happens that the milk does not agree, either from fatigue, indiscretion in diet, or bad health in the nurse; what is swallowed soon causes flatulence and pain till it is finally rejected as a curd from the stomach, and the child at once seizes the breast again till the same symptoms recur, or after some discomfort it passes through the stomach and creates intestinal irritation and diarrhœa. The same is likely to ensue when the milk is healthy, but the child has been allowed to go too long without food, or is fatigued from heat or overexcitement. If, from any of these circumstances, vomiting ensues, it is important

to allow the stomach rest, and whilst its tone is lost, to give a teaspoonful of cold water or barley-water, till the sickness has passed off. When the symptoms do not yield to these measures, and the child is otherwise in good health, a mild mercurial and milk and lime-water given by a teaspoon will generally afford relief. It may at the same time be advisable to prescribe small doses of hydrocyanic acid in a solution of magnesia, and to apply a mustard poultice to the epigastrium.

During the continuance of this state of things the child is weakly, and an erythematous rash may appear on the buttocks, or eczema on the face and scalp. I have seen this appear and disappear according to the severity of the indigestion, and in one case it was so bad that the eyelids became œdematous from the swelling and the features distorted.

Anorexia is a common symptom in dyspepsia, and when it is present children will struggle to the utmost rather than swallow one particle of food. *Vitiated* appetite is sometimes seen in children. In one case under my care, a girl suffering from anasarca and albuminuria, devoured the most loathsome things possible, and required careful watching to prevent her from so doing.

Bulimia is seen among children suffering from worms in the intestinal canal or mesenteric disease. It is also very common in cases of chronic hydrocephalus, and is by no means rare during convalescence from measles and some other acute diseases.*

Then there is a form of dyspepsia not uncommon, especially in boys † The tongue loses its epithelium and is superficially ulcerated. Children thus affected bolt their food and have ravenous appetites. They lose flesh and do not thrive; they are pallid and delicate-looking, and if the condition is allowed to go on it may pass into mesenteric disease.

In some cases dyspepsia and intestinal irritation are brought on by giving young children too much animal food, which they swallow without sufficiently masticating it. After a time, in addition to epigastric pain, tenesmus and bearing down ensue, the child wishing to go to the closet every minute; the motions are lumpy, thick, and brown, with jellylike clots of blood on them, and there are faintness and nausea before the bowels act. This form of indigestion may, if the symptoms are not attended to, pass into dys-

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* See Chapter X.

† See Chapter II.

enteric diarrhœa, and the child may die of mesenteric disease and phthisis.

Pyrosis is sometimes seen in children of eight or nine years of age, demanding the same line of treatment as in the adult.

The *causes* of indigestion in infants arise in nineteen cases out of twenty from defective power on the part of the stomach to assimilate and digest the food that is supplied, or to the food not being always of the most digestible quality. I remember a lady who had five children, and all of them reached the age of one year without any illness or drawback. All the five children were wet-nursed. The sixth child was born at the full term, and in every respect was strong and vigorous. A healthy wet-nurse was procured whose milk presented microscopically no deviation from the healthy standard, she was twenty-five years old, and all her functions were regular. The child at the age of two months had an erythematous eruption of the face and scalp, attended with great itching and much redness. Small vesicles and prominent elevated points soon appeared over the inflamed parts, and finally ran into one another, causing excoriation and superficial ulceration of the surface. The tongue was clean and without aphthæ, the surface of the body healthy, and there were seldom less than three or four motions in the twenty-four hours, of a bright-yellow color. The child occasionally brought up a curdlike mass of milk, almost as soon as swallowed, and the uneasiness evinced by a whining cry, and the incessant drawing up of the extremities, would often momentarily cease, after lasting many hours, by the expulsion of wind from the stomach, or by the action of the bowels. This was clearly owing to indigestion, and imperfect assimilation of the milk taken; either it was too rich, or the stomach too feeble to exert the necessary changes, or the mucous membrane secreted an undue amount of acid, and caused fermentation in the food products. Barley-water, substituted for a time, would arrest sickness and spasms, and so would isinglass and water, and then the child would return again to the nurse's milk for a few days without any inconvenience. But after a time the same inconvenience would return, and then it was finally determined to discard the nurse, and try the effect of cows' milk with an equal quantity of water, and one tablespoonful of lime-water to the bottle. A third of a bottleful was allowed at each feeding at intervals of two hours. Immediately the change of diet was instituted, a remarkable improvement set in, the erup-

tion began to fade, and the child was brisk and lively. But after a few more days had elapsed the same colicky pains and flatulence returned, the child was pale and pinched, and the motions became acrid, offensive, white, and sticky.* It was obvious that the liver was not pouring out its proper biliary secretion, and to meet this, a powder containing a grain of gray powder, two grains of rhubarb, and half a grain of cinnamon powder, was given every night, whilst a carminative mixture of bicarbonate of potash, sal volatile, and dill-water was given at intervals during the day. About twenty drops of brandy were added to each bottle of milk. An improvement soon set in, the motions assumed a more healthy character, and the child became bright, the features filled out, it slept, and enjoyed the food, which now caused scarcely any flatulence or discomfort. A still further manifestation of improvement was shown in the decline of the eczematous eruption, once so persistent and troublesome, but now fading with the child's better nutrition, and only giving evidence of its latency by occasionally showing itself when the digestive functions were temporarily disturbed.

The alimentary canal is extremely sensitive in early life, and a mother learns from experience that if she is careless in keeping her own digestion in proper order she is sure to derange that of her offspring. After the seventh or eighth month, when the teeth begin to appear, the child will need some solid article of food, and it is then that biscuits and some farinaceous articles of diet may be given with the milk, later on a little beef tea or gravy, but not meat, till the second year. The irritation caused by the coming molar teeth induces the child to make masticatory efforts, and this excites the action of the salivary glands.

The other *causes* of indigestion are an impure atmosphere and confined rooms, especially if several children occupy the same apartment. Hot sultry weather will frequently induce the complaint, and children reared in towns and cities are more frequent sufferers than those brought up in the country. Artificial feeding is probably the most frequent cause, especially that by the bottle, from the liability of the contents to turn sour and disorder the digestion. All children so suffering should be fed with a teaspoon.

Older children experience indigestion from eating unwholesome

* See Chap. XV, On Diarrhœa.

food, as sweets and raisins, cherries, etc., which, undergoing only partial change, cause pain and intestinal irritation. They are often feverish and drowsy, have headache, and are disinclined to move; they bring up what is swallowed, and complain of pain over the epigastrium. Their nights are restless, and the nervous system is so upset that a convulsion may follow. The neglect or continuance of the disease may lead to aphthous ulceration of the mouth, diarrhœa, or eclampsia.

Treatment.—In addition to the hints and suggestions already thrown out in this chapter, concerning food and judicious feeding, there are other matters to be recollected. Three conditions appear to be necessary to ward off indigestion in an infant, and when they exist, it is remarkable how slight is the stomach derangement. These conditions are: 1. The child to be healthy born; 2. The mother to be healthy, if she supports her own child; 3. The cow's milk used to be pure, from the same cow, and to be properly diluted.

The cause in operation requires to be diligently sought for, and a careful inquiry should be made into the circumstances of each individual case in order to remove it. It sometimes happens that an emetic will get rid of the offending material at once.

Care in nursing and proper feeding will often cure the disorder. The fixed alkalies of lime and magnesia may be added to the milk. If there is acidity, an occasional powder of soda and rhubarb is of service, and a grain or two of mercury and chalk may be added when the biliary secretion is deficient. It is a good plan to give alkalies when there are free acids generated in the stomach; a grain or two of bicarbonate of potash with sal volatile will prevent the coagulation of the milk and the formation of a curd. Dandelion and calumba may be added if the stomach has lost its tone and the liver is inactive.*

Alkalies ought not to be continued for too long a period, and the circumstance that curd is vomited by no means implies that there

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* Formula 19:

℞. Sodæ bicarb., ... gr. xij
Spt. amm. arom., ... ♏xij
Syr. rhei, vel succi taraxaci, ... ʒiij
Tinct. calumbæ, ... ʒj
Aquam anethi ad . . . . . ℥iss.—M.
ʒij ter die. For children a year old.

is acid in the stomach, because the gastric juice may be insufficient and the stomach weak. In that case the mineral acids are suitable to the youngest child, the hydrochloric or nitric acid, or both combined.* If there is sickness and debility, with scanty secretion from the liver, hydrocyanic acid in combination with nitric acid may be given.† Bark and nux vomica are also useful in some cases.‡

Indigestion in children sometimes assumes an exceedingly acute form. From being comparatively well, a child becomes suddenly ill, restless, and feverish; its circulation and respiration are excited, and its temperature runs up to 103°, or even higher; the mother thinks the child has caught cold, or is commencing some feverish attack, but the suddenness and character of the seizure render this view unlikely. This suddenness is the great characteristic of acute indigestion, and at once points to the real cause, and relieves the anxiety. In such cases it is well to give an emetic of ipecacuanha, with a little antimonial powder and calomel. The child vomits, is at once somewhat better, and if its bowels are opened subsequently, in a few hours the alarming symptoms disappear. The quickness of the decline corresponds to the acuteness of the attack.

In chronic indigestion change of air is very serviceable, and one wet-nurse may have to be changed after another; calumba, bark, and nitric acid are useful in these cases. In older children,

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* Formula 20:

℞. Acid. nit. dil., ... ♏xij
Acid. hydroch. dil., ... ♏xxiv
Tinct. calumbæ, ... ʒj
Syr. aurant, ... ʒij
Aquam ad . . . . . ℥ij.—M.
ʒj ter die. For children a year old.

† Formula 21:

℞. Acid. hydrocyan. dil., ... ♏xij
Acid. nitric. dil., ... ♏xx
Syrupi, ... ʒij
Aquam ad . . . . . ℥iss.—M.
ʒj ter die. For children a year old.

‡ Formula 22:

℞. Tinct. cinch. co., ... ʒiss.
Tinct. nucis vom., ... ♏xij
Syrupi, ... ʒij
Aquam ad . . . . . ℥iss.—M.
ʒj ter die. For children a year old.

the citrate of iron and quinine is a valuable remedy if there is anæmia.

Dr. Lauder Brunton advocates for children with defective digestion, stale bread cut very thin, and the butter well rubbed into it, in preference to bread cut thick, with a thick layer of butter, commonly seen in the nursery. In doing this the fat becomes finely subdivided, resembling the condition found in milk.

CHAPTER XV.

DIARRHŒA.

VARIETIES—1. *Simple diarrhœa (catarrhal diarrhœa)*—2. *Bilious diarrhœa*—3. *Choleraic diarrhœa (cholera infantum)*—4. *Congestive or inflammatory diarrhœa (chronic muco-enteritis, mucous diarrhœa, entero-colitis)*—*Thermic diarrhœa*—5. *Lientery (lienteric diarrhœa)*—6. *Dysenteric diarrhœa*—*Symptoms of the different forms*—*Green stools, their causes and significance*—*Clay-colored pasty stools*—*Chronic diarrhœa*—*The result of persistent simple diarrhœa, or the other varieties*—*Causes of diarrhœa*—*Dentition*—*Oversuckling*—*Impure air and water*—*Filth and overcrowding*—*Irritating food*—*Sour milk*—*Cold*—*Dyspepsia*—*Congestion of the liver*—*Artificial feeding*—*Sometimes a complication of rickets, whooping-cough, and measles*—*Treatment of simple diarrhœa*—*Castor oil*—*Dover's powder*—*Bismuth*—*Ipecacuanha*—*Astringents*—*Warmth*—*Rest*—*Stimulants in cases of exhaustion*—*Rhubarb*—*Treatment of the choleraic, and remaining acute forms of diarrhœa*—*Treatment of chronic diarrhœa*—*Raw meat juice*—*Extract of malt*—*Acetate of lead*—*Gallic acid*—*Logwood*—*Catechu*—*Krameria*—*Sulphuric acid*—*Syrup of red gum*—*Extract of Bael*—*Sulphate of copper and opium*—*Astringent enemata*—*Change of air*—*Prolapsus ani*—*Its causes and treatment.*

DIARRHŒA is produced by many conditions, and among children is more often a salutary than a diseased process. It is of common occurrence when a septic poison is generated from the decomposition of vegetable matter, or the atmosphere is charged with miasmatic effluvia. After absorption through the lungs into the blood, the intestinal mucous membrane becomes irritated and excited, in virtue of an inherent disposition on the part of the economy to eliminate these noxious agents.*

We meet with it again, when water containing organic impurities, obtained from the vicinity of graveyards and stagnant pools, is used for drinking purposes. When contaminated with fetid

* See Lectures on the Infective Processes of Disease, by J. Burdon Sanderson, M.D., LL.D., F.R.S., December, 1877.

gases, fermentative dyspepsia arises, and the bowels show signs of a disorder, varying from simple irritation to choleraic purging, cramps, and loss of body heat.*

As a healthy process, a sharp attack of diarrhœa proves its own cure, irritant and offensive matter being thus got rid of by the bowels, when the stomach cannot assimilate the food that is taken. We aid these efforts when nature fails to complete the cure by administering such remedies as remove any morbid materials from the system.

Diarrhœa is common enough in infants when too much milk is swallowed, or when rich or sour milk, instead of being thrown up by vomiting, passes on into the intestines, and creates irritation there. Exposure while dressing, insufficient clothing, the use of too cold water in washing, and the neglect of cleanliness, will all induce excessive peristaltic action of the bowels.

Statistics clearly prove that there are few diseases in infancy and early life of greater frequency or danger than diarrhœa; it will often set in from slight or unascertainable causes, and decide the fate of a young child in a few hours. The delicacy of the stomach and intestines in infancy renders this one of the commonest ailments. If the supply of food is not of the simplest kind, and given in small quantities to suit the tender age of the child, the process of digestion and absorption will be deranged, and the local disturbance thus initiated will convey the irritation to some other organ, and expose the life of the child to considerable peril.

Diarrhœa in children may be conveniently grouped into the forms enumerated at the commencement of this chapter. This is, however, at best, but an arbitrary division, for simple diarrhœa may pass into any of the other varieties, if the irritation lasts long enough to excite sufficient disturbance in the mucous membrane; and it is often impossible to separate them in practice.

* The diminution in the number of deaths from infantile diarrhœa during the last seven years is mainly attributable to improved sanitary legislation, and is far less dependent on temperature and other atmospheric conditions than is generally supposed. Indeed, the returns of the Registrar-General for 1877 show that the mortality of infants from this cause was, during the third or Michaelmas quarter, not much more than half the average of the seven preceding summer quarters. The poor, in receiving higher wages, are enabled to live in better houses, and to obtain a superior quality of food. This change in their social position will most likely induce them to exercise greater vigilance than formerly, and will awaken them to the danger of any unhealthy influences that may spring up around them.

1. *Simple Diarrhœa* (Catarrhal diarrhœa).—In this variety there is an excess of natural action, the evacuations are copious, relaxed and frequent, and the child, if an infant, is soon exhausted in consequence. The attack may at first be painless, and as there is a loss of consistence in the motions they are squirted out with spasmodic effort. The evacuations are fecal, and if at first greenish, they become yellow as the symptoms subside and improvement sets in.* The early symptoms of *simple diarrhœa* are hardly noticeable if the discharges are moderate, but there soon follow general discomfort and peevishness, the child is disturbed in its sleep, and, perhaps, becomes languid and paler than usual. The tongue may be slightly coated, and there is usually some thirst and diminished appetite. When the attack is acute there is sickness, thirst, and dryness of the mouth; the strength is reduced, and in a few hours the child may be much weakened. The little patient becomes sunken about the eyes, the features are sharpened and even collapsed, and the fontanelles are depressed; there is sometimes febrile disturbance with cough and bronchial irritation; the abdomen may be swollen and tender from flatulence, or concave and empty. If the diarrhœa goes on actively for a day or two, flesh and strength are rapidly lost, the muscles feel soft and flabby, the pulse becomes quick and feeble, and life is placed in imminent danger. The change in the character of the evacuations consists in their being thinner and more copious, though they seldom lose their feculent appearance, except in very severe cases, or where the disease is obstinate. In these cases the motions soon become offensive after escape from the body, and may be even greenish and slimy.

When the diarrhœa is sharp and continuous it sometimes induces so much relaxation of the sphincter as to cause prolapsus ani.

The *anatomical* changes in the lining membrane of the intestinal tract consist in congestion of the vessels, which disappears after death. There would seem to be no pathological changes in the simple form of the complaint, even if it proceed to a fatal termination.

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* "The normal form of the infantile fæces in the first year is pappy; the color is yellowish, like that of the yolk of egg; the smell is feebly acid, never putrid, and only in children who are fed upon a meat diet repulsively pungent, as in the adult; in later years they are no longer to be distinguished from the adult."—*Vogel, Diseases of Children*, 1874, p. 135.

2. *Bilious diarrhœa* may be witnessed in some children who eat inordinately of animal food, and live too well for the wants of the system. Impure milk, like impure water, is capable of giving rise to this form of diarrhœa, and in severe cases the symptoms may become dysenteric.* A large quantity of bile is secreted by the liver and poured out into the intestines, which it irritates. The disease is most common in hot weather, and of course far more frequent in tropical climates, when the liver is apt to be congested from diminished respiratory action. It arises from an excessive secretion of bile, which stimulates the bowels to frequent action, the motions being copious, loose, and of a dark-yellow or green color; the urine is scanty and high-colored, and may contain traces of bile also. The secretion of bile may be enough to provoke fever, unless it finds its way freely out of the system.

3. *Choleraic diarrhœa* (cholera infantum — gastro-intestinal catarrh—Rilliet and Barthez) is most common in infants, and in those who are early weaned or badly fed. The disease usually follows a rapid and fatal course. Its frequency is much greater in cities than in country districts, and in summer and autumn, than at other seasons of the year. "It is so frequent during the period of first dentition, that some writers consider dentition a cause." (Lewis Smith.) It is in my experience far more frequently due to atmospheric influences and errors of diet. It usually commences with simple or inflammatory diarrhœa, the child loses its appetite and is fretful, then it is seized with purging, and occasionally with vomiting, attended with prostration, pallor, and symptoms of sinking. Violent retching sometimes coexist with choleraic diarrhœa, and the disease may set in very suddenly, and rapidly proceed to a fatal termination. The tongue is slightly coated or clean, smooth, and dry, and the pulse quick and small. As the disease progresses the respiration becomes oppressed, the urinary secretion is suspended, and the surface of the body is cold, damp, and sometimes livid. The discharges at first are thin and fecal, or frothy, with mucus or altered bile; but

* An epidemic of diarrhœa, traceable to one special milk supply, is described by Dr. Philpot as having occurred at Upper Norwood in September, 1877. The attack was ushered in with rigors, pains in the limbs, and pyrexia. The bowel discharges were "of an offensive bilious character, going on to mucus, and, in some instances, bloody stools, with tenesmus." There was no fatal case, and the disease yielded to treatment in a few days.—*Medical Examiner*, Jan. 10th, 1878, p. 29.

in the course of a few hours there are no traces of a biliary secretion whatever, the evacuations being copious, frequent, and like rice-water or oatmeal gruel, from containing shreds of intestinal epithelium. It is the excessive discharges of colorless fluid which distinguish this form of diarrhœa from any other. So great is the quantity that one evacuation will saturate the napkins of the child, and completely soak through the bed linen, as though they had been kept under water for hours. When the stools are pale and fluid there is no odor belonging to them; but if they are in any degree feculent, and yellowish or greenish, then they are extremely fetid and offensive, and, notwithstanding the utmost cleanliness, the odor is at once perceptible on entering the sick-apartment.

At first there are evidences of pain and griping sensations in the stomach and bowels; the hands and extremities are cold, the face pinched, and the eyes hollow. There is usually a craving thirst, and fluids are no sooner swallowed than they are brought up again; all appetite is gone, and sleep is broken and unrefreshing. If the disease does not soon yield to remedies, the child passes into a state of coma and dies. If the disorder lapses into a chronic form, the evacuations may assume a dark-greenish and putrid character; the belly becomes tumid or tympanitic, and the tongue is covered with aphthæ. The disease may end fatally in a few hours or extend over some weeks. Cases apparently hopeless sometimes recover.

The liver has been observed to be enlarged in this affection by several writers, but the most constant anatomical change would appear to be enlargement or softening of Peyer's patches, with an erythematous or inflammatory condition of the lining mucous membrane.

The following is an example illustrating these several points: A female infant, ten months old, was seen by me on July 10th, 1868, at 8 A.M., having slept only two hours during the night, and not at all the day before. It had been taken out in the air, and the want of sleep attributed to being left in the sun. The bowels acted three times before 3 o'clock on the preceding day, and again at 3 A.M. next morning; the last motion was very watery, but fecal. On my visit the child was cold, pinched, and collapsed, eyes languid and set, lips very blue. The child was at once placed in a warm bath, and twenty drops of brandy given in some arrow-

root, which she greedily sucked. The circulation almost at once returned in the skin and lips, and she was then taken out and put into a blanket; but gradually the arterial hue deserted the lips, the surface of the body was pale and contracted, and she became livid as before. She was again placed in the bath, and precisely similar symptoms resulted, the color returning, and the child assuming a brighter aspect. When removed from the bath she as quickly as before became blue and collapsed, but to a somewhat less extent. A mixture of aromatic spirit of ammonia and spirit of chloroform was given, and a mustard poultice applied along the spine. At 11 A.M. the child had rallied, and there had been a colorless watery motion without a tinge of bile. The medicine and beef tea were given alternately every hour. At 1 P.M. dilute sulphuric acid with spirit of chloroform was prescribed every second hour, and at 5 P.M. the child had rallied, though there had been three similar rice-colored watery motions, after which more decided collapse set in, and the child expired with a slight convulsive seizure at 7.45 P.M. No post-mortem was allowed.

4. *Congestive Inflammatory or Mucous Diarrhœa—Entero-colitis—Muco-enteritis.*—In this variety there is a considerable degree of inflammatory action, quickness of pulse, and constitutional disturbance. The evacuations contain a large quantity of thin mucus, which afterwards becomes thicker and approaches the color of pus. The motions are neither frequent nor excessive; they are usually variable in color, sometimes being greenish and offensive like chopped spinach, and at other times yellow and mixed with mucus.* Straining in going to stool is a common and distressing symptom, and more or less blood is intimately mixed with the mucus or fecal matter.

Among the *causes* of this form of diarrhœa may be enumerated damp and cold, and transitions of weather, but errors in diet would appear to be a fertile source of its origin. If the nurse's milk is too rich, or in any way unhealthy, it is very likely to set up diarrhœa in any form. It may be a sequel to choleraic diarrhœa, the

* "Dr. Graves regards this green matter as a secretion from the mucous membrane of the small intestines, and not bile. Drs. Simon and Golding Bird (Medical Gazette, Sept., 1845) consider it owing to blood which has undergone a chemical change."—Quoted from Churchill's *Diseases of Children*, 1848, p. 533. Ballard held that it was the mucus of the gastro-intestinal canal acted upon by the gastric juice, and indicating insufficient or improper food. It is often the sign that weaning should be instituted, the mother's milk no longer being a sufficient food.

bowels remaining irritable, and producing chronic inflammatory changes in the mucous membrane, so leading to gradual death by exhaustion. I quite agree with Meigs and Pepper, who consider that whether diarrhœa is caused by improper food, summer heat, dentition, or epidemic influences, the complaint, if it becomes chronic, is apt to terminate in this disease.* It is not unfrequently met with in children in the outdoor department of our hospitals, and I have long been of the opinion that the complaint is traceable in them to exposure to heat or cold. The cases we ordinarily meet with during the summer are of this character, and hence its frequency among the children of the poor, who are at the same time badly fed and reared in an unhealthy atmosphere.

The cutting of the teeth may exert an influence in causing diarrhœa, as it does in setting up irritation in the brain and other organs. It is common between the ages of six months and two years, when the first dentition is completed.†

The disease may be acute or chronic. In the first form the symptoms are active from the first, inflammatory products passing off from the intestines, and the disease seldom lasting more than a week or ten days. The *chronic* form of the disorder may continue for weeks or months; there is a gradual loss of flesh and strength, and the bowels are perpetually acting.

The morbid appearances are a thickening or inflammation of the intestinal mucous membrane, which becomes red or of a darkish-gray hue, with the evidence of ulceration or enlargement of the glandular follicles lining the colon and small intestine.

Muco-enteritis may follow an attack of measles, pneumonia, whooping-cough, or typhoid fever. It is prone to attack feeble and delicate children of strumous constitution. The abuse of aperient medicines may induce a simple diarrhœa which passes into this form, and weaning, or the change of a nurse is another cause. The morbid anatomy of the affection shows disease of both the large and small intestines. In the large intestine, the sigmoid flexure and descending colon are chiefly affected; in the small intestine the lower part of the ileum. In the acute stage,

* Diseases of Children, 5th edition, 1874, p. 384.

† "The greatest prevalence of diarrhœa coincides exactly with that time whilst the process of dentition is going on most actively, and that exactly half of all cases of diarrhœa occurred in children between the ages of six months and two years."—West, *on the Diseases of Infancy and Childhood*, 1859, p. 587.

the mucous membrane of the intestine is increased in vascularity and softened.

Thermic diarrhœa is the form met with in summer and especially in hot climates. It has been well described by Dr. C. G. Comegys and Dr. H. C. Wood. It may be designated "thermic or heat diarrhœa." "Any one who has seen," says Dr. Wood, "as I have this summer, the child on whom drugs had ceased to act, and who was seemingly doomed to die, relieved in twelve hours by enforced cold bathing, every three or four hours, will grant to Dr. Comegys the credit of having introduced one of the most life-saving improvements in modern infantile therapeutics. The sudden sweet sleep, replacing, after the bath, the fretful nights and days of unrest, is a thing never to be forgotten when once seen, and the arrest of diarrhœa is certainly no less remarkable."*

"We are summoned, in short, very often to see a child with a hot skin (temperature 102½°–105°), rapid pulse (130–150) and breathing (30–40), with frequent purging of semifluid, greenish, watery, fecal, and half-digested matters; the mouth and tongue are dry, the thirst is intense, but the water given to appease it is quickly thrown off, the eyes are staring, pupils contracted, insomnia, rolling the head, and uttering distressing cries, due to the headache from hyperæmia of the cerebral vessels and the unappeased thirst." The bath is first at the summer temperature of 75°, the feet and legs are first gradually immersed, and then water is poured over the chest and abdomen till the whole body is under water. Colder water (65°) is then poured in a continuous stream over the upper part of the head, and this is kept up for fifteen minutes. When the child is removed from the bath it is wrapped in a woollen shawl, and placed in bed with additional covering. It falls asleep, the skin is cool, the pulse and respiration fall in frequency, and the temperature is at or below the normal standard. If the symptoms return the bath may be resumed three or four times a day. The internal treatment consists in giving beef tea, milk, and lime-water; "one grain of quinine and a half to a teaspoonful of whiskey every three hours for a child eight to sixteen months look formidable, but they will be borne admirably."

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* Sunstroke or Thermic Fever, by Dr. H. C. Wood, Philadelphia Medical Times, August 5th, 1876, p. 542.

With the departure of the fever, bismuth and pepsin are given to restrain diarrhœa and assist digestion.*

5. *Lienteric Diarrhœa.*—This form of diarrhœa, known as *lientery*, is characterized by the passage of undigested food through the bowels; it is very commonly seen in artificially reared children, especially among those who are subject to mesenteric disease. Food which they cannot assimilate passes through them. Meat, or bad milk, or vegetables, on which the gastric juice has no action, pass through the stomach, setting up irritation in the bowels. The food undergoes scarcely any change in its passage through the long and tortuous length of the alimentary canal. Shortly after eating the child experiences discomfort, and passes the meat, which has just been previously taken, without the secretion of the stomach having exerted a solvent action upon it. It is probable that the stomach is feeble and primarily at fault in so rapidly dislodging its contents. The child's appetite is greedy and never satisfied; there is great debility and loss of flesh, because the food is not absorbed, and there is thirst and general irritability.

Dysenteric Diarrhœa.—When the discharge of mucus from the bowels is excessive, and is attended with a considerable quantity of blood also, and there is no fever, we may recognize this form. It is not exactly one of acute or chronic dysentery, but of great congestion of the intestinal vessels, leading to their rupture. There are feculent discharges, with tenesmus, pain in the body, and wasting, and the child loses flesh rapidly. Dysentery may be described as a severe form of muco-enteritis, with more pain than is felt in diarrhœa.

Chronic Diarrhœa.—This form may be, and often is, the consequence of the acute forms passing into it by slow degrees, or it may follow cold and overfeeding, the use of sour milk, or the milk of a wet-nurse which is in all respects apparently healthy. The continued discharges from the bowels gradually reduce the strength and impair the powers of nutrition. A chronic state of irritation or catarrh is induced, and the longer it lasts the more difficult will it be to control. In this form of the disease the motions are variable, sometimes being copious and at other times quite

* Cool Bathing in the Treatment of Inflammatory Bowel Affections during the Summer, by C. G. Comegys, M.D., Philadelphia Medical Times, July 17th, 1875, p. 665.

thin and slimy, with gelatinous masses of mucus streaked with blood. As we have seen in the disease known as "*lientery*," any undigested food in the motions is significant of feeble digestive power and impaired nutrition; the milk or other articles of diet pass through the stomach rapidly, and in many cases there is a deficiency of bile.

Causes of Diarrhœa.—In most cases diarrhœa is the consequence of improper feeding. A very common cause is the habit of giving young children farinaceous or biscuit food instead of milk, especially if the child is delicate or rickety. The stomach is easily deranged, and the unhealthy products of digestion entering the intestinal canal excite irritation till they are eliminated. So far, it is a salutary process, and the diarrhœa may soon pass off. Since the use of feeding-bottles has become general, diarrhœa is easily provoked if they are not properly cleansed and rinsed out. When this precaution is neglected, any fresh milk that may be put in turns sour and acid. It may be induced by unhealthy nurses whose milk is deranged through privation or anxiety, or when they are suffering from leucorrhœa. Impure water, bad air, filth and overcrowding, are also to be enumerated among the chief causes of the complaint. Exposure to cold or heat, and biliary derangement may all lead to the disorder. Very troublesome diarrhœa may sometimes be witnessed in children at the time of weaning. The child has probably become badly nourished from the mother suckling it till it is a year old, and then the change of diet to corn flour, mashed potatoes, bread and butter, and even a little meat, will cause relaxation of the bowels, restlessness, and thirst; five or six motions will escape during the day, slimy and containing spots of blood. Only a change of diet can set matters right.

Diarrhœa is sometimes noticed in connection with rickets, and it very frequently follows whooping-cough and measles.

Troublesome diarrhœa may be kept up by the indiscriminate use of aperient medicines.

Treatment.—This will depend upon the cause, which should be if possible ascertained. But whatever may be the origin, and whatever the variety or stage of the disorder, the diet will require immediate and careful attention. Nothing can be done towards effecting a cure till the age and constitution of the child are considered, and it should be particularly noticed whether it has

become suddenly or gradually ill; this question is of immense importance in the plan of treatment to be pursued. If the child has no teeth, corn-flour, and farinaceous food of all kinds must be forbidden, and milk in some shape be relied upon. If the child is an infant, and artificially reared, a tablespoonful or two of lime-water should be mixed with each bottle of milk, and this will aid the digestion of it and prevent it turning sour. If there is much sickness, it may be necessary to apply a small mustard poultice to the pit of the stomach, to suspend the milk for a time, and to give barley-water in its place, and a teaspoonful of cold water occasionally. Too much stress cannot be laid on the importance of feeding, and of selecting the purest milk. When every precaution has been taken with the bottle, in the way of cleanliness, I have known the diarrhœa continue, or the bowels to remain quiet one day and the discharges to be healthy, and yet griping pain, exhausting diarrhœa, and sickness to follow next day. The bottle is abandoned in consequence, and the child is fed with diluted cow's milk in a teaspoon, and forthwith the diarrhœa ceases. In some cases Swiss milk has occssionally succeeded better than cow's milk, and that when one wet-nurse after another has failed.*

The *simple* form of diarrhœa is consequent upon irritation of the lining membrane of the bowels in the majority of cases, and therefore it is not prudent to hastily check it, as it is an effort on the part of nature to expel offending matters from the system; if after a time the diarrhœa continues, a morbid action of the mucous membrane is kept up, which demands remedies to control it. If it appears to arise from irritation in the stomach or bowels, a teaspoonful of castor oil, or a few grains of soda and rhubarb, will soon arrest the symptoms and the child will feel no further trouble. In that variety of diarrhœa where there is straining with mucus, or mucus with blood, a paste of castor oil† and magnesia, with a carminative will be very useful. If there is

* See Chapter II.

† Formula 23:

℞. Ol. ricini, ... ℥ss.
Magnes. carb., ... ʒij
Sacchari, ... ʒiij
Ol. anisi, ... ♏ij.—M.

A teaspooful for a dose. (An infant may take a dose occasionally.) For children from six to twelve months old.

griping pain, and the diarrhœa is profuse, the addition of half a minim of laudanum will be serviceable.* Castor oil possesses mild and unirritating qualities, and promotes the escape of fluid secretions from the intestinal canal without pain or discomfort. This being accomplished, its subsequent action is said to be astringent, so that at the commencement it is probably the safest and best eliminator of morbid secretions which excite the irritation of the bowel.

When the diarrhœa is acute and recent, soothing and unirritating diet is especially to be recommended, rice-water flavored with cinnamon, or barley-water, so that the intestines may have all possible rest. Sago, tapioca, corn-flour, arrowroot, and chicken broth, are all articles of diet to be borne in mind. In older children, where the diarrhœa appears to depend on congestion of the mucous membrane, a combination of gray powder and Dover's powder will be useful for a few nights, with bismuth mixture during the day.† I have seen excellent results from this plan of treatment in out-patient practice, even when the children have not been confined to the house. The treatment of summer diarrhœa has already been considered.

The treatment of *diarrhœa*, particularly in *teething* children, is apt to be looked at with a one-sided view,—the quickest way to stop the diarrhœa. This is a fatal mistake. If the child is of full habit with florid face and greedy with its food, it is not a good plan to hastily check the diarrhœa, but we should simply moderate the alvine losses by some alkaline mixture; and if there are any teeth pressing against the gums, the latter should be

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* Formula 24:

℞. Ol. ricini, ... ℥ss.
T. opii, ... ♏vj
Mucilag., ... ʒij
Syr. zingib., ... ʒiij
Aquam anethi ad . . . . . ʒiss.—M.

One teaspoonful to be given occasionally. For children from six to twelve months old.

† Formula 25:

℞. Sodæ bicarb., ... gr. xij
Liq. bismuth., ... ʒij
Mucilag., ... ʒij
Syr. zingib., ... ℥ss.
Liq. magnes. carb., ... ℥iv.—M.

A dessertspoonful three times a day. For a child two years old.

scarified or well incised. Very often the general disturbance and intestinal disorder yield at once to these remedies. Speaking of the diarrhœa arising from improper food or teething, Dr. Pavy writes: "I am in the habit of giving, and with the most satisfactory result, a little ipecacuanha with a bitter and a saline. My prescription consists of a few minims of the vinum ipecacuanha, twenty minims or so of the tincture of calumba, and one or two or three drachms of the Mistura Salina of the Guy's Pharmacopœia, which is made by saturating a solution of carbonate of potash, containing twenty grains of the carbonate to each fluid ounce of water, with lemon-juice. Conjoined with this a couple of grains of gray powder are sometimes given as an alterative every morning; or sometimes a powder consisting of a quarter or half a grain of calomel, two grains of the dried carbonate of soda, and five grains of the aromatic powder of chalk."* The formula, recommended by Dr. West, containing small doses of vinum ipecacuanhæ and liquor potassæ, is also very useful.†

As a rule, astringents are objectionable at an early stage of diarrhœa, which may continue in spite of them unless other precautions are taken. If the motions contain mucus and are slimy, and there is any escape of blood, or redness about the anus, chalk mixture, catechu, acids, or bismuth, will be of no service; but in their stead the remedies we have already pointed out, especially the castor oil paste and alkalies, with an alterative or sedative, as the case may appear to warrant.

The diet is primarily at fault in these cases, undigested food having passed into the bowels, and having excited over-activity of their functions. Warmth and the most complete rest, with a dose of castor oil, is the most appropriate treatment, and a grain of Dover's powder with a grain of gray powder may be necessary. Now and then a quarter of a grain of calomel will be found of use in children who are old enough and strong enough to bear it.

Among hospital patients, a large number of cases of diarrhœa are traceable to oversuckling, and suckling by mothers in delicate health, or harassed by anxiety. The return of the catamenia or even menorrhagia is no hindrance to the habit. If such children are removed from the breast, and cows' milk is given diluted with water, previously warmed and sweetened, the diarrhœa will gener-

* Digestion and its Disorders, 1867, p. 199.

† Op. cit., p. 524.

ally subside. When milk appears to keep up the diarrhœa, barley-water, or cold water thickened with isinglass will be necessary, or thin water arrowroot. Sometimes a powder containing two or three grains of rhubarb and carbonate of soda will neutralize the acidity which has resulted from the fermentative products of digestion and soon arrest the disorder.*

In some cases where a child is strong, and where there is no abdominal pain, the motions containing mucus or blood, a mixture of sulphate of magnesia, tincture of rhubarb and peppermint-water may be prescribed with advantage.†

As to *stimulants*, if there is much exhaustion a few drops of brandy (and there is no better stimulant) in weak arrowroot or milk are advisable, and if there is much sickness, a mustard poultice to the epigastrium. A teaspoonful of cold or iced water will often allay the sickness. Wine whey (one part of wine to three of boiled milk) is useful where the child is exhausted, and life may sometimes be saved by it.

In the treatment of *bilious diarrhœa*, alkalies, especially soda salts, should be given to relieve acidity, with one or two minims of laudanum, if there be much pain. An occasional mild mercurial is also serviceable.

Treatment of Cholera Infantum.—In the whole catalogue of infantile disorders there is no disease requiring greater vigilance and care. Any error of judgment is speedily fatal. The child should be confined to a spacious airy room, and the utmost quietude observed. When the bowel discharges are profuse and watery, and the child's strength is good, a dose of castor oil or rhubarb may be advisable, because the choleraic poison, or other offending

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* Formula 26:

℞. Pulv. rhei,
Sodæ bicarb., āā . . . . . gr. xij
Spt. amm. arom., ... ♏xx
Syr. zingib., ... ʒiij
Aquam menth. pip. ad . . . . . ℥iss.—M.
A teaspoonful every four hours. For children a year old.

† Formula 27:

℞. Magn. sulph., ... ʒj
Tinct. rhei, ... ʒj
Vel syr. rhei, ... ʒij
Tinct. quiniæ, ... ʒss.
Aquam. menth. pip. ad . . . . . ℥iss.—M.
A teaspoonful every four hours. For children a year old.

materials, will keep up the intestinal discharges, as long as they remain pent up in the system. Elimination through the bowels, consistent with the strength of the child, is therefore a rational mode of treatment.

After this, it is well to moderate the drain, if the child's strength fails, by krameria, or one or two drops of laudanum (Form. 15), and the treatment continued, or modified, according to circumstances. If looseness of the bowels goes on unchecked, it becomes a diseased and not a curative process.

When there is vomiting, I have given prussic acid in combination with a drop or two of laudanum, or the solution of muriate of morphia; but too frequently nothing has arrested the sickness. It is in these cases that dilute sulphuric acid has been recommended (Form. 34). The fact of vomiting ought not to discourage a plentiful supply of cold water, in very small quantities at a time, or toast-water to alleviate the thirst. If indeed the retching is distressing and urgent, a drink of tepid water, by facilitating the escape of morbid secretions from the stomach, is a rational plan to try. In this way the vomiting and purging may be arrested in many cases that appear almost hopeless.

As long as there are offensive matters in the bowels, it must be our endeavor to get rid of them, as their retention in the body increases the mischief, and therefore opium and its preparations should be given with great caution.

When the disease has passed into the stage of collapse, there is an impediment to the circulation through the lungs, and the remedies for exhaustion, as stimulants and opiates, generally fail to afford relief. The body must be kept warm with flannel or the warm bath, cramps relieved by friction, and a few minims of sal volatile or chloric ether administered. If it is considered advisable to employ a warm bath to encourage reaction, the temperature should not exceed 95° Fahr.; the child should not be suddenly immersed, but a blanket should be laid over it, and then the child being also well protected with flannel, can be gradually let down into the water without causing any alarm.

Dr. George Johnson attributes the collapse in cholera to spasm of the arterioles of the pulmonary artery from an alteration in the blood, but this does not appear to me quite a satisfactory explanation of the phenomena, when we remember there are conditions allied to this form of collapse in which the blood cannot be said to

have undergone a poisoned state, or the lungs to be specially implicated. On the other hand, some drugs in poisonous doses, and some animal and vegetable substances have exerted such an irritating action on the stomach and intestines as to produce symptoms resembling cholera collapse.* The calibre of the vessels may be influenced by the sympathetic nerve throughout the alimentary canal, and paralysis of the vasomotor nerves would produce dilatation and relaxation of the vessels, the child being thus bled as it were into its own veins, and watery discharges are the consequence.

When reaction is established, a few drops of brandy are useful, chicken broth, milk, and the mineral acids are serviceable.

Calomel is scarcely to be thought of in these cases, for fear of increasing the general depression. If it is ever advisable it should be confined to the early stage where the motions are fecal, and never had recourse to where the discharges are watery and serous, for fear of increasing the gastro-intestinal irritation. Niemeyer seems, however, to have used it successfully, and Dr. Lewis Smith has seen advantage follow a fractional part night and morning with opium and astringents. "For cholera infantum, if seen early, give a hypodermic injection of morphia of suitable dose, to be followed up with small doses of calomel and camphor in sugar of milk, until biliary dejections are seen." (Comegys.) This seems to me, however, a very hazardous measure.

In the treatment of *dysenteric diarrhœa*, Dr. de Havilland Hall advises one or two grains of ipecacuanha three times a day, and though sickness may at first be produced, tolerance is soon established.†

Treatment of Chronic Diarrhœa.—If the diarrhœa occurs in an infant it should, if suckling, be limited to the breast, and no other food be given whatever, unless circumstances of a grave character should arise, and then it may be necessary to suspend nursing for a time, and give barley-water, thin veal broth, etc. Then, too, the milk of one nurse will keep up diarrhœa, when that of another will be easily digested; and it will not unfrequently be found that one nurse after another will fail to supply suitable nourishment to the child, till we have to fall back upon plain milk and water. If this

* On some Analogies of Cholera, etc., Med.-Chir. Trans., 1868, vol. ii, p. 1, by W. Sedgwick, M.R.C.S.E.

† St. Barth. Hosp. Repts., vol. xi, p. 273.

does not succeed, condensed milk should be tried, as I have previously mentioned. The microscope may detect nothing wrong in the milk of the nurse, and yet it may cause the most violent irritation. Where milk disagrees to such an extent as this, it is obvious that some other means must be adopted for a time to support the child. For children who have reached five or six months old, veal broth, or weak beef tea, or raw meat juice, may be tried, if the milk appears to keep up irritation. As the child grows older it will be able to digest better, and then the discretion of the practitioner must be used, and the diet varied according to circumstances. As long as the stools are unhealthy, or pasty, all farinaceous food must be given with caution, as it will frequently pass through the stomach undigested.

Too much importance cannot be attached to the food. It is of the highest consideration that it should be pure, nutritious, and unirritating. Where there is defective nutrition the child will gradually waste, and the more exhausted it becomes, the more difficult will it be to overcome the diarrhœa, which is prone to go on in spite of all the pharmaceutical remedies in vogue. Hence it is that *raw meat juice* sometimes answers so well in these cases. It may be made of beef, or mutton.*

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* "Take a quarter of a pound of the best rump steak, gravy meat, or reddish buttock meat; cut it in very minute pieces, so as to make the finest possible mince of it, as fine as cut up spinach. This is best done by a sausage machine, then add *water* to the brim. If there be time to wait, this water may be cold; if not, it should be *lukewarm*, or, at least, not exceeding a temperature of 120° Fahr. Stir up frequently with a spoon. At the end of two or three hours the supernatant water will have the color of dark claret. The meat at the bottom will have become as white as fish. Strain through a coarse sieve. *Drink the juice cold*—about a claretglassful three times a day."—*On Infant Feeding*, by C. H. F. Routh, M.D., 3d edit., p. 335.

"Take one pound of fresh beef, free from fat, chop it up fine, and pour over it eight ounces of soft water, add five or six drops of hydrochloric acid and fifty or sixty grains of common salt, stir it well, and leave it for three hours in a cold place. Then pass the fluid through a hair sieve, pressing the meat slightly, and adding gradually towards the end of the straining about two more ounces of water. The liquid thus obtained is of a red color, possessing the taste of soup. It should be taken cold, a teacupful at a time. If preferred warm, it must not be put on the fire, but heated in a covered vessel placed in hot water. Should it be undesirable for the patient to take the acid, this soup may be made by merely soaking the minced beef in distilled water."—*Handbook of Therapeutics*, by S. Ringer, M.D., 4th edit., p. 610.

"A piece of the lean of mutton should be minced, pounded to a pulp, and all fibrous threads carefully removed. To insure its fine division and complete separation from indigestible fibre, it is useful to have it rubbed through a sieve. The pulp, duly mixed with breadcrumbs and salt, may be given in a daily quantity of from one to three ounces, according to the age of the child. This is particularly called for when the

With regard to drugs, it should be remembered that there is a great tendency to acidity of the secretions; excess of acid in the stomach retards the digestive power, excites fermentation, and causes flatulence, pain, and irritation, so that the child is never easy, and can obtain no rest.* Potash, by neutralizing the acidity, arrests the fermentative process, and it may be given with dill, aniseed, or cinnamon-water, three or four times a day after feeding. If the stools are thin a mixture of bismuth and potash, or soda may be given (Form. 25). As long as the motions are acrid and offensive one of these remedies should be prescribed. Sometimes a grain of Hyd. c. Creta may be most advantageously added to a powder of soda and rhubarb. Ipecacuanha in doses of a quarter of a grain, with the castor oil mixture and laudanum (Form. 24), is an excellent remedy, particularly in the dysenteric variety. Creasote has been employed successfully where the motions are frothy and fetid. A chronic diarrhœa is cured or kept in check by gallic acid or acetate of lead, recommended by Dr. West (Form. 28, 29).† Some of the following mixtures containing

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motions contain a large proportion of unaltered food. Under this invaluable remedy the state of the bowels and of the general health often improves at once and together. Occasionally, in chronic diarrhœa, I have seen benefit from the extract of malt."—*On Infantile Diarrhœa*, by W. H. Dickinson, M.D., Medical Times and Gazette, September, 1872, p. 256.

* See Chapter XIV, "On Indigestion."

† Formula 28:

℞. Acid. gallic., ... gr. viij
Tinct. cinnam., ... ʒj
Tinct. opii, ... ♏iv
Syrupi, ... ʒij
Aquæ cinnamomi, ... ʒv
Aquam ad . . . . . ℥ij.—M.

Two teaspoonfuls every four hours.

Formula 29:

℞. Plumbi acetat., ... gr. vj
Aceti, ... ♏xx
Tinct. opii, ... ♏viij
Mucilag. acaciæ, ... ʒij
Syr. zingib., ... ʒj
Aquam ad . . . . . ℥ij.—M.

Two teaspoonfuls every six hours.

Formula 30:

℞. Tinct. opii, ... ♏vj
Tinct. card. co., ... ʒj
Syrupi, ... ʒij
Decoct. hæmatoxyli ad . . . . . ℥iss.—M.

A teaspoonful every four hours.

logwood (Form. 30), catechu, and chalk (Form. 31), krameria (Form. 32), nitric acid (Form. 33), or sulphuric acid (Form. 34), with bark or chloric ether, may all prove useful in turn. Sulphuric acid, however, whether combined with an aromatic or sedative has

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Formula 31:

℞. Tinct. catechu, ... ℥j
Syr. zingib., ... ℥ij
Mist. cretæ ad . . . . . ℨiss.—M.

A teaspoonful every four hours.

Formula 32:

℞. Tinct. krameriæ, ... ℥j
Tinct. opii, ... ♏vj
Spt. chloroform., ... ♏xx
Pulv. acaciæ, ... ℥ss.
Aquam ad . . . . . ℨiss.—M.

A teaspoonful every four hours.

Formula 33:

℞. Acid. nitric. dil., ... ♏xxiv
Tinct. camph. co., ... ℥j
Spt. chloroform., ... ♏xij
Syr. zingib., ... ℥ij
Decoct. hæmatoxyli ad . . . . . ℨiss.—M.

A teaspoonful every four hours.

Formula 34:

℞. Acid. sulph. dil., ... ℥ss.
Spt. chloroform., ... ♏xx
Syrupi, ... ℥ij
Aquam ad . . . . . ℨiss.—M.

A teaspoonful every four hours.

Formula 35:

℞. Acid. nitric. dil., ... ♏xx
Syr. gummi rubr., ... ℥ij
Spt. chloroform., ... ♏xx
Decoct. hæmatoxyli ad . . . . . ℨiss.—M.

A teaspoonful every four hours.

These prescriptions are suitable for children of a year old.

Formula 36:

℞. Ext. belæ liquid, ... ℨss.
Syr. gummi rubr., ... ℥ij
Tinct. camph. co., ... ℥j
Syr. zingib., ... ℥ij
Aquam ad . . . . . ℨiss.—M.

A teaspoonful three or four times a day. For children six years of age.

Formula 37:

℞. Cupri sulph., ... gr. ij
Liq. opii sed., ... ♏xxiv
Spt. chloroform., ... ℥j
Aquam cinnamomi ad . . . . . ℨiij.—M.

Two teaspoonfuls three times a day. For children six years of age.

not answered my expectations, and I have been so frequently disappointed with it that I now seldom employ it. The syrup of red gum, combined with nitric acid and logwood (Form. 35), or with the extract of bael, are all useful (Form. 36). A dose of castor-oil paste (Form. 23) may be needed to remove irritant matter from the bowels, and especially in those cases where exposure to cold has chilled the surface and increased the congestion of the internal organs.

Sulphate of copper is another remedy to be employed with opium, and a few drops of spirit of chloroform in special cases (Form. 37).

In very obstinate cases enemata of starch and opium may be necessary. I found no remedies administered by the mouth check the alvine discharges so effectually as one used night and morning in a case depending on mesenteric disease. In very obstinate cases Trousseau employs an enema of one grain of nitrate of silver dissolved in an ounce of water. In the dysenteric diarrhœa of children, Dr. Ringer speaks favorably of salicylic acid used as an injection (1 to 300).*

This chronic diarrhœa indicates a relaxed state of the system generally and loss of tone. A tonic regime is consequently required, and frequently gives relief when other remedies have failed. Thus, change of air, by altering the surrounding circumstances, is often of incalculable benefit. Removal to the seaside, or some dry and healthy locality, will accomplish more than any drugs when the case has assumed a chronic character and the bowels are irregular in their action. Cold baths in the morning, or if the little patient be very feeble, baths with the chill taken off, with friction and shampooing, tend to brace up the relaxed tissues. Benefit is frequently obtained from the use of cod-liver oil, steel wine, malt extract, and other remedies of a similar invigorating character. Every case of diarrhœa demands care, from its liability under neglect to lead to the severe forms we have described, or to originate mischief in the brain, or tubercle, or marasmus, as the general strength becomes more and more reduced.

Prolapsus Ani.—In cases of long-continued diarrhœa the sphincter ani loses its contractility, and the surrounding parts become relaxed. When the diarrhœa is cured the local irritation ceases,

* Handbook of Therapeutics, 8th edition, p. 599.

and the child's bowels may act once or twice daily without any protrusion of the rectum. The treatment consists in sponging the relaxed parts with cold water, and if there is tenesmus an opiate enema after the bowels act will be of service. Another plan is to wash away all fecal matter from the gut, and then apply a strong solution of alum before it is returned. When the gut remains protruded apart from any action of the bowels, gentle pressure with the finger dipped in oil will cause it to return. Cold water enemata every morning are serviceable in this state of relaxation. I have found great benefit from the use of sulphate of iron and infusion of quassia as a valuable astringent enema,* and the decoction of tormentilla has also been recommended. Where the prolapsus ani is not the result of diarrhœa, but is rather a chronic condition, it is well to hold the child in the hands whilst the bowels are being relieved, as, by so doing, the gut will rarely be forced down. If, on the other hand, the child is placed where its feet can reach the ground, it will make such powerful expulsive efforts as will commonly cause protrusion. Another plan is to keep the little patient lying on its back whilst the motions are passed. A compress and bandage may be worn during the day to prevent descent.

CHAPTER XVI.

GASTRITIS—MELÆNA—DYSENTERY.

GASTRITIS: *Symptoms—Causes and treatment.* SOFTENING OF THE STOMACH: *Nature and causes.* HÆMATEMESIS AND MELÆNA: *Causes—Symptoms and treatment.* DYSENTERY: *Symptoms—Causes—Pathology and treatment.*

GASTRITIS is of rare occurrence in children, and the symptoms are too obscure to enable us to diagnose the disease with any approach to certainty. Catarrh of the gastric mucous membrane (*gastritis mucosa*) has been referred to active hyperæmia; it occurs in the case of drunkards, as well as in chronic heart disease and pulmonary phthisis. The anatomical changes in this state are a

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* Formula 38:

R. Ferri sulphat., ... ℥j
Inf. quassiæ, ... ℥viij.—M.
Fiat enema. A fourth part to be used every morning.

dark-reddish slate-gray discoloration of the mucous membrane, spots of ecchymosis, and a general hypertrophy of the parietes of the stomach.* The disease may be induced by irritating articles of food, and by swallowing corrosive acrid substances, or from any causes which excite indigestion or flatulence. The stomach may exhibit the evidence of gastric catarrh after death in those children who, during life, have had no symptoms of the disease, nor even disturbance of digestion.

The symptoms are distension and pain at the epigastrium, increased on pressure, vomiting of a glairy mucus or greenish secretion, and constant retching after food. If the disease goes on the child becomes thin and emaciated; there is thirst, and the tongue is covered with a thick white fur; the pulse is frequent and small in acute cases, and there is constipation alternating with diarrhœa; but a subacute form of gastritis may be present, giving rise to no more symptoms than are ordinarily to be met with in irritative dyspepsia. If this continues the nutrition of the child suffers, and it loses flesh and strength.

The *treatment* consists in giving cold water and sedatives after a careful regulation of the diet. Whilst pain and sickness continue, milk in small quantities at a time is the best form of nourishment, and it may be necessary to add a little lime-water to assist digestion. For the relief of the profuse gastric secretion, Vogel† recommends half a grain of nitrate of silver in three ounces of water as a mixture, of which two teaspoonfuls may be given to children from one to two years of age. For older children he gives a sixth of a grain of nitrate of silver.

But gastritis, of a subacute character, demands that bland and non-irritating food should be taken, cold or iced water to allay thirst, and bicarbonate of potash and hydrocyanic acid as a sedative to the mucous membrane. If there is much irritability of the stomach, a grain of calomel, with a few grains of tragacanth powder, divided into six parts, and given in the space of twenty-four hours, will be a serviceable remedy. Poultices may be applied to the epigastrium if the pain does not yield to the remedies mentioned, and enemata are preferable to purgatives.

In cases of gastritis produced traumatically the best treatment probably is that of opium and bismuth.

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* Rokitansky, Path. Anat., vol. ii, p. 257.

† Diseases of Children, 1874, p. 141.

Softening of the Stomach.—It is most important not to mistake the appearance found in the stomach after death, from the action of the gastric juice, with those that result from disease, or the introduction of irritating substances. The experiments of Hunter showed that the gastric juice after death was capable of discoloring the coats of the stomach, more especially in those persons who had died suddenly. As many individuals were quite well up to the time of death, he believed that these changes were caused by the action of the gastric juice after life was extinct.

In some instances, the process is limited to the mucous membrane, which is softer than usual, and breaks down under slight pressure of the finger; in other instances, the morbid change is greater, and it extends through all the coats, by means of a soft irregular ulcer, the contents of the stomach escaping into the peritoneal cavity. The diseased process most frequently attacks the fundus of the organ, where the fluids gravitate, and the bloodvessels ramifying over the coats of the stomach are dark and congested, producing a condition resembling chronic inflammation. Adherent to the interior membrane may be seen an opaque or brownish tenacious mucus, which is easily removed on pouring over it a slight stream of water.

The disease appears to be not uncommon in infancy and early life, when gastric disorder is so frequent, but I am not able to refer to any symptoms, either in my own experience, or that of others, which would enable us to say during life, that softening of the stomach would be found after death.

Softening of the intestines has also been mentioned by writers on medicine, the mucous membrane becoming softened or destroyed down to the peritoneal investment.

Hæmatemesis and Melæna Vera.—Infants of a few days old suffer occasionally from vomiting or purging of blood, sometimes from both. "It is essentially a disease of the early days of life, generally occuring between the first and sixth day."* Dr. Rahn Escher considers that the hæmorrhage is greatest within the first twenty-four hours of life, usually ceases on the second day, but may continue to the fifth, or even later.

Causes.—In many cases it is impossible to find out the source of the hæmorrhage. Various opinions have been offered as to the cause of this rare and obscure condition. The disease would ap-

* Diseases of Infancy and Childhood, by T. H. Tanner, M.D., p. 116.

pear to depend chiefly on the physiological changes which take place at birth, when respiration becomes established, and the lungs, liver, spleen, and intestines are liable to become congested through an increase of pressure on the venous system; hence one reason, probably, why convulsions are frequent after birth in delicate children. Tedious labor and the pressure of instruments are mentioned as factors in the production of the hæmorrhage. Some cases are on record which show a hereditary tendency to bleed in the parents.*

Of twenty-two cases recorded by Rilliet and Barthez, twelve recovered. These were probably cases of pressure of the child's head during tedious labor, and congestion of the venous system from a difficulty in establishing respiration at birth.† "Taking the cases altogether, the mortality is about 60 per cent." (Croom.)

Pathology.—Some authorities consider the hæmorrhage as a crisis of the plethoric condition, and such cases would appear to be by no means uncommon in the newly born, there being general congestion of the integuments and chief internal organs. Cases are recorded which show that it is sometimes due to blood change, as in purpura hæmorrhagica. Bouchut quotes from Billard (p. 497) the case of an infant, five days old, whose trunk, limbs, and arms were covered with violet petechiæ, and the yellowish spaces between them (from the slight jaundice which was present) gave the surface "a tiger-like aspect." After death, dark blood was found in the intestines and stomach, the spleen had ruptured from over-engorgement, and the heart was full of blood; the cellular tissues contained large ecchymoses, as did the kidneys and bladder; the pleuræ presented petechiæ, and the brain was congested.

After death, in ordinary cases, the internal organs have been found exsanguine, but healthy. Spiegelberg and Landau report cases in which abscesses were found in the duodenum, arising from embolism. Cases of this kind never recover.‡

The *symptoms* are prostration of the strength, pallor, rapid breathing, inability to suck, small pulse, and occasionally convulsions. Cases which survive the shock may end in diarrhœa, hydrocephalus, or mesenteric disease.

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* Melæna Neonatorum, by J. Halliday Croom, M.B., Med. Times and Gazette, Oct. 23d, 1880, p. 480.

† Traité Clinique et Pratique des Maladies des Enfans, Paris, vol. ii, 1853.

‡ Melæna Neonatorum, by J. Halliday Croom, M.B., Med. Times and Gazette, Oct. 23d, 1880, p. 480.

Blood drawn from the nipple in suckling (*spurious hæmatemesis*) must not be mistaken for true hæmatemesis.

Treatment.—This is unsatisfactory and uncertain; little, if anything, can be done. Astringent enemata with cold water where the hæmorrhage from the bowels is bright and active, or even cold applications to the abdomen, may be suitable in some cases. When faintness and exhaustion threaten, ammonia, ether, etc., will be required.

Dysentery.—Young children are sometimes seized with this disorder, but it is very rare, and it is not improbable that intestinal hæmorrhage has been mistaken for it. When the stools are slimy and contain mucus, there is an alteration in the intestinal mucous membrane, and, if it lasts, more or less blood may be mixed with them. In some chronic cases the evacuations are little more than lumps of blood and mucus, dark in some instances, and pink or bright red in others. In aggravated cases, the bowel discharges are so altered that they become offensive, and of a slate-gray hue from containing portions of mucous membrane which have sloughed, and there is a discharge of pus, indicating the presence of ulceration. Dysentery may begin as a primary disease, or commence as simple diarrhœa, and depend upon the same causes; the inflammatory form of diarrhœa (*entero-colitis*) is closely connected with it.

The *symptoms* resemble those of entero-colitis, but are more severe; they usually begin with violent sickness and vomiting, when the disease is acute, accompanied with shivering and pallor. The motions at the onset may be copious, and for the first few days of a bilious character, then they become more scanty and slimy, with glairy mucus resembling white of egg, and mixed with blood. Sometimes pure blood escapes, but generally it is mixed with the fecal matter, which now and then escapes in lumps, causing griping pain in the abdomen, tenesmus, cramps in the thighs, and difficulty in micturition. There are abdominal pain and tenderness in the course of the colon, and frequently around the navel. Fever is seldom present unless the disease lasts some time, when the skin becomes harsh and hot, and the pulse frequent.

When the disease assumes a chronic form, the child becomes emaciated, and the bowel discharges are mixed with pus and blood; there are pieces of lymph in the motions, which are very

acrid and offensive. The child is restless, and cannot sleep at night from pain and tenderness; there is gradual loss of flesh, prostration of strength, constant thirst, nausea, and disinclination for food. "Of thirty-six cases, the termination of which we have recorded, four proved fatal." (Meigs and Pepper.) The complaint may terminate in peritonitis and ascites, in mesenteric disease and hectic fever, or in a sudden fit of convulsions. When the disease is progressing towards recovery, the evacuations become less frequent, and blood no longer appears in them; the child ceases to be feverish, and rests at night, whilst the appetite returns.

Causes.—The disease is more frequent in hot summer weather, when unripe fruit is eaten, and bowel disorders are common. Improper feeding, defective ventilation, scanty clothing, impure water, and exposure to cold and damp, are all capable of originating the disease. The influence of malaria, too, is to be reckoned as a cause, as well as the exanthemata, particularly measles and variola (Meigs and Pepper), and diseased intestine from typhoid.

Pathology.—In the acute stage of the disorder, the morbid changes are to be seen in the large intestine and rectum, as in entero-colitis. It resembles this disease, except that the changes in the rectum and colon are greater, and it often exists in an endemic and epidermic form. In some cases the small intestines are involved; the mucous membrane is swollen, soft, and reddened in patches or throughout its entire length. In some places it may assume a dark or gangrenous appearance. The follicles are enlarged. In the more advanced or chronic stage, small round specks of ulceration form, which finally run together, and produce a ragged uneven appearance, varying in extent and depth. The mesenteric glands may be natural, or slightly enlarged and red. In long-standing cases the ulcers become contracted, and surrounded by hardened tissue.

Treatment.—When the disease is recent, and sets in with acute symptoms, a warm bath is of great service, followed by poultices to the abdomen. The most absolute rest and warmth are demanded, and, if there is no vomiting, the castor-oil paste (Form. 23), with a drop or two of laudanum, will be necessary to administer in order to clear the bowels of any scybalæ (Form. 24). If there be tenesmus and straining, an opiate clyster will give great relief. In some form or other opium is the most valuable remedy

we possess in this complaint, as it controls the action of the bowels, allays pain, and procures sleep. Acetate of lead, catechu, krameria, sulphate of copper (Form. 29, 31, 32, 37), will at once come to our aid in turn, when the bowels continue obstinately irritable.

When calomel is employed, it should be given in very small doses at an early stage, in combination with opium or Dover's powder, but its use requires extreme caution.

Nitrate of silver has been recommended, in combination with a few drops of opium, given in some suitable vehicle, like mucilage or syrup. The eighth of a grain may be given to a child two years old every three or four hours.

As regards diet, if an infant, it should be kept to the breast, and no other form of food given. Older children may have barley-water, sago, tapioca, rice-water, etc., as mentioned under the treatment of chronic diarrhœa.

CHAPTER XVII.

CONSTIPATION AND COLIC.

CAUSES OF CONSTIPATION: *General debility—Diet—Deficiency of gastric, hepatic and intestinal secretions—Torpor of intestines from atony of their muscular fibres—A frequent accompaniment of cerebral disease—Hernia and intussusception.* TREATMENT: *Regulation of diet—Laxatives—Aperients—Nitrohydrochloric acid and taraxacum—Belladonna—Strychnia—Enemata.* CAUSES OF COLIC: *Diet—Poisonous or irritating substances—Flatulence—Presence of scybalæ in intestines.* SYMPTOMS AND DIAGNOSIS FROM PERITONITIS: TREATMENT: *Castor oil and opium—Use of enemata—Hot poultices—Belladonna—Hydrate of chloral and bromide of potassium.*

CONSTIPATION is one of the commonest disorders of early life. When it occurs in infants it is a source of much trouble to the mother, who is sorely tried with the difficulty, because the child cannot thrive without a frequent action of the bowels. The younger a child is the oftener should the bowels act. In infants they are moved three or four times a day; and in children over one year there are generally two evacuations daily.

Among children artificially reared, constipation is a frequent ailment, particularly if they are feeble. There is deficiency of intestinal secretion, so that by the time the motions reach the large intestine and rectum they are extremely hard and pebbly, and the

child cries and undergoes painful straining to evacuate the hardened masses. Rest is not obtainable at night from flatulence, the belly becomes swollen, the legs are spasmodically drawn up, and then stretched out again. If this state of things is suffered to go on, the child may have a convulsion, or die worn out with pain and exhaustion. An accumulation of gas in the intestines may occur in these cases, especially where the secretion of bile is scanty, and those articles of diet are indulged in which cause fermentation. When the amount of mucus is sparingly secreted, the muscular fibre fails to propel the contents of the bowel, and hence constipation is common in such cases.

The color of the fæces depends upon the admixture of bile, and the motions may be brown, green, or almost black, or like clay. When bile is deficient, the motions are pale; ordinarily they are of a gingerbread hue. "The consistency of the fæces also varies considerably; they are liquid when the serous exhalation of the mucous membrane is excessive; semifluid when the secretion is muco-gelatinous, or they are mixed with the secretion of the shape of grumous particles. The feculent matter found above the various intestinal strictures presents a peculiar frothy appearance."* Constipation, too, in older children is sometimes caused by starch compounds, as rice, arrowroot, tea, astringent and tonic mixtures. And, according to my experience, it often originates in the neglect of parents to inculcate the habit of getting the bowels to act at stated hours. Constipation is also a frequent accompaniment of cerebral disease, as meningitis, hydrocephalus, marasmus, in consequence of a loss of tone in the muscular fibre of the intestinal coats.

Constipation is likewise observable in children with sluggish livers, who are not otherwise ill. The complexion is sallow and the appetite capricious, the motions are pale and contain scarcely a trace of bile. The tongue is coated, the urine scanty and high-colored, and headache and lassitude are also common. These symptoms often arise from overfeeding and eating greedily.

I have elsewhere alluded to constipation as the consequence of hernia, intussusception, and intestinal obstruction.† Imperforate anus is another cause.

The *symptoms* generally met with in constipation are distension

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* Rokitansky, Path. Anatomy, vol. ii, p. 110, Syd. Soc., 1849.

† See Chap. XVIII–XIX.

of the abdomen from tympanites; the bowels having lost their contractile power, expand and push up the liver, stomach, and spleen, thus interfering with the descent of the diaphragm. In these cases the abdomen after a time becomes painful, and the child is restless, the tongue is furred, the mouth hot, and there is sometimes vomiting.

In many simple and uncomplicated cases, the symptoms are not so marked, the abdomen is more or less tense, and there are scanty dry evacuations, heaviness of manner, loss of appetite and thirst. Habitual constipation may cause convulsions in young children.

Whilst constipation is most common in delicate children, especially if brought up by hand, it is of frequent occurrence in strong children who are so reared; and hence I am inclined to credit injudicious feeding as a cause. I have over and over again seen the strongest and best-developed children so attacked; they are plump, bright, and healthy-looking, the only ailment being a painful straining in emptying the bowels. Now, in these cases, although the skin is of a normal hue, and the conjunctivæ of pearly brightness, deficient biliary secretion is the essential cause of the evil; and until the liver pours out more bile, there is no probability of relief. When the liver has been stirred up by a mercurial purgative, the bowels have become regulated, and a recurrence of the evil has only happened with food, improper in quantity or quality.

Treatment.—No remedies will be of any use till we have ascertained the cause; and the first step to take under any circumstances will be a proper regulation of the diet. To prescribe drugs till this is inquired into will be a fruitless proceeding. Milk ought to enter largely into the dietary of young children, and weak animal broths in place of mucilaginous and starchy foods, with a liberal allowance of cold water. If the child is old enough, Scotch oatmeal with milk once a day is an excellent remedy to keep the bowels open. The oatmeal and treacle biscuits made by Scotch confectioners and bakers, or the so-called "Yorkshire parkin," is a famous aperient food for children. These biscuits may be procured of Macalpine & Co., 287 Oxford Street. Prunes and senna are also serviceable, and if in season, a few grapes or a baked apple may be allowed. In infants and children of a few months old, the castor-oil paste is a safe aperient (Form. 23), relieving the flatulence and exciting the action of the bowels. The

syrup of rhubarb is another good remedy, and manna is a safe and mild laxative which infants take readily.* Manna may also be given in the form of paste with a little cream of tartar.† A suppository of common yellow soap introduced into the rectum at night will sometimes cause the bowels to act naturally in the early morning. A child delicate from birth suffered from constipation, passing motions resembling clay marbles in color and shape; it was never easy day or night. All treatment failed to give relief till at six months old, malt extract, mixed with milk, was tried, and in a very short time the motions became natural and the bowels regular.

In older children I have known treacle and bread insure a daily and regular action of the bowels.‡ In some strong children where febrile disturbance and heat of surface attend constipation, a few grains of sulphate of magnesia with cinnamon, which disguises the taste, will answer extremely well,§ or (Form. 8), regulating the dose according to the age of the child. If the complexion is sallow, the urine turbid, or if the motions indicate a deficiency of bile, a little gray powder with rhubarb and bicarbonate of soda may be given with advantage for a few nights, and a citrate of potash mixture during the day. In some cases, if the belly is tumid and the hepatic secretion habitually defective, small doses of the perchloride of mercury may be ordered with tincture of cinchona and taraxacum. I have also seen excellent effects follow the administration of nitrohydrochloric acid with taraxa-

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* Formula 39:

℞. Mannæ opt., ... ℥ij
Aquæ anethi, ... ℥j.—M.

A teaspoonful once in two or three hours till the bowels act. For children from four to six months old.

† Formula 40:

℞. Potass. bitart., ... ℥ss.
Mannæ, ... ℥ss.
Aquam anethi ad . . . . . ℥iss.—M.

About gr. x or gr. xv for a dose, to be repeated occasionally. For children from four to six months old.

‡ See Chapter II.

§ Formula 41:

℞. Magnes. sulph., ... ℥j
Syr. rhei, ... ℥ss.
Tinct. cinnam. co., ... ℥ss.
Liq. magnes. carb. ad . . . . . ℥iss.—M.

One or two teaspoonfuls occasionally. For children from four to six months old.

cum* where the liver is sluggish, and the child is torpid and pale, and needs a tonic and alterative at the same time. The Pulv. Glycyrrhizæ Co. (Ger.), which contains sulphur is an admirable aperient for children, and is not disagreeable to take.

Lastly, there are cases repeatedly met with where it should be our object to give as little aperient medicine as possible by the mouth, because the constipation depends on a laxity of the intestinal fibre. A judicious combination of belladonna and strychnia is to be recommended in obstinate constipation, but if in spite of these remedies and diet, the bowels remain persistently costive, a two-ounce enema of warm soap and water will rouse them to activity, and render soluble the fecal masses which are lodged in the descending bowel and rectum. This may be used for infants and children of any age.

In every case of obstinate constipation, the finger well oiled, or an elastic tube should be passed up the bowel to ascertain if any hernia or mechanical obstruction exist, for if it does, all treatment by the mouth will be unavailing until it is removed.

Experience, however, teaches us the danger of too active interference in cases of constipation, unless urgent symptoms are present; the bowels may be torpid for days or weeks together in exceptional cases, without danger to life.†

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* Formula 42:

℞ Acid. nitric dil., ... ♏xvj
Acid. hydrochl. dil., ... ʒss.
Succi taraxaci, ... ʒi
Syrupi, ... ʒss.
Aquam ad . . . . . ʒiv.—M.

A dessertspoonful three times a day. For a child three or four years old.

† Mr. John Gay has recorded a case of obstinate constipation in a boy aged seven, of healthy appearance, who was admitted into the Royal Free Hospital, in July, 1853. Four years previously he had an attack of typhus fever, accompanied with pain and tenderness. On recovery his bowels were torpid, and purgatives and enemata were needed to procure evacuations from them. "During the three months prior to his admission, nothing whatever passed from his bowels." Neither his health nor appetite suffered, and he had only been sick on one or two occasions in consequence of taking unwholesome food. The umbilical measurement increased to forty-nine inches without material inconvenience to the respiratory organs. Along the left side of the body was a prominent swelling, corresponding to an enlarged descending colon. One remedy after another failed to dislodge any fecal matter, and at last a speculum was introduced into the rectum, and the sphincter dilated; then the tube of an enema syringe was passed high up into the bowel, and a stream of warm water kept constantly playing for half an hour upon the contents till they were dissolved. These repeated operations brought

Colic is a common complaint in young children. It consists in painful contraction of the intestinal coats, and is caused by the accumulation of hard fecal matter in the bowels, or some irritant food, or substance lodged in the intestines. Slight attacks in infants are not uncommon from excessive acidity in the stomach, forming milk into a hard indigestible curd. In children it is frequently induced by eating unripe gooseberries or other indigestible fruit, and drinking large quantities of cold water when the stomach is empty and the body heated. Worms in the bowels, internal strangulation, or obstruction are severally capable of causing the disorder. Colic often accompanies diarrhœa in young children. Exposure to cold is another cause, and so is bathing in too cold water.

The *symptoms* are sudden twisting pain in the abdomen, generally in the direction of the transverse colon, and coming on in paroxysms. The child draws up the legs and bends the body forwards to relax the abdominal muscles. There is generally flatulence, but the suffering may be intense, without any distension whatever, and with even retraction of the umbilicus. When the gas which is naturally formed in the stomach and intestines is not expelled by the anus, then the delicate muscular structure of these organs yields, and the abdominal wall becomes distended and tense. In typhoid fever and some other affections in which the ganglionic system is severely implicated, there is a drumlike distension of the intestines (meteorism) accompanied with quick shallow breathing, and increased action of the heart. The abdomen is not equally distended; it may be conical along the centre, and the small intestines be more involved than the colon in certain cases. I believe that in the latter class, fecal matter or undigested food is the chief cause of the pain. In addition to the symptoms just enumerated, the child shrieks out with pain, the angles of the mouth are drawn down, and the face is pitiable. Syncope and even convulsions may happen in severe cases.

The disease is to be distinguished from peritonitis by the suddenness of the pain, and the freedom from suffering between the paroxysms; by the quietude of the pulse, the absence of fever, and the relief obtained from pressure. Most practitioners must

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away hard and fecal matter, like hard cinders, and soon reduced the size of the abdomen to that of twenty-six inches in circumference.—*Path. Trans.*, vol. v, p. 174; also Holmes's System of Surgery, loc. cit.

have observed children when pale with agony, throw themselves across a chair to obtain the relief which that pressure affords.

Treatment.—If the case is one of simple colic, and we consider the pain to be due to muscular contraction, it will be advisable to keep the bowels quiet till the pain is relieved. To attain this end, flannel wrung out of warm water should be applied to the abdomen, or repeated poultices. I have found a mixture of carbonate of magnesia and spirit of chloroform with peppermint-water very serviceable, particularly if the bowels are distended. When the pain is mitigated, and we think it is desirable to act upon the bowels, a dose of castor oil with tincture of opium and two or three minims of spirit of chloroform will be indicated. In infants at the breast troubled with colic, it is often well to give the mother or nurse some carbonate of magnesia; in other cases, where the milk is too firmly curdled by excessive acidity in the stomach, and who "possett"* a portion of this curdled milk, cajeput oil with potash is useful.†

A copious injection of warm water with a little oil will often produce speedy relief. When colic seems to arise from indigestible matter in the stomach, an emetic of ipecacuanha may be given.

If there are symptoms of obstruction, they must be dealt with in accordance with the instructions under that heading;‡ enemata may be tried, and if these fail, the little patient must be kept under the influence of opium and belladonna. The latter drug is said to be very serviceable in the colic of children.§ Hydrate of chloral and bromide of potassium are also useful, by relieving spasm and inducing sleep.

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* This is a provincialism for which we have no equivalent in ordinary English; it means when a portion of the milk curdled by the stomach is ejected by the mouth.

† Formula 43:

℞. Potass. bicarb., ... gr. viij
Ol. cajeputi, ... ♏viij
Aquæ anethi, ... ℥j.—M.

A teaspoonful three times a day.

‡ See Chap. XVII.

§ Handbook of Therapeutics, by S. Ringer, M.D., 4th edit., p. 502.

CHAPTER XVIII.

INTESTINAL OBSTRUCTION.

CAUSES: *Intussusception—Fecal accumulation and foreign bodies—Hernia—Malformation of rectum and anus—Diverticula and congenital strictures—Clinical records of these affections—Diagnosis of rarer forms of obstruction.* TREATMENT: *Reduction of any hernial protrusion—Abdominal section to disengage the bowel—Enemata.*

BY obstruction of the bowels is to be understood an interruption to their functions, arising either from causes acting from without, as in hernia or volvulus; from within, as in fecal accumulation; or directly implicating the walls of the intestine, as in stricture.

Intussusception is the most frequent cause of acute obstruction in childhood.*

Next to this, hernia is not uncommon in children as a cause of obstruction, but the protruded intestine does not often become strangulated before adolescence. In obscure cases of obstruction, before resorting to extreme measures, it is advisable that a surgeon should examine the abdomen in the regions where hernia may occur. Mr. Howard Marsh tabulates forty-seven cases of strangulated hernia in children, giving as full details as he could glean from the original records of each case. This valuable table accompanies a paper in which the author discusses the subject at length.†

In cases of obstruction in new-born infants the practitioner may find that he can pass his little finger into the anus. That being the case he must still bear in mind that the rectum may be imperforate some distance above the anal aperture.

The most puzzling forms of acute obstruction that are met with in childhood are those due to certain congenital malformations of the intestinal canal. From time to time such cases come under the notice of the physician.

In children and adults no trace can be found, as a rule, of the fetal omphalo-mesenteric duct. But it sometimes remains as a diverticulum from the ileum.‡ Close to this abnormal outgrowth

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* See Chap. XIX.

† Reports Illustrating the Surgery of Childhood, St. Bartholomew's Hospital Reports, vol. x.

‡ For the anatomy of this condition, see Struthers, On Diverticula from the Small Intestine, Edin. Med. and Surg. Journal, 1854.

the intestine itself is often very narrow, not from any morbid deposit in or outside its coats, nor yet from ulceration and cicatrization, but purely from ill-development.

An interesting case is recorded of "intestinal obstruction caused by a hernia through the mesentery of a Meckel's diverticulum, which had retained its attachment to the umbilicus." The patient, a boy seven years of age, was seized with severe pain at the umbilicus, relieved by the sitting posture. He had occasionally suffered from attacks of pain. Vomiting set in on the third day, and continued with varying severity throughout the illness, but it was never fecal. The urine was scanty, and of high specific gravity. Paroxysms of pain occurred from time to time, and enemata brought away fecal masses. The pain abated on the fifth day, but on the following, increased distension of the belly took place, and he died. After death, commencing peritonitis was discovered, and "about two feet of the lower part of the ileum were found hanging in a collapsed condition on each side of a cordlike loop. This loop was formed in the mesentery of a well-developed diverticulum, the upper end of which was attached to the umbilicus by an impervious cord half an inch long, the diverticulum itself being four inches in length. The gut, where it passed through the loop, was constricted and pale, but a small projecting portion at the origin of the diverticulum was of a deep purple color."* Two cases of fatal obstruction, one in a girl of thirteen, are recorded by Dr. Southey, from congenital constriction of the gut, at the point of departure of diverticula, the remains of the omphalo-mesenteric duct.†

Very frequently the diverticulum itself is the cause of mischievous or fatal complications. It may adhere to some part of the abdominal wall, and drag the intestine to such an extent as to completely obstruct it. This occurred in a child of ten, in Dr. Wilk's experience.‡ Sometimes the diverticulum becomes adherent by a band of lymph to the mesentery, forming a loop in which a knuckle of intestine may become strangulated; this has been observed in a child aged four.§ In other cases the diverticulum may become filled with foreign bodies, or undigested food,

* Clin. Soc., Oct. 22d, 1880.

† Trans. Clin. Soc., vol. v, pp. 159–163.

‡ Trans. Path. Soc., vol. xvi.

§ Holmes's System of Surgery, vol. iv, Art. Diseases of the Intestines, by George Pollock, Esq., p. 610.

and fatal obstruction with perforation of the morbid outgrowth may ensue, as in a specimen exhibited before the Pathological Society.*

Diverticula may become perforated in typhoid fever.†

A displaced appendix vermiformis may become united to the bowel, forming a band, and ultimately causing obstruction.

Mr. Pollock, in his article on diseases of the intestines, in Holmes's *System of Surgery*, after enumerating the signs of intussusception, then proceeds to describe the symptoms of these rarer forms now under our consideration.

"In all internal strangulations by bands, etc., the symptoms are generally very acute; the pain is sudden, sharp, even agonizing occasionally; vomiting sets in early, and is usually incessant; the distension may not be as great as in the more slowly operating causes of obstruction, since little food can be taken, but still the small intestine becomes much loaded; there is generally great tenderness on pressure, for usually peritonitis is not long absent; there is early evidence of grave constitutional damage, for the portion of intestine, tightly bound down or encircled at the strictured part, soon thickens and inflames, or may blacken and mortify."

As for chronic obstruction, the physician should be on his guard in watching all disorders in which it may take place. It often accompanies intractable tubercular disease of the peritoneum in ill-fed children.

Treatment.—If a hernia exists and can be discovered, it should be reduced, and after this an enema of oil or gruel should be employed. If the symptoms point to internal strangulation, and a diagnosis can be established, the abdomen should be opened that the constricted intestine may be set free. If any abdominal swelling points to fecal accumulation in the cæcum, or large intestine, enemata of castor oil and poultices to the abdomen should be used, and it may be necessary sometimes to remove the hardened masses from the rectum with a scoop. In some cases of abdominal obstruction attended with inflammatory symptoms, it may be necessary to employ a few leeches to the abdomen, and give full doses of opium and belladonna.‡

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* Trans. Path. Soc., vol. xxiii.

† The Lancet, November 10th, 1877.

‡ See Chapter XVII, On Constipation and Colic.

A case is recorded where a child three days after birth had passed no motion. As the finger could only be introduced an inch within the rectum, the case was looked upon as one of imperforate anus, and an operation was performed. Two days later, the child died from peritonitis. A post-mortem examination showed that the obstruction was due to a volvulus situated two feet above the ileo-cæcal valve.*

CHAPTER XIX.

INTUSSUSCEPTION—INVAGINATION.

MEANING AND DEFINITION: *Two forms described*—1. *Simple intussusception, slight or spasmodic—Case in illustration*—2. *Severe or inflammatory forms.* ANATOMICAL APPEARANCES—CAUSES: *Diarrhœa the commonest cause—Constipation—Blows upon the abdomen or sudden jerks on the body—Weight of a tumor dragging down part of intestine.* SYMPTOMS: *Course and terminations—Persistent vomiting frequently present—Tenesmus and bloody mucus.* DIAGNOSIS: *From local enteritis—Internal strangulation—Simple colic—Vomiting—Amount of urinary secretion as a means of diagnosis—Impacted fæces—Typhlitis, etc.* TREATMENT: *Enemata—Inflation—Dangers of purgatives—Gastrotomy.*

INVAGINATION belongs particularly to infancy and early life, and is one of those disorders that demands prompt and judicious treatment. Fortunately its frequency bears no relation to its invariable painfulness and danger. This malady essentially consists in the passage or inversion of one portion of intestine into another, just in the same way as one tube may be slipped into another, or, what is a better illustration, the end of a glove-finger or stocking pushed within the upper portion. The effect of this invagination is not primarily strangulation, or arrest of the circulation, but ob struction to the passage of the intestinal contents. Sir Thomas Watson observes, however, that "the contain*ed* portion of intestine is liable to be nipped and strangulated by the contain*ing* portion, and all the peril of hernia results, with much less chance of relief by art. This state of things is called intussusception."†

Intussusception may be divided into: 1. Simple, slight, or spasmodic cases, where the invaginated intestine has not been

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* Brit. Med. Journ., vol. i, 1880, p. 738.

† Principles and Practice of Physic, 1857, vol. i, p. 40.

sufficiently irritated to become inflamed. 2. Severe cases, where the involved portion has inflamed or sloughed.

The first variety is unattended by inflammation, and may be considered mainly due to spasm. A good example of this will be described presently. Slight intussusceptions have been found in the bodies of children who have had no symptoms of such displacement during life, and who have died from other forms of disease. Invagination of the small intestine is not unfrequently found at the autopsies of children who have died during the period of dentition, or from diarrhœa, without any symptoms of intussusception.* Billard has seen it in cases of constipation, and Lewis Smith in infants who had had subacute or chronic entero-colitis.† "It is the result of an unequal irritability of the intestine, and the consequent irregularity of its movements, and it is, therefore, frequent in diseases characterized by torpor of the cerebro-spinal system, and in the mortal agony proceeding from them; whereas it rarely or never occurs in diseases accompanied by, or ending with, abdominal paralysis, such as cholera, typhus, general peritonitis, etc."‡

The intussusception in some cases is slight enough to make it probable that no trace of inflammation or even congestion is present. The invaginated mass is usually from half an inch to two inches in length, and, as a rule, this accident is multiple. There may be ten or more distinct intussusceptions at distances of a few inches from each other. In the museum of the College of Surgeons there is a specimen of a portion of the small intestine of a child four years of age, in which three intussusceptions are to be seen all close to one another.§

An intussusception involves three layers of intestine. The innermost consists of the invaginated upper portion of intestine; its mucous layer is internal and the peritoneal external. The middle or inverted portion also belongs to the invaginated segment, and is reflected below from the lower limit of the inner layer, and above is continuous with the upper margin of the outer layer. From its inversion the mucous membrane lies external to its peri-

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* Meigs and Pepper, Diseases of Children, art. vi, Intussusception, p. 463.

† Lewis Smith on Diseases of Children, Philadelphia, 1869, p. 419.

‡ Rokitansky, Path. Anatomy, 1849, vol. ii, p. 54, translated by E. H. Sieveking, M.D.

§ No. 1365, Pathological series.

toneal coat. The outer layer consists entirely of that portion of intestine into which the former two have intruded themselves. Above it is reflected upon the middle layer, with which, in fact, it is there continuous. Its mucous surface is innermost, facing that of the middle layer. "The inverted portion is invariably the one that suffers most; the inflammation of the entering tube is less considerable, and it is characteristic that, even when the inflammation of the volvulus runs high, its mucous membrane remains pale; the sheath of the volvulus also is but slightly affected in small intussusceptions, with the exception of the peritonitis at the point where it enters."* "The vessels of the portion of intestine thus incarcerated become engorged and render the obstruction complete; the whole of the folds involved become swollen and deeply congested; blood is extravasated into the substance of the mucous membrane as well as into the mesentery; in a short time both the serous and mucous surfaces become inflamed and the effusion of lymph takes place; the opposed serous surfaces become adherent, and also, to a less degree, the mucous surfaces; bloody serum and mucus are effused into the canal, and this discharged per rectum is very diagnostic of intussusception."†

The following I consider to have been a typical case of the spasmodic variety, unattended by peritonitis, or actual constriction, and terminating in complete recovery.

E. S——, æt. 2 years and 9 months, was first seen by me on January 4th, 1875, at 10 A.M., having been in good health the previous day. She was an intelligent and precocious child. I found her in bed, very flushed and excited, skin hot, but sweating. Temp. 103°, pulse 160, respirations quick and shallow. She lay with her legs extended, and bore pressure over the abdomen with the hand without complaining. The belly was rather tympanitic, and the bowels constipated; they had acted scantily on both the two previous days; there was thirst, but no vomiting. The child was allowed to drink a little milk and iced water at intervals to allay thirst. The abdomen was fomented, and half a grain of calomel ordered every four hours, together with citrate of potash.

January 5th (10 A.M.).—The child had been sick once, and the bowels not having acted, her mother used a simple enema of warm water, which returned as injected. She cried out occasionally with

* Rokitansky, Path. Anatomy, p. 57.

† On Diseases of the Alimentary Canal, by S. O. Habershon, M.D., 1857, p. 316.

pain, but no distension or tumor can be felt. Has taken two powders, and kept both down. The sixth of a grain of calomel, with one grain of Dover's powder, was ordered every four hours. (7 P.M.). Dozing, and no return of sickness. Having passed no urine, a gum elastic catheter was introduced, and six ounces of clear urine drawn off.

6th —A good deal of tenderness over stomach and neighborhood of umbilicus, but no vomiting. Eight ounces of warm soap and water were thrown up the bowels, which brought away a little feculent matter. A carminative mixture of rhubarb, aromatic spirit of ammonia, and peppermint-water were substituted, and ordered every four hours in place of the powders.

7th (10 A.M.).—The bowels not having acted, and there being no certainty of obstruction, I gave a lozenge of scammony and gr. ¼ of calomel, which had the effect of causing considerable pain and uneasiness, without producing any evacuation. The child again could not pass urine, and on that account a catheter was introduced into the bladder, and seven ounces of clear acid urine drawn off. The finger inserted into the rectum was unstained by fecal matter. I now determined to keep the bowels at perfect rest, and ordered the following mixture:

R.	T. belladonnæ, ...	♏vj
	Spt. chloroform, ...	♏vij
	Acid. hydrocy. dil, ...	♏vj
	Syrupi, ...	℥ss.
	Aquam ad	℥iss.—M.

℥ij every four hours.

(3.30 P.M.). The child was disposed to be drowsy, and the muscular system was much relaxed; great tympanites over stomach, and above line of umbilicus, but nothing marked over either iliac fossa; lips rather dry, and tongue creamy; has kept down milk and water and beef tea during the day. Urine again drawn off, less in quantity and deeper in color, sp. gr. 1020, reaction acid, faint cloud on heat, and nitric acid. (8 P.M.) Mr. Stephens, of Hoddesden, and Dr. Habershon, joined me in consultation. We considered the symptoms due to intussusception, though no cause could be ascertained beyond a sudden change to a more luxurious and mixed diet than the child was accustomed to at home. Restlessness and refusal of the bowels to act (notwithstanding the remedies tried) were the chief symptoms. Three grains of the

bicarbonate of soda were added to each dose of the mixture. Four ounces of urine drawn off. A copious warm soap-and-water enema was thrown into the rectum, and three or four small scybalæ came away, which could not be detected in the morning. Dr. Habershon thought the belladonna had brought them down. He considered that a portion of the ileum had slipped into the cæcum; but my first impression was, from the twisting umbilical pain, and the absence of any lump or dulness in either iliac region, that the displacement (if any really existed) took place between the lower portion of the jejunum and the upper part of the ileum. The paralysis of the bladder must have arisen from sympathetic irritation.

8th (10 A.M.).—No action of the bowels or sickness; has passed a little urine. At the upper constricted part of the rectum (left sacro-iliac symphysis) I felt something hard protruding through it for about an inch, and between the rectum and bladder at its upper part was an elastic fulness, which I considered to be a distended convolution of small intestine. An O'Beirne's tube, well oiled, was passed up gradually into the descending colon without meeting with any resistance. An enema of sixteen ounces of warm soap-and-water, with two ounces of infusion of rhubarb, was then injected, and it speedily returned as thrown up. Shortly after this, a repetition of the enema brought down a mass of feculent matter four inches in length; and by continuing to wash out the rectum, the fulness much diminished behind the bladder. A warm poultice was applied to the abdomen, and the belladonna mixture continued. (10 P.M.) No further action of the bowels; rectum empty.

9th.—In uneasy sleep, waking up at intervals in pain and discomfort; the tympanites was less over the stomach, and the margins of the ribs could be distinctly seen over the hypochondria; pain referred to hypogastrium, but no tumor could be felt; has passed a little urine; injection repeated, followed by the escape of a few small scybalæ. Pulv. Ipecac. Co. gr. iss. to be given every four hours, if in pain.

10th.—A few scybalous masses came away after an injection of warm water.

11th.—Rectum empty. Half an ounce of warm linseed oil thrown into the rectum. Has passed water three times since yesterday.

12th.—During the latter part of yesterday there were three scanty actions of the bowels, with considerable pain for three or four hours. Twelve ounces of warm soap-and-water were injected, which returned untinged with fæces. An ounce of warm linseed oil was therefore thrown into the bowel.

13th.—The abdomen was more tympanitic, and painful at the lower part. She passed water freely, and there was tenesmus, but no motion; pulse 112, weak and thready. I thought this increase of pain and swelling might be owing to the bowel, after recovery from the invagination, again slipping down into its old position. A few drops of brandy ordered in a little thin arrowroot every three hours.

14th.—A very slight oozing of fecal matter.

15th.—Bowels moved slightly three times.

16th.—From 10.30 till 12.30 last night she was most uncomfortable, after which she passed a dark-green liquid motion. At 2 A.M., one copious but less dark motion, at 3 A.M., one of a bright-yellow color, all being attended with pain of a griping twisting character; at 11 A.M. there was a rather lumpy action of the bowels; at 8.30, 11.30, and 12 P.M. a liquid motion, so that it was evident from the quantity that had passed, there must have been accumulation beyond the immediate reach of enemata.

17th.—A soft motion was passed this morning, when the child shrieked out with more pain than she had felt before, and clasped her mother; the pain was referred to the umbilicus, but only a slight degree of tympanites could be detected in this situation. Though this escape of fecal matter might have been sufficient to irritate the bowels and produce pain, it was possible that a portion of intestine had become invaginated or twisted from time to time, or the pain was due to the bowels being thrown into commotion, causing irregular contraction or spasm, by their freer action. Two grains of the Pulv. Ipecac. Co., and the sixth of a grain of calomel, were ordered every two hours if in pain.

18th.—Had seven hours' sleep. Took two powders.

19th.—Bowels open four times.

20th.—Bowels acted twice—a good night.

21st.—Bowels moved twice. Went to her home in the country.

April 10th.—Mr. Stephens reported that the journey home threw the child back a month, and enemata were required every third day, in order to act on the bowels. There were tenderness and

tympanites, and only small scybalous motions were evacuated. For a long time after her return home the temporal fossæ were greatly sunken, and the skin was like vellum from the absorption of fat.

January, 1876.—For some three months past the child had been quite well.

In this case the degree of constriction was too slight to entirely prevent the passage of the intestinal contents, and the chief danger lay in death from exhaustion rather than from obstruction. The normal vermicular movement of the intestines in these slight cases has the effect of restoring the invaginated gut to its proper place, when rest and appropriate measures are adopted.

The *second variety of intussusception* is that which chiefly concerns us, by producing very positive and umistakable symptoms, in addition, in some cases, to a defined abdominial tumor, and the partial protrusion of the invaginated intestine (sausage-like in shape) into the rectum, within reach of the surgeon's finger.

A mass of coagula may be mistaken for an intussusception, as in a case recorded by Mr. Morris, in the twenty-eighth volume of the *Path. Soc. Trans.*, where an intussusception of the ileum actually existed, but this did not involve the large intestine, which was full of clots.

In genuine intussusception, it is the upper segment of the bowel that is almost invariably forced into the lower Brinton doubted whether the contrary can ever occur. Ascending intussusception,* however, is spoken of by some writers.† Handfield Jones and Herbert Page describe a case where both varieties coexisted, and "the extremities of the two intussusceptions overlapped each other."‡

The proportion of frequency with respect to age goes to show, that of twelve specimens in children noted in the Museum of the College of Surgeons, two were aged respectively four years, one a year old, and none of the remainder exceeded ten months.

The proportions of frequency in the different parts of the canal

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* In the Museum of the College of Surgeons is a specimen of a cat's intestine, with an ascending or retrograde intussusception close to one of the ordinary variety.

† Meigs and Pepper, p. 463.

‡ A Case of Intussusception in which Abdominial Section was performed, Med.-Chir. Trans., vol. lxi.

which are liable to this displacement are as follows, according to Brinton:*

Ileum and cæcum into large intestine, 56 per cent.

"Half the large class of ileo-cæcal intussusceptions are infants under seven years of age, many but a few months old."

"Small intestine invaginated into a lower part of small intestine, 32 per cent."

Colon intussuscepted into itself, 12 per cent. (According to Rokitansky, however, "Intussusceptions occur with equal frequency in the colon and small intestine.")

"The rectum scarcely ever forms more than the outer layer of an intussusception which has descended into it from above."

Brinton believes that the sloughing-off of an intussusception is not complete on an average before the eighth day, and the liberated bowel is not expelled till two days later; "and as the intussusception, where primarily fatal, mostly kills in about five days and a half, we may fairly conjecture that the casting loose of the invagination is sometimes only prevented by the death of the patient." (Brinton.)

The average duration of the cases directly fatal, appears to be the same in the different varieties, five days and a half.

Anatomical Appearances.—There are numerous specimens of intussusception at the Museum of the College of Surgeons, showing the direction which the displaced intestine takes. In nearly all cases from the human subject, it is of the descending variety, or in a direction downwards.

In infants, the lower end of the ileum suffers most frequently. This is owing partly to the looseness of the attachment of the cæcum in the right iliac fossa, and the imperfect development of its muscular coat in early life, which allows the ileum to slip through the valve.

Causes.—Intussusception in very young children may arise from many disorders of the alimentary canal, especially diarrhœa; indeed, this is a common cause in infants; even in older children, diarrhœa, muco-enteritis, and dysenteric discharges are capable of originating the complaint. In a large number of cases it cannot be denied that derangement of the functions of the intestinal viscera precedes the displacement, and since it happens so fre-

* Intestinal Obstruction, by Wm. Brinton, M.D., F.R.S., edited by T. Buzzard, M.D.

quently to young children, it may be accepted as a certainty, that irregular contraction of these viscera from the ingesta is a common cause of the disorder. "The cause of this abnormal involution appears to be sudden and spasmodic contraction of a portion of intestine, impelled onwards into a portion less contracted or altogether flaccid. It occurs at all periods of life, but perhaps is more frequent in youth and infancy."*

Of 52 cases tabulated by Dr. Lewis Smith, the health was recorded before the invagination in 34; of these 34, the previous health was good in 17, and deranged in 17; the previous health in most of the 17 consisted of diarrhœa or dysentery, or diarrhœa alternating with constipation; others had threadworms, obscure abdominal pains, nausea, and vomiting. One child had symptoms of invagination at ten weeks old, which passed off.†

The male sex is most liable to the complaint, and of 34 cases, 23 were boys. (Lewis Smith.)

The liability of young children to the disorder is in a great measure due to the delicate structure of the walls of the intestines, which are imperfectly developed in infancy, and to unsteadiness in their movements.

It is not proved that intussusception is due to congenital laxity of the mesocæcum or mesocolon.

Among the exciting causes, blows and contusions of the abdomen have produced diarrhœa and constipation, followed by invagination; violent fits of screaming, and straining at stool have induced the complaint. Tossing the child up in the arms suddenly with a jerk, and then bringing it quickly to the ground, may cause intussusception. (Rilliet and Barthez.)

The simple form of intussusception is usually situated in the small intestines, and very rarely in the colon; in the more aggravated form the ileum is generally invaginated into the colon. The latter is, as Brinton has shown, the most frequent.

The bowels may act as many as four or five times a day, and the child die notwithstanding, and after death the invaginated intestine may be from one to two feet long. The bowels may remain pervious for weeks, and then death ensue.

Symptoms.—These vary in severity according to the age of the child and the cause which may have produced it, but griping par-

* Habershon, op. cit., p. 318.

† Lewis Smith, op. cit., 1869, p. 420.

oxysmal pain, pallor, faintness, and constipation, are common in most cases, increasing after a few days when enteritis is established. At first, as in the case of simple invagination related, pressure is borne by the hand, and the little patient may have comfortable snatches of sleep; but if the invagination continues, the symptoms assume a more aggravated form, and inflammation, marked by great abdominal pain, vomiting, and tenesmus, arises in the displaced portion of intestine. If the child is very young, convulsions may supervene,* and even if this complication does not arise, the child soon loses flesh, the face is pinched and haggard, and the eyes dark and sunken. Vomiting is a frequent symptom, and cases are rare where it is not present; at first the contents of the stomach are simply rejected, and afterwards the ejecta are grass-green, and ultimately become stercoraceous, as in the well-known vomiting in cases of strangulated hernia. After a day or two, the bowels generally cease to act, and a few more scanty evacuations will not in these cases prove that the bowels are not obstructed, for the excrementitious matters may issue from below the seat of obstruction. These scanty motions are generally tinged with blood, including much mucus, and are very characteristic. But as Mr. Marsh has pithily remarked in regard to the case of a young child in his own experience, "intussusception, even though it involves a considerable length of intestine, does not necessarily produce any symptoms beyond those that commonly attend slight catarrhal enteritis. The development of symptoms depends upon the degree of constriction. In this respect an intussusception is like a hernia, which may be 'down' without being strangulated or even obstructed. And to say that vomiting, constipation, and the discharge of blood and mucus or serum from the bowel are the symptoms of invagination is inexact, in the same sense, in which it would be to say that vomiting and constipation are symptoms of hernia."†

A solid cylindrical tumor may generally be detected by careful examination. It is most frequently found in the right iliac or hypogastric regions, sometimes it can be felt by passing the finger

* Dr. Habershon records a case of intussusception where convulsions and insensibility followed constipation, vomiting, and pain in the abdomen, in a boy six years of age. Notwithstanding that he passed the cæcum, together with the vermiform process and ascending colon, in a motion, he completely recovered.—Op. cit., p. 337.

† A Case in which Abdominal Section was performed for Intussusception, St. Barth. Hosp. Rep., vol. xii.

up the rectum, but it may be obscured by tympanites due to the enteritis which it produces. When it can no longer be distinguished after having once been detected, it may have shifted, but more frequently it has sloughed off.

Diagnosis.—In endeavoring to form a right conclusion as to the cause of the symptoms of obstruction, we must not hastily infer that they arise from intussusception. "I admitted into St. George's Hospital, some years ago, a little child who had many of the symptoms of intussusception,—obstinate constipation, straining to go to stool, occasional vomiting, and, it was said, a bloody discharge from the anus occasionally; and in whom there was also to be felt a kind of oblong tumor, somewhat tender to the touch, at one part of the abdomen. All this rather pointed to intussusception, but the course of the disease convinced me that the cause of the obstruction was really (as I believe it very often is) limited peritonitis, producing adhesion or impaction of neighboring coils of intestine."* It may be impossible to distinguish the vomiting, feeble pulse, tympanites, and worn look from local enteritis or internal strangulation, but when mucus and blood are passed per anum, it greatly assists the diagnosis. "The sudden onset of the pain, and its subsidence, becoming aggravated in paroxysms, is an indication of this form of obstruction."† The symptoms often commence insidiously, and are so puzzling that the ripest judgment may be deceived. It may be mistaken for enteritis, but the history should come to our assistance, the temperature and febrile excitement are not so great, and the colicky pain is more paroxysmal and severe. "In contrast to simple colic the spasm is more regular in its recurrence, there is less sensation of twisting and grinding, and more of a continued paroxysm, caused by the violent and energetic action of the muscular fibre to overcome the obstruction; the large coils of intestine may sometimes be felt rolling and turning over in the abdomen during its continuance."‡

"The movements and throes of intestinal obstruction, added to the pain and intense constitutional reaction of enteritis, form, in the earlier stages of intussusception, a concurrence of symptoms so characteristic of this state as often hardly to require the detection of the swelling produced by the invaginated bowel." (Brinton)

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* Holmes's Surgical Treatment of Children's Diseases, 1868, p. 569.

† Habershon, op. cit., p. 318.

‡ Medical Diagnosis, by Dr. Barclay, 1859, p. 460.

Let it also be borne in mind that in forming a diagnosis we should recollect that hardened and impacted fæces, typhlitis, hæmorrhage, dysentery, peritonitis, and cholera infantum may all be mistaken for the condition we are describing; and that the symptoms belonging to each of these states must be carefully observed and compared, for the diagnosis is not unattended with difficulty.

When the obstruction is high up in the intestinal tube the urinary secretion is more scanty than when it is situated lower down; but this symptom cannot be much relied on. "Still less reliance is to be placed on the allegation that vomiting comes on earlier, and is more distressing when the obstruction is high up. . . . . We incline to believe the cause of the obstruction to be invagination if a little bloody mucus be passed by stool, if a sudden pain were felt before vomiting had been experienced, and when constipation had not been known to exist."*

Intussusception may end fatally in a few days, or terminate in recovery in three weeks. In infants the disease is almost invariably fatal.

Intussusception of the small intestine is readily distinguished from the ileo-cæcal and colic forms.

Small intestine alone involved.	Ileo-cæcal form and colic form.
1. Little or no tenesmus.	1. Much tenesmus.
2. Much hæmorrhage by stool and vomit.	2. Simple blood-staining of motions.
3. Symptoms of obstruction very early.	3. Obstruction late or absent.
4. Tumor small and movable.	4. Tumor large, more fixed, easy to feel.
5. Invagination not felt per rectum.	5. Invagination often detected per rectum.

Sloughing and expulsion of the intussusception is most frequent when the small intestine alone is involved. Recovery too is far more frequent in that variety than in ileo-cæcal or colic intussusceptions.

Treatment. — This is *medical*, *mechanical*, and *operative*. The symptoms in many cases at the onset are too obscure to indicate with anything approaching certainty the lesion we have to encounter. Mucous discharges from the bowel, vomiting, tenesmus, and the escape of blood are not conclusive signs. Even diarrhœa and intestinal derangement, which more properly belong to an irritated rather than to a displaced intestine, may be present in cases of intussusception.

* Barclay, op. cit., p. 463.

Whenever symptoms of obstruction of the bowels present themselves in a young child, we should not overlook the possibility of intussusception. When the seizure is sudden, and displacement is considered no longer doubtful, we may adopt remedies with some chance of success. If there be a tumor in the abdomen with localized tenderness, two or three leeches may be applied over the spot.

If there be no sickness at the beginning, and constipation be the chief feature of the complaint, a dose of castor oil may be necessary, and warm-water enemata; but if these should fail to move the bowels it is no longer advisable to continue them, but to substitute in their places remedies of a soothing and sedative character. The intestines may be kept at rest by opium in small and repeated doses, and fomentations to the abdomen may be used, or a warm bath. The opium will often allay the distressing sickness which is present, and iced water, ice to suck, or hydrocyanic acid will all be useful. Sometimes a small mustard poultice to the pit of the stomach will stop the sickness.

The chief aim of the *medical* treatment consists in the most absolute repose and the simplest diet, that the intestines may be kept free from commotion, and bulky matters, the refuse of digestion, may not enter them. Under this plan the bowels have, after many days, often gradually righted themselves.

The *mechanical* treatment consists in the forcible injection of copious enemata of warm water, soap-and-water, or thin gruel. This simple measure is often successful, for where the intussusception takes place between the ileum and cæcum (as it frequently does), the fluid may pass beyond the valve into the ileum, and overcome the resistance. Another plan is to pour warm water through a funnel at a varying height, according to the force required. A piece of india-rubber tubing, about two yards long, is attached by one extremity to the funnel, and by the other to a tube, which is inserted into the rectum. I have recorded a very interesting case, successfully treated in this manner.*

Inflation by means of air has been used successfully since the time of Hippocrates, and it is doubtful whether, in these modern times, it is practiced as often as it ought to be; for when it has

* Intestinal Obstruction in a Child: Treatment by Belladonna and Gradual Injection of Warm Water poured into the Rectum through a Funnel and India-rubber Tubing; Recovery. By W. H. Day, M.D., Brit. Med. Journ., May 31st, 1879.

been employed in children, many cases are recorded where the resistance has been overcome. A pair of ordinary bellows may be used, the nozzle introduced into the rectum, and the inflation proceeded with till the obstruction yields.

The *surgical* treatment consists in performing the operation of gastrotomy, when all other measures have proved unavailing. The circumstances of each particular case must be carefully weighed—the urgency of the symptoms, and the strength of the patient; the probability of inflammation, and the prospect of alighting on the seat of mischief. From what we have learned of late years respecting the tolerance of the peritoneum to local injury, and with what impunity it may be handled without exciting inflammation, there is reason to think that the lives of many children might have been saved if the operation had not been too long delayed.

Many writers, however, are of opinion that this treatment is attended with too much risk to justify the step, because there is difficulty in ascertaining the seat of obstruction, and even if found, the operation is attended with extreme danger. If a tumor can be felt in the left iliac fossa, where the intussusception frequently is located, there is a fair chance of localizing the constriction, and the operator has not to search at all parts of the intestinal tube. Besides, the distance to which enemata travel may aid the diagnosis. It seems certain that if the operation holds out any chance of success, it should not be delayed over three or four days when the symptoms are severe; because the invaginated bowel may inflame and contract adhesions with the surrounding parts. "Only three cases collected by Haven, in which gastrotomy was performed, terminated favorably."*

The two following are examples of gastrotomy, one fatal, and one successful.

Case 1.—Mr. Hutchinson has described an interesting case of a child six months old on whom he operated. The child was under the care of Dr. Madge, and had been ill four days when he saw it, with painful straining and the passage of bloody mucus. "The invaginated part could be easily felt in the left flank by manipulation through the abdominal wall, and also by the finger introduced into the rectum." (An infant sister died a year previously of the same lesion.) The intussusception had begun in the cæcum, and at the post-mortem next day there was universal peritonitis, and

* Meigs and Pepper, op. cit., p. 477.

the cæcum was attached by a long mesentery. Mr. Hutchinson considered that the cæcum had been loose congenitally.*

Case 2.—Mr. Howard Marsh† has described an interesting and successful case of gastrotomy. The child (a male infant seven months old) was seized, fourteen days before he saw him, with diarrhœa, sickness, and occasional griping pains in the abdomen. The case was considered by the medical attendants, Dr. Miller and Dr. Barnes, of Eye, in Suffolk, to be due to catarrhal enteritis, and natural evacuations followed small doses of castor oil emulsion. In two or three days griping and sickness returned, and there were in addition tenesmus and a quantity of slimy mucus mixed with blood. The child remained in much the same condition till twelve hours before the consultation (April 11th, 1875), when the pain and tenesmus were violent, and he became pale and restless. On examination a firm cylindrical and sausage-shaped tumor was felt in the abdomen, "extending from the umbilicus to the left iliac fossa," and two inches of the bowel protruded from the anus, with the ileo-cæcal valve at the extremity. Insufflation and warm-water enemata failed to reduce the invagination. The child was placed under chloroform, and the abdomen having been opened, the entering portion of the gut was carefully pulled out, when it was found that the invaginated intestine "included at least half the colon, and an equal portion of the small intestine." After the operation small doses of laudanum were given, and the child drank freely of milk and water. The sickness ceased at once, and two days after the operation a feculent motion was passed. The wound had nearly healed eighty-four hours after the operation, and a few days later the child recovered. Nine months after the child was in good health. This case is one which testifies to the importance of an operation when the symptoms are severe; and shows that the possibility of strangulation or inflammation being present, should not prevent the operation, when the case holds out no other hope of success. In cases which appear most formidable before the operation, the invagination having been restored, improvement may at once set in, proving that the circulation through the bowel has not been interfered with.

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* Med.-Chir. Trans., vol. lix, 1876, p. 100, Abdominal Section for Intussusception into Colon.

† Ibid., p. 81, A Case in which Abdominal Section was successfully performed for Intussusception in an Infant seven months old.

CHAPTER XX.

DISEASES OF THE LIVER.

CONGESTION OF THE LIVER: *Nature—Causes—Symptoms and treatment.* ADHESIVE INFLAMMATION OF THE LIVER—HEPATITIS—INTERSTITIAL HEPATITIS—HOB-NAILED LIVER—CIRRHOSIS—CHRONIC ATROPHY: *Symptoms—Causes—Diagnosis—Morbid anatomy—Treatment.* SYPHILITIC DISEASE OF THE LIVER—ALBUMINOID ENLARGEMENT.

CONGESTION of the liver is not unfrequent in children. It is manifested by constipated bowels and clay-colored evacuations; the appetite is poor, the complexion sallow, and the tongue coated; the conjunctivæ have a yellowish tint, and the urine is high-colored and turbid on standing. There is a sense of weight and fulness about the region of the liver, and its edge may sometimes be felt below the ribs on the right side. This is a state of *active* congestion.

It should be remarked that in making an examination of the liver we shall find it proportionately larger in early life than in adult life, and that what would be considered an enlarged area of hepatic dulness in the latter would not necessarily be so in the former.

"In the adult the average weight of the liver is one-fortieth that of the entire body, whereas previous to puberty it may be as much as one-thirtieth or even one-twentieth."* The liver varies in health as to size, and there is more blood in it at one time than at another. "For instance, the amount of blood in the liver and its size are greatly influenced by diet, both being temporarily increased after a meal, and particularly when the food has been too large in quantity, or has contained an excess of fatty, saccharine, or alcoholic ingredients."†

The pathology or nature of the change consists in a uniform enlargement of the liver, which is also darker in color, from containing more blood than it does normally. The congestion may affect chiefly the hepatic or portal vein; the lobules have in the first case a light border, and in the second a dark border. The congestion, therefore, is spoken of as intralobular and interlobular.

The *causes* are overfeeding and inattention to the rules of

* Lectures on Diseases of the Liver, by Dr. Murchison, 1877, p. 7.

† Ibid., p. 131.

health. Rich and stimulating food in large quantities, especially if children are confined indoors, and do not get sufficient exercise; or cold after a heavy meal may induce it. Organic disease of the valves of the heart, as mitral regurgitation, and more or less distension of the right cavities, will, by inducing a mechanical obstacle to the return of blood through the veins, set up *passive* congestion. Under these circumstances the liver is habitually congested, and it grows larger, at least for a time. "The pressure exerted by the constantly distended hepatic veins causes atrophy of the central portions of the lobules, and induces a form of granular liver, different from true cirrhosis, where the atrophy commences at the circumference of the lobules."* An enlarged liver may sometimes occur in connection with chronic disease of the lungs. In two cases of emphysema of the lungs, in children under my care, the liver was enlarged in both; it may be present in ascites, and sometimes produces it; it occurs in mesenteric disease, and in rickety subjects, where the head is large, the teeth decayed, and the limbs small.

The *symptoms* are a dragging pain or tightness below the right ribs, but, as some children will bear pressure without complaining, the physical signs denoting enlargement of the liver are mostly to be relied on for diagnosis. In a large number of cases pain is altogether absent. There is now and then some degree of jaundice present, but this is more often seen in adults than in children; the liver may be felt an inch below the ribs, and the motions may be deficient in bile when the skin is perfectly clear. Simple congestion of the liver, therefore, in children is not usually attended with jaundice. The urine is scanty, and on standing may throw down copious urates, though it is sometimes perfectly clear and natural. The general signs are headache, nausea, loss of appetite, furred tongue, flatulence, and even vomiting. There may be diarrhœa and irritation of the bowels, languor and drowsiness. The liver may remain large after jaundice for a long time, and pain of a dragging character ensue, with dyspeptic symptoms, headache, and lassitude. As the circulation is relieved and the turgid capillaries are unloaded, the jaundiced hue, which is not necessarily present, passes off.

Treatment.—We must first aim at the removal of the cause. When congestion of the liver happens to young children from

* Lectures on Diseases of the Liver, by Dr. Murchison, 1877, p. 132.

overfeeding and inattention to the rules of health, care and attention to diet will soon cure the complaint. In the shape of medicine a mild mercurial, followed by a saline aperient, will excite a watery discharge from the mucous membrane of the bowels, and bring away some bilious motions. A warm bath at bedtime for a few nights is an admirable remedy, and if there is pain or weight over the region of the liver, a hot poultice will be beneficial. The perchloride of mercury with tincture of bark is often useful, and the nitrohydrochloric acid and taraxacum (Form. 42) where there is debility and dislike to food. When the congestion is due to disease of the thoracic viscera an occasional calomel purge, followed by a saline aperient is equally available, and the diet will require to be regulated. A small dose of calomel stimulates the upper bowel and duodenum, and drives the bile along the intestines. Small doses of ipecacuanha are also useful by increasing the action of the liver and skin.

When children are sleepless and irritable, bromide of potassium is useful if the liver is congested, and the urine high-colored and scanty. In similar cases, the chloride of ammonium, which acts on the skin and kidneys, is an excellent remedy, though rather too nauseous for children.

Later on, when the urine is clear, and there is debility, the syrup of the iodide of iron, nux vomica, or arsenic, are suitable remedies.

Adhesive Inflammation of the Liver.—The liver may be enlarged from interstitial hepatitis or adhesive inflammation, and attain a large size, stretching above to the nipple, and below to the navel. In an early stage it has been known to extend to the pubes, and the spleen to be enlarged at the same time.

In cirrhosis the liver is at first increased in size in consequence of an infiltration of small round cells into the areolar tissue of the portal canals, and the increase of the organ depends upon the extent of the cell proliferation. After a time, as this cellular tissue fibrillates and contracts, the liver diminishes in size, the portal veins are compressed, and the passage of blood is impeded; the vascularity of the liver is lessened, indeed some of the branches of the portal vein are entirely obliterated, hence atrophy and shrinking of portions of the liver. The small gall-ducts undergo compression in the same way as the branches of the portal vein. Wilks and Moxon consider that in many cases there is no proof of

lymph being thrown out as in active inflammation, and that the whole change is chronic.*

An interesting case of cirrhosis in a child is recorded by Dr. Arthur Fox,† accompanied with jaundice, hæmatemesis, and coma. After death the liver was found unusually large, the capsule thickened, and the surface finely granular. "The glands in the portal fissure were much enlarged and deeply pigmented. The spleen was enormously gorged with blood and somewhat friable." The kidneys were congested but otherwise normal. The intense jaundice was attributed to the pressure of the enlarged glands on the bile-duct. There was no history of hereditary syphilis, but his mother had been a chronic drinker for years. Dr. Fox considers that cirrhosis in children may be one of the consequences of alcoholic heredity, though it may occur independent of it as a grave general disease.

Dr. Murchison relates a case of interstitial hepatitis in a child twelve years of age, coming on from a chill, and ending in cirrhotic contraction and death. The disease set in slowly, followed by severe abdominal pain and deep jaundice. The liver extended nearly to the pubes, and the spleen was enlarged. Death was preceded by diarrhœa, with hæmorrhage, offensive breath, rapid pulse, fever, delirium, irregular breathing, and coma. A post-mortem examination revealed a small rounded liver (16 ounces), the tissue being firm and the surface irregular and puckered; capsule thickened; spleen enlarged.‡

Causes.—Spirit-drinking is the most common cause of cirrhosis in the adult. When taken up by the bloodvessels of the stomach, alcohol is at once conveyed to the liver. Murchison relates a case in a boy, nine years of age, who drank "a good deal of wine and water between meals." Paracentesis was twice performed. He died from prostration and collapse. After death the liver was found tough and hob-nailed, and weighed 21½ ounces.§ A torpid and sluggish liver, hereditary syphilis, cold and chills, and the want of regular exercise have given rise to the disease in children.

According to Dr. Budd, the small miliary tubercles found in

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* Pathological Anatomy, 1875, p. 447.

† "Case of cirrhosis in a boy aged eleven years; jaundice of nearly three years' duration."—*Brit. Med. Journ.*, Dec. 21st, 1878, p. 913.

‡ Lecture on Diseases of the Liver, by Dr. Murchison, 1877, p. 632.

§ Op. cit., p. 302.

the liver of persons dying of phthisis never cause adhesive inflammation of the organ, which, as he says, is remarkable, seeing the tendency they have to set up inflammation in the different tissues of the lung.*

Diagnosis.—This is not very easy in children who exceptionally indulge in alcohol. A sallow hue of the skin, or even jaundice; thirst, dry tongue, furred or reddish; scanty and high-colored urine; costive bowels, with a deficiency of bile in the motions; pain in the hepatic region, and tenderness on pressure are to be looked for. Ascites is often present to a considerable degree. There is sometimes epistaxis, or hæmorrhage from the bowels.

Morbid Anatomy.—The liver is much reduced in size, and of a yellowish color, resembling beeswax. Fibrous tissue of a tough character is diffused through the organ and around the vessels. As it contracts, the parenchyma is squeezed into a coarse nodular appearance; the capsule is thickened; the walls of the portal vein are also thickened, and its calibre is diminished. The hepatic cells are destroyed, or in a state of fatty degeneration.

Treatment.—Diet is important. It should consist of milk, eggs, white fish, farinaceous food, and poultry. At an early stage, when the liver is congested and tender, the application of two or three leeches may be necessary, or a linseed poultice frequently renewed. Small doses of hyd. c. creta with rhubarb are serviceable, and a saline aperient to unload the portal circulation, and keep the bowels freely open, will relieve the symptoms greatly. If there is loss of appetite the compound infusion of gentian, taraxacum, and dilute nitric acid may be given. When ascites threatens, diuretics, such as the acetate of potash in decoction of broom, should be tried, and if they fail, hydragogue purgatives, as the compound jalap powder, are indicated. When ascites is present to a degree which embarrasses the respiration and causes pain, recourse must be had to paracentesis. If there is a syphilitic history, mercury and iodide of potassium may be demanded.

Syphilitic diseases of the liver is another form of hepatic enlargement. The lesions of this organ seen in hereditary syphilis usually consist in hardening and hypertrophy, so that it creaks as the knife passes through it. "On a uniform yellowish ground a more or less close layer of small white opaque grains is seen, having the appearance of grains of semola, with some delicate arborescences

* Diseases of the Liver, 1852, p. 129.

formed of empty bloodvessels. On pressure no blood is forced out, but only a slightly yellow serum, which is derived from the albumen."* The change may be limited to the right or the left lobe of the liver. The capillary vessels are obliterated, and the dimensions of the larger vessels reduced. The microscope shows the morbid appearances to be due to the presence of a fibro-plastic material. These changes may be developed during intrauterine life. The symptoms are not very definite; there may be vomiting, diarrhœa, or constipation, but never any jaundice. Death takes place early. Fatal peritonitis, it has been said, may be the consequence of the hepatitis being followed by the extension of inflammation from the peritoneal covering of the liver.

There is a case recorded by Dr. Goodhart,† in which the liver and spleen were very large in an infant two months old. The evidence of congenital syphilis was doubtful, but a cure was effected by one grain of gray powder, given night and morning, followed by the syrup of the iodide of iron.

Frerichs speaks of three forms of syphilitic disease of the liver: 1. Simple interstitial hepatitis; 2. Hepatitis gummosa; 3. Waxy, amyloid or lardaceous degeneration of the liver. All three forms may be found in the same liver, or may exist independently.‡

There is *albuminoid* enlargement of the liver, in which albuminous matter is infiltrated through the organ. It is commonly met with in rickety children. The organ is paler, harder, and more elastic than natural, and the connective tissue around the portal vessels is increased. A similar state of the liver is found in congenital syphilis. (Wilks and Moxon.)

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* Diday on Infantile Syphilis, New Syd. Soc., 1859, p. 92.

† Enlargement of the liver and spleen; the hepatic swelling quickly subsiding under medical treatment.—Brit. Med. Journ., vol. ii, 1878, p. 438.

‡ Diseases of the Liver, New Syd. Soc. Trans., 1861, vol. ii, p. 152.

CHAPTER XXI.

ICTERUS OR JAUNDICE.

DEFINITION AND SYMPTOMS: *Causes—Cold and bad atmosphere—The entrance of bile into the blood from distension of the bile-ducts, and retention of bile within the liver—Fecal accumulation pressing on the liver—Treatment*: ICTERUS NEONATORUM—ACUTE YELLOW ATROPHY OF THE LIVER.

BY the term jaundice we understand a yellowish color of the integument, caused by the entrance of bile into the blood; this, with yellow conjunctivæ and urine, and the whitish or pipeclay appearance of the fæces, distinguish it from every other disease.

The *symptoms* of jaundice in children often commence with sickness and vomiting of food; there may be severe frontal headache, languor, and lassitude; the child can make no exertion to do anything; there is loss of appetite, and sometimes pain over the region of the liver, though this may be absent even when the organ is considerably enlarged. Pain, indeed, is a rare symptom in the jaundice of children, and when present in the jaundice of adults, it probably indicates distension of the bile-ducts from the passage of a gall-stone. The surface of the body and conjunctivæ generally assume a yellow appearance, and the extremities are sometimes much more affected than the back. The temperature is normal, and the pulse slow, except there is acute pain over the liver from the amount of congestion present, and then there is dryness of the skin and febrile disturbance.

The urine is generally of a dark Madeira color, from the admixture of bile, and it stains linen yellow. Casts of the urinary tubules have been observed in it. In very severe cases the sweat and saliva are also yellow, and objects appear yellow to the eye. The bowels are usually constipated, and the motions pale like pipeclay. Sometimes there is diarrhœa, and the stools are colorless, if the bile-duct is completely obstructed. In cases where the constitution is bad, petechiæ may appear on the skin, and there may even be hæmorrhage from the mucous surfaces. According to Wickham Legg, the tint of jaundice has been observed by several authorities in the mouth before it has been apparent elsewhere.*

Causes.—Jaundice results in infants and very young children

* St. Bart. Hosp. Rept., vol. xiii, p. 12.

from a bad atmosphere and cold, so that the skin and organs of respiration do not perfectly perform their functions. The disease is most common in the feeble and delicate. As the skin takes on its proper functions, and cold is guarded against, the jaundice disappears in a few days, provided nothing is given in the shape of food except breast-milk. A grain of Hyd. c. Creta, followed by a dose of castor oil or some other laxative, complete the treatment.

Jaundice may, however, arise from enlargement and inflammation of the liver or umbilical veins, or from obstruction or inflammation of the bile-ducts, or even absence of the gall-bladder. It has been attributed to spasmodic closure of the ducts, but whether this can produce it or not, we know that the essential or true cause is a retention of the bile within the liver, and the transudation of the bile through the capillaries and bile-ducts into the circulating blood. Jaundice may arise from congestion of the liver; the secretion of bile is diminished because the gorged state of the bloodvessels presses upon the gall-ducts, and does not allow the bile to pass freely through them. "In young persons, and in persons in whom the liver is healthy and its capsule thin, it will necessarily enlarge much more for a given force of distension than in persons in opposite circumstances."* The liver is enlarged and of a deep-red color in the central parts, whilst the margins are pale.

Jaundice in older children, as in adults, is most common in summer and autumn, and in some cases is accompanied with diarrhœa. Nausea and sickness, headache, loss of appetite, drowsiness, and restless nights are common symptoms. I attended a severe case of jaundice in a young lad some years ago, which came on after excitement and running some distance immediately after a heavy meal.

Jaundice has arisen from round worms entering the orifice of the bile-duct and causing biliary colic, vomiting, and all the symptoms of gall-stones.† A similar case is also on record.‡ Dr. Budd mentions the fact that several cases of jaundice, in quick succession, have come to his knowledge in children of the same family, or in several persons living in the same locality. He attributes it to some poison (probably miasm) which arrests the secretion of the

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* Budd on the Liver, 1852, p. 56.

† Murchison, op. cit., p. 345. ‡ Brit. Med. Journ., vol. ii, 1878, p. 877.

liver owing to some change in the blood.* Probably the liver was imperfectly developed. Some persons have small livers, just as others have small hearts.

The diagnosis from cerebral disease consists in the absence of febrile disturbance—no heat of head or intolerance of light—the vomiting is less, and the pulse is slow rather than frequent. There is often tenderness over the region of the liver, the motions are pale, and the urine high-colored.

The *treatment* of jaundice is that of biliary congestion. If there is pain or great tenderness over the liver a leech or two may be applied there or at the anus, followed by a warm linseed poultice. Two grains of Hyd. c. Creta, or even a grain of calomel should be given at bedtime to a child seven or eight years old, followed by sulphate of magnesia during the day, or the nitromuriatic acid mixture, with taraxacum (Form. 42). It is important to keep the bowels open and to give a farinaceous diet chiefly. Milk in soda-water is nutritious and refreshing. If there is thirst, barley-water, with a little cream of tartar in it, will be useful. Bicarbonate of soda and tartaric acid given in full doses whilst effervescing will relieve sickness and keep up a gentle action of the bowels. If the liver remains sluggish and painful, a lotion of nitric acid applied at bedtime under oiled silk is a good application. It causes redness and tingling of the skin, and when this happens it should be omitted till the erythema has passed away before it is reapplied.† Emetics repeated daily are in favor with some practitioners, especially when the jaundice is due to catarrh of the bile-ducts.

Icterus neonatorum is not a disease of the liver, as its name seems to imply, but is merely caused by the changes in the color of the skin during the first few days of life. In infants after birth the skin is much congested; this gradually declines till a rosy tint is reached in the course of a few days. It sometimes happens in children otherwise well, that the skin, after the first two or three days of life, assumes a yellowish-orange tint, which popularly goes by the name of jaundice, the urine and motions being in all respects natural. The complaint is caused by the blood in the skin

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* Diseases of the Liver, 1852, p. 273.

† Formula 44:

R. Acid. nit. dil., ... ℥j

Aquam rosæ ad . . . . . ℥xx

Fiat Lotio.

changing into a yellowish tint before the normal color is reached. The conjunctivæ in these cases remain clear, and the urine contains no trace of bile-pigment. The disorder is, therefore, in most cases, a mere cutaneous discoloration.

This simple form of icterus has been shown to be frequently due to deficient oxygenation of the blood, but "*icterus neonatorum*" may also represent a very grave condition, viz., obstruction of the bile-duct* from congenital stricture, or from inspissated bile, or the jaundice may have a pyæmic origin from phlebitis of the umbilical vein, as Dr. Murchison has shown (op. cit., p. 347).

A male infant, seven weeks' old, was sent to me by Mr. Butler, of Guildford, on April 8th, 1879, suffering from severe jaundice. On the third day after birth, he became very yellow, but took Swiss milk well, and was also suckled by a wet-nurse. The child was well nourished, and had not wasted, though the mother said he seemed less plump than at birth. The color of the integument was of a deep yellow on the face and thorax, and of a lighter hue below the umbilicus, scrotum, and buttocks. The conjunctivæ presented a yellowish-green tint, varying from time to time in intensity. Both the liver and spleen were enlarged. There was a good deal of tympanites, but the child could retain his food; there was no vomiting, the fæces were relaxed, and although nearly always clay colored, a trace of bile had been seen in the motions; the urine was of a pale-saffron color. The history of the case favored the supposition that the jaundice might be caused by absence, obstruction, or malformation of the gall-bladder or bile-ducts. He was ordered to be fed on milk and lime-water, and as the diagnosis could at best be only doubtful, a powder containing a grain of Hydr. cum Creta and bicarbonate of soda, was ordered, occasionally at bedtime, and a mixture containing the solution of carbonate of magnesia and taraxacum during the day.

Mr. Butler informed me, six months later, that the child had died, and a post-mortem examination had been made by Mr. Bisshopp, of Tunbridge Wells, on August 23d, 1879. A good deal

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* Mr. Glaister has described a most interesting case of fatal "*icterus neonatorum*," where the common bile-duct was found to be constricted, "a few lines from its duodenal insertion," and the left hepatic duct "seemed to split up into fibrous threads." The mother had borne seven children before, six of whom had shown similar symptoms, four out of these six cases ending fatally. Both parents were troubled with frequent hepatic symptoms.—*Lancet*, vol. i, 1879, pp. 293, 330.

of ascitic fluid was found in the abdominal cavity of a deep-yellow color, which appeared due, not to any inflammation of the peritoneum itself, but to the dense, hard, contracted state of the liver, from chronic inflammatory changes, which had obstructed the hepatic circulation precisely in the manner seen in cirrhosis. The gall-bladder contained a glairy white fluid, but no bile. The hepatic, cystic, and common bile-ducts were all absent. The anatomical malformation had caused the incurable jaundice, the chronic inflammation of the liver and dropsy, and finally the general wasting and death.

Acute yellow atrophy of the liver (*suppressed secretion of bile—fatal jaundice*) has been met with in young subjects, but it is very rare in children. "Out of 25,700 cases admitted into the London Fever Hospital in nine years, there was only one case of this disease."* It is supposed to consist in inflammation of the organ, which leads to suppression of bile, and degeneration of structure. In this curious disease the liver quickly undergoes degeneration, after a few days of indisposition, and hepatic derangement. The premonitory symptoms are nausea, furred tongue, diarrhœa, or constipation, slight pyrexia; there may be rheumatic pains and cardiac distress. Jaundice is always present, but bile is to be seen in the stools, and there is no obstruction in the bile-ducts. The severe symptoms are owing to biliary suppression, and the accumulation of bile products in the blood. The skin becomes hot and dry, the pulse quick, vomiting of coffee-grounds matters follows, with hæmorrhage from the bowels. Sometimes there is epistaxis, and the bowels are constipated; the urine is of a dark-brown color, like porter, and contains bile, tyrosin, leucin, etc. As the disease proceeds, delirium and coma (sometimes convulsions) come on, the motions are dark from the presence of blood, the skin is of a deeper jaundice hue, and petechial spots of ecchymosis occur in different parts of the body.

In the case of a boy, aged seventeen, described by the late Mr. Harry Leach, there had been "slight icterus for fourteen days, pain across the epigastrium, anorexia, and frequent vomiting." These symptoms were followed by stupor, debility, intense jaundice, pain over the liver, which was enlarged, coffee-grounds vomiting, convulsions, frantic delirium, loud screaming, and death. The pulse was weak and irregular, the respiration slow, the heart

* Murchison, op. cit., p. 257.

thumping. The bowels were constipated, the urine (which was of the color of porter) required to be drawn off with a catheter. It contained tyrosin, a large quantity of urea, phosphates, and chlorides, but no albumen. The sp. gr. was 1035. A post-mortem examination revealed congestion of both lungs; the spleen weighed 4¾ oz., both kidneys 10½ oz., and were granular and fatty; the liver weighed 31½ oz.—it was soft, pale, and flabby; the inferior aspect was of a dark-greenish hue from the accumulation of bile in the independent portions. The biliary vesicle and ducts were empty and shrunken. The portal vein was free.*

This form of jaundice, ending in coma, occurred to four members of the same family; in the case of two of them, being brothers of the respective ages of 11 and 13 years, it terminated fatally.†

Causes.—Syphilis, and irregular habits in youth, predispose to the disease. According to Frerichs, hyperæmia and diffuse inflammation of the liver are exciting causes.

Diagnosis.—The disease resembles yellow fever, but is to be distinguished from it by the shrinking of the liver, and the presence of leucin in the urine.

Morbid Anatomy.—The liver is shrunk and shrivelled, and the division into lobules is not discernible; it may shrink to one-half its size in the course of a week or ten days, "it is soft and flabby, and of a light-yellow color, or brownish-yellow, or crimson orange, or some kindred tint."‡

It may be enlarged at an early stage, but this is of short duration, and is soon followed by a diminution in its bulk. The hepatic cells disappear, leaving only granular matter and oil, the biliary ducts are pervious, the gall-bladder is empty, the spleen is congested and enlarged.

Treatment.—This is almost hopeless. At an early stage cupping or leeching over the liver may be of service; an emetic, followed by a full dose of calomel, appear to be the remedies which in a few cases have been attended by recovery. Dr. Budd recommends sulphate and carbonate of magnesia, with small doses of sal volatile.

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* Brit. Med. Jour., 1878, vol. ii, p. 877.

† Budd, op. cit., p. 269.

‡ Ibid., p. 270.

CHAPTER XXII.

PAINLESS ENLARGEMENTS OF THE LIVER.

HYDATIDS OF THE LIVER: *Pathology—Symptoms—Causes—Diagnosis—Termination and Treatment.* LARDACEOUS OR AMYLOID DISEASE. FATTY LIVER. SIMPLE HYPERTROPHY OF LIVER.

HYDATID tumors of the liver, most common during the middle period of life, are rarely found in childhood or old age. I have seen a large hydatid cyst extending downwards to the umbilicus, and across to the splenic region, in a girl eight years of age; and cases are recorded of its occurrence in children considerably younger. A membranous sac or cyst forms in the liver, containing a colorless limpid fluid like water. In the fluid a variable number of cysts or bladders (acephalocysts) are found, varying in size "from a millet-seed to a goose's egg." Hundreds or even thousands of these acephalocysts may be detected in a single parent cyst, to the walls of which the scolices of the echinococcus adhere. The sac or cyst is formed by the tissue of the liver, and is of variable thickness, being thicker in tumors of old than of recent standing.

Hydatid tumors grow very slowly, and are generally painless, at least when of small size, and they are rarely accompanied by dropsy or jaundice. This latter symptom will depend upon whether the common bile-duct undergoes compression from being surrounded by enlarged lymphatic glands, or is otherwise obstructed by some swelling of the liver, when there may be continued or remittent jaundice.* A case is also recorded by Dr. Cayley, in which a patient had repeated attacks of hepatic pain with jaundice. The hydatids came away per anum, and the health remained good.† Hydatid tumors may be large enough to fill the greater part of the abdominal cavity, or to reach upwards into the chest nearly to the clavicle; they may not exceed the size of an orange, and when deeply seated they may escape observation altogether.‡

When they can be felt they are perfectly smooth, and they have an elastic or fluctuating feel. Occasionally the so-called hydatid fremitus may be felt. If several cysts exist, the surface of the liver may be irregular or lobulated.

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* Path. Trans., vol. xxv, p. 156. † Path. Soc., Oct. 20th, 1874.

‡ Diseases of the Liver, by C. Murchison, M.D., 1877, p. 55.

Ascites is an occasional consequence of pressure and interference with the circulation through the liver, but a case is on record where the portal fissure was much pressed upon without producing this result.* In some cases there is œdema of the lower limbs from pressure on the vena cava, and albumen has been detected in the urine from the tumor compressing the renal vein. In very exceptional instances, secondary hydatid cysts have been found in the spleen and kidney.

Causes.—The adult tænia ecchinococcus inhabits the intestines of the dog; the ova are voided in the fæces of the animal, and being swallowed with the food and drink, find their way to the liver, lung, or some other organ, and there become encysted.

Diagnosis.—When a tumor occupying the region of the liver is smooth and globular, and there is fluctuation with an absence of pain, fever, and jaundice, and the general health moreover remains good, we should suspect the existence of echinococci. The possibility of abscess or ovarian cyst, and especially pleuritic effusion, should be remembered, but these conditions could scarcely be confounded with a hydatid cyst, if care be taken before coming to a conclusion.

Termination.—The contents of a hydatid tumor may ultimately dry up, and the sac become obliterated, or it may burst spontaneously through the walls of the abdomen, or into the bronchi, intestine, or stomach, and the patient recover. The cyst may suppurate and induce pyæmia and gangrenous abscess of the liver, or it may burst into the pleura and produce fatal empyema.† When it bursts into the lung, the patient spits up a hydatid from time to time, and as the disease proceeds and the orifice in the pulmonary tissue becomes larger, several hydatids may be coughed up at one time. The symptoms attending this pulmonary complication are frequent straining cough, constant expectoration of a sanguineous or purulent character, and a disgusting taste in the mouth from the admixture of bile.‡ The most dangerous consequence is the liability of the sac under gradual growth and distension to ulcerate and rupture into the peritoneum, and there set up fatal inflammation. The tumor, too, may continue to increase in size, causing such compression of the hepatic structure, and

* Clin. Trans., 1878, p. 236.

† Murchison, op. cit., p. 120–123.

‡ Budd, op. cit., p. 444.

disturbing the functions of adjacent organs by its growth, till it wears the child out by pain and exhaustion.

Treatment.—Up to the present time, drugs have proved useless. When the tumor is large, it should be tapped with a fine exploratory trocar, or aspirator, and the fluid drawn off. The withdrawal of a small quantity of fluid by the hypodermic syringe, as a means of diagnosis, has been sometimes followed by complete atrophy of the cyst. The cases most likely to end in cure are those which have a thin cyst-wall, and where the vesicles are few in number, or the acephalocyst is solitary. Several successful cases are related by Budd,* and Dr. Murchison† gives a table of eighty cases in which a cure followed the operation of puncture. Moreover, inflammation and suppuration may be set up in the sac by puncture, and recovery even then may ensue; or the hydatid may slowly exhaust the patient's strength, as we sometimes see in opening a large chronic abscess. Even the simple process of puncture is not free from danger, as there is a risk of the irritating fluid escaping into the abdominal cavity and provoking inflammation. Several fatal cases are recorded from puncture, death occurring in a few hours, faintness, rigors, vomiting of bilious matter, pain in the abdomen, and coldness of the extremities preceding death. Sometimes peritonitis has ensued, followed by a slow recovery ‡ A case is related by Mr. Bryant, where agonizing pain, lividity, unconsciousness, and sudden death followed the tapping of a hydatid cyst, and the result of the post-mortem examination seemed to show that the portal vein had been transfixed by the trocar, and that the hydatid fluid, being sucked into it, acted as a fatal poison.§

Injections into the cyst have been tried, those containing iodine or carbolic acid being generally selected. Iodide of potassium given internally, and iodine ointment rubbed in over the enlarged liver, have severally been employed without success.

Lardaceous or amyloid disease of the liver—scrofulous enlargement of the liver (Budd)—is a disease which belongs to the weak and cachectic. In this peculiar degeneration of the liver, waxy and fatty matter is infiltrated throughout it, and in many instances a

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* Budd, op. cit., p. 448.

† Murchison, Clinical Lectures on Diseases of the Liver, 1877, p. 77.

‡ Frerichs on Diseases of the Liver, New Syd. Soc., vol. ii, p. 251.

§ Clin. Trans., 1878, p. 236.

similar extension of the disorder can be traced into the different tissues, as the lymphatic glands, bloodvessels, spleen, and renal organs.

Pathology.—The liver is greatly enlarged and thickened; it may be somewhat paler than usual from a deficiency of blood, or at other times scarcely altered from its normal appearance. In some cases it presents a white appearance on section, and the lobules are either obliterated altogether, or they are scarcely to be distinguished. This "waxy" or albuminous matter never becomes hard, or shows any tendency to contract like lymph, which is the product of inflammation; it is destitute of cells or organization. The surface of the liver is smooth, white and glistening, even when the disease is of long standing. "These circumstances," says Dr. Budd,* "explain the fact that the foreign matter, though large in amount, does not much impede either the passage of the blood through the liver or the escape of the bile through the ducts." The lobules become of a faint reddish color and enlarged, the gland structure is uniform and smooth, and on section resembles "smoked salmon." This peculiar deposit may occur in isolated portions of the liver, or it may be scattered throughout the entire organ. It is first deposited within the lobules, and between the secreting cells, which are diminished in number. A similar condition of the spleen often accompanies this degeneration. Microscopically oil-globules can be seen in abundance when the fatty matter is examined, but the great increase in the size of the liver is owing to the infiltration of this peculiar morbid matter stretching the capsule and obliterating the appearance of the lobules. "It first affects the minute vessels, especially the arteries, and extends to the capillaries, afterwards invading the proper elements of the texture implicated."† Syphilis and scrofulous disease of the bones, especially when accompanied by chronic suppuration, are its usual casual relations. Caries of long standing appears to be a common cause. "Out of eighty-three cases of lardaceous disease, seventy-three were in connection with either suppuration or syphilis, leaving but ten cases which were not ostensibly accounted for by these agents."‡

The *general* symptoms are those indicative of anæmia, gradual

* Diseases of Liver, 1852, p. 318.

† Pathological Anatomy, by Wilks and Moxon, 1875, p. 640.

‡ Discussion on Lardaceous Disease, Path. Soc., March 18th, 1879.

wasting and cachexia. It comes on so slowly that if it were not for the increased size of the abdomen, no notice would be taken of it; there is occasional yellowishness of the conjunctiva and a little tenderness over the liver. After a time there is languor and loss of appetite, gastro-intestinal derangement, and sometimes vomiting and diarrhœa, with pale stools. Fever of an irregular type is common, attended with cough, dyspnœa, and quick pulse; the urine is often of low specific gravity from the presence of albumen, which is a consequence of the kidneys participating in the waxy degeneration, and the drain of albumen may be so great as to destroy life. The presence of waxy casts in the urine is a guide to diagnosis.

In addition to these symptoms we frequently meet with enlargement of the submaxillary and cervical glands. The disease may terminate in peritonitis, pneumonia, or tubercular disease of the lungs; but more frequently it ends in exhaustion, ascites, or general anasarca.

In a case mentioned by Portal of a boy, aged 8, who died from the disease, the bronchial and mesenteric glands were found enlarged, "and filled with a substance like plaster," and a slice of the liver exposed to heat became hardened like albumen.* In another case, related by Abercrombie, of a boy, aged 11 years, there was found after death, extensive disease of the mesenteric glands, the lungs were tuberculous, and there was a chain of enlarged glands extending from the bifurcation of the trachea to the diaphragm; some contained pus, others were of cartilaginous hardness, whilst in some there were calcareous particles.†

There is little to be hoped from treatment beyond attention to the general health, warm clothing, nourishing diet, chloride of ammonium, preparations of iron, cod-liver oil, and pure air. When there is disease of the joints the surgeon's aid may be required, and if the complaint has a syphilitic origin, it will demand special remedies. Dr. Budd gives as his experience that he has met with more than one instance where recovery took place, the peculiar morbid matter passing off with the bile, or becoming absorbed.

Fatty Liver.—This form of enlarged liver arises from the accumulation of oil within its substance. The organ increases uniformly

* Budd on the Liver, 1852, p. 304. † Ibid., p. 305.

in size in every direction; it is smooth on its surface, of doughy consistence, and on examination, after death, it is found to be pale in color. No matter how severe the disease may be, the secretion of bile is not interfered with, therefore jaundice, in uncomplicated cases, does not occur; the superficial veins of the abdomen are not enlarged, and there is no ascites.

Symptoms.—These are anæmia and debility, languor, lassitude, flatulence, irregular bowels, and depression of spirits. The skin is bloodless, and has a sallow or waxy appearance, resembling fine polished ivory, or a common wax model. Most of the constitutional symptoms are "often due for the most part to fatty degeneration of other organs, and more especially of the heart."*

The spleen is rarely enlarged, and the complaint appears to arise chiefly in connection with phthisis, or some other wasting disorder.

Treatment.—This consists in attention to the digestive organs by alkalies, vegetable bitters, and aperients. The waters of Ems, Vichy, and Schwalbach are to be recommended. When anæmia is the leading feature, the preparations of iron, especially the ferri et ammoniæ citras will be found serviceable. The treatment, however, resolves itself into that which the primary affection requires.

A simple hypertrophy of the liver has occasionally been met with in diabetes.

CHAPTER XXIII.

DISEASES OF THE SPLEEN.

SYMPTOMS: *Pain in left hypochondrium—Cough—Dyspnœa—Sallowness of complexion—Increased size of the abdomen—May lead to cirrhosis and enlarged superficial veins over abdomen.* PATHOLOGY—CAUSES: *Ague—Typhoid fever—Diseases of liver—Obstructive disease of the heart—Emphysema of the lungs—Tuberculosis—Syphilis—Anæmia.* DIAGNOSIS: *Generally easy on account of thinness of abdominal walls—Not to be mistaken for enlarged liver, kidney, or mesenteric glands.* TREATMENT: *Attention to the general health—Fomentations—Poultices and leeches in the acute stage—Mild mercurials in syphilitic cases—Quinine and arsenic if traceable to ague—Chalybeates in anæmia.*

AFFECTIONS of the spleen in children have been in my own personal experience almost exclusively confined to the lower classes, and even among them they are not of frequent occurrence.† "We

* Diseases of the Liver, by C. Murchison, M.D., 1877, p. 49.

† "60 cases of death returned as due to spleen diseases in England, among male subjects, which occurred in 1877, only 9 were under five years of age; and of 67 females,

sometimes meet with splenic disease in children in this country, and more especially in dispensary and hospital practice, where poor and insufficient food, bad ventilation, and humid houses have exerted a predisposing effect."* They may be described as those of enlargement and hypertrophy, arising chiefly from congestion and inflammation.

The elastic structure of the spleen renders it susceptible of distension from slight causes, and hence any affection of the liver or arrested skin action may increase its bulk. If these disorders continue, the spleen fails after a time to propel the blood onward, and, from such arrest, permanent congestion and enlargement follow; and sometimes inflammation and abscess.

There is no organ so variable in size and consistence as the spleen. "It is much smaller in elderly than in young people—indeed, it may waste away in old age to a pale relic of not more than two or three drachms in weight."†

In amyloid or lardaceous degeneration, the Malpighian corpuscles may alone be affected. The spleen is enlarged, and its density is increased. On section, clear waxlike little bodies, of variable size, having the appearance of boiled sago, are to be seen in these corpuscles, hence the disease is known as the "sago spleen," which is frequently seen in those children who die of phthisis. There is another variety of the amyloid spleen in which the pulp is chiefly involved. It appears to be an advanced condition of the former affection, the disease extending from the corpuscles to the pulpy parenchyma.‡

The general symptoms are not well marked, but if the spleen has attained any considerable size, there is usually some amount of pain or tenderness, or distension in the left hypochondriac region, or over the epigastrium, extending through to the back; and there may be cough or dyspnœa on lying down; but these are only occasional symptoms. The child is sallow and pale; the tongue is bloodless and clean; the pulse is weak and frequent, and

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only 12 were under five years of age. Under fifteen years of age it is extremely rare. In London, in the year 1877, of 8 cases of death in males, 3 were under five years of age; and of 10 cases of females, 2 were under five years of age."—*Fortieth Annual Report of the Registrar-General*, pp. 152–158.

* Reynolds's System of Medidine, vol. v, p. 178, article, Diseases of the Spleen, by J. R. Wardell, M.D., F.R.C.P.

† Pathological Anatomy, by Wilks and Moxon, 1875, p. 473.

‡ Pathology and Morbid Anatomy, by T. H. Green, M.D., 1871, p. 69.

there is loss of flesh and strength. The urine often contains urates, and the motions are offensive, deficient in bile, or they are loose and contain mucus. Sometimes they are constipated. In some cases there is scarcely any inconvenience beyond that caused by the increased size of the abdomen from the splenic tumor, the appetite and digestion being excellent. In two cases that came under my notice, although the tumor reached below the umbilicus in one case, and nearly filled the abdomen in the other, there were no noticeable symptoms beyond the inconvenience of a bulky mass in the abdomen. The complexion was sallow in both cases, but there was no headache, no fever, no pain in the side, or shoulder, which is often mentioned by writers.* In other instances pain is complained of on pressure over the splenic region; the child lies on the left side with its knees drawn up, and is restless and sleepless at night. As splenic disease progresses, and the blood becomes more impoverished, an anæmic bruit may be heard over the base of the heart. There may be swelling of the abdomen terminating in ascites; but this is very rare, owing to the thick capsule of the spleen not admitting of the exudation of any fluid, as happens in some affections of the liver and intestines. The spleen, being out of the way of the portal circulation, has no direct tendency to cause ascites; but when there is cirrhosis, or any mechanical impediment to the venous circulation in the liver, the spleen may become enlarged. When the spleen has attained a very large size, the superficial veins become distended, in consequence of an interference with the circulation through the deeper abdominal vessels. In very long-standing cases of splenic disease, the patient becomes anæmic, from a deficiency of red corpuscles in the blood, and an excess of the white. In one disease of the spleen there is an excess of white corpuscles in the blood (leukæmia) over the red, just as there is in disease of the lymphatic glands, and there is associated with it at the same time a new growth of lymphatic tissue in the spleen. Hence the tendency to pallor, to œdema of the limbs, to

* "The shoulder-tip pain and the nerve tenderness in these diseases are owing, as I believe they are in liver diseases, to an extension of irritation or inflammation from the diseased organ along its pneumogastric twigs to the trunk of the par vagum. In a case in which the morbid state of the spleen has been intense, and continued for a time, this irritation or inflammation passes up the trunk of the nerve to the base, and even to the origin of the par vagum, and the two divisions of the spinal accessory, giving rise to pains there, and other disturbances."—*On the Symmetry of the Pancreas and Spleen*, by D. Embleton, M.D., Brit. Med. Journ., vol. ii, 1874, p. 371.

hæmorrhage from the gums or nasal passages, as the consequence of these changes in the circulating blood. Under a continuance of these symptoms the child sinks from exhaustion, or death is often due to diarrhœa.

Pathology.—As we are unacquainted with the functions of the spleen, we are in doubt concerning the theory of the morbid changes to which it is liable. Its turgidity, probably, depends upon some relaxation of the vessels and tissues of which it is composed, as well as to a nerve paresis. The fact of the spleen having been removed from the body without impairing the rest of the functions would go far to substantiate the view that it has no influence upon the secretions of the stomach or pancreas. Still, Michael Foster writes as follows: "After a meal the spleen increases in size, reaching its maximum about five hours after the taking of food; it remains swollen for some time, and then returns to its normal bulk."*

"It is a point of considerable interest that the spleen, the lymphatic glands, and Peyer's patches all suffer involution at the same period of life—about fifty. At that time the spleen grows smaller, the lymphatic glands waste, and Peyer's patches smooth down and lose their peculiar structure; and that is about the period of life at which the diseases, and especially typhoid fever, in which these three parts are involved, cease to be common."†

Some interesting observations are mentioned by Swedenborg.‡

Causes.—Enlargement of the spleen is frequently due to ague, and hence mostly prevails in marshy districts along with intermittent fever. Louis, Murchison, Warburton Begbie, and many other observers have noticed it diseased in typhoid fever. Disease of the liver, as cirrhosis, or whatever obstructs the circulation of the spleen, may increase its bulk. "It is often greatly enlarged in European children who are resident in the tropics."§ This is most likely a state of mere hyperæmia, but long-continued congestion ultimately leads to enlargement and induration. Obstructive disease of the heart, emphysema of the lungs, by causing dilatation of the right cavities of the heart, and acute tuberculosis may in-

* A Textbook of Physiology, 1878, p. 346.

† Clinical Lectures on the Diagnosis of Extra-pelvic Tumors of the Abdomen, by Sir W. Jenner, Bart., M.D., Brit. Med. Jour., 1869, vol. i, p. 113.

‡ On the Functions of the Spleen, ibid., p. 403.

§ Reynolds's System of Medicine, article, Diseases of the Spleen, by J. R. Wardell, M.D., F.R.C.P., vol. v, p. 141.

duce congestion of the spleen. In the latter affection I have seen a few caseous deposits of considerable size both in this organ and the liver, when the lungs have been studded with similar tubercles and the diaphragm honeycombed.* An enlarged spleen, associated with rickets, came under my care in April, 1880, in the case of a child a year old, the spleen reaching to the ilium below, and on its inner border to the umbilicus. Although mechanical congestion may be one cause of the hypertrophy, it more frequently arises from some morbid condition of the blood, from endocarditis, giving rise to infarctions,† from syphilis,‡ from fevers,§ from anæmia,‖ but in many instances it undergoes enlargement without assignable cause. On section it is soft, vascular, and of a dark-red color. A healthy woman and her husband had six children, three of whom had disease of the spleen. One child, a boy, was noticed to have a large spleen when fifteen months old, and he lived to be nine years and a half old. Epistaxis began at the age of five years, and continued to recur periodically about once a month. A second child (whom I saw in August, 1880), ten years of age, bled from the nose in the same way, and quite as profusely.¶ A third child, a girl one year old, had an enlarged spleen, extending to the ilium and umbilicus. It had only been detected five weeks. All these children were ravenous for food. The spleen has also been found hypertrophied in some cases of leucocythæmia (*splenic leucocythæmia*), and in this affection it attains a great size. Dr. Taylor has recorded the case of a boy, twelve years of age, who died from this disease, and whose spleen was found to weigh 51 ounces.**

Diagnosis.—As the abdominal wall in children is not covered with much fat, and the muscles are thin, the diagnosis of enlarged spleen is far easier in them than in adults. Some care, however,

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* "Tubercle occurs, for the most part, in the spleen only in acute universal tuberculosis; it occurs more frequently in children than in adults, in the proportion of 40 to 13. It appears both in the form of gray granulations, yellow miliary tubercles, or yellowish cheesy masses, of the size of a pea and above."—*Jones and Sieveking's Path. Anat.*, by Payne, 1875, p. 657.

† *Vide* Chap. LI, On Ulcerative Endocarditis.

‡ *Vide* Chap. L, On Syphilis.

§ *Vide* Chap. VII, On Fevers.

‖ *Vide* Chap. LI, On Anæmia.

¶ "In nearly all affections of the spleen nasal hæmorrhage is a common symptom, and among ancient physicians, and to this day among the people, repeated bleeding of the nose, especially if from the left nostril, is taken for an almost pathognomonic symptom of such disease."—*Niemeyer's Textbook of Practical Medicine*, 1875, vol. i, p. 293.

** Path. Trans., vol. xxv, p. 253.

is necessary not to mistake for an enlarged spleen an abdominal tumor caused by enlargement of the kidney or liver, or by disease of the mesenteric glands. In forming an opinion of tumors in this situation, it is well to glance at the anatomical position of the spleen. It lies hidden in the left hypochondrium under cover of the ribs, between them and the stomach. When healthy it cannot be felt through the abdominal parietes; if it can it is diseased. Moreover, it is influenced by the respiratory movements.

An enlarged spleen may extend inwards to the epigastrium and umbilicus. In some children it reaches down to the spine of the ilium. The tumor is smooth, elastic, and firm, and, being situated just beneath the integument, its shape and firmness can generally be well ascertained. In cases of difficult diagnosis the history of ague would be of much assistance. Sir W. Jenner has seen a tumor, supposed to be fecal, which turned out to be "a big spleen, and the child was purged for it till it had bloody stools."* Tumors which are due to enlargement of the kidney do not cause any projection posteriorly; the expansion takes place in the direction in which they meet with the least resistance, and that is always in front.†

Treatment.—The general health will require careful attention to maintain it at the best possible standard. In this we must be guided according to the circumstances and surroundings of each individual case, the strength of the child, the stage at which the disease has arrived, and the complications it may have produced. If inflammatory symptoms are present, and there is any degree of acute pain, thirst, dyspnœa, etc., poultices and fomentations, and even two or three leeches, applied over the affected part, may be necessary to reduce congestion of the gland. If the skin is hot and dry, and there is any degree of fever, saline aperients (Form. 8–41) to unload the bowels and drain the portal system will be needed. When all acute symptoms have departed, the use of iodine externally, in the shape of ointment (Ung. Iodi.), and the iodide of potassium internally may be demanded. Very frequently a cachectic state of the system exists, arising from ague, syphilis, or rickets, and these conditions must be met by suitable remedies, such as arsenic, mild mercurials, quinine, etc., continued for a long

* Clinical Lectures on the Diagnosis of Extra-pelvic Tumors of the Abdomen, Brit. Med. Journ., 1869, vol. ii, p. 43.

† See Chap. XXIV, Hydronephrosis.

time. Mr. Tyson, of Folkestone, has recorded a "Case of Syphilitic Enlarged Spleen in a Child." At two years of age, the spleen reached to the crest of the ilium, and nearly to the umbilicus. A grain of gray powder was given night and morning, and one grain of iodide of potassium with ten minims of the syrup of iodide of iron, three times a day. In three months the spleen was smaller, and two months later it only extended an inch below the margin of the ribs. The remedies were given for about a year, when the spleen was imperceptible, and the child's health excellent.*

In a large number of cases, anæmia is so marked, and the constitution so reduced, that the patients lose flesh, and gradually sink away exhausted. Chalybeates are of course indicated.

CHAPTER XXIV.

DISEASES OF THE KIDNEYS AND URINARY ORGANS.

Theories of the urinary secretion—Remarks on the urine—Congestion of the kidneys (active and passive)—Temporary and intermittent albuminuria—Treatment of congestion. ACUTE DESQUAMATIVE NEPHRITIS: *Local and constitutional symptoms—State of urine and appearances under the microscope—Scarlet fever the most frequent cause.* PATHOLOGY: *Morbid anatomy.* PROGNOSIS: *Case of acute desquamative nephritis from cold and exposure, terminating in chronic albuminuria.* TREATMENT: *Value of small doses of perchloride of mercury and perchloride of iron in the congestive stage.*

THE renal affections of children are less frequent than many of the ailments to which early life is liable, but there hangs about them an obscurity which, in a physiological point of view, is perplexing, and in a clinical one, difficult to reconcile with our knowledge of disease, and of the active functions which the kidneys possess when health is continuously maintained.

In order to understand the disorders to which the kidney is liable, it is well to glance at the renal apparatus in health, and to see how the different structures are concerned in the elimination of morbid elements from the blood.

Beale and Johnson say the water is first eliminated from the blood, and the urine salts are gradually added as the water passes

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* The Lancet, 1880, vol. ii, p. 653.

down the tubules. Ludwig, Brunton, and others, entertain the view that the water of the blood, holding the different salts in solution, is first squeezed out in a very diluted form, and that the absorption of water goes on through the epithelial lining of the tubules, the urine thus becoming more concentrated as it passes down the tubules. The former assert that the function of the epithelial cells of the tubules is to excrete urine salts, while the latter assert that their true function is to absorb water.

There are two facts which stand in a very significant relation to these views: one, that after copious draughts of water the epithelial cells do not exert themselves in absorbing water freely, and so the urine is copious and of low specific gravity, while during thirst the epithelial cells absorb water more actively, and the urine is scanty and contains excess of salts. The other fact is that in cirrhosis of the kidney, where the tubules are denuded of epithelium, the urine is copious and of low specific gravity.

The importance of this subject practically, is the question as to whether the urine, when first squeezed into the glomeruli, is albuminous or not. According to the view of Ludwig and others, it is primarily albuminous in a faint degree, and the albumen is reabsorbed along with much of the water by the epithelial cells of the tubules. According to the other view, albumen is thrown out along with the urine salts in disease of the urinary tubules. The question has not yet been settled, but the view of Ludwig seems more feasible, and consistent with the known fact, that albumen appears in the urine when the tubules are diseased.

On the assumption that the epithelial cells normally reabsorb albumen as well as water, we can readily understand how, in certain conditions, albumen is present in the urine. When the tubules are the subject of inflammation, they lose their power to reabsorb albumen, consequently albuminuria is constantly found in tubular nephritis, as we see commonly after scarlet fever. We can therefore understand how temporary derangement of the epithelial lining of the tubules *may* be followed by the appearance of albumen in the water. Such a condition may exist without the kidneys being necessarily organically diseased. In cases of albuminuria, then, the question arises, whether the passage of albumen in the water is due to conditions of temporary derangement, or to structural disease of the kidneys.

In the treatment of sick children, a constant observation of the

urine is as important as in the management of disease in adult life. At all ages morbid conditions affect the secretion of the kidneys, and childhood is no exception to this rule. Even when not on the sick-bed, the insidious effects of errors of diet, and other bad habits, are first shown in alterations of the amount of daily excretion of urine, and in changes in its constituents. Intemperance, the chief vice of man, directly affects the kidneys, so that the reveller longs to make water after a banquet. Gluttony, and the preference for rich, rather than wholesome food, are the commonest failings in childhood. Hence the turbid urine passed by children subject to gastric and intestinal irritation through over-indulgence in sweets and pastry. Ignorance of the evil effects of draughts of cold air, and wet feet, renders children liable to catarrhal affections, which produce changes in the urine.

For some obscure reason, calculus is not rare among boys in the humbler ranks of society, possibly because their skin and lungs are hardened against chill, whilst during customary exposure to cold their kidneys become congested; on the other hand, children of gentle breeding, have often weaker lungs, but through efficient clothing they are less liable to contraction of the bloodvessels of the skin, and to consequent increased pressure on the kidneys. Lastly, it is in childhood that reflex and emotional influences act so strongly on the renal secretion. The phenomena of enuresis, and of loss of control over the bladder, from the very fear of that accident, are almost peculiar to childhood in civilized lands, where the adult, even among the lowliest, learns self-control, or through experience, adopts precautions. An antiquated, coarse expression, common to most countries, shows that in former less refined states of society the involuntary escape of urine, as the result of fear, was not rare in adults. It is physiologically most interesting to observe, on the other hand, the great delicacy of even very young well-bred children in this country with regard to micturition. A gentleman taking his little girl out for a walk, is often astonished to find that when the child shows symptoms of desire to pass water she cannot be persuaded to do so in the open air, and indeed feels much hurt at any attempt at persuasion of a kind which previously she has only heard from her nurse or mother. An infant is often assisted in micturition by being hummed to, or coaxed, a practice very similar to the method em-

ployed by a rider when he desires his horse to stale at a moment convenient to himself.

Since very slight disturbances produce feverishness in childhood, and since high temperature involves the excretion of concentrated urine, that fluid will almost always be found to be *above* the normal specific gravity in a children's ward, its acid reaction is likewise well marked under these circumstances. In fever among children, the thick and almost milky urine, turbid when passed, not merely turbid when cool, is highly characteristic. The turbidity is dissolved but slowly on boiling in a test-tube, for it is due to the urate of soda, insoluble in cold, and only sparingly soluble in hot water. In many febrile diseases, however, children pass clear urine, which on cooling throws down the well-known deposit so readily redissolved on boiling in a test-tube. In this deposit the more soluble urate of ammonia predominates.

The urine of a child suffering from acute scarlatinal nephritis is very rich in morbid products. It is smoky, or almost brothlike, from the presence of altered blood, and throws down a deposit rich in epithelial casts, and in the beautiful light-yellow rhomboidal crystals of uric acid. Such urine must be carefully examined day after day, and its gradual return to a normal condition will be a valuable guide to the treatment of the case. Phosphates are often found in the urine of nervous and sick children, and in such cases the fluid may be copious and below the normal specific gravity; oxalates may also be found in pale abundantly excreted urine. Mucus is frequently deposited in the urine of children suffering from paraplegia, from spina-bifida, or from local causes, such as calculus, and is an unfavorable symptom, since it may denote serious changes in the genito-urinary tract; the presence of pus is due to the same causes as in adults. In cases of enuresis the condition of the urine must be carefully examined; when a morbid salt is discovered the administration of a drug which counteracts its formation often cures the patient, as the presence of such a salt in the bladder may alone cause the complaint.

That attention which is now paid to the urine in adults when ill has not extended as far as it should do to the examination of urine in children. With the exception of the albuminuria of scarlet fever the profession as a body knows little of these modifications of the urine produced by disease in children. There seems to exist a widespread impression that changes in this secretion are only

important in adult and advanced life, an impression which, to my mind, is erroneous and ill-founded.

In the present state of our knowledge we are not able to draw any satisfactory inferences from the specific gravity of the urine in children. I found that in 242 cases admitted into the Samaritan Hospital under my care, the highest specific gravity reached, was 1034, in four cases. 1. Epileptoid seizures; 2. Congestive headache; 3. Tuberculosis; 4. Catarrh. In all these four cases the urine was pale, scanty, and very acid. The lowest specific gravity was 1006, in a boy six years of age, on the fifth day of typhoid fever, when it became pale, clear, and alkaline. After taking small doses of hydrochloric acid for five days, the reaction became acid, and the specific gravity reached 1018. The urine was never turbid, nor threw down a deposit, notwithstanding that the temperature reached 103.6°. In states of debility, and in some cases of mitral disease, the specific gravity fell to 1010. The average specific gravity of the whole 242 cases was 1023, and instances of this were furnished in anæmia, debility, pleurodynia, rickets, phthisis and headache. In only 32 was the specific gravity under 1020; 57 had a specific gravity of 1030, or over. In 38 there were phosphates. In none was sugar found. In three cases only were there large "cayenne pepper crystals," and these were in: 1. A case of tuberculosis, where the urine was highly acid, pale, and scanty. 2. Lobular pneumonia. 3. Chronic albuminuria. A girl suffering from chronic mitral disease became very nervous, and afterwards her urine threw down a great deal of uric acid.

There was only *one* case of chronic albuminuria in the whole 242 cases, and this occurred in a strumous girl, nine years of age. The specific gravity varied from 1016 to 1020, and the microscope showed irregular-sided granular casts, some uric acid, epithelial cells, and broken-down blood-corpuscles.

Congestion of the kidneys is one of the most important disorders to which these organs are liable. It is a common attendant on many ailments of children, passing away with the recovery of the patient, and leaving neither inconvenience nor structural change behind it.

In measles and scarlatina, as well as in many inflammatory diseases, there is a determination of blood to the internal organs, and active congestion of the kidneys is of frequent occurrence. In measles it is often slight; it is notably more marked in some cases

of scarlet fever, and there is a considerable amount of blood with casts of the uriniferous tubes and epithelial cells, so that the urine is albuminous. This is a point I shall more particularly consider when I come to speak of a state of congestion of the kidney, brought on, not by the scarlatinal poison, but by exposure, bad living, impure air, and the strumous habit.

The *passive* form of congestion, as in adults, is most common in mitral regurgitation, and other valvular diseases of the heart; in emphysema, pneumonic conditions, pleuritic effusion, or disease of the liver, pressing on the vena cava. This form of venous congestion is owing to an impediment through the systemic veins. The passage of blood through the kidney is slow, and congestion takes place, the urine is scanty and high-colored or turbid, and more or less impregnated with albumen. In obstructive disease of the heart, the fulness of the venous system distends the renal veins, and the Malpighian capillaries becoming engorged, a transudation of serum takes place through their walls, rendering the urine albuminous. When the walls of the capillaries are ruptured from this overdistension, blood is mixed with the urine, and blood casts are visible.

The first effect of passive congestion is to cause enlargement of the gland, and ultimately contraction and atrophy, the surface of the kidney becoming uneven, and finely granular as the wasting process goes on. (Johnson.)

The *treatment* consists in relieving the circulation by hydragogue cathartics, absolute rest, and tapping of the chest or abdomen, if there is a large accumulation of fluid, and it cannot be got rid of in any other way.

Experimental research has long demonstrated the fact, that a ligature placed round the renal vein, obstructing the return of blood, causes the kidney to increase in volume, and the urine to contain albumen, casts of the uriniferous tubes, and renal epithelium. Hence the liability, in inflammatory disorders, and checked cutaneous action, for the kidneys to become congested, like other organs, and so to create a disturbance in the intricate and nicely adapted circulation through the Malpighian tufts, and plexus of capillaries, which surround the uriniferous tubes.

Some cases of *intermittent albuminuria* are due to congestion of the renal vessels, or to loss of tone in them. An interesting case of this kind is alluded to by Dr. Morley Rooke, of Cheltenham.

There were no renal products under the microscope, the albumen disappearing with rest, but returning when the patient assumed a vertical position.*

In children, as in adults, the injudicious use of mercury may produce temporary albuminuria, either by setting up some blood change, or inflammatory condition of the renal structures. It passes away when the remedy is discontinued. Other irritants or substances, which find their way out of the system by the kidneys chiefly, as lead and alcohol, have the same effect.

Acute Desquamative Nephritis.—The disease follows the same course and presents similar symptoms in children to adults. The symptoms are those of general febrile action with a temperature which may reach 104,† with quick throbbing pulse, thirst, headache, and loss of appetite. There is pain in the loins and legs, and in a few days the face is pale and shrunken, the eyelids are puffy, so that the eyes cannot be seen, general anasarca or dropsy sets in early, and the hands and lower limbs are œdematous; effusion into the pleural sacs, pericardium, or abdomen, are common, and pneumonia is occasionally present. At first the urine is scanty or almost entirely suppressed; it is dark from the presence of blood, and contains a thick sediment. If there is pain across the loins, or deepseated tenderness on pressure, more or less blood will often be seen, or detected under the microscope, with tube-casts, and renal epithelium. The patient is restless and talkative in sleep, and if the urine does not increase in quantity, the poisoned elements in the blood will sometimes lead to convulsions, delirium, or coma. Convulsions are, however, infrequent in the albuminuria of children. As the disease progresses, and congestion of the kidneys diminishes, the urine becomes pale and increased in quantity, and the anasarca gradually disappears. Notwithstand-

* Brit. Med. Journ., Manchester Meeting, Aug., 1877.

See Chronic Desquamative Nephritis, p. 264.

"Under ordinary circumstances albuminous bodies do not diffuse through animal membranes, but it has been shown by Bernard, Pavy, Stockvis, and others, that albumen of eggs will pass out through the kidneys, while the albumen of blood does not do so under similar conditions" (Dr. Lauder Brunton).—*Practitioner*, June, 1877, p. 427.

† This high temperature appears to be unusual. Dr. Dickinson mentions that he has no thermometric record, at the outset of this disease, of more than a few points above 100°. When uncomplicated, he has known the temperature to range for many weeks between 97.5° and 99.5°.—Diseases of the Kidney, part 2, Albuminuria, 1877, p. 278.

ing this, the albumen may be equally great in amount, and any error in diet, or cold, will renew the renal congestion and hæmaturia.

The microscopical appearances of the urine show epithelial casts of the uriniferous tubes. In these casts are to be seen blood-corpuscles and renal gland cells, besides small and large hyaline casts, but these are often indistinct, and cannot be seen for weeks together, even when there is a large amount of albumen. The large hyaline casts may be absent altogether (Johnson). As the disease goes on, oily casts and cells are detected in the tube-casts, indicating that the secreting cells of the kidney are undergoing fatty change.*

The *causes* of this affection in childhood, are most frequently due to scarlatina and to suppressed action of the skin following exposure to wet and cold. When the rash of scarlet fever is out, or the skin is desquamating, cutaneous action is checked by cold, and a morbid process is set up in the kidney. The circulation being impeded, the urinary constituents accumulate in the blood and lead to dropsical effusions. It is generally admitted that the more severe the throat affection the less likely are the kidneys to become affected; but it must be borne in mind that when the throat is very sore the patient is treated with more care, and is not so likely to be exposed to cold, which would cause or aggravate kidney disease. Scarlatinal dropsy is most frequent from the tenth to the fourteenth day, but it may be delayed much later. In two cases under my care, about the same time, the symptoms came on in one case at the end of the fifth week, and in the other case at the seventh week.

Nephritis in children has also been observed in connection with pneumonia, rheumatic fever, small-pox, typhoid fever, chronic dyspepsia, and the consumption of indigestible food. Next to scarlatina, diphtheria and measles are the most common causes.

Scarlatina then is the most frequent cause of acute nephritis, the kidneys being irritated as they assist in the removal of morbid products from the blood. This unhealthy stimulation throws upon these organs work to which they are unaccustomed, and as a consequence they become congested, and the tubes choked up with

* For further information on this subject the reader is referred to Dr. George Johnson's Lectures on Bright's Disease, 1873; Dr. Roberts on Urinary and Renal Diseases, 1877; and Dr. Dickinson on Diseases of the Kidney, part 2, Albuminuria, 1877.

exudation. If, at the same time, the patient is exposed to wet and cold during the shedding of the cuticle, symptoms of acute renal disturbance are set up and dropsy follows. Dr. Dickinson writes: "That at the Children's Hospital where children are treated up to twelve, a series of 103 cases of albuminuria connected apparently with renal inflammation, gave 75 where the disorder was traced to scarlatina, 3 to measles, 1 to erysipelas, 1 to acute rheumatism, and 1 in which it came on in the course of eczema; 5 from cold, and 17 from uncertain causes made up the tale."*

Boys are more liable to scarlatinal dropsy than girls, just as adult males are more prone to kidney disease than females. The greatest frequency in children is between the ages of five and fifteen. "There are two periods which are especially amenable to the disease. The scarlatinal form is most common under ten years of age; the form which results from cold is especially apt to occur between twenty and thirty."† The association of tuberculosis with this disease is extremely uncommon.

Pathology.—In consequence of suppressed skin action the kidneys become congested through having to take on increased functional activity, whereby the organs become congested and swollen.

Hyperplasia of the epithelial cells in the tubules then takes place, and these cells are incapable of separating the solid urinary constituents, which, remaining in the blood, give rise to the well-known symptoms already described. Hence effusion takes place in the various tissues and serous sacs of the body. The blood undergoes changes, in becoming poor and thin, falling in specific gravity, whilst albumen and blood appear in the urine from dilatation and rupture of the renal capillaries. For some time urea is eliminated by the vomiting and diarrhœa that ensue; but when these functions fail, the gradual accumulation of excrementitious urinary compounds in the blood occasions convulsions or coma.

Morbid Anatomy.—If death takes place during the acute stage the kidneys are found congested and enlarged; they are of a dark-red or chocolate color, the cortex is mottled with spots of anæmia and is ecchymosed, and the medullary cones are dark and congested. The uriniferous tubes are crowded with epithelial cells and blood, the walls of the capillaries are thickened, and congestion of the pelvis of the kidneys, ureters, and bladder is found in

* Diseases of the Kidney, by Dr. Dickinson, part 2, Albuminuria, p. 321.

† Ib., part 2, Albuminuria, p. 268.

addition to effusion into the serous sacs. After a variable period the kidneys in some cases undergo degeneration (*chronic desquamative nephritis*).

Prognosis.—When the secretion of urine is free and there is not much blood or albumen mixed with it, the prognosis is favorable, and many cases due to scarlatina or measles completely recover; but if the albumen is in excess and the urine is deficient in quantity, or the child is of a strumous constitution, the prognosis is bad. The subjoined case is a good example of acute desquamative nephritis, terminating in permanent albuminuria and chronic change of structure.

E. S——, æt. 9½, a fast-growing, strumous-looking girl, was admitted into the Samaritan Hospital under my care on June 15th, 1875, suffering from acute desquamative nephritis and anasarca. The parents stated she had never had scarlet fever, nor had the disease prevailed in the house or neighborhood. The case seemed due to cold and exposure. On admission, the eyes were almost obscured from œdema of the lids; the arms, legs, and thighs were tense from subcutaneous infiltration, and there was free fluid in the peritoneum. There was slight effusion into the left pleural sac (about a quarter of a pint); the first sound of the heart was a little prolonged, and louder than usual, but the valves were healthy. Temperature 100.1°, pulse 120, respiration 32. The mother said that she noticed her daughter's face swollen in December, 1874, but she had attended school regularly till a month before admission.

The urine was high-colored and turbid; reaction, acid; sp. gr. 1010; it was thick and clotty on boiling, and the addition of nitric acid rendered the whole an albuminous curdlike mass, adherent to the test-tube.

June 16th.—There was much more œdema of the feet and legs, and the temperature was 102·2°. The urine was thick, scanty, and dark-colored; only twelve ounces were passed in twenty-four hours (although she drank freely of cold water), sp. gr. 1030; on the application of heat, the urine coagulated in large and divided clots. The addition of nitric acid converted it into a thick, soapy mass, which admitted of the tube being inverted, while only a little fluid escaped. Under the microscope, there was not a trace of blood-corpuscle, urinary cast, or epithelial cell, which is unusual with this albuminous condition of the urine.

She was ordered a mixture of tincture of digitalis with acetate of potash, and compound jalap powder occasionally.

19th.—The temperature had risen to 104°, and the pulse to 140; the anasarca had much increased, and there was great stupor and drowsiness. A third of the urine was albuminous, and on standing all night looked like barm. The microscope now showed large epithelial cells, probably from the straight portion of the tubes, and numerous blood-corpuscles, some of them altered and shrunken; a few epithelial cells from the convoluted portion of the kidneys, and two short and small granular casts. There was now acute nephritis, with a limited degree of desquamation.

Three days later, forty-four ounces of pale urine were passed in twenty-four hours. A few hyaline-looking casts, large and small, with here and there a renal gland cell, were seen under the microscope. Bark and hydrochloric acid were now substituted for the previous mixture. At the end of another week, seventy-five ounces of similar urine, with a low specific gravity, were passed in twenty-four hours. The tincture of the perchloride of iron was given in ten-minim doses three times a day.

During the remainder of her stay in the hospital she passed above the average amount of urine, as the healthy functions of the kidneys were in slow process of restoration.

On the 24th of July she left the hospital feeling quite well, and presenting no trace of dropsy. The presence of albumen was doubtful.

On October 9th of the same year, the patient was readmitted with symptoms of acute desquamative nephritis. There was much anasarca of the face and limbs, which increased for a few days after admission into the hospital. The urine was highly albuminous, and clotted like cream on the sides of the test-tube. The deposit contained granular casts, indicating the desquamation of cells already morbid; moreover, numerous cayenne pepper crystals of uric acid were found, proving imperfect elaboration of the nitrogenous principles in the blood, from reduced functional activity of other organs.

In November she caught cold, and had an attack of acute renal congestion, followed by a large quantity of bloody urine, of a bright claret-color. At the close of the month, the urine was still dark, containing blood-corpuscles, broken irregular granular casts, and some fresh renal cells. For the first time I detected

increased impulse of heart, and intensification of aortic second sound. The $\frac{1}{24}$ of a grain of perchloride of mercury was added to each dose of the mixture. There was a slight reduplication of the first sound over the interventricular septum, and the apex beat was lower by half an inch.

January 11th, 1876.—A careful examination of the heart revealed the following condition. The second sound was intensified to a certain extent over the aorta, and to a greater extent over the pulmonary artery in the second left intercostal space. There was occasional doubling of the second sound over the conus arteriosus; there was no doubling of the first sound anywhere; cooing inspiration was audible over the upper lobes in front, but not behind. Apex beat in fourth interspace, and impulse extended to outer side of nipple. The pulse did not present the feeling of tension, and when the finger was lightly applied to the radial artery it felt the stroke and collapse. Sphygmographic tracings showed moderate tension; greatest sweep at about 150° to 200°; systolic rise was not anywhere greatly prolonged.

27th.—At her mother's request, the patient left the hospital, her general health was good, and all dropsy had disappeared. The urine was clear and acid, sp. gr. 1020; it contained only a trace of albumen. This favorable change was attributable to the perchloride of mercury, which she had continued regularly up to this time.

June 11th, 1877.—She was perfectly well in health, and had remained so ever since January, 1876. She had never any headache, sickness, or diarrhœa, and her mother considered her as well as at any time of her life. She was fed on oatmeal porridge and milk every morning, and had meat three times a week.

Analysis of Urine.—Clear bright yellow, with mucous cloud; sp. gr. 1024; faintly acid reaction. Became very milky with heat, and the cloud was partially cleared with effervescence by the addition of a few drops of nitric acid (phosphates). Albumen a sixth part.

The *microscope* showed ordinary squamous epithelium, and a quantity of hyaline tube-casts, but they were very indistinct. The high specific gravity is unusual with such albuminous urine.*

* There are several points in which this case is both suggestive and instructive, showing as it does, in a very striking manner, that the presence of a large amount of albumen in the urine is not incompatible with active growth of the body, and a good

As a rule, children recover more frequently from the dropsy of scarlatina and other febrile diseases, than from that which is due to cold and constitutional causes. Usually the disease terminates in six months, but it may assume a chronic form, and be indefinitely protracted; the interstitial tissue of the kidneys increases, and contraction ensues. Of 50 fatal cases under the age of sixteen, 28 died from diseases of the respiratory organs, including pneumonia, pleurisy, bronchitis, and empyema. Of the remaining 22 cases, death was caused by uræmic convulsions in 8, by pleuritic effusion in 5, by vomiting in 3, by peritonitis in 4, by pericarditis in 1, and by sloughing of the scrotum in 1. (Dickinson.)

Now as to the general management of these cases. When the primary cause of the disease can be ascertained, we may do much in mitigation, or cure of the symptoms, by directing careful attention to all those points which bear upon the original malady. If the albumen be due to pressure from morbid growths, or to an enlarged liver, we know the best plan to adopt in mitigation of the evil; and if the thoracic organs are unhealthy, they may induce renal changes through obstruction to the circulation. We may excite the action of the skin by the warm bath, and by diaphoretics; we may relieve the portal circulation by efficient purgation, and thus we can indefinitely prolong life if there is no hope of saving it. But all drugs and therapeutic agents are secondary to

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state of health. When such cases as these occasionally come under close observation, and opportunities are afforded of studying their course and progress, we may reasonably commit ourselves to the assertion, that whenever a large amount of albumen is daily separated from the blood for many months, it must indicate pathological changes in the renal organs of a chronic and incurable nature.

It is remarkable, and very exceptional, that the retained urinary excreta should cease to give rise to any constitutional symptoms when there was no vicarious discharge from the stomach or bowels going on, to wash out the impurities from the system. There was no flatulence, dyspepsia, or any complaint whatever, and the slender ankles, healthy features, and the hue of the countenance indicated a return to health, though the patient was living in a poor home, without much care or attention to diet.

In this case we may explain the coexistence of albuminuria with good general health on the hypothesis, that a mild subacute inflammation of one, or even both kidneys, was at one time going on. Such a condition is not incompatible with an almost perfect functional activity of the kidneys in other respects, and may be compared with chronic catarrh of the mucous membrane of the nose and bronchi, where inflammatory products are discharged for years. But the fact must not be overlooked, in this and similar cases, that continued congestion, whether it be inflammatory or otherwise, ultimately tends to modify the nutrition of the kidney, and to alter the glandular structures, so that in time it leads to atrophy and contraction of the organ.

diet, for the closest relation exists betwixt the solids and fluids taken in as food, and the condition of the urinary secretion.

Treatment of Acute Desquamative Nephritis.—The patient should be kept in bed, and the temperature of the apartment maintained between 65° and 70°, but well ventilated, and free from currents of cold air. In all cases, and particularly where the secretion of urine is scanty, diluent drinks should be taken freely, and the diet be very scanty. For children, milk is the only nourishment necessary, as it does not irritate the kidney. If the milk disagrees, or the patient tires of it after a time, or if it deranges digestion, or causes constipation, a little veal broth or mutton broth must be substituted, and barley-water, sago, or arrowroot are useful, but in every case the patient must soon return to a mik diet. Alcoholic stimulants should be prohibited.

To reduce the inflammation, cupping, or leeches to the loins may be necessary, if the child is strong and full of blood; but if there is much hæmorrhage from the kidney the patient may be too weakened, and aperients and diaphoretics will be safer. A diaphoretic mixture containing antimony, or a solution of acetate of ammonia, will determine action in the skin, and relieve any dropsical effusion that may be present. It is important to unload the bowels well, and for this purpose, a purge occasionally of compound jalap powder, will relieve arterial tension if present, and rouse the kidneys to freer action. A fair allowance of fluid should be taken to wash out the tubes, and to prevent their obstruction. In this way the congestion of the gland is relieved, and there is a better chance for all the constituents of the urine to escape. "Of all diuretics water is the best" (Dickinson), and it may be taken to the extent of two or three pints daily. The bitartrate of potash drink, flavored with lemon and sweetened with sugar, is very agreeable; whilst it helps to clear the renal channels of morbid secretions, it keeps the bowels free, and also assists in relieving the contamination of the blood.

A mixture of citrate of potash and tincture of digitalis increases the quantity of urine, and, so far as my experience goes, has no tendency to aggravate renal congestion. It is a favorite remedy with me when the secretion is scanty and high-colored, or contains blood, although Dr. Dickinson is of opinion that digitalis, by adding to the force of the heart, may increase the discharge of blood.

In the form of infusion, digitalis is a good diuretic, and one or two drachms may be taken three times a day.

In the early stage of the acute affection, warm baths, or the hot vapor-bath, may be used with great advantage, and they are particularly suitable for children, if the action of the skin is defective, and there are any signs of cerebral oppression. The sweating that ensues brings immense relief to the system, unloading the capillary circulation, and lessening the distension of the renal vessels. The baths may be employed every night on going to bed, for the first few nights, and then less frequently. The temperature may vary from 98° to 100°, and the child may be immersed from 10 to 15 minutes. Dr. George Johnson speaks highly of a wet sheet and blanket bath. "A sheet is wrung out of warm water, and the patient, either naked or covered only by a shirt, is enveloped in the wet sheet up to the neck. Then three or four dry blankets are closely folded over the wet sheet. He may remain thus packed from two to four or six hours, or even longer. Recently, a boy in the hospital with acute renal disease and almost complete suppression of urine, consequent on scarlet fever, was kept packed incessantly for four days without serious discomfort, and with great relief from very distressing and alarming symptoms. When he left the hospital all traces of his malady had disappeared."*

If head symptoms in the character of convulsions or coma supervene, we may generally attribute them to a poisoned state of the blood (uræmia), or to an anæmic state of the brain through some source of exhaustion, as protracted vomiting or diarrhœa. Yet it is remarkable that some severe cases of nephritis in children, with an enormous escape of albumen from the system, are not accompanied by headache, or cerebral symptoms of any kind. If they are present, and the head is hot or painful, cold lotions may be applied, or a mustard poultice to the nape of the neck will be serviceable. Bromide of potassium or chloral may be needed to calm the cerebral irritation, and a free action on the bowels and kidneys must be kept up, so that the morbid products may be gradually eliminated from the circulation.†

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* Lectures on Bright's Disease, 1873, p. 133.

† "I offer for your practical guidance this rule of treatment: when such symptoms as headache, delirium, convulsions, or coma are the results of uræmia, give purgatives freely; and if the renal disease be acute, and therefore probably curable, your treatment will often be completely successful. On the other hand, when you have reason

Inflammatory complications, as pleurisy, pericarditis, bronchitis, and peritonitis, must be treated on general principles, always remembering that the kidney disorder is the cause of the evil. Diaphoretics and local applications, with careful regulation of the diet, are the remedies to be relied upon.

When the acute stage has passed, and there is passive congestion of the kidney, our treatment must undergo considerable change. Of all remedies, none are equal to small doses of perchloride of mercury, combined with the tincture of perchloride of iron, when every trace of blood has disappeared from the urine, and there is sufficient albumen to justify the opinion that renal congestion is present. I have known epithelial and fibrinous casts to be facilitated in their escape from the convoluted tubules of the kidney, when these remedies have been continued for weeks, and the amount of albumen to undergo a marvellous diminution. When the evidences of general debility and anæmia are most prominent, the perchloride of mercury should be withdrawn, and the iron given alone. In some cases, the vinum ferri, or the acetate of iron, may be ordered according to the discretion of the practitioner, and if there is a deficiency of renal secretion, the bitartrate or the acetate of potash may be added.

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to believe that the like brain-symptoms are consequent on cerebral hæmorrhage, or embolism, or thrombosis, be very cautious in the use of purgatives, which may greatly increase the patient's distress and exhaustion, while they can do little to improve his condition. In inflammatory affections of the brain and its membranes, purgatives are often useful, but less frequently and strikingly so than when cerebral symptoms are the result of uræmia."—*Lectures on Bright's Disease*, by G. Johnson, M.D., F.R.S., 1873, p. 136.

CHAPTER XXIV (*continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS.

CHRONIC DESQUAMATIVE NEPHRITIS: *Sometimes follows an acute attack after scarlet fever or exposure to cold—May be associated with* (1) *the large white kidney;* (2) *the red granular kidney—Symptoms of the disease with the large white kidney—Character of the urine—Albumen occasionally absent in confirmed cases—Conclusions to be drawn from a microscopic examination of the urine—Small red granular kidney rare in early life—Symptoms and morbid appearances—Cardio-vascular changes—Lardaceous or waxy kidney—Nature and causes—State of the urine in—Treatment of chronic Bright's disease in the different varieties of the affection.*

CHRONIC DESQUAMATIVE NEPHRITIS is a very rare disease in children; it may be the consequence of an acute attack after scarlet fever, or exposure to cold, but in by far the greater number of instances it creeps on slowly, and belongs to adult life. The course it follows and the symptoms it presents in children, are in all respects like the same disease in the adult. If the acute stage does not pass away completely, and any inflammation remains behind, the urinary tubules become plugged with a fibrinous or exudative material, which interrupts the circulation through the gland, and by favoring a state of habitual congestion, renders the chances of recovery less promising.

After an attack of acute Bright's disease (*acute desquamative nephritis*), when the constitutional symptoms have improved, and the urine remains persistently albuminous, the patient is exposed to a return of the disorder from cold, or errors in diet, renewing renal congestion, and paving the way for incurable degeneration. This chronic form of disease may be associated with (1) *the large white kidney;* (2) *the red granular kidney.*

It appears that we may have disease of the kidneys commencing in (1) *the epithelial lining of the tubules;* (2) *in the fibrous tissue;* (3) *in the blood vessels.* The symptoms and morbid appearances are characteristic of each variety to a great extent, and ought to be carefully studied in their clinical history and pathological bearings. When the urinary tubules are inflamed and irritated by the passage of a specific poison through them, as in scarlet fever, they take on an excess of cell growth, and, as exudation proceeds from the congested vessels, the kidney increases in volume, and becomes large and smooth. The capsule peels off readily (*large white kidney*). If the disease is not arrested, or cured, the morbid altera-

tions continue, and the mischief extends to the intertubular structure, at the same time the growth of fibroid tissue begins, which may end in contraction and granulation. The kidneys are reduced in size to one-half, especially in the cortical part, and the surface instead of being smooth is irregular and granulated. They are firm and fibrous, and the capsule thickened and adherent. The depressions and granulations are produced by the contraction of the fibrous tissue between the tubes (*granular kidney—cirrhosis of the kidney*).

The large white kidney is the sequel of an acute attack of nephritis, particularly after scarlet fever, or exposure to cold. The dropsy and œdema, if present during any time of the acute affection, pass off more or less completely, leaving the state of the urine to tell the mischief that has been inflicted upon the renal organs. The albuminuria may continue for months, or even years, before symptoms of degeneration ensue; or, indeed, at a time when the general health is in no way deranged. This, however, will greatly depend on the amount of albumen in the urine; if there is only a mere cloudiness or opalescence in the secretion, the health may be unimpaired, and the patient perform the usual duties of life without suffering any inconvenience, but a copious precipitate cannot continue very long without the liability of a return of dropsy and inflammatory complications. The disease sometimes commences as a chronic disorder.

The general symptoms of *chronic disease with a large white kidney* when pronounced, are a pale and pasty face, and dropsy. There is loss of appetite and nausea, and the bowels and stomach are easily deranged, diarrhœa and vomiting being very common. In the case of a girl under my care in 1876, the profuse albuminuria was attended on three or four occasions with severe epistaxis, preceded by frontal headache. Troublesome cough, from congestion of the lungs and bronchial irritation, often prove extremely inveterate, whilst pericarditis, and serous effusion into one or both pleural sacs is not uncommon. Cerebral symptoms from uræmia, and hæmorrhages and extravasations of blood, more especially belong to the granular form of the complaint.

The urine is generally pale and of normal specific gravity; as the disease proceeds, a microscopical examination detects granular and hyaline casts. The variability in the amount of albumen in the urine from time to time is just one of those circumstances

which requires especial notice and attention. The patient, to whom I have alluded, presented a good example of this when the chronic stage was established. There were days when the albumen was so small in quantity that the urine revealed on careful examination a mere trace, and I had my doubts whether it was present at all; but when the urine was allowed to stand a few hours, after carefully employing the usual tests, its presence could invariably be verified. I can only connect this temporary decrease of albumen to some mysterious process of digestion.* In many cases of albuminuria the albumen is present in the urine chiefly, indeed, in many cases solely, during the period of digestion; just as in some cases of diabetes the sugar is found in the urine mainly, and sometimes only, during digestion.†

A case of albuminuria is described in an infant seven weeks old. It was born healthy, but soon after birth suffered from constant vomiting. There was no history of scarlatina or measles, and no evidence of disease in the thorax or abdomen; indeed, the child lay listlessly in any position in which it was placed, and apparently suffered no pain whatever. The urine was "almost like pure water, and containing sufficient albumen to make a deposit of some height in the test-tube." Emaciation followed, and death took place at the end of a month. As the kidneys only presented some spots of congestion, the case was considered as one of albuminuria from imperfect digestion and assimilation of the albuminous constituents of the food.‡ In other cases albumen is never present in the urine except after severe exercise. The question may, however, be asked: Is albumen in such a case as this ever entirely absent from the urine? Dr. Roberts relates the case of a girl, æt. 8, who came under his care in April, 1864. She had general anasarca after scarlet fever four months previously. There was excessive pallor, shortness of breath, and a puffy, pasty face. The urine was scanty and high-colored, but not a trace of albumen or tube-cast could be found. She died four weeks after admission. On a post-mortem examination, "the *kidneys* were good examples of the 'smooth, white' Bright's kidney." They were slightly en-

* Temporary albuminuria may arise from indigestible articles of food, as some kinds of cheese, shellfish, crabs, cockles, mussels, etc. Nervous excitement and mental emotion will also give rise to it.—Dr. Basham, On Dropsy, 1866, p. 306.

† See the remarks on Intermittent Albuminuria, p. 253.

‡ "Albuminuria in a child seven weeks old," by G. F. Helm, B.A., F.R.C.S.; Lancet, Jan. 18th, 1868, p. 85.

larged, and the capsule peeled off readily. The surface was depressed here and there, and atrophy had commenced.*

There are some points worth considering here in reference to the microscopical character of the urine. In the earliest stages it is scarcely altered, being, as we have before mentioned, of normal color and specific gravity, but more or less albuminous. When death occurs before fatty casts and cells are detected, the kidneys are in the first stage of degeneration (*large white smooth*). When small hyaline and oily casts and cells appear in the urine, there is a process of atrophy (*fatty degeneration*). When granular and large hyaline casts appear, there is a further contraction of the kidney, or the disease is in the third stage (*granular degeneration*).

After death the kidneys are found: 1. Large, white, and smooth. 2. The same appearance, with yellowish opaque specks on the surface (granular fat kidney), or large white kidney, with fatty degeneration. 3. Atrophy of the cortical portion, with an uneven granular surface (Johnson).

The small red granular kidney so far belongs to advancing years as to be hardly worth noticing under the diseases of early life. It is a chronic and insidious disease from the commencement, and although associated with the gouty diathesis more particularly, no cause can be assigned in a large number of cases. It holds no relationship to tubercle whatever. Dr. Dickinson has seen the disease in a girl of 5. He mentions another case of a girl under the late Dr. Hillier who died at the age of 10, and one under Dr. Ogle, at St. George's Hospital, of a boy, who died at 11, "with granular degeneration traceable to scarlatina." Dr. Dickinson had two fatal cases under his own care at the respective ages of 12 and 14.† The disease has succeeded to scarlatina contracted many years previously. A case is related by Barthels‡ of a girl who at 10 years of age had ague, measles, and scarlet fever, but no dropsy. At 18, after being in good health for eight years, she became affected with albuminuric retinitis; there was albumen, with small hyaline casts in the urine, and hypertrophy of the left ventricle. Maddening headache and obstinate vomiting succeeded to diminished urinary secretion. She became completely blind, and had

* On Urinary and Renal Diseases, p. 408.

† Part 2, Albuminuria, p. 376.

‡ Cyclopædia of the Practice of Medicine, by Dr. H. von Ziemssen, Diseases of the Kidney, vol. xv, p. 429.

five convulsions of an epileptic character in one day. To these symptoms succeeded twitchings of the muscles, profuse diarrhœa, and death from exhaustion. After death the kidneys were found atrophied, and the surface mottled and covered with shallow depressions; the substance of the organs was tough; renal arteries large; there was purulent peritonitis and ulceration of the mucous membrane at the lower end of the ileum; the brain was pale and firm; the left ventricle of the heart was hypertrophied.

The kidney in this disease is much reduced in weight, the surface is rough and irregular, and the capsule so thickened that it cannot be torn off the surface beneath without removing some of the tissue. Some of the urinary tubules are denuded of epithelium, and others contain fibrinous deposit. The urine, in granular disease of the kidney, contains a small quantity of albumen, and is copious and of low specific gravity; epithelial, granular, and hyaline casts are found under the microscope.

Dropsy is almost certainly absent, but there may be transient puffiness of the eyes and ankles. We often find dyspnœa on exertion from œdema of the pulmonary tissue or cardiac change; and in these cases the face is sallow rather than white.

With these changes the heart becomes hypertrophied, and the arteries thickened. Simple cardiac hypertrophy is a common accompaniment of *granular disease of the kidney;* the morbid matters, not readily passing through the capillaries, raise the blood pressure in the arteries, and, an obstruction thus being created in the blood flow, the left ventricle hypertrophies. For a long time there may be no signs present except accentuation of the aortic second sound or reduplication, but not necessarily any murmur, unless the valves are diseased. Atheromatous change has been found in the mitral valve and aorta, associated with granular fibrosis of the kidney at the age of six.* The muscular coat of the small arteries undergoes thickening, and even degenerative changes. The sphygmograph affords ample evidence of this in the characteristic tracing, and the finger placed on the pulse detects tension and hardness. This increased effort on the part of the heart and systemic arteries, causes both to become hypertrophied. As the heart increases in power the vessels lose their elasticity and become brittle, whilst the force with which the blood is driven through their channels, frequently leads to rupture and extravasations. The researches of

* Dickinson, op. cit., p. 412.

Sir William Gull and Dr. Sutton are in the direction of proving, that the view advanced by Dr. Johnson is unsupported by their experiments and investigations; they consider that blood charged with urinary excreta does not satisfactorily explain the cause of hypertrophy of the heart, and the arterial changes in the muscular coat of the smaller vessels. This change in the minute arteries is due to the formation of a "hyaline-fibroid" substance in the intertubular parts of the kidney, "and that, in fact, the muscular coat is often variously atrophied." The cardio-vascular changes are not consecutive to the renal mischief; they may be independent of it, and the contracted granular kidney forms only part of a general morbid condition. These observers admit the frequent association between hypertrophy of the heart and renal degeneration, but at the same time they consider that this is no proof of any relation between them of cause and effect. The large white kidney, the granular contracted kidney, and the lardaceous kidney have been found when the heart was free from hypertrophy. For further information on the subject I refer the reader to the paper of Sir William Gull and Dr. Sutton.*

The next form is that known as the *lardaceous or waxy kidney.* It has also received the name of *amyloid kidney.* A waxlike material is found infiltrating the kidney, commencing in the muscular coat of the minute arteries; this imparts to the kidney a smooth and anæmic look. When the disease is far advanced, the gland loses all its smoothness, and becomes shrunken, uneven, and puckered. On incising the surface, the natural structure is seen to be much wasted, the cortex is bloodless, and the cones red, whilst the whole organ is much more tough and hard. This disease is secondary and constitutional, not local. It consists primarily in a change in the composition of the blood, and secondarily in the walls of the arteries, as well as all the organs of the body which they supply.†

The striking peculiarity of the morbid deposit is a deep brown-reddish color, which it assumes on the addition of a weak solution of iodine.

The *causes* of the disease are chronic suppuration from caries or

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* Med.-Chir. Trans., vol. lv, 1872, Chronic Bright's Disease with Contracted Kidney (Arterio-capillary Fibrosis).

† See Chapter XX, On Diseases of the Liver,—Lardaceous or Amyloid Disease of the Liver.

necrosis of bones, scrofulous abscesses, phthisis, chronic bedsores, syphilis, etc.

The disease is essentially chronic and most common in males. It is most frequent between 20 and 30. Dr. Dickinson has seen it in a child of 5, and he alludes to the case of a boy 2½ years old, under Dr. Gee, who died from chronic abscesses in the thigh and pyæmia.* The disease is recognized during life by a worn and cachectic look; by the copious secretion of albuminous urine; and by the presence of œdema and dropsy. The urine is abundant in the early stages, but as the complaint advances it becomes scanty, very albuminous, and of high specific gravity. "Cells resembling those of pus are occasionally found, either separate or aggregated round a cast. The tube-casts are usually hyaline, and do not yield a brown coloration with iodine. Epithelial casts are also sometimes seen."† They are sometimes granular, or they contain fatty epithelium (Green).

Treatment of Chronic Bright's Disease.—To aim at a cure or to give relief in this formidable complaint, we must bear in mind the course of the malady and its tendency towards a fatal termination; for in so doing we know what symptoms to expect, and how best to avert or relieve them when they threaten. The cause having been ascertained, we may learn how to approach the disease in its milder forms with some chance of success. Is it the sequel of an acute attack, or a chronic insidious disease from the first? Is the constitution fairly good, or the health broken down? For on the issue of these questions our opinion may be in a great measure guided. In one case the tendency of the renal changes will be to cause cerebral trouble in the form of chronic headache, confusion of ideas, and convulsions or coma; in another case inflammatory complications of the serous cavities; in a third anasarca or dropsy; in a fourth derangement of the stomach and bowels is the chief evidence of the poisoned blood; in a fifth the changes fall chiefly on the systemic vessels, and the left ventricle of the heart, producing for a time no other indication of failing health than stupor and inactivity, nausea and capricious appetite, or occasional epistaxis or hæmaturia.

If the chronic disease has succeeded to the acute variety of the affection, as after scarlet fever or exposure to cold, great care is

* Dickinson, part 2, Albuminuria, 1877, p. 491.

† On Urinary and Renal Diseases, by Dr. Roberts, 1876, p. 491.

required not to submit the patient to changes of temperature, or to an irregular diet, as acute renal congestion is rekindled on slight provocation. If there is chronic disease of any bone or joint, and the albuminuria appears to be dependent on these affections, then the source of such irritation should be removed if possible before the patient's strength is worn out, and the renal degeneration is too far advanced.

If there is local pain to any extent across the loins the patient should be put to bed and a linseed poultice applied. If the urine is turbid and contains renal blood-casts, it is advisable to make the child lie on the abdomen to lessen the renal congestion, and to give diluents and fluid diet. In one case immediate relief followed the adoption of this simple method of treatment.

When the patient is well enough to be out of doors he should be warmly clothed with flannel next the skin, and the greatest care be taken to avoid cold. A residence at the seaside is to be recommended, and moderate exercise may be taken if the disease is not so far advanced as to prevent it.

All treatment will be futile without the most rigid attention to diet, and this should consist chiefly of milk, or milk and water, if there is much albumen in the urine, and renal congestion is present to any extent. Animal food should be prohibited under these circumstances, for if indulged in it will increase arterial tension, and derange the digestive functions. This is not borne out by the experience of some writers, who consider that animal food should be given as soon as the stomach will bear it. "It is a most remarkable fact that the albumen in the urine *decreases* by the use of animal food, and *increases* again under a vegetable diet."* But this testimony is quite at variance with my experience, as the case of E. S——, related at p. 257, very strikingly proves.

All stimulants should be prohibited, as they are apt to produce deleterious consequences. Children do not require them in health, and there is no disorder in which they would prove more injurious.

If anæmia is a leading feature of the complaint, the liquor ferri perchloridi is a good hæmatic, and a safe diuretic at the same time. When the urine is deficient in quantity, and there is any anasarca from renal inadequacy, the efficacy of the tincture of the perchloride is well spoken of in combination with the liquor ammoniæ

* Basham, On Dropsy, 1866, p. 217.

acetatis. "It is as an ammonio-chloride kept in solution by acetic acid that its beneficial influence becomes most apparent. It is a very simple preparation; a few drops of the tincture, according to the age of the patient, are added to a drachm of the liquor ammoniæ acetatis, previously acidulated with acetic acid."* Another writer on this subject also testifies to the same effect. "I have frequently combined with each dose of the perchloride of iron ten grains of the hydrochlorate of ammonia; and I believe that this ammonio-chloride of iron is a useful preparation."†

If there is any renal congestion, the addition of small doses of perchloride of mercury to the liquor ferri perchloridi, as previously referred to under the acute affection, will be advisable. The syrup of the iodide of iron, the syrup of the phosphate of iron, or steel wine, in combination with cod-liver oil, are useful preparations in strumous subjects, and may be taken advantageously for weeks together. However important it may be to improve the quality of the blood in chronic Bright's disease by the exhibition of ferruginous preparations, they cause in many instances so much headache and constipation, that they cannot be given alone for any length of time; if the headache is dependent on congestion rather than on anæmia, they must be set aside for other remedies. The bowels ought to act once every day at least.

Sometimes the mineral acids—phosphoric, nitric, or hydrochloric—are useful where the loss of albumen is excessive, and there is atonic dyspepsia. Gallic acid seems to be ineffectual in lessening the drain of albumen.

Dr. Lauder Brunton found that strychnia in doses of gr. $\frac{1}{20}$th stopped the albumen in a case of chronic and intermittent albuminuria, but caused sickness and headache; in the same case pancreatic emulsion stopped it at first, but afterwards it became worse than ever; quinine and sulphuric acid doubled the quantity in twenty-four hours. But the same authority speaks in the highest terms of arsenic, which acts "upon the secreting structures of the kidney . . . and appears also to possess a special affinity for epithelial structures." He gave Liq. Fowleri ℥iij at mealtimes and the albumen disappeared, reappearing when the arsenic was discontinued, and again arresting the albumen when the remedy was resumed. The case in question was supposed by Dr. Brunton to

* Basham, On Dropsy, 1866, p. 218.

† Lectures on Bright's Disease, by G. Johnson, M.D., 1873, p. 138.

be due to "imperfect digestion of albuminous substances, which were absorbed from the intestine, and excreted in the urine in much the same way as white of egg would have been if the person had swallowed several raw eggs at once."*

For any dropsical condition that may exist, a dose of the compound jalap powder, with a little bitartrate of potash, is a good and quickly acting aperient, which may be given once or twice a week in a little tea or plain water, early in the morning, but even this aperient must be employed with due consideration to the general strength.

If anasarcous effusion is great, it may be necessary to puncture the extremities. The ordinary practice is to make one or two punctures through the subcutaneous tissue on the dorsum of the foot or calf of the leg, from half an inch to an inch in length, and then to wrap the limb in hot moist flannel. I have repeatedly made a small puncture either on the dorsum of the foot or over one or both ankles, and then wrapped the limb in dry flannel, changing it as often as it becomes very wet. I have never seen any local irritation or erysipelas follow this plan, though the drain of fluid in some cases has been enormous. Dr. Southey has recorded the notes of a case of parenchymatous nephritis, in which the anasarca was combated by drainage-tubes and small silver canulas. The advantages claimed were, that one puncture in each limb was sufficient, and that sores and erysipelas were not so likely to ensue; the canula could be kept in the same opening without inconvenience for forty-eight hours, and when the instrument was withdrawn the orifice closed at once. Above all the patient is kept dry. Several pints of dropsical effusion may thus be safely and painlessly drained away in the course of one day.† Dr. Southey found the same plan equally advantageous in drawing away pleuritic effusions.‡

Diuretics are sometimes serviceable to assist in the removal of dropsical effusions. In some forms of the disease diuresis is profuse enough to contraindicate their use. They are infinitely less valuable than purgatives, which relieve the portal circulation and intestinal veins, by inducing watery secretion from the bowels. I have a great preference for digitalis, with acetate or citrate of potash, when an alkali is not objectionable.

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* Arsenic in Albuminuria, Practitioner, June, 1877, p. 432.

† Clin. Trans., vol. x, 1877. ‡ Ibid., vol. xii, 1879.

Bronchial and dyspeptic symptoms require no special consideration; they must be treated according to the circumstances of each particular case, remembering that the strength of the patient is to be carefully husbanded, and that mercury and antimony, if occasionally required, are seldom necessary.

If uræmic symptoms threaten, the action of the skin and kidneys must be encouraged. The poisoned and watery state of the blood will seldom admit of venesection or any kind of depletion.

An occasional warm bath is an excellent diaphoretic, by promoting the action of the skin, and increasing the secretion of urine at the same time. The skin becomes supple under its use, and a general amelioration in the patient's condition takes place. I have known headache relieved when the temperature of the bath has not exceeded 98°, but if much higher, and there is no free sweating, headache, capillary engorgement of the face, and other distressing symptoms may ensue.

Finally, we may repeat that warm clothing, thick boots, care against cold, especially in the evenings, and a seaside residence ought to be rigidly enforced.

CHAPTER XXIV (*continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS.

Dysuria—Renal Concretions and Calculi—Lithiasis—Symptoms of Stone in the Kidney and Bladder—Oxaluria—Hæmaturia—Tubercle of the Kidney—Cancer of the Kidney—Hydronephrosis—Incontinence of Urine—Diabetes mellitus—Diabetes insipidus—Acute Cystitis—*Causes—Symptoms and treatment.*

Dysuria—*Renal Concretions and Calculi.*—Calculous disorders are very common in early life, from the liability of the digestive functions when deranged to cause irritation in the urinary passages. The imperfect assimilation of the nitrogenous principles of food checks their downward metamorphosis to urea, so that a quantity of intermediate products are formed; these products are either insoluble, or, at least, irritating to the genito-urinary organs.

Lithiasis is recognized by pain and weight about the loins, and difficulty in voiding urine, which is scanty and high-colored; it becomes turbid on cooling, and has a strong sickly odor. The

commonest form of gravel consists of urate of ammonia, or free uric acid, which falls to the bottom of the vessel on standing like brickdust. The digestive functions are deranged, the tongue being furred, the appetite excessive, and the bowels costive. The child is restless and feverish at night, and loses energy and activity. The white or pink tinge of the urates depends upon the amount of coloring matter in the urine. "In young children the 'milky urine,' which alarms mothers, is due to a deposit of peculiarly white urates."*† The pink or brickdust deposit, only visible after the urine has cooled, and readily dissolved by heat, consists of the amorphous urate of ammonia colored with purpurin. The milky sediment, which exists as a deposit before the urine has cooled, is formed of the crystals of urate of soda.

When a careful section of the kidneys is made, yellowish or brownish striæ may be seen running towards the base of the pyramids. This appears to be a post-mortem change arising from the precipitation of the urates into the uriniferous tubes.‡ When it occurs during life it may prove the commencement of those changes which lead to gravel or calculus, blocking up the uriniferous tubes, and finally causing them to become impervious, or the concretions escape into the pelvis of the kidney, where they may be seen in large numbers after death.

The symptoms of stone in the kidney, or of the descent of a calculus from the kidney to the bladder, are less marked in children than in adults. There is febrile disturbance, and pain and difficulty in passing water, with localized pain and tenderness over one loin. In severe cases, there is faintness and vomiting, and the skin is bedewed with a clammy sweat. Uric acid calculi have been seen in the pelvis of the kidney of an infant. The occurrence of colic in children of three or four years old is often attended with uric acid gravel (West).§ It must always be borne

* Guide to the Examination of the Urine, by Dr. Wickham Legg, 2d edition, 1872, p. 48.

† "In the urine of children it is very frequently met with in the form of small spherical globules very like the crystals of carbonate of lime from horses' urine; and these sometimes occur in the adult."—*Urine and Urinary Deposits*, by Dr. Beale, 1861, p. 275.

‡ "In infants dying within forty-eight hours of their birth, such striæ are almost invariably found (Virchow); they have also been found in still-born infants, which have never respired (Hoogeweg and Martin)."—*On Urinary and Renal Diseases*, by Dr. Roberts, 3d edition, 1876, p. 477.

§ "Dr. Debout d'Estrées gives an account of a child at Contrexeville, born of gouty

in mind that it is most difficult to elicit symptoms of localized pain in children.

The treatment of *dysuria* and *uric acid gravel*, when severe, consists in the employment of warm baths at bedtime, which relieve the pain of micturition and encourage diaphoresis. If there is reason to think from the local and recurrent pain that a concretion has formed in the kidney, hot poultices to the loins will be advisable. The bowels must be kept fully open, and for this purpose there is nothing better than a full dose of castor oil. After this a mixture of liquor potassæ and tincture of hyoscyamus will lessen the acidity of the urine, and promote its free discharge. The diet should be sparing and unstimulating, and should consist of milk and water, barley-water, and thin arrowroot. No animal food should be given whatever till the urine has assumed a healthy state, and pain and irritation have passed away. The waters of Carlsbad and Vichy are very useful.

In children, *calculi* and *urinary sediments* usually consist of urates, hence the alkaline carbonates are very serviceable, and they may be persevered with to great advantage. Children who have had rheumatism sometimes suffer from uric acid in the urine, and in such cases the diathesis will require careful attention.

When a stone has formed, the child must be handed over to the surgeon. The *symptoms of stone in the bladder* in children are the same as in the adult—frequent desire to pass water, which is voided with painful efforts, and is sometimes mixed with blood; occasional stoppage of the stream, and a sore and elongated prepuce from the child's hands being constantly applied to it. Prolapsus ani, accompanied with marked dysuria, is often the first symptom of calculus in children.

Calculi, though frequent in boys, are very rarely found in female children. Hence, when morbid vesical symptoms occur in little girls, the probability of the presence of a stone in the bladder must not be overlooked on account of its rarity. In the autumn

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parents, which had real nephritic fits at a fortnight old. The mother, a young woman, twenty-six years old, who had been suffering from uric gravel for four years, had, during her pregnancy, three fits of nephritic colic; nevertheless, the child was born in due time and in good condition, but a fortnight after its birth it had real nephritic fits, vomiting, writhing, and complaining chiefly when the loins were touched. The fits ended by the emission of rather thick sand. They returned every six weeks."—*A Few Words on the Causes of Gravel*, Practitioner, June, 1877.

of 1877 a girl, nine years of age, came under my care in the Samaritan Hospital. Her mother stated that she had been subject since birth to incontinence of urine, and for more than six months before admission she suffered from dysuria, with constant desire to pass water. On the day of admission the labia were swollen, and the clitoris was large and tender. A few excrescences, neither vascular nor painful, existed around the meatus urinarius. The urine contained a trace of albumen, and there was a scanty deposit of pus-cells. Suspecting the presence of a calculus, I asked my colleague, Mr. Alban Doran, to sound the patient under chloroform. He discovered a large stone, and two days later removed it through the urethra, which he enlarged by means of the dilator, invented by the late Professor Simon, of Heidelberg. The stone weighed 2½ drachms, and consisted of a nucleus of uric acid, coated with oxalate of lime. The patient was enabled to retain her urine and to pass it at will the following day. She made a good and rapid recovery.

Within a month after this patient was discharged, a delicate girl of ten was admitted, also suffering from incontinence of urine and occasional dysuria. There was a distinct history of calculus in the family, her maternal uncle having been operated on for stone when a youth. A sound was introduced into the bladder under chloroform, but no calculus could be detected. The mucous membrane of the bladder was rough at one or two points. The inguinal and the whole line of iliac and lumbar glands were much enlarged, but the abdominal walls were flattened, and none of the solid viscera had increased in size. On examining her urine two days after the sounding it presented many of the qualities it did on admission; it was very acid, and deposited a large amount of mucus. Under the microscope, a great number of crystals of oxalate of lime were detected. She recovered completely under rest and antistrumous remedies.

Dr. W. Roberts* and others have shown that although *oxaluria* is most frequent in nervous and debilitated young people, it is not accompanied with definite symptoms, since in many cases it may exist to such an extent as to produce the characteristic mulberry calculus, without any constitutional symptoms, until the stone has mechanically caused vesical irritation.

Hæmaturia or hæmorrhage from the kidneys in children may be

* Urinary and Renal Diseases, 1876.

met with in tuberculosis, scarlatina, purpura, and some other diseases in which the blood has undergone changes in its composition. A case of acute hæmaturia is recorded in a girl of nine, in which sudden hæmorrhage followed the disappearance of severe pustular eczema on the face and body, of two years' duration * I have given details of a very interesting case of "Paroxysmal or intermittent hæmaturia in a young child, following supposed injury."† The treatment must be in accordance with the disease which has originated the symptoms. Gallic acid in five-grain doses, three times a day, will be found beneficial, and if there is anæmia, the tincture of the perchloride of iron is a good styptic and diuretic at the same time. Quinine may be sometimes prescribed with advantage. If there is any evidences of renal congestion, rest in bed and a milk diet will be necessary.

Tubercle of the kidney is seen in cases of general tuberculosis, one kidney being generally affected. The organ is increased in size, and converted into a soft, cheesy, yellow mass. Any treatment is unsatisfactory.

Cancer of the kidney is a rare disease, and when present, is of the medullary character.‡ I have had no experience of the affection, but authors describe the symptoms as beginning with pain in the region of the kidney, frequent micturition, and the presence of blood and albumen in the urine. It is extremely doubtful whether cancer-cells have been seen in the urine. "The most important symptom is a generally uneven, nodulated, immovable tumor, sometimes as large as a child's head, reaching from the false ribs to the crest of the ilium, and inwards to the vertebral column, and occupying a considerable part of the abdominal cavity." (Steiner.)§ The children become cachectic and sallow, and finally die exhausted. Mr. Spencer Wells has recorded a most interesting case of *soft cancer of the right kidney* in a girl only four years of age. "The diagnosis in this case was made without much difficulty, although the urine was quite normal. The growth was extremely rapid, hardly six months from its commencement to its fatal termination, when the diseased mass weighed between 16

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* Brit. Med. Journ., 1878, vol. ii, p. 877. † The Lancet, vol. ii, 1880, p. 336.

‡ "In the Children's Hospital at Prague in 100,000 cases it was only seen four times."—*Steiner on Diseases of Children*, by Lawson Tait, 1874, p. 279.

§ "In 16 children its average weight was 8½ lbs.; the smallest was 1 lb. 9 oz., and the largest 31 lbs."—*On Urinary and Renal Diseases*, by Dr. W. Roberts, 1876, p. 523.

and 17 lbs. The tumor occupied the whole of the right side of the abdomen, bulging backwards in the right loin. It was uniformly elastic, but no fluctuation could be detected. The intestines were pushed downwards, and to the left side. The rapid growth, and the absence of fluctuation, were, of course, strongly against the opinion that the tumor was ovarian; while the rarity of ovarian disease in young children, and the comparative frequency of renal encephaloid, led to a diagnosis which was confirmed by a puncture with a fine exploring needle. A few drops of reddish serum were obtained, containing nucleated cells of various size and shape. I sent the child home, with a note to Dr. Williamson, of Nantwich, expressing my opinion that the tumor was a mass of soft cancer, and that the right kidney was the most probable seat of the disease. This proved to be correct. Dr. Williamson sent me the specimen, and I exhibited it at the Pathological Society in December, 1862.* The whole kidney was infiltrated with encephaloid. Although so enormously enlarged, the shape of a normal kidney was distinctly preserved. Its surface was soft and elastic, in some spots giving a sense of deepseated fluctuation, but no cyst was found, nor were there any marks of suppuration or hæmorrhage. Coils of small intestine adhered to its inner and under surface. The ureter was completely occluded by the pressure of the tumor. The left kidney was quite healthy. Thus the normal condition of the urine was explained. The diseased kidney added nothing to the contents of the bladder, and the healthy kidney supplied only normal urine."†

Hydronephrosis—Dropsy of the Kidney.—This disorder is caused by an obstruction to the escape of urine from the kidney. The pelvis of the kidney becomes dilated into a pouch or bag, and the renal substance atrophied or absorbed. Sometimes it is divided into smaller compartments or cavities. The tumor may attain enormous dimensions, and fill the abdomen as a soft fluctuating mass. In women it has been mistaken for an ovarian cyst, and tapped under that impression. One or both kidneys may be affected.‡

"Of 52 cases collected by me the hydronephrosis was confined to one kidney in 32 instances, and affected both (double hydronephrosis) in 20 cases. When the hydronephrosis was single the

* Trans. Path. Soc., vol. xiv, p. 179.

† Diseases of the Ovaries, 1872, p. 203.

‡ See Chap. XXVI.

right side was more frequently affected than the left (19 right and 13 left)."* Of these 52 cases "there existed congenital malformation in 20 cases, affecting the kidneys, the ureter, and the renal artery. . . . . In 13 out of the 20 congenital cases the hydronephrosis was double, that is, it affected both kidneys. Two of these perished still-born, one lived six hours, one thirty, and one thirty-six, whilst one died twenty days, and another between three and four months, after birth."†

The contents of these cysts consists of watery urine, uric acid, and the earthy salts, but blood, pus, and epithelium may be also present. Death may occur suddenly from uræmia. In some cases of congenital hydronephrosis urea is absent. A very interesting case is recorded by Mr. Henry Morris to prove that urine is freely secreted during intrauterine life, and that a considerable quantity which the bladder and ureters cannot hold is passed into the sac of the amnion, in which the child floats. Urea appears to be in very small proportion (5 in 1000).‡

Hydronephrosis is found to be caused by the impaction of a stone or calculus in the ureter, which causes inflammation and contraction; an imperforate urethra is another cause. A pelvic growth, by compressing the ureter, may prevent the escape of the urine. In some obscure cases no mechanical cause can be ascertained to account for the condition.

The *symptoms* depend on the size of the tumor and the pressure it exerts on surrounding organs. The usual situation of the tumor is in the lumbar region, extending forward to the umbilicus and downwards to the iliac region. The tumor is soft and fluctuating; it is sometimes felt distinctly lobulated, and if of large size there is dyspnœa, and the child cannot lie down without difficulty. The colon generally lies in front of the tumor. "There is one peculiarity which is pathognomonic when present, namely, the sudden diminution or disappearance of the swelling coincidently with the sudden discharge of a large quantity of urine. This sign is not always available, but it is sufficiently frequently met with to give it an important diagnostic value."§

When the symptoms arise from the impaction of a calculus,

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* Renal and Urinary Diseases, by Dr. Roberts, 3d edit., 1876, p. 487.

† Ibid., p. 490.

‡ Case of Congenital Hydronephrosis, Royal Med.-Chir. Soc., May 13th, 1876.

§ On Urinary and Renal Diseases, by Dr. Roberts, 1876, p. 497.

attacks of nephritic colic and vomiting are not uncommon, with pus and even blood in the urine. If both kidneys are affected, then the elimination of urea is imperfect, and symptoms of uræmia may be looked for. Should the disease be caused by a renal calculus it may be dislodged, and, the sac emptying itself, the symptoms pass away, the sac shrivelling up and causing no further trouble. Peritonitis, septicæmia, or suppuration in the tumor, followed by hectic, may ensue. Impaired health and chronic tuberculosis have also followed.

Treatment.—A milk and fluid diet is preferable to much animal food, as it is important to keep the urine free and to avoid the accumulation of fecal matter in the bowels. When there is constipation a warm-water enema, or a mild non-irritating aperient, will be called for. In the case of a little girl under Dr. Roberts's care, friction and shampooing the tumor resulted in the escape of a large quantity of urine, and the swelling subsided. Other cases are recorded where the tumor has suddenly disappeared after a profuse discharge of urine through the ureter and bladder. If this does not occur, and the patient's rest is broken from pain and want of sleep, tapping may be had recourse to as a means of temporary relief. In October, 1879, a girl seven years of age was admitted under my care into the Dorset Street Branch of the Samaritan Hospital suffering from abdominal tumor, which had been known to exist since she was two years old. The case was seen by my colleagues and variously diagnosed as hydatid, ovarian, and renal. Mr. Knowsley Thornton, holding the latter opinion, advised and performed exploratory and antiseptic tapping, and drew off six and a half pints of slightly albuminous urine. The cyst refilled, and, the diagnosis being now certain, Mr. Thornton removed the cyst by laparotomy on January 2d, 1880, securing the renal vessels with fine carbolized silk, and using all details of Lister's method. Some congestion of the other kidney, with hæmaturia, followed the operation, but passed off in a few hours, and the child recovered rapidly, and four months afterwards was in perfect health. The cyst was shown as a fresh specimen at the Pathological Society, January 6th, the child at a meeting of the Royal Medical and Chirurgical Society, March 9th, 1880, when nephrectomy was under discussion, and full details have been published by Mr. Thornton jointly with myself.*

* The Lancet, vol. i, 1880, p. 870.

Enuresis (incontinence of urine).—This common disease in children is generally difficult to cure, and the closest investigation frequently fails to discover the true cause. It is met with in the progress of disease of the bladder and brain, and from deficient power in the tone of the bladder and sphincter, in weakly and strumous subjects. "We can sometimes trace the affection to spinal irritation; and the worst case of the disease I ever saw was in a girl affected with diseased spine."* It may originate from gastro-intestinal disorder, ascarides in the rectum, and an excess of uric acid in the urine. When these sources of irritation are removed the patient gets well. But incontinence of urine, among children in too many instances, appears to arise from no mechanical or inflammatory condition of the bladder or kidney, and from no unhealthy state of the urine. We know that the child wets the bed, but neither the parents nor the physician can always assign any reason for it. A long prepuce would seem to be a frequent cause. A very obstinate case under my care, which had resisted all drugs, was cured on its removal. Children who are put to bed without emptying the bladder, often wet the bed at night, and when the habit is once established, it is difficult to overcome. In some children the absence of control over the bladder occurs only at night, and in others during the daytime also; in some cases there is almost a constant dribbling, and the child is wet and excoriated, whilst in other cases the desire to pass water is very frequent, and he cannot hold it for a moment when once the desire to pass it has commenced. Boys suffer far more frequently than girls. It may be again urged that the condition of the urine may increase its irritating qualities, especially acid conditions. In such cases, a comparatively small quantity of urine in the bladder may excite reflexly the relaxation of the sphincters.

Incontinence of urine commonly depends upon an abnormal condition of the bladder centres situated in the lumbar portion of the cord.

In normal micturition, the sensation of fulness in the bladder is received by the centre in the cord, until it excites an efferent impulse to the sphincter, which relaxes and permits the contents of the bladder to escape. In early infancy this does not excite consciousness; then the micturition is involuntary, and purely

* Holmes's Surgical Treatment of Children's Diseases, 1868, p. 581.

reflex. About the period of the completion of the first dentition, or even earlier, a child ordinarily becomes conscious of the call to void urine, and intimates the desire to its nurse. The relations of the call to consciousness have become established. These relations never become lost again ordinarily, except in very advanced life, or in disease of the spinal cord. Under other circumstances the relations of this call to consciousness do not become perfectly established. In the majority of cases of nocturnal incontinence, during the period of wakefulness, the little patient is conscious of the call, but during sleep the reflex action goes on without exciting consciousness. In more aggravated cases the call does not excite the attention, and the incontinence occurs during the waking state, as well as during sleep.

Prognosis.—This is hopeful, for as the child grows older he gains strength. Incontinence of urine usually ceases at puberty, when the spinal centres become perfectly developed. The disease is never fatal.

Treatment.—From what has been written concerning the causes of enuresis, the treatment will have to be adopted accordingly. The patient should lie on a hard bed, and strict attention be paid to hygienic rules. As bedtime approaches, the quantity of fluid should be limited, and two or three hours after falling asleep the child should be awakened to pass water, and the same thing should be repeated during the night, that the bladder may not get too full. He should be prevented from lying on his back, and for this purpose a handkerchief tied round the waist, with a knot over the spine.

If the urine is high-colored and there are urates, it must be put into a healthy state, but if it is clear and throws down no deposit, the extract of belladonna (gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$) three times a day is a drug we ought to employ. "It appears generally admitted that of all specific means the administration of belladonna is the most effectual, and such is certainly my experience. I begin with $\frac{1}{8}$th of a grain of the extract three times a day, or a smaller quantity in very young children, and gradually increase the quantity until the fauces and the pupil become affected. If the enuresis is not materially relieved by the time the fauces become dry and the pupil enlarged, I leave off the drug; but if there is a material improvement, a few days' perseverance will usually cure the disease for a time. I believe that it is liable to recur, as I have seen several

cases of relapse. They are, however, under the immediate control of the drug, and are, therefore, of no very serious consequence."*

In belladonna poisoning there is paralytic retention of urine, consequently in these cases of hyperæsthesia of the bladder centres belladonna is useful.† In those cases where no abnormal source of irritation can be discovered it is well to give belladonna. In many cases this drug will effect a cure, but it should be given in full doses, and all young creatures, including human beings, bear comparatively larger doses of this agent than are required in the case of adults. "I have been obliged to give as much as ℥iss. or even ℥ij of the tincture before success was attained."‡ In many cases it is well to add bromide of potassium to the belladonna.

If the condition seems to depend on debility, the tincture of the perchloride of iron, with or without strychnia, will be found of service—five minims in a little water three times a day has often proved of great benefit in my hands. The mineral acids, too, are sometimes serviceable. Cold sponging to the loins and lower part of the back in the early morning are useful measures, and in very obstinate cases a blister to the sacrum. "Another local application, which is very energetic, and in obstinate cases ought certainly to be employed, is the cauterization of the neck of the bladder. Either the stick-caustic should be used, or a solution of ten grains or even more to the ounce. I prefer the former. But it is a very painful application and not free from danger, and should never be employed till after the failure of general treatment."§ I have applied to the urethra, a solution of nitrate of silver (℈j ad ℥j), with very encouraging results. The patient, a nervous timid girl, ten years of age, had suffered from incontinence of urine from birth, and the treatment hitherto employed had been unsuccessful. The incontinence took place during the night, as well as the day, and the mother said "her child's clothes were always wet." I used a small uterine sound, and twisted round the top of it a piece of cotton-wool, well saturated with the solution. This was passed along the urethra to the neck of the bladder, and then quickly withdrawn. The application caused no pain at the time, nor any subsequent inconvenience. At the end of a week, the patient had

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* Holmes, op. cit., p. 585.

† A Treatise on Therapeutics, by H. C. Wood, M.D., 1876, p. 232.

‡ A Guide to Therapeutics, by R. Farquharson, M.D., 1877, p 223.

§ Holmes, op. cit., p. 584.

only wetted the bed once; at the termination of a fortnight, twice; and on both these occasions the incontinence was nocturnal. I should state that as the urine was high-colored and rather acid, I prescribed a mixture of belladonna and bicarbonate of potash, but the good effects were, I believe, largely attributable to the caustic application, as the child had been under the care of several medical men, who had, no doubt, employed the usual remedies.

In some cases of imperfect development of the cerebro-spinal system, this incontinence of urine is best treated by strychnia, a well-known stimulant to the spinal centres; in other cases there is a hyperæsthesia of the bladder centres in the cord, and then a sedative like bromide of potassium is indicated; in some cases, other different sensations than these of a full bladder are received by this centre, and under what may be called a misconception, the efferent impulse is sent off to the sphincter to relax, and the contents of the bladder escape. In such case, careful search for every possible source of such irritation must be instituted, and, if possible, be found and removed. Without that, all treatment is futile.

According to Dr. Herbert Tibbits, incontinence of urine in children has yielded to faradization after every other sort of treatment had failed. "One sponge should be applied over the symphysis pubis, and the other to the sacrum and perinæum alternately."*

Sometimes enuresis arises from a long prepuce, and when this is the case there is nothing to do but to remove it. A boy, aged six years, came under my care in 1871, suffering from incontinence, which was perpetually troubling him during the day, but not at night. The prepuce was very long, and the child perpetually put his hands to it, which kept up the irritation. The tincture of the perchloride of iron was given without relief. Hydrate of chloral, in five-grain doses every night at bedtime, caused temporary improvement, but he soon grew worse than ever. Large doses of belladonna kept the disease in check for three weeks, and then the symptoms returned with their former severity. The removal of the prepuce completely cured him.

A chronic case of incontinence of urine is recorded by Mr. Teevan, in which a perfect cure was brought about by an operation.† A boy, 12 years of age, had suffered from nocturnal incon-

* A Handbook of Medical and Surgical Elecrticity, 1877, p. 215.

† Practitioner, October 1st, 1876.

tinence from birth, and all medical treatment, including iron and belladonna, had been unavailing. On the 11th of February, 1876, when Mr. Teevan saw him first, the urethral orifice was "not much bigger than a pin-hole," and there was, in addition, "a small blind internal fistula situated just above the sphincter." The sphincter was divided, and the floor of the meatus externus incised. Six weeks afterwards the cure was complete and permanent.

Acute cystitis is sometimes met with in children either from injury, or the irritation of stone in the bladder. It is also said to arise from cold, and to occur during the course of febrile affections. The mucous membrane of the bladder is injected and swollen, and pours out considerable secretion. In the chronic form, mucus and pus are freely poured out. The symptoms are straining in passing water, followed by a few drops sometimes mixed with blood; pain over the pubis and weight in the perinæum. In a case of simple acute cystitis which came under my notice in November, 1876, the desire to pass urine was frequent, and very painful. The patient was a girl ten years of age, and no cause could be discovered to produce it. There was no indication of stone or other mechanical cause. The urine was never albuminous, but frequently high-colored and turbid, and this was the only explanation that could be offered. Under the influence of rest in bed, and a milk diet, with a mixture of citrate of potash, the symptoms passed off in about a fortnight, the urine never becoming ammoniacal or alkaline.

Treatment.—This consists in confinement to bed, and the employment of warm hip-baths at bedtime, if micturition is frequent and painful. A linseed-meal poultice should be employed over the loins, or lower part of the abdomen, if there is much pain. A demulcent mixture of mucilage and liquor potassæ, with or without opium,* is useful to allay pain and irritation which the acid urine excites. In some cases, tincture of belladonna with citrate of potash is even more efficacious. As a mild and efficient purgative there is nothing better than castor oil. The diet must be simple and no stimulants of any kind should be given. Milk and

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* Formula 45:

℞ Liquor. potass., ... ℥j
Liquor. opii sed., ... ♏viij
Mucilag., ... ℥ss.
Mist. camph. ad . . . . . ℥iv.—M.

A tablespoonful every four hours for a child of eight or ten years old.

water, or milk in soda-water, are the best forms of nourishment. If milk is strongly objected to, then weak veal or chicken broth, and barley-water must be substituted. In this respect, the diet and treatment generally are closely akin to that recommended for the uric acid diathesis.

CHAPTER XXIV (*continued*).

DISEASES OF THE KIDNEYS AND URINARY ORGANS.

DIABETES: *Varieties of.* 1. DIABETES MELLITUS: *Symptoms—Causes—Tests for sugar in the urine—Pathology—Prognosis—Treatment.* 2. DIABETES INSIPIDUS, OR SIMPLE DIURESIS: *Symptoms—Causes—Pathology—Treatment.*

DIABETES MELLITUS is recognized by a large increase in the urinary secretion, owing to the presence of sugar. The complaint is not frequent in adults, and in children it is exceedingly rare, particularly under five years of age. It is not alluded to by Tanner, or Meigs and Pepper, Vogel, or Lewis Smith. Dr. West mentions one case as having come under his observation, in a little girl three and a half years of age, whose brother at two years, and whose sister at two and a half years, died of the same disease.* Out of a total of nearly 700 cases, Dr. Prout only saw one instance in a child of five, and about a dozen cases between eight and twenty years of age, four of whom were females.† Dr. W. Roberts met with it in a boy of three years, and he mentions the singular fact that as many as ten deaths from diabetes under the age of one year are recorded in the Registrar-General's Report for 1851–1860.‡

Symptoms.—These are gradual in their onset, the disease being generally of some weeks', or even months' duration before it is discovered. Failing strength and gradual loss of flesh, notwithstanding an excessive appetite, excite suspicion that the patient is going wrong. Then the frequent calls to pass urine in immoderate quantities, and the insatiable thirst soon clear up the nature of the malady. It is worthy of notice that there may be urgent thirst before the renal secretion is increased. The urine is of a light

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* West, on the Diseases of Infancy and Childhood, 1859, p. 655.

† Prout, on Stomach and Renal Diseases, 1848, 5th edit., p. 36.

‡ On Urinary and Renal Diseases, 1876, p. 221.

straw-color, and has the odor of new-mown hay; it is more or less saccharine in taste, and of high specific gravity, reaching 1030 to 1050, or even 1060. In this respect it differs from albuminous urine, and that of *diabetes insipidus*. It should, however, be borne in mind that the specific gravity of saccharine urine may be low. Prout mentions a case where it was as low as 1010,* and Dr. W. Roberts says it may sink to 1015.† There appears to be an antagonism between diabetes and gout, the latter ceasing on the supervention of the former in adults.‡

As the complaint advances, the symptoms increase in severity, the thirst becomes greater, and the appetite is excessive; the patient rapidly loses flesh and strength; the skin is dry and harsh; the tongue clean and flabby, or red and aphthous; digestion is deranged, and pain or sinking at the stomach is often present, with more or less flatulence, or even vomiting; the bowels are constipated and the mind is depressed. In some cases there is sweating at this stage, and even attacks of diarrhœa. Inflammatory complications of the pleura and peritoneum may supervene, and later on symptoms of pulmonary phthisis, with diarrhœa and hectic. Phthisis is the most frequent termination according to Prout. The urine now diminishes in quantity, the legs become œdematous, and death usually occurs from exhaustion. In some cases death takes place from coma.

Causes.—The disease appears to prevail chiefly in families that are phthisical or epileptic. Dr. W. Roberts alludes to a family of eight children who all became diabetic, though the parents were healthy,§ and instances are mentioned in which it has appeared through the third and fourth generations. The exciting causes are probably exposure to cold and damp, drinking large quantities of fluid when the body is heated, excessive use of saccharine articles of food, febrile diseases, and mental emotion. "Glycosuria has been repeatedly observed in cases of pneumonia, whooping-cough, and phthisis, which lead to deficient oxygenation of the blood."‖ Some disturbance in digestion and assimilation appears capable of originating it; the kidneys take an excessive action followed by the usual symptoms.

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* Prout, on Stomach and Renal Diseases, 1848, 5th edit., p. 25.

† On Urinary and Renal Diseases, 1876, p. 226.

‡ Lectures on Diseases of the Liver, by C. Murchison, M.D., 1877, p. 559.

§ Op. cit., p. 223.

‖ Lectures on Diseases of the Liver, by C. Murchison, M.D., 1877, p. 558.

Diabetes is sometimes of traumatic origin, following injury to the brain or spinal cord.

The chief tests for sugar in the urine are three:

1. *The Copper Test* (Trommer's test).—Put some of the suspected urine in a test-tube, to which add a drop or two of a solution of sulphate of copper. Liquor potassæ to the extent of half the volume of urine is then added, and the mixture boiled. If sugar is present, a reddish deposit of the suboxide of copper is thrown down. When there is no sugar, the precipitate consists of black oxide of copper.

Fehling's solution is a more delicate test than the preceding. Boil a small quantity of the solution in a test-tube, and then add a few drops of urine. If there is much sugar present, a yellowish-brown precipitate of oxide of copper will be thrown down. When no change results from boiling an equal quantity of urine and the solution, there is no sugar present. Pellets containing the constituents of the cupric test, introduced by Dr. Pavy, are convenient, and form both a simple and reliable test.

2. *Moore's Test.*—An equal quantity of urine is to be boiled with liquor potassæ in a test-tube, when, if sugar be present, the mixture will assume a dark-brown brandy-color. There is some objection to this test, as the same proceeding slightly darkens healthy urine. "Again, all high-colored urines of high density become darker when boiled with liquor potassæ, although free from sugar, and albuminous urines, even when not high-colored, darken sensibly under the same treatment."*

3. *The Fermentation Test.*—A little German yeast is to be put into a test-tube, and then filled to the top with the suspected urine. The tube is now to be inverted in a dish or saucer, and put in a warm place, or in a temperature of 80°. The urine begins to ferment, and carbonic acid gas is seen collecting at the top of the tube, and if there is a large quantity of sugar, all the urine is driven out before it. According to Dr. Roberts, this is a less sensitive method of sugar-testing than Moore's plan.†

Another plan is to take two glasses of urine; to one, add German yeast, and put both aside in a warm place for twenty-four hours; then take the specific gravity of each; the difference will indicate the number of grains per ounce.

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* On Urinary and Renal Diseases, by W. Roberts, M.D., 1876, p. 183.

† Op. cit., p. 183.

Pathology.—Claude Bernard, in 1848, stated that sugar was secreted by the liver in health, and that if the eighth pair of nerves were irritated at their origin in the fourth ventricle, an abnormal quantity of sugar is produced in the liver. The sugar so formed was supposed to be carried to the heart by the hepatic veins and vena cava, thence it was conducted to the lungs by the pulmonary arteries, and combustion taking place, the sugar was consumed. Further researches have tended to show that it is glycogen, not sugar, that is formed in the liver; but glycogen is a product so readily converted into sugar, that as far as the pathology of diabetes is concerned, the distinction is not important.

When the sugar formed in the process of digestion is in excess of the capacity of the liver to dehydrate into glycogen, then it appears in the urine. Or in cases where oxygenation is defective, and the sugar found in the liver and muscles is consequently not burnt off, then also it appears in the urine. We therefore get glycosuria as the consequence of derangement of the digestive act, or in diseases where the blood is imperfectly oxygenized. Further, "whatever quickens the circulation of the blood through the liver, particularly in the hepatic arteries, favors the conversion of glycogen into sugar, possibly by increasing the amount of albuminoid ferment; and, accordingly, whatever paralyzes the vasomotor nerves of the hepatic vessels, either directly or indirectly, dilates these vessels, produces an increased flow of blood through them, and so leads to diabetes."*

Prognosis.—This is very unfavorable, the disease being fatal in the greater number of cases, and the younger the child the greater is the fatality. The duration of the disease is variable. It usually lasts from one to three years. "I saw a case, a child of three years, who died in three weeks. Becquerel mentions the case of a boy of nine years who died in six days."† If sugar persists in the urine when the patient is restricted to a purely animal diet, it is of evil omen.

Treatment.—This, in children, is based on the treatment found useful in diabetes in adults; it mainly consists in regulating the diet, so as to prevent the accumulation of sugar in the blood, for on this depends the excessive thirst, the inordinate appetite, and

* Lectures on Diseases of the Liver, by C. Murchison, M.D., 1877, p. 558.

† Dr. W. Roberts on Urinary and Renal Diseases, 1876, p. 281.

the emaciation. All food, therefore, containing sugar, or articles convertible into it, should be avoided, especially bread and potatoes, rice, tapioca, and arrowroot—indeed, all matters rich in starch. Some vegetables, as turnips, cabbage, broccoli, carrots, parsnips, peas, asparagus, and seakale, must be avoided. Endive, watercress, lettuce, and celery, may be taken. Sweet fruits, as apples, pears, oranges, and currants, fresh or preserved, are deleterious. Animal food is chiefly to be relied on; bacon and ham, fish of every kind, butcher's meat, poultry, game, and broths and soups are permissible. Eggs dressed in any form, cheese, butter, cream—indeed, every form of fat may be taken. Bran cakes, made after the formula of Dr. Camplin, are very serviceable. They are entirely free from starch, consisting of bran, eggs, butter, and milk. Gluten bread and biscuits, prepared by Van Abbott, Princes Street, London, and similar bread of other well-known firms, is to be recommended. There are also almond rusks and biscuits, introduced by Dr. Pavy, and made by Mr. Blatchley, Oxford Street. These may be taken in change with other suitable forms of diet.

Dr. A. S. Donkin relates the case of a girl ten years of age, who was successfully treated by the skim-milk method. The urine ranged from 1040 to 1045. There was great thirst, excessive appetite, polyuria, and great loss of flesh. A restricted meat diet, iron, and Dover's powder at night failed to do good, but when the patient was placed on a skim-milk diet the specific gravity of the urine fell to 1016 within a week, and on the thirteenth day of the treatment it fell to 1012, and not a trace of sugar could be detected. In little more than six weeks she had gained five pounds in weight. "This case, and others I have treated, convince me that diabetes is curable in childhood and early life, when the disease is recognized early and the constitution good. On the other hand I have found, contrary to what has been asserted by certain writers, that the disease is quite intractable, especially when considerably advanced, in subjects at or beyond the middle period of life."*

Glycerin should take the place of sugar, and in combination with dilute phosphoric acid it allays thirst. Tea and coffee without sugar are suitable.

The patient should drink enough water, and no more than to allay thirst, and lemon-juice may be added to it.

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* Clinical Transactions, vol. ix, p. 39.

Exercise in the open air, short of fatigue, is important.

Drugs have little or no influence over the disease, the only means that hold out any hope of cure being great care in diet. In the experience of many physicians, opium, however, is a remedy which, when given in large doses, reduces the quantity of urine. It seems to have the power of diminishing the appetite and thirst, and of inducing sleep and allaying irritability. Some physicians have a preference for codeia; it is equally effective and less constipating. Alkalies, arsenic, bromide of potassium, lactic acid, and peroxide of hydrogen are all useless. A powder of bicarbonate of soda and rhubarb, or castor oil, by correcting the secretions and relieving constipation, will be advisable from time to time. Iron may possibly retard the progress of the disease for a period where the patient is anæmic, and there are no better forms for administration than the ferri et ammoniæ citras, the tincture of the perchloride, or the solution of dialyzed iron. Cod-liver oil, too, is useful to support the strength.

The clothing requires to be warm, and flannel should be worn next the skin. A residence at the seaside, or even sea-bathing will be advantageous in some cases. The best foreign watering-places are Carlsbad and Vichy.

Finally, all those hygienic measures ought to be carried out which naturally suggest themselves where the kidneys are doing excessive work.

Diabetes insipidus is characterized by great thirst and excessive discharge of pure limpid urine of low specific gravity (1003 to 1007), containing neither sugar nor albumen. In a table of seventy cases given by Dr. W. Roberts, seven occurred in infancy, and fifteen from five to ten years. In two or three of the cases the disease existed at birth.*

As in *diabetes mellitus*, the complaint would seem sometimes dependent on gastric and intestinal disturbance, but in a large proportion of cases no cause can be ascertained. Exposure to cold, by checking the action of the skin, and throwing more work upon the kidneys, has originated the complaint; drinking large draughts of cold water, violent muscular exertion, cerebral tubercle, febrile diseases, blows and falls, syphilis and hereditary influences appear to be among the most frequent causes. The exact cause has been attributed to some change in the renal capillaries, which allows of

* On Urinary and Renal Diseases, 1876, p. 198.

an increased quantity of watery fluid being separated from the blood, just as happens in a hysterical paroxysm. Dr. Handfield Jones considers that the Malpighian capillaries are more affected than those of the tubular plexus.* Some authorities consider the disease neurotic.

Symptoms.—These may be gradual, the disease having lasted from infancy to maturity in some cases, or it may come on quite suddenly. "In two cases the symptoms commenced immediately after violent muscular effort. One was a boy of twelve, who strained himself in pushing a cart-wheel sunk in the mud."† The urine is colorless, and containing a very small proportion of solid constituents, having a specific gravity nearly as low as water itself, 1003 to 1007; it is of acid reaction, but quickly becomes neutral or alkaline, and undergoes decomposition. The skin is generally harsh and dry, and the thirst intense, arising no doubt from the greater quantity of urine passed than in saccharine diabetes The general health is often wonderfully preserved, notwithstanding that the disease may have existed from an early period of life. Dr. W. Roberts mentions the fact of a boy of ten years of age under his care, being well nourished and in good health, though he passed fifteen pints of urine daily for several months.‡ In most instances, however, symptoms resembling those met with in *diabetes mellitus* are present; there is loss of flesh, thirst, voracious appetite, heat and dryness of the skin, pains in the limbs and loins, and irritability of temper. The disease is of uncertain duration, and generally terminates in phthisis or cerebral disease.

Pathology.—After death the kidneys have been found degenerated and containing very small abscesses. The base of the brain has revealed miliary tubercles in a few cases. "The pathology of *diabetes insipidus* appears to be somewhat similar to that of *diabetes mellitus*, only that the renal vessels are dilated instead of the hepatic ones."§

Treatment.—Valerian in large doses is well spoken of by Trousseau and Handfield Jones. In a boy, ten years of age, under the care of Dr. W. Roberts, the valerianate of zinc in gradually in-

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* On Functional Nervous Disorders, 1870, p. 790.

† Roberts, op. cit., p. 200. ‡ Op. cit., p. 204.

§ Diabetes Insipidus, by Lauder Brunton, M.D., Reynolds's System of Medicine, vol. v, p. 430.

creasing doses, up to twenty grains daily, reduced the urine from fifteen to five pints a day, and greatly diminished the thirst.* Camphor, iron, ergot, and galvanism have been tried with varying success. Mercury and iodide of potassium have been found serviceable where the disease is of syphilitic origin. The disease, however, can scarcely be considered amenable to treatment. No remedy has been known to cure it, and it has usually a fatal termination. A normal appetite, and the absence of organic complication, may be looked upon as favorable signs.

CHAPTER XXV.

DISEASES OF THE PERITONEUM.

ACUTE PERITONITIS: *Symptoms—Causes—Morbid appearances—Diagnosis and prognosis—Treatment.* CHRONIC PERITONITIS: *Causes and treatment.* TUBERCULAR PERITONITIS (TABES MESENTERICA): *Symptoms—Causes—Consequences—Morbid appearances—Diagnosis and treatment* ENLARGEMENT OF THE ABDOMEN.

ACUTE PERITONITIS is a very rare disease in children, the mucous membranes being much more prone to inflammation than the serous in the young. When it is present the symptoms resemble those observed in the adult. In the new-born infant, peritonitis is more common than in later childhood, and syphilis appears to be a frequent cause of it at that early period. There may be constitutional evidence in the hoarse voice and copper-colored eruption over the body. Rilliet and Barthez met with a dozen cases of acute peritonitis. "M. Thore found that acute peritonitis existed in about six per cent. of all the infants who died at the Hospice des Enfans trouvés."†

Peritonitis, which is rarely a primary disease, may commence rather suddenly with rigors and shivering; more frequently it comes on gradually in the course of some other disease, with pain in some part of the abdomen, as about the umbilicus or hypogastrium, and from thence it spreads over the whole abdominal region. The slightest pressure is intolerable, not even the weight of the bedclothes can be borne; the child lies on his back with his knees

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* Op. cit., p. 215.

† Diseases of Children, Dr. Churchill, 1858, p. 592.

drawn up, to relax the muscles of the abdomen. The face wears an anxious and painful expression, the lips are compressed, and the nostrils active; the breathing is short and thoracic, for as the diaphragm descends on full inspiration, the abdominal pain is increased, but the epigastrium may rapidly rise and fall at the same time. In such cases I have known the respirations to reach 80 per minute. The bowels may be constipated or relaxed, and the urine scanty and high-colored. Occasionally the bladder is paralyzed, and the urine has to be drawn off. The tongue is clean, or it has a whitish fur upon it, which soon becomes dry. There is thirst and loss of appetite. The disease may drag on for some days, during which the skin becomes moist and damp, the pulse feeble and fluttering, and there is vomiting of coffee-colored fluid, besides gaseous distension of the abdomen, torpor of the mental faculties, and death by asthenia is often the result. Sometimes the disease is more limited and circumscribed; it does not extend over the whole abdomen, and yields to the remedies employed.

Causes.—Peritonitis may arise from cold, wet, fatigue, and bad living. A fatal case is recorded by Mr. Jeaffreson, of Newcastle-on-Tyne, of a girl fifteen years of age, from perforation of the rectum with a walking-stick, which her uncle was holding between his legs whilst she was jumping on his knee. A rent was discovered in the anterior wall of the rectum, through which the finger could be passed into the peritoneal cavity. Peritonitis ensued, and death took place within forty-eight hours.* It sometimes occurs as a sequel to scarlatina.

Dr. Burney Yeo has related an instructive case of "infective peritonitis" in a boy twelve years of age, complicating an attack of whooping-cough, and terminating fatally. There was pneumonic infiltration of the left lung and fluid in the left pleural sac. He quotes from Ziemssen's *Cyclopædia* to the effect, that pus may pass from the pleural cavity through the diaphragm into the peritoneum, and there set up fatal peritonitis.† Several cases have come under my notice in which septicæmia in women, springing from operations involving the peritoneum, has extended to the pericardium and pleural cavities.

Peritonitis has followed inflammation of the cæcum, from the impaction of a foreign body in the vermiform appendix. The

* Brit. Med. Journ., 1874, vol. ii, p. 403.

† Ibid., December 7th, 1878, p. 827.

disease may terminate in twenty-four hours, or last four or five weeks. It may also follow injuries or operations on the abdomen, as tapping.

The *morbid changes* detected after death, are the effusion of lymph over the peritoneal surface and amongst the intestines; the vessels of the peritoneum and abdominal wall are injected; and there is clear or lemon-tinted serum in the peritoneal cavity, or even a thick or thin muco-purulent matter. The spleen and liver may be coated with lymph. In a case related by Dr. West, of a boy, nine years of age, a pint of pus was found in the right pleura, the inflammation having extended from the abdomen to the thorax.* This is not an uncommon coincidence.

The *diagnosis* from colic has been already given,† but we may repeat that in peritonitis the constitutional symptoms are more severe, the pain is increased on pressure, it is not paroxysmal, and the pulse soon becomes quick and feeble. As the disease assumes a more chronic form, crepitation can often be felt by the hand, when it is laid on the abdomen above the effused lymph.

The prognosis is grave, unless the inflammation is limited in extent and moderate in degree.

Treatment.—Where the patient is strong enough, a few leeches should be applied to the abdomen, and it may be even necessary to repeat them. This requires to be carried out effectually if the case be seen early, and the child is able to bear depletion well. It offers the best chance of relief. Then warm light poultices are very comforting, and they should be frequently renewed. Small doses of calomel, combined with opium or Dover's powder, are also serviceable to allay pain and abate inflammation. Opium is invaluable in peritonitis, and should be given freely. If the bowels are constipated for any length of time, warm-water enemata, and an elastic tube passed up the anus to favor the escape of gas will be advisable. The diet should consist of milk-and-water, thin arrowroot, or weak beef tea, according to the state of the stomach and the strength of the patient.

When peritonitis succeeds scarlet fever the symptoms are less acute, but, owing to the defective elimination of urine by the kidneys, dropsy is very apt to arise.

Chronic peritonitis may be the sequel of an acute attack, or it

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* Diseases of Infancy and Childhood, 4th edit., p. 618.

† See Chap. XVII, On Constipation and Colic.

may arise from the irritation of tubercles in the peritoneum of strumous subjects. The symptoms are abdominal pain and tenderness, with more or less swelling; sometimes crepitation can be felt from the effusion of lymph between the folds of the intestines. If this does not cause fatal obstruction the case may recover, but where the complaint is due to the irritation of tubercle, the mesenteric glands are apt to become involved, febrile disturbance comes on in the evening, food is vomited, and death takes place from phthisis or exhaustion.

The *treatment* consists in supporting the general strength by nutritious and easily digestible food, such as milk, raw eggs, cod-liver oil, or malt extract. A blister to the abdomen is sometimes of service.

Tabes mesenterica is a chronic tubercular disease of the mesenteric glands, and is sometimes associated with tubercular peritonitis. Enlargement of the abdomen is the first symptom which attracts notice, and there may be some amount of fluid in the peritoneal cavity. A child may be quite well and strong till he is seized with whooping-cough, or one of the exanthemata, and from that period the disease commences. He gradually loses flesh and strength, and if he has been accustomed to run about he now ceases to do so; he complains of being tired, and wishes to be nursed by his mother. The complaint sometimes commences with looseness of the bowels, the motions being thin and yeastlike, containing mucus or even streaks of blood. Then the abdomen begins to swell, and is tender on pressure, colicky pains are common, and the child will lie on his back in bed with his legs drawn up. He often cries out with pain, and the face is pinched and drawn. On examination, the liver may sometimes be felt below the ribs, and the spleen also. As the case goes on, the abdomen becomes irregular in shape, and in some cases crepitus can be detected when the hand is passed lightly over it, from the effusion of semi-organized lymph. As the disease advances, an irregular nodular mass may be felt about the umbilicus, or to one side of it. This is frequently found to consist of omentum, mesentery, and intestines glued together, and among this mass there are enlarged mesenteric glands, sometimes the size of a filbert. As the disease goes on, some degree of ascites is present, and the lumbar regions are dull on percussion. Emaciation sets in, there is constant vomiting and diarrhœa, the pulse becomes quick and small, the temperature rises in the evening, and

the child dies exhausted or in convulsions. The disease may terminate by bronchial phthisis, pulmonary consumption, or tubercular meningitis.

Disease of the mesenteric glands may lead to intestinal occlusion. In the case of a boy, four years of age, who came under my care at the Samaritan Hospital in 1878,* there was considerable distension of the abdomen, and symptoms of obstruction a few days before death, which was preceded by coffee-grounds vomiting, convulsions, and unconsciousness. After death, the intestines and omentum were found glued together in a large mass, and adherent to the peritoneum at the umbilicus and brim of the pelvis.

The *diagnosis* is generally not difficult; the liver is often healthy, and as the disease advances the belly becomes irregular over its surface, and more painful than in ascites. There is often a fluctuation in the temperature, and the signs of tubercular mischief in other organs as the complaint advances.

The *treatment* consists in maintaining the general strength and meeting the chief symptoms as they arise, but it is very unsatisfactory. If there is any amount of peritonitis, opium in some shape or other must be given, and linseed poultices be applied to the abdomen to relieve the pain and tenderness. When diarrhœa is very active, a little chalk mixture with catechu or krameria (Form. 31, 32) will be necessary, and the diet must consist of rice, milk, and arrowroot. The treatment is much the same as should be employed in chronic diarrhœa. When the bowels are quiet the syrup of the iodide of iron and cod-liver oil, if the stomach will retain it, should be prescribed. I have found painting the abdomen night and morning with a weak tincture of iodine (1 in 7) useful, and then applying a flannel bandage. I prefer this to rubbing any kind of ointment into the abdomen. When the child is well enough to be moved, change of air to the seaside will be advisable.

Enlargement of the abdomen is very commonly observed in delicate children who are rickety or of a strumous habit of body, but I have seen it in fairly developed children who are otherwise healthy. The parents observe that the abdomen is disproportionately large to the rest of the body, and that it becomes very much so after food. In many cases the increased size is chiefly due to flatus in the intestines, to constipation, and improper feeding. The abdomi-

* Lancet, Aug. 10th, 1878, p. 185.

nal walls yield and become overstretched; the abdomen is soft, pressure gives no pain, and no tumor can be felt. This condition is sometimes seen with congestion of the liver, and with that condition known as "pot belly." I have noticed it not rarely in delicate children after an acute illness, as whooping-cough or measles. In children brought up by hand, with delayed dentition, it is not uncommon. It arises chiefly from the accumulation of gas in the intestines; a clear tympanitic note is heard all over the abdomen, especially in the left hypochondrium, and in both flanks. The epigastrium is prominent, either from undue distension of the stomach, or of the transverse colon behind it. "The little child's abdomen is large because its abdominal and intestinal muscles are weak, its pelvis is shallow and small, its diaphragm flat, and its liver and spleen large, and because much flatus is formed in its small intestines, especially during the digestive process."*

Enlargement of the abdomen, when seen in connection with tubercular peritonitis, causes pain on pressure; the abdomen is irregular in outline, partly from the enlarged viscera beneath or from semi-organized lymph; the bowels are often very loose, and the belly painful; the face is pinched, and the child rapidly loses flesh.

The liver may remain very large without any impairment of the general health, a condition we sometimes see in connection with the strumous diathesis and general cachexia.

CHAPTER XXVI.

ASCITES.

Causes—Nature—Symptoms—Diagnosis—Treatment—Iron—Saline aperients—Copaiba—Paracentesis.

Disease of the liver, by obstructing the portal circulation, is the most common cause of ascites in children, but it may arise also from great enlargement of the spleen, from chronic peritonitis, and from tabes mesenterica. The enlarged glands in the latter disease cause friction and irritation of the peritoneum, and so lead

* On Extra-pelvic Tumors of the Abdomen, by Sir W. Jenner, Bart., M.D., Brit. Med. Journ., Jan. 2d, 1869, p. 2.

to serous effusion into the cavity. It has been supposed to arise from the pressure of enlarged lymphatic glands on the portal vein near the liver.* It appears to me that cachexia and anæmia are not uncommon causes of this form of dropsy. In the absence of any history of acute illness, and if organic disease is not present, it seems a reasonable inference that a loss of tone in the peritoneum or lymphatics may favor the secretion of serum into the peritoneal cavity. I have published a case in illustration of this view.†

Symptoms.—The abdomen is more or less prominent in proportion to the amount of fluid present. If the distension is great the diaphragm is pushed upwards, and there may be some dulness on percussion and defective expansion in the lower lobes of the lungs. Over the seat of effusion the percussion-note is dull, chiefly heard in the flanks, and more in one flank than in the other when the patient turns on his side. Along the anterior surface of the abdomen the percussion-note is clear, and this varies according to the amount of air which the intestines contain; the higher they float the more tympanitic is the note. The constitutional symptoms are a gradual decline in the general health; the skin is dry; the bowels are usually constipated; the urine is scanty, acid, and high-colored, from the presence of urates, which may be whitish instead of pink; there is often thirst and a voracious appetite. As the abdominal distension increases, the superficial veins become enlarged and tortuous; the child is thin and wasted, the features are pinched, and the nights restless and wakeful. As the disease advances the emaciation increases, a hectic flush appears on the cheeks at night, the pulse becomes rapid and feeble, respiration is accelerated, and death takes place from exhaustion.

The *diagnosis* mainly rests on the primary and uniform swelling in the abdomen, without any œdema of the legs, and the absence of swelling in the upper parts of the body, the presence of disease in the liver, and the high-colored, scanty, and non-albuminous urine. As ovarian cysts have been met with in children, this fact should be borne in mind in all cases of doubtful diagnosis. Hydatid cysts of the liver, hydronephrosis, enlarged spleen, and mesenteric glands must also be taken into consideration, and the conditions

* Brit. Med. Journ., Nov. 20th, 1875.

† Ascites in a Young Child; Treatment by Paracentesis and Copaiba; Recovery, by W. H. Day, M.D., Clin. Trans., 1877, p. 164.

belonging to each carefully investigated. The chief points of diagnosis in the case of ovarian tumors, as distinguished from ascites, are to be found in Mr. Spencer Wells's work.*

Treatment.—This to a great extent depends upon the cause. If there is disease of the heart, lungs, or kidneys, these affections must receive appropriate treatment; but usually, however, the mischief is seated in the liver, which we must endeavor to overcome. Whatever may be the cause which has induced the disease, the bowels should be kept freely open, and for this purpose the compound jalap powder, given early every morning, is a good remedy to drain off the fluid. When the urine is scanty and high-colored, digitalis and citrate of potash will relieve the congestion of the kidneys and act as a brisk diuretic. Then the syrup of the iodide of iron is a good tonic, or the tincture of the perchloride of iron may be given. Ascites has over and over again yielded to tonics, and they ought to have a steady and fair trial where the effusion appears to be independent of any organic lesion.†

If these remedies fail, as they frequently will do, copaiba is an excellent remedy, according to some authorities, acting as a diuretic and carrying off much fluid by the bowels. In the case just alluded to, I believe its action was that of a general tonic and not that of a diuretic. It does not disagree with digestion or appetite. Other cases of ascites are recorded which have yielded to the use of copaiba. Dr. Liveing's two cases of improvement seemed due to its action as a diuretic, but it should be held in mind that the urine was albuminous in both, and remained so when the patients left the hospital, although the dropsy had entirely disappeared. There was chronic (Bright's) disease in one, and a soft systolic bruit at the cardiac apex in the other, so that the relief at best was only temporary.‡

When all drugs have proved unavailing, and the increasing pressure causes pain and discomfort, paracentesis must be had recourse to, and the operation should be performed before the abdomen is too much distended. The tonic treatment and the copaiba may be again employed after the tapping, and a permanent cure may follow the operation in some cases when it has

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* Diseases of the Ovaries, 1872, p. 125.

† Case of Ascites treated successfully with Tonics, by J. S. Bristowe, M.D., Clin. Trans., 1869, p. 12.

‡ Cases of Ascites treated with Copaiba, Clin. Trans., 1870, p. 30.

been twice performed. Such cases seem generally due to liver disorder, or to debility and anæmia.

CHAPTER XXVII.

INTESTINAL WORMS.

Varieties of—OXYURIS VERMICULARIS, OR ASCARIS VERMICULARIS—ASCARIDES (THREADWORM)—ASCARIS LUMBRICOIDES (ROUND-WORM): *Symptoms—Causes—Treatment.* TRICHOCEPHALUS DISPAR (LONG THREADWORM)—TÆNIA OR TAPE-WORM: *Treatment.*

THE presence of worms in the intestinal canal is one of the commonest troubles of childhood. Worms produce in some cases an amount of constitutional disturbance and local irritation which the best observers may be pardoned if they attribute to specific disease.

It is with the two nematodes, *Oxyuris* and *Ascaris*, that we have generally to deal in childhood. The *Oxyuris vermicularis*, or threadworm, has its headquarters in the cæcum, but frequently descends to the lower part of the large intestine or rectum. Worms infest children, whether living in country districts or in the confined dwellings of houses and cities; but their presence is not necessarily incompatible with previously good health. They are not uncommon in strumous subjects, or in children laboring under chronic disease, in whom the digestive and assimilative functions are at fault—where there is subacute inflammation of the intestinal glands (muco-enteritis). They are often spoken of as "ascarides," since Linnæus placed their species under the genus *Ascaris*. But the term is confusing, as they have long been classified under a separate genus, *Oxyuris*, and must not be confounded with the long worm *Ascaris lumbricoides*.

In a mass of *Oxyuri*, or threadworms, the majority are females, and appear like little moving pieces of thread, about a quarter of an inch long, with a pointed tail. The males are shorter, and keep the anal end of their body more or less coiled up. The eggs are commonly introduced by the habit which children have of biting their nails. They are hatched in the stomach, the larvæ under-

going their subsequent growth and metamorphosis within the alimentary canal.

Symptoms.—The appearance of the parasite in the motions is of course the only pathognomonic sign; as it almost exclusively inhabits the large intestine, it is very rarely vomited like the true *Ascaris*,* though the constitutional symptoms are the same in both affections. But the presence of threadworms in the bowels excites symptoms of reflex irritation, by which they may be suspected before they are seen. Itching of the nose and anus is the most frequent feature of this kind. At night the irritation becomes so great that sleep may be prevented, and in any case the child is certain to indulge in the dirty habit of continually touching the anus. The finger nails often excoriate the skin around that orifice, leaving marks once erroneously believed to be caused by the biting of the worms. The irritation causes a free discharge of mucus from the lining membrane of the intestine, and the child constantly voids this at stool by straining, and thereby often producing prolapsus ani. The worms appear in the motions in great numbers, and escape of their own accord from the anus; they even enter the vagina in female children, and set up leucorrhœa. Symptoms of vesical irritation also develop themselves, sometimes simulating calculus, more usually seen in the form of a frequent desire to pass water. Priapism is also not unfrequently observed in male children troubled with threadworms, and Lallemand was of opinion that in this manner the parasites produced the habit of masturbation, with its consequent evils. All general disorders, especially those of the nervous system, are aggravated by the presence of threadworms; this particularly applies to the spastic contractions of muscles which produce some forms of talipes.

Treatment.—As the threadworms are mostly confined to the lower part of the large intestine they are within the access of enemata. An injection of infusion of quassia, mixed with table-salt or sulphate of iron, is perhaps the most effectual method of treatment; but as it seldom or ever effects a cure at once it must

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* Dr. Goubert, in his recent work, Des Vers chez les Enfants, remarks that "they can never reach the stomach or the small intestine, and consequently can never be thrown up in vomiting, as Bréra and P. Franck have asserted." But Dr. Pampa describes a case where a child aged ten was troubled by *Oxyuri* appearing in her mouth in the evening, Lond. Med. Record, 1878, p. 524.

be frequently repeated.* Lime-water is another good application.† Since the bowels generally act irregularly when threadworms have remained long in the large intestine, the treatment should be commenced in all cases by the administration of an alterative aperient, such as gray powder and rhubarb, or rhubarb and soda. When children are strong enough, one grain of calomel and three of scammony is a good aperient to start with. The mucous discharge produced by the irritation of the parasites appears to afford lodgment for them, and so must itself be cleared away to insure their complete expulsion. They rapidly reappear. Two or three grains of santonin at night, followed by a dose of castor oil in the morning, will effect the discharge of these threadworms. Afterwards steel wine, or the tincture of perchloride of iron, will be useful. "Iron, in these circumstances, acts, I believe, not merely as a tonic, but also by its admixture with the secretions, it renders the intestinal mucous membrane unsuitable to serve as a nidus for the reproduction of the worms."‡

Dr. R. Liveing informs me that as a local application, about an equal quantity of mercurial ointment and lard, smeared on the anal aperture at night, will prove effectual in relieving the itching and preventing the escape of the worms and ova. The child thus gives up the habit of scratching with the fingers, by which the ova are introduced under the nails and then conveyed to the mouth.

Children should not be permitted to drink unfiltered water, nor to eat salad, radishes, or cress, unless thoroughly washed, as the ova of the *Oxyuris* are possibly transmitted in this way. It is significant that of country children, the peasant class are the most subject to intestinal worms. Of course they have more opportunities of drinking out of wells or brooks, and of eating raw food, than have young people in town. So long as infants are fed with breast-milk they are not troubled with worms.

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* Formula 46:

℞. Sodii chlorid. vel
Ferri sulph., ... ℥j
Inf. quassiæ, ... Oj
Fiat enema. A third part to be used every morning.

† Formula 47:

℞. Liquor. calcis, ... ℥vj
Fiat enema. To be used every morning.

‡ West, on Diseases of Infancy and Childhood, 1859, p. 637.

The *Ascaris lumbricoides*, or round-worm, by no means rare, is however less frequent than the threadworm. It is best to distinguish the two species by their English names, for, as I have above remarked, the generic name *Ascaris* is still retained by many in speaking of the *Oxyuris*, though the two worms are very different in appearance. The round-worm is a very large parasite, always several inches in length when full grown, and sometimes a foot long. It bears a strong superficial resemblance to the common earth-worm (*Lumbricus terrestris*), which is not a nematode at all, nor even does it belong to the class *Scolecida*. The earth-worm is included in the sub-kingdom Annulosa, and, like the leech, it differs from the Crustacea in lacking true feet. Independently of the different internal structure this worm is much stouter than the *Ascaris*, and bears eight rows of minute bristles, which give its integuments a rough feeling.

The male *Ascaris* is rarer and smaller than the female, and its anal extremity is curved as in *Oxyuris*. Davaine has shown that the female produces over 50,000 eggs! That observer, confirming previous researches, has proved that the eggs do not hatch in the intestine of the child in whom the parent worm dwells. The ova are expelled in the fæces, and find their way into sewage-water, etc. They are absolutely indestructible by any natural force, though boiling, or many other artificial processes, will destroy them. They are introduced into the bowels by unfiltered drinking-water, etc., and, being dissolved by the action of the digestive juices, the embryos which they contain are set free.*

Not only does the *Ascaris* differ from the *Oxyuris* generically, but it differs also in habitation. It dwells in the small intestine, often in numbers, but never in such masses as are seen in bad cases of accumulations of threadworms in the rectum. It is not unfrequently vomited. A countrywoman in one of the wards of the Samaritan Hospital, in the autumn of 1878, brought up a lumbricus during an attack of sickness after ovariotomy. Mr. Alban Doran informs me that a man in St. Bartholomew's Hospital, in

* Davaine, Traité des Entozoaires et des Maladies Vermineuses de l'Homme et des Animaux Domestiques. Goubert's work, already quoted, contains a very clear, yet short, description of *Ascaris* and *Oxyuris*. The works of Cobbold and Küchenmeister should be consulted by those desiring minute details with regard to entozoa.

1870, vomited several when dying of dysentery contracted a few months before in Buenos Ayres. Still oftener do children throw up round-worms, and in violent retching the parasites may be expelled through the nares as well as by the mouth; or they may remain in the nasal cavities a short time, and suddenly appearing out of the nostrils cause great alarm to the patient and his parents. The *Ascaris* sometimes escapes out of the cavities of abscesses formed after perityphlitis when such collections of pus are opened spontaneously or surgically. They may also enter the peritoneal cavity through typhoid or gastric perforating ulcers. But Davaine has shown that it is quite impossible for the worm to force its own way through the coats of the intestine, as it is not provided with cutting or boring appendages.

Symptoms.—This worm gives more trouble than the *Oxyuris*, and often produces much reflex irritation. The bowels act in an irregular manner, dull pain is felt around the umbilicus or in the epigastrium, and there is itching at the nose and anus. Any malady from which the patient is already suffering will be aggravated. But since, as in the case of the threadworm, the appearance of the worm itself is the only reliable symptom, it is most unjustifiable to subject a child to a long course of worm medicines on suspicion alone. If the worm really exist in the intestine, it will soon be discharged in the motions after a few days of treatment. It must be remembered that in cases of round-worm some morbid condition of the intestinal mucous membrane very often pre-exists.

Treatment.—Prophylaxis is more important and more efficacious in the management of disorders caused by this parasite than in cases of invasion of the *Oxyuris*, for the round-worm always appears to be introduced, as an egg, in water, whether taken pure or with raw food washed for the table. As for cure, the physician, knowing that these parasites often do little harm, must not forget that Davaine has recorded several fatal cases where a round-worm has found its way through the glottis during a fit of vomiting. Moreover, the reflex results of the presence of the parasites induce dirty habits, such as picking of the nose or scratching the anus.

By far the best remedy for the round-worm is santonin. From one to six grains should be given to a child, according to age; it

may be administered in a powder mixed with sugar,* or as the compound scammony powder.† Dr. Eustace Smith speaks highly of santonin in the form of confection.‡ It is advisable to follow up its administration by a dose of castor oil, and then to give tonics, particularly steel wine, or the mineral acids with some bitter infusion. I am in the habit of giving the santonin every other night for about four nights, and during the day a tonic of iron, arsenic, or quinine. I sometimes combine these three remedies together, but I am generally content with the two first (Form. 93). The persistence of the parasite after long treatment will most likely be due to the neglect of prophylactic measures, such as a careful examination into the water-supply and the sanitary measures.

Another nematode, *Trichocephalus dispar*, infests the cæcum and colon. It measures over an inch in length, and the anterior part of its body is filiform, the posterior being much stouter. It is remarkable for producing, as a rule, no symptoms of irritation, and it is only recognized in lifetime by the appearance of its ova in great quantity in the fæces. It may be expelled by doses of santonin, or active aperients.§

Tapeworm.—The tæniæ are Scolecida, arranged in a distinct order very different from the nematodes. Their anatomy is very

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* Formula 48:

℞ Santonin, ... gr. iv–vj
Sacchari, ... gr. ij

Fiat pulvis. To be taken every third night.

† Formula 49:

℞ Santonin, ... gr. ij
Pulv. scammonii co., ... gr. v.

Fiat pulvis. To be taken at bedtime.

‡ Formula 50:

℞ Santonin, ... gr. xv
Pulv. zingib., ... gr. v
Pulv. jalapæ, ... ℥ss.
Sulphuris loti, ... ℥jss.
Conf. Sennæ, ... ℥j.—M.

℥j three times a day.

§ The practitioner wishing to identify a parasite which he believes to be *Trichocephalus dispar*, will find specimens (Nos. 86 and 87) in the collection of Entozoa at the Museum of the Royal College of Surgeons, arranged by Dr. Cobbold.

complicated, and their method of propagation has already been described in the chapter on "Hydatid Diseases."*

"The tænia† is rare in childhood; in 206 of Wawruch's cases, 22 were children under fifteen years of age, the youngest was 3½; Legendre (*Archives Génerale de Médécine*, vol. iv, p. 642) has collected from different authorities 26 cases of tapeworm in children under twelve. (In children from fourteen to fifteen months of age, 2 cases; two years old, 1 case; three years old, 2 cases; four years old, 2 cases; five years old, 3 cases; six years old, 3 cases; seven years old, 4 cases; eight and nine years old, 1 case; ten years old, 2 cases; eleven years old, 4 cases; twelve years old, 1 case.) Hufeland, quoted by M. Davaine, has seen an infant six months old, and at the breast, subject to tapeworm; 'on different occasions he passed up to twenty meters (over sixty-five feet) of tænia, *sans accident retentissant sur sa sante.*'"

The treatment will be similar in childhood to that adopted for adults. The remarkable words which we have left in their original language at the close of the above quotation fortunately apply, at least to a great extent, to most cases. The extract of male-fern is as efficacious in the young as in the old. It is a good plan to see that the bowels are effectually emptied before beginning the specific treatment, and to attain this end a mild aperient should be given occasionally, and the diet, for a few days, ought to consist only of milk and beef tea. When the attempt is made to dislodge the parasite a dose of castor oil should be given at night, and the oil of male-fern early on the following morning.‡ Foreign writers prefer pomegranate and kousso for children. Goubert gives 15 grams (equivalent to 231 grains) of pomegranate-root-bark, in decoction, to children under five, and 20.40 grams for a child from six to twelve, in 750 grams of water,

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* The Museum of the College of Surgeons contains numerous specimens of the beef tapeworm (*T. mediocanellata*). One of these is from a little girl (Entozoa series, No. 116). This is much more common than the pork tapeworm (*T. solium*). Dr. Cobbold estimates the proportion in England at 94 per cent. in favor of the former species.

† Goubert, op. cit.

‡ Formula 51:

℞. Ext. filicis liquid., ... ℥ss.-℥j
Syr. zingib., ... ℥j
Pulv. acaciæ, ... gr. x
Aquam cinnamoni ad . . . . . ℥j.—M.
Fiat haustus. For a child from five to ten years old.

to be taken in three doses at intervals of half an hour, followed by castor oil if the parasite be not passed within six hours.

The exotic and rarer parasites hardly come within the scope of this work. But, in conclusion, a few general remarks may be made on the symptoms which worms are capable of producing, and how difficult it is sometimes to form a diagnosis.

Symptoms of an obscure and deceptive character, which cannot be classified under any definite disorder, and which vary from day to day, are frequently cleared up by the discovery of worms. Lurking mischief in the lung or brain has been apprehended in some cases, or the approach of fever has seemed imminent in others. Fits of passion, violent screaming, restless sleep, and even fits of epilepsy or chorea, have been ascertained to depend upon these parasites in the intestines, and the symptoms have been found to pass away on their expulsion. A child so affected loses its animation, and is languid and out of sorts; it suffers from headache, and its temperature is high in the evening. This has been known to reach 103°, or more. The child becomes weak and thin, and ceases to thrive; the appetite is capricious, and it sometimes refuses almost any kind of food that is offered, while at others it is quite ravenous; the eyes are dark and hollow, the tongue is furred, and there is sometimes a dry hacking cough, which makes parents anxious, although they are assured that no lesion in the lungs can be discovered. Such cases are often ascribed to commencing tubercular mischief in the lungs or brain, and the best observers have been misled in their diagnosis. The cough being the result of intestinal irritation the child recovers its usual health as soon as the worms are removed.

These symptoms are very treacherous, and they continue so obstinate in some cases that only time can clear up their true meaning. They may simulate brain disease by the occurrence of a convulsion followed by squinting. Vogel mentions the case of a child who was attacked by convulsions, and a few days after with all the symptoms of acute hydrocephalus, followed by death in a few hours. On a post-mortem examination, the brain and all the internal organs were found in a perfectly healthy state, "but in the intestinal canal there were more than a hundred round-worms, rolled up in small and large balls, at some points completely choking up the calibre of the canal; the mucous membrane itself in the same regions had become reddened."*

* Diseases of Children, 1871, p. 207.

CHAPTER XXVIII.

DISEASES OF THE NASAL CAVITIES.

CORYZA—NASAL CATARRH (COMMON COLD, OR COLD IN THE HEAD): *Nature—Causes—Pathology—Symptoms—Treatment.* OZÆNA: *Nature—Causes—3 Forms.* 1. SCROFULOUS OZÆNA. 2. SYPHILITIC OZÆNA. 3. TRAUMATIC OZÆNA: *Symptoms—Treatment.* EPISTAXIS: *Nature—Causes—Treatment.* LARYNGEAL AND TRACHEAL IRRITATION IN YOUNG CHILDREN: *Symptoms and causes—Diagnosis from croup—Local and general treatment.*

THE entire mucous membrane in infancy and childhood is prone to morbid action, commencing at the mouth or nostrils, and frequently exciting catarrh, not only in the larynx and air-passages, but in the intestinal tract also.

The mucous membrane of the nose is liable to hyperæmia, inflammation, and tumefaction.

Coryza, or cold in the head, is a common ailment, and is frequently observed in delicate and strumous children. It is most common in winter, but it may occur at all seasons of the year. It may be associated with bronchitis, laryngeal catarrh, measles, whooping-cough, etc.

Causes.—These are exposure to cold when the surface becomes chilled. There is, according to Rosenthal, a heat-producing area and a heat-radiating area, and when a loss of balance takes place between the two, a chill to the surface brings about this frequent ailment. If heat-loss and heat-production are equivalent, no harm results from exposure. Whenever a person is exposed to cold, the cutaneous vessels undergo contraction, so that the blood accumulates in the internal organs, and more animal heat is evolved than is usual. Hence a child more easily catches cold if it is not sufficiently protected by proper clothing, or the temperature of the rooms in which it lives and sleeps is too low. When, on the other hand, the atmosphere of the room is too hot, or active exertion is undertaken in it, so as to induce free perspiration, the vessels of the skin dilate, and animal heat is freely given off. The vasomotor nerves of the vessels of the air-tubes become partially paralyzed, and hence a catarrhal state is easily set up. If now, as often happens, the child exposes itself to a draught of cold air, or goes into an apartment that is many degrees too low, then the vessels which are dilated lose their power to contract, and the

blood, instead of passing freely through them as before, stagnates in them, or accumulates in the deeper tissues or organs of the body. All the morbid elements, instead of finding an outlet through the skin, accumulate in the blood, to the detriment of the patient's general nutrition. If the atmospheric air inhaled at the same time be not pure, another evil is added; the lungs, like the skin, do not part with a sufficient quantity of carbonic acid, and the condition of cold may lead to some more serious state. Every case is not equally severe. When the blood is only slightly contaminated with refuse products, the cutaneous vessels, after moderate dilatation, soon resume their normal calibre, and a cold is either avoided altogether, or it is very transient in duration.

Living in rooms above a temperature of 65° predisposes to cold by weakening the system. "There are few causes which promote susceptibility to cold so much as sleeping in close rooms; the blood being thus charged with carbonic acid and other foul gases is prone to stagnate, and thus congestion, the first step to catarrhal inflammation, occurs."*

Local irritation arising from fog and mist, the entrance of dust into the nostrils, air laden with pollen from hay, and repeated blowing of the nose, are all excitants of nasal catarrh.

The most intense nasal catarrh is sometimes induced by taking a few grains of iodide of potassium. I myself suffered from sleeplessness and severe pain across the frontal sinuses, with great irritation of the lining membrane of the nose, and a peculiar sensation of fulness and tightness across the forehead, in consequence of taking this drug. The discomfort was so peculiar and severe, that I never before experienced anything at all like it from the most severe catarrh.

Pathology.—The capillaries are swollen and engorged with blood, producing hyperæmia and congestion of the mucous membrane. This furnishes an acid, saline, and watery secretion, which inflames and even excoriates the lips. In severe cases, the submucous tissues are infiltrated, and the pharyngeal glands are enlarged, or even ulcerated. As the swelling of the mucous membrane diminishes, the discharge becomes thicker in consistence, and even purulent in character.

As to the possible contagion of catarrh, it cannot be denied that the frequency with which colds run through a household seems

* Colds and Coughs, by E. Symes Thompson, M.D., 1877, p. 26.

to prove that those who suffer may by contact impart it to the healthy. Using the same pockethandkerchief may become another medium of conveyance. The contagious principle given off by sneezing or coughing may excite irritation in a healthy mucous membrane, and produce catarrh.

Symptoms.—The earliest symptoms are those of dryness and titillation, with the sensation of obstruction in the nostrils, which induces a disposition to blow the nose frequently. This is accompanied with sneezing and pain across the frontal sinuses, or even headache; the voice is thick and nasal, the conjunctivæ are injected or inflamed, and tears run down the cheeks; if the discomfort is so great that there is much blowing of the nose, considerable epistaxis may result; the larynx may be involved, inducing soreness and hoarseness, whilst the catarrh may extend up the Eustachian tube, producing deafness and singing in the ears. There is more or less febrile disturbance, loss of appetite, and thirst.

A large number of cases of incurable deafness, chronic conjunctivitis, and lachrymal disease have been traced to frequent attacks of coryza.*

Treatment.—When an acute catarrh is developed with febrile disturbance and running of the nose, confinement to bed in a warm room, fluid food, and diluents will be necessary to encourage diaphoresis, and so relieve the internal organs from mischief. A warm linseed poultice covering the entire chest is often comforting and beneficial. Ipecacuanha, small doses of tartarated antimony with liquor ammoniæ acetatis (Form. 7) will be suitable; while a saline aperient (Form. 8) will cool the system, and bring down the fever. A pleasant cooling drink may be made by adding one teaspoonful of acid tartrate of potash (cream of tartar) to a pint of barley-water, sweetened and flavored with lemon-juice. It acts as a refrigerant, diuretic, and aperient. A correspondent speaks highly of full doses of the tincture of belladonna night and morning in severe coryza. Two doses generally complete the cure. As children bear this drug so well it may be given in suitable cases.† Fruit lozenges, and lozenges of Iceland moss and chlorate of potash are demulcent, and encourage secretion. Morphia and other sedatives require to be given with great care to children, for by arrest-

* Brit. Med. Jour., vol. i, 1880, p. 490.

† Ib., vol. i, 1877, p. 220.

ing secretion they may increase the congestion of the mucous membrane, and derange the health.

Ozæna.—The mucous membrane of the nose is also liable to an eczematous or ulcerating surface, from which a thick, irritating discharge escapes. The mucous membrane is thickened and congested, as in ordinary catarrh. This is followed by the drying up of the secretion into thick crusts, which almost close the nasal cavities, and become a source of great annoyance to the child. When these crusts are removed the surface is found ulcerated beneath.

"In many instances we find the posterior wall of the pharynx covered with similar crusts."* The discharge is muco-purulent and bloody, escaping from one or both nostrils, highly offensive in odor, tedious in duration, and difficult of cure. When the patient lies down the discharge may trickle into the larynx, and set up congestion and irritation there.

The leading feature of ozæna is intense fetor of the breath. The discharge may be too offensive for the patient to go into society, and yet the nasal bones remain unaffected. When the discharge is of this character we may suspect that diseased bone is at the root of the evil. There is sometimes burning and throbbing pain in the nostrils, and the integumental covering of the nose is red and swollen when the discharge does not freely escape.

Causes.—These discharges are met with in delicate children, and not unfrequently follow tedious catarrh or the eruptive fevers, as measles and scarlet fever. Ozæna may be associated with syphilis and scrofula. A blow on the nose may act as an exciting cause.

Mr. Warrington Haward, in an excellent paper on ozæna, from which I have gathered much information for this article, classifies the disease under three principal heads: 1. Scrofulous ozæna. 2. Syphilitic ozæna. 3. Traumatic ozæna. He also mentions an "idiopathic ozæna" not referable to either of the above causes.†

1. *Scrofulous Ozæna.*—A large number of cases of ozæna appear to arise from scrofula in children. The skin and mucous membranes are especially liable to be affected in this diathesis, and hence we see troublesome eczema, strumous ophthalmia, otorrhœa, bronchial affections, and chronic diarrhœa. Children with this

* Niemeyer's Textbook of Practical Medicine, 1875, vol. i, p. 290.

† St. George's Hospital Reports, 1874–1876, p. 130.

constitutional taint suffer from enlarged cervical glands, which sometimes ulcerate and are slow to heal. The nasal mucous membrane is thickened and swollen, and pustules and small round ulcers are seen on the lining membrane. This form of scrofula is often accompanied by troublesome eczema (Haward). The horrible fetor of ozæna is owing to the discharge being either pent up in a cavity from which it cannot escape, and therefore it decomposes, or to the presence of a piece of dead bone. In the latter case no antiseptic injection will be of any service till the necrosed bone has been removed.

2. *Syphilitic Ozæna.*—Syphilis is the next most common cause of ozæna, of which there are symptoms not to be mistaken. The ulcers are superficial or deep, excavated and sloughing; they are larger, fewer in number, and more irregular in outline than in the preceding variety. When the bone becomes affected the discharge is most offensive.

3. *Traumatic ozæna* is the result of injury to the nose, or of the presence of some foreign body. This sets up periostitis, followed by necrosis of the bone, and the cure depends upon its removal. In children, peas, beans, bits of wood or pencil are sometimes thrust up the nose, giving rise to inflammation and ulceration of the mucous membrane. If the offending body is removed before the bone is diseased, the discharge, which depends on a local cause, usually soon ceases.

"*Idiopathic ozæna*," according to Mr. Haward, seems to frequently follow scarlatina and measles. In my own experience a very severe case of ozæna followed measles in a child who had no constitutional taint. A thin, semi-purulent, and sometimes gleety discharge continued for many weeks, but ultimately ceased. The nasal mucous membrane was red and swollen, and easily bled on examination or blowing the nose.

When purulent matter is pent up in the sinuses there is severe frontal headache and sleeplessness at night. Cases are mentioned where the discharge has found its way into the cranium, or the sinus has become so distended that it has encroached on the orbit and displaced the eyeball.

Treatment.—With the aid of the laryngoscope, the nasal cavities, previously washed out by means of the nasal douche, can be well examined. Mr. Haward also recommends that the nostrils be dilated by Fraenkel's speculum, which he says is the best.

In the treatment of *scrofulous ozæna*, the general health must be attended to. Cod-liver oil, steel wine, the ammonio-citrate of iron, or reduced iron, will be necessary. The nasal cavities may be washed out frequently with a solution of common salt (half an ounce to a pint of slightly warm water), or tincture of myrrh ℥ij, chlorate of potash ℥ij to a pint of water, or ℥ij of Condy's fluid to a pint of water. Sea air is of the greatest utility.

In the treatment of *syphilitic ozæna* mercury must be employed, and the best mode of using it, according to Mr. Haward, is the calomel vapor-bath, recommended by Mr. Henry Lee. Hyd. c. creta for children is valuable, whilst iron, bark, cod-liver oil, and iodide of potassium are to be given at the same time. As a local application, when the bone is not affected, Mr. Haward recommends an ointment of fifteen or twenty grains of red oxide of mercury, and olive oil and lard, of each half an ounce. After syringing with the nasal douche, this should be applied with a brush. He also speaks well of the ammonio-chloride of mercury ointment, with olive oil.

In the *treatment* of the *traumatic form*, antiseptic washings will be needed, and the necrosed bone must be removed if present.

For the management of the *idiopathic forms*, the general health will require attention, and the application from time to time of a lotion of chlorate of potash and myrrh. Glycerin of tannic acid and dilute mercurial ointment are also useful in some cases.

Carbolic acid has been found very serviceable in ozæna, and in other discharges from the nose and throat. All mucus should be first cleared from the affected parts by a weak alkaline solution, and then carbolic acid (1 in 40) should be injected along the floor of the nostrils, or into the pharynx, as the case may be.*

A diluted tincture of iodine (1 in 30) may be sometimes injected into the nostrils with advantage.

In chronic ozæna, where the mucous membrane is in a relaxed and weak condition, twenty to thirty grains of alum, added to eight ounces of water, form an excellent application. It should be injected up the nostrils with a bottle syringe, or one end of an elastic tube may be inserted in a basin containing the solution, at a proper height, and the other placed in the nostril. If the head is bent forward and the mouth kept open, the fluid will permeate

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* Brit. Med. Jour., 1869, vol. i, p. 145.

the nasal cavity and run out of the other nostril. Carbolic acid is preferable where there is much fetor.

Mr. Pugin Thornton recommends a cold lotion* to be injected daily up the nostrils by means of a hand-ball spray apparatus. He says it has succeeded in very obstinate cases, after the inhalation of camphor, benzoin, and carbolic acid had failed. Eight or ten applications have cured the most obstinate cases.†

Glycerin of tannin is another application, particularly useful in syphilitic ozæna. Iodide of potassium may be cautiously given, but small doses of mercury with bark or iron in such a case would be preferable, as this salt so often induces nasal irritation.

Nitrate of silver (gr. v ad ℥j) is serviceable where the mucous membrane is swollen, and the complaint seems within reach.

In those cases that resist all medical treatment, a surgical operation may become necessary.

Epistaxis is the most common form of spontaneous hæmorrhage, arising in all likelihood from the slender resistance which the walls of the vessels afford to the force of the blood-current. The rupture, too, in many instances, probably depends upon a morbid state of the capillary walls or the hæmorrhagic diathesis.

Among the causes which predispose to this affection are catarrh and whooping-cough, tuberculosis, disease of the spleen, and the exanthemata. A blow or fall on the nose may excite bleeding at once. One of the worst cases I ever saw was that of a girl suffering from typhoid fever, where the blood had become thin and deteriorated. Plugging of the posterior nares was required to arrest the profuse bleeding; the patient bled from the bowels and urinary tract at the same time, and the body was covered with hæmorrhagic spots (petechiæ).

Epistaxis is rarely seen in very young children or in those who are strong and well developed. It is most common in the delicate, who have weak muscles and thin bones. The blood may flow from one or both nostrils, either in drops or a full stream. If the hæmorrhage should happen during sleep, the blood flows back into the pharynx, and excites cough if it gets into the larynx, or

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* ℞. Sodæ carb.,
Sodæ biborat., āā . . . . . ℥ij
Liq. sodæ chlorinatæ, ... ℥ss.-℥ij
Glycerini, ... ℥j
Aquam ad . . . . . ℥viij.—M.

† The Treatment of Ozæna, Brit. Med. Journ., 1880, vol. i, p. 475.

vomiting if it goes into the stomach. If, as often happens, coagulation takes place quickly, the hæmorrhage is speedily checked; but if the blood be thin, the tendency to coagulation is so slight that the patient may bleed till the lips and face are pallid, the conjunctivæ blanched, and the skin is of waxy whiteness. After continued and great loss of blood, the heart becomes weak and irritable, there is faintness and prostration, the surface is damp and sweating, there is restlessness, headache, and even delirium.

Treatment.—Absolute rest in bed, in a semi-erect posture, should be observed in all cases of nasal hæmorrhage where the loss is considerable, and the effects of the drain are telling upon the system. It is most important to avoid blowing of the nose, which, however, in children is by no means easy to prevent. Holding the nostrils tightly between the fingers, and applying cold to the bridge of the nose will stop the hæmorrhage in most cases. If this fail, the injection of iced water up the nostrils with an ordinary bottle syringe may prove effectual. The introduction of powdered alum, or ox-galls has sometimes succeeded. Internally, gallic acid, sulphuric acid, tincture of the perchloride of iron, and ergot will be suitable remedies. Sir T. Watson mentions the simple expedient of the patient raising one or both arms above his head, and of maintaining them in this position for some time.* In cases which resist all ordinary treatment, we must have recourse to the unpleasant operation of plugging the posterior nares.

Laryngeal and Tracheal Irritation in Young Children.—No sooner is the respiratory apparatus called into play than it becomes liable to disease, and it remains so from infancy to old age, especially in this variable climate. We have recorded, on the authority of Orfila, Cruveilhier, and others, that traces of inflammation and its products are even sometimes met with in the bronchial tubes and structure of the lung during fetal life. "The great transition," says Dr. Churchill, "from the atmosphere of uterine life to the severe and changeable atmosphere of extrauterine existence, renders the infant peculiarly susceptible." Exposure, as in dressing, to draughts of cold air, readily excites the mucous membrane of the air-passages, which becomes vascular, tender, and irritable. At certain seasons of the year, when the thermometer is lower than usual, affections of the breathing organs are very common among young children.

* Principles and Practice of Medicine, 4th edit., vol. i, p. 795.

Bronchitis, croup, pneumonia, arising from cold or as a sequence of scarlatina and measles, come constantly before us; but there is a condition, not expressed by either of these terms, which is apt to be overlooked, from the absence of marked physical and general signs, and from the insidious manner in which it commences and steals on. This condition is at first one of purely local irritation, occupying the larynx and trachea, neither extending to the pharynx and tonsils nor into the bronchial tubes.

A very common mode of its commencement is the following: The nurse observes that the child (probably from one to two years old) is quite well, with the exception of a slight cold, but there is no cough or other disturbance of the system; all the functions are regular, and the child sleeps well; it perhaps looks pallid, and the nostrils and upper lip are red, caused by frequent wiping of the nose, as in older children and adults when suffering from catarrh. This state of things goes on for several days, and if the weather should become mild, the child goes out of doors as in health, and the cold—for it seems no more—passes away. Should circumstances, however, prove unfavorable, these symptoms are soon succeeded by a short, shrill, barking cough, unattended by the prolonged inspiratory effort of croup and laryngismus; the pulse is quiet, and there is no fever. If the medical attendant is consulted at this stage he observes nothing of importance, the muscles of the larynx and neck are tranquil, and the child when asleep leans his head forward on his chest. The nurse will tell you that the cough is the only symptom worth notice; that it wakes the child, and makes him peevish and fretful—no doubt from the extreme tenderness and irritability of the membrane involved. The chest is clear on percussion, and there are no moist sounds from base to apex. The affection is often ascribed to teething, and on looking into the mouth the gums may be inflamed from the pressure of new teeth. Another day elapses, and perhaps in the night the child starts up in his sleep, flushed and excited, with one or both cheeks red; the skin is hot, and the little patient is irritable and alarmed; the cough is louder, more barking, and resembles croup; the respiration is not quickened in proportion to the pulse, the alæ nasi are not active, nor is the countenance anxious and distressed, as would be the case in pneumonia or croup. On looking into the throat no redness or change of any sort can be observed. As the disease creeps on, the child becomes prostrate, loses appetite, and

will not leave the nurse's arms or lie down in bed. If you apply the ear or stethoscope between the scapulæ at the upper part, you may hear a little crackling at each inspiration, or slight rhonchus; but the percussion-sound is clear throughout the chest, and the respiration is normal in all other parts. If these symptoms are not relieved, genuine bronchitis, pneumonia, or convulsions may supervene—conditions favored by the state of the atmosphere and the constitution of the patient.

So far as I have seen, the face never, at any period of the complaint, assumes that bluish tinge from imperfect aeration of the blood unless these complications arise. The physiological causes of this condition must be ascribed to nervous excitation; and in very young children, we see how this may be set up. The trifacial nerve, the pneumogastric nerve, and the spinal nerves are all separately irritated and disturbed in their functions during the period of dentition, and in gastric and intestinal disorder. Under the combined influence of cold, teething, and gastric disturbance, how easy of explanation are these laryngeal symptoms. Now croup is the disease most likely to be confused with this affection, and when we are first consulted we may reasonably pause before committing ourselves to an opinion; but there are the following broad distinctions: If the child can talk, there is neither hoarseness nor huskiness of voice; the fever is never high; the respiration not perceptibly hurried; the cough may be sudden, convulsive, and ringing, but the crowing inspiration is absent, and there is not the restlessness and anxiety of croup, nor is the larynx either tender or apparently the seat of uneasiness. The cough and expiratory bark are the symptoms of all others that resemble croup; and, at an early stage, it is difficult to decide on the disease that may be about to spring up; but when twenty-four or thirty hours have elapsed, we shall have very little difficulty. When this condition has lasted a few days, the child being one day better and another worse, you may almost with certainty give a favorable prognosis of the termination. As a rule, the precursory stage of croup does not last beyond a day or two; the hoarse voice and catarrhal symptoms being rapidly succeeded by more marked and decided proofs of a dangerous disease.

As to the treatment of these cases, first and foremost is a warm, moist, and equable temperature, not lower than 60° Fahr., or above 70°. In the acute stage of genuine croup, it might be necessary

to raise the temperature of the apartment higher than this. The cases under consideration are less acute and threatening, and it is therefore necessary that surrounding influences should not be too exhausting. If there is a choice of an apartment it should be large and airy, and candles should be used in preference to gas and lamps. On many occasions I have noticed two large gas-burners in small, low nurseries at the top of the house, where one or two children with their nurse are living through the day; so that the allowance of oxygen for each person must be very limited, and calculated to impair the general health, and to keep up rather than subdue the tracheal irritation. On removing such patients to larger and better-ventilated apartments they have speedily improved; but it is necessary to maintain a moist atmosphere, and for this purpose it is an excellent plan to place a flat kettle on the fire, with a long tube projecting above the guard of the fireplace into the room. At the end of the tube should be a transverse top, perforated with holes, like a garden flower-pot, to allow the steam to escape gradually. Such kettles are sold by Swan Nash, in Oxford Street, under the name of "Bronchitis Kettles;" in all cases of croup and laryngeal irritation they will be found of great value. Where they are not obtainable, an ordinary kettle of water should be kept boiling on the fire; and even a hot brick or fire-ball should be thrown into a pan of hot water. This keeps up warmth and moisture in the room, and soon exerts a soothing effect on the irritable membrane. When the symptoms are urgent and the cough distressing, a sponge wrung out of hot water and kept constantly applied to the throat will give relief. Unless the management be carefully looked after, the nurse is apt to make the child's clothes wet, and even to neglect the application. I therefore usually employ a piece of rag wetted in tepid water, and apply it round the throat under oil-silk. This is both a convenient and good remedy. Mustard and vinegar poultices to the throat, strong liniments, and other applications of a stimulating character distress and irritate the child, and are not to be thought of. If, as will generally be found, the stomach and bowels are not satisfactorily performing their functions, we should lose no time in applying suitable treatment. The motions are often scanty and light-colored, sometimes containing undigested articles of food; sometimes of a greenish hue and highly offensive. A grain of calomel, if the child is from one to two years old, with two grains of jalapin and two of white

sugar, will be necessary, and this will usually stir up the liver and small intestines; after a free action of the bowels the breathing will improve. In some cases I have seen, the breathing has been good in the morning and the child has appeared lively, and even played with his toys; but towards the afternoon and evening, cough has come on, and he has been more than once sick in the attempt to dislodge a little glairy mucus from the larynx. Succeeding in this, the child has gone on again comparatively well, as in whooping-cough, till the returning spasm and vomiting. But in most cases the discomfort is aggravated towards evening, and he passes a restless night, getting no sleep from the irritating cough. Under these circumstances, it is a good plan to give an emetic at bedtime; say thirty drops of ipecacuanha wine in an equal quantity of simple syrup. This will usually cause vomiting, and if not, it may be repeated in ten minutes, or even a larger dose given; but this is sufficient in most cases, and the child is not depressed by it. A saline and diaphoretic mixture, with two or three minims of ipecacuanha wine, and the same quantity of the compound tincture of camphor, will relieve the cough and calm the nervous system.

When the more acute symptoms have subsided, a grain or two of bromide of potassium may be added to each dose of the mixture with advantage. Where the cough is very irksome, a teaspoonful of a mixture composed of equal parts of aromatic syrup of senna, syrup of poppies, and syrup of squills, is worth giving occasionally. I sometimes substitute the syrup of buckthorn for the senna. This generally opens the bowels, and saves the necessity for more active medicine. Debility, pallor of face, and a wasted and wan look overtake the child when shut up in one room long together; and this is soon accompanied by a thick white fur on the back of the tongue, darkness under the eyes, and tremulous pulse. A grain of the carbonate of ammonia should be given at this stage, with a few drops of syrup of Tolu, under the influence of which the tongue cleans and the child resumes his liveliness; to this should be added a few drops of the tincture of cinchona. The child may now be brought downstairs into a large room, and gradually prepared to be taken out of doors. Throughout an illness of this kind it is most important to support the bodily strength with beef tea, veal or chicken broth, milk, thin arrowroot and water, to which a third part of milk is added, or a little isinglass in milk and water.

CHAPTER XXIX.

CROUP (LARYNGO-TRACHEAL DIPHTHERIA OF SOME WRITERS).

PATHOLOGY: *Nature of the exudation—Two varieties of croup*—1. *The mucous or catarrhal*—2. *The fibrinous or inflammatory—Symptoms, course, and progress of each form—Morbid appearances—Clinical characters of true or typical croup—Diagnosis from diphtheria and laryngismus—Treatment by the vapor-bath and emetics—Antimony—Mercury—Aconite—Tracheotomy.*

AMONG the diseases of young children croup occupies a foremost position from the occasional suddenness of its accession, the rapidity of its course, and the danger attending its termination. Parents readily recognize the first symptoms and are at once alarmed, and the child itself soon becomes terrified to a degree rarely seen in any other disease.

True croup consists in an inflammatory condition of the mucous membrane of the larynx and trachea, with the exudation of plastic lymph, which is quickly transformed into a firm adhesive membrane.

The inflammation has a tendency to seriously impede the functions of respiration by extending down the air-passages and producing troublesome and dangerous inflammatory complications in the lungs. The disease is generally acknowledged to be more frequent among male than female children. In my own experience three-fourths of all the cases that have come under my notice have happened to males.

The varieties of croup enumerated by different authors are not clearly to be recognized in practice. We may fairly speak of two varieties: 1. The *mucous* or *catarrhal*. 2. The *fibrinous* or *inflammatory* (croupous membrane), according to the predominance of certain symptoms. The disease is modified by the age and constitution of the child, and spasm or inflammation may be more severe in one case than in another.

1. The *catarrhal* or *mucous* form is attended with hyperæmia of the mucous membrane, followed by excess of secretion and dyspnœa. The symptoms may be slow and insidious in some cases, and the catarrh and cough, which precede the stage of development, excite no alarm till the hoarse voice and ringing cough announce the true character of the affection. In some instances we learn that the child has always had a delicate chest, that any exposure to damp

weather brings on cold and cough, or it may be traceable to bronchitis. The temperature in these cases rarely exceeds 101°. Such a history is favorable to an attack of croup in a young child. In another case the symptoms are more sudden in their accession. Delicate young children are sometimes seized whilst playing. In one case that came under my observation, a boy, æt. 8, left his play at 4 P.M., complaining of an uncomfortable feeling in his throat, and before six hours had elapsed the symptoms were severe and dangerous. In another case, a strong and healthy child, æt. 2½, was seized with croupal symptoms at 11 A.M., and in eight hours afterwards they had attained alarming severity. Her parents assured me that she had slept well, and was very brisk and lively till the attack came on. In these cases laryngitis would seem to begin at once. Still it will be found, with few exceptions, that some catarrhal and feverish symptoms had been present a day or two previous to the attack of croup. If an active emetic be given at this stage the breathing may rapidly improve, though the symptoms may recur and require similar treatment in the course of a few hours. In the majority of cases the following day will see the child in a fair way of recovery.

2. *Fibrinous croup* (*tracheo-laryngitis—croupous* or *membranous*) is the typical variety of the affection in its severest form. This is a more acute or intense inflammation; it is a true tracheitis, with exudation of plastic material, because the inflammation affects not only the mucous membrane but the fibrous tissue beneath. I will describe the course of the disease according to my own personal observation. It generally begins with hoarseness of voice and a peculiar harsh and ringing cough, because there is absolutely no secretion; for the same reason there is a sense of constriction in the trachea. The respiration is hurried, and the inspiratory effort is long and crowing. In some cases a few hours will bring about the most severe symptoms; the pomum Adami may be seen rising and falling very conspicuously with respiration; the eyes become swollen and bloodshot, the lips dusky, and the alæ nasi active; the skin is hot and dry, and the pulse small, hard, and rapid. Unlike the variety which has just been described, the temperature may reach 103° or more. The child may put his hand to his throat, and, in a deep hoarse voice, say or express that he cannot fetch his breath. At this stage the percussion-note is clear over the thorax, the respiratory murmur is much diminished

throughout the chest, and a loud sonorous râle attends it. No moist sounds have as yet been heard. As the case goes on, the croupal exudation becomes more organized and clings to the larynx, when, if the case progresses favorably, either the cast is thrown off or resolution ensues with absorption. If the disease is extending, inspiration is now greatly impeded from blocking of the trachea by the false membrane; there may also be a tough piece of lymph in the trachea which cannot be dislodged. The larynx and muscles of the neck are very active. Notwithstanding the laborious and painful respiration the child may, nevertheless, sleep soundly, though waking occasionally in terror. Thirst is generally present, and swallowing may be painful, but I have known a child drink a large cup of milk half an hour before death. Still, any attempt at deglutition is generally painful and brings on the cough. The pulse now becomes small and weak, and reaches 160; the crowing and hissing sounds in respiration increase, and the cough is incessant and painful. When the symptoms have attained this intensity, recovery is rare; the voice falls to a whisper, or departs altogether, and the cough is weak and suffocating. Sometimes, even at this stage of strangulation, shreds of lymph and false membrane are expelled by a violent effort and paroxysm of coughing; but the relief is only temporary, and the agony of oppressed breathing soon returns. The countenance now betrays the most painful anxiety; it is bloated and distressed, the tongue and lips are dusky, and the forehead and surface of the body are bathed in sweat. The pulse becomes feeble and threadlike, occasionally intermitting, or falling in frequency. The child is restless, and constantly turning about for relief, throwing the head back against the spine, or from side to side, while the fingers are bent in the palms of the hand. Agony is depicted in every feature. The struggle for breath goes on till the little sufferer dies convulsed, or passes into a state of stupor from which it never wakes again. A case that came under my notice illustrates the sudden fatal termination not infrequent in this disease. The child, æt. 3, had been going on well for two days, and was sitting up in bed playing with her toys, and breathing tranquilly. In the night the respiration became embarrassed, and she died asphyxiated twelve hours from the period of relapse. After death a thin piece of partially detached croupal exudation was found lodged in the

glottis, and this caused the fatal symptoms by occluding the larynx.

The false membrane found lining the air-passages varies in extent; in one of my cases I found, on opening the larynx and trachea, three long and narrow pieces of lymph, one upwards of two inches in length, and the others nearly as long, between the lower border of the cricoid cartilage and the last rings of the trachea, without any extension to the bronchi. In this case moist sounds were heard in the chest on the second day of the illness; but they had disappeared on the fourth and fatal day. Near the level of the upper border of the cricoid cartilage were to be seen small tough fragments of lymph, not readily detached from the surface beneath. The mucous membrane was everywhere red, and in places vividly so; but there was not any evidence of submucous effusion, for it must be remembered that the connective tissue of the larynx is very small in quantity. In other cases, lymph may be observed throughout the trachea, and the mucous membrane may be pale, except in isolated patches, where it is red and vascular. The false membrane varies much in form and consistency; sometimes it is cylindrical in shape, and loose, or adherent to the mucous membrane beneath, from which it is not readily separated; in other instances it is moulded to the shape of the bronchial tubes, where the inflammation has extended into the lungs, and in these cases the efforts of vomiting fail to bring away the source of irritation, and the danger to life is thereby increased. When the false membrane is loose and fragile, it is easier of expectoration; and it is these cases that have the best chance of recovery, particularly if limited to the larynx and trachea, the lungs not being involved in the inflammatory process.

Of late so much difference of opinion has arisen on the pathology of croup that we are induced to ask what is understood by the term?* Until recently it has generally been regarded as a local disease, an inflammation of the trachea attended with the formation of false membrane (croupal exudation), though the practical physician most commonly recognizes the disease by the spasmodic closure of the glottis, the prolonged and crowing inspiration, and

* The result of the discussion on membranous croup and diphtheria at the Royal Medical and Chirurgical Society in 1879 was, that membranous laryngitis may arise from common inflammation, or in connection with specific disorders of various kinds, but that the most frequent cause is diphtheria.

the fear of impending suffocation. If to these symptoms are added fever and inflammatory excitement, he has no doubt whatever that he is dealing with a case of genuine typical croup, such as had been known before diphtheria was recognized and distinguished in this country. To me it appears that croup, whether simple or membranous, is a totally different disease from diphtheria, and that they only approach any degree of relationship when the latter disease has invaded the larynx, and then the symptoms due to obstructed breathing are much the same in both cases.

We constantly meet with genuine croup of an acute and local inflammatory character, leading to the well-known false membrane in the trachea and larynx, as described by the old-fashioned authorities. It seems impossible that we can mistake this true croup (which we have been in the habit of meeting with all our lives) for the peculiar membranous inflammation of the trachea sometimes seen in cases of diphtheria. It is well to glance at some remarkable points of difference in the two affections.

1. True croup is prone to attack the healthiest children, and in districts where diphtheria does not prevail.*

2. True croup is apt to come on very suddenly, and in cases of recovery the general health is rapidly re-established, as compared with diphtheria.

3. In diphtheritic croup the disease is of a well-marked consti-

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* There are many instances on record of a whole family of children dying of diphtheria in the course of twenty or thirty days. Malignant epidemics of this nature have prevailed in this country since 1857; but we have never known of three cases of genuine croup happening at one and the same time to a single family, and we have never known them last so long. The recurrence of diphtheria in the same house has been noticed over and over again, and traced to bad drainage, proving that the power of contagion lurks and lingers about, ready to seize on any person lowered in health or susceptible to its influence. The disease is most prone to attack delicate children, whose homes are badly ventilated, and where sanitary precautions are neglected.

It would be impossible for the want of space to enter here into the long and vexed question as to whether the croup of Home and Cheyne in this country is the same disease as the "diphtherite" of Bretonneau. I can discover nothing to warrant this conclusion, for, if identical, surely modern writers would have had their attention directed to the resemblance in the course of long and varied experience. Diphtheria is a disease only recently described with precision; as soon as attention was directed to it physicians at once recognized a new disorder, both in its anatomical and clinical features, entirely different from anything they had previously seen, and presenting symptoms at complete variance with the so-called inflammatory or true croup.

tutional character, and is always accompanied by great depression and nervous symptoms.

4. Croup is a local disease; diphtheria is a constitutional affection, in which the kidneys and intestines may be involved. Croup is neither infectious nor contagious; diphtheria is both.

5. The cases that recover from diphtheritic croup are few, and the convalescence is not only very slow and tedious, but the throat affection is usually preceded by a characteristic membrane on the palate, and the prostration is always great. Partial loss of voice, fetid breath, swollen neck and glands, diminution of muscular power, paralysis of the muscles of deglutition, and albuminuria are common in diphtheria; but they are not witnessed in inflammatory croup.

6. Between croup and diphtheria there is also another very important diagnostic difference; diphtheria generally begins in the pharynx, croup in the larynx.* The false membrane found in the larynx in cases of genuine croup is quite different from the leathery or yellowish-gray exudation found on the tonsils, in the larynx, and bronchial tubes in cases of diphtheria. The pathological differences between croup and diphtheria are open to further contrast. In the early stage of croup there is an increase in the vascularity of the affected membrane, as in severe catarrh, with a trifling amount of inflammatory exudation. This is succeeded by fibrillation of the exuded lymph, which, with the new-formed cellular elements, becomes transformed into the characteristic *false membrane*. Its consistence varies, being in some cases tough, in others soft and amorphous, and easily removed from the mucous membrane beneath. In the larynx and upper part of the trachea, where the inflammation is most acute, the exudation is croupal or membranous, and is very characteristic of true croup, but in the lowest part of the trachea and diverging bronchi, there may be nothing more than a scanty superficial layer of mucus.

* "My idea of the problem to be solved is, in fact, this: It must be admitted that the diphtheritic poison is capable of giving rise to a plastic inflammation of the larynx, apart from the existence of any similar affection of the pharynx. But there is good reason to believe that during epidemics of diphtheria the cases in which this occurs are in the highest degree exceptional. If, therefore, it can be shown that in the practice of a general hospital the cases of plastic laryngitis, of uncertain origin, bear a large proportion to the total number of cases of diphtheria, there will be a strong probability that the majority of the former cases are dependent upon some other cause than the diphtheritic poison."—*Diphtheria and Croup*, by W. H. Lamb, M.B., and C. Hilton Fagge, M.D., Guy's Hospital Reports, 1877, p. 345.

"It is difficult in many cases to draw any line of demarcation between the histological changes occurring in diphtheria and those of croup. In diphtheria, however, the submucous tissue usually becomes more extensively involved, so that the false membrane is much less readily removed. The circulation also often becomes so much interfered with that portions of the tissue lose their vitality, and large ash-colored sloughs are formed, which, after removal, leave a considerable loss of substance."*

7. If croup were identical with diphtheria, it seems to me that the operation of tracheotomy would rarely succeed; whereas it is often successful when false membrane has blocked up the tracheal tube, and has been removed from time to time after the operation.

The following affords an excellent illustration of the comparison between croup and diphtheria.

Dr. Sansom has related a case of pharyngo-laryngeal diphtheria with albuminuria, in a female child four and a half years old, where tracheotomy was resorted to on account of dyspnœa and embarrassed breathing. White patches were observed on the pharynx and right tonsil. The edges of the wound were covered with diphtheritic false membrane, and sloughing proceeded, accompanied with extreme prostration. A wound of the ring finger of the right hand was covered by false membrane, and from this wound ulceration extended, and involved a part of the right hand. During the following week there was little change, then extreme adynamia ensued, pneumonia attacked the bases of both lungs, and the child died sixteen days after the operation of tracheotomy. After death the larynx was covered with false membrane, the tissues around the tracheal wound were infiltrated, and there was sloughing of the soft structures. The kidneys were in a state of acute nephritis, and the lungs showed diffused bronchopneumonia.†

The treatment that would put an end to catarrhal croup would hourly aggravate a case of diphtheria and hasten death. This alone is sufficient to convince us that the two diseases are essentially different. A child is put to bed in an atmosphere of steam, suffering from acute croup, and after the action of tartar emetic, and perhaps a grain of calomel, the alarming symptoms gradually subside. This is never seen in a case of diphtheria; the nervous

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* Pathology and Morbid Anatomy, by T. H. Green, M.D., 3d edition, 1875, p. 303.

† Croup and Diphtheria: a Contrast, Med. Soc. Proc., vol. iii, 1875–77, p. 105.

prostration which invariably accompanies it would be aggravated, and life probably sacrificed, by the adoption of such treatment.

Laryngismus stridulus is another disease which is apt to be mistaken for croup; but the following diagnostic points of difference are so broad and clear that in ordinary and well-developed cases it would be inexcusable to confuse them:

1. Laryngismus usually sets in suddenly with alarming symptoms, and terminates abruptly; in true croup the invasion is less sudden, there has been cough and febrile disturbance for a day or two, and the symptoms, instead of declining, go on increasing in severity.

2. In a typical case of laryngismus the voice is unaffected, and there is no cough; in croup there is both cough and change of voice, and the latter is often weak and feeble from the commencement.

3. In laryngismus there is no expectoration nor any catarrhal sounds in the chest; in croup such symptoms are constantly met with.

4. In laryngismus there is no fever (that is, sufficient rise of temperature to deserve the name of fever), and the circulation is undisturbed, except during the paroxysms; in croup the fever runs very high, there is thirst, heat of skin, and quick pulse.

5. Age comes greatly to our aid. Laryngismus is most common in infants during dentition; croup is most frequent between the second and fifth years.

6. Laryngismus is most common among strumous and rickety children, and those who have been ailing and out of health. It is constantly associated with dentition, and overfeeding or improper food; croup often attacks the healthiest and strongest children, and generally arises from exposure to cold winds, or damp; it is far more frequently fatal than laryngismus, which is only exceptionally dangerous.

7. In croup there is not the same immediate violent struggling for breath as in laryngismus; then, too, in laryngismus there is complete recovery between the paroxysms.

8. In laryngismus the condition is one rather of syncope or fainting; the attacks are usually too short to produce permanent lividity from imperfect aeration of the blood.

9. In laryngismus death may occur from complete asphyxia; in croup a sudden termination may result from a portion of detached

false membrane exciting fatal spasm of the larynx; but death usually happens from interrupted respiration and circulation through the lungs, with gradual depression of the vital powers.

10. In a case of laryngismus the inspiratory effort is temporarily affected, arrested, or even stopped entirely; whilst in croup, the embarrassed breathing is permanent, and expiration as well as inspiration are both involved.

11. The treatment of the two affections is diametrically opposed; the remedies that would relieve the one would aggravate the other.

So much for the distinctions of laryngismus from croup. But I must not dismiss this question of diagnosis without admitting that there are complicated or mixed cases, attended with wheezing and catarrhal symptoms, where a degree of catarrhal inflammation is mixed up with the spasmodic affection. These are the cases which more nearly resemble true croup, cases of modified laryngismus happening to young children, where we have no such precise landmarks as those I have attempted to define. They commence with slight catarah (*catarrhal laryngitis*), hoarse and noisy cough a day or two before the characteristic crowing inspiration, and they sometimes precede an attack of pneumonia or measles. It is cases of this kind, attended with a croupy cough, which are apt to deceive and mislead us; there is, in fact, some swelling and inflammatory action of the larynx and vocal cords added to the original spasmodic affection. The presence of cough, with wheezing and dyspnœa, might induce even a practiced observer to think he was dealing with an ordinary case of croup, but as it advances he is able to satisfy himself that genuine spasm is at the root of the evil. In the simplest forms of catarrh in some young children, the voice is hoarse and the cough barking. To such an extent does this prevail, that a diagnosis is not invariably easy at the beginning of an illness. The mucous membrane of the larynx is highly irritable and sensitive, and readily becomes inflamed and swollen on exposure to cold air. This is probably the condition that is present in those cases of laryngismus attended with incessant and croupy cough. Though we must not expect to find the same pathological change, or the same catalogue of symptoms, in all cases of laryngismus, still, viewing these cases from what point of view we may, I can seldom imagine any real difficulty to obscure the diagnosis of these two affections, if we

bear in mind that in genuine laryngismus the larynx and trachea are free from inflammation, that the attacks are sudden and temporary, that there is no cough and no fever; all which symptoms are the accompaniments of croup.

Of the forms of croup, there is: 1. The catarrhal croup, a mild class of cases of frequent occurrence, which rarely places the life of the patient in imminent danger. It may come on in the night, with some heat of skin, frequent husky cough, quick pulse, and flushed face; and for a few hours the symptoms are severe and alarming to the parents; even the medical attendant is doubtful about the issue of the case; but after a dose of calomel and the free action of an emetic (the room being kept moist, and its temperature high), the symptoms soon decline, and the child is himself again, with the exception of being a little prostrate and pallid.

2. The *fibrinous croup* or *tracheitis*, happening to healthy children, which comes on suddenly and is attended throughout with danger. These cases are rapid in their onset, and are quickly fatal.

The tendency to a recurrence of croup in some children is a favorable sign so far as regards its severity; such cases seldom terminate fatally, for these are of the *catarrhal* form. If we are told that the child has had one or two previous attacks, we may generally regard the case as satisfactory. Such cases stop short of actual exudation, and spasm also plays an important part in the production of the symptoms. The mucous membrane of the larynx and trachea is in a state of inflammatory excitement, and the vessels are full and congested. Prompt treatment rapidly unloads the distended vessels and encourages expectoration. Intelligent mothers, whose children are so attacked, come at last to view the symptoms with little or no anxiety, feeling confident that a good fire, with a steaming kettle in the room, a brisk emetic, and hot sponges kept constantly applied to the throat, will soon bring the child round. The lesson to be learnt here, as in every other variety of croup, is to lose no time, for success in treatment depends on meeting the symptoms with promptitude. Above all, care must be taken not to confound these cases with laryngismus, for in the one there is fever and persistent difficult breathing, whilst in the other there is no fever, and the breathing between the paroxysms is calm and tranquil.

Treatment.—Careful study of the disease has done much to instruct the medical attendant, and the knowledge that no time is to be lost is so commonly spread, that before we are summoned to give relief some useful measures have been tried, and thus many lives are saved which neglect would have rendered hopeless; yet for all this it is estimated, according to the returns of the Registrar-General, that about 6000 children die annually of croup in the United Kingdom, a mortality which ought to enlighten us as to its fatal nature, and induce us to study the best method of dealing with it.

I have observed nothing of late years to induce me materially to alter my opinion from the following conclusions, at which I arrived in 1863:*

1. The temperature of the room should not be lower than 65°.

2. The vapor-bath is indispensable in the treatment of croup, and should be used at the commencement in every case, and continued unremittingly until all fear of a relapse has departed.

3. All cases of croup are invariably relieved by the vapor-bath, especially if the tracheal membrane is dry; when it is moist there might be fear of causing too much depression.

4. The earlier that a case comes under treatment the greater the probability of a successful termination, because it is then possible to prevent the tracheal secretion becoming organized.

5. The most trying difficulty we have to contend with in the management of croup in the catarrhal form is a relapse, because with it comes exhaustion; and the weaker the patient the less will be the chance of recovery.

6. Tartarated antimony is our sheet-anchor as a medicinal agent, not so much from any specific effect it exerts on the tracheal membrane as from its certainty in effecting free and speedy vomiting.

7. When the emetic has fully operated, if there be much febrile excitement and disordered primæ viæ, which aggravate the laryngeal symptoms, a grain of calomel every four hours, or one full dose for the purpose of emptying the bowels and controlling the fever will be found necessary. In the fibrinous form, when there is violent and acute inflammation, with a firm hard pulse, and a full reserve of strength, two or three leeches may be applied over the thyroid cartilage, and bleeding can easily be arrested by pressure with the finger, and if need be with cotton-wool; then mer-

* Brit. Med. Journ., May 30th.

cury may prove a valuable addition to the antimonial treatment. Some of my cases improved from the moment the mercury affected the bowels, the fever diminishing, and the expectoration of the false membrane being promoted. When employed in small doses at regular intervals, it would appear to diminish the cohesive attachment to the mucous membrane, and to render the lymph less fibrinous and more readily absorbed.

8. When in a case of croup, seen at an early stage, and satisfactorily progressing, forty-eight hours have elapsed, we may generally augur a favorable termination; and we should then begin, if not before, to support our patients with good beef tea, milk, and arrowroot, and (it may be) a little wine and water.

If after vomiting the temperature remains high, and especially when the bowels have acted freely, minim doses of aconite every two or three hours are of great service in inflammatory croup. This keeps up a gentle diaphoretic action on the skin, diminishes tension of the pulse, and controls vascular excitement in a very striking manner. At this stage it comes in well, because antimony should not be long continued in any of the diseases of children, and it certainly ought not to be in this disorder.

On the question of *tracheotomy*, I am inclined to think we may urge a great deal in its favor.* When the respiration is so involved as to produce almost complete unconsciousness, swelling and distension of the features, and lividity of the lips (convulsive efforts that indicate approaching suffocation), we should cling to the chance it holds out. When all remedies have failed to improve the patient's condition, and death is near at hand, we should not let the patient die without giving him the chance of life which an operation affords.

In most of the cases of tracheotomy that have fallen under my notice I have almost invariably observed an improvement for a time in the respiration, and the fact that a few days have been gained when death must have terminated in as many hours is a great point in favor of the operation, and for not delaying it too long. If tracheotomy is to succeed, it must be done before the strength is quite exhausted and asphyxia has thoroughly set in. M. E. Dudon, of the Hôpital St. André, Bordeaux, performed the operation in twelve cases, with six recoveries; and he is of opinion that could he have performed the operation earlier in some of the

* See the remarks on tracheotomy in the next chapter.

other cases he would have had more recoveries. When medical means have failed, and the larynx is invaded by false membranes, which cannot be got rid of by vomiting or other means, M. Dudon thinks tracheotomy justifiable.*

It should be our earnest endeavor to recognize whether we are dealing with the catarrhal or the fibrinous form of croup. If we are convinced it is the fibrinous form, then it must be at the discretion of the surgeon whether or not the symptoms are such as to lead him to expect that resolution will take place. If not, tracheotomy should be performed at once, as its postponement would render a successful issue less probable.

Tracheotomy in itself is not a dangerous operation, but if it be delayed till the lining membrane of the larynx and trachea are covered with false membrane, extending as far as the primary divisions of the bronchi, and the constitutional symptoms are becoming severe, the chances of its success are materially diminished. This we often see when tracheotomy has been performed at too late a period of the disease, and the operation has the discredit of the fatal result.

When extensive, or loose, or purulent portions of false membrane occupy the primary branches of the bronchi, and extend to and choke up the smaller or minute bronchi, the operation cannot be expected to succeed. It is frequently performed as a last resource, when the respiration is impeded and embarrassed, and exhaustion has advanced too far. Under a combination of asphyxia and asthenia the child sinks.

In those children who survive the operation for some days, bronchitis, pneumonia, bronchopneumonia, and convulsions are the most frequent causes of death. A tendency to pulmonary excitement already exists, and indeed the operation itself is calculated to originate it. Tracheotomy is a very successful operation when performed for the relief of chronic laryngeal diseases, or for the removal of foreign bodies from the air-passages. But it is significant that this operation does not generally yield satisfactory results when undertaken in cases of œdema of the glottis, occurring in children who have sucked boiling water from the spouts of kettles. After this grave accident, lung affections very often supervene, from the inspiration of scalding vapor simultaneously with the boiling fluid. Tracheotomy aggravates the pulmonary

* The Lancet, July 20th, 1872.

complication; yet it must be done, on account of the œdema of the glottis. Very similar considerations apply to croup. In some cases where children have been saved from the prospect of immediate death by tracheotomy, and the canula cannot be removed with safety for a moment without the danger of asphyxia, the chances of ultimate recovery are very slight. The little patient, having rallied from the operation, goes on satisfactorily for some days, when it becomes restless and feverish at night, with a hot skin and a quick pulse. If we auscultate the chest, we find extensive bronchitis, and perhaps some pneumonia. No more sputa are evacuated through the canula, and the child soon becomes convulsed, or dies in a comatose condition. There may be no accumulation of false membrane in the larynx; but if the glottis is nearly closed by swelling and œdema, and the mucous membrane injected and vascular, the extension of inflammation down the trachea and bronchi into the tissue of the lung is almost certain to ensue. If the case goes on, abscess of a portion of the lung, pleurisy, or empyema are among the morbid changes discovered after death. From all I have been able to ascertain, the operation of tracheotomy is less likely to succeed in children under two years of age than in those above it. The trachea is small and undeveloped, it is not so easily reached as in older children, and hæmorrhage may occur, but a competent surgeon may readily overcome it. Yet in the face of these difficulties infants have survived the operation; but the greatest number of recoveries has occurred between the ages of five and six years.

It has been alleged that the direct admission of air to the lungs without having previously passed through the mouth and nasal passages, is attended with real danger, and that congestion of the lungs is another danger induced by the operation. But seeing that the temperature of the room can be raised to any extent, and that appliances for the supply of warm moist air are to be procured, congestion of the lungs from this cause alone ought not to occur.

CHAPTER XXX.

DIPHTHERIA.

SYMPTOMS: *Period of incubation—Insidious approach of the disease before any complaint of illness is made—Elevation of temperature—Weakness of the pulse an early and significant feature of the disease—Albumen in the urine—Character of the throat affection and peculiarities of the exudation—Constitutional depression and implication of the larynx and voice—Diphtheritic croup—Tendency to delirium and restlessness—Death by suffocation or asthenia.* CAUSES: *Influence of a specific cause—Debility and exhaustion predispose to the affection—Effects of locality and moisture in favoring its occurrence.* SEQUELÆ: *Anæmia, debility, and paresis—Weak action of the heart, secondary endocarditis—Paralysis of the muscles of deglutition and upper and lower extremities—Impaired vision and deafness—Bronchitis and pneumonia—Albuminuria—Hæmorrhage from nose and bronchi.* MORBID ANATOMY: *Bronchitis and pneumonia—Fibrinous coagula in the heart—Congestion of kidneys, brain, and spinal cord.* DIAGNOSIS *of the affection from croup, scarlet fever, and tonsillitis—Theory of contagion.* TREATMENT: *Local and constitutional—Necessity of supporting the general strength by nourishment and stimulants—Value of iron and other tonic preparations—Applications to the throat as in scarlet fever—Importance of tracheotomy in imminent death from suffocation—Statistics of Professor George Buchanan, of Glasgow, in croup and diphtheria—Strychnia and galvanism in diphtherial paralysis.*

DIPHTHERIA (diphtherite of Bretonneau) is a contagious and epidemic disorder, characterized by a specific inflammation of the pharynx and air-passages, attended with the exudation of fibrin or other lymph, and the enlargement of the cervical glands. Other mucous membranes or the skin may be sometimes involved. The vital powers are greatly prostrated. Death takes place from exhaustion or suffocation through diphtheritic deposit in the trachea and larynx. Diphtheria bears an affinity to the exanthemata in the fact that it chiefly attacks the young. The mortality is greatest between the ages of five and ten years, but infants of a few days old have been attacked.

Evidence of the antiquity of the disease is to be found in the writings of Hippocrates, Celsus, Aretæus, Galen, and Cœlius Aurelianus. In more modern times, descriptions of it are given by Spanish, Italian, French, and English writers, and traces of its progress have been met with in America, Africa, and Hindostan. It prevailed in Holland in the sixteenth century. By some writers it is thought to be the same disease that was known a hundred years ago under the name of epidemic croup and malignant sore throat.* It made its appearance at Tours, in France, in 1818.

* Dr. Fothergill's account of the sore throat attended with ulcers, 1748.

This disease, until the last few years, has been confounded with erysipelas and scarlet fever during their epidemic prevalence. The credit belongs to Bretonneau of being the first writer to define its exact nature, and to show that the local appearances on the throat and fauces are the manifestations of a general and constitutional disorder.

Since the beginning of this century, cases of diphtheria have been recorded from time to time by English physicians. In the years 1858 and 1859 the epidemic attained its maximum in this country, and in two years about 20,000 persons fell victims to it.*

Symptoms.—The incubation period is usually very short. "According to Oertels, the latest and best writer upon the disease, it may be stated positively to occupy from two to five days. His own experiments also show that in from twelve to twenty-four hours after artificial inoculation upon the surface of wounds, we can detect a grayish-white discoloration, a dirty-grayish layer, and the other signs of infection."† Dr. Morell Mackenzie has given an instance of a prolonged period of incubation, fifteen days elapsing from the exposure to contagion to the appearance of diphtheria.‡ The disease creeps on very insidiously, and may have advanced considerably before any complaint is made about the throat. The earliest symptoms are chilliness, weakness, and lassitude, with pain in the back and limbs, followed by febrile disturbance of varying duration. In some severe cases the fever is transient and soon passes off, but in mild cases it is of longer duration. Elevation of temperature generally marks the commencement of the disease, it may soon reach 103° or 104°, when delirium is often present; but in many cases the temperature appears to fall as the disease advances, the skin becoming cold, and the pulse slow. These symptoms often precede death. There is headache, thirst, and pallor of the face; the sleep is restless and uneasy, the mental faculties are clouded or excited; the pulse is almost always quick at the beginning of the complaint, and soon becomes weak and compressible. Cases are recorded of unusual slowness of the pulse, and Dr. Heslop mentions one in a child of five years of age, where it did not exceed forty beats a minute.§

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* On Diphtheria, by Dr. Squire, Reynolds's System of Medicine, vol. i, p. 11.

† Article Diphtheria, Ziemssen's Cyclopædia of Medicine, vol. i, p. 594. Quoted by Murchison, Clin. Trans., 1878, p. 248.

‡ On Diphtheria, 1879, p. 19.

§ Greenhow on Diphtheria, p. 211.

The tongue is covered with a thin, creamy fur, or it is quite clean except at the posterior part. The appetite for food is small, and the prostration of strength so great that the patient is too weak to exert himself to take food, and consequently many patients die, who reasonably might be expected to recover if they could take a proper amount of nourishment.

The urine is pale; it contains urates or even phosphates, and at an early stage albumen is frequently found. Albuminuria is one of the most interesting features of the disease. Attention was first drawn to this symptom by Dr. Wade, of Birmingham.* It generally appears at an early period of the disease. It is a frequent complication of diphtheria, and increases the danger to life. Whether albumen is present in large or in small quantity, it is a serious symptom. But albumen bears no relation to the other symptoms, as it is equally present in mild as in severe cases. Casts of the urinary tubes do not invariably accompany the most profuse albuminuria,† and the albumen may disappear altogether in the course of a few days, as the approach of convalescence is reached. Greenhow remarks that he has "several times been unable to detect albumen by the proper tests in very malignant cases of diphtheria."‡

On looking into the throat, some redness or swelling may be observed on the fauces, pharynx, and tonsils; the cervical glands are enlarged; there is pain in deglutition, and stiffness of the neck in separating the jaws. The eyes have a heavy, languid look, and the conjunctival vessels are injected; the nostrils are inflamed, or obstructed from swelling of the Schneiderian membrane, or the presence of a tenacious secretion. Between the first and second day from the commencement of the throat symptoms, the tonsils become more swollen, and a fibrinous exudation can be seen coating them, as well as on the back of the pharynx, which is now turgid, and assumes a claret hue. Over a part of the inflamed surface, a tough layer of gray-looking lymph is deposited, resembling wetted chamois leather or damp parchment, which continues to increase in thickness; in some instances it is very thin and superficial. This *false membrane* (which is pathognomonic of the disease) is not invariably of the same color; in some cases it presents

* Midland Quarterly Journal of the Medical Sciences, 1858.

† Greenhow on Diphtheria, p. 204.

‡ Ibid., p. 207.

a dirty white or yellowish appearance; in others it is of a brownish or ash-colored hue, and in exceptional cases it has a blackish, gangrenous look, and is horribly offensive.* In some cases the exudation is first seen on the soft palate, or on one or both tonsils, but wherever it may be, it either extends from one part to another, or it simultaneously appears on several parts at the same time. Spots of exudation, which at first are separate and distinct, will coalesce and form a continuous layer in a few hours. The extent and color of the exudation are generally in proportion to the severity of the disease. When there is a light and small distinct patch the disease is mild and runs a favorable course; but when the exudation is extensive or thick, or the patches unite or form a continuous layer, then the constitutional depression is great, and the patient is in imminent danger of his life. In some cases cough is a very early symptom. In June, 1869, a boy, aged six years, presented himself in the out-patient department of the Samaritan Hospital, whose illness began with a slight cough on the 5th. On the 8th, when he came under notice, he had a hoarse and frequent cough, and his voice was subdued and husky. On the lower part of the pharynx and right tonsil was the characteristic membrane; the child was very weak and pallid, the tongue coated, and the pulse 140 and feeble. He made a good recovery, the only sequelæ being enlargement of the tonsils.

When the exudation has fully formed, it mingles with the secretion from the mucous follicles, and the cervical and submaxillary glands become enlarged, and the whole neck swells. The child is now much distressed, as there is great pain in swallowing, and the poisonous secretion excoriates the mouth and nostrils. As portions of the deposit separate from the throat and are coughed up, there

* "The diphtheritic pseudo-membranes, or, to speak more precisely, the diphtheritic sloughs, result from superficial gangrene of the mucous membrane, which again depends on compression of its nutrient vessels by an interstitial fibrinous exudation, or from swelling of the tissue elements, which are filled with a cloudy substance."—*Niemeyer's Practical Medicine*, vol. ii, p. 615.

Inflammation is not essential to the disease, according to some authorities; but this is a question which pathology ought to decide. Diphtheria is distinguished by a peculiar morbid condition of the mucous membrane of the throat and tonsils. A seromucous effusion is poured out on the back of the throat, which becomes changed into a tenacious membrane, followed by the formation of another similar membranous formation, till a tough plastic layer is produced. The false membrane can be raised from the surface, which is ulcerated and bleeding. The pellicle of false membrane is chiefly made up of thickened epithelium, coagulable lymph, pus, and blood-corpuscles.

is great fetor of the breath, and sometimes bleeding from the mouth and nose. This exudation is tough and fibrinous, and does not separate easily except where it is undergoing decomposition. When it has separated it leaves a smooth bleeding surface, on which the exudation rapidly forms again. As the disease goes on, the respiration becomes impeded by the obstruction to the entrance of air through the larynx, producing diphtheritic croup,* and the breathing is croupy and stridulous. The voice is muffled or reduced to a whisper, and the eyes are staring and suffused. The vessels of the neck are distended, and at each inspiration the depressions above and below the clavicles are sucked inwards, and the epigastrium is retracted. With these alarming symptoms there are also pains in the head, which the child moves incessantly; the surface of the skin is cold and clammy, and there is extreme agitation and restlessness. The consciousness becomes more and more impaired, and the child dies suffocated and exhausted. Death ensues as in fatal cases of croup from asphyxia.

When the pharyngeal affection is acute and severe there is great pain and difficulty in swallowing food, but as the disease advances the sensibility becomes blunted, and there is no complaint of pain. The patient sinks low in the bed on his back, and is insensible to all that goes on around him, or he is delirious and muttering; the impulse of the heart against the walls of the chest grows weaker, and the pulse becomes feeble and imperceptible. In such cases death ensues from asthenia or syncope. When laryngeal symptoms occur the patient may die in the course of two days, but when they are absent death may not happen for two or three weeks. In cases that recover convalescence begins about the second week. "Of the seventy-four cases collected by the *British Medical Journal*, twenty-six died—fourteen from asthenia, eight from implication of the larynx, three from syncope, and one from subsequent bronchitis."†

Causes.—A specific poison, either generated within the body or external to it, is the cause of diphtheria, which spreads by

* Diphtheritic croup is more common in some epidemics than in others. The disease shows no uniform disposition to attack the larynx and trachea; many cases have terminated through sheer exhaustion, though there has been severe throat complication and sloughing; whilst other cases, and even some epidemics, have been marked by the extension of the disease into the larynx, and the symptoms of croup, with the throat and fauces comparatively free.

† On Diphtheria, by Dr. Squire, op. cit., p. 139.

contagion and infection. Sir W. Jenner traces "diphtheria (like erysipelas) to cold when the exposed person is depressed from fatigue, mental or moral causes, etc."* It spares no class of the community, affecting the poor as well as the rich, when an epidemic prevails; but it is probable that, notwithstanding the evidence that has been brought forward to the contrary, defective drainage, debility, and exhaustion favor its development. The disease is not peculiar to any particular locality; it has been as prevalent in high and exposed situations as in low and sheltered places; on clay and damp soil and on dry and light soil; on richly cultivated soil and on barren moorland; in the open country and in the densest towns.† It does not, however, appear to be so frequent in dry districts, where the drainage is good and the soil permeable, as in damp, marshy districts in the vicinity of water. Still this does not clear up the cause of the epidemic, for dry places have been severely visited and damp places have escaped. "Indeed, it is evident that some other factor besides damp is required for the causation of this disease, seeing that humidity in every conceivable form and degree always exists in one place or another; whereas diphtheria had been unknown as an epidemic in this country for three-quarters of a century previous to its recent invasion. Dampness must, therefore, be regarded rather as an auxiliary than as a principal cause of the disease."‡

As to the outbreak in North London, in 1878, Mr. W. H. Power found that, with regard to time, the customers of milk retailers who bought their milk of the same proprietor bore almost the whole of the brunt of the outburst, which first attracted attention to the district, and which was referred to sewer causation. It seems probable that Mr. Power's observations must be regarded, in the present state of our knowledge, as rather suggestive and incitive than conclusive.

What the exact nature or essence of the disease is we do not at present know. How the germs of the disease are first developed, whether they ever arise *de novo* (which is not improbable), or whether the soil into which they have been introduced is peculiarly adapted for their growth, are questions which the science of medicine has still to deal with, but certain it is that when a person is struck down with the disease, he is capable of contaminating the

* Introductory Address before the Clinical Society, 1875.

† Dr. Greenhow on Diphtheria, p. 124.

‡ Ibid., p. 125.

surrounding air and drinking-water, and so of communicating the disorder to others.

Bretonneau held the view that the atmosphere could not transmit the contagion of diphtheria. He taught that the only way in which it can be contracted is by inoculation—that the diphtheritic secretion must come in contact with "a soft or softened mucous membrane, or with the skin on a point denuded of epidermis."* This is a subject still open to discussion, but most authorities agree that the disease is contagious, and can be conveyed by the atmosphere, invisible emanations from the sick, or even from sewer gas.

Family susceptibility is sometimes very great. All the members of one family may be attacked, whilst those of another family living under the same roof may escape. Some may have the disease slightly, and others severely; the delicate succumb more readily than the strong.

A correspondent throws out the hypothesis that as the disease often spreads in a family, and does not extend to other persons going freely about the patients, "the poison germ of diphtheria is modified by its habitat, becomes in fact a new variety growing out of and specially adapted to the constitution in which it has developed, and that this contagion finds in the kindred constitutions of brothers and sisters fit soil for its growth, while it is thrown off by stranger organisms to which it is unadapted."† Dr. Alfred Carpenter also supposes "that diphtheria is dependent upon a germ of living matter, which is capable of reproducing itself when it meets with a congenial soil." He considers that there is a close analogy between it and potato blight; the conditions which promote the one have also an influence upon the other. He adds that sulphurous acid, locally and generally applied, is the best application, and that the germs cannot grow in a creasote atmosphere.‡

The clothes of a person may be infected with the poison, and he may thus transmit the disease to others, though he is not laboring under it himself.

An instance came under my notice in November, 1878, where a little boy in health called at a house in which a child was lying ill

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* New Syd. Soc. Trans.

† On the Contagiousness of Diphtheria, the Lancet, Jan. 4th, 1879, p. 34.

‡ A Possible Predisposing Cause of Diphtheria, Brit. Med. Journ., Jan. 4th, 1879, p. 8.

of the disease ; he returned home, was struck down with the disease within forty-eight hours, and died on the seventh day. He conveyed it to two brothers and a sister. The little girl, eight years of age, walked eight miles one day, was prostrate with the disease on the next day, and expected to die on the third or fourth day, but eventually recovered.

Sequelæ.—The heart is prone to become enfeebled, notwithstanding the free exhibition of stimulants and the progress towards recovery. Sudden failure of the pulse and circulation now and then comes on, and the weakness continues till death. Valvular disease of the heart has been known to result from diphtheria. The processes involved in this disease may bring about morbid changes of the endocardium affecting the valves. Dr. Burdon Sanderson* has shown the identity of the valvular lesions after diphtheria with the ulcerative endocarditis of Kirkes, well known to result from several acute specific diseases. Sanderson continues by demonstrating what he happily terms the "doubly infective character" of those forms of endocarditis after acute diseases. They result from specific infection, and in turn produce morbid changes in the organs. Infective material becomes detached from the diseased valves, and distributed to the kidneys, liver, and lungs.† Heiberg and Weigert go further, and pretend to have discovered the very *fons et origo mali* in colonies of micrococci, which they believe produce the endocardial disease.

Sometimes the muscular system is fearfully depressed, and the patient loses all power over his limbs, so that he cannot support himself or put on his clothes.

Diphtheritic Paralysis.—Authorities differ as to the nature of this paralysis, some regarding it as of reflex origin, and others as due to exhaustion of the cerebro-spinal centres. "The paralysis is more deserving of the name *general* than any other which I know, for all the physical powers are affected, and sometimes the mind is enfeebled."‡

The affection generally comes on during convalescence from diphtheria. It appears to bear some resemblance to locomotor

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* Lectures on the Infective Processes of Diseases, Lect. IV, Brit. Med. Journ., Feb. 9th, 1878, p. 179.

† See Chap. XLI, on Ulcerative Endocarditis.

‡ Diseases of the Nervous System, by S. Wilks, M.D., 1878, p. 234.

ataxy, but galvanism, which is of no use in this disorder, has considerable power over diphtheritic paralysis.

"It is probable that inflammatory disease of the pharynx, such as tonsillitis, general pharyngitis, putrid sore throat, or syphilis, may give rise to more or less disturbance of the motor apparatus of this region; but it is only in diphtheria that other nerve-centres suffer, so that this fact affords a means of differential diagnosis. The voice acquires a characteristic nasal timbre, the modification of certain articulate sounds being very characteristic, owing to the impossibility of closing the naso-pharyngeal passage. Thus *rub*, *head*, and *egg*, become *rum*, *hent*, and *enk*."*

Symptoms.—Frequently the muscles of deglutition are seriously involved, and the sensibility of the fauces is so affected that there is difficulty in swallowing, and fluids regurgitate through the nose, or pass into the larynx. The voice is weak and nasal, the uvula and velum are relaxed, the power of expectoration is lost or impaired, mucus accumulates in the pharynx, and the taste and smell are more or less blunted. Deafness sometimes ensues. According to the experience of Dr. Maund, "the frequency of these paralytic affections is in inverse ratio to the severity of the attack of diphtheria." . . . . . Out of two hundred cases attended in East Kent in 1858 and 1859, not more than ten exhibited any secondary nervous symptoms †

In other cases the sight is impaired, but the weakness of vision resulting from paralysis of the ciliary muscles passes off when the health is restored.

Diphtheritic ophthalmia has been known to occur in connection with malignant diphtheria of the throat and air-passages.‡

Occasionally there is a general loss of sensibility coming on during convalescence.

The paralytic symptoms are generally most severe on that side of the body corresponding to the throat disorder.

Paralysis of the lower limbs, and wasting of the extremities, occur in some cases. The upper extremities are rarely affected. Where the muscles of respiration are attacked, danger is imminent. The paralysis is, however, generally curable, and yields to treatment in time.

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* Diseases of the Throat and Nose, by Morell Mackenzie, M.D., 1880, p. 115.

† St. And. Grad. Assoc. Journ., 1869, p. 89.

‡ Diphtheritic Ophthalmia, by Edward Nettleship, St. Thos. Hosp. Rep., vol. x, p. 27.

The three following cases, in children of the same family, came under my notice in July and August, 1880. They illustrate many of the preceding observations.

Case 1.—D. A——, a female child nearly four years of age, had a severe attack of diphtheria, with copious membranous deposit on the tonsils and pharynx. There was high fever, drowsiness, and albumen in the urine to the extent of one-sixteenth of the quantity passed. The albumen persisted for some weeks. The paralytic symptoms that followed consisted in indistinct articulation and slight squinting. Under tonic treatment the recovery was perfect.

Case 2.—H. A——, a healthy boy, eight years of age, had membranous exudation on both tonsils and back of the pharynx. The constitutional symptoms were more severe than in the previous case, but there was very little albumen. The paralysis consisted in double vision, squinting, articulation almost gone. Could not see black objects, but all other colors. When walking in the street, he ran up against people in passing. Two months after this illness he was quite well.

Case 3.—A. A——, a boy, aged fourteen, of nervous temperament, was taken ill August 8th. Diphtheritic membrane extended over the arch of the palate, back of pharynx, and left tonsil, thick, tenacious, and wash-leather like. Albumen appeared on the fifth day to the extent of one-half. The two following days the urine was nearly solid, then it gradually diminished, and temporarily disappeared on September 9th. It returned from time to time, and disappeared altogether on September 20th. The paralysis consisted in almost complete loss of sight, succeeded by double vision, imperfect articulation, choking, and occasional fainting. An ophthalmoscopic examination showed hypermetropic refraction, and thinness of choroid. On nasal side, and in substance of disk, there were seen two distinct nodules of lymphlike deposit, clear and well defined; vascularity normal. The patient made a good recovery.

Hæmorrhage from the throat, nose, and bronchial mucous membrane occurs occasionally in conjunction with diphtheria; also eruptions of the skin, resembling typhoid fever and measles, are mentioned by different observers. Erythema, urticaria, and dark claret spots like purpura have also been noticed.

Morbid Anatomy.—On examining the bodies of children and

adults who have died of diphtheria, evidences of bronchitis and pneumonia are frequently seen. In the trachea and bronchial tubes the peculiar membranous formation is found, and on the removal of the exudation the mucous membrane is seen congested and excoriated, and there are small bloody points similar to those observed in the fauces. As the disease descends into the larynx and trachea, the false membrane becomes thin and spreads out like a transparent film, or the exudation is converted into a thick creamy fluid. The false membrane has been observed lining the bronchial tubes to the third or fourth bifurcation. It sometimes extends to the œsophagus and stomach, which are found red and covered with exudation. The mucous membrane may be thickened or ulcerated, and the tonsils gangrenous.

The heart has been found small, and its muscular tissue pale; cases, too, of fatty degeneration have been recorded, and the parietes have been studded with black infiltrated patches and petechial spots from sanguineous extravasation. Fibrinous coagula sometimes occur in the cavities of the heart, as in scarlet fever and the pneumonia of children. They may be seen in the right auricle or ventricle, or in all the four chambers of the heart, of firm consistence, and so adherent to the chordæ tendineæ, that the deposit must have happened during life.

The kidneys have been found quite healthy after death, as may be expected when the urine has been free from albumen during life; but careful microscopical examination usually reveals some change of a special character. The kidneys are sometimes only congested in simple cases, but where albumen has been a persistent symptom, some change in the intratubular structure will generally be found; the tubules may be blocked with granular matter, oily globules, blood-corpuscles, and fibrinous exudation.

The sinuses and membranes of the brain and venous system generally, have been found remarkably full of blood. In a fatal case recorded by Sir William Gull, and quoted by Dr. Greenhow, the membranes of the brain and spinal cord were in a state of suppurative inflammation.*

Diagnosis.—The diagnosis of diphtheria from croup is given in the previous chapter.

I may here quote an interesting passage from Niemeyer on the anatomical appearance of the exudation. "If the larynx and

* On Diphtheria, p. 239.

trachea participate in the disease, the croupous, not the diphtheritic form of inflammation of the mucous membrane occurs—that is, the surface of the mucous membrane is covered with a more or less tough and consistent false membrane, which may readily be removed, and leaves no loss of substance after its removal. This circumstance has induced some physicians to identify primary genuine croup, which is due to catching cold, etc., with croupous laryngitis caused by infection with diphtheritic contagion. I consider this a false view. The division of diseases, according to the pathologico-anatomical changes they induce, is only a makeshift. In all cases where, as in genuine and diphtheritic croup, we find that two anatomically similar disturbances of nutrition depend on very different causes, we should consider them as distinct."* It is this similarity in the character of the exudation between inflammatory croup and diphtheria which has continually led observers to consider them as one and the same disease; but this certainly cannot decide the question.

The throat in malignant scarlet fever and diphtheria is very much the same in appearance, and may be confounded the one with the other. As regards the diagnosis at the beginning of diphtheria, the more circumscribed redness and the peculiar yellow patch of the exudation is, from an anatomical point of view, so characteristic, that it is conclusive evidence of the disease. Yellowish or grayish-brown sloughs of plastic lymph on the tonsils and pharynx, leaving later on a bleeding surface where the membrane is removed, are common in diphtheria; but in severe instances of either disease, ashy-looking, gangrenous deposits may be seen, and owing to this circumstance, a diagnosis would be impossible. In scarlatina, the constitutional symptoms preceding the throat affection are more marked, the skin is pungent and hot, and the temperature is high; whereas in diphtheria, the throat may be severely affected in the absence of these symptoms, and the pulse and respiration are low. In both diseases the lymphatic glands are involved. The throat generally presents a more uniform redness, and the tongue is characteristic in scarlet fever. The soft palate and tonsils have a milky or creamlike aspect; there is a thick layer, which soon clears off, leaving the parts beneath angry and red. In diphtheria the exudation is more deeply seated,

* Niemeyer's Practical Medicine, vol. ii, p. 615.

and it comes off in dense membranous layers, representing a cast of the surface on which they have formed.

At a very early stage it is not easy to distinguish the redness of diphtheria from the inflamed sore throat of inflammatory catarrh, in which the tonsils are tumid, and have a thin layer of lymph upon them. The pharynx is vascular and irritable, and the lymphatic glands are tender and enlarged; but they go down when the cold is relieved. In healthy subjects, however, an inflamed state of the cervical glands is exceptional in cases of tonsillitis. I have many times known children with a temperature of 103°, or more, in this complaint, and the throat so swollen and the fauces narrowed, that the swallowing of liquids was most painful, and yet the glands in the neck were not enlarged. When they are swollen there is fear of a strumous taint, and the specific inflammation is often sufficient to excite chronic enlargement, if not suppuration. Then there is a discharge from the nose, and the fever is considerable, with thirst and difficulty in swallowing.

The diagnosis from tonsillitis can generally be made; in the latter affection the constitutional symptoms are not of the low and adynamic type which belong to diphtheria, and one tonsil is more affected than the other.

Scarlet fever and diphtheria have prevailed together at the same time and place, and each disease has exhibited the characteristic local symptoms. One member of a family has had the peculiar exudation of the fauces, but no rash or desquamation which occurs in scarlet fever. "Sometimes," says Dr. Greenhow,* "cases of diphtheria and scarlet fever have even been intermingled in the same family, or diphtheria has appeared in persons who have been in communication with patients suffering from scarlet fever." Another difference between the two diseases is, that the albuminuria of scarlet fever comes on at a late stage, often at the end of a week or month, after the eruption has left, during the period of desquamation, and it goes on to dropsy and anasarca with hæmaturia. In diphtheria, albuminuria is an earlier symptom when it does occur; hæmaturia is rare, and dropsy does not result, nor is the excretion of urea lessened. The urine does not present the smoky appearance which is common in scarlet fever, but casts of the urinary tubules are generally found.† The presence of albumen in the urine is by no means a constant symptom, even in

* On Diphtheria, p. 102. † Ibid., p. 205.

severe cases, but when it is present in large quantity it is a serious indication. Anasarca is rarely present except in cases complicated with scarlet fever. Uræmia has not been observed in connection with the albuminuria of diphtheria; but excess of phosphates and urates, with high specific gravity of the urine, is of common occurrence.*

It has been asked whether there is any relationship between diphtheria and enteric fever, and it appears certain that the two diseases are not unfrequently associated. Dr. Murchison considers that it is not true diphtheria, the throat complication in enteric fever being frequently found where there is no diphtheria. As the causes of the two diseases are much alike, we should expect them to prevail together, and not look upon their existence as a mere coincidence. Dr. Greenfield brought before the Pathological Society (November 6th, 1877), a specimen of diphtheritic membrane from the larynx and pharynx of a child, aged five, who had been under the care of Dr. Murchison at St. Thomas's Hospital, suffering from unmistakable enteric fever. There was ulceration of Peyer's patches, and also swelling and round excavated sloughing ulcers in the lower part of the ileum. In addition there was bronchopneumonia; but no false membrane could be seen on the fauces or the tonsils, which were red and swollen.

As to the communicability of the disease, it is held to take place through the secretions of the throat by Bretonneau and others; but the experience of many medical men during the epidemic of 1858 and 1859, does not concur in the opinion that the disease is communicated in this way.† In contemplating the record of cases, however, we can hardly fail to observe that the diphtheritic secretions have induced ophthalmia and throat affections in those persons who have been nursing the sick, or have seized upon the medical attendants who have been close enough to receive particles of the exudation when the patients have coughed or sneezed during an examination of the throat and fauces, or the application of some local agent. The character of the disease so induced, has been in a few instances that have come within my knowledge, so precisely like the diphtheritic exudation, that I think the evidence of propagation by contact with the secretion, cannot be set aside. The disease has spread with rapidity in the cottages of the poor, where the appliances of the sick are scanty, and cleanliness is dis-

* On Diphtheria, p. 208. † Ibid., p. 137.

regarded. Then, again, a child laboring under diphtheria has been brought from a distance to its own home, and soon afterwards the disease has attacked other members of the family, when previous to its return, not a single case had happened in the house, or the surrounding district for many miles. Dr. Squire notices that the more abundant the secretion in particular cases of diphtheria the greater the danger of infection.*

I think we shall be forced to admit that diphtheria, like typhoid fever, has sometimes a spontaneous origin, when soil and season, temperature, filth, and uncleanliness combine to lower the general health and contaminate the blood. If it were not so, how shall we explain the alarming outbreaks of these diseases in schools and isolated homes, and their tendency to remain within a limited area, and not to spread in an epidemic form?

The infection of the atmosphere by the exhaled air of the sick patient, leaves no room for doubt that this is another mode by which the disease is propagated. Children who have been in the same house with diphtheritic patients have contracted the disease, when they have not ventured near the sufferer; and there are no doubt other vehicles for the transmission of the poison, subtle, tenacious, mysterious, ever ready to seize upon the young. "The greater frequency of the disease among children than adults does not seem to be due to greater predisposition of the former, but to their being more exposed to infection than adults are."†

Treatment.—This is a disease demanding local and constitutional measures, and from the first neither should be disregarded. Sometimes the local should be the most energetic, and sometimes the constitutional; but from the commencement the treatment must be supporting, if not stimulating, and those measures that are most to be relied on in exhaustion and syncope are to be held in close reserve. Like other epidemics, the disease does not admit of depletory measures, and all practitioners who have had a large experience of it insist upon the necessity of employing a supporting plan of treatment. Each case will require some modification in accordance with its peculiarities and tendencies, so that it is not easy to lay down any exact rules to follow. The patient should be placed in a large and well-ventilated room, the temperature of which should range from 60° to 65°. He should be

* Reynolds's System of Medicine, vol. i, 3d edit., p. 115.

† Niemeyer, op. cit., vol. ii, p. 615.

kept absolutely quiet in bed, with the head low, and all excitement carefully guarded against.

At the commencement of the disease, a purge of calomel and rhubarb is sometimes required, so that some of the poison may be eliminated by the intestinal canal. This has been insisted upon by Sir William Jenner; and other observers have advocated this treatment at the beginning of the disorder, when the strength is equal to it. Under most circumstances, a mild saline aperient, to keep the bowels regular, will be occasionally required, or a small dose of castor oil; still, caution must be observed in the administration of aperients. Our best guide in this matter is the mildness or severity of the attack, for in the malignant form the child is overpowered by the poison at once, and the pulse is so feeble that any depressing remedy would only hasten the tendency to fatal syncope. Milk in large quantities, beef tea, chicken broth, and eggs are the forms of nourishment best suited to maintain the flagging strength. Wine or brandy will be almost invariably needed, and the quantity must be regulated by the strength and frequency of the pulse. Where there is a tendency to syncope or failure of the heart's action, or the pulse is slow, very frequent, or irregular, considerable quantities of alcohol can be taken with advantage. Perseverance in the administration of food and medicine is imperatively demanded, and the attempt must not be abandoned under the impression that the child is unable to swallow, for this is constantly found to be erroneous.

When exhaustion is the leading feature of the case, the child should not be allowed to sleep too long without nourishment. If the throat is painful, and there is thirst, a piece of ice to suck is very grateful and refreshing. A small quantity of iced water should be offered frequently if the mouth and lips get dry quickly. In the shape of medicine, the carbonate of ammonia, with the tincture of bark (Form. 11), is an excellent combination for supporting the system against exhaustion. When the skin is hot and the temperature high, ice, cooling drinks, and diaphoretics*

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* Formula 52:

℞. Liq. amm. acet., ... ℥ij
Spt. æther. nitr., ... ℥j
Syr. rosæ, ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A tablespoonful to be taken every four hours.

will be useful; with these may be combined the tincture of the perchloride of iron,* or the iron may be given alone or with chlorate of potash. In most of the inflammatory throat affections of children, this preparation of iron has a wonderful effect, and is as specific as in erysipelas, which may be possibly due to some antiseptic properties which it exerts locally, and possesses after its entrance into the blood. It requires to be given frequently, and, according to some authorities, in large doses. A small dose (♏v to ♏x), with or without the dilute hydrochloric acid, once in four hours, is often enough in mild cases. If the tongue is furred and the breath fetid, chlorate of potash, in combination with the acid, is an excellent remedy, and recovery will take place under its steady continuance. Quinine, salicylic acid, benzoate of soda, when the temperature is high and the system depressed by the septic nature of the disease, are all useful. When the throat exhibits dark and softened portions of exudation, with a tendency to bleed when touched, or there is hæmorrhage from the mucous surfaces, then the perchloride of iron must be combined with it; and in this formidable complication, a full dose should be given every hour or two, till the urgent symptoms are relieved. In most cases I prefer a mixture consisting of iron, chlorate of potash, and hydrochloric acid.† It is particularly suitable when the exudation is firm, the tongue coated, and the throat exhibits no hæmorrhagic tendency.

The chlorine drink recommended in scarlet fever is equally of service here. It is grateful to the little patients by relieving the throat and febrile symptoms when they are present. It also possesses antiseptic properties, and improves the character of the exudation.

Quinine and the mineral acids are also useful variously com-

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* Formula 53:

℞. Tinct. ferri perchlor., ... ℥j
Glycerini, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.
A tablespoonful every four hours. For children five years of age.

† Formula 54:

℞. Tinct. ferri perchl., ... ♏xl
Potass. chlorat., ... gr. xl
Acid. hydrochl. dil., ... ♏xl
Syrupi, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.
A tablespoonful every four hours. For children five years of age.

bined. External applications to the throat, in the shape of leeches, blisters, and counter-irritants, are in no case requisite, and will do harm. Warm poultices, fomentations, or water-dressing, are comfortable and useful.

The applications to the throat internally, are those indicated in scarlet fever, and the same precautions as to strength are to be observed. In young children who cannot gargle, a solution of borax may be applied to the throat (ʒss. to the ʒj), or equal parts of the liquor ferri perchloridi and honey may be used with advantage. This is perhaps the best astringent application. In a case that came under my care a few years ago, a thick solution of chlorate of potash, borax, glycerin, and honey,* gave much relief to the throat. At an early stage, when the membrane is thin on the fauces and tonsils, a solution of nitrate of silver (gr. x or gr. xx to the ʒj), applied with a camel-hair brush, twice in the twenty-four hours, has been of benefit. The application of the solid nitrate of silver must be cautiously resorted to; indeed, it is questionable whether this or any other caustic, as hydrochloric acid, or the acid nitrate of mercury, is ever necessary. They increase the pain and difficulty of swallowing, and at the same time aggravate the local mischief. If there is fetor of the breath, and the parts incline to be sloughing and gangrenous, the solution of chlorinated soda, in the proportion of one drachm of the solution to two ounces of water, is an excellent application. This, and the iron solution, are two most valuable measures, according to my experience, in every stage of diphtheritic sore throat. Some children are so alarmed and frightened at the attempt to press down the tongue, and apply applications to the throat, that these measures had better be given up altogether in such cases. Nervous and delicate children are almost thrown into convulsions by their struggles and resistance, and where these applications cannot be used there is consolation in remembering that escharotics are of doubtful efficacy, and even, according to some English and foreign physicians, who have had great experience of the malady, decidedly injurious. In diph-

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* Formula 55:

℞. Potass. chlorat.,
Boracis, āā . . . . . ʒj
Glycerini,
Mellis, āā . . . . . ℥ss.—M.

The throat to be mopped out with a little of this solution frequently during the day.

theritic affections of the throat, the carbolic acid spray will often be found very useful, just as it is in the faucial affections of scarlet fever and measles. Lime-water, sulphurous acid, lactic acid, etc., have been also used in like manner with success. The most convenient plan of using the spray is to employ Siegle's apparatus, or the hand spray of Dr. Andrew Clark.

As regards the operation of tracheotomy when death threatens from suffocation and dyspnœa, Professor George Buchanan, of Glasgow, has recorded some interesting cases of success. Out of thirty cases he had eleven recoveries.* He has subsequently informed me that in every eight tracheotomies performed on children practically moribund from suffocative membranous effusion into the trachea, he has saved three children, and this is true of over fifty cases operated upon.†

Two interesting cases of successful tracheotomy, in the last stage of diphtheria, were brought before the Clinical Society by Mr. George Lawson and Mr. Pugin Thornton (Feb. 28th, 1879). Two cases of diphtheritic laryngitis have been recorded in which recovery also followed tracheotomy. The first case was that of a boy, six years of age, who was admitted into the Middlesex Hospital, under the care of Dr Coupland, May 30th, 1880. The successful issue was owing to the operation having been performed at an early period of the disease before much false membrane had formed. The second case was also that of a boy, seven years of age, who was admitted into the Children's Hospital, under the care of Dr. Gee, on Sept. 15th, 1879. Recovery followed quickly, notwithstanding the extreme dyspnœa at the time of operation, and the large quantity of membranous casts expelled through the tube afterwards.‡ The following case had a different termination, owing, as I believe, to the delicate health of the child, the delay of the operation, and the collection of pus and false membrane in the trachea. On June 18th, 1880, a female child, three years of age, was admitted under my care into the Samaritan Hospital

* Brit. Med. Journ., 1875, vol. ii, p. 293.

† A statistical table of all the cases, with remarks on the conditions demanding tracheotomy, will be found in the British Medical Journal, vol. i, p. 555, 1880. "Taking the whole of the cases, the result is that nearly *two* out of every *five* operations were successful; and as the operation was never performed unless there was no hope of recovery otherwise, it may be fairly stated that the lives of these nineteen children were *saved* by tracheotomy."

‡ The Lancet, 1880, vol. i, p. 950.

with diphtheria, symptoms of commencing laryngeal obstruction, and great prostration of the strength. The face was pale and the cervical veins normal, but the respiration was wheezing and noisy, and the cough frequent and laryngeal. Air entered the lungs. At 4 P.M. the child was not so well, the head was thrown back against the spine, the respiration was more embarrassed, and the epigastrium was retracted at each inspiration. Tracheotomy was performed at my suggestion by Mr Knowsley Thornton, the patient being under the influence of bichloride of methylene. As soon as the trachea was opened, a teaspoonful of purulent matter escaped, and the child shortly after expired from shock and asphyxia. A post-mortem examination revealed the upper surface of the soft palate and uvula uniformly covered with diphtheritic patches. Another patch lined the mucous membrane of the larynx immediately below the right vocal cord and projected into the glottis; a long slough lined the mucous membrane of the trachea, below the incision, extending almost to the division of the bronchi. The larynx and trachea were filled with purulent fluid. Both lungs were slightly congested, but floated in water; the bronchi contained some purulent fluid, but no false membrane. There was a large decolorized sizy clot in the right auricle; no abnormal appearances in the liver, mucous membrane of œsophagus, stomach, or intestines. The mesenteric glands were much enlarged, but not softened.

A case of diphtheria in a child is recorded by the late Dr. Murchison, in which tracheotomy was performed on account of the urgent dyspnœa. The points of most interest lay in the morbid changes found in the intestines. After the operation a little thick exudation was removed, with relief to the breathing. Death occurred in twenty-five hours afterwards. With the return of the embarrassed breathing the temperature rose to 107.6°, and at the time of death it fell to 104.5°. The interior of the larynx and trachea was completely lined by a layer of false membrane, which was firm in some places and easily detached in others. At about the fourth ring of the trachea it could be separated in a complete layer, beneath which the surface was red and raw-looking, and "studded with minute vascular points." The larger bronchi, as far as the third or fourth division, were filled with a curdy fluid, and some of the smaller bronchi were dilated. The state of the *small intestines was the chief point of interest in the case*, as the child

was said to have been quite well the day previous to admission. The solitary and follicular glands of the small intestines were distinct and prominent throughout, and there were three or four small rounded ulcers apparently connected with them at the middle third of the ileum. In the ileum, also, there were three or four ulcers of irregular shape with raised edges, and the Peyer's patches had undergone a change resembling that met with in the earlier stages of typhoid fever. The large intestines were healthy. Both lungs were collapsed and dense; the right cavities of the heart were distended with dark, perfectly coagulated blood. It would appear that although tracheotomy temporarily relieved the distressing dyspnœa, no hope of recovery could have been entertained where the local mischief was so extensive and the effect of blood-poisoning had become so general.*

But supposing the non-identity of croup and diphtheria is admitted, and that the diseases are in many respects clinically and practically different, still both are prone to terminate fatally by exhaustion, or by suffocation; and these urgent symptoms would seem, at least, to demand the same line of treatment. When the latter condition threatens, and all other remedies have proved useless, we allow that tracheotomy is justifiable, and that the operation has rescued many a little sufferer from an agonizing death. Henceforth we must look upon tracheotomy in diphtheria as a proper step to take when the child is beginning to struggle for its breath, and the strength is departing; when the features are livid from obstruction to the circulation, and the mischief is limited to the trachea and larynx. If the larger bronchial tubes are involved there will be no objection to the operation; but if viscid secretion is blocking up the smaller tubes, and there is any sign of pneumonic consolidation, then the operation had better not be attempted.

For the anæmia and nervous affections which follow diphtheria, citrate of iron and quinine, the mineral acids and calumba (Form. 14–20), should be employed. Strychnia and galvanism are also very useful in diphtheritic paralysis. For any albuminuria and prolonged weakness, the tincture of the perchloride of iron and hydrochloric acid are the best remedies. Change to the seaside is important in protracted cases.

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* The Lancet, vol. ii, 1873, p. 771.

CHAPTER XXXI.

LARYNGISMUS STRIDULUS.

SYNONYMS: *Laryngismus stridulus* (Dr. Good)—*Spasm of the glottis—Crowing inspiration or spasmodic croup—Child crowing* (Marshall Hall)—*Spasmodic or thymic asthma of children* (German writers)—*Internal convulsions—Convulsions interne* (Trousseau, Rilliet and Barthez). NATURE, DEFINITION, AND SYMPTOMS—CAUSES: *Predisposing and exciting—Cases in illustration—General course and termination.* THREE MODES OF DEATH: 1. *From asphyxia;* 2. *From congestion of the brain and effusion;* 3. *From exhaustion.* PATHOLOGY: *A purely neurosal affection of the par vagum or its branches, propagating an irritation to the muscles of the larynx and throwing them into spasm.* DIAGNOSIS: *From croup and whooping-cough.* PROGNOSIS: *Favorable in mild cases where the health is good—Unfavorable in severe cases.* TREATMENT: *Removal of exciting causes—Mild aperients—Belladonna—Bromide of potassium—Quinine bark—Preparations of iron—Cod-liver oil—Attention to diet and general health.*

THIS affection is recognized by a peculiar crowing noise which takes place during inspiration. It is so characteristic that when once heard it cannot be forgotten. It arises from spasmodic narrowing, or temporary closure of the glottis and larynx. It is a form of internal convulsion—a clonic spasm of some of the respiratory muscles. As a rule, the general health is below a right standard, and the child is restless and out of sorts before the seizure happens. The disease is frequently associated with general debility, atrophy, or convulsions.

It is not uncommon for slight wheezing and catarrh to precede the development of the symptoms for some days, but it is not usually attended by cough.

Males are more subject to the disease than females. "Out of my fifteen cases, eleven were boys, so that it seems as if the larynx of male children begins, even in the very earliest youth, to distinguish itself in form, or at least in physiological activity, from that of female children."*

Symptoms.—When a child is seized with a severe attack he struggles violently, and fights with his hands clenched, as if about to suffer instant suffocation; the face is livid and congested, the eyes are staring and suffused, the cervical veins are distended, the head is thrown back against the spine, and the whole body is in tremulous agitation. After about a minute or two, and some ineffectual

* Vogel on Diseases of Children, 1874, p. 274.

efforts to breathe, the spasm becomes relaxed, and air passes down the larynx with a shrill crowing sound, an indication that all immediate danger has departed. The child now cries and looks terrified, and then generally falls asleep. In exceptional cases, the fæces and urine may be passed involuntarily, but I believe this to be rare.

During the seizure, when the muscular struggling is at its height, the thumbs may be noticed tightly bent into the palms of the hands, and the toes turned inwards and towards the soles of the feet. The wrists and ankles are similarly flexed inwards.

It should be remembered that all cases are not equally severe, nor equally frequent. Some are milder than others, the intervals are longer, and the spasms less pronounced; the child has a mild attack of catching in the breath, with slight and occasional crowing at long intervals, and then perhaps these symptoms pass off altogether if the general health improve; but if not, the spasms may gradually increase in frequency, and several attacks occur during the day. The spasms, which begin slightly in the laryngeal muscles, may become more and more severe, and in some instances terminate in general convulsions and death. Under any circumstances, the seizures leave the child exhausted and drowsy, especially if they are frequent. The attacks often come on in the night, or when the child wakes out of sleep, or attempts to take food or drink.

When the bowels are disordered, or there are worms in the intestinal canal, some children are liable to a loud, ringing cough, of a purely nervous character, which alarms parents. With it there is excited pulse and flushed face, but all these symptoms disappear when an active aperient is given, and the source of irritation is removed.

The duration of the disorder is uncertain. In some instances it occurs more or less during dentition, and ceases when the teeth have appeared; in other instances it slowly or suddenly grows worse, and ends in convulsions or asphyxia. If the disorder recur from time to time it is seldom fatal. Spasm of the glottis has been often assigned as a cause of sudden death among infants and young children, which could not be otherwise explained. Dr. Churchill says, "I confess that I am inclined to believe that many of the deaths attributed to the nurse or mother overlaying the

child are, in truth, cases of sudden death from spasm of the glottis."*

Causes.—These are predisposing and exciting. Among the former are infancy and the strumous diathesis; among the latter teething and worms in the intestinal canal. Enlargement of the bronchial and mediastinal glands has been also enumerated as a cause of the affection, by pressing on the inferior recurrent laryngeal nerve. "Laryngismus has been attributed to enlargement of the thymus, but this view is not now entertained, one very good reason being that post-mortem examinations show that in many instances there is no enlargement of the organ. Moreover, in cases where a large thymus has been found, there has been no laryngismus."† Further than this, the disease is rare in young infants where the thymus gland is largest. "M. Herard examined the thymus gland in six children who died of internal convulsions, and in sixty who died of other affections, and was not able to discover in its condition any causative relation to this disease. Indeed, cases have been reported in which the thymus had undergone more than its usual atrophy at the time when the convulsion occurred (Hasse)."‡ Though enlargement of the lymphatic glands in the thorax is constantly present without causing the disease, I cannot avoid the conclusion that there is some connection between the peculiar shrill squeaking cough when the bronchial glands are enlarged, and laryngismus stridulus. The disease is more frequent in damp and in moist situations than where the air is pure and dry. It is far oftener observed in towns than in healthy country districts. It is also said to be sometimes hereditary, occurring among families of nervous excitable persons. I have myself known three children of the same family who were affected with spasm of the glottis. "There are families in which all the children suffer more or less from it, and Powell even relates an instance where, out of thirteen children, brought up by the same parents, only one escaped the disease."§

As to the period of life when the disease is most common, we may mention that of infancy, and about the seventh month when there is disturbance in dentition. After the age of three years it

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* Diseases of Children, 1848, p. 231.

† Reynolds's System of Medicine, vol. ii, p. 260.

‡ Diseases of Children, by J. Lewis Smith, M.D., 1869, p. 194.

§ Vogel on Diseases of Children, 1874, p. 274.

is much less frequent. "In 31 out of 37 cases, of which I have preserved a record, the symptoms manifested themselves between the ages of six months and two years, or just at that time when the process of dentition is going on with the greatest activity."* "Of 226 cases which have come under my own notice, 174 were in the first year of life, and the remaining 52 between the second and third years; and the relative proportion of the sexes was 150 boys to 76 girls. In both parents and children there was very frequent evidence of rickets."† "In every case of *laryngismus stridulus* (save two) which has come within the experience of Sir W. Jenner, the child was the subject of rickets."‡

Most observers agree that laryngismus stridulus is not uncommon in cases of chronic hydrocephalus, and this has been pointed out by West, Elsässer, Vogel, and many others. Where the nervous system is excited or exhausted it is sometimes seen. I have known attacks to occur so often as to convince me that this is by no means an uncommon cause. Fright, alarm, emotion, anger, loud noises, etc., are all to be enumerated as excitants of the seizure.

The researches of Dr. Marshall Hall elaborately explain how the disease may originate through irritation of some of the cranial and spinal nerves. "Spasm of the glottis is an excitation of the true spinal or excito-motory system. It *originates* in

"A. The *trifacial nerve*, in teething.

B. The *pneumogastric*, in over or improperly fed infants.

C. The *spinal nerves*, in constipation, intestinal disorder, or catharsis.

These act through the medium of

2. The *spinal marrow*, and

3. A. The *inferior or recurrent laryngeal*, the constrictor of the larynx.

B. The *intercostals* and *diaphragmatic*, the motors of respiration."

When the disease is once established, a violent fit of crying, or any attempts at swallowing, or sudden movements will bring it on. Changing the nurse or giving improper food will invite an attack in a delicate child, especially if it is the subject of convulsions, between which and laryngismus there seems to be a close

* West on Diseases of Infancy and Childhood, 1859, p. 181.

† Steiner's Diseases of Children, by Lawson Tait, 1874, p. 129.

‡ Reynolds's System of Medicine, vol. i, 2d edit., p. 823.

connection.* The following is a fatal case in point: On the 27th of January, 1875, I was requested to see the male child of a lady residing in a large and well-arranged house in the west end of London. He was five months old, and was born strong and healthy. A wet-nurse was procured for the first three months, when she left, as her milk was supposed to disagree. The child was fed with milk and Robb's biscuits, and for a few days before my visit, "Chapman's wheat flour" was substituted, which appeared to agree. The child had been successfully vaccinated on the 25th of December from a healthy infant, and from this time the mother thought it had become pallid and flabby. The general condition seemed, however, satisfactory, and the pallor was probably due to his being shut up in the house. There was a large family of children, but none of the others had ever suffered from a similar affection or from any illness of importance. On the day previous to my visit the child was seized with what the nurse termed croup, being unable to get his breath for some moments, the attack ending in a crowing inspiration and a wheezing cough. The child was irritable and restless, and could not obtain sleep; the bowels were sluggish, and the motions dark and offensive. I prescribed a powder consisting of bicarbonate of soda and rhubarb every night, and a mixture of bromide of potassium and sal volatile three times a day. The child to be fed on cow's milk only.

January 28th, 9 A.M.—I received a note to say that the child had had four convulsions since my last visit. The nurse had carried him in her arms all the night, and if she attempted to put him down he could not breathe. The seizures were marked by fixed eyes, pallor of cheeks, darkness of the lips, and a convulsive movement of the body. Some of these attacks ended in a long crowing inspiration. When I approached the child at my visit he seemed almost electrified, starting in the nurse's lap, and looking dreadfully alarmed. There was some coryza, with running of the nose and eyes; the skin was moist and warm; temperature 100°, pulse 156; respirations 36, noiseless. At 3.30 A.M. the bowels had

* "Out of 50 cases of laryngismus, of which I have notes, 19 had had eclamptic fits."—Dr. Gee, St. Bartholomew's Hospital Reports, vol. iii.

"The occurrence of general convulsions in connection with laryngismus, indicates that the morbid action extends to and involves some larger group of nerve-cells than in the local spasm, probably either the whole of the medulla oblongata, or the corpora quadrigemina also."—*On Functional Nervous Disorders*, J. C. Handfield Jones, M.B., 1870, p. 631.

acted well, the motion being of a light-yellowish ochrey color, with slimy discharge. The food ordered to consist exclusively of two parts of cow's milk and one of sweetened barley-water. In the shape of medicine, a mixture consisting of citrate of potash, bromide of potassium, and tincture of henbane.

12 M.—Sleeping tranquilly, but on being touched he started convulsively; there had been one attack of crowing since my last visit. At 5 P.M. he was sleeping, and there had been no return of the crowing; at 9 P.M. he was resting in his mother's lap; the face was calm and peaceful; the skin cool; pulse 120.

29th, 9 A.M.—The bowels had acted moderately three times, but the child was continually drawing up his legs and crying, as though in pain; there had been no sickness and no convulsion. He was rather pale; pulse 120, respirations 32; the skin was cool, and the breathing, as ascertained by putting the ear to the back of the lungs, was unembarrassed; the pupils were normal, and he looked round intelligently. I considered he was likely to recover. I went downstairs, and just as I had reached the hall I was summoned again, when the mother handed me the child, whose lips and face were now dark, his limbs relaxed, and he had ceased to breathe. Death must have taken place in a minute from asphyxia.

Cases are sometimes to be met with of a more chronic character, and where there is no immediate danger to life.

CASE 2.—On April 12th, 1875, a female child, fifteen months old, came under my care at the Samaritan Hospital, which had suffered more or less from laryngismus ever since she was six months old. The child was rickety, with the strumous diathesis strongly marked, the head was large, and the anterior fontanelle wide and prominent; the veins were distended over the scalp; the face was pale and flabby, and there were only six teeth. Three months before I saw the child she had had convulsions, which continued more or less for some time. The child was often breathless, the respiration habitually accelerated, and the cough croupy. If excited in any way, as playing with other children, the attack was certain to occur, and so bad was it that her mother thought she would sometimes die in it, as her face became dark and purple. Sudden changes of weather, as from heat to cold, or the reverse, were certain to invite a seizure. It sometimes came on in the night. The mother stated that she had suckled the child,

having had plenty of milk, but her health was delicate; and till within a short period she had scarcely ever given her any other form of nourishment. The child made a fair recovery, but remained delicate when I saw her a year after first coming under treatment.

Death may take place (1) from asphyxia, as in the first case related, where the cavities of the heart are full of blood, and the lungs engorged; (2) from cerebral congestion and serous effusion; (3) from exhaustion and failure of the vital powers. "The sudden death, which is by no means uncommon in this disease, depends, I conceive, on the transmission of irritation along the cardiac fibres of the vagi to the heart, which is then arrested in its action, just as when the pneumogastrics are strongly galvanized."*

Pathology.—The disease appears to depend primarily on irritation of the pneumogastric nerves, which is provoked by disease of the cervical or bronchial glands, or by irritation of the fifth nerve, as from teething, or by disorder of the stomach and intestines.

The irritation is propagated to the inferior or recurrent laryngeal nerve, and the muscles of the larynx are thrown into spasm. The larynx is entirely free from inflammation, and there is no lesion of its mucous membrane. It is a purely neurosal affection, and whatever anatomical changes may be found after death are in most cases consequences, rather than causes, of the seizure. "It seems rather to be an independent affection of the par vagum, or of its recurrent branch, due either to pressure along some part of the course of one of these nerves, or to centric irritation at the root of the vagus; or else we may be compelled to regard its exalted sensibility as a reflex phenomenon arising from excitement of some other nervous trunk. In most cases the pathogeny of this disease is obscure."† Dr. West likens the disease to hysterical fits in the female, and says that both affections are most common when the processes of life are most active.‡ In some cases, effusion into the ventricles, congestion of the brain, or even tumors in the cerebral substance, have been found after death.

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* Handfield Jones, M.B., op. cit., p. 633.

† Niemeyer's Practical Medicine, 1875, vol. i, p. 51.

‡ Op. cit., p. 181.

Tubercle of the lung and bronchial congestion have been also noticed. Still morbid appearances are sometimes entirely absent.

The *diagnosis* from croup is given in the chapter under that heading (page 329), but it may be here stated that in laryngismus the suddenness of the seizure and its departure, the normal breathing in the intervals of the attacks, and the absence of fever and inflammation, are the distinguishing features of this peculiar complaint. As the disease increases there is a disposition to general convulsions, whilst these occur only in the last stage of croup. The crowing sound is not unlike that of whooping-cough, but in laryngismus there is no expectoration, nor vomiting, nor catarrh in the strict sense of the term.

The *prognosis* may be considered generally favorable in slight cases, when the seizures are not frequent, the health tolerably good, and there is no complication. When the case is mild, and the crowing comes on at long intervals, it usually yields to judicious treatment. Still, the disease is always to be regarded with anxiety, and especially, if severe, from the liability to cerebral complications, convulsions, or sudden death. "Out of fifteen cases of which I have kept a record, eight died. Rilliet and Barthez, out of nine cases, and Herard out of seven, observed in each only one single instance of recovery."*

Treatment.—The first indications are to remove all exciting causes. If the bowels are disordered they should be set right as soon as possible by proper aperients, and healthy digestion promoted. If the child has taken a heavy meal, or indigestible food, an emetic may be advisable; and should the gums be swollen and dentition appear to invite the complaint, they ought to be scarified. The child should occupy an airy apartment, and noise and excitement be precluded. If seen during the paroxysm it should be kept in an upright position, and the windows opened, so that it may be encouraged to breathe. In severe cases, especially if a convulsion threaten, it may be immersed in a warm bath, whilst cold water is sprinkled at the same time over the face. Dr. Morley Rooke recorded a case of laryngismus stridulus in a child nine months old, where occlusion of the larynx during the fit produced symptoms like those of a "recently drowned person." The little patient "showed no signs of life" when first seen in the seizure; the lips were blue and swollen, the face a livid gray, and the eyes

* Vogel, op. cit., p. 272.

half closed and glassy. Dr. Rooke thrust his finger between the teeth to the fauces, when the child gave a short heave and a gasp; on repeating the movement inspiration took place, and in a few more seconds breathing ensued. On two more occasions, when occlusion of the larynx was equally severe, a similar manœuvre brought round the child. This is a mode of treatment well worth bearing in mind when the child threatens to die from spasm of the glottis. The cure was completed by bromide of potassium, which was taken for eleven months.* Dr. Wardell also points out the beneficial effect of "rotating the finger in the throat" in these cases; it induces an attempt to vomit, when the laryngeal muscles become relaxed, and air is admitted into the trachea. He says it is the first thing to be done, and he has seen it succeed when death seemed imminent.†

In extreme cases, where death threatens from asphyxia, the operation of tracheotomy should be employed. The inhalation of chloroform has been recommended in some cases, but then its influence soon passes off, and it cannot be said to have any curative effect. When there is much restlessness, and the child can obtain no sleep, the excitability of the nervous centres must be calmed, and for this purpose small doses of morphia may be cautiously employed. In the intervals of the seizures the bowels must be kept freely open, so as to remove all sources of irritation that might sympathetically excite spasm.

Among the chief drugs are belladonna, in the form of extract or tincture, which sometimes has the effect of diminishing the glottic spasm, but in many cases it fails altogether. Bromide of potassium is very serviceable, given with citrate of potash, sal volatile, or quinine, according to the peculiarities of each case.‡ Carbonate of ammonia, henbane, bark, and mild preparations of iron, as the ammonio citrate, or the syrup of the iodide are remedies to be selected. If the child is strumous and rickety, or in any way delicate, cod-liver oil is invaluable.

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* Brit. Med. Journ., 1868, vol. i, p. 370.

† Ibid., p. 474.

‡ Formula 56:

R. Potass. bromid., ... ℥j
Tinct. quiniæ, ... ℥ij
Glycerini, ... ℥ss.
Aquam ad . . . . . ℥j.—M.
A teaspoonful three times a day. For a child one year old.

Diet is of great importance, and, when carefully selected, the disease may disappear without drugs. If the child is fed at the breast it is sometimes advisable to change the nurse, or to give cows' or asses' milk. If older, the food must be light and nutritious, and given frequently in small quantities. The clothing should be warm, and if the child is not too ill he ought to be taken out in the open air daily. Sponging the child's chest with cold water may be practiced with advantage.

CHAPTER XXXII.

PERTUSSIS OR WHOOPING-COUGH.

*An infectious disease common in early life—Sometimes happening a second time, and in adult or advanced age—Nature and pathology—Three stages—*1. *The catarrhal—*2. *The spasmodic—Symptoms of each stage—Influence of peripheral irritation—Ulcers on the frænum linguæ—Pulmonary and cerebral complications—Bronchitis—Pneumonia—Emphysema—Collapse of lung—Tuberculosis—Convulsions—Enlarged bronchial glands —*3. *The last or terminal stage.* TREATMENT: *Difficulty in prescribing any plan for general adoption—Occasional utility of local bloodletting in cerebral and pulmonary congestion—Emetics in loaded bronchi—Importance of attention to diet, which should be light and nutritious—Dr. Fuller's plan of treatment—Sulphate of zinc—Zinc and belladonna—Sulphate of atropia—Cannabis indica—Hydrate of chloral—Croton-chloral —Bromide of potassium—Alum—Nitric acid—Hydrocyanic acid—Hydrocyanic acid and quinine—Carbonate of potash—Topical remedies to larynx—Carbolic acid inhalation and spray—Quinine and bromide of potassium in the neurosal stage—Change of air.*

WHOOPING-COUGH is an infectious disease of early life, varying in duration from a few weeks to many months. It is characterized by a peculiar paroxysmal cough, and irritation or inflammation in the lining membrane of the air-passages. Sometimes whooping-cough prevails as an epidemic, and sporadic cases are common at all periods of the year; sometimes the attacks are mild, and sometimes they are highly dangerous to life. It may attack very young infants; but children between the ages of one and seven are most liable to it. The mortality appears to be greater among females than males. It may be complicated with pulmonary or cerebral disease, or it may run its course from beginning to end with much spasmodic cough and scarcely any bronchial affection. In two or three instances I have met with the disease occurring a second

time, and such is also the experience of other observers. A lady, whom I have seen professionally for many years, assures me that she had whooping-cough when a child, and a second and very tedious attack when over forty years of age. The late Sir John Forbes had an attack of whooping-cough about a year before his death. Dr. Easton, of Norfolk Crescent, has kindly furnished me with the details of two very remarkable cases that came under his care. The first case was that of a gentleman in his seventy-first year, who resided in the West-end of London. On April 14th, 1869, Dr. Easton was consulted. He ascertained that the patient had had a cough for a week, which resisted the usual domestic remedies. The cough increased in frequency and severity, and on the 18th he first whooped distinctly. On the 11th of May he was well enough to leave town. During the attendance he had shown unmistakable symptoms of whooping-cough, the paroxysms occurring very frequently, and being often followed by vomiting. On April 24th, whilst in attendance on this patient, Dr. Easton was summoned to see Mrs. P——, in her 94th year, the mother of the above. She had been in the habit of receiving daily visits from her son, from whom she no doubt had caught the disease. She had a spasmodic cough, which gradually increased, and in a few days she had also well-marked symptoms of pertussis. The cough continued until the 24th of May. These patients had not previously suffered from the disease to their knowledge.

As to the *nature and origin* of the disease, a wide difference of opinion prevails. In the earlier stages of simple and uncomplicated cases, nervous irritation holds a very prominent position in the chain of causation, and this appears to be the opinion of most writers. Some have ascribed the source of mischief to the stomach, others to the lungs, and others, again, to the phrenic and pneumogastric nerves. Dr. Copland attributed the seat of irritation to the medulla oblongata and base of the brain, whilst by some, the nervous system generally has been considered at fault. That in many cases the pneumogastric nerves are the seat of great irritation, and that the brain is involved through the medium of the sympathetic, is certain; but whether they are primarily or essentially concerned in the production of the peculiar phenomena appears to me doubtful. Whooping-cough depends on a materies morbi in the blood, having a special affinity for the larynx and

organs of respiration.* It has a tendency to throw the muscles of the glottis into violent spasm, through irritation of the inferior laryngeal nerves, which not only prevents the expulsion of the mucus so largely secreted by the windpipe in this affection, but by the violence of the coughing, and the extension of the irritation to the main trunk of the pneumogastric, affects the stomach and causes vomiting.

The *latent or incubation period* may last from one to three weeks. Dr. Squire estimates it about a week, and Dr. Bristowe about a fortnight.

The disease may be said to have three stages :

1. *The catarrhal.*
2. *The spasmodic.*
3. *The terminal or last stage.*

1. *The catarrhal stage* is usually ushered in with most of the symptoms of a common cold, such as languor and febrile disturbance ; but it should be borne in mind that the spasmodic stage may sometimes precede it, and the whoop be heard before any bronchial irritation can be detected. The child is peevish and restless at night, the nose furnishes a slight discharge, and sneezing and tickling cough soon succeed. It is the severe and paroxysmal character of the cough during this period, with a persistent restless and feverish state, that suggest—in the absence of genuine bronchitis symptoms—the approach of pertussis. The cough for some days may be hard, frequent, and irritating; but there is neither distinct whoop nor expectoration. Until the whoop occurs we are in ignorance as to the nature of the disease; while even if we were not in ignorance, we should still be without any specific to cut it short or ward it off.

2. *The spasmodic or characteristic stage* is recognized by an increase in the frequency and severity of the cough, and a change in its character. The fit of coughing is painfully prolonged and spasmodic ; the little sufferer opens his mouth wide, as though he

* The Registrar-General includes whooping-cough among the principal diseases of the zymotic class. Like small-pox, measles, and diphtheria, scarlet fever, and typhoid fever, its prevalence is sometimes great and fatal. Thus, of 1322 deaths registered in London for the week ending May 22d, 1875, 2 died from small-pox, 23 from measles, 31 from scarlet fever, 14 from diphtheria, 91 from whooping-cough, 25 from different forms of fever, and 15 from diarrhœa, so that of these 201 deaths from zymotic diseases, nearly half arose from fatal cases of whooping-cough.

were choked; there is an attack of vomiting with it, and the escape of some phlegm and mucus from the air-passages. Before the seizure comes on, the child seems as if he were inwardly struggling to suppress it, and he has a very anxious aspect. When the cough once really begins, the eyes are swelled and bloodshot,* and tears run down the cheeks; the lips are bluish, and the face has a pallid, bloated look; the veins of the forehead and neck are distended, owing to temporary arrest of the circulation through the lungs, the pulse and respiration are much increased in frequency. When the cough is very severe the child may bleed from the mouth and nose, owing to the turgid and congested state of the mucous membrane. In consequence of the extreme distension of the capillary bloodvessels, they rupture. Hæmorrhage, indeed, from the mouth during the congestive stage, when the cough is severe and prolonged, is extremely common, and will recur for weeks together in some cases. "In certain instances hæmorrhage may take place *within* the cavity of the tympanum in the same manner and from the same cause as in the nose, mouth, and eyes. If the blood be not absorbed suppuration is liable to ensue; and subsequently ulcerative destruction of the tympanic membrane, as occurs in scarlet fever."†

The attacks are usually worse at night, and when they come on the child may get out of bed alarmed, and in terror run round the room in a breathless state. Sometimes the child cannot lie down from fits of suffocative cough, nor get any rest at night. It is not unusual to meet with a child suffering from most of the physical and general signs of bronchitis in whom the poison of whooping-cough is not suspected, because the whoop has not been heard. This cough may last when the bronchitis improves, and be attended with violent and continuous expiratory efforts, when the look of the child's face and the nature of the cough (coming on in paroxysms, especially at night) are characteristic of pertussis. Nothing is absent but the whoop. This may develop itself further on, or

* In 1878, a boy aged eleven years, of robust frame, came under my care with whooping-cough. From the extreme violence of the paroxysms, a large effusion of dark blood took place in the left anterior chamber of the eye, only leaving a mere speck of the white sclerotic at its upper part. There was considerable bronchial irritation, and some recent emphysema.

† Hæmorrhage from the Ears in Whooping-cough; its real cause, by George D. Gibb, M.D., Brit. Med. Jour., 1861, vol. ii, p. 435.

never be completely developed at all; but the disease is the same, and in all other respects runs its course in the usual way. I have occasionally in practice met with a case where one child in a family whooped, and the others, who presumably suffered from the same cough, did not whoop; and I have known the pulmonary symptoms gradually assume the most serious aspect, while the whoop has declined, even if it has not been altogether absent. This is partly to be explained by the temperament and constitution of the child. The dread of coughing, or the fear of lying down to sleep, or a fit of passion or crying, is quite sufficient to bring on a paroxysm. The cough consists in a number of expirations, and when the child has seemingly forced all the air out of the lungs (and a considerable quantity is expelled) the effort is succeeded by a long and deep inspiration. As the air passes through the glottis the peculiar sound or whoop is produced, and this sound is liable to great modification. In a little girl under my care in 1874, the inspiration was very clear and lengthened, fading away gradually like the sharp, shrill note of a flute. In other cases it is more barking and crowing. If bronchitis is not present in the convulsive or spasmodic stage, we may detect no physical changes in the lungs beyond a slight light mucous râle. Between the fits of coughing the vesicular murmur may not be impaired, and air may enter the minute structure of the lungs, as in health; but during the fit of coughing the lungs empty themselves of air, and none whatever can be heard to enter the pulmonary tissue. When the expirations are long and continuous the child is brought to the verge of suffocation.

A good deal has been recently written on the connection of ulcers of the frænum linguæ with whooping-cough. I have examined a large number of cases, and I am inclined to agree with those observers who regard them as accidental rather than pathological. When present, they prove the violence of the convulsive paroxysms. As the tongue is protruded from the mouth, its under surface and the frænum linguæ come in contact with the lower incisor teeth, so that these ulcers may be looked upon as the result of injury. They are absent in mild cases, or where the duration of the disease is short, or the lower incisor teeth are not developed.

The cough of some children when suffering merely from a common cold is convulsive and ringing; in some it has a deep and sonorous sound, which parents attribute to a consumptive origin;

and in others it has a croupy character, which they think is the forerunner of croup; but the whoop, when present, is not to be mistaken, and settles all doubts as to the true nature of the disorder.

When whooping-cough has succeeded to the eruptive diseases, or has followed any acute illness or long-standing debility, it is difficult to treat and dangerous in its results. When a child has no sooner recovered from measles than he is attacked by whooping-cough, the two diseases greatly aggravate the danger. Scarcely has there been time for the constitution to recover its lost tone before it is attacked by a second disease, and so what at first might have passed off as simple functional disturbance, now becomes intensified, and may terminate in organic change.

Nervous symptoms are more readily excited in some children than in others, and these cases are always anxious ones—in fact, nervous irritation exerts a powerful influence in many other diseases of childhood. Dr. Barnes, speaking of the influence which peripheral irritation has upon the nervous centres of a naturally irritable child, mentions a case of tetanus induced in an infant by whooping-cough which came under his own observation. He says, "On January 16th, 1866, I met Mr. Giles, now of Henley-on-Thames, on the case of a boy aged nine months. He had been weaned two months, and was taking cows' milk and Robb's biscuits. He had had whooping-cough three weeks, having taken it from his brother. During the last three days a singular train of nervous symptoms appeared; first trismus, then emprosthotonos, the hands touching the feet, then the body arched back into opisthotonos. The fits seemed the first expression of the impulse to cough, the cough coming on soon after the fit. Anything in a spoon excited cough or fit. The child was not much wasted, but there was some degree of anæmia; the bowels had been out of order, the stools pale. Calomel and rhubarb had corrected this condition. He had had belladonna. We recommended goats' milk, solution of perchloride of iron, and gave a favorable prognosis." The child recovered. "Such a case," adds Dr. Barnes, "must be studied in connection with the trismus nascentium. It proves very clearly the intimacy of the association between whooping-cough and convulsive diseases."* This is a truthful maxim

* Lumleian Lectures; On Convulsive Diseases of Women, Brit. Med. Journ., April 19th, 1873, p. 424.

which should fix itself on the minds of all medical men. Irritation need only be very slight and transient at the period of the first dentition to originate mischief in one or other of the nervous centres. Convulsive movements, stopping short of actual culmination, are exceedingly common at this early period of life. The nervous system is so highly organized that any impression on any tissue or organ of the body is at once felt, and irritation, however varied and remote, freely communicates its influence to it.

Unless complications arise, such as bronchitis, pneumonia, cerebral or mesenteric disease, whooping-cough is not dangerous. Although the disease may pursue a tedious course, and cannot be abruptly terminated by any method of treatment with which we are acquainted, it will sooner or later end in complete recovery, if these complications can be warded off.

Generally the amount of spasmodic cough bears no relation to the severity of the bronchitis when it is present. In the case of a strumous-looking child, five years of age, admitted into the Samaritan Hospital, under my care, in December, 1874, the whooping was very moderate, whilst the bronchial affection and congestion of the lungs were very severe, the pulse reaching 140, and the respirations 56 per minute; the pupils were dilated, and the eyelids œdematous. The temperature, which was 102.6° on admission, fell to normal in five days; yet the gravity of the case did not lessen by the fall. The child lay betwixt life and death for many days, and the restlessness became extreme at night; the cough was excessive, and attended with copious bronchial sputa; loud mucous râles were heard in the lungs. The violence of the cough led to a considerable degree of emphysema of the lungs, and when the child had recovered, the chest was unduly resonant on percussion. Rupture of the air-cells may lead to an emphysematous condition of the face, neck, and chest. In two cases under my care, a prominent and doughy swelling was situated above the clavicles some months after the disease was cured.

The bronchial glands not unfrequently become enlarged in whooping-cough, as they sometimes do in the course of scarlatina and measles. It is supposed by Dr. Gueneau de Mussy, that by the pressure of these glands on the pneumogastric nerve, and particularly on the inferior laryngeal branch, the peculiar spasmodic cough is due.* But it is important to remember, as Dr. Barlow

* Enlargement of the Bronchial Lymphatic Glands with relation to Whooping-cough, Brit. Med. Jour., 1879, vol. ii, p. 649.

very truly states, that enlargement of the bronchial glands in whooping-cough is not constant, and that they may be enlarged without paroxysmal cough.*

3. *The terminal or last stage* may be described as the decline of the complaint. The cough is no longer so paroxysmal, the sputa are thicker and more easily expectorated, and there is no vomiting. The child sleeps soundly at night, as convalescence is approached, and gradually gains flesh and strength.

Treatment.—Here we have to contend with difficulties. Any contribution that could throw new light on a speedy and successful method of treating whooping-cough would be hailed with very great satisfaction. Few diseases are more rebellious to treatment, whether in the acute or chronic stage, and nothing would be more presumptuous than to lay down any plan for general adoption. Whooping-cough, like many other diseases, must be treated on general principles, for we know of no real specific. That plan will be most successful which meets the peculiarities of each case, no two cases being exactly alike, and the epidemic being seldom of the same character and severity. The weakly, strumous child, whose disease is complicated with a pulmonary or a cerebral affection, must not be subjected to the same treatment as a strong and healthy child, for whooping-cough is modified by the strength and constitution of the child, by the age, and by the season of the year. When catarrhal or inflammatory symptoms prevail, or general bronchitis is present, our plan of treatment is obvious. If convulsions or threatening symptoms of hydrocephalus should supervene it is equally plain; but to mitigate suffocative attacks of spasm, and to cut short this painful disease, we have no remedy on which we can confidently rely.

In cases where bronchitis is a prominent feature, and febrile symptoms are present, cooling aperients and saline medicines are called for. A mixture containing nitrate of potash, tincture of hyoscyamus, ipecacuanha wine, and the solution of acetate of ammonia will be useful. If the febrile symptoms are severe, and the bowels disposed to be obstinate, a few grains of sulphate of magnesia may be added to each dose, which will have an aperient effect and moderate the fever. Sometimes it is necessary to give a good purge, and after it the child is lighter and better. A grain

* Enlargement of Bronchial Glands with relation to Whooping-cough, ibid., p. 889.

of calomel, and a few grains of scammony or rhubarb, will now and then do great good by emptying the bowels, subduing the fever, and relieving the laryngeal spasm. At an early stage, if the child is strong enough, we may follow out this plan with advantage, and cases occur where it succeeds when specific treatment fails. In this condition we sometimes find the lungs full of loose, scattered bronchial râles, and the child so prostrate that it cannot stand, the skin hot, the tongue furred, the respiration short, quick, and catching. The spasmodic cough and constant expectoration reduce the child's strength much quicker than in uncomplicated bronchitis. The child is now apt to become heavy and torpid, and after a fit of coughing and sickness to fall into a drowsy state from congestion of the brain. When the lips swell, the eyes are heavy and meaningless, and the face becomes bloated from violent coughing and bronchial congestion; it may be necessary to apply two or three leeches to the head, and give a grain of calomel, followed by a soap-and-water enema, if the bowels do not quickly respond.

As the febrile disturbance diminishes, the nervous prostration and harassing cough are sometimes very troublesome. In this condition carbonate of ammonia and spirits of chloroform are necessary to aid the expectoration (Form. 61); but so long as there is much irritation in the lungs we must be careful in the use of sedatives, as I have previously mentioned. In some cases the child becomes much exhausted from the violence of the cough and the copiousness of the expectoration; the skin becomes relaxed and sweating, a state of passive congestion of the whole surface ensues, and stupor and drowsiness set in. Here the exhibition of sedatives would be dangerous from more points than one, and in place of them we must give ammonia and bark, and supply the child with nutritious food in small and repeated quantities.

When we have succeeded in overcoming the inflammatory state, antispasmodic remedies are valuable, the diet being carefully regulated, and the action of the bowels being kept as free as is consistent with the strength of the patient. On listening to the chest we may often detect extensive mucous râles and a large accumulation of phlegm in the air-passages, and there is necessarily danger lest through declining strength the phlegm should fail to excite cough in the bronchial mucous membrane. At first it may excite greater cough, but as the child becomes exhausted by these painful

efforts the cough fails to come on. The right side of the heart becomes overloaded from obstruction to the capillary circulation, and a state of passive or venous congestion ensues, attended with prostration and collapse. I have seen a few cases terminate fatally in this way, death being preceded by cerebral congestion and stupor, cold clammy skin, and blueness of the general surface. Sometimes the inflammation spreads to the smaller bronchi, or to the air-cells of the lung itself, leading to condensation of the lung, even if it does not produce tubercular disease in feeble and badly nourished children.

When the strength is fairly good, and the patients are harassed by perpetual cough and glairy tenacious mucus, we may order a teaspoonful of ipecacuanha wine every ten minutes at bedtime till vomiting ensues; but the treatment requires judgment, lest we weaken the digestive powers and lay the foundation for convulsions or some other serious complication. Usually one dose is enough, and the patient falls into sound sleep after it. I have seen the greatest advantage follow this plan of treatment in a large number of cases, when a bromide mixture with belladonna has been given three times a day, and an emetic at night. This plan of making the child sick is of less use if the minute bronchi are choked up, and there are any signs of impeded circulation through the heart and lungs, but it is of especial value where the upper bronchial tubes are loaded, and the larynx is congested and irritated. Gentle emetics will aid the expulsion of morbid secretions, subdue the cough, moderate the fever, and rouse the child from stupor and lethargy. If the child has been overdosed with narcotics, this treatment will be the more serviceable.*

Diet is of the first importance in the treatment of whooping-cough. It should be light and nutritious. Egg pudding, beef tea, and milk are the chief kinds of food to be chosen, because they are digestible and non-irritating. Bread may be given soaked in milk; but a small piece of plain bread and butter will often provoke a fit of coughing. Minced mutton and chicken, in very small quantities, are suitable for children of a certain age. Barley-water, sweetened, and flavored with lemon, is an excellent mucilaginous drink. The stomach is very sensitive, and the nervous system so impressible in this disease, that improper food, cold air, or deficient clothing, will be sure to aggravate the com-

* See the action of emetics in Chaps. II and XXXVI.

plaint. A child should always be fed immediately after an attack of cough accompanied by vomiting, so that the food may be digested and assimilated ere the next paroxysm comes on. If this be not attended to, the food is apt to be vomited in the next attack in a partially digested condition, and so is lost for all purposes of nutrition. As far as possible, the most perfect rest of body and mind should be maintained.

The late Dr. Fuller tried sulphate of zinc, in gradually increasing doses, to subdue the spasmodic cough. "In five only of fifty-nine cases in which I had the opportunity of testing its virtues did it fail in giving marked and speedy relief."* In no instance did the disease last longer than the eighth week.

In 1858 Dr. Fuller obtained the most satisfactory results from a combination of sulphate of zinc with belladonna. He estimated the average duration of an uncomplicated attack to be three weeks or a month. "As soon as the whoop declares itself, a draught is given every three or four hours, containing a grain of sulphate of zinc and a sixth of a grain of extract of belladonna, to two drachms of syrup of orange, in from two to six of water; and an additional grain of sulphate of zinc, and an additional sixth of a grain of belladonna, are added to each dose daily, or every alternate day, until the quantity taken daily amounts to from six grains to a drachm of zinc, and from two to six grains of the extract of belladonna, according to the age of the patient. To children under a twelvemonth old, I have never administered more than ten grains of the zinc and two grains of the belladonna daily, which were given in doses of a grain and a quarter of the zinc, and a quarter of a grain of belladonna, every three hours; whilst for children of eight or ten years of age I frequently prescribe half a drachm, or two scruples of the zinc and six grains of belladonna."† Belladonna deserves to rank among the first of our remedies in the treatment of this affection. The excitement and frequency of the cough are allayed by it in a marvellous manner. Large doses of belladonna are well borne by children. But it is important to increase the dose slowly, and if excitement, feverishness, or bronchial engorgement should ensue, then salines and emetics may be called for.

I have met with few instances where belladonna has not proved

* On Diseases of the Lungs, 1867, p. 384.

† Ibid., p. 386.

of benefit, and none where it has appeared to do harm. It is of most use in the spasmodic stage, when the bronchial irritation has subsided. I usually begin with a quarter of a grain for a child aged two years, in glycerin or syrup of tolu, every four hours. If it has no effect I give the same dose every two hours until it has made an impression upon the system. In a recent case I found that the spasmodic cough was uncontrolled till the child, aged eight years, took one grain every three hours. After a few doses the pupils became dilated, the cough lessened, and the child obtained refreshing sleep. Dr. Barnes observes: "The value of belladonna in allaying spasmodic or convulsive action is often striking. I have seen nothing so effective in the whooping-cough of children. Its power over other forms of convulsion is incontestable."* But, as I have pointed out, if it is to be of service, we must give it in gradually increasing doses till its sedative effects become manifest and the pupils are fully dilated. Like some other remedies employed in this intractable affection, it has obtained no credit, and been looked upon as inert and valueless. This is because the dose given is too small. I can have no doubt of the value of the drug, and at one stage or another I almost invariably give it. It lessens the frequency and severity of the spasmodic attacks in a remarkably certain manner, and subdues the tendency to convulsive movements. When its action has been kept up, and especially when combined with bromide of potassium, it tranquillizes the nervous system, induces sleep, and relieves the cough.

Sulphate of atropia may be given in place of belladonna, from being tasteless, and the readiness with which it dissolves in water. The dose at first should not exceed the one-hundredth part of a grain. "One-sixtieth of a grain of atropia or its salt, given hypodermically, will generally produce slight dryness of the throat or other indications of its constitutional action. Where rapidity of action is required, this is the best method of administering belladonna."†

Cannabis indica is recommended by some practitioners in the spasmodic stage. One drop of the tincture in a teaspoonful of water, may be given three or four times a day for each year of the child's age.

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* Dr. Barnes, Lumleian Lectures, On the Convulsive Diseases of Women., Brit. Med. Journ., May 3d, 1873, p. 483.

† H. C. Wood, M.D., op. cit., 1876, p. 257.

Hydrate of chloral has done good in the spasmodic stage, and relieved the cough, even when ipecacuanha and belladonna have failed. Five grains every four hours may be given to a child five years of age.* Of twenty-two cases in which it was employed "to relieve the cough, after the whooping stage was fairly reached," in only three did it produce any "appreciable benefit."†

Croton-chloral has been spoken of as a specific.‡

Bromide of potassium, like belladonna, is of most value in the spasmodic stage; and if convulsions or much nervous irritability should complicate the condition, it will be all the more serviceable. When there is much bronchial congestion and secretion it should be held in reserve, and not given till the lungs are freed of this load of phlegm by an emetic; but a moderate amount of catarrh and bronchitis do not contraindicate its use.

In whooping-cough when the breathing is excited, bromide of potassium as a sedative to the respiratory centre is indicated. On the other hand, when the respiration is labored or shallow, then belladonna is the drug to use as a stimulant to the respiratory centre.

Dr. Dillnberger says, "Some paroxysms of coughing may be allayed by laying a cold dressing on the lower part of the breast-bone, and hence, too, water poured over the breast-bone is recommended."§ This treatment is new to me; but we can readily understand that it may exert a tonic and remedial effect where there is an absence of bronchial congestion, and the spasmodic cough is the chief and distressing symptom. The spasmodic paroxysms are sometimes very alarming, and, in a case I saw in 1876, I thought that the child would have been suffocated from their violence and frequency.

When a paroxysm of whooping-cough is about to commence, the head should be elevated, and the child raised up if in bed. Everything about the neck and breast should be loosened. If the child is old enough to understand what is said to him, he should be encouraged and reassured. The temperature of the room in

* Hydrate of Chloral in Pertussis, Clinical Lectures on Medicine by Dr. Murchison, Lancet, Oct. 29th, 1870.

† Chloral Hydrate, by W. Bathurst Woodman, M.D., St. And. Med. Grad. Trans., 1871, vol. iv, p. 222.

‡ The Lancet, 1877, p. 223.

§ Handybook of the Treatment of Women's and Children's Diseases, p. 176. London, J. and A. Churchill, 1871.

the early stages requires to be warm and elevated, as in cases of bronchitis. The tenacious mucus must be wiped from the child's mouth with a handkerchief; the distress and alarm caused by the little patient's attempt to dislodge it is characteristic, and, from the fear induced, the paroxysm is often prolonged, and the child much exhausted.

Alum has been considered of benefit by some authorities in the spasmodic stage of uncomplicated whooping-cough; but I have been so satisfied with belladonna that I have seldom employed it. When all fever has departed, or the complaint has become chronic and irksome, it may be given with syrup three or four times a day, in doses of three or four grains. When the bronchial mucous membrane furnishes a copious secretion (bronchorrhœa), and the child is getting weak from the cough and sickness, alum seems to act both as an astringent and tonic, lessening the frequency and severity of the paroxysms without causing constipation or any ill consequences. Combined with belladonna, Meigs and Pepper have obtained better results than with any other remedy. They prescribe the undermentioned formula.*

I have never tried nitric acid in the doses recommended by the late Dr. Gibb, but I have frequently given, in the decline of the complaint, the nitromuriatic acid alone, or with tincture of bark, to improve digestion and appetite. Much in the same way, and in the same states, we should prescribe iron.

I have rarely given hydrocyanic acid alone. Its specific action is best seen in controlling the severity of the paroxysms, and the frequency of the convulsive cough. Its sedative action on the gastric nerves may also have a beneficial effect in allaying the irritation of the digestive organs, and diminishing the general sensibility of the nervous system; but it will have little or no effect on the cough, if the irritation depends on the accumulation of phlegm in the air-passages. Here it may be necessary to give an emetic in the daytime as well as at night. To be of service hydrocyanic acid should be given frequently, according to the severity of the

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* Formula 57:

℞. Ext. belladonnæ, ... gr. j
Aluminis, ... ℥ss.
Syr. zingib.
Syr. acaciæ.
Aquam ad . . . . . ℥j.—M.
℥j four times in the twenty-four hours. For a child a year old.

spasm and the frequency of the cough. It is a remedy that requires careful watching, for an overdose may produce syncope or convulsions, and it is for this reason that I seldom prescribe it.

When the whoop is declining, and the febrile symptoms are departing, hydrocyanic acid and quinine are good remedies, and may be given with advantage, even when there is some rhonchus in the lungs, and a little moist crepitation. In three children in one family, who were all seized with whooping-cough about the same time, I found that in each case the frequent and spasmodic cough was rapidly relieved by this treatment, and they were able to digest sufficient nourishing food to strengthen the general system and shorten the duration of the disease. At the end of a week or fortnight, the signs of pulmonary irritation may all disappear, and cod-liver oil and preparations of iron will then complete the cure.

But among medicines used in whooping-cough the old-fashioned remedy of carbonate of potash cannot be ignored. The testimony that has been urged in its favor is very strong. It is of most service when the secretions in the larynx are tenacious, and adhere to the parts about the glottis, so that they cannot easily be dislodged by expectoration. The alkali is of service here, as it is in the early stages of bronchitis, when the bronchial membrane is vascular, secreting, and irritable. It controls the violence of the paroxysms which so terribly exhaust the child, and it enables the copious secretion about the air-passages to be more easily dislodged. The cochineal usually combined with the potash mixture is probably of no value, but it is pleasant to the eye, and with syrup will not be refused by the youngest child.*

As to the topical application of remedies to the larynx in this intractable disorder, I have had no experience. Sponging the pharynx with a solution of nitrate of silver was long ago advocated by Dr. Eben Watson, of Glasgow, Dr. Horace Green, of New York, M. Joubert, and some other French physicians. Dr. Watson applied it successfully to a baby at the breast, whose life was in danger, and he has given some statistics to show that of sixty-six

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* Formula 58:

℞. Cocci, ... gr. v
Potass. bicarb., ... gr. xl
Syrupi, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful every three or four hours. For a child two years old.

cases treated by him, forty-six were cured in a fortnight, and the remaining twenty in three or four weeks. Not one child resisted the treatment, In another calculation, from a severe epidemic at Glasgow, he gives the proportions of deaths at only 0.6 per cent., and the cases cured within a month were 36.5 per cent.* There would seem to be something extraordinary in the rapidity of these cures, because, looking at the experience of most writers on the subject, the duration of the disease has generally been much longer. A disease that may end in a fortnight, or extend over six months, pursues such an indefinite course that no reliable calculation can be made. If the application of a solution of nitrate of silver (℈j to the ℥j) is such a valuable remedy we are somewhat surprised to learn that it is not more generally adopted. It appears to me that sponging the pharynx and aperture of the glottis may give relief, in the purely spasmodic stage, to children of six or seven years of age; but to pass the sponge beneath the glottis into the larynx, which is the only way to act on the secretion which sets up the spasm, must be attended with difficulty and danger. The larynx is very small in young children, and it would require considerable skill to enter it. Then, too, the alarm and agitation produced by the operation, are quite enough to increase the spasm, if not to provoke a convulsion.

Dr. R. J. Lee† has called attention to the use of carbolic acid in the treatment of whooping-cough. One part of carbolic acid and ten parts of water form a standard mixture, of which two drachms are to be mixed with four ounces of water. This is put into a steam-draught inhaler, and the vapor inspired every ten minutes or quarter of an hour, three or four times a day. Dr. Lee contends that carbolic acid used in this manner is a more satisfactory remedy than any other, and that it has proved of advantage in other diseases of the respiratory organs. Dr. Burchardt,‡ Lecturer at the University of Berlin, states that in 1873 he used a solution of carbolic acid in water for inhalation three times a day (one and a half to two parts of acid in a hundred parts of water) with perfect

* On the Topical Medication of the Larynx, by Dr. Eben Watson, chap. vi, p. 103. London, J. Churchill, 1854.

† British Medical Association, held in Edinburgh, August 3d, 4th, 5th, and 6th, 1875. Section A: Medicine. Remarks on Whooping-cough, and its Treatment with Carbolic Acid Vapor, by Robert J. Lee, M.D., London.

‡ Treatment of Whooping-cough with Carbolic Acid Vapor, Brit. Med. Journ., September 25th, 1875, p. 396.

success in the treatment of whooping-cough and other affections of the respiratory organs. Mr. T. D. Harries records several cases of whooping-cough which resisted every remedy but carbolic acid, under which the malady rapidly subsided. It should not only be used internally, but be deposited about the house.* Dr. George Rugg,† of Clapham Road, appears to have successfully employed carbolic inhalation as far back as 1866 in the cases of five of his own children. His plan is both ingenious and ready. A few minims of the acid are inserted into the bowl of a tobacco-pipe, which the children smoke. Dr. Rugg, however, is doubtful as to the efficacy and safety of the remedy, for he says, "the use of carbolic acid is not without danger." He now prescribes a solution of chlorinated soda with permanganate of potash, in the form of spray, both for inhalation and disinfection; he also fumigates the room by means of iodine. As bromide of potassium, belladonna, and an emetic at bedtime are also given, it is impossible to say what share of credit, if any, the carbolic acid inhalation is entitled to. It seems to me that we are dealing with a disease presenting so many local and constitutional variations—spasmodic, congestive, and inflammatory—that no specific treatment and no medicated inhalation will be suitable for every period and stage of the complaint.

In the neurosal stage, quinine and bromide of potassium are very useful;‡ zinc and belladonna are also sometimes efficacious, as I have before remarked; but if the lungs are loaded with mucus, this must be got rid of before any of these remedies can be of service, for as long as it remains in the bronchial tubes it keeps up the cough, and exhausts the child. We must never forget to keep the salient points before us,—the neurosal side is the essential factor in one case, the pulmonary or bronchitic in the other.

Any error of diet, and especially overfeeding, fatigue, or exposure to cold, will bring on a return of the symptoms when the

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* The Lancet, July 13th, 1878.

† Treatment of Whooping-cough with Carbolic Acid Inhalation, Brit. Med. Journ., October 2d, 1875, p. 425.

‡ Formula 59:

R. Tinct. quiniæ,	℥ij
Potass. bromid.,	gr. xl
Glycerini,	℥ss.
Aquam ad	℥iv.—M.

A dessertspoonful three times a day, for a child five years old.

whooping has entirely disappeared, and we have pronounced the patient cured. The peculiar cough may recur after three months' cessation when convalescence has been interfered with.

In the cough which often remains after pertussis, as a form of habit, quinine is most useful. It may be given as the hydrobromate, or with hydrobromic acid, with advantage.

Change of air and locality are very serviceable, and will sometimes effectually get rid of the remaining cough in a short time. In some cases change appears to be attended by no advantage, but it should always be advocated as soon as the disease becomes chronic, and has proved rebellious to treatment. If the general health keeps fairly good, and no complications arise, a nutritious and careful diet, with an occasional aperient, is all that is demanded till the malady wears itself out.

CHAPTER XXXIII.

ENLARGED BRONCHIAL AND MEDIASTINAL GLANDS.

CAUSES: *Unfavorable hygienic conditions—Cold and exposure—The exanthemata—Evil effects of overfeeding.* SYMPTOMS: *Bronchial irritation and attacks of dyspnœa resembling spasmodic asthma—Cases in illustration—Post-mortem appearances.* TREATMENT: *Expectorants and sedatives to relieve cough and dyspnœa—Preparations of iron and cod-liver oil—Application of a weak solution of tincture of iodine to the enlarged glands.*

CLOSELY associated with the morbid changes in connection with hypertrophy of the mesenteric glands are those similar changes observed in the bronchial and mediastinal glands. The constitutional condition which originates the complaint in both sets of cases is similar; but as the symptoms are necessarily different and often obscure in the latter, I shall devote a separate chapter to the consideration of them.

Below the bifurcation of the trachea, in the angle formed by the divergence of the two bronchi, from ten to fifteen lymphatic glands are situated; and glands also exist along the course of the bronchi, chiefly behind them.

Dr. Quain states the important fact, that in health these glands are proportionately larger in infancy than in the adult.*

* Diseases of the Bronchial Glands, Brit. Med. Journ., vol. ii, 1878, p. 863.

Being lymphatic organs, these glands are subject to the same diseases that attack their homologues in other parts of the body, as, for example, that simple strumous enlargement so common in the glands in the neighborhood of the sterno-mastoid muscles. But, from their situation, any enlargement of the bronchial glands entails the risk of grave mechanical results. Pressure on a bronchus, on branches of the great vessels of the lung, or on the pneumogastric nerve, cannot fail to affect most seriously the processes of respiration and circulation. As glands exist in the mediastina, they may from their situation cause, when diseased, complications almost as severe as when the lymphatics of the bronchi are involved.

The *causes* of lymphatic enlargements in the mediastinum and around the bronchi are doubtless similar to the causes of swelling in the glands elsewhere. Thus, unfavorable hygienic conditions, debility from disease, starvation, or neglect, may induce the disease under consideration. Cold and exposure are common exciting causes of congestion of these glands, or disease may be provoked by the glands participating in the inflammation of surrounding tissues with which they may chance to be connected. During whooping-cough, the exanthemata, and typhoid fever, the bronchial glands are apt to become enlarged. The disease may be met with during the first dentition; it is intimately connected with struma and tubercle, and the hypertrophied glands undergo caseous degeneration, or even abscess and suppuration. Its frequency in early life is admitted by nearly all authorities on the subject; yet the observations of Dr. Quain "on young persons and adults show that in fifty-nine cases, twenty-one were males and thirty-six females (in one case the sex was not recorded). Of these, two were under ten years of age, nine were between ten and twenty years of age, eighteen were between twenty and thirty, and twenty-six were over thirty years of age; while in three cases the age was not stated. If these observations justify any inference, it is that females are more liable to disease of the bronchial glands than males, and that the disease occurs with increasing frequency after puberty."*

Dr. Goodhart has insisted on the evil effects of overfeeding in association with enlargement of the mediastinal glands. He shows

* Diseases of the Bronchial Glands, Brit. Med. Journ., 1878, vol. ii, p. 864.

that this enforced intemperance with regard to diet not only produces disease of the alimentary canal, but "does harm in another way; by overstuffing the lymph-glands, giving them more than they can do; choking them with their own materials, and leading directly to tabes mesenterica, bronchial glandular enlargement, and even, I believe, to a general disease in the glandular elements in many parts—a process which, at its onset, is more aptly compared to stuffing turkeys or geese than to any strictly pathological condition."*

The physiology of nerve stimulation and reflex action is complex, and in no respect can be more complicated than with regard to the functions of the nerves controlling respiration. It is now considered probable that the grave reflex results due to this disorder are not invariably confined to spasm of the laryngeal muscles. The mischief appears to lie in the bronchioles and the lung itself, a condition "closely allied," as Dr. Goodhart remarks, "to what we suppose to be the case in spasmodic asthma." With the knowledge of this fact, the practitioner becomes aware of the futility of attempting tracheotomy in ordinary cases of enlargement of the bronchial glands. But hard-and-fast rules cannot be founded on physiological hypotheses. In very severe and sudden fits of dyspnœa from the disease now claiming our attention, it may happen that a gland has ulcerated into the bronchus, become detached, and produced the same spasm of the glottis which follows the entrance of cherry-stones or other foreign bodies into the air-passages. The well-known fatal case from this cause, in a boy aged eight years, described by Mr. Edwards in the thirty-sixth volume of the *Medico-Chirurgical Transactions*, and quoted in Holmes's *System of Surgery*, might have recovered if tracheotomy could have been performed earlier.

On post-mortem examination, the appearances of the affected region are readily made out by any observer who has had a fair idea of the normal size of the bronchial and mediastinal glands. From their position (especially as regards those at the root of the lung) it may readily be seen to what extent they press on neighboring vessels and nerves. Dr. Goodhart, in one case, found the pneumogastric nerve firmly adherent to a diseased gland. The

* Cases of Enlargement or Inflammation of the Mediastinal Glands, Brit. Med. Journ., vol. i, 1879, p. 580.

patient was a boy, aged eight, who died after suffering from severe paroxysms of dyspnœa for a fortnight. The same authority describes an autopsy where the thymus gland was found much enlarged. The patient, an infant eight months old, had been subject to convulsions and fits of choking. Irritation of the mediastinal nerves by the large thymus had probably exercised a considerable share in the fatal result. The trachea and bronchi may be ulcerated by pressure of the glands, and even plugged by them.

The *symptoms* belonging to enlarged mediastinal glands are spasmodic fits of coughing, causing lividity of the features, and threatening asphyxia. Other cases begin with catarrh and febrile disturbance, which may last for a week, and then spasmodic cough and crowing inspiration ensue. The child cannot lie down in bed for fear of choking, and he is in constant danger of suffocation.

The chief symptoms are those of bronchial irritation. Wheezing, with attacks of dyspnœa, sometimes amounting to spasmodic asthma, is very general in these cases. The fits of coughing are not unlike those of whooping-cough,* and in some instances the child seems as though it could not get breath, and dies of asphyxia. After death in such cases, enlarged caseous glands are found in the mediastinum, and near the bifurcation of the bronchi. In the case of a child, two and a half years old, recorded by Dr. Goodhart, a large caseous gland had opened into the trachea, and caused death.† The mesenteric glands were also enlarged, and Peyer's patches were thickened, whilst the mucous membrane generally over this part of the ileum was thickened, and the glands were in a state of overgrowth. In another case related by him, the thymus gland was very large, and where the inferior laryngeal nerve is given off from the par vagum there was an enlarged gland, the size of a "haricot bean," imbedded in the surrounding fibrous tissue. The glands about the root of the lung and vagus were equally large, but not caseous.

An attack of difficult breathing, like asthma, may come on, accompanied with lividity of the features, paroxysmal cough, staring eyes, painful anxiety, and end in death by coma. In such a case there may be caseous and suppurating glands, with bronchopneumonia.

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* See Chap. XXXII, On Pertussis.

† Cases of Enlargement or Inflammation of the Mediastinal Glands, Brit. Med. Journ., vol. i, 1879, p. 542.

I have seen the disease in connection with rickets, acute tuberculosis, and emphysema. The following is a very instructive and interesting case, and the examination after death confirms the diagnosis which was made when the child first came under treatment.

C. J——, æt. 1¾, was brought to me on January 3d, 1876, at the Samaritan Hospital, as an out-patient, with the following history: In September, 1875, he was seized with cough, breathlessness, and febrile disturbance, having been up to this time strong and well. The father and mother were healthy, and there was no phthisis in the family. The child was pallid, with gray eyes, light hair, and prominent forehead. He had sixteen teeth, which were decayed and ragged, and the gums were red and spongy. The thorax was thin and rounded, and the ribs were very prominent from loss of flesh; beneath both clavicles the percussion-note was hyper-resonant, especially on the left side; posteriorly the note was tympanitic between the scapulæ at the upper part, and the breathing was almost cavernous between the spine of the right scapula and vertebral column, but there was no moist crepitation. I diagnosed an empty cavity in this situation. Temperature 102.6°; pulse 160, small; respirations 80, short and superficial.

The head was large, and the veins over the forehead and temples distended. He was not admitted into the hospital, as the mother preferred keeping him at home. He was ordered a diet of milk and beef tea, and in the shape of medicine a mixture every four hours, consisting of carbonate of ammonia and tincture of cinchona, with syrup of tolu and water.

February 3d.—He was better for a time, in consequence of the directions being carefully carried out, but he relapsed again yesterday afternoon, was hot, and had headache, sweating and perspiration of the scalp; the child had evidently been in great pain, judging from the rolling of the head to and fro. The mother stated that he was always feverish, with flushed cheeks in the evening; but the temperature was only 98°, pulse 132, respirations 56. Loud rhonchus and catarrhal sounds were heard throughout the chest, both in front and behind; there was loose gurgling heard over the suspected cavity or suppurating gland at the upper part of the left scapular region, close to the vertebræ. The child was very fidgety, irritable, and quarrelsome. Two grains of bromide of potassium were added to each dose of the mixture, and a teaspoon-

ful of syrup of senna was given occasionally to keep the bowels freely open.

14th.—He had greatly improved up to this date, and was much better; had had no feverish attack since the 6th, but his cough was very troublesome, and he was rapidly losing flesh; he was never sick; temperature 99°, pulse 132, respirations 48. The cough was less, and the breathing, though quick, was easier, and more indicative of debility than pulmonary embarrassment; face very pallid, pupils large, eyes bright, skin of arms and legs loose, and both limbs much wasted. To continue the mixture, and take a teaspoonful of cod-liver oil twice a day.

22d.—The mother feared the child had whooping-cough, as his sister was suffering severely from it, though she had not heard him whoop; he coughed up much phlegm of a stringy tenacious character. He was so restless and fretful that it was difficult to count the pulse. After some trouble I made out the temperature in the rectum 99.8°, pulse 140, respirations 52. The bromide was again increased to four grains three times a day.

24th.—Not so well, the cough being too incessant and troublesome for him to obtain any rest or sleep at night; there were loud mucous râles throughout the chest, and though he did not whoop, the violence of the cough was suspicious. He was much more manageable, and did not move when the thermometer was put into the rectum. He was ordered three grains of bromide of potassium and two grains of hydrate of chloral, to be taken every night at bedtime.

28th.—No rest since last visit; for an hour or two he seemed as though he would lapse into unconsciousness. Though he had not whooped, the cough was incessant and tearing, and the perspiration poured off his head. The feet and hands were inclined to swell; the eyes had a staring and wild look, and the rolling motion of the head indicated cerebral trouble. There could be no doubt that whooping-cough was a complication.

29th.—He appeared better, and ate some pudding, shortly after which he was seized with a choking cough, turned rather dusky, and then died suddenly, without any sign of struggling.

Post-mortem Examination (twenty-four hours after death).—Body thin and pale, with livid marks posteriorly. On opening the thoracic cavity, the lungs were found to be approximated at the anterior borders, pallid, and very emphysematous, especially the

upper lobes. At the upper and posterior portion of the right lung, close to the spine, where gurgling was heard when the child first came under notice, was a caseous, suppurating bronchial gland, from which about a teaspoonful of yellow cheesy matter was squeezed out; the entire half of this lung, when cut into, contained many semi-transparent gray granulations, and the whole lung-tissue in this situation was pallid, and of a light rosy hue; many of the air-cells had ruptured. The left lung was more pallid and emphysematous; it contained here and there a few gray granulations and very minute cavities, irregularly and scantily distributed, some the size of a pin's head.

The pericardium contained some thin serous fluid, and the vessels on the outer surface of the heart were full. In the right ventricle was a clot of fibrin, as big as a small walnut, and some dark blood; to it was attached a cord of fibrin, six inches long, with a branch going into the pulmonary artery, and this might have been the cause of sudden death, although post-mortem clots are very frequent in this vessel. The kidneys, spleen, and mesentery were healthy, and no tubercle was detected. The liver was large, extending into the left hypochondriac region; no sign of tubercle.

The brain-structure was soft and pallid; it was considerably enlarged, and the sinuses at the base were very full and distended, but nothing like albuminous or sero-purulent matter was to be observed around any of the nerves where it is usually seen in meningitis, and no excess of fluid was present. The brain, however, was altogether more watery than usual. There was no tubercles anywhere, nor any fluid in the ventricles.

Note.—The immediate cause of death was probably the obstruction of the pulmonary and systemic circulations by the entrance of the clot into the pulmonary artery, and so the heart failed.

The next case, though it did not terminate fatally, illustrates all the clinical features of enlarged bronchial glands.

A. N——, æt. 4, was admitted into the Samaritan Hospital on October 29th, 1877. He had been ill three weeks with a bronchial attack and cough. On admission the temperature was 101°, pulse 132, respiration 34. After a purge and a saline mixture the temperature fell to 99.4° in twenty-four hours, and two days later it was normal.

The cervical glands on the left side were so large that they ob-

literated the ramus of the lower jaw and filled up the space in the neck. On the right side they were also large, but much less so than on the left.

The patient had a shrill, whistling, choking cough, but varied a good deal in character, being sometimes like croup, and at others resembling a "Punch-and-Judy" squeak. He was unable to assume a recumbent posture, but sat up in bed with his head bent forwards. His breathing was frequent and noisy, and wheezing was particularly loud after coughing or taking food. Over the upper sternum and along its centre the percussion-note was very resonant. The resonance was impaired and the breathing weak under the clavicles. There were loud laryngeal moist sounds, the respiration was diaphragmatic, and the lower part of the sternum was drawn in at each inspiration. Posteriorly there was dulness over the upper lobes of the lungs, especially on the right side, between the spine and upper edge of the scapula; resonance was well marked below, but throughout there was rhonchus, mixed with large and loose crepitation. Sometimes the respiration was placid and noiseless, particularly in the daytime; but in the evening, or during the night, the breathing was occasionally difficult, and resembled an attack of spasmodic asthma.

The treatment consisted in giving the syrup of iodide of iron, cod-liver oil, and good diet. A weak solution of tincture of iodine was applied to the glands in the neck, and between the shoulders at the upper part of the scapulæ.

The condition varied a good deal for the first three weeks, but on the 28th of November the glands in the neck had much decreased in size, and although the face was bloated it was not dusky.

December 28th. The child had in all respects improved; he was lively and cheerful, enjoying his food, and sleeping tranquilly at night. He could lie with his shoulders low, or on either side, without causing cough or inconvenience in breathing. The chest was everywhere resonant, inspiration was freer and longer, whilst expiration was much shorter, and there were no moist sounds to be heard, though there was considerable rhonchus. Pulse 88; respiration 20. The diminution in the size of the glands in the neck was remarkable.

Caseous degeneration of the bronchial glands has been found in connection with tuberculosis of the lungs, as we have just seen.

There is a case recorded by the late Dr. Pearson Irvine in which it was associated with tubercle in the lungs, brain, and kidneys. In a boy, æt. 7 years, "a tumor" was found beneath the thyroid body after death as large as a walnut; the bronchial glands were swollen and caseating, whilst the upper lobes of both lungs contained gray granulations, some being small and translucent and others larger and undergoing caseation. The lower lobes of the lungs and the kidneys also contained scattered tubercles. At the base of the skull there were about eight ounces of serous effusion, and near the posterior end of the falx cerebri "a mass about the size of a large Barcelona nut." There were no tubercles at the base of the brain, but they were numerous in the cerebrum, "varying in size from a marble to a small walnut," and they were also met with in the cerebellum. Notwithstanding these changes, this boy never experienced any cough from the beginning to the end of his illness.*

Another singular case is recorded by Dr. Sydney Coupland,† in which a caseous mediastinal gland burst into the trachea, causing death in a paroxysm of dyspnœa. The patient, a delicate boy four years of age, was said to be "asthmatical" shortly after birth; later on, when two years old, he had "low fever," lasting seven weeks. When three years old he took cold, and suffered from alarming attacks of shortness of breath, general bronchitis, and hoarse ringing cough. Under treatment he became convalescent, and left the hospital. Nine days later he was readmitted with bronchitis, and soon afterwards suffered from paroxysmal attacks of dyspnœa, inability to lie down, and lividity of the lips. During one of these seizures Mr. Morris performed tracheotomy, which quieted the breathing for a time, but in a month from the date of his readmission another attack occurred, and the child died asphyxiated.

On a post-mortem examination, there was found a collection of enlarged and indurated glands in the anterior mediastinum, mostly near the root of the right lung. In the posterior mediastinum there was a chain of enlarged glands, and above the right bronchus they had formed a mass of caseous matter. "On laying open the trachea, that tube was found to be occluded just above the point

* Path. Trans., vol. xxix, p. 11. It somewhat resembles Mr. Edwards's case already quoted, p. 385.

† Ibid., vol. xxv, p. 29.

of bifurcation by a mass of cheesy matter extending into the right bronchus, and proceeding from the largest mass in the mediastinum, which had ulcerated through the trachea at this point, the aperture measuring nearly an inch along the axis of the tube, while, for more than half an inch above, the calibre of the channel was narrowed by the pressure of the gland from without." There was a cavity in the right apex, the bronchi were dilated, and the lung-tissue was more or less solidified. There was some enlargement of the mesenteric glands.

Treatment.—This must be conducted on general principles. If there are indications of bronchitis or pulmonary congestion, they must be controlled by sedatives and counter-irritants; febrile symptoms demand salines and mild aperients (Forms. 7, 8, 12). Carbonate of ammonia, senega, and ipecacuanha should be selected to relieve cough and oppression in breathing (Forms. 61–66). When the case is not associated with any acute febrile disorders, as tubercle, whooping-cough, or measles, but only accompanies loss of flesh and strength, failing appetite, and general wasting, then cod-liver oil, malt extract, and the syrup of the iodide of iron, are the remedies best calculated to afford relief.

When bronchial symptoms are present, and there is pain in the chest, the application of a small linseed poultice with a table spoonful of mustard for a few minutes at bedtime may be necessary, the chest being afterwards protected with cotton-wool. Another form of local application consists of a stimulating and sedative liniment, composed of equal parts of aconite and camphor liniment, or of belladonna liniment and spirit of chloroform, sprinkled on a piece of flannel wrung out of hot water, and applied under a folded towel or on spongiopiline. This will relieve pain in the chest when present, just as it will mitigate the suffering of sciatica in adults.

When the enlarged glands have passed into a chronic state, the application of diluted tincture of iodine (1 in 4) may be advantageously resorted to. It is remarkable how the hypertrophied cervical and bronchial glands sometimes become diminished in size under the persevering use of this valuable absorbent, combined with good diet, pure air, and such internal remedies as the circumstances of the case may appear to warrant.

CHAPTER XXXIV.

ON ASTHMA.

CAUSES: *Predisposing and exciting—Sometimes hereditary—Its neurosal origin—Follows whooping-cough, bronchitis, and measles—An occasional sequel to scarlet fever—Sometimes excited by certain fungi—Odors of plants and animals—Irritation of dust, etc.—Indigestion.* SYMPTOMS: *Frequently comes on suddenly at night during sleep—Symptoms of a paroxysm—Rapid breathing—Anxious countenance—Inspiration short—Expiration prolonged—Duration of the fit—May begin with catarrh—Association with gout—Albuminuria.* DIAGNOSIS: *General absence of fever—Suddenness of the paroxysms, and recurrence at uncertain intervals—Tranquil respiration between the attacks—Dyspnœa of asthma gradual and decline rapid—Cardiac dyspnœa always increased by exertion, and patient not so well after a seizure as after an asthmatic attack.* PROGNOSIS: *Favorable in young subjects, and when disease arises from hypertrophy of bronchial glands—Unfavorable in tubercular, cardiac, or renal cases.* PATHOLOGY: *Essential cause of asthma consists in a spasmodic contraction of the muscular walls of the bronchial tubes—A true pulmonary neurosis accompanied by catarrh, not necessarily by any fever.* TREATMENT: *Apartments, and especially sleeping-rooms, to be large and airy—Action of remedies very uncertain—Use of expectorants where there is much secretion and congestion—Nitre-paper fumes—Belladonna—Stramonium—Hydrate of chloral—Ipecacuanha—Strong coffee—Arsenic—Iron—Cod-liver oil—Inhalation of iodide of ethyl and of chloroform to arrest a paroxysm—Injection of pilocarpin—Spray inhalation of carbolic acid, etc.—Care necessary in diet—Avoidance of stimulants—Mild aperients—Gentle exercise—Baths—Sea air—Gymnastics.*

ASTHMA is one of the most peculiar and intractable of diseases, consisting of a paroxysmal form of dyspnœa, with tranquil respiration in the intervals of the seizures. It does not necessarily depend upon organic or structural change in any part of the thoracic organs, and hence it has been looked upon as a purely nervous affection; although it would appear that the integrity of the pulmonary tissue does become impaired and the heart diseased when the paroxysms are frequent, and the complaint is of long continuance.

Neither West, Underwood, Meigs and Pepper, Steiner, Churchill, nor Niemeyer, alludes to asthma in childhood, which seems to me an omission, seeing that however infrequent it may be at an early period of life, it occurs sufficiently often to require consideration and careful study. Trousseau, Hyde Salter, Thorowgood, and Berkart, enter into the subject of asthma in children. It is rare in hospital practice. I have only seen a few cases, and none of these were under ten years of age.

Causes.—These are predisposing and exciting. The disease is

hereditary, running through families with as much regularity as tubercle, or gout itself. It occurs in the children of parents who are hysterical, or whose nervous system is highly impressible. To a child so predisposed any exertion or emotion will be enough to invite a paroxysm, solely through the effect it produces upon the nervous system, notwithstanding that the lungs themselves are perfectly sound.

Asthma follows whooping-cough, bronchitis, and measles; and the inference to be derived from this fact is, that the lungs in such cases have sustained damage which disposes them to asthma. The bronchial mucous membrane undergoes some inappreciable pathological change, and its sensibility becomes morbidly increased. "These diseases are, beyond a doubt, the commonest of all the causes of asthma; a large proportion (as much as 80 per cent.) of cases of asthma in the young date from one or other of them."* "Like all hereditary disorders," says Dr. Fuller, "it may occur at any period of life, and instances are not wanting of its existence in infancy and early youth. One of the most frightful examples of it I ever met with was in the person of a boy thirteen years of age. Indeed, it often dates its origin from the diseases of childhood, from the straining efforts incident to whooping-cough, and the severe bronchitis which accompanies measles."† Dr. Thorowgood relates the case of a child, aged four, who got an attack of asthma after scarlet fever, though there was no anasarca, the urine only contained lithates, and no albumen. At nine he was still under treatment, and more relief was obtained from a dry bracing air than from any medicine.

The *exciting* causes of asthma are numerous, and they vary in different persons—that which will excite the paroxysm in one person will not do so in another. Irritant substances, such as dust, offensive smells, and cold air admitted into the air-passages in respiration, are common excitants of the asthmatic paroxysm; they appear to irritate and offend the bronchial mucous membrane, and thus to excite convulsive cough and dyspnœa. Trousseau, who himself was a sufferer from asthma, attributes the worst attack he ever had to the dust from oats, which were being measured in his presence, penetrating into the bronchi. He relates cases caused by the thrashing of rice, the shaking of a feather

* On Asthma, by Dr. Hyde Salter, 1860, p. 130.

† Diseases of the Lungs, 1867, p. 368.

bed in the presence of an asthmatic patient, the odor of ipecacuanha, linseed, or scammony, scents of any kinds, the perfume of violets and some other flowers. Season, climate, and temperature have also a powerful influence in the production of asthma. The smell of cats, dogs, and hare-skins, seems to be capable of causing the paroxysm in some persons. Some asthmatic patients cannot sleep out of London, and others can only obtain rest in certain districts. Trousseau relates the circumstance of two brothers who were twins, and of remarkable physical likeness. When one had an attack of ophthalmia in Paris, the other, who was in Vienna at the time, was also suffering in precisely the same manner. Both were subject to fearful asthma in Marseilles, where they were born ; but in Paris they were free. When one was affected the other was also, and both experienced immunity in the same localities.*

Irritation of the air-tubes by the inhalation of dust may cause a certain degree of thickening and contraction of the bronchial tubes, but it is not of itself enough to provoke the asthmatic paroxysm. We know that this is so in mining and manufacturing districts, where workmen are exposed to such inhalation during the chief portion of their lives. The tendency is, however, in them, to effect an alteration in the mucous membrane (mechanical bronchitis) and the structure of the lungs, and not to produce spasmodic narrowing, and the resultant asthma. Certain indigestible articles of diet, as cheese and nuts, may, by irritating the pneumogastric nerve in the stomach, excite reflex spasm in the bronchial tubes. In a large number of cases the attack comes on without apparent cause.

The influence which the stomach exercises in provoking an attack of asthma is very remarkable ; but it is no more than we might expect when we consider that there is a close connection between the lung and the stomach through the medium of the pneumogastric. In asthmatic cases the stomach is generally irritable and the appetite irregular. Salter relates the case of a little girl, eight years of age, who vomited everything immediately it was swallowed, but without pain or tenderness. This continued for years, and caused great weakness and emaciation. Nothing, except teaspoonfuls of milk, could be retained on the stomach.

* Clin. Med., vol. i, 1867, p. 630.

At length the vomiting ceased and asthma began. The irritation was transferred from the gastric portion of the pneumogastric to the pulmonary portion.* Eating late in the day will sometimes provoke a paroxysm, while an early dinner, and taking no solid food till next day will ward it off.

Symptoms.—The child, as is the case with an adult, may seem to retire to bed in good health, and an attack may come on in the night, which is the most usual time.† The patient drops off to sleep, and after an uncertain interval wakes up frightened with an attack of dyspnœa and inability to get his breath. Pain, or a sense of constriction is felt across the chest. He feels suffocated, and is anxious to get all the air he can obtain; hence he may run to an open window, or he at least sits up in bed with his arms thrown backwards, or he kneels, or is propped up in a chair, with his thorax and clavicles fixed and drawn upwards. The face is flushed or of a pale livid hue, and fearfully anxious; the skin is bathed in sweat, the eyes are staring and prominent, and the extremities cold. The pulse may be rapid, and the respirations 60 to 70 per minute. The chest is elevated, rounded, and resonant, with scarcely any expansible movement; the epigastrium is retracted from elevation of the diaphragm, whilst the lower ribs are retracted during inspiration. The expiration is prolonged and wheezing, the inspiration is short, frequent, and sometimes convulsive. Sonorous and sibilant rhonchi usurp the place of the normal respiratory murmur.

The fit may last half an hour in mild cases, or two or three hours in severe ones. Then it passes off, the face assumes a natural appearance, and the child is himself again. During the fit the urine is copious and clear, but when it has terminated it is scanty and turbid. Sleep generally follows the attacks. A sense of heaviness, weight at the chest, and dyspeptic symptoms succeed, to be followed night after night by similar attacks. The frequency of return is uncertain, the interval may be weeks or months; in exceptional cases years may elapse.

The disease often begins with catarrh, constant sneezing, running of the eyes and nose; and these symptoms may have preceded the asthmatic paroxysm by some days. This is frequently the case with children. In these cases there is urgent dyspnœa and

* Op. cit., p. 218.

† "In some cases the attacks are *diurnal* instead of *nocturnal*."—*Trousseau.*

inability to lie down; the normal respiratory murmur is replaced by sonorous and mucous rhonchi, which gradually cease after the paroxysm is over.

Trousseau describes a case of an opposite character in a child. "The patient was a Moldavian boy, aged 5, who had very distinct and well-characterized fits of asthma, together with some pulmonary emphysema. In his family history there was no mention of any hereditary taint of gout or of rheumatism. I saw him again two years afterwards; he had then a most characteristic fit of the gout, with redness, swelling, and pain in the big toe. This was the first, and has been the last instance I have ever seen of gout at such an early age. The gouty arthritis attacked the knees, and had not the slightest resemblance to acute articular rheumatism. During this attack of gout the boy had not a single paroxysm of asthma. The disease ran its usual course, for, as I will tell you by-and-by, gout and asthma are often manifestations of one and the same diathesis, and they may alternate in the same individual, as they did in my Moldavian patient."* Asthmatic seizures have owed their origin to albuminuria and pulmonary œdema, accompanying some forms of Bright's disease.†

Diagnosis.—When there are inflammatory symptoms present in the bronchial tubes, and a great deal of secretion is poured out, the real cause of the dyspnœa may be overlooked; but it will be generally found, on careful examination, that the fever is slight, and has no comparison to the local trouble; the paroxysms recur at uncertain intervals, and they often terminate very rapidly. The respiration is calm and undisturbed between the paroxysms. The dyspnœa of asthma begins gradually, reaches its acme, and then declines; the dyspnœa of heart disease is generally sudden and due to exertion; it is alarming, and when it has subsided, the patient is not so well as a person after an asthmatic attack, who will be able to go about his duties as though nothing had happened. A patient suffering from heart disease cannot do this. An adult with a delicate heart, or a child with mitral disease, cannot run upstairs, or walk up a hill without becoming breathless; but it is not so with the asthmatic, for when the paroxysm is off, his respiration is then free enough. It is important to bear these distinctions in mind, because heart disease is common enough in children. If asthma or heart disease be complicated with emphy-

* Op. cit., p. 621.

† Berkart, p. 83.

sema, the diagnosis may be more difficult. A certain degree of emphysema probably complicates all asthma of long standing; although it has nothing to do really with the cause of the disorder, being rather an effect of it.

Dyspnœa of an intermittent character, it should be remembered, is also associated with cerebral disease, but the history would point to its right cause. The irritation of dentition is capable of causing some asthmatic fits. In cases of enlarged bronchial glands pressing upon the vagus and mediastinal nerves, attacks of dyspnœa and difficult breathing, not unlike spasmodic asthma, may arise, but these cases ought not to be confounded with genuine spasmodic or bronchial asthma, which solely affects the structures concerned in the paroxysm. An asthmatic paroxysm arising from this cause would be likely to cease as the child grew older and recovered strength.*

Prognosis.—This is greatly determined by the age and coustitution of the patient. Dr. Hyde Salter states that the tendency in young subjects is almost invariably towards recovery; and that under the age of fifteen, if there is no organic disease, we may generally predict a favorable issue. This arises in a great measure from the power possessed by young persons to throw off disease; and that in the intervals of the seizures the bronchial congestion completely passes off, and the capillaries again recover their lost tone. Then, too, the disease does not last so long as is generally the rule in adults, and moreover the "nervous irritability" in children, which diminishes as they grow older, also favorably influences the prognosis.† If it is found that residence in some favored locality keeps off the attacks, while only errors in diet bring them on, then the patients have the cure in their own hands. But if there is heart disease or emphysema, and the asthmatic seizures have recurred so frequently as to induce chronic bronchitis and impeded breathing, then the complication is serious. A recent writer is less hopeful of a favorable termination. He says, "A complete recovery is possible only in children in whom the disease is produced by a simple hypertrophy of the bronchial glands, as this enlargement occasionally subsides and the irritability of the lymphatic system also diminishes towards puberty. But this

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* See Chap. XXXIII, On Enlarged Bronchial and Mediastinal Glands.

† On Asthma, 1860, p. 274.

favorable issue is very rare, and there are few instances in which children have been known to 'grow out' of their complaint."*

The presence of tubercular or renal disease will increase the gravity of the prognosis. In these cases the dyspnœa is permanent. It may be here mentioned, however, that the coexistence of spasmodic asthma and consumption is very rare, so rare that some authorities have denied it altogether. Dr. Fuller mentions three cases, and I have seen one. "The utmost that can be truly stated is that asthma does not predispose to consumption, nor tubercular disease to spasmodic asthma."†

It is extremely rare for the disease to terminate fatally in a paroxysm. Hyde Salter never witnessed a paroxysm prove fatal ‡ It most usually wears out the patient by causing obstruction to the circulation, and inducing organic disease of the heart and lungs.

Pathology.—The essential cause of asthma is a spasmodic contraction of the muscular walls of the bronchial tubes; and hence the inspiration becomes difficult because enough air cannot be drawn into the pulmonary tissue to properly aerate the blood, the forced muscles of inspiration, such as the scapular and pectoral, are therefore brought into play, and the diaphragm is more or less on a plane. Most competent observers now admit the existence of circular muscular fibres in the smallest bronchial tubes, and they have also clearly shown that irritation of the par vagum will excite contraction of these bronchial muscles.

A pulmonary neurosis may be accompanied by moist rhonchi in the lungs—an excess of secretion which is apt to lead the practitioner to suppose that there is inflammation, when in fact there is none. This condition is frequently overlooked in nervous and delicate children; in the rickety it is by no means uncommon to get bronchial sounds of a persistent character following slight catarrh. The secretion from the mucous membrane is considerable, and there is wheezing and hurried respiration, and yet there is no elevation of temperature in asthma. It is not an inflammatory, but a truly neurosal disorder, and if we are not enlightened enough to recognize this, and allow the idea of inflammation in all instances to take possession of us, we shall not relieve the morbid state. If a child who is subject to asthma takes cold, and

* On Asthma, by J. B. Berkart, M.D., 1878, p. 204.

† Op. cit., p. 370.

‡ Op. cit., p. 135.

gets an attack of bronchitis, the bronchial inflammation may act as an exciting cause in producing the asthmatic paroxysm, but it has no power to develop it. The spasmodic character of the complaint is very strongly shown by the relief which the inhalation of sedatives so often affords.

The degree of bronchitis alone would not produce the peculiar fit of asthma, which really owes its origin to the spasmodic element. The spasmodic attack is chiefly due to the contraction of the muscular coat of the bronchial tubes. "Even then, under the catarrh, which overlies the nervous element so as to mask it, the essence of the disease is always the same, and its nature has not changed."* Still it must be conceded that repeated asthmatic seizures have the effect of thickening, and at the same time permanently narrowing the bronchial tubes, by throwing upon them an extra amount of work to discharge. Hypertrophy takes place in virtue of the same law which causes muscles to become larger when their functions are increased. "A certain amount then of thickening, and a certain amount of contraction of the bronchial tubes is fairly to be assigned to asthma, and has in it its sole and sufficient cause."†

Some degree of emphysema is always associated with asthma.

Treatment.—The rooms in which these patients live and sleep should be large and airy, with high ceilings and scanty furniture. If there is not a free supply of air they seem choked, and cannot get their breath. Air is what they want, and they are often driven to the open window to obtain it, unlike patients suffering from any other pulmonary complaint. During the night it is all-important that they should have a plentiful supply of pure air.

The next point to attend to is the removal of the neurosal or spasmodic element; the presence of wheezing and catarrhal sounds must not induce us to overlook this important matter, for if we do, and the asthma goes on undetected, we shall not easily subdue the disease. It must be confessed that the remedies are both numerous and uncertain in their effects, one remedy answering in one case and failing to afford relief in another.

If there is much secretion and congestion attending the asthmatic paroxysm, then expectorants will be needed; but if there be pure spasm then a residence either in a moist or a pure clear

* Trousseau, Clin. Med., vol. i, 1867, p. 623.

† Hyde Salter, op. cit., p. 138.

air must be sought. There are, however, many asthmatics who can breathe well in the close confined air of London, but cannot sleep at night out of it. These peculiarities are most difficult to explain. When the system is low and the vessels are relaxed and weak, it is necessary to select a mild climate, so that the bronchial mucous membrane may not be irritated, and the general health improved.

Nitrous fumes are highly useful in the treatment of asthma when the spasmodic element prevails, and there is no bronchitis present. The fumes act as an antispasmodic and sedative to the irritated bronchial nerves. "The well-known nitre-paper is best made by dissolving four ounces of nitrate of potash in a pint of hot water, and in this should be soaked a porous paper of the thickness and consistence of ordinary blotting-paper. The paper thus made will be strong, fiercely-burning paper, and should be kept in a stoppered bottle. When used it must be burnt fast and furiously, so as to fill the room, and commonly it is not till the atmosphere is quite thick with nitrous vapors that the asthmatic gets relief."*

If the nitre-paper fails, Dr. Thorowgood recommends that the powdered leaves of stramonium or dry belladonna leaves be sprinkled on it.† Trousseau advises the burning of stramonium leaves. He relates the case of a child who was always relieved by this method of treatment. The advantage which stramonium smoking has over opium is, that it is a sedative, but not a narcotic. Still, in some cases it utterly fails.

Belladonna is another remedy which sometimes acts in a marvellous manner. It has a similar action to stramonium in diminishing the contractility of the bronchial muscle, and in allaying spasmodic cough. Children, as I have elsewhere stated, bear belladonna well, and therefore the dose must be gradually increased before we give it up as hopeless.‡ The remedy may be sometimes advantageously combined with bromide of potassium.

Ipecacuanha, in emetic doses, sometimes brings unexpected and immediate relief; it lessens nervous irritability by its action as a depressant; it relaxes the bronchial spasm, and if there be much catarrh clears the larger bronchi of secretion, and in this way proves beneficial. Dr. Salter relates the case of a youth who had

* Lettsomian Lectures, On Bronchial Asthma, 1879, p. 59.

† Op. cit., p. 65.

‡ See Chapter XXXII, On Whooping-cough.

asthma from infancy. The attacks would wake him about four or five in the morning. They were attended with severe dyspnœa and wheezing, and he was obliged to get out of bed. In half an hour after taking the emetic every trace of asthma had disappeared, and he would then sleep like an infant, and have no return for a week. The dose was twenty grains, and it never failed.* Its action was that of a depressant; it produced faintness and nausea, and then the spasm gave way and relief came, before it acted as an emetic. By giving the remedy at the commencement of the seizure we may often cut it short, whereas if the malady is allowed to proceed, and the spasm and bronchial congestion have become thoroughly established, the symptoms are longer in yielding, and when they do there is so much pulmonary congestion and dyspnœa that the consequences of the attack are long and tedious.

Tobacco sometimes acts in a similar manner, but it has a tendency to produce more deathly collapse. Antimony has also a similar action, but ipecacuanha is less dangerous.

Hydrate of chloral, by its power to allay spasm, may shorten the asthmatic paroxysm, and quiet the respiration. It is sometimes given with the effect of relieving the wheezing and sonorous rhonchi.

Coffee is highly recommended by Hyde Salter. He says, "it relieves asthma in two-thirds of the cases in which it is tried." It should be given strong, in small quantities, without milk, and on an empty stomach.† Thorowgood gives instances of great success following the use of citrate of caffein, in doses varying from one to four grains. It appears to calm the irritation of the nerve centres, to allay excitement, and to promote sleep.‡

Arsenic has been found very serviceable in spasmodic asthma. It is a remedy which appears to improve the breathing, to increase appetite and digestion, and to act as a general tonic. Mr. Gaskoin, speaking of the relation between psoriasis and asthma, says, that a connection existed in at least one-third of the cases.§ Where the disease is complicated with eczema or psoriasis, the remedy is

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* However young the patient, the dose should never be smaller (Salter). The powder is the most desirable form.

† Op. cit., p. 182. ‡ Ibid., p. 72.

§ On the relations of Asthma to Skin Disease, Royal Med.-Chir. Soc., March 10th, 1874, The Lancet, vol. i, p. 443, 1874.

very serviceable. The liquor arsenicalis may be given in two-minim doses three times a day after food. It always agrees with children.

Thorowgood speaks well of arsenical preparations in spasmodic and congestive asthma. He recommends gr. $\frac{1}{30}$ of arsenious acid, or liquor arsenicalis ♏ij–♏v, three times a day after food.*

Tincture of nux vomica alone, or with the tincture of iron, is also useful in some cases. (Form. 53.) The syrup of the hypophosphite of lime and iron is a good remedy. Cod-liver oil, by improving general nutrition, ought to be given in suitable cases, especially if the patient be strumous or rickety.

The inhalation of the iodide of ethyl, in ten-minim doses three times a day, has been found serviceable in some cases of bronchial asthma, according to Dr. Thorowgood and other writers; but in some instances it causes vertigo and dizziness. It is antispasmodic, and relieves congestion at the same time.

The inhalation of chloroform has also been employed with great success in arresting a paroxysm. Where the bronchial spasm is severe, and the agony is distressing, there can be no objection to trying it if other remedies fail. The inhalation should be proceeded with slowly and cautiously, for it is to be noted that the spasm may yield entirely without insensibility being produced. Temporary relief may also be sometimes obtained by the judicious use of morphia, ether, lobelia, or ammonia.

According to Salter opium never does good in asthma. It frequently does harm by narcotizing and producing sleep, for the heavier and more drowsy the patient becomes the more likely is the asthmatic paroxysm to supervene.

Dr. Berkart speaks highly of the use of pilocarpin in the asthmatic paroxysm. He says that it attracts to the skin and salivary glands a large volume of blood, and so relieves the congested internal organs by the copious perspiration and salivation which it induces. Where the cardiac muscles are weak, or the heart is in a state of fatty degeneration, alarming symptoms may ensue, but the subcutaneous injection of gr. $\frac{1}{120}$ or gr. $\frac{1}{60}$ of atropia soon restores the balance. Ten drops of a two per cent. solution of pilocarpin should be injected for an adult, and a less quantity for a child. The patient should assume a recumbent posture (which the speedy relief afforded enables him to do), and the

* Op. cit., p. 69.

effects of the remedy watched till they have passed away. "Pilocarpin is more suitable in the treatment of the younger asthmatics, but is by no means contraindicated in patients of more advanced age."*

Spray inhalations of carbolic acid, ipecacuanha, benzoin, creasote, etc., are all useful in certain cases; but in children they are not very easy of application.

Diet is of the utmost importance. It should be of the simplest description, as roast or boiled fresh meat, chicken, light pudding, etc., given at regular intervals. If the food be indigestible, or too much be taken at one time, then it is apt to disorder the stomach, and to bring on a paroxysm of dyspnœa. It is, therefore, important to select such a diet for the child that whilst it appeases its appetite it shall contain the necessary nutritious elements. If during digestion the food taken undergoes fermentation, and produces distension and fulness, the breathing will be deranged.

A sparing quantity of fluid should be taken, and beer and stimulants ought to be avoided. The bowels should be kept free by gentle aperients, as a little sulphate of magnesia, or compound liquorice powder; and if there are worms in the intestinal canal, the proper remedies should be selected for their expulsion.

Gentle exercise in the open air is most essential when the weather is mild. It brings the muscles into better working order, improves the failing appetite, stimulates the functions of the skin, by which morbid products are removed from the body, and in this way, as the general strength is built up, so the child may possibly grow out of its disorder.

An occasional warm bath at bedtime will prove of great utility, by relieving the congestion of the lungs and bronchi, and in this way will equalize the cutaneous and respiratory functions. Tidman's sea-salt may be added to the morning bath if the child is in a fitting state for it, and the weather is warm enough. These baths act as tonics, and are very useful in strumous and rickety cases.

"In feeble children, especially those whose thorax had been crippled by rickets, gentle gymnastics (Swedish) greatly assist the development of the lungs. Athletic sports, if not carried to exhaustion, are still more useful."†

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* Brit. Med. Journ., 1880, vol. i, p. 918.

† Berkart, op. cit., p. 221.

CHAPTER XXXV.

EMPHYSEMA.

TWO VARIETIES GENERALLY DESCRIBED: 1. *The vesicular.* 2. *The interlobular.*—PATHOLOGY, GENERAL SYMPTOMS, AND PHYSICAL SIGNS. CAUSES AND CONSEQUENCES. TREATMENT: *Iron—Strychnia—Use of emetics and expectorants where bronchitis or asthma are present—Active aperients to relieve congestion of internal organs—Sedatives and Sedative inhalations to allay cough—If emaciation or profuse expectoration are present, cod-liver oil or malt extract—Regulation in diet—Gentle exercise—Change of air.*

WE meet with two forms of this disease, the *vesicular* and the *interlobular;* in the former condition a number of air-cells are dilated, and their walls being ruptured and torn they become merged into one, or the alveolar spaces may be simply distended through a loss of elasticity, and their vessels atrophied and destroyed; in the latter condition the air-vesicles are ruptured, and air escapes into the intercellular tissue of the lungs and causes distension. In *vesicular emphysema*, which is by far the most frequent variety, the lungs are increased in size, while their elasticity is destroyed, so that when the chest is opened their anterior borders are in close contact, and they do not collapse. The surface of the lungs is irregularly elevated from the dilatation of the air-cells, but there is no escape of air into the connective tissue. In this variety a few air-sacs may be involved, the whole of a lobule, or even the entire lung. The apices and margins of the base of the lungs are particularly liable to be affected. The lung-tissue has lost its crepitant feeling to the touch, it pits on pressure, and is doughy, pale, and bloodless; the borders of the lungs come forward, covering the heart, and the liver is depressed, whilst the configuration of the thorax is altered, becoming short, deep, and rounded.

Emphysema in its acute form is not an infrequent disease among children, and especially those who are the subjects of rickets and asthma; in the chronic form it is more common in adults. In children who have died of acute bronchitis or pneumonia, portions of the lung will often be noticed to be emphysematous. This, however, is a long and complicated subject, and the reader will find the pathology fully discussed in the ordinary textbooks.

Interlobular Emphysema.—In this variety the connective tissue which binds the lobules together is infiltrated with air, which es-

capes into it and beneath the pleura, in consequence of the air-vesicles having ruptured. "I have never seen it as an independent affection, but in almost every case where there has been extensive vesicular emphysema I have found the interlobular kind existing to a greater or less extent. It is often very partial, and seems to have little disposition to spread."* Some other writers consider that it is very rarely connected with vesicular emphysema.† Cases in which the pleura is raised from the surface of the lung by emphysema are most frequently met with in whooping-cough, and in one case under my care‡ the apices of the lungs were much involved, producing marked swelling of the neck from the extravasation of air into the cellular tissue. In this form the air-vesicles are rounded, prominent, and movable, and can be squeezed from one place to another between the lobules, and it may even lead to general emphysema. This variety is comparatively rare in children. Whooping-cough is its most frequent cause.

Vesicular Emphysema—Pathology.—There can be no doubt that the morbid changes may be produced by mechanical causes, as in whooping-cough and bronchitis, which causes stretching and diminution in the elasticity of the air-sacs, and this without any morbid change in the lung-tissue itself; still it must be admitted that the disease sometimes creeps on in children who have not suffered from these affections, or any violent cough, as we shall hereafter see. The air-sacs become stretched and enlarged, and finally the elastic fibres give way, leading to perforation and rupture. Fatty matter has been found in the emphysematous portions of the lung, and fatty degeneration assists in the rupture of the air-cells. In some children it is the result of pulmonary catarrh, but cases occur in which it appears to arise spontaneously without any hereditary influence, and such instances as these are chiefly met with in strumous and tubercular subjects. In some children it appears to be congenital, and in two cases which came under my care in 1876 and 1877, no other cause could be assigned.§ It often arises in connection with pulmonary collapse and bronchitis in children from forcible inspiration, and the strain put upon the distended air-

* Diseases of the Chest, by A. T. H. Waters, 1873, p. 113.

† Diseases of the Lungs, by W. H. Walshe, M.D., 1854, p. 489.

‡ See Chap. XXXII, On Whooping-cough.

§ Of 43 emphysematous persons, the hereditary tendency was well marked in persons from 7 to 20 years of age, the number being five, and all predisposed to the disease in either parent.—*Fuller*, On Diseases of the Lungs, p. 339.

vesicles by coughing. It is not commonly associated with pneumonia, and still rarer with tubercle or phthisis; but in nearly every case it may be stated that there is pre-existing disease in some of the vesicles or lobules of the lungs. The bronchial tubes are generally in a state of chronic inflammation, and pleuritic adhesions are not rare. The disease tends to produce hypertrophy of the right heart and cerebral congestion.

Symptoms.—The chief symptoms are shortness of breath and dyspnœa, increased by walking fast, ascending a hill, or going upstairs. At first this is only felt on exertion, but as the disease advances the breathing becomes accelerated, and even panting when the patient is sitting still. An attack of bronchial irritation, or indigestion, will aggravate the condition, particularly if there is flatulence, which, however, is more frequent in adults. In many respects the symptoms, according to my experience, are far less urgent in children than in adults, and the fits of orthopnœa and violent palpitation, which are so common in the latter, are not usual among the former in the most advanced stages of the disease. The sputa are bronchial, and sometimes there is a little blood, from the rupture of small bloodvessels in the distended lung-tissue. The face is dusky and anxious, and in old-standing cases, it has a cyanotic tint; the nostrils are dilated, the voice is weak, and the cough feeble; the pulse is weak, and like the respiration, usually slow; the hands feel cold, and the fingers have a bluish tint. Headache and drowsiness are common. In some cases emaciation is considerable; the abdomen is large, and as the disease is confirmed the liver and spleen become increased in size. If dropsy occur there is generally tricuspid regurgitation. In recent cases complicated with whooping-cough, the lips are puffed and venous, the conjunctivæ are watery and injected, and the nose loses its outline from puffiness and infiltration of the subcutaneous cellular tissue; the clavicles are elevated, and depressions may be noted above them in some cases. These spaces are sometimes completely obliterated, or they are even prominent and puffy, in consequence of the emphysematous apices of the lungs forcing their way upwards from the thoracic cavity. The whole thorax is elevated and increased in size at its upper part (barrel-shaped), the ribs lose their obliquity, and their anterior extremities are drawn upwards. The intercostal spaces are widened, and the spine curved with the concavity forward. In the case to-

which allusion is made further on, the capacity of the lower part of the chest was much diminished.

The complaint is increased in the winter and spring months, and decreases in summer and mild weather. In those cases which are owing to permanent organic change, dry bracing weather always relieves the respiration.

The respiration is characteristic. The child, like the adult, leans forward in bed with its hands folded, the muscles of the neck, as the scaleni and sterno-cleido-mastoidei, being brought into powerful action, and the shoulders rounded. The upper part of the chest is nearly fixed, for the lungs, having already expanded to the utmost, are scarcely affected by inspiration. The lower portion of the thorax is drawn in, and the diaphragm in these cases appears passive, and the abdomen flat, or even concave. The respiration varies, however, the thorax, in some cases, being distinctly raised and elevated, and the abdominal muscles forcibly expanding. The inspiration is short and hurried, from the diminished expansion of the chest, and the expiration is wheezing and prolonged, because the elasticity of the lungs is lessened. In conversation the child waits to get breath if its answers are required quickly, and spasmodic fits of coughing are common if the bronchial tubes are loaded with mucus. The character of the breathing is one of the most significant symptoms of the complaint.

A *physical* examination of the chest reveals bulging of the infraclavicular, mammary, and entire sternal regions. The circumference of the thorax is increased, not only because the ribs are more horizontal, and the intercostal spaces widened, but the lungs themselves are larger, from overdistension of the air-vesicles, and the spine is curved forwards, as we have before seen. The resonance is so increased as sometimes to amount to tympanites over the whole thorax, the note elicited on percussion being much exaggerated in clearness and fulness, especially along the line of the sternum, where the borders of the lung approximate. This clear percussion-sound arises from there being more air within the chest, and inspiration does not, as in healthy lungs, affect it; nor is it diminished by any forced expiratory effort. The respiration is weak, rarely raised in pitch, but it may be considerably altered in quality, and sometimes be heard loud and superficial, or mixed with sibilant rhonchus.

When the lungs are much involved the heart is pushed back-

wards and downwards towards the median line, and the whole cardiac region is resonant, notwithstanding a great amount of hypertrophy of the right heart. Epigastric pulsation is often observable. If the heart is simply thrown backwards behind the overlaping lung the sounds are weaker and more distant. When in long-standing cases the right heart is unable to empty itself, the auriculo-ventricular valve becomes damaged, and being unable any longer to fully contract on its contents, the walls of the ventricle yield and become dilated, so that congestion of all the internal organs takes place gradually, and this quantity of blood being thrown back on the general circulation, venous congestion is sometimes followed by ascites and anasarca. But this is rare.

In children, where the disease has been of any continuance, there is often marked anæmia and pallor of the surface; they lose flesh and strength, and become sallow and cachectic as the complaint continues, or there is a fixed venous abrupt color on the cheeks, as we have before remarked. It is in such cases as these that we often notice that the jugular veins are swollen, the neck broad, and the shoulders elevated.

Emphysema and tuberculosis sometimes exist together, but in my experience the alliance is rare, and no well-marked case has come under my notice for years. Dr. Theodore Williams, however, informs me that it is common enough at the Brompton Hospital.

One of the most marked cases of emphysema I have seen, was that of a girl, æt. 11, who was of short stature and very thickly set; her tibiæ were both curved anteriorly at the lower third, the head was large and the neck very short. Her face had a distressed and sad appearance from cardiac trouble, and the thorax presented the following condition: It was deep in its antero-posterior diameter, and much rounded over, and the intercostal spaces in this situation were completely obliterated. The elevation commenced immediately and somewhat abruptly below the clavicles, and was rounded to the nipple on the right side, whence the ribs sank in; on the left side it was much more bulging and prominent over the whole cardiac region, and, in consequence of the hypertrophied and strong action of the heart, the ribs below the nipple were not retracted as on the other side. The upper portion of the lungs, being in a state of emphysema, had forced the heart downwards, as we sometimes see in aortic regurgitation, and had produced collapse

in the lower lobes. The apex beat, instead of being limited to the area of health, was diffused over a large space; long-continued congestion had caused enlargement of the liver, so that its edge could be felt in the epigastrium. The breathing was diaphragmatic, the upper part of the sternum almost fixed in respiration, though the clavicles and shoulders rose with each inspiration, a slight cup-shaped depression being noticeable above the clavicle. The whole thorax rose at once, instead of the slow dilatation of the chest-walls, as in health. The sinking in of the epigastrium, and the drawing inwards of the lower ribs during inspiration, proved that the entrance of air to the whole pulmonary tissue was interfered with, and this sometimes happens in bronchitis, causing collapse of the lungs. Posteriorly the chest was much rounded and the sternum arched, and although the child was not stout, the internal or posterior border of the scapulæ could scarcely be seen.* Dr. Steiner says: "The capacity of the chest is increased, though it does not present the peculiar barrel-shaped enlargement, which is the result of emphysema in adults."† No better instance to the contrary could have been furnished than this case.

There was a difference in the percussion, and in the character of the breathing over the right back; the note was more resonant over the greater part of the lung, and the breathing weaker, the inspiration being very short and deficient, and the expiration prolonged. Over the left lung, the inspiration was longer, but not so much so as the expiration, which was musical and wheezing, and the lung was less resonant throughout. In the right axilla, and as low as the line of the fourth rib, a little faint breathing was heard, but none over the retracted ribs or the infra-axillary region indicating collapse. The pulse was 96, respirations 32, temperature normal; no expectoration. The face was not swelled, but the cheeks had a deep crimson flush, and the lips were dusky. From time to time, in consequence of the gravity of the heart affection, there was great headache, owing to passive hyperæmia of the brain; the forehead was hot, and ached for days together; the jugular veins were swollen, the temporal vessels were full and throbbing, and the child did not know where to lay her head for ease. The whole cardiac region was resonant, from the edges of

* Heart Disease in Children, connected with Valvular Disease, and with Thoracic Deformity, Medical Society Proceedings, vol. iv, p. 196, and Medical Press and Circular, May 7th–14th, 1879.

† Diseases of Children, translated by Lawson Tait, F.R.C.S., 1874, p. 157.

the lungs being emphysematous and overlapping the heart. It was somewhat remarkable in this case that there could exist such a degree of heart disease (tricuspid and mitral) with obstruction to the circulation through the lungs without any sign of dropsy, or turbid urine, the latter secretion being at all times free and healthy.* Indeed, in children I have rarely met with ascites or anasarca, but we know the disease, especially with heart affection, is prone to produce these complications.

Emphysema is irrecoverable when complicated with organic disease of the heart or asthma; but when it occurs as the accompaniment of whooping-cough, it will gradually pass away with the disorder, and the child may grow up without any sign of ever having suffered from it.

Treatment.—The pathology of the disease proves that the ruptured lung-tissue is incapable of repair, but in slight and recent cases we may do much to arrest further destructive changes. Constitutional remedies are chiefly to be relied upon in these cases, for if we cannot again restore the elasticity of the walls of the air-cells to their normal state, we may prevent, or at least indefinitely retard, degeneration in the structure of the lungs. If there is an absence of renal disease, and the heart is feeble in its action, we must select such remedies as will strengthen it, and improve the quality of the blood at the same time. In the shape of drugs, iron is one of the best remedies for improving the cachexia which is so often present. The tincture of the perchloride is my favorite form. Dr. Waters speaks well of the ethereal tincture of the acetate. Strychnia has been employed to increase the tone of the muscular fibre in the relaxed bronchial tubes, but no positive benefit has ever followed its use, nor has electricity done any good to the damaged pulmonary tissue.

If bronchitis is an accompaniment, and the disease is acute, it will demand for the time being our chief consideration, but the remedies should not be too depressing. An emetic of sulphate of zinc is sometimes useful by relieving the pulmonary congestion

* In confirmed cases of vesicular emphysema renal congestion takes place, when albumen and sometimes blood are present in the urine. It is in such cases that the secretion is often high-colored, and throws down copious urates on standing. At other times, in equally severe cases, the urine may be abundant and clear, and of low specific gravity. When there is a large and persistent amount of albumen, and the circulation through the lungs is not much impeded, there is suspicion of organic disease of the kidneys.

and overloaded digestive organs. Where the mucous membrane is dry, and the breathing short, ipecacuanha and the solution of the acetate of ammonia may be employed, with or without iodide of potassium or chloride of ammonium, to favor secretion. If there is difficulty in expectoration, and of ridding the bronchial tubes of mucus, carbonate of ammonia, squill, senega, and wine will be needed. After this stage has passed away iron may again be given.

For the asthma, heart disease, and dropsy accompanying emphysema, the treatment must be directed in accordance with the prevailing symptoms.

Where there is passive hyperæmia of the chief internal organs, as the liver, spleen, and kidneys, a scanty diet and free purgation will be occasionally needed. No remedies tend so effectually to relieve the shortness of breath as a grain of calomel now and then, followed by a seidlitz powder, or some saline aperient. After this a gentle effect on the liver may be kept up by taraxacum, with a few grains of bicarbonate of soda, or the nitro-muriactic acid with taraxacum, or calumba (Form. 20–42). Quinine and small doses of strychnine, to improve appetite and digestion, are to be recommended.

Where the brain is overloaded with blood from passive congestion, a few leeches to the temples and cold to the head, will be required before relief follows.

Sedative remedies to relieve cough, if at all violent, must be given (Form. 65–74); they obviate in some degree the congestion of the lungs which is sure to follow continued paroxysms, and prevent the patient from obtaining rest. Sedative inhalations are also useful. The required quantity of chloroform, or nitrite of amyl, conium, or hops, is to be put on a piece of sponge and inhaled through a convenient apparatus, as the steam of hot water passes through it, or the medicated fluid may be put into a pint of water at 150°, and the inhalation be continued for about ten minutes. The patient should inhale before meals, and should not venture out of doors for some time afterwards. The Electric Inhaler, made by Maw, at the suggestion of Dr. Morell Mackenzie, is very convenient.*

If the bronchitis and catarrh when present be attended with profuse expectoration, and the child is losing flesh, quinine, iron,

* The Pharmacopœia of the Hospital for Diseases of the Throat, 1872, p. 67.

the mineral acids, and cod-liver oil or malt extract, will be beneficial.

Blisters are not required for children, but liniments, turpentine fomentations, and mustard poultices may be needed to relieve congestion of the stomach or lungs.

The diet in all chronic cases must be generous and carefully regulated, the food being nutritious and given in small quantities so as not to overload the digestive organs and cause flatulence, which distresses the heart by interfering with the action of the lungs and the descent of the diaphragm.

Gentle and never violent exercise should be resorted to, care being taken to avoid fatigue and to calm the nervous apprehensions of the sufferer.

Change of air often proves of great benefit.

CHAPTER XXXVI.

BRONCHITIS.

TWO VARIETIES: 1. *The acute—2. The chronic—Exposure to cold a common exciting cause of the acute—Irritation of dust and noxious vapors—Over-suckling—Bronchitis from tubercular, renal, and heart diseases—Often an accompaniment of measles and whooping-cough—Mortality of bronchitis.* SYMPTOMS OF ACUTE BRONCHITIS (*Capillary bronchitis*), PHYSICAL AND GENERAL: *Pulse—Respiration—Temperature—State of the pulmonary mucous membrane—Death by exhaustion, convulsions, or coma—Chief indications denoting danger—Chronic bronchitis may be a sequel of the acute form, or be associated with renal disease or valvular disease of the heart—Its symptoms and complications—Morbid changes found in the lungs in fatal cases—Collapse of lung, how produced—Frequency in children—Expansion and dilatation of bronchi*—SEQUELÆ: *Emphysema—Congestion of liver—Disease of heart—Dropsy—Pathology of acute and chronic bronchitis.* TREATMENT OF THE ACUTE VARIETY IN DIFFERENT STAGES: *Depletory measures—Tartar emetic—Diaphoretics—Alkalies in combination with a mercurial—Stimulating expectorants—Saline aperients—Henbane—Dangers of opium by lessening secretion, and of chloral by depressing cardiac ganglia—Bromide of potassium—Value of tonics—Beef tea—Milk—Stimulants—Failure of right heart.* TREATMENT OF CHRONIC BRONCHITIS: *Conium—Dover's powder—Squill—Ipecacuanha—Emetics—Syrup of iodide of iron—Cod-liver oil—Mineral acids—Quinine—Change of air—Warm clothing.*

Two varieties of bronchitis are described, the acute and chronic. The acute frequently follows on ordinary catarrh or cold, which for some days has seized upon the young patient with the well-

known symptoms previously described,—running from the eyes and nostrils, frontal headache, loss of appetite, sore throat, and febrile disturbance. At the end of a few days (for the time cannot always be definitely stated) the irritation may have extended to the bronchial mucous membrane, and the child gradually getting worse is unable to leave his bed.

Among the chief causes which invite this affection are cold and sudden changes of temperature (hence its prevalence in the spring and winter months), insufficient clothing, the irritation of dust and noxious vapors; debility from prolonged suckling, and whatever circumstances tend to reduce the tone of the body, rendering it unable to resist disease of any kind, more particularly that which is so prone to seize upon the bronchial membrane at an early period of life.

Bronchitis in children may arise from hypertrophy and valvular diseases of the heart, which induce local congestion and disturb the balance of the circulation. It occurs in tuberculosis, albuminuria, and some other disordered states of the blood, and it accompanies pretty constantly the various exanthemata. Measles and whooping-cough are the two diseases with which it is most commonly associated.

In measles the pulmonary mucous membrane is particularly liable to inflammation, and sometimes it is seriously affected, producing capillary bronchitis, and even bronchopneumonia.

The mortality of bronchitis among young children constitutes it one of the most fatal of diseases.

The general symptoms of the acute form depend on the extent to which the respiratory tract is involved. If the larger tubes are principally affected, and the smaller bronchi have escaped, the constitutional disturbance is moderate, and the child may be up and have an appetite for food; but if the seizure has been sudden and severe, and the smaller ramifications of the tubes are implicated, there may be considerable dyspnœa and paroxysms of cough, coated tongue, high-colored urine, elevation of temperature, headache, and thirst. If the child is old enough to talk, and to express its feelings intelligibly, it will complain of soreness and even pain over the sternum, an irritation in the trachea, and a sense of constriction at or about the epigastrium corresponding to the insertion of the diaphragm. The cough is frequent, hoarse, and tearing, and it persists whether the child is awake or asleep, while it will

often raise itself up in bed unconsciously, from the severity of the paroxysms, as if frightened, and look about it in amazement. The face is generally flushed and heated in strong children, and there is headache and restlessness, the pulse is full and frequent, the temperature is elevated from 99° to 102° or 103°; frequently it is not above 100°, and in many severe cases when the pulmonary condition denotes considerable danger, it is scarcely raised above the normal standard, though the pulse may reach 140, and the respirations be 50 or 60 per minute, with noisy breathing and prolonged expiration. In these cases the nervous excitement is great, and exhaustion is evident, and there is often a good deal of mucus in the tubes, indicated by catarrhal sounds and loose cough. When the temperature remains low or falls, and the pulse and respirations are quick, debility is the chief element to contend with, unless there is enough mischief in the lung to account for the constitutional condition. If the pulse is quick, the respiration is usually quick also, and as the one falls so does the other; but it will often be observed, when there is nothing in the lung to account for it, that the pulse drops in frequency and improves in quality, whilst the respiration remains quick for a considerable time, and only falls to the normal standard as the strength is re-established. In very young children of a few months old, who have never been strong from birth, there may be loud mucous rattling over the back of the chest, and wheezing at each inspiration; they may vomit all the food they take from the violence of the cough, so that it becomes important to seize the opportunity of giving nourishment immediately afterwards; and if this plan is carried out, many cases that appear hopeless may be saved. These symptoms, which increase in severity at night, and may be followed by convulsions, are not uncommon in cases of bronchitis complicated with whooping-cough.

The cough of children, as of adults, is much influenced by the position they assume in bed. When they sink low down with the head bent forward on the thorax, the cough is distressing, and though worn out and weary, they are prevented from sleep by the constant and harassing irritation; it is almost useless to rectify their position and to raise them up in bed, for they quickly sink down again with the head buried in the clothes.

The character of the cough is not much guide as to the nature of the bronchitis in an early stage, though some writers have

attached great importance to it. "A bad sign, furthermore, is when the children cough more when laid on one or the other side than on the back, for this cough in most cases is due to great material alterations in the pulmonary structure. Children with simple bronchitis cough less in the dorsal decubitus than in the upright posture; no difference can be noted in them between the lateral and the dorsal decubitus."* Still it must be admitted that they often get much ease when taken out of bed and nursed in the lap.

On a physical examination of the thorax, the chest is found to be resonant throughout, and loud rhonchi of a sonorous character are heard over the upper lobes of the lungs posteriorly, especially between the scapulæ; whilst the respiration may be clear in the lower lobes. In children of good constitution the disease, even when very acute, does not invariably extend beyond the larger bronchi. If the symptoms increase, sibilant rhonchi (sounds less hoarse and large, but more shrill than the former), denoting implication of the smaller bronchi, are heard in the inferior lobes, and there is oppression and weight at the epigastrium. In a day or two, secretion is poured out from the bronchi, the cough becomes moister, and the sputa are thin and frothy. If the cough is severe there may be streaks of blood in the expectoration, but it soon changes its character, and becomes semi-transparent, or of a faint yellow color. Later on it is of a yellowish-green, and is more viscid and opaque.

Rhonchus and sibilus may occur together at the same time, and they generally do, but they may be present independently of each other. The same may be said of the large and small crepitation, the one heard in the large and the other in the small bronchial tubes when there is an excess of fluid in them. Just as sibilus is a more important sound than rhonchus, so is small crepitation than large crepitation, because it denotes the implication of the ramifications of the bronchial tubes. I have described the course which bronchitis usually takes, but all cases do not run into the moist stage, or that in which crepitation is produced. Now and then the disease stops short of this. Rhonchi and sibili may not proceed further, but be succeeded by the normal respiratory murmur, without any secretion being poured out. All practitioners have seen cases where rhonchus and bronchial breathing have been

* Vogel on Diseases of Children, 1874, p. 284.

the only physical signs heard in the lung. Ringing cough, soreness of the chest, hurried respiration, flushed face, and fever have been the leading symptoms. Three or four days later the disease had passed away without any secretion taking place. I do not think this is frequent; one or two attacks may end in this way, but subsequent seizures are sure to be followed by copious secretion. In young children, if there is loud rhonchus, it is nearly always succeeded by moist sounds, and the secretion so poured out often causes dyspnœa and death. In 1869 I attended a boy ten years of age, who had been laid up with cough and febrile symptoms for three days. When I saw him on the fourth day he had become much worse, his breathing was hurried and difficult (40 per minute), nostrils active, face flushed, pulse 100. Loud rhonchus and sibilus with shrill musical sounds were heard throughout the lungs, but percussion was clear both in front and back of the chest, and the heart's sounds were normal. There was no history of asthma, but I suspected a certain amount of spasm in the case. A grain of calomel was given on sugar, and a dose of a mixture, containing a few grains of nitrate of potash and a sixth part of a grain of tartarated antimony, every four hours. A poultice was applied to the chest. Next day he was better, and three days later he was well, without any secretion into the air-passages having taken place. A very similar case is described by Dr. Latham.*

The next change in severe cases is the disappearance of all glairiness in the sputa, and a purulent nummular condition, which denotes the decline of the disease. This may happen in three or four days, or it may be delayed for a week or more; and the purulent secretion which we estimate as a most favorable sign may be only slightly marked. Any return of the glairy watery secretion denotes fresh bronchial irritation. Congestion of the mucous membrane diminishes, oppression is relieved, and loose bubbling crepitation is heard; but if the disease extends into the vesicular structure of the lungs, the face becomes dusky and anxious, and the breathing is embarrassed. In some cases the secretion is more organized, and takes on the form of croupal exudation, being moulded to the shape of a bronchial tube.

When the inflammation is severe, the elasticity of the lungs is greatly impaired, and the lobules becoming distended and weak-

* Clin. Med., vol. ii, New Syd. Soc., 1879, p. 118.

ened, the air is imprisoned and cannot escape. When this takes place the vesicular murmur is abolished, and there is urgent dyspnœa, and wheezing sounds are heard throughout the chest. The character of the crepitation varies according to the size of the implicated tubes. When secretion is fairly established, coarse, loose, and moist crepitation are heard over the larger tubes, and small crepitation over the smaller ones; and the sounds are so varied and peculiar in some cases as to be whistling and musical—analogous in certain instances to the rush of air and fluid through a narrow thin tube. In severe cases it is extremely difficult to distinguish the line which separates inflammation of the finer bronchial tubes from that of the vesicular structure. The real distinguishing mark is the absence of dulness in the first case and its invariable presence in the latter. The cough in pneumonia is much more tearing and painful, the child seems to dread it, the dyspnœa is more urgent, and there is a further rise in temperature. In young children, the secretion into the bronchi is sometimes so profuse as to give rise to suffocative catarrh and convulsive cough, because the mucus is drawn back into the smaller tubes and cannot escape; and when they are so distended no air can be heard to enter the chest. In these cases there is often a good deal of oppression, tightness, and pain at the chest, dyspnœa, and restlessness. The child is flushed in the face; the skin is hot or perspiring, and the veins about the neck distended from the circulation being impeded through the right heart; the tips of the fingers are livid, and the countenance is dusky. In severe cases, clots form in the heart or pulmonary artery, the pulse increases in frequency, or is intermittent and feeble, whilst the temperature falls, and the skin is bedewed with a clammy sweat. There is great danger in this condition, and in many cases the next alarming stage is reached. The child becomes more drowsy and unconscious, and there is difficulty in rousing it to take nourishment. It probably coughs less, though the air-tubes are more loaded, because there is no strength to expectorate; the pulse becomes more rapid and feeble, and the respiration is quick, short, and silent. In consequence of the circulation being nearly arrested in the lungs and the right cavities of the heart, the child may die at any moment from suffocation, with convulsions, or coma.

We sometimes meet with acute bronchitis in children of a few months old, who cough and breathe badly for weeks before the

affection is fully developed. The children have perhaps been brought up by hand, and are feeble and flabby; they breathe badly at night from an accumulation of phlegm; the bowels are relaxed, and the motions greenish or white; the respirations are 40 per minute, and the expiration is noisy and wheezing; the pulse is quick, but the temperature not much elevated. The cough may be so great that the food is vomited, and the children waste in consequence. Bronchitis is sometimes complicated with laryngismus.

The indications of danger are urgent dyspnœa, livid or dusky features, quick pulse, sweating skin, and failure of strength. In capillary bronchitis the danger to life is greater, because the swelling of the tubes interferes with the aeration of the blood; and also because there is a great tendency to collapse of the lung.

In some children who have suffered from bronchitis for only three or four days, the skin breaks out somewhat suddenly in a clammy sweat; the eyes are dim and the lids half closed, whilst the face is pallid and the lips blue. The child is perpetually restless, drawing up its legs, throwing its arms wildly about, and attempting to turn from side to side. The pulse is rapid and small; the respirations 60 or 70 per minute, short, shallow, and entirely diaphragmatic. The upper lobes of the lungs are fairly resonant on percussion, and the respiration is accompanied with loud rhonchus in this situation. Whistling tubular breathing is also heard in the centre and lower lobes, and some parts of the chest-wall are more resonant than others. The child, even if supported by food and stimulants, too frequently relapses into drowsiness and coma, or dies in a fit of convulsions. In these cases some degree of catarrhal pneumonia or collapse of the lung may be found after death.

Chronic bronchitis is a sequel to the *acute* form, or it may result from neglected colds and a low form of inflammation. If the general health has been reduced, or the child is delicate, it is a very obstinate complaint. Not uncommonly it will be found associated with renal disease. A case of this kind was under my care in 1876, where the bronchial excitement followed desquamative nephritis; then, too, it is often kept up by tubercular disease of the lung and dilatation or valvular disease of the heart, which interfere with the pulmonary circulation, and induce congestion of the bronchial ramifications. Strumous and rickety children are also liable to this complaint. When it persists in

mild weather, and in spite of careful management, it should put us on the lookout for tubercle; diffused bronchial sounds through the chest of any continuance, particularly if the temperature rises persistently in the evening, or is fluctuating, are very suggestive of organic mischief in young subjects. In the cold weather of spring and winter, young children are liable to subacute attacks of bronchitis, with feverishness, wheezing, and troublesome cough. Rhonchi and loose mucous râles may be heard over the front and back of the chest, and the pulse and breathing are both quickened. If dentition is going on, the appearance of every new tooth is a signal for fresh pulmonary irritation, because the general health is lowered and the child is too weak to resist the changes of weather. When, on the other hand, there is free secretion from the bronchial tubes, with habitual cough and shortness of breath, the pulmonary tissue becomes impaired and emphysema results. This is more common in adults. The tubes become dilated, and the pulmonary tissue shrinks and wastes.

Collapse of the lung is one of the consequences of bronchitis, and it has been asserted by some that it may either lead to pneumonia, or to a more serious condition. The collapsed portions of the lung require to be distinguished from pneumonic consolidation; they are not really pneumonic, for although of a venous red or plum color, and not crepitating under the finger, they are wanting in firmness. They bear no traces of inflammatory exudation and sink when placed in water. Moreover, they can be inflated. When the secretion from the bronchial tubes becomes copious and organized, a plug of mucus is apt to be carried along one of their ramifications till it is arrested, so that it cannot pass in any direction. In expiration, the air behind the obstruction dislodges it to some extent and passes outwards, but the act of inspiration draws it back again into the tube, where it becomes wedged, and does not permit any air to enter the collapsed lung. "Its mechanism is very simple, and is admirably illustrated by an experiment of Mendelsohn and Traube. They introduced a shot into the bronchus of a living dog, and the lung beyond the shot became collapsed and thoroughly emptied of air. A solution of gum injected into the bronchi produced the same result. The air gradually found its way out past the obstruction, and was expelled during expiration, but was prevented entering again during inspiration. So it is with a plug of tenacious mucus at the bifur-

cation of a bronchus. It acts the part of a ball-valve in a syringe; each expiratory blast may dislodge it so far as to admit of the escape of air around it, but not so far as to prevent its falling back into its old position, and thus closing the passage against the ingress of air during inspiration. This condition of things leads to the emptying and consequent collapse of the air-vesicles beyond the seat of obstruction, with attacks of dyspnœa, more or less severe according to the size of the portion of lung affected, and more or less enduring according to the period which elapses before the obstruction is removed."*

Pathology of Acute and Chronic Bronchitis.—In health the mucous membrane of the bronchi and their smaller ramifications is smooth and uniform, and pours out just enough mucus to keep them moist and lubricated, and to prevent dryness. When from congestion and hyperæmia of the membrane, an abnormal quantity of mucus is secreted, it accumulates in the bronchi and dyspnœa is the result. The larger bronchi may be alone affected, and the smaller escape, or both may be involved when the disease is much more serious; but it is seldom that all are alike affected, and one lung may be much more involved than the other. The inflamed mucous membrane is of a pinkish hue, the vessels are injected and arborescent, and if the attack goes on, the mucous membrane becomes darker, of a dusky scarlet tint, thickened, and of a soft velvety appearance, being covered with mucus.† In the bronchitis of measles, the mucous membrane is covered with spots similar to those on the skin, and in small-pox pustules have been met with in the trachea and larger tubes. The bloodvessels are overloaded, and with increased exudation from the serum of the blood there is an œdematous state of the tissues, and the mucus presents an increased number of cells. The secretion is at first thin and frothy, with a good deal of air; then it becomes tenacious and glairy, and mixed with purlulent secretion. "When pus-cells present

* Fuller on Diseases of the Lungs, 1867, p. 325.

† "Ulceration of the mucous membrane of the trachea and larger bronchi, which is occasionally met with in the bronchitis of adults, I have never observed but once. In that case, a little boy, twenty months old, who had suffered from a not very severe attack of bronchitis, in the course of which, however, he had had occasional difficulty in deglutition, with return of fluids by the nose, died rather suddenly. The only remarkable appearance besides a general redness of the bronchial tubes, consisted in the presence of several small excavated ulcerations or erosions in the upper part of the larynx, just above the chordæ vocales."—West, *On the Diseases of Infancy and Childhood*, 1859, 2d edition, p. 295.

themselves in large numbers, they are probably also to some extent produced by the proliferation of the subepithelial cells of the connective tissue."*

Treatment.—In the acute variety the first step to insist upon is to put the child to bed, and then to direct our treatment according to the age and severity of the attack. If the larger tubes of the lungs are implicated, and there is heat of skin and febrile disturbance, a warm bath and a saline diaphoretic mixture will be advisable, and this, by inducing a free action of the skin and kidneys, may cut short the attack. When the symptoms are of a more serious character, more active treatment will be required. Venesection or leeching is rarely required. I have never found it necessary to employ either in the case of a child, but I can understand that when the respiration is greatly accelerated, and there is so much rhonchus as to indicate great congestion of the vessels, it might prove serviceable. In children the consitution is usually not robust enough to stand it, and it must not be reckoned among the appropriate remedies. "In children I believe it is never necessary to open a vein, for leeches on the chest form a convenient and effective substitute for phlebotomy."† Small doses of tartar emetic, with the liquor amm. acet. (Form. 7), will generally suffice, and if they should excite vomiting at first it will be no drawback. The one-sixth or one-eighth of a grain in solution with the liq. amm. acet. every three or four hours favors secretion, and lessens the severity of the symptoms. It is important to change the hot dry skin into a moist and relaxed one, and the same applies to the congested mucous membrane of the bronchi. Even in these cases it is necessary to be watchful and cautious, as depression and exhaustion may quickly ensue. When antimony is employed, strong children only should be selected, for a few doses will generally produce a rapid and lowering effect, and they cannot be too carefully watched. Pallor of the face, duskiness of lips, sweating skin, and increased bronchial râles are to be looked for, and the local as well as the constitutional condition will grow worse instead of improving in young subjects unless they are vigorous. The vinum antimoniale is generally sufficient to control ordinary cases. In infants and very young children ipecacuanha is preferable, and even this milder remedy should be watched, and combined with

* Fenwick, Medical Diagnosis, p. 45.

† Fuller, op. cit., p. 316.

the spt. æther. nitr. or the liq. amm. acet. I have sometimes given hydrocyanic acid in addition to arrest vomiting.* If the child becomes pale after a few doses, and the skin is moist and the pulse weak, or if the temperature is falling, it should be discontinued, and ammonia, nourishment, and even wine or brandy employed. In very young children, when the face is dusky, and there is drowsiness, with loose coarse râles over the chest, there is no better combination than the carbonate of ammonia and spirit of chloroform.† Even in these cases I have sometimes known an emetic of ipecacuanha and sulphate of zinc have a remarkable rallying effect by dislodging a large quantity of bronchial mucus.‡ A few drops of brandy should be given in milk frequently, or a small quantity of champagne in soda-water; water arrowroot, to which brandy is also added, and beef tea, veal, or chicken broth, will be demanded. Under this treatment the temperature may fall from 102.4° to 100°, and the pulse from 164 to 140 in the course of a few hours. In the case of strong children, with much febrile excitement and sthenic action, it may be well to give a powder of calomel, James's powder, and nitrate of potash§ (Form. 62). I find this an excellent combination to act on the skin and bowels, exciting free action in these organs, and so reducing the fever and controlling the constitutional disturbance. Four of these powders are invariably enough in my experience to bring about the desired

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* Formula 60:

℞. Liquor. amm. acet., ... ℥j
Acid. hydrocy. dil., ... ♏viij
Vin. antimonialis, ... ♏xl
Syr. scillæ, ... ℥ss.
Aquam ad. . . . . ℥iv.—M.

A dessertspoonful every four hours. For a child five or six years old.

† Formula 61:

℞. Amm. carb., ... gr. iv
Spt. chloroform., ... ♏xx
Syr. tolut., ... ℥ss.
Aquam ad . . . . . ℥ij.—M.

A teaspoonful every four hours. For a child a year old.

‡ See the action of emetics in the treatment of bronchopneumonia, Chap. XXXVI, and in Chap. II.

§ Formula 62:

℞. Hydr. chlorid., ... gr. ij
Pulv. antimonialis, ... gr. viij
Potass. nitrat.,
Sacchari, āā . . . . . gr. xij.—M.

Et divide in pulveres iv. One every four or six hours. For a child five years old.

result, and it must be understood that the administration of a remedy like calomel is only called for under the conditions above enumerated. When the disease is limited to the larger bronchi, and there is great hyperæmia of the vessels, it has an extraordinary effect upon the capillary circulation. Whilst it encourages secretion, it subdues the tendency to inflammatory action, and the plastic effusion which frequently follows it. When the cough is very troublesome, mixture of syrup of squill and syrup of tolu will be useful,* and if the bowels are sluggish, syrup of senna may be added.† In some mild cases the citrate or bicarbonate of potash, with ipecacuanha, will be found a suitable remedy if the tongue be coated and an alkali is indicated.‡ If the bowels are sluggish, a simple soap-and-water enema, or a drachm of the syrup of senna or rhubarb, will be sufficient to excite peristaltic action. The temperature of the room should be 65° to 70°, and in cold weather a bronchitis kettle, or the steam of boiling water, to moisten the atmosphere of the apartment, will be useful. When there is much restlessness henbane will be required, or even hydrate of chloral if there is vascular excitement; but this last-named fashionable drug, like opium, should be used with caution lest it check the secretion.§ Chloral, too, requires great care in its employment, as it may depress the respiratory centres and the nervous ganglia of the heart.

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* Formula 63:

℞ Syr. tolut.,
Syr. scillæ,
Aquam, āā . . . . . ℥ss.—M.

A teaspoonful when the cough is troublesome.

† Formula 64:

℞ Syr. tolut.,
Syr. scillæ,
Syr. sennæ, āā . . . . . ℥ss.—M.

A teaspoonful twice or three times a day, or when the cough is troublesome.

‡ Formula 65:

℞ Potass. citrat., vel
Potass. bicarb., ... ʒss.
T. camph. comp.,
Vin. ipecac., āā . . . . . ʒj
Syr. scillæ, ... ℥ss.
Aquam ad . . . . . ℥ij.—M.

A teaspoonful every three hours. For children from one to two years of age.

§ The physiological and therapeutical action of hydrate of chloral are considered in Chap. XXXVIII, On Pneumonia.

When the nervous element prevails, as it does in some children, a sedative is useful to procure rest and sleep, and for this end a few grains of the bromide of potassium, with or without the chloral, or even Dover's powder alone, will be serviceable. When the secretion is freely established, such expectorants as ipecacuanha, squill, and senega will be necessary.* As regards local applications, a turpentine stupe or a warm poultice, made with equal parts of linseed meal and bread, should be applied to the chest or back. In very young children it is an excellent plan to envelop the chest (front and back) in cotton-wool, and to cover this with oil silk. This acts like a poultice, and is far better than the application of stupes and poultices, while the child is not distressed by frequent change of clothing.

I have observed immense relief in many cases from placing young children as much as possible on the face in bronchitis; but this can only be done with infants satisfactorily. It relieves the cough and respiration, and the tendency of the secretion to gravitate to the lower and posterior surface of the lungs is lessened. The child should be held across the arm of the nurse, with its face downwards, and kept for hours together in this position. In the winter of 1876, I attended a child seven months old, with acute bronchitis, and I am satisfied that recovery was in a great measure due to the position the child was kept in during the catarrhal stage, when the secretion was copious and the cough exhausting. The child was weak, and at one time unable to cough from the loaded state of the tubes, and the weakness of the respiratory act. There was danger of the elasticity of the lung being destroyed by the accumulation of phlegm in the dependent parts of the chest. I therefore had the child turned on its face, and laid across the nurse's lap in a semi-erect posture. It soon began to improve, coughing up phlegm easily, and sleeping soundly at intervals. An emetic of ipecacuanha in these cases at bedtime is sometimes ad-

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* Formula 66:

℞. Vin. ipecac.,
Tinct. scillæ, āā . . . . . ♏xl
Tinct. conii, ... ℥j
Spt. æther. nit., ... ℥j
Syr. tolut.,. . . . . ℥ss.
Decoct. senegæ ad . . . . . ℥iv.—M.

A dessertspoonful every four hours.

visable, and even at an early stage it may subdue the hyperæmia of the tubes, and shorten the severity of the acute stage.*

The duration of the disease is uncertain. It may destroy the life of an infant or young child in forty-eight hours, but the ordinary period is from seven to ten days.

Treatment of Chronic Bronchitis.—From the onset of the attack it is most important to support the patient's strength. It is never necessary to abstract blood, or even to employ antimony, though there may be fine bubbling râles, and other signs of bronchial inflammation. To meet this condition we must rely on the administration of ipecacuanha, squills, senega, and nitrous ether. A warm poultice to the chest, or a turpentine fomentation is best and safest, with such stimulants as support the circulation and avert the tendency to sinking and fatal prostration. When the pulmonary irritation is less active, the carbonate of ammonia and tincture of bark will be found useful.† An occasional emetic to empty the bronchial tubes at bedtime will promote sleep and insure rest. Alarm may sometimes be caused by children appearing as if they would choke in the act of vomiting, but this never actually happens, and no fear need be apprehended on this ground. I have seen great benefit follow the administration of the syrup of the iodide of iron, with a few drops of ipecacuanha‡ when there is cough, debility, and free secretion in the lungs. Expectorants alone have an injurious effect, and sedatives are equally bad. The necessity of using opium with the utmost caution in young and feeble children, for fear of checking expectoration, cannot be too strongly insisted on. The incessant cough depends on phlegm which has accumulated in the air-passages. Opium renders the mucous membrane insensitive, consequently cough is no longer ex-

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* See also the action of emetics in Chap. II.

† Formula 67:

℞. Amm. carb., ... gr. viij
Tinct. cinch. co., ... ℥ij
Syr. tolut., ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful three or four times a day.

‡ Formula 68:

℞. Syr. ferri iod., ... ℥ss.
Vin. ipecac., ... ℥j
Aquam ad . . . . . ℥iij.—M.

Two teaspoonfuls three times a day. These prescriptions are suitable for children of five or six years old.

cited, and the child may die asphyxiated from the blood not being sufficiently decarbonized. In older and stronger children a sedative allays irritation and prevents exhaustion, if the condition of the mucous membrane is rather one of irritation and congestion than of free exudation. When the secretion is copious, and the bronchi loaded or obstructed, an emetic of ipecacuanha or sulphate of zinc at night is serviceable, and when it has acted well, a stimulating expectorant and wine should be employed. Cod-liver oil is another remedy at this stage, and is most valuable in obviating the exhaustion and ill-health which so frequently ensue. When the secretion remains profuse (bronchorrhœa), and the cough is frequent, quinine, the mineral acids (which are very valuable), iron, conium, and cod-liver oil are most to be relied on. Change of air to a warm equable temperature and a generous diet will get rid of this condition. It is at all times important to attend to the ventilation of the sleeping apartments, which should be dry and airy, neither too cold nor too hot, but as uniform as it is possible to make them. Flannel should be worn next the skin, and the feet kept warm.

CHAPTER XXXVII.

PLEURISY.

SYMPTOMS: *Of the acute form—General and local.* CAUSES: *Cold and exposure—Rheumatic fever and the exanthemata—Tubercle.* DIAGNOSIS: *Generally easy of recognition, but may be mistaken in some cases for tuberculosis or bronchopneumonia—In exceptional cases for abdominal disease or encephalitis when severe headache or delirium is present—Means of distinguishing the several affections.* PROGNOSIS: *Favorable when the effusion is moderate and the disease is uncomplicated.* MORBID ANATOMY: *Dryness of pleuræ—Effusion of coagulable lymph and pus—Adhesions—Extreme effusion.* TREATMENT: *Leeches—Warm poultices to the affected side—Calomel and opium—Sudorifics—Free purgation.* CHRONIC PLEURISY: *Causes—Symptoms—Terminations—Treatment.* EMPYEMA: *Causes—Symptoms—Diagnosis and treatment—Paracentesis thoracis—Method of operation—Risks attending it—Simple tapping—Aspiration—Use of the drainage-tube—Indications for the employment of tapping—Injections into the pleural cavity—The coexistence of empyema with pneumothorax.*

ACUTE PLEURISY, or inflammation of the membrane which invests the lung and thoracic walls, is a most painful affection, since the inflamed visceral and parietal layers of the pleura must necessarily rub against each other during inspiration and expiration, so that rest cannot be afforded them.

Pleurisy when uncomplicated with pneumonia is held to be rare under five years of age. Still it must be admitted that the disease is more frequent in early life than is generally supposed; for in the absence of dyspnœa the chest constantly escapes examination, and even if it does not, a limited degree of inflammation of the pleura is not easy to diagnose during life.

The disease generally begins with a rise of temperature and rigors, soon followed by catching pain in one side of the chest, limited to one or two intercostal spaces. If pressure be made over them the patient winces and cries out. The pain commences above and to the left or right of one nipple, as the case may be, and extends through the sternum or up to the axilla. The pain at each inspiration resembles that caused by a sharp instrument penetrating the side. In some cases nearly the whole side is affected. If the disease be complicated with bronchitis or pneumonia, the physical signs of these diseases are present. There is dyspnœa and a short dry cough, and the pain is aggravated by each inspiratory effort, which is hurried and interrupted. The pulse is frequent, hard, and small, and it may be tense; the countenance is distressed and anxious, and the face sometimes flushed; there is high fever in some cases, but it is not so high as in pneumonia, and it is more subject to fluctuation; the skin is hot, but moist, and the tongue coated; the urine is scanty and high-colored, its specific gravity is also high, and as in many other acute inflammatory disorders there may be a trace of albumen from venous congestion.

There are exceptions to this general condition, the pain being much less in some cases than in others; it may be absent, and the breathing may be unaffected even when the physical signs indicate considerable effusion. Indeed, very rapid effusion of necessity relieves the characteristic pain by preventing friction between the opposed surfaces of the pleuræ. In some cases quick breathing and debility are the only symptoms which accompany effusion.

Dyspnœa is a symptom which is apt to mislead the young practitioner, more importance being attached to it than it frequently deserves. It is often present at the commencement of pleurisy, when the pain in the side is acute, and before the effusive stage has been reached. The child does not inflate his lung completely by a full inspiration, because the effort increases the pain caused by the movements of the thoracic parietes, and the

pyrexia which is present has the effect of accelerating the respiration. "This dyspnœa at the commencement, then, is a false dyspnœa, and is not due, like true dyspnœa, to defective and insufficient hæmatosis, but to the pain which limits the respiratory movements and destroys their normal rhythm."* Hence it is that, as the effusion increases, the pain diminishes, and the respiration scarcely exceeds the rate of health, when the sound lung comes into play from apex to base, and takes on additional work.

The position which the patient assumes in bed is a matter of some interest and importance. According to my experience the decubitus is usually dorsal; the patient cannot lie on the affected side owing to the pleural friction and the pain which that position entails; on the other hand, lying on the sound side causes discomfort, since then extra work is imposed on the lung lying uppermost, which requires rest as its pleura is inflamed. Still the child will assume any position which enables it to breathe with the greatest facility and affords the fullest freedom to the unaffected lung.

The *physical* signs vary with the stage which the pleurisy has reached, and according to the strength and constitution of the patient. When the pleura is dry and inflamed at an early period of the illness, there will be diminished mobility of the affected side in consequence of the pain experienced on inspiration. The respiratory murmur is weak or indistinct, a rough or grating friction-sound is heard from the opposing congested and dry surfaces rubbing against each other. It is a peculiar jerking interrupted sound, as if some structure was suddenly dislocated; the patient's sensations give him the same impression; whilst if the hand be laid over the part, a sudden rough jerk is communicated to it as though a rib had slipped over an uneven surface. The position where this is usually detected is in the infra-axillary region. The sound disappears when adhesion takes place between the surfaces in apposition, as I have explained when speaking of pericarditis. The percussion-sound is unaltered on the affected side, or at the most the resonance in uncomplicated pleurisy is only slightly diminished, and the respiration is puerile in the unaffected lung.

In the next stage, or that of effusion, the movements of the

* Dr. Dieulafoy on Dyspnœa in Acute Pleurisy, Gaz. Hebdom., Sept., 1878. Quoted from Med. Times and Gaz., Oct., 1878.

chest-wall on the affected side are diminished, varying of course according to the amount of fluid poured out. If the effusion is considerable the lower part of the chest-wall bulges out, and if very large, there may be a more general enlargement of the affected side, a wider separation of the ribs, and obliteration of the intercostal spaces. Vocal fremitus is diminished in small effusions, and abolished in large ones. The heart (as well as the liver and spleen) may be displaced in extensive pleuritic effusions, and seem to pulsate out of its normal position.

In cases of extensive effusion in children whose chest-walls are thin, fluctuation may be detected between the ribs, and the surface is smooth, tense, or even œdematous. If the chest is examined carefully from before and behind, enlargement may be detected over the inferior ribs of the affected side. This is often very apparent when the child is sitting up in bed, and the physician examines the chest from behind. He is apt to think that the diseased side must invariably measure more than the sound one, but there may be considerable effusion without any increase in its dimensions. A large quantity of fluid may be present in one pleura without causing the side to become larger. If several ounces are present, the measurement of the diseased side may not exceed the sound one by more than an inch. This is best ascertained by using the cyrtometer. I have had many opportunities of observing this fact in pleuritic effusion of adults, which sometimes results from the pressure of ovarian and other abdominal tumors obstructing the circulation.

The elasticity or power of expansion in the chest-wall depends upon its thickness, the age of the patient, and the strength of the constitution. Hence it is that in children the ribs act with greater freedom, and the ligaments and muscles easily stretch before any force that may be brought to bear on them, such as the pressure caused from within by pleuritic effusions.

Andral* speaks of great dilatation of the thorax by the fourth or fifth day of an acute attack; and Dr. Fuller also states that there may be bulging in the lower part of the chest-wall before the end of the third day of attack, and that other cases are recorded where the chest is considerably enlarged before the end of the fifth day. "In my experience," he says, "however, this early enlargement has occurred only in childhood, when the chest-walls

* Principles and Practice of Medicine, by Sir T. Watson, Bart., 1857, vol. ii, p. 116.

are unusually yielding, and in those children only in whom the costal pleura has suffered severely, and in whom the intercostal muscles being paralyzed, and the subserous structure softened and infiltrated with serum, the chest-walls yield to the outward pressure with unusual readiness."* In short, enlargement of the affected side of the thorax is the rule in cases of extensive pleural effusion during childhood, but is, as I have said before, by no means invariable.

On percussion over the seat of effusion the dulness is absolute. It may be termed characteristic when the fluid beneath is considerable; but in recent cases, when it is moderate in quantity and the lung has not suffered much compression, then the note becomes resonant if the patient shifts his position and lies on the sound side. When he lies on his back, the note is resonant over the front of the chest. When he lies on his face the fluid gravitates to the front, and the note is dull in this situation, though if adhesions be present the fluid may be prevented from shifting.

The uppermost part of the chest always elicits a hollow sound when struck, varying of course with every attitude of the patient. This is a valuable diagnostic sign. Again it may be noticed that if the upper portion of the lung has escaped compression and the effusion does not extend above the nipple-line, the percussion-note is so clear as to be tympanitic. Respiration is heard in the affected lung down to the effusion; but in severe cases, when the pleural cavity is nearly full of fluid and the lung is much compressed, the whole side is dull. The respiratory murmur is absent, or there is bronchial breathing, with bronchophony along the spine. Of course the sounds are altered and modified according to the extent of effusion. Above the line of effusion the breathing is often harsh, tubular, or hollow; vocal vibration is increased, and in the interscapular region the respiration may be loud and blowing, and the voice bronchophonic. The unaffected side of the chest is hyperresonant, and the breathing puerile.

In ordinary cases, after three or four days, the pain and fever abate and convalescence begins.

The disease may terminate in resolution, or in adhesion of the two pleural surfaces, or in effusion and empyema. But if uncomplicated with tubercle or pericarditis, pleurisy is seldom fatal.

The stage of absorption and resolution is characterized by the

* Diseases of the Lungs, 1867, p. 181.

elasticity in the chest-walls being regained, and by a return to the normal size. The intercostal spaces lose their distension, and vocal vibration returns. The percussion-note gradually becomes clearer as the effusion is absorbed, and the lung begins to recover from compression, except where the exudation is thick and plastic, and then the dulness is permanent. This is particularly the case in the lower portion of the chest, in the axillary line. As regards auscultation, the respiratory murmur slowly returns, at first weak, short, or harsh, but later on full and complete, as in normal respiration. During this process of absorption, the rubbing of the pleural surfaces one against the other, as at the commencement of the disease, sometimes produces a friction-sound, as in pericarditis, when the effused fluid is taken up and the heart comes in contact with the roughened pericardium.

Causes.—The disease may follow cold and exposure, a case of which came under my notice a few years ago in a child six years of age. It may occur in the course of rheumatic fever. One of the worst cases I ever witnessed was in a boy of twelve years of age, who was suffering from acute rheumatism complicated with pneumonia of the left lung. It may happen during one of the exanthemata, particularly scarlet fever or measles; or be excited by pericarditis, or tubercular infiltration of the lung. It may also accompany albuminuria. Dr. West mentions two cases which followed peritonitis.

Diagnosis and Prognosis.—Pleurisy is not generally difficult of detection. The presence of fever along with the acute and catching pain in the side, aggravated by a full inspiration, distinguish it from pleurodynia, with which it can scarcely be confounded; and the physical signs clear up its true nature. But the difficulty arises later on when effusion occurs; and then if the case is complicated with bronchial congestion, pulmonary tubercle, or bronchopneumonia, we may be doubtful as to the presence of fluid. These diseases, however, are most frequently bilateral, whilst a pleuritic effusion is rarely so, though serum or pus has been present in both pleural cavities at the same time.

If the outset of the disease is attended with purging, which is not infrequent, and the pain is referred to the abdomen and right hypochondrium instead of the side, and if moreover there is bilious vomiting, our attention may be diverted from the chest to the abdomen; but a careful consideration of all the symptoms ought to

prevent us from falling into error. These symptoms, with cough, strong fever, and urgent dyspnœa, constitute "diaphragmatic pleurisy." Pleurisy may extend to the pericardium and involve this membrane in inflammation.* Like pneumonia, the disease sometimes commences with so much headache and delirium that it has been mistaken for encephalitis. If there is vomiting also, and the cough and pain in the side are slight, and the respiratory murmur is simply weak, and no friction-sound can be detected, we may overlook the complaint. Still, if we carefully review the whole history of the case, and consider the way in which the disease has commenced, we can scarcely fall into error. As in pneumonia, pleurisy sets in with much more fever than is present in meningitis, the heat of the head is not so great, and there is no squinting or intolerance of light. The child, if old enough, can answer questions intelligibly.

The difference in dulness between pneumonia and pleurisy is also a great help in diagnosis. In the latter affection it is first detected in the lowest part of the thoracic cavity, and as the disease proceeds it is heard over the whole chest, which is rare in pneumonia. "The dulness comes on much more quickly in pleurisy than in pneumonia. It has been noticed within twelve hours from the invasion of the disease."† Taking into consideration the intense and absolute dulness of pleurisy, the greater rapidity with which it occurs, and the serous effusion which may displace the heart and mediastinum, we have good grounds for framing a diagnosis between the two affections. Occasionally, we have also another very characteristic sign of pleurisy when fluid is poured out around the larger bronchi, and the lung is compressed by it. The sound then heard is a modification of bronchophony, and is known as œgophony. It is like a distant tremulous voice when the patient speaks, resembling the squeak of Punch, or, as Laennec says, like the "bleating of a goat."

When pleurisy attacks a healthy constitution, and is of recent date, the prognosis is favorable; but if complicated with pulmonary phthisis, and the child is of a delicate or rickety constitution, or if there is great debility, then it must be viewed in an unfavorable light.

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* *Vide* Chapter XLI, On Pericarditis.

† Principles and Practice of Medicine, by Sir T. Watson, Bart., 1857, vol. ii, p. 123.

Morbid Anatomy.—In the first stage of pleurisy the pleura is drier than in health ; its smoothness and transparency are diminished, and its surface is more or less vascular, and covered with flocculi of lymph. In the next stage, or that of effusion, a variable quantity of serum may be present in the pleural sac, either very transparent, or of a pale lemon-color, or it is sero-purulent with loose flakes of lymph. In exceptional cases the fluid is of a reddish tint, due to the presence of blood thrown out by the vascular membrane. Layers of thick lymph may also in some cases be seen deposited on the surface of the lung, gluing it to the costal pleura, and preventing the movement which normally takes place between them. It is certain that the character of the exudation varies from time to time, according to the health of the patient and the changes that take place in the affected membrane. It may be serous at first, and then become sero-purulent, or even purulent. Post-mortem evidence of pleurisy without pneumonia has been detected in the youngest children. The case of an infant a few days old at the Paris Foundling Hospital is alluded to by Dr. Barlow, where two ounces of sero-sanguinolent pus were found in the left pleura, etc. Of fourteen cases of pleural effusion under his care, between the ages of eleven months and two years, "eleven were purulent, two were serous, and one was serous with thick lymph."*

Compression of the lung depends on the extent of effusion. If slight it only affects the lower lobe; but if the cavity be nearly full of fluid, and it has been collecting for some time, then it will squeeze the lung against the vertebral column, and increase the dimensions of the chest. In a case of thoracentesis recorded by Dr. Sansom, the lung of a child twelve years of age was reduced to the size of a small lemon, and the pleura was thickened and ulcerated.† The diaphragm and liver may also be pushed downwards, and the heart displaced.

In the stage of absorption the exudation that has been thrown out disappears, and the two layers of the pleuræ unite together by means of the lymph, which becomes changed from a soft structure into a fibro-cellular membrane of variable consistency, in some cases firmly uniting the ribs to the pulmonary pleura, and in others leaving a distinct space between the points of attachment.

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* On Frequency of Pleural Effusion in Infancy, Lancet, 1878, vol. ii, p. 877.

† Med. Times and Gaz., December 18th, 1875.

As the upper part of the chest-wall is in closer contact with the lung than the lower part, adhesion is more common in this situation; whilst in the latter the effusion gravitates to the lowest part of the pleural cavity, and the ribs act with greater activity.

Treatment.—On our knowledge of the exact pathology of each case must rest fundamentally our line of treatment. In most cases a large jacket poultice applied to the side will relieve the pain and relax the inflamed tissues, without the necessity of abstracting blood.

Still I am of opinion that when the disease attacks a strong and healthy child, and he is seen at an early stage, when the pulse is good, and the pain in the side is severe, three or four leeches applied to the painful part will be likely to arrest the inflammation, and favor resolution; whereas, if depletion is neglected the disease may run into effusion or suppuration, and recovery be difficult and protracted. In a few cases I have employed leeching with advantage, and I do not hesitate to adopt it, as I would in some cases of pneumonia when the inflammation runs high, and the constitution is strong. When pyrexia and pain are felt from the commencement of an acute effusive pleurisy, Dr. Clifford Allbutt recommends leeching, followed by a saline diaphoretic. "At the outset, that is, within twenty-four or forty-eight hours, at farthest, leeches should be applied liberally to the parts, according to the forces of the patient, and a poultice applied to receive the bleeding. As soon as the bleeding has ceased, the affected side should be bound down by strapping, after the manner best described by Dr. Roberts."*

At the commencement of the disease, when the vessels are first overloaded and engorged, a small dose of antimony, given every four hours with the solution of acetate of ammonia, and two or three minims of laudanum (according to the age of the child), will lower the pulse and promote diaphoresis. But antimony is far less beneficial in pleurisy than in pneumonia; and unless the case is complicated with the latter affection, it is quite secondary to calomel and opium. Nevertheless, free sweating wonderfully relieves the pain, and the remedy is well calculated to cut short the high inflammatory fever in a robust constitution. Calomel, with two or three grains of Dover's powder, is a good combination; and

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* On the Treatment of Pleuritic Effusion, Brit. Med. Journ., vol. ii, 1877, p. 726.

if there is not much pain the mercurial may be given with nitrate of potash and James's powder. (Form. 62.)

An active purgative dose ought to be given at the commencement of the disease to open the bowels, if the pain is not acute enough to be increased by the muscular exertion which it involves. When the pain is severe, our first step should be if possible to arrest it, because its continuance prevents sleep, and is more exhausting than any depleting measures. It should be an axiom to remove pain at once. "Of medicines," says Dr. Allbutt, "I advise a mild saline purgative at the beginning, by the use of mercury and chalk combined with the use of Dover's powder in fractional doses, or in weakly patients by the use of Dover's powder alone. Between these powders I give a mixture containing acetate of potash and large doses of liquor ammoniæ acetatis. By this method I obtain far better results than were wont to follow my expectant treatment of former years. The fibrinous effusion which issues in these cases almost always subsides when it has reached its height, and, if this height be the height of the spine of the scapula and the fourth rib, I am for this reason never in haste to interfere by operation so long as the patient breathes in tolerable comfort and the other lung is well at work. On the other hand, if the patient be uneasy, or if the entry of blood to the right heart be hindered, I do not hesitate to tap it at once. The favorable aspects of operation in such cases is that suppurative conversion rarely occurs in these highly organized effusions, even if air enters the pleura."*

When the acute symptoms have subsided and all fever has departed, counter-irritation to the affected side, in the shape of blisters, with the perchloride of mercury and bark, will get rid of any fluid that may remain. But a blister should not be applied till the chronic stage is reached and the pain is diminishing. Then it does not increase the local mischief, whilst it promotes the absorption of any fluid that may be present. A succession of flying blisters is preferable to one allowed to remain long enough to cause troublesome vesication and soreness. For it should be remembered that obstinate sores and great weakness are prone to follow their use in young children. They should not, therefore, be employed without carefully considering the grave results that may ensue.

* On the Treatment of Pleuritic Effusion, Brit. Med. Journ., vol. ii, 1877, p. 726.

The diet in acute pleurisy should be strictly antiphlogistic.

Chronic Pleurisy.—The causes which usually induce this condition are the consequences of the acute form, or of pleuropneumonia. The effusion which has taken place is slow of absorption, or resists it altogether. If there is fever and the general health is cachectic or much impaired, the effusion may become permanent, and no relief can be afforded except by a surgical operation. Chronic pleurisy, however, cannot always be traced to the acute form. It sometimes steals on imperceptibly in delicate children, and is only ascertained when a careful examination of the chest reveals the cause of the chronic cough and breathlessness. It may attend the dropsy which follows scarlatina and renal disease, or the anæmia of strumous and badly-fed children. It may also arise from the irritation of tubercle exciting a low form of inflammation in the pleura and leading to copious effusion. In these last-mentioned instances the disease is of a subacute or latent form.

Pleuritic effusion is most frequently met with on the left side of the thorax; and the more serous the fluid the more readily is it absorbed. When purulent or sero-purulent, it disappears very slowly.

The *signs* that follow the effusion of fluid in the pleural cavity in the chronic state are similar to those of the acute. There are universal dulness on percussion and an absence of vocal vibration; normal respiration is replaced by bronchial or tubular breathing, or it may be entirely absent, and dyspnœa, accelerated pulse, failing health, and loss of flesh are to be noted. In some cases there is hectic fever. The breathing is not always difficult in the absence of tubercle. The effusion may be considerable, and the lung on the affected side may be prevented from expanding; and yet the breathing may be tranquil and cough absent, when one lung is sound and healthy. More particularly is this the case when the effusion has been gradual and the function of the lung diminished by degrees. And it should also be borne in mind that a small effusion may act as an irritant and cause much embarrassment in respiration, when a larger effusion has no such effect. If the effusion is copious, and has lasted for some time, the functions of the lung become gradually impaired or even lost altogether. Both air and blood are forced out of the pulmonary tissue by the compression to which it is subjected; and hence the lung, in long-standing

cases of effusion, becomes flattened, tough, and contracted. It never completely re-expands, and therefore when the fluid is re-absorbed the chest falls in, the sternum is flattened, the diameter of the chest is diminished, and the spine is curved. The pleura becomes much thickened, and in some cases ulcerated. The muscles are more or less wasted, the patient walks much less erect, and leans towards the affected side. The puerile respiration in the sound lung, which has been recognized during the effusive stage, leads to more or less enlargement of the air-cells and dilatation of the bronchial tubes.

When the effusion into the left pleural sac is considerable, the apex beat can be sometimes felt to the right of the sternum. "I have observed that in children there is, as a rule, less visceral dislocation than in adults. The diaphragm is not so often driven downwards, nor is the heart thrust away so frequently from its position. Their yielding chest-walls expand, and percussion discovers but occasionally that the heart or liver is displaced."* In chronic pleurisy, with extensive effusion, the patient cannot lie on the sound side. It is said by some authorities that syncope and irregularity of the heart's action are more common when the effusion is on the left than on the right side. This seems quite possible, for the fibrous adhesions which bind the lung to the spine may limit the heart's movements. "Such bands also, though less frequently, fasten the pericardium in an unnatural position, by which the action of the heart is hindered."†

The *treatment* of chronic pleurisy is altogether different from that of the acute form. In the former the diet must be more liberal, and good food and wine will in some cases be needed. It may be necessary to apply a blister from time to time, followed by the application of iodine. The affected side of the chest should be painted with tincture of iodine, diluted with water (one in seven), night and morning, and then covered with two folds of flannel and calico like a half waistcoat in shape. This practice was first advocated by Dr. Fuller.

Iodide of potassium with bark, or small doses of perchloride of mercury, squill, digitalis, or acetate of potash may be administered. When the urine is scanty or high-colored, and the effusion is of a

* On Pleuritic Effusions, by Dr. Wardell, Brit. Med. Journ., 1874.

† On Tapping and Draining the Pleura, by Berkeley Hill, F.R.C.S., The Lancet, vol. ii, 1875, p. 87.

chronic or half inflammatory character, diuretic remedies are of value. Dr. Gairdner speaks highly of cream of tartar electuary in acute and chronic cases of effusion, which not only stimulates the kidneys, but keeps the bowels freely open, if they are not already so. It consists of cream of tartar, mixed with equal parts of honey, treacle, or marmalade, and of this a small teaspoonful or more may be given according to the age of the patient.*

If the child is weak and anæmic we must have recourse to tonics in order to maintain the general strength and to promote the absorption of the fluid. Among them the preparation of quinine and iron are invaluable, given alone or in a combination. If the kidneys are sluggish in their action, and the tongue is clean, the tincture of the perchloride of iron will prove one of the best of remedies. The syrup of the iodide of iron, the syrup of the phosphate of iron, and the soluble dialyzed iron will furnish good results in some instances. The mineral acids (Form. 14, 20, 21), liquor strychniæ, with phosphoric acid, and the tincture of bark, are likewise indicated in special cases. Cod-liver oil should be given in all chronic cases. The skin should be kept in a healthy state by an occasional bath, and even friction over the affected side will in some degree assist in favoring absorption. Above all, the action of the liver and bowels should be efficiently maintained, so that a free elimination of morbid matters may take place through the chief excretory organs.

When the health is sound and vigorous and the effusion is of a serous character, every opportunity ought to be given to promote absorption of the fluid before resorting to thoracentesis.

Empyema.—This is extremely frequent in children.† When the effusion resulting from chronic pleurisy remains unabsorbed and there is pyrexia, we may suspect that it has become purulent, more especially if there are in addition delirium or profuse perspiration. The fluid becomes transformed into pus much quicker in some cases than in others, but no exact time can be stated with accuracy. It remains serous in some instances for weeks together, and in others it is purulent from an early date, probably at the

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* Clinical Medicine, 1872, p. 297.

† "Out of forty-four consecutive cases of pleurisy admitted as in-patients at Great Ormond Street, twenty-seven were empyemata. Taking another series of sixteen cases, fourteen were empyemata."—*Notes on Pleuritic Effusion in Childhood*, by T. Barlow, M.D., and R. W. Parker, Brit. Med. Journ., vol. ii, 1877, p. 759.

end of a week or two. Empyema rarely springs from tubercle. Whether there be a simple serous effusion, or pus, the symptoms are very similar—there is dyspnœa, increased by lying down or walking, a sense of constriction or discomfort in the chest, and dry and frequent cough with or without expectoration. Generally the face is anxious, or pale, or dusky, the pulse quick and weak, and the pulsations of the heart readily affected in force and frequency by trifling causes.

The physical signs are the same as those met with in pleural effusion, except that there is usually more bulging of the intercostal spaces. Dr. Wilks says, that if after an inflammatory attack in the chest, whether of acute pleurisy or of pleuropneumonia, "there result localized dulness, with absence of breath-sound, and perhaps distant tubular breathing, an empyema may be safely suspected;"* but I think this testimony must be received with caution, even from so high an authority. "It has appeared to us that the aspect of the patient—a peculiar anæmia, with an earthy complexion, and, above all, clubbing of the finger ends, have been the most characteristic features, suggesting empyema, rather than serous effusion."† If the effusion is only moderate and not of sufficient standing to seriously impair the resiliency of the lung, then, as in the serous form, the dulness will vary with the position of the patient, and if he be made to lie on the unaffected side, the part of the thorax which before was dull may become resonant in consequence of the fluid gravitating to the lowest part of the pleural cavity. "When the liquid has for a long time been effused, the intercostal muscles, from having been continuously stretched, lose their contractile power, become paralyzed, flat, and then even tend to protrude. Albertini supposed, and Stokes believed, that such a state denoted pus."‡

Of all the diagnostic signs of fluid in the chest, whether serous or purulent, the dull heavy thud which percussion elicits is the most certain. Whenever fluid in any quantity is collected no resonance can be produced; this resonance extends to the limits of the

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* Local Empyema; its Diagnosis and Treatment, Brit. Med. Journ., vol. i, 1879, p. 528.

† Notes on Pleuritic Effusion in Childhood, by T. Barlow, M.D., and R. W. Parker, Brit. Med. Journ., 1877, vol. ii, p. 759.

‡ On Pleuritic Effusion, by R. Wardell, M.D., Brit. Med. Journ., 1874.

effusion, varying with the position of the trunk, unless the pleuræ have become thickened and adhesions formed between them.

It is said that patients cannot lie on the sound side, nor indeed on the other; but I have known them assume any position in bed with considerable fluid in the pleura, either serous or purulent, without any oppression in breathing. The absence of this symptom, therefore, must not be relied on as evidence that no effusion exists, and the chest in consequence overlooked.

A case of empyema came under my notice in a girl, five years of age, who was admitted into the Samaritan Hospital, March 12th, 1878, under the care of Dr. Wynn Williams. She was pale, thin, and delicate, with the fingers much clubbed. The pulse was weak and accelerated, but the temperature was normal. The respirations were twenty-eight per minute. It was stated that she had had inflammation of the chest for thirteen weeks, and that two months before admission an abscess had been opened, external and two inches below the left nipple, leaving a sinus surrounded by a large granular flabby ulcer. Matter was discharged, and it continued to drain away till her admission.

On examination the left or affected side of the chest was found to be flattened; it measured ten inches from the spine to the centre of the sternum; the right side was more rounded, and measured ten and a half inches. Below the left clavicle the flattening was very perceptible, dulness was great, and no air entered the lung. The left side of the thorax was immovable on inspiration. Through the sinus laudable pus was discharged, and for two inches around it the percussion-note was tympanitic when she turned on the right side, because the pus gravitated to the bottom of the pleural cavity, which now contained air. The respiration was exaggerated over the whole right thorax. Posteriorly the percussion-note was clear throughout the right lung. In the left suprascapular space it was very dull, and respiration was weak and bronchophonic throughout; there was diminished resonance between the spine and the scapula on the left side. No respiration could be heard in the left axillary region. The heart's sounds were normal and very distinct. The apex-beat was seen for an inch to the right side of the left nipple. There was short dry cough, but the appetite was good, and there was no sweating.

On March 22d an opening was made below the angle of the left scapula, and about an ounce of pus drained away through a piece

of india-rubber tubing. On the following evening the temperature rose to 103.4°, and the pulse to 134. On the 23d the temperature fell to 101.0°, and two days later it did not exceed the normal point. On the 31st an ounce of pus was drawn off through the anterior opening, and a weak solution of iodine injected without raising the temperature. The child left the hospital after a stay of nearly three months, with the sinus still discharging.

The patient again presented herself at the hospital (August 4th, 1879) on her return from the Isle of Wight, where she had been staying for two months. In December, 1878, an abscess which had been forming gradually at the centre of the sternum and to the left of the median line burst, and had been discharging a quantity of thick yellow pus ever since. The two openings previously alluded to healed in February, 1879. The contour of the thorax was much changed in its appearance, particularly laterally and posteriorly. The spine was much curved, chiefly in the dorsal region between the scapulæ, the convexity being towards the right side. On the left side the collapse of the lung and the copious discharge of pus from time to time had caused the ribs to fall inwards, and to diminish the capacity of the thorax, so that the infra-axillary region was concave, and the ribs behind drawn in below the left scapula, the angle of which was tilted upwards. The measurements of the two sides of the thorax present a remarkable contrast:

	Right side.	Left side.
Line of nipple from centre of sternum to spine, .	12½ inches.	8½ inches.
Line of ensiform cartilage, ...	12 "	9 "
Line of axilla, ...	11½ "	9 "

Below the left clavicle the note was dull, but some air could be heard to enter it; posteriorly there was resonance throughout the left lung, and respiration was slowly being re-established. Over the old cicatrices air could not be heard to enter from adhesions which had formed there. Throughout the right lung, both in front and behind, the note was hyper-resonant and the respiration puerile. The heart was thrown over to the right side, and its apex felt beating to the right of the ensiform cartilage. There was a distinct apex bruit, which was probably due to displacement and pressure, and also to relaxation of the cavities. The murmur was heard in the back. As the pulse was quiet and the temperature normal, and there was neither cough nor sweating, we may

reasonably hope that the last abscess will contract like the two former ones, and the patient eventually recover her health.

When the acute symptoms are of shorter duration the wound may heal quickly. A little girl, aged ten, was admitted into the London Hospital, with signs of effusion in the right pleura, pointing beneath the nipple, and cardiac displacement to the left. Although the chest was aspirated from behind, and six ounces of pus removed, the skin gave way below the nipple three weeks after admission, and discharged freely. The wound healed completely in two months, and the right chest had fallen in.* We must not, however, overlook the fact that a fistulous orifice in the pleura may remain open for years, and finally contract and heal up. A girl on whom Mr. Berkeley Hill operated for empyema, wore a silver tube "from her eighth to her thirteenth year, during which period she had scarlet fever."† The cure was perfect, leaving very little contraction over the affected side.

An empyema when left to itself may dry up and disappear by absorption. In rare instances the pus may find its way through the diaphragm into the abdominal cavity and set up peritonitis, or it may perforate the lung-tissue and be discharged through the bronchus, even after paracentesis, and the child then recover.‡ A case is recorded in which an empyema in a girl, ten years of age, burst into the œsophagus.§

Paracentesis.—The operation, if indicated, should be delayed till the pyrexia has passed away and the patient is in a quiescent state. But the fact of an elevation of two or three degrees of temperature, fever being present, ought not to stand in the way of an operation, if the fluid is in such quantity as to have resisted absorption, or if it is purulent.‖ In either case the temperature generally falls when the fluid is drawn off, and the patient breathes

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* Report of the Medical Registrar for 1876, p. 77.

† Op. cit., p. 88.

‡ Brit. Med. Journ., vol. i, 1880, p. 850.

§ Steiner's Diseases of Children, 1874, p. 170.

‖ Dr. Sidney Ringer has recorded some cases of pleuritic effusion in young children in which paracentesis was performed with immense relief, and with very little disturbance to the general health. Dr. Ringer says his cases show that the operation may be performed during the febrile and non-febrile period of the disease, that the fluid may be withdrawn by the aspirator during the fever, without any reaccumulation; that in some cases of febrile and non-febrile empyema, a part of the pus may be withdrawn by the aspirator, and the rest disappear. They further show that in severe empyema the temperature may be normal, or nearly so. (Practitioner, 1873, vol. ii, p. 408.)

more easily, and is in all respects better. The indications which appear to justify thoracentesis are failure in the process of absorption, so that the fluid remains compressing the lung, and causing urgent dyspnœa, irregular pulse, and feebleness of the heart's action; or when the fluid becomes fetid, and produces such constitutional disturbance that the patient is in danger of dying from hectic fever and septic poisoning.

A case of pleuritic effusion, probably unique from the tender age of the patient and the operation of paracentesis, is recorded by Dr. Cayley, where a well-grown male infant, fed at the breast, suffered from cough and difficulty of breathing of one week's duration before any relief was sought. When seen by Dr. Cayley (Oct. 22d, 1878) there was extreme dyspnœa and rapid respirations, tossing of the arms about, and throwing back of the head. "There was a frequent short abortive cough." The whole of the left lung was dull on percussion, and there was an absence of breath-sounds. The heart's apex beat to the right of the sternum. Paracentesis was performed below the angle of the scapula by means of a trocar and canula, and "eight ounces of turbid serum were drawn off by a bell-jar aspirator." A fortnight after the operation there was still cough, but the child appeared well. There was impaired resonance at the left base, and the breathing was tubular,—symptoms not unlike a refilling of the pleural cavity.*

After paracentesis, when serum only is evacuated, any fluid that remains behind may become purulent and the patient may die. As long as the fluid is simply serum every chance should be given to the persevering use of blisters, iodine, and other local remedies; but when it is purulent, which can only be positively ascertained by passing a grooved needle, or still better, a hypodermic syringe, through an intercostal space, the sooner it is got rid of the better. It is nothing more nor less than an abscess, and must be dealt with accordingly. When pus is drawn off by tapping, recovery is invariably slow, because the extensive area of the pleural membrane is in a state of chronic inflammation, and the lung may be bound down through thickening and the formation of false membrane.

The operation having been decided upon, an anæsthetic should be administered, in order to keep the patient quiet and to abolish pain. I have administered the bichloride of methylene in several

* "Pleurisy with Effusion in an Infant four months old, Paracentesis, Recovery."—*Lancet*, vol. ii, 1878, p. 807.

cases, without inducing the slightest danger, the pulse often improving under its administration. Every child should be anæsthetized whose chest requires tapping. The danger arising from it is practically *nil* if carefully administered, and infinitely less than would follow the tedious and painful operation of puncturing the chest-wall during consciousness, at a time when the child is already weakened and terrified. Antiseptic precautions are to be adopted.

If the effusion be on the left side it is customary to make an opening in the fifth intercostal space, if on the right side in the fourth intercostal space, midway between the spine and the sternum (infra-axillary region), then to introduce a probe and to pass it downwards to the lower part of the pleural cavity above the diaphragm. The point having been felt beneath the skin an opening is made upon it, and a drainage-tube is pulled through, and the two ends united. Simple tapping may be had recourse to if the effusion is serous, and the operation may be repeated from time to time, so as to give the cavity a chance of contracting, and the lung of expanding. This has happened in some cases. But if the collection be purulent a permanent drainage must be established.

Another plan, recommended by Mr. Howard Marsh, is to procure a No. 3 catheter, and by means of a silver wire to push "from the eye to the handle end" a strong silk ligature, hanging out at either end. The catheter is introduced through the upper opening, and its point is directed to an intercostal space at the lowest part of the pleural cavity. An incision is made upon it, the silk seized and held firmly while the catheter is drawn out of it as it was introduced, and a drainage-tube being attached to the silk it is drawn through the two openings.*

When the fluid drawn off by the aspirator or hypodermic syringe is purulent, and there is accumulation from time to time, a permanent orifice should be maintained by means of a double opening, one anteriorly, and the other below the angle of the scapula, through which a piece of drainage-tube is passed, and secured at both ends in the manner previously described.

During the operation the admission of air into the pleural sac should be carefutly guarded against lest it produce suppuration in the sac, "still there is a considerable body of evidence to show

* The Surgical Treatment of Empyema, Brit. Med. Journ., 1877, vol. ii, p. 887.

that the admission of air to the cavity of the thorax, when serous effusion exists, does not *necessarily* induce purulence. I may, however, remark that such an accident should be regarded as dangerous; but it is a danger not always easy to avoid, and it should be taken seriously into account among the risks of the operation."* Dr. Markham Skerritt prefers the use of an aspirator, as air is thus kept out of the pleural cavity.† The best form of aspirator is that in which a special receiver is dispensed with, the tube of the aspirator being set in a plug of vulcanite india-rubber; this can then be fitted into the neck of any ordinary bottle. This convenient modification of the aspirator was introduced by Professor Wood. But whatever instrument we employ, it is certain that Lister's antiseptic method properly carried out renders the admission of air comparatively harmless. Mr. Berkeley Hill says, "You need not aspirate at all in most cases; the pressure within the chest will drive out the fluid fast enough, though the syringe is useful to force back a clot, or shred of lymph, if such block the tube."‡

The physical and general symptoms which justify the operation of paracentesis may be thus classified.

1. When the effusion has become chronic, the pyrexia has subsided, and the health is perceptibly declining. Under these circumstances death may take place from suffocation or syncope.

2. When the effusion is so large that the lung is compressed and incapable of expanding. This can usually be ascertained by dulness on percussion and the absence of respiration, by obliteration or bulging of the intercostal spaces, and occasional increase in the dimensions of the side.

3. When the heart is displaced by effusion, or the liver and spleen pushed downwards, and there is irregularity of the pulse and dyspnœa.

4. When the effusion remains copious after the assiduous employment of constitutional and local remedies, and especially if pus follow the introduction of a grooved needle into the pleural cavity.

5. The longer the fluid is allowed to remain in the pleural cavity the more likely is it to undergo pathological changes and to resist absorption.

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* On the Mortality of Pleurisy, considered in relation to the Operation of Paracentesis Thoracis, by Dr. Wilson Fox, Brit. Med. Journ., 1877, p. 725.

† Treatment of Pleuritic Effusion, Brit. Med. Journ., 1879, vol. ii, p. 54.

‡ Op. cit., p. 88.

6. Fluid may be drawn off as it forms from time to time, lest adhesions ensue, and the lung never completely re-expand. "Contrary to what was once alleged, repeated puncture is more likely to prevent the conversion of serum into pus than to hasten it."* The partial evacuation of an empyema may be followed by the drying up of the rest.

7. When the functions of one lung are impaired by the mechanical pressure of the fluid and there is bronchitis or pneumonia in the other.

8. A certain degree of fever does not contraindicate the operation, nor does it necessarily increase the local changes. After tapping, the fever generally falls; and even if hectic fever is present, the free escape of pus through a good-sized opening in the most dependent part of the chest-wall will sometimes arrest it entirely.

With regard to injections of iodine into the pleural sac, I have known considerable fever and pain follow their use in the most diluted form. When there is a copious secretion of offensive pus keeping up the febrile state, a weak solution of carbolic acid, introduced through a flexible catheter, appears to be highly advantageous. Dr. D. M. Williams washed out the pleural cavity for thirty-one days with a weak solution of sulphurous acid, and a good result followed †

In long-standing cases of empyema the chest may be contracted and the ribs approximate, so as to produce great deformity, and yet the pleural cavity may be full of fluid, and the diaphragm be pressed downwards.

Empyema may exist with pneumothorax, air having found its way into the cavity of the chest through the pleura lining the lung, or the interior of the chest. A singular case is recorded by Dr. Cheadle, in which a boy, ten years of age, who was admitted into the Hospital for Sick Children, April 18th, 1877, had effusion in the right pleura with displacement of the heart's apex. The temperature oscillated between 99.5° and 102°. Between the time of his admission and the August following he was tapped four times. On the last occasion twenty-six ounces of thick pus were removed. There were fever and sweating, soon followed by phlebitis in the right leg, and slight albuminuria. In September a counter-opening was made in the chest, a drainage-tube in-

* Berkeley Hill, op. cit., p. 88.

† Practitioner, 1878, p. 125.

serted, and the cavity of the pleura syringed out with carbolic acid lotion. Three days before death the respirations became rapid, face blue, cardiac resonance, and amphoric breathing over the left nipple. "At the post-mortem examination the right lung was found completely collapsed, while the pleural cavity was full of air. A hole, capable of admitting the little finger, and lined with lymph, passed through into the pericardium, forming a free communication between it and the pleural cavity. The heart was uncovered by lung, and came up close to the chest-wall; the pericardium was thickened and lined throughout with a thick layer of lymph, as was also the heart, but there were no adhesions. It appeared certain that a condition of pneumo-pericardium existed. There was no sign of tubercle."*

CHAPTER XXXVIII.

PNEUMONIA.

DIVIDED IN THREE STAGES AS IN ADULTS: 1. *Stage of engorgement—Congestion or splenization—2. Red hepatization—3. Gray or yellow hepatization—Pathological condition of the different stages, similar to those in adult life.* VARIETIES OF PNEUMONIA: *May be divided in children into three—1. Acute pneumonia (lobar or croupous pneumonia) general and local signs of pneumonia, the same disease as in adults, and presents similar morbid appearances—Sometimes complicated with pleurisy—State of the blood in.* SYMPTOMS: *General and physical in the different stages—Local pain—Temperature—Pungent heat of skin—Cough—Dyspnœa—Abdominal respiration—Pulse and respiration.* CAUSES: *Predisposing and exciting—Previous state of health, cold, catarrh, and bronchitis—Eruptive fevers—Heart and renal disease.* PATHOLOGY OF CROUPOUS PNEUMONIA: *Terminations—Usually in resolution, or may end in phthisis or chronic pneumonia.* PROGNOSIS: *Doubtful in tubercular cases, or where there is heart or renal disease.* DIAGNOSIS: *From bronchitis—Tubercular phthisis—Bronchopneumonia—Œdema of the lungs—Typhoid fever—Meningitis.* TREATMENT OF ACUTE PNEUMONIA: *Venesection not to be discarded in some cases—Local bleeding by leeches—Tartarated antimony—Calomel and aconite—Nitrate of potash—Action of hydrate of chloral and the dangers attending its employment—Use of bromide of potassium—Poultices and their mode of action—Turpentine stupes—Importance of stimulants if the child is feeble or delirious from exhaustion, and there is no vascular excitement—Treatment of the second and third stages—2. Catarrhal pneumonia (lobular—bronchopneumonia)—Relation to bronchitis and the period of dentition—Common in bronchitis and whooping-cough—Symptoms—Pathology, Diagnosis, and Treatment—3. Chronic lobular pneumonia—Nature and causes—Diagnosis from tubercle in the lung—Cases in illustration—Treatment—Œdema of the lungs—Causes and treatment.*

PNEUMONIA is a disease about which so much has been observed and written that it would be strange if its nature and treatment

* Brit. Med. Journ., 1877, vol. ii, p. 387.

were not better understood now than formerly. The most complete attention has been directed to it, and the physical and general symptoms attending its various stages have been carefully studied by physicians and pathologists. If the disease in consequence of this advancement has lessened in mortality among adults, it must still be viewed as a serious one in children. Genuine pneumonia in early life is a formidable and fatal affection (even when it is uncomplicated by renal or cardiac disease); the urgent dyspnœa, and embarrassed pulmonary circulation, are soon followed by coma and death if both lungs are affected, or even if one is rendered nearly useless as a breathing organ.

Pneumonia in children is divided into three stages of inflammation, as in adults, and the same pathological appearances accompany each stage of them. 1. The stage of *engorgement*. 2. The stage of *red hepatization*. 3. The stage of *gray hepatization*.

In the *stage of engorgement* the lung is of a reddish brick-color approaching to brown, or it is mottled or livid. It is less elastic, heavier, and softer, and this diminution in its consistence has earned the name of *splenization*, because it is easily torn like the spleen itself. Some portions of the lung float in water, and others sink from the small amount of air in them, and when a section is made there exudes a frothy and viscid bloody serum containing air.

In the stage of *red hepatization* the lung has lost all crepitation, and the weight is increased. It is more solid and distended from the amount of fibrinous exudation, and the marks of the ribs are sometimes observed where the lung has been pressed against them. The external aspect presents a deep red color, and on section the surface is either marbly or of a grayish opaque hue. The granular appearance is the characteristic feature of this stage. Sometimes the cut surface is like a piece of liver. It is produced by the effusion of coagulable lymph into the air-vesicles, and is not so commonly observed in children as in adults, or when the exudation is softer and thinner. Scarcely any fluid escapes except on pressure, which is thick, scanty, reddish, and non-aerated. The lung instantly sinks in water.

In the third stage, that of *gray* or *yellow hepatization*, the color of the lung is paler, of a greenish-yellow, or of a light-gray slate, and, as in the previous stage, it is dense and impermeable to air. The air-vesicles are distended with inflammatory exudation, and

the lung sinks in water. It is also soft and pulpy, and breaks down under pressure of the finger.* On section, a gray-yellowish fluid (approaching the consistence and appearance of pus) escapes in considerable quantity, and in bad cases the whole lung becomes infiltrated with purulent matter, which, if the case terminates successfully, is either absorbed or expectorated. This stage very rarely ends in abscess and gangrene.

"In some cases of pneumonic inflammation there is no reddening of the mucous membrane of the finest bronchial tubes—no post-mortem appearance to show that there has been anything more than a simple uncomplicated inflammation of the air-sacs; whilst in other cases an increased vascularity of the bronchial membrane indicates the concurrent existence of bronchitic inflammation."†

Symptoms.—Pneumonia in its first stage sets in with rigors and shivering, high inflammatory fever, pungent heat of skin, flushed face, headache, furred tongue, scanty and high-colored urine, prostration of the strength, quick pulse, thirst, loss of appetite, deep-seated pain in the chest, or in one side when the pleura is primarily involved, and a short dry cough. The mode of invasion, however, differs, as we shall presently see. In a day or two the cough is looser, and some adhesive mucus is expectorated of a rusty or varnish color, though in children of eight or ten years of age there may not be the vestige of expectoration. After this the symptoms subside, the expectoration, if any, becomes mucopurulent, and in the course of ten or fourteen days the patient is convalescent. In other cases the symptoms are more unfavorable; on the third or fourth day the respiration increases in frequency, and if there are sputa they are streaked with blood, the pulse is frequent and feeble, the tongue dry or brown, and delirium or coma comes on, with the attendant symptoms spoken of as typhoid. The last stage is announced by fluttering of the pulse, accelerated respiration, and a sweating clammy skin. There is somnolence and stupor, and the child is as heavy and indifferent as though he

* "The gray color, indeed, which the lung presents is due mainly to the natural pigment which it contains, and thus it happens that a hepatized lung is much darker in aged persons, where more natural pigment exists, than in children, where pigment is almost deficient; thus it is that the hepatized lung of children is white, or yellowish-white." (Wilks and Moxon), Pathological Anatomy, 1875, p. 325.

† Diseases of the Chest, by Dr. Waters, 1873, p. 27.

was laboring under a narcotic poison. As the fatal issue approaches, the cheeks become pale, and the lips and extremities of the fingers dusky, whilst the temperature falls, and the pulse is gradually extinguished. The *local signs* are indicated by fine crepitation, replacing the vesicular murmur in the inferior portion of the lung, with dulness on percussion, bronchial breathing, and increased vocal resonance. There is puerile respiration in the healthy lung. Dulness on percussion and minute crepitation are the most characteristic signs. If the case pursues a favorable course, the bronchophony and bronchial breathing diminish, or disappear, and large mucous crepitation, or subcrepitant rhonchus takes their place. If the inflammation subsides, the crepitation is gradually succeeded by the healthy vesicular murmur, and the lung again after an indefinite time becomes resonant on percussion. When resolution does not ensue, the bronchophony and dulness increase, and vocal fremitus is absent. But if one lung becomes so consolidated that no air can enter it, there is an absence of tracheal breathing and bronchophony. If the hepatized lung suppurate, and matter is discharged, amphoric breathing and pectoriloquy, as in a phthisical cavity, are to be expected and watched for.

Pneumonia does not follow the same course in all cases; in some delicate and badly-nourished children, one or more abscesses may form, which discharge themselves into the bronchi or pleura, or the fluid parts being absorbed they undergo calcareous change and dry up, surrounded by a firm tight membrane. In other cases the fibrinous effusion undergoes contraction and shrinking, and leads to the condition known as cirrhosis of the lung, or "fibroid phthisis."*

We may now consider the different forms and peculiarities of pneumonia to which the lung is liable, and these are the following:

Acute pneumonia (*lobar, or ordinary pneumonia—croupous pneumonia*) presents the anatomical appearances just described. It generally attacks the lower lobe of one lung (*basic pneumonia*) in adults, but in children it may occur in the middle lobe also, and not unfrequently the apex is the only part seized upon, the rest of the lung remaining free. The apex is prone to suffer in quite young children. When this is the case we may hastily attribute

* See Fibroid Phthisis, in Chapter XL, On Phthisis Pulmonalis or Pulmonary Consumption.

the condition to tubercular deposit, though this form of pneumonia would not necessarily seem to be more fatal in this part than in the inferior portion of the lungs. Still we are always anxious when the apex is the chosen seat, for it must be considered a sign of delicate health or cachexia. More or less of bronchitis is usually present in these cases, pleurisy is very common, and there may be some effusion into the pleural sac. When pneumonia is at all severe, the right cavities of the heart are distended, and the heart may be seen beating at the epigastrium; the venous system is full, giving rise to capillary congestion and enlargement of the jugular veins. The blood abounds in fibrin, and the "buffy" coat is present.

Symptoms.—These are not the same in all cases. In some the complaint sets in slowly, with slight bronchitis or catarrh for a few days before the lung exhibits dulness and the usual signs of pneumonia. In other cases the disease commences more suddenly with rigors or convulsions, or there is headache, vomiting, pain in the chest, and a dry hacking cough. Thirst and loss of appetite are usually present, the tongue is covered with a creamy fur, through which the enlarged papillæ project, and there is constipation. In most instances there is pain in the side, or about the mammary region, extending downwards, which may lead an inexperienced observer to think the pain is abdominal. When the pain takes this course there is generally some pleurisy present. It is piercing or stabbing, causing the child to cry out if the part is touched, or if there is coughing. The face is anxious and flushed, the nostrils are active at each inspiration, which is short and catching, and the little patient sinks low down in the bed. The skin is usually acrid and pungently hot, but it may be perspiring at an early period of the complaint, with no amelioration to the other symptoms, the respiration being equally hurried, and the general distress quite as great. The temperature varies from 103° to 104°, or even more, the latter being a common elevation in children, and when it does not exceed this recovery is the rule, but it should be borne in mind that in cases of free cutaneous action it may never rise high, and yet the disease be extremely severe and dangerous. The significance of the temperature must be estimated by comparison of the physical signs. In one case which came under my notice, however, with a temperature of 105°, the child had severe lung mischief, but recovered notwith-

standing. It is seldom that the temperature exceeds this except in tubercular pneumonia. One or both cheeks are often flushed, or there is a livid dusky patch on them, and the expression is anxious or heavy, and has a yellow or earthy cast. Stupor and indifference are striking symptoms, as the complaint steals on, and the cough is choking and subdued, instead of tearing and painful.

The pulse varies in frequency from 120 to 140. In mild cases it may not exceed 100, even if the evening temperature runs up to 103°, and the respirations are not more than 28 to 30, but in severe cases the pulse will reach 160, or even exceed this, and the respirations be as frequent as 70 or 80 per minute, particularly where both lungs are involved. The pulse is strong and full in sthenic cases at the beginning, but as the disease advances it becomes weak, small, and running; in other cases it is irregularly intermittent.

Nothing can usually be gathered from the appearance of the sputa, as at first they are scanty, afterwards they are swallowed, unless the child should vomit, when some rusty or sanguineous frothy liquid may be wiped from the mouth, but the symptoms are liable to considerable deviation both as regards the local and general signs.*

If the child is young enough to be nourished at the breast, he repeatedly lets the nipple fall from his mouth, because, with a closed mouth, the nostrils do not admit a sufficient quantity of air to the lungs. When the constitutional symptoms have reached the point already described, the lung will give evidence of some change. If examined at the earliest period the respiration may be little altered, but in nearly all the cases I have seen, when the general symptoms have attained any importance, some dulness will be detected over the lung, and there will be heard on auscultation both rhonchus and sibilus. At the lower lobe of the lung,

* Dr. Squire states that acute (lobar, or croupous) pneumonia is not uncommon in childhood. He quotes the experience of Stenitz, of Breslau, with 84 cases, and of Ziemssen, of Berlin, who gives 186 cases of pneumonia, specifically stated not to be catarrhal, of which 117 occurred in the first six years of age, and 69 in the next ten years. Four consecutive cases given by Dr. Squire "commenced suddenly with higher temperature and greater disturbance of respiration and circulation than other acute diseases of childhood." An elevated temperature for five or eight days suddenly subsiding marks these cases. On Infantile Pneumonia, read before the British Medical Association at Manchester, August, 1877.

fine crepitant rhonchus is heard at the end of inspiration, and bronchial or tubular breathing above of a shrill metallic character from commencing consolidation. The voice or cry reaches the ear distinctly from the thin state of the chest-walls. When the sounds just mentioned have taken place, the movements of the thorax on the affected side are restricted, and at each inspiration the intercostal muscles are drawn in, leaving the spaces depressed. If these physical signs continue (which are commonly heard about the third or fourth day), the small crepitation is exchanged for a coarser kind, or that known as subcrepitant rhonchus, the fluid now being more copious in the air-vesicles, which are dilated and enfeebled. The true crepitation of this form of pneumonia is very brief in children, and is soon exchanged for the coarser variety. As the disease advances to recovery, the dulness on percussion diminishes, and the crepitation becomes moist and bubbling, whilst the respiration is softer and less frequent. There is in this respect a great difference in cases, the dulness being slow to pass away in some instances, even if it does not become chronic, and the breath-sounds remaining feeble, harsh, or moist for a great length of time—in fact a coarse crepitation may remain after many weeks, in defiance of every constitutional and local measure.

Pneumonia sometimes commences with severe vomiting, and feverishness ensues at the end of two or three days, with pain in the side, cough, headache, and restless sleep, followed by wandering, or even delirium at night; the skin is hot and pungent, and the urine high-colored, with deposit of pink lithates; it may contain a little albumen from congestion of the kidneys, and there is a deficiency of chlorides. Such a case came under my notice in November, 1876, in a lad, fourteen years of age. On listening to the chest the lung was dull throughout posteriorly, very diminished breath-sounds at base, with crepitant rhonchus, but with bronchial breathing and bronchophony above, and in the lateral region of the affected side there was loose moist crepitation as high up as the axilla. The patient lay on his back (which is the usual position in this disease), the pulse was 100, fairly soft and compressible, respirations 28, temperature 103°. On the following day (fourth of disease) the pulse and respiration were the same, but the temperature had fallen to 100°. There was a slight cough, and expectoration of a varnish tinge. Ten days later (when I next saw him) he was sitting up, looking well, except pale. On examina-

tion the only evidence of the lung attack was a little dulness of the lower lobe, and deficient breath-sounds. The lung had almost entirely returned to its natural condition, and the lateral region presented no moist sounds whatever; the pulse was 80, respirations 20, temperature normal. The case was a mild one, and came early under treatment.

Other cases of pneumonia begin with delirium in young subjects, and the symptoms are so obscure that diagnosis is difficult for a day or two;* there is stupor, convulsions, or coma, and the tongue is brown with sordes, so that we are uncertain whether the condition is not one of typhoid fever. In adults we may often meet with this, but in children it is not so common, and if the pyrexia is moderate, and the bowels quiet, we are tolerably certain of the true state of things. When the delirium is fierce and continuous, and there is much headache, the symptoms at an

* The nervous symptoms attending *apex pneumonia* (cerebral pneumonia) in young children are well exemplified in the three following cases. In the first case, a child, five years old, was well on June 12th, and came home tired from school. In the evening she was convulsed and lost her senses; the following day there was diarrhœa, thirst, slight cough, rapid respiration, and delirium. On the 18th, when admitted into the Children's Hospital, under Dr. Gee, the temperature was 105.2°; pulse 160; respirations 60; there was dulness over the right front as far as the nipple-level, bronchial voice and respiration; fine râles on inspiration. The temperature fell on the 19th to 100.2°, and on the 20th to 98°. Recovered July 5th. In a second case, a male child, three and a half years old, was in good health on July 9th before 5 P.M., when he came indoors, complained of his head, and tossed about. In the evening he vomited. On the 10th he was drowsy, and could not sit up. On the 13th, when admitted into the Children's Hospital, under Dr. Cheadle, he was irritable and prostrate; temperature 104.2°; pulse 160; respirations 52; skin hot; tongue red, and coated with a white fur; right front of thorax dull as low as nipple, and upper half of axilla; respiration weak and bronchial. On the 16th he was screaming, delirious, and constantly trying to get out of bed; temperature 104°. On the 18th there was less delirium, but constant cough. On the 20th temperature 101°; fine crepitation over upper half of right front of chest to nipple. 23d, temperature 98.4°. July 17th went home. In a third case, a boy aged ten years, admitted into University College Hospital, under Dr. Ringer. His mother died of consumption, and he had had a cough the previous winter. Was suddenly taken ill on August 11th, and complained of pain in head, neck, and chest. On admission (four days later) right front of chest dull at apex; increased vocal resonance and fremitus; bronchial respiration. Left back hyper-resonant. Temperature 102.2°; pulse 133; respirations 48, tongue covered with a yellow fur, red at tip and edges; constipation. On the 17th there was vomiting; temperature 98.4°. On the 22d there was scarcely any difference on the two sides of the chest. Feels well. Secondary pyrexia followed after the physical signs had cleared up, which was considered due to the absorption of inflammatory products, or allied to septicæmia, as there were no signs of tuberculosis. On the 13th of September he was discharged.—Cases of Apex Pneumonia, Medical Times and Gazette, October 6th, 1877, p. 386.

early period of the illness are not unlike approaching meningitis. In those cases of meningitis complicated with pneumonia, broncho-pneumonia, pericarditis, etc., great difficulties often present themselves in arriving at a correct diagnosis till the characters of one or the other disease predominate.

Causes.—These are predisposing and exciting. Among the former are the previous state of health, and the liability to pulmonary disease. Among the latter are exposure to cold in winter and spring, particularly after measles and the eruptive fevers, debility, privation, violent exercise, congestion from heart or kidney disease, or from tubercular deposit in the lung. The exciting causes, too, are exposure to cold when the body is heated, croupous exudation in the lung, and the deposit of diphtheria. Injury to the chest, or a blow setting up abscess in the walls of the chest, is another ascertained cause.

Pathology.—The epithelial lining is unaltered in croupous pneumonia. The exudation filling the alveoli consists of fibrin and leucocytes, or "exudation cells," which readily undergo fatty degeneration; they are partly thrown off in the sputa, or disappear by absorption, which is quite different to what happens in catarrhal pneumonia. In the first affection the whole lung, or one lobe, is consolidated, whilst in the last-named variety isolated patches (lobules) are affected, surrounded by pulmonary tissue permeable to air.

Terminations.—Pneumonia generally ends in resolution in healthy subjects. A crisis takes place in the form of sweating or diarrhœa, or there is an abundant urinary discharge, and forthwith all the symptoms speedily decline. This may be usually looked for at the end of a week, when the pulse and respiration become reduced in frequency, but the crisis may not occur for another five or six days, leaving the child prostrate, thin, and pale. In other cases, when convalescence appears to be approaching, a relapse takes place, and the child may die of asphyxia or convulsions from a clot of fibrin blocking up the pulmonary artery and obstructing the circulation through the lungs; or it drags on, and at last perishes from exhaustion. In another class of cases the exudation thrown out is never absorbed, but it provokes fever and cough, and ultimately leads to phthisis or chronic pneumonia, which is slowly recovered from if the general health can be maintained and proper treatment is employed.

Prognosis.—From the liability of young subjects to tubercular disease, pneumonia is full of peril to the weak and delicate, particularly if the pleura or pericardium has been involved, or there is renal or heart disease. If both lungs are affected, and there is copious secretion (especially if dark or prune-juice in color), the respiration increases in urgency, and collapse is to be apprehended. In such cases profuse perspiration breaks out, low muttering delirium sets in, and the child gradually sinks.

The *diagnosis* of croupous pneumonia is to be sought in the tubular breathing, fine crepitation, dulness on percussion, elevated temperature, and rapid respiration. Change from the normal ratio between frequency of pulse and frequency of respiration is very marked is this disorder. In any febrile disturbance in young children the temperature is apt to run rapidly high, even in dentition, but then it is of very brief duration compared to pneumonia, and in bronchitis it is not usually so high, though I have known it reach 105° when the disease has been limited to the bronchi alone, and the pulmonary tissue has escaped. The rhonchi of pneumonia are more sonorous and scanty, and the moist crepitation is not so loose and bubbling as in bronchitis. When acute lobar pneumonia attacks the upper lobe of a lung, it is liable to be mistaken for phthisis. The exudation poured out in these cases, and the dulness and tubular breathing, are just the signs which ensue from tubercular deposit. The local indications are often trifling, however, compared to the febrile disturbance and prostration, and time alone may be capable of clearing up the diagnosis. In the case of simple inflammation the local and general symptoms soon pass off, whilst in tubercular cases they gradually become worse, or merge into the chronic form, when the diagnosis is all the more difficult, if not impossible. Physical signs cannot clear up the difficulty, for both in pneumonia and apex consolidation from tubercle there is great dulness, bronchophony, and bronchial respiration, to indicate that the lung-tissue at this part is consolidated. Miliary tubercle may give rise to no signs whatever, and the disease usually creeps on but slowly, with fever and emaciation, cough, and loss of appetite. Tubercle may be present in some other parts of the body, and there may be a history of it in the family. The diagnosis from pleurisy is given in the chapter devoted to that subject.

The symptoms of *lobar pneumonia* differ from those of *lobular*

or *catarrhal pneumonia* in the greater dyspnœa of the latter affection, the duskiness of the lips, and the pallid and bloated countenance. There is more restlessness and anxiety, the cough is loose and choking, and mucopurulent phlegm is often dislodged from the air-passages by a paroxysm of suffocative cough or vomiting. When the child is too young or feeble to expectorate, the sounds over the affected tubes are loose and extensive. The symptoms in this variety come on earlier, and the vital prostration is more marked.

Pneumonia may be distinguished from œdema of the lungs by the dulness on percussion and the tubular breathing, whilst in the latter affection the sputa are frothy and thin, and the complaint occurs as the consequence of long-continued congestion from heart or kidney disease. The onset of pneumonia may be mistaken for typhoid fever, and even meningitis, but these have been alluded to in another place.*

Treatment of Lobar Pneumonia.—In the acute congestive stage, if the child is strong enough, and there is much pain in the side, the application of a few leeches, or even venesection, is not to be neglected. But it is of the greatest importance to be very cautious in the selection of cases for this heroic treatment; these will almost invariably be found in country practice, and seldom in large towns and cities. No doubt children have been so saved when all other remedies have failed,† and the plan is always one to be held

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* See Chap. VIII, On Typhoid Fever, and Chap. XLII, On Diseases of the Brain.

† "In a healthy child of four years old a vein may be opened in the arm, and four ounces of blood may be allowed to flow, provided that faintness be not earlier produced, without there being any reason for us to apprehend that the plan we are adopting is too energetic. It often happens that the child faints before this quantity of blood has been drawn, while in other cases not above one or two ounces can be obtained; still, whenever the patient is seen at the commencement of the attack, general depletion is desirable, even though it should be necessary to follow it up by local bleeding; for the immediate effect which it produces is greater than that which follows depletion, and the quantity of blood abstracted by it is definite; while, if both the nurse and the medical attendant understand how to manage children, it may be conducted so as to cause them but little excitement or alarm. If but very little blood can be drawn from the arm, or if, as is not seldom the case with infants under two years of age, it be not possible to find a vein, depletion must be accomplished by means of leeches, which, for reasons already stated, it is desirable to apply beneath the scapula. How great soever may have been the relief which followed the first bleeding, it is not always permanent, and hence the child should be seen again in from six to eight hours; and if the symptoms appear to be returning with anything of the former severity, depletion must be

in mind, as it frequently saves the lung from organic change and preserves life. Every case, however, must be treated on its own merits, and if suitable diet and rest are observed the patient may be left to nature in many cases. Two or three leeches to the side in sthenic cases have relieved pain and rapid breathing, causing the blood to circulate more freely through the lungs, controlling the temperature, and lessening the violence of the heart's action. This treatment should be resorted to early in the disease.

Tartarated antimony is a most useful drug, and in strong children it may be given advantageously for a short time in small doses, as gr. $\frac{1}{12}$th to $\frac{1}{6}$th, with the solution of acetate of ammonia, or the dilute hydrocyanic acid (Form. 60). The antimony acts best when it does not provoke vomiting, but simply determines to the skin and lowers vascular action. Valuable as antimony undoubtedly is, it must be used with great caution, and watched very carefully, for in young children it soon causes depression and faintness, and if the occurrence of these symptoms is not guarded against, the local signs increase instead of improving. This again, like bleeding, is only suitable for strong children in the early stage of the disease, and not for those who have been reared in the contaminated atmosphere of large towns. A few drops of antimonial wine, with citrate of potash and the solution of acetate of ammonia or spirit of nitrous ether, will keep up a gentle action of the skin and bring relief. Emetics are not indicated in this form of pneumonia.

With the tendency to exudation of lymph mercury may be employed, but more sparingly in this than in some other parenchymatous inflammations. When the constitution will bear it, its action as an antiphlogistic may shorten the stage of exudation, and promote and hasten the absorption of the newly effused lymph

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repeated, though then local bloodletting is to be preferred to venesection, even in cases in which bleeding from the arm had been resorted to in the first instance. It must never be forgotten that in the child, as well as in the adult, no subsequent care can make up for the inefficient treatment of the early stage of pneumonia; if the first twenty-four hours be allowed to pass while you are employing inadequate remedies, the lung, which at first was merely congested, will have become solid, and recovery, if it takes place eventually, will be tardy, and perhaps imperfect. On the other hand, cases that set in with the greatest severity sometimes appear to be at once cut short by free depletion; the violent symptoms being arrested, and recovery going on uninterruptedly, almost without the employment of any other remedy."—West, *Diseases of Infancy and Childhood*, 1859, 4th edition, p. 321.

before it has had time to become organized, and to act as an irritant to the surrounding healthy textures. Small doses of calomel with a few grains of James's powder may be sometimes given with advantage (Form. 62). Minim doses of tincture of aconite are also useful from their power in promoting diaphoresis. The antiphlogistic effects of aconite are very marked in relieving tension in the pulse, and lowering arterial pressure, but this drug tends to reduce the respiratory movements as well as the temperature, and acts as a sedative on the cardiac circulation. I have never observed any bad effects follow its administration in acute pyrexia in small and repeated doses, but great benefit where the vascular excitement has been considerable, and the skin pungently hot.*

When the physical signs announce that the lung is freely secreting, and sthenic action is reduced, a grain or two of the carbonate of ammonia may be given, particularly if the pulse is weak or unsteady, and there are signs of collapse, when it may be safely combined with decoction of oak bark, or senega. Whilst the sputa are viscid and the urine turbid, alkalies are indispensable.

A few grains of hydrate of chloral may be of service where depression is to be apprehended from the want of sleep. We should bear in mind that it lessens the activity of the respiratory centre and enfeebles the vasomotor system—a state of things we are most anxious to guard against. Its action is also very manifest on the circulation, lowering and weakening the action of the heart, by paralyzing its sympathetic ganglia. The combination of belladonna tends to obviate this. I should never administer it where the pulmonary circulation was much involved, for fear of increasing relaxation in the vessels and further enfeebling the action of the heart.†

Bromide of potassium is a safer remedy, having a sedative influence on the nervous system, and so inducing sleep, without depressing the heart's action.

In the shape of local applications, nothing equals a warm linseed or jacket poultice. It should be applied over the whole of the affected lung, as hot as can be borne, and changed once in two or

* See the action of Aconite in Chap. XI, On Scarlet Fever.

† "The breathing tends to become slower, and finally to cease, from paralysis of the respiratory centre; but urgent dyspnœa has occasionally been observed, and this has been ascribed to dilatation of the pulmonary vessels, causing an increased afflux of blood to be directed suddenly to the lungs."—*Guide to Therapeutics*, by Dr. Farquharson, 1877, p. 132.

three hours. The fault of poultices in general is that they are not made large enough to envelop the diseased organ, for the object aimed at is, not only to relieve pain but to draw the blood to the surface, and so to act as a sedative on the inflamed or congested parts beneath. "In lung diseases of children, whose chest-walls are very thin, the value of poultices has seemed to be much greater than in corresponding affections in adults; and it is not illogical to believe that the difference may be dependent upon the irregularity of the chest-walls."* When moderately and cautiously used a turpentine stupe is very serviceable. A piece of thick household flannel should be folded the required size, then wrung out of hot water, and a few drops of turpentine sprinkled over it. This should be laid over the affected part of the lung, and covered with a piece of oiled silk, or a dry fold of linen rag, and kept on for twenty minutes. When it is removed the skin will be found of a bright erythematous hue, and the cutaneous vessels will be kept dilated for a considerable time.

The diet should be light, and at first without stimulants. After about five days or a week, when the temperature falls (perhaps with crisis of diarrhœa or sweating), wine, eggs, and additional nourishment are needed. In all cases, milk, beef tea, and cooling drinks from the onset, should be given freely. The temperature of the room should be about 60° and well ventilated; the head raised, and the position changed frequently.

In the treatment of the second stage, or that of hepatization, a flying blister, or the application of iodine may be needed, but this will be more fully alluded to when we come to speak of the disease in its chronic form. The perchloride of mercury in small doses, iodide of potassium, and cinchona, are valuable remedies in their turn. The ammonio-citrate of iron, or the syrup of the iodide, are both useful remedies, particularly if the child is anæmic.

In the third stage, carbonate of ammonia, brandy, quinine, and the mineral acids may be required, followed by cod-liver oil and change of air.

2. *Catarrhal Pneumonia* (*acute lobular pneumonia, epithelial pneumonia*), *Bronchopneumonia*.—In this variety distinct and separate lobules are affected. The inflammation extends along the smaller bronchial tubes to the air-vesicles, or it originates in collapsed

* Wood on Therapeutics, 1876, p. 558.

lobules, which are firm and red. On section they are smooth and give exit to a bloody fluid. It is very common in whooping-cough, measles, and diphtheria, but it may arise apart from these diseases in consequence of debility and an impure atmosphere. Cold and changes of weather appear to be the most common causes, and any exhausting disease which has kept the child for a long time in the recumbent posture is capable of originating this mixed disorder. Children who are delicate from birth and have bronchitis are subject to it. I have met with children of fifteen months old with symptoms of wasting and marasmus who get bronchitis. The wheezing extends down the bronchi, and involves the smaller bronchial tubes of one lung, increasing the frequency and urgency of the respiration, and by retarding the circulation through the lower portion of the lung leads to dulness and consolidation of it. The lips become blue, and the skin breaks out into a cold clammy perspiration. The temperature may reach 104° or 105°, but it is not maintained at this height, the pulse 200, small, thrilling, and collapsing, and the respirations 60 or even 100 per minute. The child is extremely restless, turning about and hiding the ball of the eye beneath the upper eyelid. The dulness may creep upwards above the spine of the scapula, and tubular breathing be detected below the clavicle on the same side. There is phlegm, which cannot be dislodged, and the child cries out when he coughs, and only gets snatches of sleep. Soon the lung is dull throughout, and the alæ nasi are active; large and loose crepitation succeed, the respiration becomes rattling, and the child may die in a convulsion, or pass into coma and sink. In other cases the crepitation which has been heard during the pure bronchitic stage is succeeded in a day or two by tubular breathing, harsh and dry; the dulness increases, and becomes apparent in front as well as behind.

Lobular pneumonia, when it is at all severe, is a frequent outcome of bronchitis, indeed the two conditions constantly occur together, but they must be recognized as separate and distinct diseases, having a different clinical and pathological importance. "Lobular pneumonia is always a secondary disease, either to those specific disorders which are accompanied by bronchitis almost as one of their elements (in which rank measles and whooping-cough stand obviously first), or to bronchitis of a primary kind. So far as careful post-mortem observation permits a generalization to be made, the course of the disease is invariably through the occurrence

of collapse. After a lobule has become emptied of air, and after more or less of the bronchial contents have been forced by inspiratory action into the alveoli, the lobule itself passes into a state of active congestion, and then of hepatization, and by degrees the test of inflation gives only a partial result, and eventually no air can be forced into the lobule. The microscope shows in the earlier periods of this consolidation the parenchyma of the lung unchanged, but the alveoli stuffed with cells and their epithelium occasionally undergoing some fatty change. The next anatomical change is the coalescence of these collapsed and inflamed lobules into larger masses, which frequently give rise to consolidation of large portions of the lung, especially of the posterior surface. In these, next, a softening change goes on, and the centre of the lobule loses the dull-brown color of the rest, and becomes gray and diffluent, the liquid part having all the characters of pus. Or another process may be set up in the occluded lobule, and a cheesy matter be formed, which to the microscope presents various fatty elements and nuclei. This occurs at a later stage of the disease in unhealthy children, in whom, however, miliary tubercle need not exist."*

Pathology.—Unlike the croupous form of pneumonia we have just considered there is no fibrinous exudation, but a cell proliferation which distends the alveoli at the termination of the smallest bronchi. These cells are derived from the epithelial lining of the alveoli where they remain, and as they cannot be readily discharged by expectoration, they accumulate, cause local irritation, and form into masses, which undergo retrogressive changes. Hence the inflammation may lead to abscesses in the lungs or to caseous degeneration (*scrofulous pneumonia*), or to tuberculosis, and that terrible acute form of phthisis known as "*galloping consumption.*" In some protracted cases the disease may terminate in chronic pneumonia.

Treatment.—In this variety lowering measures must be discarded. Ipecacuanha wine in a saline mixture, and carbonate of ammonia, senega, and tolu, are the remedies to be depended upon (Form. 61, 65, 66). When there is an accumulation of phlegm in the air-tubes an emetic at night to dislodge it will relieve the breathing and insure rest. Some of the best effects have followed the use of mild emetics at bedtime in these and other similar

* Lettsomian Lectures—On the Diagnosis and Management of Lung Diseases in Children, by George Buchanan, M.D., F.R.C.P., The Lancet, Feb. 8th, 1868, p. 215.

cases, as bronchitis or whooping-cough, where the bronchial tubes are loaded with mucus. I have not observed any bad effects follow the use of a teaspoonful of ipecacuanha wine, followed by a little warm water, till vomiting ensues, unless the child is very exhausted. Generally one or two doses will be enough, but if the child is prostrate, and there is lividity of the face and mucous membranes, with a feeble pulse and shallow respiration, the ipecacuanha failing to excite cough or vomiting will increase the general distress. The bronchial tubes remain loaded with phlegm and mucus, and the general discomfort and pain in the chest cannot be relieved so long as the mucus remains. In these cases it may be well to combine the ipecacuanha with a stimulant like the carbonate of ammonia, or a few grains of sulphate of zinc, and if its action is delayed, to tickle the fauces with a feather, but even these attempts sometimes fail, and then our only chance is to place the child in as upright a position as possible in bed and support the failing circulation by ammonia, spirit of chloroform, wine, and beef tea. When an emetic acts efficiently it excites the action of the respiratory muscles, empties the larger tubes of their tough or fluid contents, and stimulates the smaller, bronchi to renewed secretion and activity. The dry sounds and hyperæmia of the mucous membrane diminish and give place to moist crepitation, and resonance on percussion. The expression changes and becomes lively and animated, the duskiness of surface passing off as the blood is better aerated, and the child is restored by refreshing sleep.

The carbonate of ammonia is an excellent remedy by loosening the contents of the bronchi, and favoring expectoration. I have many times known children expectorate or bring up phlegm by coughing, just in proportion as they have taken the remedy or not. When the temperature is high and the pulse weak and quick, I have seen excellent effects from combining the ammonia with quinine and senega.* This encourages expectoration and improves the pulse and appetite. If the tongue is furred, and the sputa

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* Formula 69:

℞. Amm. carb., ... gr. viij
Tinct. quiniæ, ... ʒiij
Spt. chloroform, ... ♏xx
Syr. tolut., ... ʒiij
Decoct. senegæ ad . . . . . ʒiv.—M.

A tablespoonful every four hours. For children five or six years old.

thick and tenacious, the ammonia may be given with bicarbonate of potash and ipecacuanha.* When there is no tendency to accumulation in the bronchi, and the cough is irritating and the child restless, a few drops of the compound tincture of camphor, or henbane, may be safely added.

As to diet, the child should be fed with milk and lime-water, chicken or veal broth, and a few drops of brandy may be added to the milk three or four times a day. In feeble children of only a year old I have sometimes given a little champagne in potash-water, with excellent results, and I consider that recovery is often due to the rallying effect of the wine.

As regards local applications, warm linseed poultices, with or without mustard, as we have mentioned under lobar pneumonia, will be of most benefit.

Later on, the preparations of iron—the syrup of the iodide, the syrup of the phosphate (syrup. ferri phosp., B. P.), the chemical food (syrup. ferri phosp. comp.), or the vinum ferri, will be necessary to strengthen the system and improve the quality of the blood. During convalescence cod-liver oil or Squire's malt extract will be found serviceable, or they may be combined with great advantage. The latter remedy may be given in milk.

3. *Chronic Lobular Pneumonia.*—This is a disease of great interest and importance from its liability to be mistaken for tuberculosis or chronic phthisis. The connective tissue between the lobules is affected, leading to induration and consolidation of the pulmonary tissue. It generally follows bronchitis, pneumonia, measles, or diphtheria, or, what is far more common, it creeps on insidiously in bad states of health, and may prove persistent and troublesome. I have met with it in feeble children of rickety constitution, and for weeks together could not decide whether the disease was tubercular or not. In fact, until a case of this form of pneumonia had been for some time under observation, it is impossible to come to a decision. When we are sure that a child has

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* Formula 70:

℞.	Amm. carb.,	gr. vii
	Potass. bicarb.,	ʒij
	Vin. ipecac.,	♏xl
	Syr. tolut.,	ʒiij
	Aquam ad	℥iv.—M.

A tablespoonful every four hours. For children five or six years old.

enjoyed good health till an attack of bronchitis or whooping-cough has happened, and then the complaint passes into localized dulness below one clavicle or scapula, with or without moist crepitation and bronchophony, we are generally correct in assuming that the complaint is of simple origin. The two following cases exemplify this condition.

Chronic lobular pneumonia, simulating tuberculosis; recovery.

Case 1.—V. B——, æt. 9½, was admitted into the Samaritan Hospital, under my care, on March 25th, 1875. He was a pale, thin, emaciated boy, with light hair and gray eyes, and had been ailing in health, more or less, for five years. There was no history of an acute attack. Had had both whooping-cough and measles; his mother dated his delicacy to an attack of quinsy three years previously.

On examination there was a general flattening of the thorax below the clavicle, especially on the left side, to the inner aspect of the corresponding nipple, and this was in a great measure due to imperfect development of the left half of the thorax. He could take a full inspiration, at the termination of which was a cooing, dry, bronchial sound, not heard on the right side. The percussion-note was good in front, but nowhere clear behind; the respiration was harsh and irregular, and there was distinct bronchophony, but no moist sound; the pulse was variable, the least fatigue or excitement at once accelerating it, and I have felt it one day as low as 72, and another as high as 112; the respirations were tranquil, and did not exceed 20 per minute, the morning and evening temperature 99.2°. He was ordered a diet of milk, eggs, and beef tea; a mixture of hydrochloric acid and quinine; diluted tincture of iodine (one in seven) to be painted under the left collar-bone night and morning.

In May he was much better, and in June he had gained in flesh and weight, and his general health was most satisfactory. Temperature normal; pulse 72, respirations 20. The physical signs still indicated some remaining dulness and bronchophony between the scapulæ. He was discharged well on June 23d.

Readmitted February 17th, 1876.—Some time after leaving the hospital he seemed to be in perfect health, but latterly he had lost much flesh and strength. The wasting was most apparent about the temples, in the arms and legs, and in the shrunken hands, the sternum and scapular region. He looked like a child

in the last stage of phthisis. The chest was clear on percussion, and expansion was everywhere good, the inspiration was rather short and harsh, but there was no dulness, and the vocal vibration was slight. As the expiratory note was not caught at all, its suppression was probably due to nervousness. In the right supra-scapular space, inspiration was short and rather harsh, but there was neither dulness nor vocal vibration. Immediately below the spine of the scapula, and over the centre of the bone, small crepitant rhonchus was most distinct, which disappeared between the inner border of the scapula and the spine; over the middle lobe of the lung there were coarse, loose, and moist bubbling rhonchi (suspected softening of middle lobe), and dulness was very marked from this point downwards. There was no bronchophony, the complete absence of which I could not explain, but on inspiration the air seemed to be entering some small cavity, the thin sternal walls only intervening between it and the ear, when applied to the chest-wall. There was some consolidation of the lung. In the middle and lower lobes of the right side there was heard crepitant rhonchus, precisely resembling the small crepitant rhonchus of pneumonia; over this the percussion-note was resonant. The urine was turbid, slightly alkaline, and rather high-colored, with a sp. gr. 1024; on boiling, flakes like albumen floated freely in the specimen, which immediately disappeared with effervescence (phosphates) on the addition of nitric acid. The pulse was 96, and of good calibre; the respirations 20; the morning temperature was 99.4°, the evening 100°. The variation in breathing was very noticeable here—one minute only breathing twenty times, and another as many as twelve times in the quarter of a minute, just as we see in some cases of tubercular meningitis, and gradual death from exhaustion.* He was never flushed, and there was no sweating. He was ordered quinine, phosphoric acid, and cod-liver oil.

22d.—The urine was unchanged—he was ordered port wine.

24th.—There was more loose crackling in the lung, which appeared to be breaking down, as gurgling and pectoriloquy were distinct, and when he whispered the sound travelled up the stethoscope distinctly.

March 9th.—During the last few days no bronchophony or gurgling was to be heard.

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* See Chap. XLII, On Diseases of the Brain.

24th.—He had gained flesh and looked better, and although his appetite was good his cough was still troublesome. The change in the physical signs of the lung was very remarkable ; the note was clear throughout the surface of the right lung, there was no trace of bronchophony or moist sound of any kind, except a little dry crackle ; all the characteristic signs of breaking-down of lung-texture on the 24th ult. had disappeared. The only sound now was prolonged expiration and diminished expansion on this side. It is possible that the cause of this was due to some "*lobular pneumonia*" of a chronic character pressing on the tubes, and that consolidation of lung-tissue was set up.

April 21st.—The only change now detectable was that the respiratory murmur was weaker over the affected side than the left, every trace of crackling and consolidation having disappeared. He was ordered the ammonio-citrate of iron in five-grain doses twice a day and to leave the hospital. A year later (April, 1877) he was in perfect health.

Case 2.—This case presented considerable interest, and when sent to me an abscess communicated with the left lung and pleura.

B. M—, æt. 3, a fair and very intelligent child, was admitted into the Samaritan Hospital, under my care, on December 22d, 1876. The mother stated that the child had been ailing with bronchitis and cough ever since the previous September, and had not enjoyed a day's health since. There was no history of an acute illness ; on the other hand, the symptoms were gradual, and at no time marked by fever or inability to leave her bed. On examination there was a prominent and circumscribed swelling on the left side, over the lower ribs, about two inches below the nipple. On auscultation there was considerable dulness and imperfect expansion below the left clavicle ; the voice was bronchophonic and the respiration harsh and bronchial. The heart's sounds were distinctly heard throughout the thorax. Posteriorly the dulness extended downwards to the middle of the scapula, and the note was not at all clear below this ; the respiration was dry and harsh. There was scarcely any cough to speak of, and the temperature was normal, but the pulse was 160, small and weak ; the respirations 56, short and catching ; the bowels regular and the urine free and clear. A poultice was ordered to the swelling, and a grain of carbonate

of ammonia in tincture of cinchona every four hours.* The diet consisted of beef tea, milk, and two eggs daily, beaten up with sherry. On the 24th the abscess was opened and a small quantity of laudable pus escaped; the child had slept tranquilly, without cough, but the pulse was very weak and small. On the 26th the temperature was 98°, pulse 128, respiration 48. The abscess had discharged a large quantity of matter in the night, and this had given her ease; she sat up in bed and was aware of all that went on around her, but she was peevish and fretful, and looked very pallid and exhausted. The upper third of the left lung was very dull posteriorly, and the breathing dry, shrill, and tubular, but descending downwards these physical signs became less marked, though everywhere they presented a striking contrast to the opposite side. On the 28th the pulse was 96, respiration 32; the abscess was discharging freely and there was no cough; over the lower lobe on the left side the percussion-note was becoming resonant, and the dry breathing was supplanted by coarse crackling respiration. On January 4th, 1877, the respiration was clearer under the left clavicle, but still showed a marked contrast to the opposite side; posteriorly the dulness was diminished, and in the lower half of the lung the moist râles were nearly absent, whilst in the centre of the lung the voice was bronchophonic. A mixture of iron, carbonate of ammonia, and a very small dose of iodide of potassium was ordered three times a day.† On the 19th the abscess reformed, and it was necessary to make a counter-opening. On March 2d the patient had gained a stone in weight since admission under the effect of good diet, cod-liver oil, and the syrup of iodide of iron. The patient shortly after sickened for measles,

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* Formula 71:

℞. Tinct. cinch. co.,	℥iiss.
Amm. carb.,	gr. viij
Tinct. camph. co.,	♏xl
Syr. tolut.,	℥iij
Aquam ad	℥iv.—M.

A dessertspoonful every four hours. For children five or six years old.

† Formula 72:

℞. Ferri et amm. citr.,	gr. xij
Amm. carb.,	gr. viij
Potass. iodidi,	gr. iv
Syrupi,	℥ij
Aquam ad	℥iv.—M.

A dessertspoonful to be taken three times a day. For children five or six years old.

and was consequently detained in hospital till April 13th, when the wound had soundly cicatrized, and no difference could be discovered in the physical signs of either lung, which presented every sign of health.

Chronic pneumonia appears to be sometimes caused by disease of the tracheal and bronchial glands. Dr. Gee has related some interesting cases.* Measles, scarlet fever, pertussis, and chronic cough were the causes of the glandular affection. In one case (aged 3 years 9 months) a cavity in the bronchial glands was found, containing a slough, which opened into the œsophagus and left bronchus; the tracheal glands were enlarged and caseous; the right lung was studded with miliary tubercles. In a second case (aged 6 years) the bronchial glands at the bifurcation of the trachea were transformed into a cheesy mass; the right bronchus was perforated by an ulcer. There was hectic fever during illness. In a third case (9 years old) at the bifurcation of the trachea there was a sloughing cavity, and the right bronchus opened into it; the right lung was entirely solidified; there was hectic fever throughout the illness. In a fourth case (aged 2½ years) the tracheal glands compressed the lung, and on section the tumor contained a cavity, the size of a walnut, filled with thick creamy pus. The bronchial glands were also enlarged.

Œdema of the lungs, though rare in children, is of sufficient importance and frequency to deserve careful consideration. There is no evidence of inflammation in the tissue of the lungs, but it is infiltrated with watery fluid, so that it is firm and inelastic; it contains very little air, scarcely crepitates, and sinks in water. On examination of the lungs after death there may be found an effusion of clear serum into the cavity of the pleura, or even a thin layer of lymph, proving that some degree of inflammation has taken place. The lungs are of a deep-red color. On cutting into their substance reddish serum exudes, and as it escapes the pulmonary tissue becomes crepitant and lighter in color. The air-cells and pulmonary connective tissue contain so much fluid that it interferes with the free entrance of air, and explains the cause of the rapid and difficult respiration. "This is a condition very frequently found in Bright's disease, or where there is a disposition to dropsy; the lung is found filling the chest and heavy, and on a section

* On the Chronic Pneumonia which attends Disease of the Tracheal and Bronchial Glands, St. Barth. Hosp. Rep., vol. xiii, p. 63.

being made a quantity of serum drains out, leaving the tissue healthy and firm. It is thus distinguished from the first stage of inflammation, in which the texture is very lacerable."*

Causes.—We may attribute this peculiar state in most cases to a passive or mechanical obstacle to the free circulation of the blood, as in pneumonia, valvular disease of the heart, and pressure on the pulmonary veins. "Laennec taught that pulmonary œdema may occur as a primary and idiopathic condition, and that the suffocative orthopnœa, which sometimes cuts off children after measles, arises from such œdema."† Cases have resulted from anasarca after scarlatina, from morbid states of the blood, as in Bright's disease, purpura, and the continued fevers. I have seen two cases which occurred as the consequence of constitutional debility, and a low state of the general health. Both were preceded by slight catarrh (a subacute form of bronchitis), and no alarm was realized till the respiration became rapid, out of all proportion to the pulmonary state. The condition is one not only associated with debility and relaxation of the vessels and tissues, but the quality of the blood has probably undergone a change similar to what occurs in passive dropsy. It is thinner and more watery than in health, the corpuscles and organic matters are diminished, and hence the transudation of the serous parts through the vessels and capillaries.

The *physical* signs which indicate this condition are not very characteristic or reliable; there is some dulness on percussion, and increase of vocal fremitus; the respiration is weak and often mixed with rather loose râles and subcrepitant rhonchus; "the fine bubbling rhonchus, when very liquid and well marked, is the most characteristic sign."‡

Treatment.—This will depend upon the cause. If the disease comes on during the anasarca of scarlet fever, the hot-air bath, and diaphoretics to act on the skin will be needed to remove renal congestion. Small doses of tartarated antimony and spirit of nitrous ether will relieve the dyspnœa, whilst a poultice may be necessary if the bronchial congestion is sufficient to demand it. But it often happens that œdema of the lungs, coming on gradually in strumous and delicate children, demands a supporting line

* Wilks and Moxon, Pathological Anatomy, 1875, p. 323.

† Diseases of the Lungs and Heart, by W. H. Walshe, M.D., 1854, p. 448.

‡ Walshe, op. cit., p. 449.

of treatment, as spirit of chloroform, ammonia, brandy, and good nourishment.

CHAPTER XXXIX.

ON TUBERCULOSIS.

NATURE AND DEFINITION OF TUBERCULOSIS. ARTIFICIAL PRODUCTION OF TUBERCLE. GRAY AND YELLOW VARIETIES. ANATOMICAL CHARACTERS AND APPEARANCES FOUND IN THE LUNGS IN TUBERCULOSIS. COMPARATIVE FREQUENCY OF TUBERCLE IN THE VARIOUS ORGANS OF THE BODY. USUAL PROGRESS OF TUBERCULOSIS. CAUSES: *Hereditary predisposition—Influence of age—External causes, as bad air and ventilation—Insufficient food—Chronic diarrhœa and indigestion—The eruptive fevers and whooping-cough—Inflammation an exciting cause of tuberculosis.* SYMPTOMS: *Pain in epigastrium and indigestion—Temperature of the body in tuberculosis the surest means of diagnosis in the absence of physical signs—Sweating, pulse, and respiration as diagnostic aids—Illustrative cases which may be mistaken for tuberculosis.*

By the term tuberculosis we mean a general condition of ill-health, attended with the deposition of tubercle in one or more organs of the body. It is a constitutional febrile affection, which is usually associated with inflammatory action in the lungs, bronchial glands, cerebral meninges, and peritoneum. We say *associated*, because its precise relation to inflammation, whether as a mere variety or as a concomitant, or a result, is still a great pathological question, which we will discuss further on. In childhood it has some special and characteristic symptoms which we do not observe in later life, and the causes and history have a separate and distinct character. In well-marked cases of tuberculosis the children are usually good-looking, with prominent veins, long eyelashes, and dilated pupils; the figure is erect and slim, the joints are small and slender, and the shafts of the bone thin and straight; the growth of mind and body is active, and the nervous system is highly impressible; the child is sensitive to reproof or kindness, quick and clever at lessons, and does not exhibit the backwardness which belongs to the phlegmatic temperament. These children are not subject to enlargement of the lymphatic glands, nor have they the thick lips and dull expression of the truly scrofulous diathesis. Tuberculosis, then, or the tuberculous cachexia, signifies that state of constitution which arises from the presence of tubercles; and by tubercles is meant a species of new matter, or

growth, prone to degeneration and decay. In its crude condition it resembles concrete albumen, and consequently becomes soft and friable, and acquires the consistence and appearance of thick cream, or cheese, or pus. But a variety of circumstances will determine the character of the exudation, and it may abound in elements at one time which are not to be detected in it at another. It is deposited upon the surface of the mucous membrane of the air-cells, or within the parenchymatous structure of the lungs, where, instead of being absorbed or excreted, as happens in the simple exudative inflammations of the healthy, it slowly degenerates by reason of its inherent faulty composition and deficient vitality. This question is discussed further on. Tubercles are the local expression of a depraved constitutional state, and most likely represent enfeebled nutritive energy. When few in number they occasionally become hard and indurated, and do not interfere with the organic functions; but when they are numerous they affect the general health, and if deposited in the lungs, cause in most instances an alteration in the physical signs, and lead to softening and suppuration of the tissues in which they are deposited. The gray and yellow varieties are the kinds with which we are familiar. Under the microscope a section of a miliary or recent tubercle shows numerous leucocytes generally included in a network of delicate fibres—the "*adenoid tissue*" seen in glands. In the centre of the tubercle are large multinucleated cells, sometimes called "*giant cells*," the processes of which are directly continuous with the reticulum. The caseous tubercle shows cells in all stages of degeneration and disintegration.

Tubercular exudation is most commonly met with in children and young adults. It occurs in the lymphatic glands, the lungs, and serous membranes, and its progress is generally slow and insidious; but, on the other hand, it is sometimes rapidly roused from latency into activity, or set up anew by some commonplace disorder. There is no attempt at absorption or perfect cell formation, but a tendency to ulceration and disintegration, with a certain train of general symptoms, recognized by failing health and strength, and persistent derangement of the digestive functions.

According to Virchow, although tubercle is the result of the death of healthy or diseased tissues, the local process—tuberculosis—also results in the exudation of a material during tuberculous inflammation; such material undergoing a kind of organization,

succeeded by its death, and by its breaking and shrivelling up into a tubercle. This gradual change is termed tuberculization.* There is much evidence to be adduced in support of that theory which classifies tubercle as a primary formation, like cancer and epithelial and melanotic growths. All the changes that take place are secondary, and without the presence of malnutrition it seems highly probable that no lesion can produce it.†

The conditions, then, under which tuberculosis originates are not precisely known, as low inflammatory products may cause induration or suppuration, and yet the disease may not be developed. It is not known whether the disease is specific or not, or how it is generated within the body. When the sputa of phthisical patients have been given to dogs and poultry, tuberculosis has sprung up; and the same has been the case with cattle fed with tubercular or scrofulous products.‡ Villemin was the first to show, by a series of experiments, that when finely divided masses of gray or yellow tubercle were introduced under the skin of guinea-pigs, rabbits, and some other animals, a local form of inflammation ensued, and at the end of two or three weeks miliary tubercles were discovered in the lungs, and at a later period in the intestines and peritoneum. Villemin, therefore, concluded that it was possible to propagate tuberculosis by inoculation, in the same way that occurs with small-pox and syphilis. Many pathologists have carried out Villemin's experiments, and they have arrived at precisely the same results; whilst Burdon Sanderson and Wilson Fox made the further discovery that miliary granulations arose in some of the chief organs of the body when pus, putrid tissue, and portions of a pneumonic lung were introduced subcutaneously. Dr. Burdon Sanderson's§ experiments on the artificial production of tubercle in the lower animals throw much light on the pathology of the affection as it occurs in man. He found that it is most readily produced in the guinea-pig, next in the rabbit, and lastly in the dog. "For three reasons," says Dr. Sanderson, "the guinea-pig is preferable; (1) because it is absolutely free from liability to natural tubercle; (2) because it is little liable to acute inflammation; and (3) because it can be inoculated with absolute certainty." An in-

* Dictionary of Medical Sciences (Dunglison), article Tubercle, 1874, p. 1062.

† Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 203.

‡ See The Lancet, Nov. 23d, 1878, p. 741.

§ Recent Researches on Artificial Tuberculosis, Edin. Med. Journ., Nov., 1869.

finitesimal dose of the infective material is taken from the diseased gland of an infected animal, and, after being mixed with a little distilled water, is injected into the peritoneum, the pleura, or subcutaneous areolar tissue. Drs. Sanderson and Wilson Fox, in 1868, produced tuberculosis in the guinea-pig by the insertion of setons and non-tubercular products. An abscess followed around the foreign body, and tuberculosis supervened. Professor Cohnheim also confirmed these experiments, and produced tuberculosis traumatically by introducing harmless foreign bodies into the peritoneum. The result obtained by these researches was to produce nodules of new growth, having a lymphatic structure, and termed lymphomas by Virchow, because they are commonly found in certain organs of the lymphatic system. Dr. Sanderson proposes the term adenoid, because he says in certain parts of the body there are organs like these growths we are considering which possess a structure identical with the follicles of the lymphatic glands, and that where they exist naturally, as beneath the pleura and peritoneum, there these tubercular nodules or overgrowths are most frequently found. These nodules or tubercles appear in fact to be nothing more than overgrown masses of pre-existing tissue, or enlarged adenoid bodies.*

In fact, these pathologists ascertained that simple mechanical irritation set up the same morbid process as the inoculation of the specific products I have alluded to. Thus it seems satisfactorily demonstrated that general tuberculosis may arise from the inoculation of a morbid poison into a wound, or from the absorption of inflammatory products; and although the injection of tubercular matter does appear to induce the disease with greater certainty and celerity, there is no reason whatever to suppose that any specific inoculation is necessary. These carefully conducted experiments

* "I am quite willing to acknowledge a close affinity between lymphatic glandular swellings and tubercles, for they affect the same subjects and run a similar course. But these glandular swellings also have a close resemblance on the one hand to swellings from inflammation, and on the other to the simple enlargement of the spleen and liver occurring in leukæmia. In both these cases there is doubtless hypertrophy or hyperplasia, but this may be in the way of exudation or cell proliferation, without the development of complex tissue which constitutes a *growth*. If the addition of cells, fibres, and other products of inflammation in a tissue constitutes a growth, then common cutaneous pimples, tubercles, and boils are growths, and the swelling from erysipelas or cellulitis must be included under the same term; but this surely would exceed its usual acceptation."—*Pulmonary Consumption*, by Drs. C. J. B. and C. T. Williams, 1871, p. 17.

have had a surprising effect in modifying our views regarding the prevailing doctrine of tubercle, and, as we shall subsequently see, they have an important practical bearing. It decides the long-disputed question that low forms of simple or even acute inflammation in some subjects may eventuate in tubercular disease, without any original deposition of tubercle; and in support of this view I may allude to the circumstance that neglected pleuritic effusion in children is often followed by empyema and occasionally by tuberculosis. A common cold in delicate children, or those predisposed to the affection, will now and then give rise to it; indeed, no vascular excitement in such subjects is to be disregarded.

With regard to the history of the above researches it may be stated, that for the last two hundred years, tubercles were considered to be allied to scrofulous lymphatic glands till the time of Bayle, who regarded tubercle as a peculiar product, and the result of a special constitutional diathesis,—a deposit depending on a morbid state of the blood. Bayle gave the name of tubercle to the gray and yellow masses which he found in the lungs. Virchow proved that yellow caseous matter was not the character of true tubercle, and that it might arise from fatty degeneration, and the products of pus, and cancer, and so forth. He called the *gray* granulation of Bayle the typical form of tubercle, and considered infiltrated tubercle and caseous masses as the consequence of inflammation. Dr. Wilson Fox entertains the view that the caseous products arising in the lung in phthisis are due to the destruction of vessels by a new growth in the walls of the air-vesicles, and that the typical gray granulation is not the only form in which tubercle occurs.* Niemeyer considers that phthisis, as a disease, has nothing to do with tubercle, which is only an accidental and secondary product when found in the lung, and the result of inspissation of inflammatory products, leading to destructive and ulcerative changes in the lung-tissue.

Dr. Fox's researches seem to show that the changes found in the lungs, in acute tuberculosis in children, are the same as those observed in the ordinary forms of phthisis.

According to this authority,† the following are the chief appearances found in the lungs of children dying of acute tuberculosis:

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* Trans. Path. Soc., 1873, vol. xxiv, p. 287.

† Discussion on the Anatomical Relations of Pulmonary Phthisis to Tubercle of the Lung, Trans. Path. Soc., 1873, vol. xxiv, p. 291.

"The semi-transparent granulation of Bayle. Opaque white granulations, for the most part soft, but with varying degrees of firmness and difficulty of crushing. Granulations like the semi-transparent granulations of Bayle, and also like the soft granulations, but more or less caseous in their centres. Yellow soft granulations, easily crushed, but not easily removed from the pulmonary tissue, varying in size from that of a poppy seed to a mustard-seed, rarely of the size of a hemp-seed, and still more rarely of the size of a split pea. Caseous granulations, dry, opaque, and friable; sometimes with, sometimes without, a gray transparent zone of induration surrounding them. Groups of granulations, mostly like the semi-opaque, sometimes entirely opaque, rarely semi-transparent; two or three, or four, or more in number, reaching the size of a split pea, or a bean, or even a small walnut, or hazelnut. Indurated pigmented granulations, singly or in groups, like the last described. And lastly, tracts of indefinite extent, one or two or more inches in diameter, irregular in outline, prominent above the surface, granular on section or tearing of the tissue, but passing sometimes insensibly into the so-called gray infiltration. Cavities, from infinitesimal specks to the size of a hazelnut or larger. Granulations softening into cavities—either the softer, the white or the yellow. The semi-transparent granulation in the lung is not, as far as I have seen, found softening into a cavity without some intermediate change. Tracts of gray semi-transparent appearance, known as the 'gray pneumonia' or 'gelatinous pneumonia,' or 'gray infiltration,' or gelatinous infiltration of Laennec; spots also of red pneumonia; in some cases œdema; in some cases injection or punctiform extravasation; in some cases emphysema and collapse; in some cases capillary bronchitis and dilatation of bronchi. The point on which I wish especially to insist is, that the gray granulation of Bayle is very seldom found alone. They are sometimes found as isolated structures scattered throughout the whole lung, but this is comparatively rare. In the combinations of eleven cases they were only found alone in two. They either coexisted with caseous, or with the white and the soft, or with the caseous, or with the soft and caseous, or with the indurated, or with the soft, yellow, and caseous, or with the soft and caseous alone; most of these being combined either with red or gray pneumonia, or with tracts of caseous infiltration. Those are the forms of the combinations of

which I made notes in eleven cases that died under my own observation. The gray granulation of Bayle, the typical tubercle of Virchow, does not therefore exist alone in the majority of cases of acute tuberculosis in the lungs of children. It is most commonly associated with other granulations, which have a different appearance to the naked eye, and also a different anatomical structure; and the latter, in some cases, are the predominant change, so that in some lungs the gray granulation is comparatively rare."

Unlike the case of adults, gray granulations and crude miliary granulations frequently exist in children as the only form of tubercular deposit. In the adult, M. Louis discovered miliary tubercles alone in 2 out of 123 cases (1.6 per cent.), and gray granulations alone only in 5 more (4 per cent.). In the child, Rilliet and Barthez found miliary tubercles without gray granulations in 107 cases out of 265 cases, and gray granulations alone in 36 out of the same number of cases. In 102 cases of phthisis in children, Dr. West* found miliary tubercles alone in the lungs in 20 instances, and gray granulations alone in 17 more. Another anatomical peculiarity in early life is the great frequency of yellow infiltrated tubercle. It seldom exists alone, but is generally associated with crude yellow tubercle and gray granulations, and sometimes with advanced disease of the bronchial glands. Rilliet and Barthez met with it in 88 out of 265 children, or in 33 per cent. of their cases.

As to the frequency with which we meet with tubercle in the different organs in the body, Steiner found the intestine involved in a third of all his cases; the most frequent seat being the *small* intestine, and the least frequent the *large*. From 302 dissections made in the Prague Hospital by Drs. Steiner and Neureulter tubercle was found

In 1 organ in 42 cases.	In 5 organs in 42 cases
In 2 organs in 48 "	In 6 " in 28 "
In 3 " in 62 "	In 7 " in 20 "
In 4 " in 47 "	In 8 " in 6 "

Five times in nine cases, and twice in ten different organs.

The bronchial glands were affected in 275 cases, the lungs in 175, and the stomach in 4.† In 312 children in whom Rilliet and Bar-

* Diseases of Infancy and Childhood, 4th edition, 1859, p. 448.

† Steiner's Diseases of Children, by Lawson Tait, 1874, p. 328.

thez found a deposit of tubercle in one or more of the viscera, the lungs were healthy in 47 cases; whilst in 123 similar instances in the adult, Louis only found one such exception.*

Dr. Wilson Fox mentions 61 cases which he examined for the chief purpose of illustrating the pulmonary manifestations of the disease. All were above ten years of age, and only 2 below fifteen and two ages not stated. In all the cases but one the lungs were affected, and in this was a combination of tubercular pleurisy with tubercular peritonitis. In 7 cases the data were uncertain; in 3 cases the disease was limited to the lungs; in 7 cases two organs were affected; in 16 cases three organs; in 12 cases four organs; in 9 cases five organs; in 6 cases six organs; in 1 case seven organs.†

M. Louis entertained the opinion that when tubercle appeared in any part of the body it was sure to exist in the lungs also, and that the apices of these organs were the selected seat of deposit. We now know that this is by no means the universal law, which the propounder considered he had established, but it holds good with a few exceptions, and is of vast assistance in diagnosis. I have heard it asserted, and I have also seen it in books, that in every case of tubercular meningitis you will find, on examination after death, evidence of tubercle in the lungs, kidneys, peritoneum, or spleen; but twice I have made a post-mortem of this well-developed cerebral affection without finding a trace of the peculiar exudation in any other organ or tissue of the body.

The sudden manner in which tubercular disease sometimes springs up without any obvious exciting cause, is alarmingly suggestive that an over-excited or ill-nourished organ may initiate the peculiar deposition in the track of the bloodvessels, and there set up decay and destruction, having no inclination to spread and contaminate other organs and tissues. Dr. Fox mentions a case recorded by Herard and Cornil, in which the disease was limited to a single lung, and he speaks of three other recorded cases where, in addition to other lesions, one lung was affected, and the other remained free.

It was long held that when tubercle was deposited in the lungs it would sooner or later proceed to a fatal issue; but repeated examination goes to prove that it is sometimes spontaneously arrested,

* Meigs and Pepper's Diseases of Children, 1874, p. 843.

† Trans. Path. Soc., 1873, vol. xxiv, p. 375.

and it has been said that this happens in one-third of the persons affected with tuberculosis. This is confined to no stage or period of the disease; it may be stopped in the early stages when the deposit is small and trifling, and instances are met with where large cavities have healed and cicatrized. "Nothing is more common," says the late Dr. Hughes Bennett,* "in examining dead bodies than to meet with cretaceous and calcareous concretions at the apices of the lungs more or less associated with cicatrices. Of 73 bodies, which I examined consecutively some years ago in the Royal Infirmary, I found these lesions in 28. Of these, puckerings existed with induration alone in 12; with cretaceous or calcareous concretions, in 16. Since then I have examined many hundred lungs at the inspections in the infirmary, and am satisfied that these proportions exist pretty constantly. At the Salpêtrière Hospital, in Paris, Roger found them in 51 bodies out of 100; at the Bicêtre Hospital, in the same city, Boudet found them in 116 out of 135 bodies." In 1868 a young man who had a vomica in the apex of the left lung, brought me from time to time portions of calcareous matter, the size of a pea, which he coughed up with expectoration. He was greatly reduced in flesh and strength, but when I saw him, five years afterwards, he had improved in every respect, and the cavity in the lung was apparently contracting. I met with a similar case in 1874, and the patient was living in 1878, and in health.

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The following facts, according to Dr. Bennett, are proof of arrested tubercle:

"1. A form of indurated tubercle is frequently met with, gritty to the feel, which, on being dried, closely resembles cretaceous concretions.

"2. These concretions are found exactly in the same situation as tubercular deposits are. Thus they are most common in the lungs, and at their apices.

"3. When the lung is the seat of tubercular infiltration throughout, whilst recent tubercle occupies the inferior portion, and older tubercle and perhaps caverns the superior, the cretaceous and calcareous concretions will be found at the apex.

"4. A comparison of the opposite lungs will frequently show,

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* Braithwaite's Retrospect, vol. xlvii, 1863, p. 55.

that whilst on one side there is firm encysted tubercle, partly transformed into cretaceous matter, on the other the transformation is perfect, and has occasionally even passed into a substance of stony hardness.

"5. The puckerings found without these concretions exactly resemble those in which they exist. Moreover, whilst puckering with gray induration may be found at the apex of one lung, a puckering surrounding a concretion may be found in the apex of the other.

"6. The seat of cicatrices admits of the same exceptions as the seat of tubercles, and in about the same proportion. There can be no question, therefore, that these cicatrices and concretions for the most part indicate the arrestment, disintegration, and transformation of pre-existing tubercular exudation into the lungs."

Causes.—Of the causes of tuberculosis, and the deposition of tubercles in the lungs, the progress of medical science has not yet enabled us to speak with any degree of certainty; and the same may be said of that variety of disease classified under the comprehensive term scrofula, with its external abscesses and disfiguring ulcerations. It is very difficult to assign the correct value to hereditary transmission from parent to offspring, regarded as a predisposing cause of tuberculosis, because a large proportion of the population is subject to anti-hygienic conditions, which call the disease into existence. The lives of so many young persons are passed in these days of hard toil under such unhealthy conditions that it is readily acquired. What is gleaned from parents respecting their family history is frequently vague and deceptive. Some will tell you that consumption is not known among them, when closer investigation satisfies us that some member of it has suffered from hip-joint disease, open abscesses in the neck, and even fatal affections of the head which must have had a strumous origin. Instances of hereditary transmission are constantly seen in the emaciated frame of the infant whose consumptive mother barely survives the birth. When the child dies, the lungs and other internal organs are so studded with tubercles that little doubt can be entertained that the disease originated at the earliest period of utero-gestation. It may be laid down as a law, having few exceptions, that the union of healthy parents results in the birth of healthy children, and that they grow up to be strong and vigorous; but that when one parent is tuberculous and the other

healthy, tuberculosis is apt to show itself in the offspring. As the children one after another reach a certain age they begin to lose flesh and strength, and at last die with all the symptoms of pulmonary phthisis, or tubercular disease in some other organ. The best explanation for this large class of cases, which we observe where the victims have been carefully shielded from exhausting or depresing influences, is to be found in a blood dyscrasia or some changes in the vessels or tissues.

Youth is one of the most fertile predisposing causes of tuberculosis, the blood in childhood having a great susceptibility to undergo those changes which constitute the peculiar pathological transformation. We can only conjecture what the specific change is; but we do know that in early life the blood is deficient in solid constituents, and in blood-corpuscles. As children grow to maturity, and life advances, the quality of the circulating fluid is enriched, the tendency to tubercular change becomes less and less, and the power of arrest or elimination is acquired if the constitutional strength can be maintained. It may be that the diminished number of red corpuscles in chlorosis and anæmia is one reason of their fatal termination being frequently accompanied by the deposit of tubercle and the gradual development of phthisis.

The effect of intermarriages has been well pointed out by Sir William Jenner. "That tuberculosis is transmitted from parent to child is one of the best established facts in medicine. The extreme frequency of tubercular diseases in some circumscribed country districts is, in part at least, explicable by the frequency of intermarriage amongst persons living in such districts; and conversely, the exception of particular circumscribed districts from tubercular disease is due to the same cause. In one case, from some special circumstance, tuberculosis has been introduced into the district, and then spread in it from the cause I have mentioned, *i. e.*, intermarrying; in the other case, the freedom from the disease of the district, at any given time, is the cause of its continued freedom. Intermarriage of the inhabitants, the disease being absent, prevents its introduction."*

Where hereditary transmission is so strong (and that it is so daily experience affords the most conclusive evidence), the germ of the disease either lies in a latent state, or is actively transmitted by the parent. Rilliet and Barthez furnish some interesting facts

* Address before the Epidemiological Society of London, 1866.

to the effect that, "of 26 children whose fathers were tuberculous, or probably so, 22 died tuberculous, and 4 non-tuberculous; of 32 children whose mothers died tuberculous, or probably so, 22 died tuberculous, and 10 non-tuberculous; of 6 children whose fathers and mothers died tuberculous, 4 died tuberculous and 2 non-tuberculous. There were 46 cases, or about 1 in 7, in which the hereditary influence more or less prevailed, and 11 in which it was the sole probable cause."* There are many points of extreme interest on this part of the subject, such as the relative frequency of its transmission by the two sexes, and the manner in which this takes place.

Children brought up by hand, and weaned too soon, or neglected by the mother, are very liable to the disease. A case is related by Meigs and Pepper† of a healthy woman, who had several vigorous children whom she had nursed. She gave birth to one which she could not nurse, and this child, after pining for many months, died of tubercular meningitis.

Bad or insufficient food, leading to prolonged indigestion and diarrhœa, exert a powerful influence in the production of tubercle. Artificial foods of all kinds, when too exclusively relied on, may awaken the disease; and defective nutrition and mal-assimilation, however brought about, are common causes of tuberculosis in those who are not even predisposed to the affection. The eruptive fevers and whooping-cough frequently act as a starting-point, the disease having an admitted tendency to spring up after these acute affections. The continuance of febrile action is liable to alter and deteriorate the quality of the blood, and to render the system liable to tubercular deposit. If we look back in memory only to our experience of the number of children who have exhibited symptoms of tuberculosis, as the consequence of febrile disorders, we are in a great measure driven to embrace the doctrine that such diseases as whooping-cough and measles not unfrequently originate the disease in constitutions not hereditarily tainted.

In those cases in which pneumonia and bronchitis are associated with tuberculosis, it is a disputed question whether the inflammation is a secondary affection, or whether it has been the essential and true cause. Both views have some show of reasoning, and I shall therefore consider the subject at some length. We may

* Ancell, on Tuberculosis, 1852, p. 377.

† Diseases of Children, p. 842.

repeatedly witness children whose general health fails for months together, when the physical signs afforded by auscultation and percussion reveal no evidence of abnormal change in the pulmonary organs. The disease may advance considerably before they afford any proof of alteration, and there may be extensive tubercular deposit, which is unsuspected.

The plasma exuded in states of acute inflammation resembles so closely that which is poured out in low forms of disease, happening to cachectic and tubercular subjects, as to be almost identical. In the former case, the essential difference consists in its vital endowments, or capacity for higher organization; whereas in the latter it has no power to advance in this direction, and the exudation remains much in the same condition as when it was first secreted. The physical and general signs, too, between a case of chronic pneumonia in a weakly person and tubercular infiltration, are so closely allied that, notwithstanding that the history and progress of the two affections may be some guide to diagnosis, they constantly fail to put us in possession of any conclusive evidence. Now, it is worthy of notice, that a general cachexia regulates the anatomical character of all these exudations, and that in the absence of any apparent exciting cause there has still been a factor in operation, which deals a fatal blow to the doctrine of spontaneous origin. The children of consumptive parents may bear characteristic proofs of the disease, but all do not die of phthisis—some may attain to a ripe old age, and others as they reach maturity drop off one by one. Every child bears traces of the constitutional diathesis in the delicacy of form, accelerated circulation, and general appearance; but some have escaped the circumstances which call tuberculosis into action. The different functions of the body are languidly carried on, and enough nourishment is appropriated for the maintenance of life; or from some unforeseen causes (ever ready to come into operation) a period arrives when an inflammatory affection of the lungs, or some other part, springs up. Through perverted nutrition, the exudation or effusion of coagulable lymph takes place, and local disease is initiated. Here is an argument suggesting the probability of a new power or agent suddenly altering the nutrition of an organ; but it may be contended, with equal force of reasoning, that the exudation was there slumbering and undiscovered, and only required the stimulus of external causes to rouse it into action. I think

strong arguments may be adduced on either side. It is evident that the earliest signs of inflammation should be looked for in those persons who manifest the tubercular cachexia; and it will, I think, accord with the experience of most physicians when I add that there is a susceptibility to irritation and congestion of the pulmonary organs from trivial causes in these cases, similar to what occurs in the different textures of the body, when the blood is contaminated by the detention of noxious elements, which the impaired or damaged secretory organs are unable to elminate from the system.

"Catching cold" is so constantly assigned as the starting-point of active pulmonary disease, that we cannot escape from the conclusion that it is no mean factor in the development of tuberculosis. There is a case recorded by Dr. Hermann Weber* of a boy, ten years of age, the son of healthy parents, who had an ordinary sore throat, in August, 1871. This was followed about the twelfth day by pain in the right side of the throat, extending to the ear, and causing deafness; the tympanic membrane became yellowish and prominent, and Dr. Weber suggested that it should be perforated, and if the advice had been carried out it might have saved the child's life. In November, 1871, he began to cough, and was sick and feverish; the pulse was 139, and the temperature 103°. The chief symptoms were headache, sleeplessness, constipation, and dry cough; crepitant rhonchi were heard, but no dulness. There was deafness, but no discharge from the ear, and the urine was non-albuminous. There were two temperature elevations every day between 103° and 105°, and two depressions to between 98° and 100°, and the pulse varied from 65 to 160 in the minute. The boy died, November 26th, and during the last few hours of life the temperature rose from 101.5° to 106°. On a post-mortem examination gray miliary tubercles were discovered in the pleura, pericardium, liver, and meninges of the brain. The right temporal bone and internal ear were normal, but the tympanic cavity was filled with soft caseous matter.

Indifferent health may be present in a large number of cases for years, and the patient may remain free from any actual disease; but when exposure has led to cough and febrile symptoms, then ensue the usual signs of bronchitis, accompanied with expectoration. No dulness is to be detected below the clavicles at first, or

* Clinical Transactions, vol. viii, 1875, p. 135.

above the spine of the scapula; but, at a later period, this significant sign is added to the rest, and we are irresistibly led to believe that we are dealing with a case of pulmonary phthisis, originating in catarrh. In many young persons, when the chest yields a clear note on percussion, and there is bronchitis affecting the smaller as well as the larger tubes, the lungs are found studded with miliary tubercles after death. Death has been so rapid in many instances that the development of these granulations must have preceded the last inflammatory attack to have reached such a mature stage. The diminution of resonance (often not to be detected) does not become apparent in these cases till the bronchitis has existed for some considerable length of time. I do not think that this view altogether invalidates the doctrine that the tubercles may not have initiated the bronchitis. The same causes originate varied affections, modified by susceptibility and constitution, though not following the same order.

In the progress of ordinary phthisis, which continues for years, each fresh attack of tubercular deposit is preceded by bronchitis. It is of common occurrence to meet with children who have dulness under one clavicle, harsh or feeble respiration, defective expansion, and prolonged expiration. Such a patient takes cold or gets wet through, and then the dulness on percussion is increased, and the inflammatory process leads to a further deposit of tubercle.

When tubercle is being deposited in the lung, bronchitis is one of the most common attendant symptoms in young subjects. If the bronchitis is persistent, and does not yield as readily as the uncomplicated affection, it excites suspicion of tuberculosis; when tubercle is disseminated equally through the pulmonary organs, the sign of consolidation is sometimes wanting, and this is apt to lead us astray. In a depraved state of health, the formation of tubercle takes place rapidly or slowly, and general crepitation may be detected throughout the chest; but there may be neither dulness nor prolonged expiration. There is but little cough, and if the subject is young the expectoration is swallowed. As the disease advances these last symptoms become more developed, hæmoptysis occurs, the lips become livid, the extremities cold, and delirium may supervene. These are, of course, rapid cases, and strictly bear the name of acute phthisis.*

Febrile symptoms are significant, and when the attacks are

* See Chap. XL, On Phthisis Pulmonalis.

severe or frequent they will generally be found dependent on the rapid formation of tubercles. But persistent feverish symptoms are sometimes met with in young children when there are no signs of a local character in the chest—no cough, no wheezing—and yet after death the lungs are found to contain tubercles. "I attended a little boy," says Dr. James Russell, of the Birmingham General Hospital, "aged six, with one of the most experienced surgeons of this town. His illness lasted for eight weeks; my attendance comprised the last week only. His sole symptom was persistent feverish reaction, though with scarcely any delirium; the one single symptom of a local character was constant rapidity of breathing. The child's chest was searched over and over again, both by my colleague and by myself, for any indication of disease, but to the very last percussion was normal; not even a wheeze could be discovered; and there was entire absence of cough and expectoration. Death was rather sudden, I suspect, from fainting. On examination, both lungs were positively filled with tubercles."* No mention is made of the temperature, but the feverish reaction and rapid breathing were very significant. If the half of one lung is obstructed in its functions by the rapid development of tubercles, they must occasion serious mischief by diminishing the power of the respiratory apparatus. In some cases where the production of tubercles is rapid and general, a state of tubercular asphyxia takes place, attended with embarrassed breathing bordering on suffocation, without suppuration in the lung or the usual symptoms of phthisis.

What is the pathology of such a frequent case as this? A young person takes cold in winter and is seized with cough—spitting and dyspnœa. During the cold weather he is tormented with his ailment, and cannot lose it till the warm weather returns. The patient appears in good health, and has not lost flesh or strength; he relishes and digests his food, and there is neither sweating nor diarrhœa. He is well in the summer, but every winter has a return of the symptoms, and each succeeding attack is more troublesome to shake off than the one that has preceded it. By-and-by the disease does not subside in the summer, and general and physical signs are added, which prove the serious nature of the affection; he now slowly begins to lose flesh and strength, and the expecto-

* Braithwaite, On Fever and Bronchitis as early signs of Phthisis, vol. lxi, p. 70, 1865.

ration becomes thicker and purulent; dulness is detected in one or both apices of the lungs, followed by softening, and a fatal termination. So much for bronchitis as a cause.

I am not sure that the means employed to reduce pneumonia in some constitutions may not prostrate the vital powers and lead to degeneration of the effused lymph, which otherwise might become organized and cast off in the healthy progress of the disease. No problem in medical practice demands more consideration for its solution than that which requires us quickly to determine at the bedside, how far we may safely venture with antiphlogistic remedies in acute disease. If active inflammation long assails vital organs like the lungs, and is timidly dealt with, the effused products after a while resist absorption and become irritating; and if the measures employed are too vigorous, then the general strength may either fail at once or decline more gradually. But a deadly disorder may grow out of the attack. Rare as it is for tuberculization of the lung to succeed pneumonia, recent investigations have shown how numerous are the sources of blood contamination, and from what slight irritation it may arise, so that we cannot dismiss the danger from our minds where a large extent of lung is involved in inflammation, even if no predisposition exists.

Symptoms.—It is a distinguishing feature of tuberculosis in childhood that several organs may be affected at one and the same time,—the lungs, the liver, the pleuræ, the spleen, kidneys, and peritoneum, when special symptoms common to disturbance in any of these organs become developed. The general symptoms, however, may be present for an indefinite period without our being able to trace any local lesion, and when this is so we shall presently see that the elevation of temperature is the only reliable ground for diagnosis. The symptoms will vary according to the seat of the tubercular lesion. Among the earliest I have noticed is pain in the stomach, the child being frequently brought under our notice by his parents for this solitary symptom, when the more general and common features of the disease, as loss of flesh, thirst, and evening paroxysms of heat, have not yet indicated its approach. I have particularly noticed this symptom of gastric pain, and occasionally vomiting, even in those exceptional instances where I have had reason to think considerabe care has been bestowed on diet and regimen. For weeks together I have known this symptom continue, and while it lasts digestion is interfered with, the chil-

dren have a pinched and exhausted look, and they lose flesh quickly. It demands attention and care, for it may be the evidence of mischief springing up in the abdomen or peritoneum when the lungs are free from any infiltration of tubercle.

Among other common symptoms is a capricious and irregular appetite, sometimes amounting to hunger, while at other times food is so disliked that the weak stomach can retain it only for a short time. When the meal lies too long undigested in the stomach it creates flatulence, pain, acid eructations, and diarrhœa. The motions vary in color and consistence, sometimes being deficient in bile and costive or loose; at other times they are dark, or have a glairy appearance resembling the white of an egg; the urine is acid and turbid on standing, throwing down pink or even white lithates; the tongue is glazed or furred at the dorsum, or it is of a bright red at the tip and edges, the papillæ being prominent. When the appetite is capricious there is a dislike for any fatty kind of food, thirst is commonly present, and the pulse is habitually quick and weak. If the local symptoms remain obstinate, a state of hectic fever is established, and under emaciation, high temperature, and diaphoresis, the patient gradually dies with the local determination of tubercle to some special organ, as the lungs, brain, or peritoneum.

Temperature.—Wherever the deposition of tubercle is taking place, the temperature gradually increases in elevation, and the destructive changes in the lung continue. Of twenty-four cases recorded by Dr. Ringer, in which tubercle was being deposited, in twenty-one there was a continued elevation of the temperature of the body, and in these twenty-one cases the deposition of tubercle was proved, during life, by increase of physical signs, or after death by the post-mortem appearances.* The temperature, according to some observers, has been noticed not to exceed 99° in some cases of acute tuberculosis, and that in the evening, when the maximum temperature is usually attained. It must be admitted that these cases are exceptional; and here I would give my own experience, that the temperature has been persistently higher in the evening than in the morning. But when this process of deposition has ceased, the lung becomes tough and puckered, and the cavities lined with fibrous walls, whilst the temperature falls to the normal

* On the Temperature of the Body as a means of Diagnosis in Phthisis and Tuberculosis. Walton and Maberly. 1865, p. 5.

point. So it seems evident that when the granulations have undergone this change, or have become quiescent and ceased to irritate, tuberculosis is curable. These cases are not unusual. Bronchitis, which is so commonly associated with softening of tubercle, and recognized by rhonchus and moist sounds, is a symptom to be expected and watched for. Here we have a rise of temperature proportionate, probably, to the tubercular infiltration and the bronchitis set up by it, though there may not be enough to interfere with the proper aeration of the blood, or to excite cough or dyspnœa.

Small deposits of tubercle, when scattered through a considerable portion of the lung, are not to be detected by physical signs, and we may not suspect such a condition till a disease like pneumonia or pleurisy sets in. Most of the symptoms of failing health and delicacy in a young person are put down to some change of constitution in the absence of frequent cough and expectoration, but the mischief has long been resident in the lungs, and the inflammatory attack only was wanting to rouse the graver evil. Some years ago I met with a young person who caught cold, and got an attack of pneumonia. There were frequent dry cough, increased frequency of respiration, bronchial breathing, accelerated pulse, wasting, and high temperature, but no expectoration or moist râles. Percussion was dull and bronchophony was general over the posterior surface of the lungs. The patient apparently recovered, but two years later died with all the symptoms of pulmonary tuberculosis. For years she had been delicate, and her family feared she might die of consumption, but one medical man after another assured her friends there was no deposit of tubercle.

There are many cases of children dying of tubercular meningitis, in whom tubercle is also met with in the lungs and peritoneum, who have exhibited no symptoms of its presence during life, and yet after death it is found so abundantly scattered through these organs, that it becomes a mystery how it was that we did not discover the morbid changes that were going on by some general or physical signs. Even the cerebral symptoms are sometimes so rapid and unexpected that the source of mischief must have been lying dormant for some considerable time.

When, moreover, it happens in tuberculosis that the weight of the body is kept up (and this is not unusual if the appetite is

good, and there is no exhausting diarrhœa going on), we are the more driven to rely on a continued elevation of temperature as the only sure point of diagnosis in doubtful cases. For a considerable time the temperature may continue high and the weight of the body remain undiminished, as in many cases of ordinary and advanced phthisis the patients retain their weight when eating well and taking cod-liver oil. But this symptom would not justify us in concluding that the disease was arrested, unless physical signs were present also, and showed improvement. It will be acknowledged that, when patients with considerable lung disease are progressing most satisfactorily, they are liable at any moment to a relapse with the complications of profuse expectoration or hæmoptysis. In these cases, if we watch the physical symptoms, we could scarcely be unprepared for the changes.

The temperature in tuberculosis is subject to so much variation that a large field of observation is required to draw any practical conclusions from it, and cases require careful and diligent watching. When, in any given case of illness in a young person, the temperature is daily elevated for a considerable period, and the continued fevers can be excluded, we may suspect tuberculosis, even if the general symptoms scarcely point to the possibility of this condition. We must be sure that the thermometer is correctly registered before it is placed in the axilla, and that the arm is kept well against the side for ten minutes or a quarter of an hour.* The temperature is said to be so slightly altered in some cases that it scarcely exceeds the normal standard, but my experience induces me to think that it never remains so if tubercle is being deposited. Soon the evening temperature is slightly elevated, and later on, in some instances, there is a rise both morning and evening. At midday, or about 5 P.M., we often observe a regular and well-marked rise, varying according to the activity of the disease.

Dr. Wilson Fox† says that "Lebert found in 22 cases the mean evening temperature of acute tuberculosis was as follows: in 2 not exceeding 100.4°; in 8, including those last mentioned, not exceeding 102.2°; in 9, more than 103.4°; in 4, from 103.4° to 104°; in

* In the case of young and fractious children, the thermometer may be inserted into the rectum, and one minute will be long enough for it to remain there.

† On the Temperature, Pulse, and Respiration in Phthisis and Acute Tuberculization of the Lungs, Med.-Chir. Trans., vol. lvi, p. 397.

1, from 104° to 105.5°." Dr. Fox found that a temperature of 104° was not exceeded by 62.5 per cent. in acute tuberculosis, and by 36 per cent. in acute phthisis. Temperatures exceeding 105°, with two exceptions (acute rheumatism and phthisis), are found exclusively in acute tuberculosis. Both Wünderlich and Lebert record cases of hyperpyrexial temperature before death. The latter mentions one case where it rose to between 107° and 108°, and, as we have noticed (p. 485), the temperature reached 106° shortly before death in Dr. Weber's case.

The more I have thought and pondered over the fluctuations of temperature in disease, the more I have doubted the possibility of constructing any classification from which to draw any accurate conclusions. Diseases like tuberculosis and phthisis, which are usually protracted and tedious, are those generally selected for experiment; but even these give such varying results that nothing absolutely definite or uniform can be gathered from them.* Patients must live under precisely the same circumstances if deductions are to be of any practical value; the hygienic conditions must be alike, the age and constitutional tendencies must be weighed and balanced; the state of the lungs must correspond, the disease being either active or quiescent, and the treatment must be the same. When tubercle is forming, the temperature may rise to 106° or more. Dr. Theodore Williams has recorded a case of phthisis in the "active third stage," in which the maximum temperature was 104.6°, and the minimum as low as 93.6°.† There is often a rise after 2 P.M., or, as is frequently the case, about 5 P.M. At the latter time it not unfrequently rises to the highest point in tuberculosis. It is possible that tubercle may form and the disease advance without any rise of temperature, which is perhaps due to exhaustion and collapse. The last writer also mentions a case of phthisis in which active disease was going on, and there were nightsweats and hæmoptysis, and yet the temperature was normal throughout.‡

Sweating, which so certainly reduces the general strength, is a common feature in cases of phthisis, though it is not even a neces-

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* If it is the rule to meet with high temperatures in tuberculosis, it should not be forgotten that the lungs may be studded with tubercles and the temperature remain persistently low.

† On the Temperature in Phthisis Pulmonalis, Med.-Chir. Trans., vol. lviii, p. 95.

‡ Ibid., p. 79.

sary feature here. Where the temperature remains persistently high for some time and then begins to decline, sweating is met with. In cases of nervous exhaustion and general weakness it is to be anticipated, so that, though it is not an invariable rule in phthisis or tuberculosis, the debility consequent upon either of these last conditions may produce it independently of elevation in temperature. The sweating that is due to a febrile condition of the body is generally noticed as the fever declines, and it thus becomes a natural and efficient means of reducing the fever without the aid of drugs; but when it comes on from sleep or exertion or fasting, it is due to exhaustion. How far these conditions may coexist, viz., fever and debility, is a point we cannot always easily decide, but, as the case advances, the difficulty is cleared up. Sweating, therefore, is a far less certain indication of tuberculosis than a persistent elevation of temperature; though, where the latter condition exists, too much weight should not be attached to its importance as a significant sign.

Pulse.—The pulse is another and more valuable guide than sweating. As the temperature rises the pulse usually increases in frequency; but this is not an invariable rule, for the temperature may reach a high point, as 103° or 104°, and yet the pulse remain infrequent, and the respiration quiet. I am inclined to think that when the pulse and respiration remain slow, and the temperature goes on rising, the patient is often in a perilous position, and that more correspondence in the relations are preferable for a hopeful diagnosis, than when the variance is so great. The pulse, therefore, is no guide in the absence of fever, or the deposition of tubercle. Then, too, when the temperature is falling, debility and exhaustion may send up the pulse, so that this is not an infallible guide—a nervous or hysterical temperament will accelerate the circulation, and this may deceive some persons if they are not aware of the condition. The pulse, therefore, as a guide to the diagnosis of tuberculosis, is of less value than the elevation of temperature. Dr. Wilson Fox says that an accelerated pulse is not constant in acute tuberculization of the lungs. He contends that it may be frequently less than 100, and in some fatal cases below 70 both in the morning and in the evening. When the disease is progressing or established the pulse is quickened. When it is slow, and accompanied by a low temperature, there is more chance of the disease being arrested or cured. Of the relation between the

pulse and the morning and evening temperatures, which is not without scientific interest and practical value, Dr. Fox found in 54 cases that the evening pulse was quicker than the morning in 20 cases; it was slower than the morning in 22 cases; the evening pulse equal to the morning in 12 cases. Of the mean pulses, in 46 cases the evening pulse was quicker than the morning in 28 cases; the evening pulse was slower than the morning in 12 cases; the evening pulse was equal to the morning in 6 cases.

The respiration becomes accelerated in proportion to the severity of the disease, and that in the evening is somewhat in excess of the morning. Sometimes quickness of breathing is the chief but overlooked symptom in acute tuberculosis; and I should attach extreme weight to such a symptom, as I should also to oppression of the cardiac region and dyspnœa in rheumatic pericarditis before physical signs were present. The respiration, as may be expected, bears a close relation to the quickness and slowness of the pulse. In health they correspond, and in fever as the circulation is accelerated the respiratory movements become more frequent; blood is transmitted with greater frequency to the respiratory centre, and stimulates it to discharge an increased amount of work. In double pneumonia, when the blood is more venous, the dyspnœa and respiration become so increased that by this symptom alone we judge of the perilous state of the patient. When the tuberculosis is intense there is usually acceleration in breathing, and both in the morning and in the evening the respirations are above 30 in the minute. In 54 cases of the quickest pulse, the evening respiration was quicker than the morning in 25 cases; the evening respiration slower than the morning in 23 cases; the evening respiration was equal to the morning in 6 cases. In 54 cases of the slowest pulse the evening respiration was quicker than the morning in 24 cases; the evening respiration slower than the morning in 17 cases; the evening respiration equal to the morning in 13 cases. Of the mean respiration in 46 cases the evening respiration was quicker than the morning in 20 cases; the evening respiration slower than the morning in 20 cases; the evening respiration equal to the morning in 6 cases.

But between the rate of the pulse and the temperature, as I have previously stated, there is no necessary relation. The temperature may be high, and the pulse slow, or *vice versa*. We may have a morning pulse of 140 and the temperature 97°; the evening

pulse may be 130 and the temperature 95° or 96° (Wilson Fox). We must infer that the variation in temperature may be accompanied with a pulse of the same frequency; those cases which are distinguished by a rapid pulse are commonly those where the temperature is highest, and low pulses are generaly met with where the temperatures are low. These conclusions of Dr. Fox accord with my experience of some other pyrexial states. Quick breathing may be associated with a slow pulse, and in exceptional cases slow breathing with a quick pulse. In one case of acute tuberculosis, the quickest pulse was 136, and the respirations 28; the slowest pulse was 88, and the respirations 32. Some condition of the nervous centres due to hysteria or exhaustion may explain this.

The relation of the respiration to the pulse is more definite than it is to the temperature; the slow pulse is usually accompanied by retardation of the respiration, whether it be morning or evening; but the pulse may be slow whilst the respiration is rapid. The pulse is more influenced by the temperature than the breathing; a slow pulse and rapid breathing may coexist with low temperatures, but a quick pulse and rapid breathing may also be associated with low temperature. When the pulse and respiration are both low the temperature is generally normal, or nearly so. Pyrexia may exist with little acceleration of either; or the temperature may be high and the pulse quick, whilst the respiration is scarcely accelerated. This applies to some other febrile states besides tuberculosis.

According to Dr. E. Smith and Dr. Fox, rapid pulses with slow breathing are not observed in the early stages of phthisis. For many of the foregoing calculations concerning the relations of the temperature, pulse, and respiration in tuberculosis I am indebted to the perusal of Dr. Fox's paper on this subject, who has collected a large number of facts from his experience and that of others.*

The two following cases are not without interest.

Case I.—Jane C——, æt. 6½ years, first came under my care at the Samaritan Hospital on October 24th, 1874. She was an intelligent child, with fair hair and gray eyes, and had grown beyond her strength. During the winter of 1873 she had had an attack of croup, and had been ailing ever since. Her father and mother

* Med.-Chir. Trans., vol. lvi, 1873.

were healthy, but a younger brother was the subject of rickets. She was too weak to take any exertion, and in the evening was feverish and hot, with a bright circumscribed flush on the left cheek. It was seldom observed on the right cheek. The chief symptoms complained of were pain in the stomach and constant sickness, so that she could retain nothing that she swallowed. She had a short, frequent, and troublesome cough, and expectorated a little thin phlegm; she complained of thirst and headache, and the tongue was covered with a thick white fur; latterly, she had become irritable and fidgety, and it was difficult to amuse or please her. There was some obscure dulness under the left clavicle, but no harshness of breathing or moist sounds; the cardiac sounds were very distinct under both clavicles. The temperature was 104.5°, pulse 160, respiration 40. I ordered the child to be kept in the prone position until the sickness was relieved, and to be fed frequently with a tablespoonful of milk and lime-water. In the shape of medicine, citrate of potash was given in effervescence with hydrocyanic acid. She was to be sponged with tepid water in the evening, and if free from pain, to have a grain and a half of quinine in a powder at bedtime before the paroxysms were expected.

27th.—The child was better, but the flushing had continued regularly morning and evening; any fatigue or excitement brought it on. The sickness and pain in the stomach were abated, she slept quietly at night, and made no complaint of headache; the tongue was cleaning at the tip and edges; pulse 96, temperature 99°. As the bowels were inclined to be costive, and the motions green, I prescribed a powder at bedtime, consisting of gray powder, bicarbonate of soda, and powdered rhubarb, of each two grains.

November 10th.—She was much better, having had flushing of the face only twice the previous week on the same day; the sickness was completely arrested, and the bowels acted regularly every morning; the tongue was clean, and she was bright and animated; pulse 92; temperature 99.1°; respirations 24; urine clear. When the fever was off her she was to take the quinine powder three times a day. Since last visit she had taken a pint of milk daily, besides beef tea and mutton broth.

24th.—She had much improved, her cheeks having filled out, and her appetite amounting to hunger. The temperature was only 98°, the pulse was 140, and this probably from nervousness,

as an attempt at examination was enough to cause flushing. She had flushing of the left cheek from overexcitement at play; it had been noticed on both cheeks, but generally on the left—never on the right cheek alone. She spat up a good deal of phlegm, and often had the feeling of wishing to clear her throat; the bowels were quite regular. Since her illness began she was generally restless in her sleep, and at these times was always flushed; the abdomen was increasing in size, and her clothes came together round the waist with difficulty. The mother noticed this swelling for the first time a week before. The region of the liver was smooth, but slightly projected below the ribs, and the belly generally was tumid and protuberant, though free from pain and tenderness. She was ordered a teaspoonful of cod-liver oil twice a day, and as much nutriment as she could digest comfortably.

On December 8th the report states that the bowels had become very loose; the motions being dark and ragged-looking; she complained of pain in her eyes, and there was headache; since the diarrhœa began there had been more flushing, which kept to the left cheek; the abdomen still increased in size. There was more cough, and some dulness below the spine of the left scapula, with mucous rhonchus. The mother refused the child to be admitted as an in-patient, and I did not see her again till November 6th, 1875, when, on calling at her house, I ascertained the following facts: After her last visit she remained ill for about a month, and then gradually regained her flesh and strength, and her body returned to its normal size. The medicine was continued regularly during this time. The chest now expanded well, but the percussion note did not appear to be quite so clear on the left side as on the right, and there was dulness in the suprascapular space of the same side, but no moist sounds anywhere. There was no enlargement of the liver or spleen, and the belly was soft and natural. Allowing for some excitement at my unexpected visit, I found the pulse did not exceed 84, respirations 24, temperature normal. The child was in every respect healthy, and went to school regularly. I see no reason to deny the possibility of a deposit of tubercle in this case, and the fall of temperature indicates its arrest, if not its cure.

Case II.—P. E——, æt. 12, was first brought to me on the 19th of April, 1875; he was the son of healthy parents residing in an elevated district in the neighborhood of London, and had five

brothers and one sister. The eldest brother died at fourteen years of age of heart disease, apparently unconnected with rheumatism. He had always experienced fair health till six weeks since, when he took cold, and had feverish symptoms at his school in Staffordshire, where the atmosphere was damp and humid. His illness was thought to be whooping-cough, but this was doubtful, as no medical man was consulted, and after his return home his parents never heard him whoop. His second brother, who went to the same school, was lately seized with rheumatic fever, and died there. He had lost much flesh, and was very thin, his clothes hanging loosely on him. He was a slender and delicate lad, with downcast eyes, and a sad, wearied expression; the veins were very prominent and distended over the front part of the chest, and the spine was much curved from weakness, the lower angle of the right scapula being within an inch of the spine; the left was three inches from it. Phthisis was not hereditary, and no member of the family on either side appeared to have suffered from it. The symptoms complained of were great languor and prostration of the strength; he had little inclination to enter into any amusement with his brothers, and if he did he was soon fatigued and glad to lie down. He had a short, frequent, hoarse cough, and spat up a little light tenacious phlegm in the daytime, but more particularly in the morning on waking. Towards evening he got flushed, and complained of headache and thirst; his mother noticed that he was restless in his sleep, and that the skin was hot and not sweating. On examination of his chest the expansion was good and equal under both clavicles, though, in consequence of his having lost so much flesh, the depressions above and below the clavicles were very marked, and the shoulders rounded and bent forward; the percussion-note was resonant, and the vocal vibration greater than usual; but this was explicable on the ground that the thoracic walls were very thin, and the intercostal spaces everywhere depressed.

A similar reason may explain the loud and rather harsh character of the respiration under both clavicles, but there were no moist sounds. On percussing the back the dulness was greater in the supra-spinous fossa on the left side than on the right; but in the absence of submucous or sonorous rhonchus, the result of this physical examination did not enable me to pronounce the patient tubercular when I was pressed for an opinion. I thought he was, and that in the course of a short time I should detect unmistaka-

ble evidence of such pulmonary changes that all doubt would be set at rest. The skin was dry and harsh, the temperature 102°; the pulse 136; the respiration quiet; bowels costive; urine clear and non-albuminous; the tongue presented a whitish coating, and the appetite for food was imperfect, which in genuine tuberculosis is sometimes craving and voracious. I ordered him a diet of beef tea, milk and eggs, and he was to have cocoa instead of tea. In the shape of medicine two grains of quinine were prescribed, morning and evening, and a syrup composed of squill, senna, and poppy, to soothe his cough and keep the bowels open. (Form. 64–74.)

May 13th.—He looked marvellously better, being fuller in the face and more animated; he had coughed less, and was never flushed in the evening; his appetite was greatly improved, and he rested well at night; pulse 112; respirations 24; temperature 98°. For three days he had complained of pain in the right side, below the nipple, which was increased on coughing or taking a deep inspiration; but as auscultation revealed nothing abnormal, the pain was probably neuralgic or muscular. The chest-sounds were the same as at the last report, but there was some laryngeal irritation and hoarseness. He was ordered to apply a warm poultice to the side at night, and to use a sponge-bath with Tidman's sea salt every morning. A mixture containing hypophosphite of lime, quinine, strychnia, and tincture of perchloride of iron was substituted for the simple quinine mixture.* This is an excellent combination in cases of anæmia and nervous exhaustion, and the slow blood-change which occurs in the diatheses of struma, syphilis, and tubercle.†

June 9th.—The laryngeal irritation had not lessened, and the cough was hacking and troublesome in the morning, but unattended with expectoration; there was no sweating, and he slept well. Nearly three months later (at the end of August), after

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* Formula 73:

R. Calcis hypophosphitis,	℈ij
Tinct. ferri perchl.,	ʒiss.
Quiniæ sulph.,	gr. vj
Liquor. strychniæ,	ʒss.
Syrupi,	℥j
Aquam ad	℥vj.—M.

A tablespoonful three times a day.

† See a paper by the author On the Hypophosphites of Iron, Quinine, and Strychnia, in cases of General Debility and Nervous Exhaustion, Clin. Trans., 1870, vol. iii, p. 1.

gaining flesh and going on remarkably well, he became faint and languid and lost his appetite from indiscretion in diet. He was irritable and fretful, and nothing went right with him, which was attributable in a great measure to over fatigue and excitement in the hot weather. His voice was now clear, and he did not suffer from cough or laryngeal irritation. The chest-sounds were normal. He derived the greatest benefit from the hypophosphites, and a month later went to Brighton apparently well.

I might relate other cases of a mixed and puzzling character, allied to genuine tuberculosis in many of the local and vital symptoms. If the lungs and other organs appear to be free from the deposit of tubercle at the time a patient comes under observation we may pronounce the illness as simple and uncomplicated, and give a favorable opinion, because recovery, so far as I have been able to trace the progress of the disorder, has sometimes followed the continuance of a class of symptoms which have borne the closest connection with what appeared to be at one time an irremediably hopeless condition.

We will consider the treatment in the next chapter.

CHAPTER XL.

PHTHISIS PULMONALIS OR PULMONARY CONSUMPTION.

Definition of the term—Nature of the disease—Analysis of the blood in phthisis—Varieties of phthisis. ACUTE PHTHISIS OR GALLOPING CONSUMPTION (ACUTE TUBERCULOSIS)—ACUTE PNEUMONIC PHTHISIS—BRONCHIAL OR CATARRHAL PHTHISIS (CASEOUS OR SCROFULOUS PNEUMONIA)—CHRONIC PHTHISIS (CHRONIC TUBERCULOSIS—TUBERCULAR PHTHISIS)—FIBROID PHTHISIS (CIRRHOSIS OF THE LUNG). SYMPTOMS: *Constitutional—State of pulse—Cough—Hæmoptysis—Diarrhœa—Physical signs of the different stages—Duration of the disease—Complications.* CAUSES: *Predisposing and exciting—Inflammatory origin of—The scrofulous diathesis—Hereditary tendency—Anæmia—Exhausting illness.* DIAGNOSIS OF ACUTE PHTHISIS FROM TYPHOID FEVER—TREATMENT OF TUBERCULOSIS: *General management—Effect of quinine and purgatives—Cold sponging—Cod-liver oil—Change of air—Sea bathing.* TREATMENT OF PHTHISIS *to be regulated according to the stage of the disease—Early or incipient phthisis—Attention to the digestive functions—Avoidance of cold—Warm clothing and attention to the general health—Counter-irritation—Seaside residence—Action of belladonna in controlling nightsweats and diarrhœa—Sulphate of atropia—Vinegar and capsicum as a local application—Management of the second or confirmed stage of the disease—To encourage expectoration, when*

it is copious and oppresses the patient, by emetics of sulphate of zinc and ipecacuanha—Treatment of cough—Hæmoptysis and diarrhœa—Management of the febrile paroxysms—Hypophosphites of lime and soda—Calumba—Bark—Preparations of iron—Quinine—Strychnia—Cod-liver oil—Phosphoric acid.

It may be well now to consider the disease called phthisis from a special or clinical point of view. Already I have referred to it with regard to its relation to tuberculosis. Now there are forms of phthisis not clearly tubercular, but as tubercle bears so close a relation to this subject, I must again repeat much of what I have said in the chapter on tuberculosis, just as in that chapter I was obliged to anticipate much that will be said on phthisis here.

The usual acceptation of the term pulmonary phthisis means wasting away. It is a constitutional rather than a local affection, associated with malnutrition and a depraved state of the blood, leading to destructive disease of the lung. In England it is both common and fatal, on account of the variable temperature of this country. It spares neither sex nor age; but the young are its special victims.* As we have said before, when speaking of tuberculosis, phthisis, which in its commonest types is allied to that disease, is often associated with a certain delicate physical beauty, and with high mental qualities. The gradual sinking and death of a typically phthisical subject has a painful, yet picturesque aspect, which has not escaped the notice of artists, poets, and writers of works of fiction. Those who are fair and beautiful, refined and accomplished, succumb rapidly or gradually to its ravages.

The leading constitutional symptoms which denote its presence are a gradual decline in the general health, and a persistent and harassing cough, with little or no expectoration at first, accelerated breathing and pulse, febrile paroxysms, nightsweats, disturbed sleep, emaciation, diarrhœa, and occasionally sudden death. The physical signs are those of pulmonary congestion, followed by consolidation, and eventually by the breaking down of the lung itself.

The peculiarities which distinguish the deposition of tubercle in early life cannot be too strongly insisted on and understood, for they are strikingly different to what we observe in later years. In

* Of 584 cases noted by Dr. Austin Flint, only one case occurred under ten, and one-half the cases occurred between twenty and thirty. Dr. Dobell's Reports on Diseases of the Chest, vol. ii, 1876, p. 19.

children there is a tendency to the diffusion of tubercle in the chief internal organs—as the brain, the lungs, liver, spleen, kidneys, bronchial and mesenteric glands, whereas in adults the pulmonary organs are remarkably prone to suffer. The disease may continue in one lung for years, and ultimately cause death without spreading to the other. Cavities are not common in the lungs of children, though I suspect that in catarrhal phthisis they are of more frequent occurrence than is generally supposed. Certainly the cavities are smaller, and they are sometimes numerous. This general diffusion of tubercle in children lends considerable support to Dr. Wilson Fox's view, that pulmonary tubercle is a primary growth, and the changes that subsequently ensue are owing to inflammation.* This of course involves the question of hereditary liability, and a state of the blood and tissues favorable to the tubercular dyscrasia. Dr. Andrew Clark notes a different view, as the following extract shows:

"The generic term (phthisis) comprehends all progressive consolidations and circumscribed suppurative disintegrations of the lungs; the specific term should indicate by a distinct adjunct the different states concurring to this end. For surely if the progressive consolidation and suppurative destruction of lung constituting phthisis be determined in one instance by tubercles, in another by pneumonic exudations, in a third by scrofulous growths, and in a fourth by fibrous invasions, and if these things be in any sense different from one another, common sense demands that their differences should be permanently recorded by distinctive designation. Hence it is both convenient and correct to speak of tubercular, scrofulous, pneumonic, fibrous, and bronchial phthisis."†

We have now to inquire in what the disease consists, how it originates, and what is its true pathology?

These are questions to be answered before we can proceed to discuss its causes and its treatment. In ascribing it to a defect or disturbance in the functions of any particular organ or tissue, we have still to inquire in what the morbid action consists. Is it not due to some primary blood change, which alters the nutrition of the body, and deranges the circulation, thus leading to exudation of materials of a low standard, incapable of absorption and irritating to the organs in which they are deposited, and thus by causing

* Trans. Path. Soc., 1873.

† Clin. Trans., Case of Fibroid Phthisis, by Andrew Clark, M.D., 1868, p. 187.

the production in them of fresh growths, involves them in destruction and decay. This seems a reasonable hypothesis, if, as I have pointed out in the previous chapter, the subcutaneous injection of inflammatory products, or tubercle itself, can originate the disorder in some of the lower animals.*

There is cell growth of imperfect formation with a great tendency to die, the more rapidly the cells are formed the less vitality they have. Healthy blood determines a healthy performance of all the organic functions, digestion, nutrition, circulation, secretion, and excretion; but when it is diseased or altered from that of health, then indisposition in some shape or form arises. Some function departs from its normal condition; and where the tubercular habit is present a morbid change ensues, which leads to the formation of tubercle, just as some other habit of body may develop another organic disease.

We can no more conjecture what determines this particular change than why children of the same family differ in physical form and mental capacity. It is an inscrutable law beyond the limits of our understanding.

Acute Phthisis (acute tuberculosis).—I have briefly alluded to this in the last chapter, and quoted a case by Dr. James Russell, of Birmingham, in which the lungs were studded with tubercles, and yet the patient had no physical symptoms before death beyond rapid breathing. It was evidently a case of acute phthisis, such as we sometimes see in young subjects following cold, and in whom there is a constitutional liability to the disease. The disease is so rapid and violent in its character, that there is no time for the action of remedies, and it runs its fatal course in a few weeks. The absence of physical signs when a few tubercles are deposited through the lungs is common enough, and we often see this verified in the post-mortem room. In such cases, there is frequently no dulness on percussion, and no alteration in the breath-sounds. When miliary tubercles are thickly deposited through the lungs, there will be found general bronchitis, announced by rhonchus and sibilus, the chest may or may not be dull in places, and the pulse and respirations are accelerated. The weakness is very great, and the wasting of flesh general. In the autumn of 1879, I was requested by a neighboring practitioner to see with him a boy ten years of age, who was dying from pulmonary disease. Several

* See Chap. XXXIX, On Tuberculosis.

members of the family had died of consumption. He had been only ailing a month with rheumatic pains in his joints, and had had no cough till within a few days of my visit. We found him sitting up in bed perfectly collected and intelligent, but breathing rapidly; the livid lips, the pallid face, the coldness of the hands, and the failing pulse, told of his approaching dissolution. The chest was resonant on percussion both in front and behind, but universal râles were heard throughout all diameters of the bronchial tubes, which were enormously loaded with mucus. Below the spine of the left scapula, the lung was evidently breaking down, judging from the cracked-pot sound on percussion, and the bronchial breathing. I suspect that the other portions of the lungs were filled with gray granulations, and some of them were passing into caseous change. The patient gradually became worse, and died in about thirty-six hours after my visit. No post-mortem examination was permitted. "They (gray granulations) break out simultaneously, like the eruption of an exanthem, and by their numbers and bulk induce such an amount of obstruction and congestion of the lungs, as to destroy life before there is time for any considerable degeneration or softening to take place. This *acute tuberculosis* is the worst and most surely fatal form of consumption."*

Another form of *acute phthisis* is that which commences with inflammation in one or both lungs, loss of appetite, dry lips, red tongue, thirst, cough, and expectoration. There may be hæmoptysis. There is usually high fever, the temperature reaching 105° in some cases in the evening, quick pulse and accelerated respiration, followed by chilliness, and sweats at night. The physical signs, if limited to one lung, indicate the stage at which the disease has arrived, from dulness on percussion arising from consolidation to the cracked-pot sound, and tubular or bronchial breathing with coarse crepitation. Death may take place in a few weeks. After death the lungs are found consolidated and hepatized from inflammatory deposit, and in places the yellow matter is breaking down into cavities. It is this form of disease which has received the name of *galloping consumption*. "To my mind, what seems certain in this form is that *scrofulous* imflammation, scattered

* Pulmonary Consumption, by Drs. C. J. B. Williams and C. Theodore Williams, 1871, p. 2.

broadly through the pulmonary substance, causes its rapid and extensive disorganization."*

In treating of the pathology of bronchopneumonia, I mentioned that it sometimes ended in tuberculosis and caseous change. This is really one of the forms of phthisis called "Catarrhal Phthisis," the result of inflammation. It is therefore implied that phthisis is sometimes due to inflammation which has clogged up the air-vesicles, and at others to degenerative changes, to adenoid or lymphatic, throughout the pulmonary tissue, in which the bronchi have no share in the morbid process. That form of consumption in which miliary tubercle is scattered through the lung without breaking down of its tissue into destruction and cavities, I have spoken of in the last chapter.

Catarrhal phthisis is a form of phthisis prone to follow the bronchopneumonia of an exanthematous affection, especially measles. It is essentially a pneumonic disease, and does not owe its origin to tubercle. Extensive caseous changes may take place in the consolidation resulting from bronchopneumonia, and the child may be in fair health, till an acute febrile disorder rouses the exudation into activity, fresh centres appear, and the lung softens and breaks down into cavities. Where cavities exist after death, fibrous tissue sometimes circumscribes them, and binds the lung to the chest-wall. I have known one lung perfectly solid from caseous consolidation in a child five years of age, who had scarcely any cough, and no febrile disturbance till measles supervened, and then the lurking mischief was at once excited, and death took place a few days after the disappearance of the rash. After death there were two cavities in the left lung which showed recent formation. There was no healthy lung-tissue. The right lung presented no trace of disease, but tubercles were found in the liver and spleen, and there were also enlarged bronchial and mesenteric glands. "This condition is the yellow tubercular infiltration of Laennec, the scrofulous pneumonia, caseous pneumonia, or tubercular pneumonia of different modern writers."†

When phthisis is chronic, and is seen in connection with tubercle and with fibroid tissue, it is termed "mixed phthisis."‡ The presence of tubercle in the affected lung cannot always be discovered; the disease is sometimes acute, and involves the whole

* Principles and Practice of Physic, by Sir T. Watson, Bart., M.D.

† Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 502.

‡ Ibid., p. 504.

of a lung, while in another it is more partial and chronic. It is difficult, if not impossible, to frame definitions which shall include all these varieties. After all, they are merely different stages of the same morbid process varying in extent and degree.

The following is an interesting case of catarrhal phthisis traceable to inflammation, and in which, as I have just stated, the tubercular condition was followed by cavities in both lungs.

M. C——, æt. 4½, was admitted into the Samaritan Hospital, under Dr. Wynn Williams, November 4th, 1878, with a temperature of 101.8°; pulse 140; respiration 60. A year previously she had had whooping-cough and bronchitis, followed by diarrhœa, and subsequently failing health. There was a history of half starvation, and the child was weary and exhausted. An examination of the chest revealed dulness over the right sternum, loud tubular breathing mixed with coarse crepitation, and the voice was bronchophonic. The right lung was resonant before and behind, and the respiration was exaggerated. On the 16th the morning temperature was 99°, and the evening 104°; the pulse and respiration were the same as on admission; the cough was loose, the lips were dusky, and râles were heard throughout both lungs. On the 22d the morning temperature was 99°, the evening 102.4°, pulse 156, respiration 44, abdominal; the eyes were dull, and the lips dark and dryish. There had been slight wandering at night since admission. There was an enormous accumulation of phlegm in the air-passages, and râles were distinctly audible throughout the front and back of the chest. The carotid arteries beat actively, and the external jugular veins were distended from defective action of the right heart; pupils turned up under both eyelids; belly flat; urine high-colored, but non-albuminous; copious discharge from both ears. On the 27th there was loud pneumonic crepitation in the lower half of the left lung, which was dull on percussion; above, tubular breathing. There was subcrepitant rhonchus in the lower half of the left lung, and slight dulness. There was a slough behind the left ear, over the mastoid process, just as is sometimes seen over the sacrum in fever. From this time forward to her death (December 2d) the temperature did not exceed 100°, but the pulse and respiration were unchanged.

Post-mortem Examination, twenty hours after Death, by Mr. Alban Doran.—Body much emaciated, and large slough around the pinnæ of both ears. Lungs studded with caseous tubercle. Ne-

crosis of squamous and petrous parts of left temporal bone. The right lung was pale and emphysematous. There was a slender old pleural adhesion near the apex, a small cavity near the apex, and a calcified tubercular deposit in the middle lobe, and pneumonia at the base. The left lung was almost universally adherent to the thoracic walls, and infiltrated throughout with tubercular caseous deposit. There was a cavity large enough to hold a walnut near the apex, and much pneumonic change at base, with caseous tubercle. There were about two ounces of turbid serum in the pericardium. A broken-down lymphatic gland filled with pseudo-pus lay close in front of the aortic arch. The heart and brain were normal. The liver was large and studded with tubercle. The spleen contained a few caseous tubercles.

Chronic phthisis (*tubercular phthisis—chronic tuberculosis*) is the most common variety of consumption that we meet with. It occurs in the form of miliary tubercle, which usually selects the apex of a lung, instead of being thickly disseminated through both lungs, as in acute tuberculosis; hence the complaint is not so rapid in its progress, and there is a better chance of the disease being arrested, or followed by complete recovery. Following these granulations there is caseation, which causes consolidation of the apex, and ultimately softening and degeneration. The centre of the mass softens and breaks down into a cavity, whilst the circumference becomes harder and fibroid in its structure. It is supposed by some authorities that all the changes can occur without the presence of tubercle, as it was once thought that all the morbid changes were primarily due to tubercular deposit. It is in such cases as these that we hear of the complaint being arrested in its first, second, or third stage, and cavities remaining quiescent for many years. There may be a difference in the changes which take place in chronic cases, because, whether tubercles form early or late, they are always complicated with inflammation; the disease may begin with inflammation, and as it advances become tubercular—tubercles added to pre-existing inflammation.

The destructive process having begun in the apex of the lung gradually proceeds downwards, and the cavity, when of any considerable duration, presents a different appearance to those cavities which subsequently form in the centre or lower parts of the lung. The walls of the cavity in chronic cases of pulmonary disease are dense, tough, and hard; they are lined by a membrane which is

more or less vascular, and pours out a free secretion. "Cavities thus lined may continue to yield for some time a purulent secretion, which gradually lessens in quantity, and all active signs of disease elsewhere having abated the case becomes one of '*quiescent cavity.*'"* The process of destruction having been arrested, the dense cartilaginous tissue surrounding the cavity undergoes contraction, and so in time diminishes its area. Those cavities which are recent have no defined outline; their walls are ragged, soft, and irregular, and may contain pus or broken-down lung-tissue. I have recorded such a case in a boy, where the cavities were very recent, although the lung disease was of considerable standing.† "There has been no induration of any part by the development of connective tissue, but the whole lung is crowded by soft, yellow, albuminous, or scrofulous matter, which has undergone so rapid a softening that the whole lung resembles a sponge soaked in purulent matter."‡ In the case to which I have alluded the whole lung, except where the two cavities existed, had the appearance of a Stilton cheese, where the white and sage-looking green parts are almost equal. It is a scrofulous material which tends rapidly to caseation and decay. There is no repair, or the possibility of it, in any lung so extensively infiltrated with this deposit.

When these changes are taking place in a chronic cavity of some standing, the bloodvessels become impervious, and thickened by hard lymph, hence hæmorrhage does not occur when vomiting or severe coughing ensues. The bronchial tubes do not, fortunately, share the same fate; their destruction proceeds with that of the pulmonary tissue, and hence they remain pervious. It is through them that the products of ulceration and suppuration make their way out of the system.

Fibroid phthisis (*cirrhosis of the lung—Corrigan*) is that variety in which the consolidation of the lung has undergone a fibrous induration; it is tough, and becomes contracted when the pulmonary tissue is compressed from pleuropneumonia, so that no exudation is thrown out into the air-cells, and the plastic matter is confined to the interstitial texture; if not reabsorbed it leads to contrac-

* Clinical Lectures on Excavation of the Lung in Phthisis, by R. Douglas Powell, M.D., The Lancet, 1877, vol. i, p. 523.

† The Lancet, 1879, vol. ii, p. 504.

‡ Pathological Anatomy, by Wilks and Moxon, 1875, p. 344.

tion and consolidation.* In this disease the bronchi are dilated, because as the air enters the chest it cannot obtain admission into the air-cells.† Hughes Bennett, Addison, Wilson Fox, Bartels, and other authorities, have shown that dilatation of the bronchi is a common consequence of bronchopneumonia in children, and that this dilatation disposes to thickening around the bronchi, and to induration of the pulmonary tissue. The parts surrounding cavities are often dense and firm, "and the process of cicatrization of such cavities is almost always affected by the production and contraction of a fibrous tissue of a similar character."‡ The disease may arise from pneumonia, or from pleuropneumonia, when the effusion thrown out into the interstitial texture of the lung becomes transformed into a tough fibrous-like tissue. "Fibroid lesions may arise from interlobular inflammations, from long-continued chronic bronchitis, from the extension of dry pleurisies into the lung, and from the transformation of pneumonic exudations. They produce contraction and induration of the lung, and occasionally dilatation of the pulmonary tissue of the bronchial tubes. Sometimes fibroid lesions lead to caseous pneumonia and to 'tubercles;' more frequently they occur alone. Their clinical history is characteristic; it is slow in its progress, apyretic in character, and sooner or later produces albuminuria and dropsy."§

Dr. Pollock states that "*Bronchitis* is a less common origin of fibroid changes, but it is observed in children and others; in the former after pertussis or rubeola, when collapse of a portion of lung is apt to occur, followed by contractile fibroid proliferation."‖ Dr. Wilson Fox also writes: "If we consider the course of acute bronchitis in children, and recollect how constantly dilatation of the bronchi occurs in this condition, both in the idiopathic form of the disease, and also in the course of measles and whooping-cough, it can only be a subject of surprise that permanent lesions of this nature are not more commonly met with as the results of these diseases."¶

This sequence of events looks very much like the blood having also undergone some important changes. "But there is also, prob-

* Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 502.

† Ibid.

‡ Pulmonary Consumption, by Drs. C. J. B. and C. Theodore Williams, 1871, p. 37.

§ Prefatory Note on Phthisical Lesions of the Lungs, by Dr. Andrew Clark, 1877.

‖ Clinical Demonstrations of Phthisis, The Lancet, 1876, vol. ii, p. 566.

¶ Reynolds's System of Medicine, article Chronic Pneumonia, vol. iii, p. 756.

ably, a peculiar fibrinous state of the blood, which Rokitansky calls a *fibrinous crasis*, in certain cases, rendering the products of inflammation more fibrinous than usual, and with smaller proportion of the corpuscular element; and tending, therefore, to produce more fibroid or contractile tissues, and less of the purulent and opaque curdy deposits which originate in the corpuscles or sarcophytes."* There may be differences of opinion as to the manner in which the disease originates, but the tendency is to cause contraction and induration of the texture in which the morbid matter is deposited, and sometimes to be followed by caseation and cavities in the lungs. The bronchial tubes also become dilated or contracted according to the part of the lung which is chiefly affected. When the lower part is invaded the air cannot get beyond the larger tubes, and so the pressure of the inspired air dilates them; while, at the upper part, the tubes are contracted from the shrinking of the lung towards the spinal column, the collapsed state of the chest-wall, and the displacement of the heart upwards.

"In characteristic cases of this nature, the cut surface of the lung is smooth and glistening; it is hard, and creaks like cartilage, or resembles the tissue of the uterus. It tears with the greatest difficulty, and no longer presents the granular appearance of ordinary pneumonia. No fluid can usually be expressed from this tissue."†

The *constitutional* symptoms of phthisis in some cases are slow and insidious; they are frequently overlooked till attention is invited to the chest, and then the presence of physical signs is too often conclusive. Illness has begun with slight catarrh, bronchitis or pleurisy, or pneumonia, and the child has not been well after it. It gets a severe cold, followed by pain in the chest, cough, and quick breathing; it improves for a time, and then gets another cold, which is more obstinate, and if any expectoration is seen it is opaque, and perhaps streaked with blood. As the case goes on, the temperature rises towards evening, sleep is disturbed at night, and the pulse and respiration are habitually quick. If the child loses appetite it wastes rapidly, there is thirst, it is fretful and irritable; the bowels are irregular, constipation is often present at an early stage, and diarrhœa later on. The

* Pulmonary Consumption, by Drs. C. J. B. and C. Theodore Williams, 1871, p. 63.

† Wilson Fox, op. cit., p. 767.

motions are greenish and loose, or clayey and offensive, and the abdomen is often large. In a case of chronic tuberculosis in a child 6½ years, who came under my care in 1875, the illness had only become observable to her friends a fortnight before I saw her; but the child was strumous and delicate-looking, and had been kept hard at her lessons till she broke down. She was fast losing flesh, and was burnt up with fever at night, yet there were no chest symptoms, and no cough or expectoration; the pulse averaged 120, morning temperature 99°, evening 101°. She remained under treatment for six months, and when I saw her then she had not improved; there was a little cough, a pulse habitually quick, and a temperature always above normal in the evening.

Hæmoptysis is another important symptom, but it is not frequent among children as a symptom of phthisis. Still it does occur now and then, especially where tubercular or pneumonic consolidation is breaking down. In an early stage it is due to active hyperæmia, to an undue determination of blood to the congested mucous membrane, and not to venous obstruction. In advance phthisis it arises from aneurismal dilatation of branches of the pulmonary artery being ruptured, and is rarely bronchial, whereas, in early phthisis, it is generally bronchial.* In bronchopneumonia and whooping-cough a little blood is frequently coughed up from overdistension or fragility of the capillaries, and the patient is none the worse for it. I have known a child, 3½ years of age, born of consumptive parents, and suffering from tuberculosis, bring up at one time a tablespoonful of blood, a year before any other chest symptoms were noticed. This hæmorrhage was then followed by loss of flesh, intense thirst, and febrile exacerbations towards evening. Small mucous râles were detected over the front of the chest and below the spine of the right scapula, which area was also dull on percussion. There was harassing cough, and thick sputa were coughed up, occasionally tinged with blood. Hæmorrhage from the lung would seem to have been the starting-point in this case—the real cause of the lung destruction. "Our experience of many thousand cases has led us to conclude that hæmoptysis to the extent of more than a drachm—in a person free from the hæmorrhagic diathesis, from cancerous disease of the lung, injury to the chest, disease of the heart, and from disor-

* Dobell, op. cit., p. 20.

der of the uterus—is indicative of a fragile state of the vessels of the lungs, closely connected with, and generally arising out of, consumptive disease of these organs."*

Hæmoptysis is less copious in the first than in the third stage of the disease. Dr. Douglas Powell has recorded a fatal case of hæmoptysis in an infant seven months old. Five other children of the same family had all died consumptive, the father had chest disease, and the grandfather died of phthisis at thirty-three. "Without having had any previous attack of hæmoptysis, the infant suddenly expectorated more than half a pint of dark clotted blood, and died almost immediately. On a post-mortem examination the surfaces of both lungs were studded with subpleural gray miliary granulations of tubercle, and the lungs, on section, were also found to be disseminated with gray granulations."† It has also been stated, in corroboration of Niemeyer's view, that in cases of severe hæmoptysis portions of blood are drawn into the alveoli, which they occupy as fibrinous nodules, and that these may set up irritation, produce a calcareous mass, or even cause laceration of the pulmonary tissue and cavities.‡

The *physical* signs of phthisis ought to be carefully studied, because they throw light upon the general symptoms of the disease, and strengthen our diagnosis, when the indications afforded by either alone might leave us uncertain. Phthisis is both a constitutional and a local malady—constitutional in the sense that it has a preliminary stage, if I may so term it, and the patient may be consumptive without any tubercle in the lung. The local change, when it does ensue, is the effect of the constitutional taint. Many children present all the general characteristics of pulmonary consumption—wasting of flesh, quick pulse, and harassing cough, and yet the chest affords no evidence of disease; the resonance is not impaired; the breathing is clear.

I have before said that tubercle tends to diffusion in young subjects rather than to concentrate itself on the apices of the lungs, as it does in adults. Still we occasionally encounter cases in young subjects where the morbid changes do not extend to the base of

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* Pulmonary Consumption, by Drs. J. C. B. and C. Theodore Williams, 1871, p. 145.

† Path. Trans., 1874, p. 40.

‡ Pathological Traces of Pulmonary Hæmorrhage, by Reginald E. Thompson, M.D., Med.-Chir. Trans., 1878, vol. lxi, p. 261.

the lungs, or if tubercle is scattered extensively through them, it mainly involves the upper lobes, and softening takes place before the patient has lived long enough for the like destruction to ensue in the lower lobes.

We shall speak of three stages of the disease:

1. That of deposit.
2. That of consolidation and softening.
3. That of suppuration, when cavities form.

Space will not admit of fully considering all the signs which various authorities have from time to time held to indicate consumption. I am bound to admit that my own experience concurs with those who are unable to declare whether mere feebleness or harshness of breathing, imperfect expansion of the chest, loudness of the heart's sounds, or bronchophony, are, any one of them, taken singly, reliable indications of tubercular disease. I think not.

Although it is important to examine the chest carefully throughout both in front and behind, the upper portions of the lung above and below the clavicles, and the suprascapular spaces, should never be overlooked. The interscapular region too often affords evidence of enlarged bronchial glands, which may serve to clear up any doubt.

First Stage.—Looking at ordinary cases as we meet with them in practice, the earliest indications of a deposit of tubercle in the pulmonary tissue are an alteration in the breath-sounds; the inspiratory murmur is weak, harsh, jerking, or bronchial, and the expiration (which is far more significant) is loud and unduly prolonged. Mere weakness of breathing does not go far as a diagnostic sign, as it occurs in many cases of general debility, and disappears with improved health. It may arise in consequence of a narrowing or obstruction of the bronchioles, pleuritic effusion, thickening of the pleura, and emphysema, which impair the elasticity of the lungs.* A comparison of the two sides of the chest is the only test of its quality, since it is very rare to find both lungs similarly involved.

Harshness of breathing is another sound at variance with the softness of health, and when also rough or blowing it passes into bronchial breathing with moist sounds. It arises from thickening and loss of elasticity in the air-cells, and also from a dry condition of the bronchial membrane.

* Clinical Demonstrations of Phthisis, by J. D. Pollock, M.D., the Lancet, vol. ii, 1876, p. 179.

When there is a change in the quality of the breathing, and the expiration is prolonged, it may be considered to indicate commencing mischief. In some states of debility among children, and in bronchitis and emphysema, audibility and lengthening of the expiratory murmur are not uncommon. This is very apparent in thin exhausted subjects when they allow the air to escape from the lung by a sudden or spasmodic effort, as they often will do when the chest is being examined. We have all observed in practice how short the inspiration is, compared to expiration, in fat and feeble subjects, when the heart is weak and the patients are breathless from flatulence or exertion.

Jerking, *wavy*, or *interrupted* respiration is only valuable as a means of diagnosis when taken in connection with other signs. Alone it is unimportant.

Changes in the form and movements of the thoracic walls are worthy of careful observation, as throwing much light on the condition of the lung. When the patient is placed in a suitable position, and the hand is laid over the sternum during inspiration, a comparison of the two sides can easily be made, and any inequality of expansion is detected through the amount of tubercular deposit. The other retrogressive changes are the sinking-in of the thoracic walls, the cup-shaped depression below the clavicle, the rounded shoulders, the bent form, the contracted chest, and the distorted spine.

Dulness on percussion is another diagnostic sign on which great reliance has been placed, and it sometimes comes to our aid; but it is not always present, as I have pointed out in enumerating the physical signs of tuberculosis. There may be considerable tubercular deposit scattered through the pulmonary tissue without causing any dulness whatever. Still in that variety of phthisis in which there is a localized deposit of tubercle in the apex of a lung, there is diminished resonance or heightened pitch.

Vocal fremitus is another physical sign to be remembered. It is dependent on the extent of pulmonary condensation beneath the thoracic walls, but it is not always present, and there are usually other signs of more significant import. Children's chest-walls are thin, and the normal vibrations are readily conveyed through them; fremitus, therefore, is often present when there is no disease. "We may, I think, conclude that whenever there is an equal amount of vocal fremitus in both infraclavicular regions the left

side *probably* is diseased; and that whenever the vibration is greater on the left than the opposite side it is *almost certainly* so."* Regarding bronchophony, another valuable sign, the same writer remarks: "If there be an equal amount of bronchophony in both infraclavicular regions, the left is *probably* morbid; and if there be a positive excess on the left side, it is *almost certainly* so; a greater development of vocal resonance, however, on the right side, is no indication of tubercular deposit, although it may be looked upon suspiciously should the excess be very highly marked."† Undue propagation of the heart's sounds, subclavian or pulmonary murmurs, are all signs of some assistance in suspected tubercular consolidation.

Moist sounds heard at the apex of a lung at the seat of tubercular deposit are very significant. There is a sound called *dry crackling rhonchus*, which is regarded as conclusive evidence of tubercle. It is a dry and crackling sound, generally heard during inspiration, and indicates an advanced condition of the *first* stage. These crackles are at most three or four in number, and are produced external to the air-cells; they are not always heard, and they are succeeded by a moist kind of crackling. The sound is not unlike subcrepitant rhonchus, which is, however, moist and bubbling, and can scarcely be mistaken for it. Subcrepitant rhonchus, however, succeeds it, and if heard at the apex is very significant, although if bronchitis be present it may be heard at the base also. This sound passes into humid crackling. If there is dry cough, a little flocculent expectoration, with febrile symptoms and any loss of flesh, the early stage of phthisis is confirmed. Dr. Pollock has known the stage of deposit to remain quiescent over and over again for fifteen or twenty years.‡

If phthisis is the consequence of bronchitis, the signs of the latter disease are increased, rhonchus of a sonorous or sibilant character is heard below the clavicles and over the greater part of the sternum, as well as between the scapulæ. If these sounds are persistent, and are more heard at the upper portions of the lungs than at the lower, they are suspicious of early phthisis, especially if the resonance on percussion is impaired in places. If also subcrepitant rhonchus accompanies the expiratory as well as the in-

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* Phthisis and the Stethoscope, by R. Payne Cotton, M.D., 1864, p. 35.

† Ibid.

‡ Op. cit., p. 179.

spiratory murmur (which, according to Dr. Williams, the crepitation of pneumonia never does), then this view is the more suspicious.*

Crepitation is a sign of obstruction to the entrance of air into the pulmonary tissue in consequence of swelling, or the presence of secretion in the air-cells. When phthisis is the result of acute pneumonia, the dulness on percussion continues, and there are bronchophony and tubular breath-sounds. After a time this chronic consolidation undergoes change into fibroid or caseous matter, in the one case contracting, and in the other breaking down into one large cavity, or several small cavities.

Second Stage.—The physical signs announcing the commencement of the *second* stage, or that of softened tubercle, are much the same as those already described. Seeing that the first stage may continue for an indefinite time, it is difficult to draw the exact line of demarcation between them. A tubercular mass may reach a considerable size in one case and produce extensive disease of the lung and pleura before it begins to soften, whilst in another case degeneration takes place in the mass at an early period. A very important sign of this stage, particularly if it is at all advanced, is increased dulness on percussion of the affected side, and the note has sometimes that particular jarring, hard, dull sound which is termed "*wooden.*" It is not a frequent sound. It seems to be produced only when consolidated lung is bound to the thoracic wall by thickened pleura (Cotton).

There is another sound, called *humid crackling* rhonchus, which may or may not be preceded by *dry* crackling. It consists of a few moist, large, clear, abrupt, clicking sounds, of varying intensity, generally during inspiration, but they may be heard during expiration also, masking both acts; this clicking is also due to softened tubercle—to destruction of lung tissue, and when once heard cannot well be confounded with subcrepitant rhonchus, which is of a bubbling character; and if the two sounds are present at the same time, which is possible if there is congestion or inflammation around the softened lung, the distinction between them is all the easier. This click in the course of time becomes louder, moister, and more or less *metallic*, subsequently passing into the third stage, or that of gurgling rhonchus. When the clicks are slow and few, and occur at intervals, the mischief in the

* Pulmonary Consumption, 1875, p. 169.

lung proceeds much slower than when they are large, metallic, mucous, and loose.

In this stage there is often wasting and loss of flesh.

As we have seen, there is a difficulty in separating the first from the second stage of phthisis, so there is an equal difficulty in defining the termination of the second stage and the commencement of the third.

Third Stage.—This is reached when a vomica, however small, is present. Now, the clavicle on the affected side is more prominent, and the hollow beneath it is deeper and more cup-shaped towards its acromial end. On deep inspiration the lower part of the chest-wall is elevated, suddenly raised, as it were, by the contraction of the diaphragm; the forced muscles of inspiration come into play, whilst the upper part of the sternum is barely expanded at all, and the hand may not be elevated on the deepest inspiration.

Gurgling rhonchus is a moist, large, bubbling, metallic sound, heard during the act of inspiration and expiration when the cavity is small. It is the final stage of the humid crackling and large subcrepitant rhonchus which have been already explained. The percussion-sound is necessarily subject to great variation, according to the state of the lung, the adhesions that have been formed, the force employed in striking the thoracic wall, and the size of the cavity. The note, from being absolutely dull or "*wooden*," is sometimes scarcely altered from that of health. I have known the infraclavicular region of a child approach healthy resonance, when the sounds elicited by auscultation and the depressed and inactive state of the chest-wall have confirmed the last stage of phthisis. When I relied mainly on percussion as a means of diagnosis, I was often in doubt as to the state of the lung. When the vomica is large, and situated near the chest-wall, or only separated from it by thickened pleura or lung, the percussion-note has a peculiar hollow-like resonance, which has acquired the expressive term *amphoric*. When this sound is present, a modification of it, called the *cracked-pot sound* (*bruit de pot fêlé*), first described by Laennec, may sometimes be heard, if the chest over a cavity is struck suddenly, rather forcibly and abruptly, whilst the patient's mouth is kept open. This peculiar sound can only be produced when the cavity is large, and freely communicates with the bronchial tubes. "In children, however—the subjects of bronchitis or emphysema,

and even sometimes when in perfect health—the natural percussion now and then bears a very close, or even a complete, resemblance to the cracked-pot sound; so that in patients who are young —say under ten, or at most twelve, years of age—this sign is of no value in diagnosis, unless accompanied by other evidence of the presence of a vomica,"* and unless it contrasts strongly with the other side of the chest.

A cavity may form so gradually in the lung, and the process of disintegration may be so slow as to escape notice, till the character of the breathing decides the doubtful point.

When there is a cavity in the lung, the expiration may assume a hollow, blowing, metallic quality, termed *cavernous;* and if the cavity is large it may possess an amphoric quality, a sound which resembles blowing into an empty bottle. Cavernous respiration is not unlike bronchial respiration, but the latter is heard over a greater extent of lung, it is rougher in quality, and is wanting in the metallic type so characteristic of the former. If a cavity contains much purulent matter, or the bronchial tubes opening into it are clogged up, and the patient is very feeble, it may escape notice altogether. The gurgling rhonchus, too, when it is large or bubbling, according to the amount of secretion, may also obliterate the cavernous character of the breathing. Coughing will often throw much light upon obscure symptoms. "It is oftentimes by no means easy to detect the vomica of very young children. In such little patients the natural respiration over the entire chest is usually so blowing, that it is apt completely to mask the cavernous character of any particular spot. All the physical signs, indeed, but especially those derived from percussion, and the auscultation of the breathing, are, in young children, at their minimum. Cavernous rhonchus, when it exists in these cases, is, perhaps, the best help to diagnosis, being less likely than any other sign to be either obscured or overlooked."†

Metallic tinkling is sometimes heard when the vomica is very large and contains fluid; but I never remember to have seen an instance in a child, owing perhaps to the rarity in them of tubercular excavation. Pectoriloquy, for the like reason, is not a frequent sign.

Elastic tissue is sometimes detected in the expectoration of

* Phthisis and the Stethoscope, by R. Payne Cotton, M.D., 1864, p. 72.

† Phthisis and the Stethoscope, 1864, p. 84.

phthisical persons who have cavities in their lungs, but it is not always found. The best method of proceeding is to boil the sputa with a solution of caustic soda, and then to examine the deposit under the microscope. "Bronchial tubes may be recognized by their branching form, and are sometimes accompanied by fragments of bloodvessels. When only small crepitations can be heard in the lungs, the greater part of the deposit will be found to consist of air-cells; where the signs of a cavity are present you will meet with portions of the bronchial tubes in the sputa; fragments of the bloodvessels can be rarely detected excepting just before or during an attack of hæmoptysis."*

The physical signs of the tubercular form of *acute phthisis* have been considered when treating of this affection under the latter heading.

Phthisical Laryngitis.—When the laryngeal mucous membrane is ulcerated, the respiration over the trachea is harsh and loud, and the voice is changed to a whisper in some cases. With these symptoms those of ordinary phthisis are generally present.

Causes.—These are predisposing and exciting. Among the former the tubercular or phthisical diathesis is to be noticed, with its light hair and eyes, fair skin, long eyelashes, and thin lips; so that, looking at the matter from a hereditary point of view, we know when a child has inherited a scrofulous constitution or has come of tuberculous parents; the disease under these circumstances is readily lighted up on slight provocation. Residence on a wet soil or in badly-ventilated homes may induce it. It is a remarkable circumstance that phthisis is not found in certain countries and localities. Dr. Leared says: "In Iceland no phthisis exists; the atmosphere is cold and clear, and the inhabited parts are not much above the level of the sea. In Morocco, where there is also no phthisis, the atmosphere is the reverse of Iceland, and the soil is sandy; there is also no phthisis in the valley of the Jordan, which is eighty to ninety feet below the level of the Mediterranean, and the atmosphere of these three places is totally different from that of Davos."† Dr. J. H. Bennett also writes: "It is worthy of remark that the inhabitants of Iceland, living in a most unhygienic state, filthy in person and habits, and cooped up in badly-ventilated huts, are said to be all free from consumption, and from other forms

* Medical Diagnosis, by Dr. Fenwick, 1876, p. 83.

† Med. Soc. Proc., vol. iv, p. 259.

of tubercular disease. This fact is not improbably connected with their great consumption of oil as an article of diet."*

Among the exciting causes, we must consider the effect of previous inflammation of the lungs, frequent catarrh, hereditary syphilis, prolonged anæmia, and exhausting illness following the eruptive fevers.

Diagnosis from Typhoid Fever.—Acute phthisis is attended with such high fever that at an early period of the illness it may be mistaken for typhoid. The chief diagnostic differences are the natural form of the abdomen, the absence of the rose spots, gurgling in the right iliac fossa, and constipation rather than diarrhœa. Then, too, the cough, livid countenance, and dyspnœa, point to the chest as the primary source of mischief.

Treatment.—In considering the treatment of tuberculosis and the arrest or absorption of tubercle, we must, in a measure, disregard the varied and special symptoms of the disease, and sustain and support the general strength. The nutritive functions being primarily at fault demand the closest attention, and whatever conduces to their healthy performance holds out the best means of controlling morbid action, and of averting the tendency to local congestion and exudation; for when these changes have occurred, the molecules or granular matter of which the exudation consists are liable to lead to softening and disintegration.

As cases of tuberculosis differ like other forms of consumptive disease, remedies of a varied character are required. In some instances in children the temperature of the body is high at an early stage of the illness, and the circulation is accelerated; there is thirst and derangement of the gastro-intestinal tract, and food is not digested, even if there is any remnant of appetite left. Antiphlogistic measures and cooling drinks to subdue this febrile excitement are absolutely required. We have seen how frequently bronchitis or pneumonia is associated with this condition, and when they are met with, salines and diaphoretics are required before supporting measures can be safely employed. If the cough is hard and tearing, and there is soreness and constriction of the chest, a tonic and stimulating plan would aggravate the condition. When moist sounds in the chest have succeeded to dry rhonchus or tubular breathing, we may commence the system of treatment which modern practice has sanctioned, and give cod-

* Nutrition in Health and Disease, 1876, p. 93.

liver oil and mild tonics during the daytime. In the evening, when febrile symptoms are chiefly observed, citrate of potash and the alkaline carbonates will abate the excitement, and soon enable us to give quinine safely in small or large doses so as to check the febrile exacerbations. For children I am in the habit of giving a grain of quinine in powder half an hour before going to bed, and sponging the body lightly with tepid water, if hot and dry, or with cold water if the temperature is disposed to rise rapidly.

Cod-liver oil is the most effectual remedy of all others in the management of this disorder, and may be given when febrile excitement has not departed. Dr. Williams says: "Cod-liver oil, when taken into the system in sufficient quantities, and for a sufficient length of time, acts as a nutrient, not only adding to the fat of the body, but also promoting the healthy growth of the protoplasm and the tissue-cells, and in some way, as an alterative, counteracting the morbid tendency to the proliferation of the decaying cells of pus, tubercle, and kindred cacoplastic and aplastic matters."*

When the oil is pale and pure it seldom causes nausea or disturbs the functions of the liver. I prefer giving it after a meal in a little orange wine or with a small quantity of milk, which, however, does not always agree. Dr. Williams gives it with a mild acid or aromatic bitter—he gives the nitric, hydrochloric, sulphuric, or phosphoric, according to the special circumstances of each case, and I can speak most favorably of the combination. I have been in the habit of giving the hydrochloric acid before the meal, and the oil afterwards. In weakness of the stomach, with a tendency to retching and nausea, the $\frac{1}{24}$th or $\frac{1}{32}$d of a grain of strychnia is given by Dr. Williams with each dose of oil. But it must have come within the experience of every one that cod-liver oil, when long continued, is apt to disagree with the stomach, and to cause biliary derangement, particularly if the diet is not carefully regulated. Here it must be suspended for a time, and an alterative and alkaline treatment employed till digestion is restored to a healthy state. In the winter season of the year cod-liver oil is an indispensable remedy, and may be continued for months together. There is a preparation called the compound phosphorated cod-liver oil,† which I have found useful in the strumous

* Op. cit., 1871, p. 322.

† Prepared by Savory and Moore, New Bond Street. A fluid drachm contains one grain of iodine, two grains of bromine, and one-fortieth of a grain of phosphorus.

diseases of children. But, however combined, the daily use of the oil has superseded every remedy that has hitherto been proposed, and there is not a physician in this country or abroad, who is not convinced of its efficacy, both in prolonging life and in curing disease.

The hypophosphites of lime and soda, with strychnia, iron, and quinine, form an excellent combination, with which I am well satisfied in these cases, and in all states of general debility and nervous exhaustion.

Whilst we are giving astringents to check diarrhœa, and seda tives to relieve cough, we are diminishing the strength and appetite, and the disease meanwhile advances. The best means of relieving these symptoms is to increase the general strength, by supplying the system with fatty elements in a form that can be easily assimilated. We have found this remedy in cod-liver oil. The molecular fluid of the chyle consists of fatty particles, from which the blood and tissues of the body are formed, and if chylification is imperfect or tardy, the blood is watery and albuminous, and thus exudation is favored. Physiology never exposed a greater therapeutic error than when it showed the danger of treating low inflammatory exudation by depressing the vital powers so that its molecules were incapable of passing through those transformations which lead to growth and elimination. By an opposite mode of treatment depraved nutrition is restored, the respiratory organs are stimulated to active exertion, and the tissues attract from a better quality of blood the necessary elements for the support of the body.

In the case of an infant, if the mother is delicate, or comes of a consumptive stock, and cannot suckle her child, a healthy nurse should be procured. Older children who exhibit a tendency to tuberculosis should wear flannel next the skin; the diet should be plain and nutritious, consisting of eggs and milk, and meat twice a day if the child can digest it.

Quinine, by improving the strength and appetite, and iron, by altering the quality of the blood, are two most valuable remedies when the digestive functions have been brought into a proper state, and there is no risk of renewing inflammation in the pulmonary organs. If there is any degree of febrile excitement or cough, it is preferable to omit the iron till it is reduced, and direct the treatment to special symptoms. The effect of quinine in non-

tuberculous cases is very remarkable in controlling the remissions and exacerbations of the fever; it is the most valuable remedy we possess, and in every case of oscillating temperature which I have treated it has been followed by a fall. Where the fever has not so quickly yielded, the lung has shown evidence of some change, in the shape of small and localized pneumonia, or gastro-hepatic disorder, or there has been cause to suspect real tuberculosis. Cod-liver oil should always be given in the daytime, when the temperature is normal, and quinine in the evening, before the rise is expected. The benefits derived from change of air and sea-bathing are too obvious to need illustration.

When we encounter phthisis in the first or incipient stage, we should aim at improving the general health by placing the patient under the most favorable circumstances for controlling inflammation and promoting the absorption of any tubercle or low organized deposit that may have taken place. For this purpose, whatever encourages local inflammation and congestion, such as cold, damp, and exposure, should be dealt with. Flannel should be worn next the skin, and the feet especially kept warm. Congestion may be relieved by the application night and morning of diluted tincture of iodine (one in seven) to that part of the chest which gives evidence of localized mischief. When there is bronchial irritation and cough, a turpentine liniment, or camphor liniment containing croton oil, is one of the best and most serviceable applications. The remaining treatment of this stage consists in providing the patient with pure air and a seaside residence, if possible, such as St. Leonard's, Torquay, Ventnor, Bournemouth, or Clifton in this country, or the south of France and the healthiest parts of the Mediterranean abroad. Sponging with sea-water, followed by friction, will be necessary, and such exercise as the strength is equal to endure.

Children affected with consumption should not sleep with other children or occupy the same room at night.

In phthisis we have to deal with a low form of cell growth, which has a decided tendency to spread. Our energies then have to be directed to this condition, and this essentially depends upon the improvement of tissue nutrition, for these two things are requisite: first, the arrest of all outgoings which impoverish the system; and second, to improve the assimilation. To attain the first object it is necessary to arrest the nightsweats, and to hold

in check the diarrhœa. Where both exist, sulphate of copper is most useful, and it is often well to give opium with it. Where there are profuse sweats without diarrhœa, belladonna is our sheet-anchor. According to Heidenhain, belladonna paralyzes the secretory nerve-endings of the sudoriparous glands. Children tolerate belladonna much better than adults, and no serious toxic symptoms need be apprehended from anything like medicinal doses. It is well to prescribe belladonna in the form of its active agent atropia. As sulphate of atropia, belladonna can be given in precise doses, while it has the great advantage of being tasteless. Children will tolerate doses commencing with gr $\frac{1}{50}$th at bedtime, while doses of gr $\frac{1}{75}$th three times a day never give real cause for anxiety. The failure of belladonna may usually be traced to insufficiency of the dose. In the very rare cases where belladonna fails, oxide of zinc with hyoscyamus may be resorted to. Gallic acid, quinine, dilute sulphuric acid, and the tincture of perchloride of iron are all useful remedies to arrest night perspiration. When any of these remedies, and full doses of belladonna, fail to arrest the nightsweats, then it becomes necessary to sponge the child over with toilet vinegar, or with warm vinegar and capsicum (a teaspoonful of cayenne pepper to the half pint of vinegar diluted with water) about half an hour before the usual time when the sweats become profuse. The arrest of the loss of blood-salts in the sweats usually leads to improvement in the appetite. The next point then is to improve the assimilative process. It is useless to give tonics and hæmatics as long as the digestion is out of order. If the tongue be foul, an occasional dose of calomel at bedtime, with a little phosphoric acid and a vegetable bitter three times a day, is indicated. When the tongue is raw or bare, or denuded of epithelium, bismuth with a little alkali is called for. When the appetite has returned and the digestive organs are fairly working, then, and not till then, tonics and hæmatics may be prescribed.

Dr. McCall Anderson has recorded two interesting cases of acute phthisis in young subjects, which yielded to the treatment employed, the temperature falling in both instances from 105° to the normal point in the course of a few days; the copious râles disappearing, the appetite returning, and loss of flesh and strength being rapidly regained. To control the high fever he applied to the abdomen folded pieces of flannel wrung out of iced water for

half an hour at a time, and gave quinine, opium, and digitalis internally. For the profuse perspiration he had recourse to the subcutaneous injection of gr. $\frac{1}{100}$th of sulphate of atropia every night, which entirely arrested it after the second night. When the injection was omitted the swelling returned, and again subsided on resuming it. Nourishment in the shape of brandy, soup, and iced milk were given every hour.*

In the shape of medicines we must be guided in a great measure by the pulmonary condition. If it is tolerably quiescent, the syrup of the iodide of iron, the syrup of phosphate of iron, and the mineral acids will be demanded. Cod-liver oil or malt extract if there is wasting. When the disease has passed into the second stage or that of suppuration, we must employ such remedies as relieve cough and facilitate expectoration. If the patient is very weak, and the lung has broken down, the accumulation of matter in a cavity is attended with most distressing symptoms,—weight and pain in the chest, gasping respiration, incessant cough, wandering, sleeplessness, and excitement.

The inhalation of carbolic acid by means of the spray (1 in 40) will sometimes relieve this, but it often fails, and then it is necessary to resort to an emetic of sulphate of zinc,—about ten grains in a tablespoonful of water, followed by a little warm water, will effect this purpose. In a girl 14 years of age, under my care in 1869, with a large cavity in the upper lobe of the left lung, I found this act remarkably well. It never occasioned hæmoptysis, of which there is a dread, but enabled the poor child to throw off a large quantity of pus from her chest, followed by great comfort and relief in breathing.

Cough is a prominent symptom of phthisis, which always calls for attention. If it is loose and moderate, and the child can obtain a fair amount of rest, special remedies to check it are hardly needed; if given they are apt to impair the appetite, to derange digestion, and to lock up secretion. There are similar drawbacks to bromide of potassium, though to a less extent, but if the child is kept awake at night it becomes exhausted, and then the simplest remedies should be first tried, as poppy and squill.† If the cough

* On Acute Phthisis (Galloping Consumption), The Lancet, 1877, vol. i, pp. 413–415.

† Formula 74:

℞. Syr. papav.,
Syr. scillæ,
Syr. limonum, āā . . . . . ℥ss.—M.
℥j pro re nata. Intended for children from five to ten years old.

is hard and violent, with scarcely any expectoration, and there is vomiting also, morphia and hydrocyanic acid may be needed;* when it comes on in convulsive paroxysms, belladonna, stramonium, etc. If the tongue is furred, the throat irritable, and there is any amount of bronchitis, chlorate of potash, with syrup of tolu and morphia may be required,† and if the expectoration is difficult, ipecacuanha or squill may be given, according to circumstances.‡ Where there is great sleeplessness, hydrate of chloral, with bromide of potassium in syrup of tolu or squill, may sometimes be given with advantage. Where the respiration is accelerated because the lung-space is infringed upon, the administration of distinctly depressing remedies is fraught with danger of paralyzing the respiratory efforts.

In the treatment of *hæmoptysis* we must be guided by the amount of blood lost. If small in quantity, perfect rest should be maintained, ice to suck, and the avoidance of all stimulants may be enough to check it, but if there be any considerable loss, and the lung is breaking down, or there is a cavity, some styptic remedy must be employed at regular intervals. Dr. C. J. B. Williams speaks highly of gallic acid with acid tartrate of potash. Tannic acid and gallic acid combined, acetate of lead, ergot, and tincture of perchloride of iron are all useful in special cases. The diet should consist of milk, cold beef tea, broth, etc. It is important

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* Formula 75:

℞. Morph. acet., ... gr. ¼
Acid. hydrocy. dil., ... ♏xvj
Glycerini, ... ʒij
Aquam ad . . . . . ℥iss.—M.
ʒj pro re nata.

† Formula 76:

℞. Potass. chlorat., ... ʒss.
Liquor. morph. hydrochlor., ... ♏xx
Syr. tolutani, ... ʒvj
Aquam ad . . . . . ℥ij.—M.
ʒj pro re nata.

‡ Formula 77:

℞. Liquor. morph. hydrochlor., ... ♏xx
Vin. ipecac., ... ʒj
Oxymellis scillæ,
Syr. mori, āā . . . . . ℥ss.
Mist. acaciæ ad . . . . . ℥ij.—M.
ʒj pro re nata.

These prescriptions are intended for children from five to ten years old.

to keep the bowels well open, and for this purpose sulphate of magnesia and sulphuric acid, in infusion of roses, is a good formula. When the hæmoptysis has ceased, cod-liver oil and other tonics can be resumed.

Diarrhœa is another complication of phthisis tending to produce great exhaustion and emaciation. When persistent it may depend upon ulceration of the small intestine. It is a symptom that must be combated at once by remedies of a suitable character. If the tongue is coated, and there is impaired digestion or unhealthy fæces, a few grains of gray powder with rhubarb will be needed, and when the secretions are corrected, one of the diarrhœa formulæ will be useful.* Those containing bismuth, logwood, krameria, sulphate of copper and opium, acetate of lead, etc., are the best. Opiate enemata must be had recourse to in severe cases, and fomentation and poultices may be required if there is abdominal pain and tenderness. The diet should consist of rice, milk, arrow-root, etc.

The hypophosphites of lime and soda are highly spoken of by some authorities. They are especially recommended by Dr. Thorowgood. In many cases under his care "decided and unmistakable good came of their administration, and that too when other well-devised means of cure had proved useless."† He gives instances in which "nightsweats" and fever gradually disappeared, and moist sounds in the lungs ceased under their administration. In a few cases cavities contracted and became drier. Some of the patients when seen months afterwards appeared well. Dr. Thorowgood advises the hypophospite of *soda* when there is a tendency to gastric irritation, and the lime-salt in cases of diarrhœa. To the former a few grains of bicarbonate of soda may often be advantageously added. Where there is slight congestion at the apex of the lung, and there is crackling or clicking, it may be used, but if dyspepsia or bronchitis from recent cold is present, it should be temporarily exchanged for other remedies. In the early or incipient stage, when there is localized dulness, with harsh or tubular breathing, or even when crackling announces that the lung is congested or giving way, he has found them of great value. He gives the hypophosphite of soda or lime, in infusion of calumba, three

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* See Chap. XV, On Diarrhœa.

† On Consumption and its Treatment by the Hypophosphites, 3d edit., 1880.

times a day.* It may be combined with bark† or some of the preparations of iron.‡ The hypophosphites are well spoken of in combination with cod-liver oil, phosphoric acid, quinine and glycerin by Dr. C. J. B. Williams.§ "Of all the tonics for strengthening the stomach and preventing nausea, with the oil, strychnia is by far the best; and as it has no heating property, its addition to the compound orange infusion supplies the most elegant and effectual form of *oil-sauce* that I have yet devised."‖ I have long been in the habit of prescribing strychnia in these cases with the best advantage.

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* Formula 78:

℞. Sodæ hypophosphitis, ... ℥ss.
Syr. aurant., ... ℥iij
Inf. calumbæ ad . . . . . ℨvj.—M.

A tablespoonful three times a day. For children ten years of age and upwards.

† Formula 79:

℞. Sodæ hypophosphitis, ... ℥ss.
Syrupi, ... ℥iij
Inf. cinch. flav. ad . . . . . ℨvj.—M.

A tablespoonful to be taken three times a day. For children ten years of age and upwards.

‡ Formula 80:

℞. Tinct. ferri perchl., ... ℥j
Calcis hypophosphitis, ... ℥ss.
Glycerini, ... ℥iij
Aquam ad . . . . . ℨvj.—M.

A tablespoonful three times a day. For children ten years of age and upwards.

§ Formula 81:

℞. Sodæ hypophosphitis, ... ℥ss.
Acid. phosph. dil., ... ℥ij
Tinct. quiniæ,
Glycerini āā . . . . . ℨss.
Inf. aurant co. ad . . . . . ℨvj.—M.

A tablespoonful three times a day, with one teaspoonful of cod-liver oil. For children ten years of age and upwards.

‖ Pulmonary Consumption, by C. J. B. and C. Theodore Williams, M.D., 1871, p. 359.

CHAPTER XLI.

DISEASES OF THE HEART.

FUNCTIONAL DISEASES OF THE HEART. PALPITATION. DEFINITION AND SYMPTOMS: *Causes—Graves's disease—Chorea.* SYNCOPE OR FAINTING. NEUROSAL AFFECTIONS: *Causes, symptoms, and treatment.*

ORGANIC OR STRUCTURAL DISEASES OF THE HEART. PERICARDITIS: *Two varieties described—Acute and chronic—Symptoms, general and physical—Delirium—Mode of termination—Diagnosis and prognosis—Morbid anatomy.* CAUSES: *Acute rheumatism—Extension of pneumonia or pleurisy—Renal disease—Chorea—Scarlatina.* TREATMENT: *Local and general means—Venesection—Leeching—Blisters—Mercury—Opium—Stimulants.* CHRONIC PERICARDITIS: *Causes—Symptoms—Consequences—Treatment.* HYDROPERICARDIUM: *Active and passive—Local and constitutional signs—Treatment by purgatives—Diuretics and tapping.* ENDOCARDITIS. CAUSES: *Acute rheumatism—Scarlet fever—Bright's disease.* SYMPTOMS AND DIAGNOSIS: *Relation to pericarditis—Pathological changes—Liability to terminate in valvular disease and embolism.* TREATMENT: *Importance of ascertaining the cause and regulating the treatment accordingly—Perfect rest in bed to lower blood-pressure and excitement of the circulation—Use of hydrate of chloral.* MYOCARDITIS: *Occurs sometimes with endocarditis, scarlet fever, and typhoid fever.* ULCERATIVE ENDOCARDITIS (Kirke). DIPHTHERITIC ENDOCARDITIS (Rosenstein). INFECTING ENDOCARDITIS (Cayley): *Pathology—Diagnosis—Causes and treatment.*

VALVULAR DISEASE OF THE HEART: *General symptoms of—Disease of the aortic valves—Aortic regurgitation—Disease of the right auriculo-ventricular orifice—Tricuspid regurgitation—General and physical signs—Venous pulsation—Liability to anasarca and dropsy—Disease of the pulmonary valves* (Peacock)*—Disease of the left auriculo-ventricular orifice (mitral regurgitation)—Chiefly in girls—Symptoms and consequences of mitral disease—Congestion of lungs in—Character of the pulse—Obstructive disease (narrowing) of mitral orifice (mitral stenosis), state of the pulmonary circulation—Presystolic murmur—How produced and its importance as a diagnostic sign—Pathological anatomy of the diseased orifices and valves—Common causes of valvular disease, especially rheumatism—General treatment and management—Effects of digitalis in—Iron—Strychnia—Association with rickets* (Rokitansky, Hilton Fagge)*, distortion of thorax—Heart cough.* HYPERTROPHY AND DILATATION: *Causes due to obstructed circulation—General and physical signs—Character of apex-beat and pulse—Area of cardiac dulness increased; masked by emphysematous lung—Hypertrophy of right ventricle and dilatation—Epigastric pulsation—Hypertrophy and dilatation from chronic kidney disease—Treatment.* PERFORATION OF THE INTERVENTRICULAR SEPTUM (Niemeyer). DEFECTIVE CLOSURE OF THE FORAMEN OVALE. PULMONARY STENOSIS. CYANOSIS. (MORBUS CÆRULEUS, BLUE DISEASE): *Symptoms—Causes and treatment.*

IN children, owing to the thinness of the chest-walls, the impulse of the heart is diffused over a larger space than in adults; not unfrequently a part of the right ventricle may be detected beating immediately under the left costal cartilages, close to the sternum. The apex may also be seen, as well as felt, in the nor-

mal position. When the intercostal spaces are depressed, and the ribs prominent at their attachment to the sternum, the partial outline of the heart becomes all the more distinct. The shape of the chest, whether natural, rickety, or pigeon-breasted, will influence the area of percussion dulness, and the extent of the cardiac movement perceptible beneath the thoracic parietes.

The size of the heart does not increase with absolute regularity in childhood, for Rilliet and Barthez have shown that between the age of fifteen months and five years and a half, its circumference remains nearly the same, increasing slowly afterwards until puberty.

Functional Disease of the Heart.

Palpitation.—We understand by palpitation a frequent and tumultuous action of the heart, not usually accompanied by organic disease, though it is sometimes present in valvular affections. On placing the hand over the cardiac region, a sudden and violent thumping movement is appreciable, and the heart's action can be seen beneath the chest-walls. The sounds are exaggerated, and there is sometimes a soft bruit which vanishes when the organ resumes its ordinary tranquillity. When the disorder is well pronounced, there is considerable constitutional excitement, quick pulse, headache, and a tendency to syncope. The female sex is more liable to it than the male. As growth proceeds, and the health remains delicate, continued palpitation of the heart may induce hypertrophy or dilatation.

The *causes* of this functional disorder are the nervous temperament, running after meals, violent exercise, mental emotion, anger, fear, etc. It is often witnessed among choreic children, and those reduced by chronic or lingering disease, loss of blood, dyspepsia, and pulmonary affections. In Graves's disease (exophthalmia) the anæmic condition is accompanied by palpitation of the heart and throbbing of the arteries.

The *diagnosis* mainly rests on the absence of the signs of organic disease and the frequency of the pulse, followed by steadiness and regularity as the attack subsides.

The treatment consists in the removal of the cause, if this can be done, and the improvement of the digestive and nervous functions. Where there is dyspepsia, an alkali with hydrocyanic acid will calm the excitement, and afterwards the ammonio-cit-

rate of iron, with a drop or two of liquor strychniæ, according to age, may be given with advantage. The emplastrum belladonnæ may be applied over the cardiac region if there be pain there. When the symptoms persist, the main hope of relief depends on an improved state of the blood and attention to hygienic rules.

Syncope or fainting is occasionally observed in children of nervous constitution. A peculiar sensation is first experienced of dizziness and swimming before the eyes, and singing noises in the ears. Then the face and lips become pale, the skin clammy, and the pulse at the wrist so weak that it is barely perceptible. The patient if unsupported falls to the ground, and the breathing is hardly distinguishable. This alarms friends and bystanders, for the pallor of the face is deathlike, the muscles are relaxed, and the extremities are cold. By-and-by, if the recumbent posture is maintained, a few deep sighs are drawn, and as respiration is established the natural co'or of the face returns. Mild cases do not last over a few seconds and the pulse is only slow and weak; but severe cases continue for some minutes, and the patient no sooner shows signs of rallying than, in attempting to stand up, the syncope returns at once, the eyelids quiver, and drops of sweat stand upon the forehead.

The *causes* are loss of blood, or even the sight of it in some nervous constitutions, profuse diarrhœa, extreme fatigue, severe pain, and affections of the heart. Sudden shock, or even excitement, are also capable of producing the symptoms.

Treatment.—The recumbent posture should be maintained, and a current of fresh air be admitted; ammonia to the nostrils, sprinkling cold water over the face, loosening all dress, and friction of the limbs. When the patient can swallow, a little brandy and water, or a draught containing ammonia with spirit of chloroform, should be given. If the vapor of ammonia be applied to the nostrils, it should be done with care.

Neurosal Affections.—These consist of a neurosis of the cardiac ganglia, inducing functional disturbance in the heart's action. This neurosis is, I believe, a very common disorder among delicate children. When they cry on slight provocation, and are restless and excitable, a careful examination of the heart and circulation will often throw light upon an obscure set of symptoms. I have elsewhere fully entered into this subject.* The complaint

* Neurosal Affections of the Heart in Children, Practitioner, Sept., 1878.

is observed in weak and delicate children, and in those who suffer from chorea or nervous states resembling it. Children who are born prematurely, and who are badly reared and neglected during the first year of life, are liable to it as they approach seven or eight years of age, particularly if the strain of school life is put upon them too early. General debility from any cause, such as anæmia and loss of blood, by disturbing the equanimity of the nervous system, will cause perverted nerve action. It may follow whooping-cough, chronic enlargement of the tonsils, or chronic pneumonia. The offspring of nervous or insane parents are also subject to it.

The *symptoms* are, palpitation of the heart, followed by faintness and exhaustion. If the hand be placed over the cardiac region, a thumping, violent movement is communicated to it, accompanied by irregularity or intermission of the pulse. This symptom is always a sign of imperfect muscular action through the quality of the blood and the unstable condition of the nervous system. Sleep is unrefreshing, and restless or noisy; dreaming is common; and the urine often contains phosphates.

The *treatment* which I have almost invariably found successful consists in the employment of rest and tonics, good food, cod-liver oil, and warm clothing. Steel wine and arsenic (Form. 93), quinine, the syrup of phosphate of iron, the ferrum dialysatum (dialyzed iron), and Parrish's chemical food, are valuable remedies in particular cases; but I place the greatest confidence in a combination of iron, digitalis, and strychnia. If there is excitement, and sleep cannot be obtained, iron may be combined with the bromide of potassium.

Organic or Structural Diseases of the Heart.

Pericarditis.—Two varieties of pericarditis are commonly described, the acute and chronic. Inflammation of the pericardium consists in the first instance of distension of the capillaries, and secondly of effusion of serum or lymph exuding from them; and in some cases, as absorption of the fluid proceeds, it ends in the gluing of the two surfaces of the pericardium together. The character of the exudation is in a great measure dependent upon the constitutional condition of the patient.

The *general* symptoms of acute pericarditis are more or less pain in the præcordial region at the situation of the apex, or at the

lower end of the sternum; it may strike through the thorax to the scapula, or extend down the left arm to the elbow and wrist. The pain in most acute cases is of a sharp, lancinating character, and is aggravated at each shallow inspiration, or movement of the patient. He cannot turn on his side, or bear the slightest pressure over the thorax; even the weight of the bedclothes is oppressive. The pain in pericarditis, when accompanied by articular rheumatism, may be owing to an affection of the muscles; and in one case which came under my care, where the physical signs were not conclusive, the cervical muscles were considerably implicated, and the patient could not move his head from side to side in the slightest degree.* Sometimes the pain is of a dull, aching, continuous character, or it is too slight to attract notice; in many instances it is absent altogether, and the physician might overlook pericardial mischief, if the anxious and alarmed expression of the patient did not invite a close inspection of the thoracic contents. This anxiety of expression, moreover, is frequently noticeable before there are any reliable physical signs to indicate a lesion in the pericardium. Palpitation and irregular action of the heart are by no means infrequently added to the pain as the disease proceeds.

Pleurisy is sometimes associated with pericarditis, and may even originate the latter affection by extension.† Endocarditis is frequently present, the two diseases being in close relationship with one another, and arising from precisely the same causes.

Pericarditis sometimes commences with rigors succeeded by fever, and a full, hard, and frequent pulse,—in some cases it is small, unequal, or irregular. As effusion takes place there are dyspnœa, hurried respiration, great restlessness, and insomnia. The commencement of the disorder may be marked by heat of skin, but this is soon bathed in perspiration, and the face becomes

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* "But pain is far from being a constant indication of pericarditis, and M. Bouillaud has found it so often absent, that he attributes it, when present, to the coexistence of pleurisy, and Dr. Hope, although he does not agree with M. Bouillaud in this opinion, yet states as the result of his extensive experience, that in the great majority of cases of pericarditis the pain was either wholly absent, or was of a mild and endurable kind."—Semple, *On Diseases of the Heart*, 1876, p. 140.

† Dr. Sibson ascertained that in 31 out of 63 cases there was pain in the side; in 19 cases on the left side, to the right in 5, and in both sides in 6. In 15 out of the 31 cases a pleuritic friction-sound was heard in the side. On Pericarditis, Reynolds's System of Medicine, vol. iv, p. 232.

pinched and intensely anxious. In young children there may be early convulsions, and as exhaustion proceeds, and the circulation is more embarrassed, there is delirium, and abrupt sleep disturbed by dreams. In severe cases, the child has the expression of alarm and dread, he cannot lie easy in any position, and is afraid of being examined or approached. When the disease is about to terminate fatally clammy sweats break out, the face becomes livid, and the eyes are staring and glassy.

The characteristic auscultatory sign which renders the diagnosis unmistakable is a to-and-fro sound (*bruit de frottement*). This is the earliest sign of pericarditis, which cannot be discovered unless the friction-sound is produced. (The late Dr. Hyde Salter, and Dr. George Johnson, of King's College Hospital, insist that the friction-sound is triple "rub-a-dub dubb." There is first the auricular contraction, then the contraction of the ventricle, and lastly the dilatation of the ventricle in diastole.) This sound depends on the position of the exudation; if it cover the auricle there is decidedly auricular friction, such as Dr. Johnson has described; if the lymph cover the ventricle only, the sound is simply to-and-fro. This sound is caused by the rubbing together of the inflamed surfaces of the pericardium, and a very good imitation of it may be obtained by applying one end of a stethoscope against the ear, and the other against the palm of the hand. The forefinger of one hand is then rubbed backwards and forwards across the hand so applied, when the peculiar friction-sound will be transmitted through the stethoscope to the ear. The murmur caused by the attrition of the inflamed surface of the heart and pericardium closely resembles this. It varies necessarily in character and intensity according to the consistence of the effused lymph; if moderately thick it has a creaking character, like new leather (*bruit de cuir*), or a rasp-file-like sound (*bruit de râpe*). When effusion takes place to such an extent that the two surfaces do not approximate, the murmur is generally, though not invariably, lost, and the heart's sounds are distant or muffled. When the friction-murmur and the cardiac sounds both disappear, we may expect that the quantity of exudation is considerable. Important as this murmur is in a diagnostic point of view, we should err greatly if we supposed that its presence was necessary to the existence of pericarditis, for a large effusion may have taken place at a very early stage of the disease, and the sound will be absent

till the effusion has become partially absorbed. The absence of the murmur altogether is quite compatible with severe inflammation of the pericardium. An endocardial murmur is also frequently heard (proving the implication of the endocardium) in the space midway between the left nipple and the sternum, which soon extends over the whole præcordial region. The exocardial murmur is distinguished by the superficial character of the sound, and by its limitation to the cardiac region, as well as by its change of character, and its temporary disappearance when the effusion is great. If the effusion is purely liquid it may be absorbed, but if it be more fibrinous and solid, the pericardium is thickened, and the opposed surfaces may become adherent. When exudation has taken place, the physical signs of pericarditis are increased dulness over the præcordial region, according to the extent of the effusion, or rather the area of diminished resonance is not increased, unless the effusion is considerable. The percussion dulness occurs chiefly at the base of the heart, where the pericardium is loose and most easily distensible. It may extend upwards to the second rib, and transversely from the right side of the sternum to the line of the left nipple. When the pericardial sac is distended to any extent the cardiac apex is pushed upwards and outwards. In the case of a boy, 7 years of age, with endocarditis and pericardial effusion, the apex-beat was in the fourth interspace, an inch and a half external to the nipple-line, and the endocardial murmur was very loud towards the left axillary region. In cases of this kind the heart's sounds are often feeble, distant, and indistinct.

Pericarditis may terminate in complete restoration to health where the effusion is serous and watery; but if lymph or solid fibrinous matter is thrown out into the pericardial sac it is likely to end in adhesion of the opposed surfaces, and lead to those general and physical signs recognized under the name of *chronic pericarditis*. It is often accompanied by endocarditis.

Diagnosis and Prognosis.—The diagnosis is easy enough if the case is well marked, and the effusion is serous and moderate in quantity. In such cases as these the patient may make a complete recovery, and be none the worse for the seizure. If the effusion is thick and fibrinous, as we have just seen, it may cause roughening, or adhesion of the surfaces. Delirium is an important diagnostic symptom, and when it occurs early in the disease it may lead to the false impression that the brain is the seat of the

malady. When delirium supervenes in the course of rheumatic fever, it would be a culpable error not to investigate the condition of the heart carefully at every visit, exposing the patient, however, as little as possible. Orthopnœa is also an important diagnostic sign. The disease is very fatal in weak and strumous children.

Morbid Anatomy.—There is an effusion of serum, sometimes of a transparent lemon-color, or of a reddish tinge, or there is pus in the pericardium with coagulable lymph, and adhesion between the two membranes. The two surfaces, when torn asunder at this stage, present a honeycombed or tripelike appearance. The white spots, so commonly found on the surface of the heart after death, have been shown by Sir James Paget to arise from previous inflammation.

Causes.—As an idiopathic affection, acute pericarditis is extremely rare, yet it does now and then occur, and may escape detection in the absence of pain about the heart; as an accompaniment of acute rheumatism it is very common. "In 5 cases of pericarditis, in 2 of acute, and in 4 of chronic endocarditis, and in 2 more in which both the pericardium and endocardium were involved—making a total of 13 out of 39 cases, or exactly 1 in 3, rheumatism was certainly known, or alleged on good grounds, to have been the starting-point of the mischief."* "Of pericarditis not in alliance with rheumatism, Corvisart gives five cases, and it was complicated with inflammation of other parts in all of them except one, and in this it was caused by a severe blow upon the region of the heart."† It may arise from the extension of pleurisy or pneumonia, or be associated with renal disease, chorea, measles, or scarlatina.‡ Andral has met with it as a complication of small-

* West, On the Diseases of Infancy and Childhood, 1859, p. 481.

"In 2 cases of pericarditis, in 3 of acute, and 1 of chronic endocarditis, or 6 out of 39 instances, the disease of the heart was traced to an attack of scarlet fever. The cardiac symptoms did not manifest themselves in the acute stage of the affection, but during the process of desquamation. They were accompanied by fever and anasarca, which, however, did not exceed mere puffiness of the face and extremities, until, in the two instances of pericarditis, both of which ran a chronic course, dropsy came on as the consequence of the heart disease."—*Ibid.*

† Dr. P. M. Latham, On Diseases of the Heart, New Syd. Soc., 1876, vol. i, p. 219.

‡ "Pericarditis is not frequent in cases of acute Bright's disease from scarlet fever in the young, since it only occurred in 1 in 14, or 7 per cent. of the patients under 16 years of age."—Sibson, On Pericarditis, Reynolds's *System of Medicine*, vol. iv, p. 408.

pox, and in the last stages of tubercular disease of the lungs with vomicæ, and with chronic asthma and bronchial congestion. A case in which the pericardium was greatly inflamed, and contained an abundance of turbid yellow serum and lymph, is recorded by Dr. Dyce Duckworth. The child was only eight months old, and the disease appeared to follow on enlargement of the bronchial and mesenteric glands. After death no tubercle was found in the pericardium or brain, but it was general in the pleuræ, lungs, liver, and spleen.*

Treatment.—The objects to be aimed at are to reduce the inflammation and to favor the absorption of the effused fluid. Leeches may be applied to the cardiac region in strong subjects, and there can be no question of their service where the pain is very acute and the pulse is frequent and hard, but venesection is never necessary in children, however robust they may be, because reduction of the strength has to be feared, especially as the complaint frequently follows rheumatism, when the constitution, already low, will not bear further depression, and the blood in many instances is poor and aqueous. A strong mustard poultice is about the best application; its action is quick, it can be obtained at a moment's notice, and when the child complains of the smarting it may occasion, it can be removed at once. In cases of acute pericarditis accompanying rheumatic fever in children, I have found these poultices act most beneficially, quickly relieving the præcordial distress and uneasiness, and I believe controlling the effusion. The chest should be covered with cotton-wool immediately the poultice is removed.

The next remedy of service is counter-irritation. I should not hesitate to employ a blister whilst the skin is reddened from the rubefacient effects of the mustard. The surface should be painted over with strong blistering fluid, and the chest protected afterwards with cotton-wool. I have never known it do any harm, but the late Dr. Sibson was opposed to blistering, on the ground that it inflicted local injury, tainted the blood by increasing its fibrin, and prolonged the inflammation. He strongly advocated "the application of chloroform over the seat of suffering, combined with belladonna liniment, sprinkled on cotton-wool, and covered with oiled silk."† After the action of the blister, an ointment composed of equal parts of savin and mercurial oint-

* Path. Transactions, 1875, vol. xxvi, p. 246.

† Op. cit., p. 433.

ment should be spread on lint and applied to the præcordial region. Another excellent application, after the blister has risen, is a combination of mercurial ointment and powdered opium (ʒj ad ʒj) recommended many years ago by Dr. Beale.

Hot fomentations are unsatisfactory, because they necessitate exposure of the patient's chest during their employment, and it is doubtful whether they can be borne hot enough to be of any benefit. Then there is the danger of getting a cold or chill, which ought to be guarded against, and so likely is this to happen that, if the case goes on satisfactorily, it is a great mistake to institute frequent stethoscopic examinations of the chest.

Mercury may be given as an aperient, but not with the view of fulfilling any special indications, and in rheumatic cases it requires great caution. If inflammatory fever runs high, and there is thirst, elevation of temperature, and scanty, turbid urine, then a general antiphlogistic treatment may be carried out, and aperients, diuretics, nitrate and bicarbonate of potash will be required. Even aconite is sometimes useful if the skin lacks moisture, and quinine may be given advantageously in small doses if the temperature is disposed to run high and there are indications of exhaustion.

Opium should be employed if there is much pain, as the continuance of it further reduces the strength of the patient, it diminishes the cardiac contractions, and controls the hurried circulation; but if the heart gets feeble, the respiration hurried, and the countenance at all livid, then stimulants, in the form of wine or brandy, ammonia, and ether will be required.

Chronic pericarditis is usually a sequel of an acute attack of rheumatic fever, and is not frequent in children. The chief symptoms are pain in the region of the heart, and inability to lie on the left side, or with the shoulders low. The changes produced in the pericardium where the acute attack has not ended in resolution, are thickening or adhesion of the pericardial surfaces, and effusion of lymph or pus. In consequence of this change the action of the heart is embarrassed, and the muscular structure of its walls becomes hypertrophied. When adhesion takes place the action of the heart is rolling or tumbling, and it can be observed over a large space; the apex is seen beating in the epigastrium, which is retracted. With these changes the face is often dusky and anxious, and if with the acute pericardial attacks the endo-

cardium has been also involved, we may have evidences of valvular disease.

The *treatment* consists in meeting the symptoms that arise, by blisters to the chest, active saline aperients to relieve the oppressed circulation, and antirheumatic remedies, as iron, quinine, and iodide of potassium.

Hydropericardium.—Pericardial effusion may be the result of acute or chronic pericarditis. The physical signs are a gradual increase in the transverse dulness just below the base of the heart, and displacement of the lungs. The dulness may extend across the thorax from the right nipple to the line of the left axilla, and as high up as the top of the sternum. In all effusions into the pericardium, however small or large, dulness extending upwards is the surest diagnostic sign from cardiac hypertrophy.

The amount of effusion by separating the heart from the chest-wall causes its impulse to be weak, and bulging of the præcordia may ensue. The liver, spleen, and diaphragm are depressed. Adherent pericardium leads to dilatation and hypertrophy of the heart.

The symptoms in the case of a lad aged 13, who came under my notice in 1864, were as follows: The patient was suffering from rheumatic fever. On the fifth day of the attack, acute pericarditis came on, and four days later there were all the symptoms of extensive pericardial effusion. The patient had to be propped up in bed from the severity of the dyspnœa, and he could not lie down for a moment without threatening suffocation. The pulse, throughout small, became fluttering, and for some hours imperceptible at the wrist; the skin was bathed in sweat, low muttering delirium was frequent, and the patient's life was despaired of. The dulness extended nearly across the sternum from one nipple to the other, and as high as the second rib. The heart's action could not be detected, but there was no palpable prominence of the præcordial region. The patient recovered without any after bad effects, either local or constitutional.

The *treatment* consists in giving aperients and diuretics. Blisters and counter-irritants should be applied to the chest. When there is no chance of the effusion becoming absorbed, an aspirator should be passed through the fifth intercostal space, and some of the fluid drawn off.

An interesting case of pericardial effusion is recorded by Dr.

Barlow, in a boy six years of age. "Twice the pericardium was tapped by the aspirator, and twice the abdomen, with marked relief, and without any bad effects from the operation. The child was feverish throughout, and neither the fever nor the considerable ascites could be satisfactorily explained during life, but after death these were found to be due to tubercular peritonitis."*

The purely passive form of effusion from obstruction to the circulation presents the same symptoms, and the treatment is also similar.

Endocarditis.—This disease consists in inflammation of the endocardium or lining membrane of the heart, and is frequently associated with pericarditis as a consequence of acute rheumatism. It is most common in the latter affection, but it may arise from exposure to cold, be developed in the course of severe chorea, or scarlet fever, or measles, or small-pox. Bright's disease may induce a chronic form.

The *general* symptoms are a sense of discomfort and uneasiness over the cardiac region, anxiety of expression, flushed countenance, and a tendency to syncope. Pain is not always present unless there is pericarditis or pleurisy, and if auscultation were not practiced carefully the disease might be overlooked. Still, in a few instances pain is severe, and increased on the slightest pressure or movement, so that the weight of the bedclothes is intolerable. There is restlessness, hot skin, thirst, and fever, followed by perspiration, which is often profuse as the disease advances; the pulse soon becomes quick, feeble, or intermittent, and the breathing is hurried and abdominal. As the disease progresses the lips become livid, the eye is dim, and the face is dull and heavy, or pale and shrunken. Wandering at night, and even delirium and convulsions are among the symptoms. Bronchial congestion, or pulmonary engorgement is apt to ensue from increasing debility, and to failure of the circulation through the lungs.

The *physical* signs are those indicating mischief at the aortic and mitral orifices, as mentioned under valvular affections; there is usually a soft bruit at the apex with the systole, but the symptoms depend on the valves which are affected, and these are generally on the left side of the heart. The disease may terminate fatally from exhaustion and cerebral symptoms, or, if the

* On a case of Pericardial Effusion, in which Paracentesis was performed, Practitioner, 1873, vol. xi, p. 265.

acute stage be passed over, no traces of the disease may remain. In most severe cases valvular changes ensue, leading to puckering of the valves and impairment of their functions, with ultimate obstruction of the circulation and general dropsy. A portion of coagula may be detached from the curtain of the inflamed valve and carried into the general circulation, causing embolism.

In endocarditis as the accompaniment of rheumatic fever there is an inflammation of the lining membrane of the heart. Effusion of lymph into the structure of the valves (*mitral valvulitis*) ensues, which finally becomes converted into a fibrous structure, the chordæ tendineæ are involved, so that they undergo contraction, and the valves become tied down or puckered up together, which either narrows the mitral orifice (*mitral stenosis*) or the opening is so wide that when the ventricle contracts regurgitation is produced (*mitral regurgitation*). The mitral valve at each ventricular contraction has to sustain much greater pressure than the aortic valve, which has only to bear the force of the returning blood against it.

Treatment.—This should in some measure depend upon the disease with which the cardiac affection is complicated, and seeing that it may arise in the course of acute rheumatism or scarlet fever, it will be important to modify the treatment accordingly. The treatment is really that of pericarditis, with which it is often associated, but there is this difference, endocarditis speedily tends to exhaustion, and is not so amenable to active agents as venesection and counter-irritation. The patient should remain in bed for a length of time after the acute stage has passed over, so that excitement may be diminished, and the effects of strain should be kept off the injured valves by lowering the blood pressure as far as possible. For such purpose chloral hydrate is indicated. This is dwelt upon by Dr. Milner Fothergill, in a lecture, in the *Medical Times and Gazette*, Sept., 1878. "This fact, then, is ascertained and confirmed by experience, viz., that the damage done to the endocardium by rheumatic inflammation may abide for four or five years without producing any conscious detriment to the health or well-being of the patient, or (as far as we have the means of judging) any farther injury to the structure of the heart. And it is a most important and consolatory fact. But in other instances other results immediately follow. When after its departure acute rheumatism leaves the endocardial murmur behind it, which, though known only to the physician, is the sure sign of injury

done to the endocardium, it leaves it attended from the beginning by other symptoms, which the patient is sufficiently conscious of, and these are directly referable to the heart. They consist of palpitation, and some pains, and some dyspnœa, which are not constantly present, but only under bodily exertion and mental excitement. The child who has had the præcordial murmur ever since it suffered a certain rheumatic attack, is just the same child as it was before, except that it cannot join in any pastime requiring rapid movement; for then its heart palpitates, it loses its breath, and is obliged to sit down. Men too are just the same men as they were before, only perhaps they cannot run upstairs without panting and hurry, and they constantly find themselves obliged to restrain their bodily efforts within certain limits, and to beware of mental excitement, for fear of palpitation and dyspnœa. These conditions too may remain for years without either augmentation or abatement. The murmur is never absent, but the palpitation and dyspnœa are never present except as the immediate effect of a certain amount of bodily exertion or mental excitement."*

Myocarditis or inflammation of the heart's substance is generally found in connection with endocarditis or pericarditis, but the muscular structure of the heart may be affected just as the muscles are in subacute or chronic rheumatism, without any inflammation whatever. Myocarditis occurs also in scarlet fever and in typhoid fever. After some fatal cases of endocarditis, the walls of the heart have been found to be thickened, and abscesses of variable size have been discovered in the muscular structure of the organ. Such changes sometimes occur in death from pyæmia, scarlet fever, and some other forms of blood-poisoning. If palpitation and violent pains in the cardiac region come on during rheumatism, and the pain extends through the shoulder, or passes down the arm, the disease may be suspected. The complaint being obscure in its manifestations, the treatment must be regulated in accordance with the most urgent symptoms and the cause in operation, if it can be discovered.

Ulcerative Endocarditis.—This disorder superficially resembles the form of endocarditis, frequent in rheumatic subjects, where minute coagula form around endocardial vegetations, and becoming detached, produce embolism in the cerebral and other arteries. But in ulcerative endocarditis the blood is previously poisoned by

* Dr. P. M. Latham, On Diseases of the Heart, New Syd. Soc., 1876, vol. i, p. 279.

some specific affection, as small-pox, pyæmia, diphtheria, etc., and coagula of infected blood form around the cardiac valves. Portions of these clots becoming detached, produce embolism of an infective character over and above their purely mechanical effects. The disease attacks only persons of bad constitution.

For much of the description now about to be given, I am indebted to an interesting lecture by Dr. Cayley, on a case of "*Ulcerative or infecting endocarditis simulating typhoid fever in a boy aged nine years.*"*

The disease is to be distinguished anatomically by a large number of embolisms in the miliary form. The emboli in ordinary endocarditis are lodged in the middle cerebral artery, producing hæmorrhage and softening of the corpus striatum and optic thalami, followed by hemiplegia. In ulcerative endocarditis they are deposited in the pia mater of the hemispheres, and do not necessarily produce any cerebral lesion. The intestine is frequently the seat of emboli in this form of endocarditis, and in both varieties the kidneys and spleen are the most common seats of embolism. The endocarditis of acute rheumatism may occasionally assume this variety, and it may even supervene on chronic valvular disease.†

The *general* symptoms sometimes resemble ordinary pyæmia; there are rigors, high fever of a remittent or intermittent type, and local suppurations. In other cases they resemble typhoid fever, as in the case recorded by Dr. Cayley.

In the typhoid form there are rigors and vomiting, often sweat-

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* Medical Times and Gazette, November 10th, 1877, p. 509.

A case of a boy, æt. 14, terminated fatally, through rupture of the heart, almost immediately after admission into hospital. A year previously he had an attack of rheumatic fever, and since then had been losing flesh, and suffered from dyspnœa on exertion. A fortnight before admission he had severe pain in the chest, constant dyspnœa, and general malaise. When admitted there was a thrill, a double murmur over the aortic valves, and a systolic murmur at the apex. "He suddenly became insensible, flushed in the face, and began to struggle, and then turned deadly pale and died." A post-mortem examination showed that "the pericardium was full of coagulated blood, which had flowed from a very small orifice in a sac lying between the aorta and pulmonary vein, and which was formed by the protrusion of the part lying at the base of the mitral valve, in which destructive inflammatory ulceration had produced the lesion."—*St. George's Hosp. Rep.*, 1874–76, p. 367.

† "The average weight of the spleen in ten cases of ulcerative endocarditis occurring in 1867–70 was 25 oz.; they were always more or less soft and pulpy. Very rarely the spleen reaches even to double the latter weight in endocarditis."—*Path. Anatomy*, by Wilks and Moxon, 1875, p. 475.

ing, and irregular febrile exacerbations. There are also brown tongue, sordes on the teeth, and delirium passing into coma. The urine is often bloody and albuminous.

Auscultation discovers the signs of valvular obstruction, the murmurs varying according to the orifices affected and the progress of the ulceration.

The disease tends to a fatal termination, and is not controlled by treatment.

Valvular Diseases of the Heart.

The general symptoms of valvular disease of the heart may be thus briefly stated. The blood is either impeded in its passage through the organ, or it regurgitates from defect in the closure of the valves, and this leads to hypertrophy with congestion of the lungs and other organs, followed by dropsy. The symptoms vary a good deal, and in children, even when the valvular condition and hypertrophy appear to be about equal, the constitution suffers differently. This arises from the conservative process of hypertrophy, which, for a long time, keeps in cheek the symptoms; but, by-and-by, the heart laboring to empty its overplus, fails, and congestion of the venous system follows. Then ensue hurried respiration, dyspnœa, pain in the region of the heart or palpitation, anxiety of expression, pallor or suffusion of the face, inability to walk upstairs, and the impossibility of resting in the recumbent position. The symptoms are increased by indigestion or mental emotion. The valves on the *left* side of the heart are far more prone to disease than those on the *right*. When the latter are affected it has been attributed to fetal endocarditis.

The constitutional symptoms in these cases are liable to considerable variation. Some children who have all the physical signs of a severely damaged valve, as the consequence of rheumatic endocarditis, experience no breathlessness and scarcely any other discomfort. They may go on for months or years with very little complaint. I have more than once known the heart entirely overlooked in these cases, and the symptoms of impaired health ascribed to weakness and general debility. But later on the symptoms of obstruction to the circulation begin to be manifest, and there are cough, congestion of the lungs, and hurried breathing. In prolonged cases the liver and digestive organs

become deranged, the features are swelled, and œdema of the extremities supervene.

Disease of the aortic valves is so rare in childhood that it might be passed over unnoticed. But, since it does now and then occur in children, it is well to call attention to this lesion. When the aortic orifice is narrowed or constricted (*aortic obstruction—aortic stenosis*), the blood is impeded in its passage from the left ventricle. Over the midsternum, but more especially over the second right costal cartilage, and in the course of the aorta and carotids, a soft systolic murmur, corresponding in time with the pulse, is heard, diminishing in intensity towards the apex. A systolic thrill is often felt over the cardiac region, at the right base, with heaving impulse. There is usually great hypertrophy of the left ventricle. If the heart's action is weak, and the narrowing of the orifice smooth, the murmur may not be easily detected. When the narrowing is great the pulse is small and feeble, but this will in some degree depend upon the amount of hypertrophy present, which modifies its character. The constitutional symptoms are pallor of the countenance, and often headache from cerebral anæmia, owing to the unfilled state of the arteries. Unless the mitral valve becomes involved, so as to allow of regurgitation taking place, the pulmonary circulation is not interfered with.

Causes.—These are most probably due to chronic valvulitis and to endocarditis after rheumatic fever. When rheumatic endocarditis happens, the inflammation begins in the mitral valve, and then, after involving the ventricular endocardium, seizes upon the aortic valves. The form assumed by aortic valvulitis in childhood is certainly that of regurgitation; the distortion and mutilation of the valves commences in the free edges, and is usually accompanied by dilatation of the aortic conus and the actual enlargement of the aortic ostium.

When the aortic valves cannot effectually close the orifice on the aortic recoil, the blood-stream returns into the ventricle, and *aortic regurgitation* is produced. The physical signs are a diastolic murmur, heard at the midsternum, obliterating the second sound, and frequently distinctly audible at the apex. It may be soft or rough, weak or loud, musical or prolonged. The pulse is sudden and jerky; it is known as "Corrigan's pulse," collapsing, "like

balls of blood shot under the fingers," but there may be considerable regurgitation without this being marked, or any visible pulsation in the superficial vessels.

The tendency of the disease is to produce extreme hypertrophy of the left ventricle, but very rarely any dropsy. The ventricle being always too full of blood, undergoes comparative hypertrophy, and containing blood in diastole, dilatation is added to hypertrophy.

Dr. De Havilland Hall afforded me an opportunity of seeing a patient of his, a boy ten years of age, who was the subject of aortic regurgitation. Six weeks before he came under observation he had complained of pains in his knees and feet, and had been confined to bed one week. When seen he was suffering from weakness and giddiness, and some shortness of breath on exertion. On examination, he was found to have a soft aortic diastolic murmur, heard loudest over the third right interspace close to the sternum, and conducted along the sternum to the apex. The impulse was greatly diffused, but most marked in the fifth interspace in the nipple-line. There was visible pulsation in the brachial arteries.

Causes.—This affection may possibly be congenital. It may also follow chronic changes, violent strains, and endocarditis after rheumatism in obstructive disease.

Disease of the right auriculo-ventricular orifice (tricuspid regurgitation) is rare, and murmurs are uncommon in this situation, except in long-standing cases of mitral disease, in which the right side of the heart has become weakened, and there is obstruction to the pulmonary circulation. "Mitral stenosis is the most frequent cause of serious tricuspid regurgitation, and the earlier in life the stenosis occurs, the more rapidly, as a rule, the tricuspid regurgitation follows, and the more serious the prognosis."* The physical signs are increased præcordial dulness to the right of the sternum, at the level of the fourth rib, and epigastric pulsation, the ventricle being seen and felt between the ensiform cartilage and receding ribs in the left hypochondrium. Owing to the accumulation of blood in the right ventricle from congestion of the lungs, it becomes enlarged and dilated. As it encroaches on the position of the left ventricle, and lies in front of it, the apex is pushed away from the chest-wall, and the impulse is extremely

* Balfour, op. cit., p. 181.

weak or cannot be felt at all. A murmur usually accompanies the systole, and is most audible over the lower part of the sternum, or ensiform cartilage. I say usually, because the murmur is altogether absent in some cases, and in others it cannot be detected, though the other signs of tricuspid incompetency are all present. Accentuations of the pulmonary second sound should be looked for, and weakness of the aortic second. The increased outline can often be distinguished readily enough in children whose chest-walls are thin, and the left lobe of the liver may receive an impulse, while at the same time the liver is not unfrequently enlarged. This condition is often attended with overfulness of the cervical veins, because the right auricle is overdistended, and in fact the right side of the heart altogether undergoes passive dilatation. The tricuspid being insufficient, each contraction of the right ventricle drives backwards the blood into the right auricle and the veins in communication with it. The wavy pulsation in the external jugular veins is an indication of considerable tricuspid regurgitation, but if the orifice is only slightly contracted, then the valve may act efficiently, and the pulsation in the vein be absent. Congestion of the intestinal veins, scanty urine, and even hæmorrhoids, are sometimes present. In a boy, aged eleven years, under my care in 1877 for mitral and tricuspid disease, œdema and anasarca of the lower extremities came on a month before death.

When the cardiac enlargement exists to the same extent in two separate cases, we may have in one case regular bowels and normal extremities with the power to lie down and assume any position; whilst in another case there are severe and continuous congestive headache, enlarged veins in the neck, and pulmonary engorgement. This depends upon the amount of injury the valve has sustained. If the tricuspid orifice is only partially constricted, and there is no defect in the valves, the venous circulation is partially congested; for it should be held in mind that a murmur in this situation, like a mitral regurgitant murmur, may be simply the expression of great debility.

A systolic murmur heard most distinctly over the pulmonary orifice is generally due to anæmia, or to pressure by consolidated lung. When organic it is almost always congenital.

Disease of the left auriculo-ventricular (mitral) valve, causing regurgitation from the ventricle into the auricle, is the most com-

mon form of cardiac disease to be met with. It is evidenced by a murmur, diastolic in time, and unlike that of mitral stenosis is not caused by the contraction of the auricle. It is very much more frequent in girls than boys. In these cases there is enlargement of the left ventricle, and the apex-beat is below and external to the nipple; it often occupies a larger space than in health, except when it strikes directly behind a rib, and then it is not detected so readily. The impulse is considerable and heaving, and if the hand be placed over the præcordial region, there is an appreciable thrill. Over the apex is a bruit accompanying the systole, partially obscuring the first sound, and diminishing, or even disappearing at the base, if only slight; but if loud or intense, it may almost obliterate the second sound at the apex, and be detected over the whole præcordial region. The murmur is synchronous with the pulse, and owing to the blood being carried back into the left auricle, can be heard in the left axilla, at the angle of the scapula on the same side, and at the spinal column. The pulmonary second sound is generally intensified. This murmur (*bruit de soufflet*) is soft and bellows-like in recent cases, where possibly the deposit on the valve has become highly organized, but in more advanced cases it is rough and grating, and resembles the sawing of wood. The peculiar vibratory motion (purring tremor—*frémissement cataire*) occasionally found in disease of the mitral orifice is essentially connected with obstructive, and rarely if ever with mitral regurgitant disease. Cough, congestion of the lungs, quick breathing, and a small contracted pulse, are common in these cases.

A loud apex murmur in mitral disease is compatible with fair strength and growth, and may be present without impairing the functions of the heart. In such cases there is probably a mere roughening of the surface of the valves, or even a vegetation, which does not permit any of the blood in the ventricle to flow back through the mitral orifice, yet a systolic apex-bruit may be present and regurgitation take place with a competent mitral valve. "In fact, the mitral valve may be perfectly free from disease, and the auriculo-ventricular opening perfectly natural and undilated, and yet regurgitation may and often does take place."* In anæmia and chlorosis, a venous murmur may sometimes be heard over the mitral area, accompanied with accentua-

* Diseases of the Heart, Balfour, 1876, p. 102.

tion of the pulmonary second sound, as in true mitral constriction and regurgitation, but unassociated with any valvular lesion. There are other cases in which the physical signs are the same, but graver mischief has been done, and the right side of the heart and lungs suffer in time. Children so affected are small, dwarfed, and stunted, and liable to die of dropsy at puberty. They rarely get over the pubertal changes.

Disease of the left auriculo-ventricular orifice (obstructive disease), causing contraction of the orifice (mitral stenosis) and obstruction to the blood-flow into the ventricle. In this disease congestion of the lungs, hæmoptysis, or pulmonary hæmorrhage may ensue. The effects on the circulation are much the same as in the former case. Chronic bronchitis, pneumonia, and urgent dyspnœa, general venous congestion, and anasarca must be looked for. After a time the embarrassed pulmonary circulation affects the right side of the heart, and its cavities become enlarged; there is increased dulness to the right side of the sternum, and the right ventricle may be seen and felt between the ensiform cartilage and the receding ribs to the left hypochondrium in long-standing cases.

Some cases of mitral constriction are supposed to be of congenital origin, and they continue for years without causing any sign of heart mischief.

The pathognomonic physical sign of obstructive disease of the mitral valve is a presystolic murmur (*auricular systolic*), and when once heard there can exist no doubt as to its significance. The murmur is produced as the current of blood in its natural passage through the heart encounters resistance at the contracted valvular orifice; the valves being converted into a curtain with a slit in it (*the button-hole mitral*), or into a fingerlike cone projecting into the ventricle. The bruit immediately precedes the first sound of the heart and carotid pulse; it is presystolic in character, and is coincident in time with the contraction of the auricles, and not that of the ventricles. It would serve no practical purpose to enter into the vexed question concerning the exact time during the heart's revolutions at which this murmur is produced, but I would just notice a remark by Dr. Andrew to the effect that it occurs at the latter part of the diastole and seems to be continuous with the first sound, from which it is difficult to distinguish an interval.* It is a short and rough murmur, and obliterates the second sound

* On Presystolic Murmurs at the Heart's Apex, St. Barth. Hosp. Rep., vol. xiii, p. 1.

at the apex, but intensifies it at the base. Accentuation of the pulmonary second sound is one of the most constant conditions of mitral stenosis. Its loudness, like all other cardiac murmurs, depends upon the condition of the blood and the size of the aperture, and the force of the heart's action; but why it should disappear from time to time whilst the constriction remains unaltered, is at present unexplained. A cardiac thrill (diastolic) is usually present, and the left ventricle is contracted and its walls thin, according to Niemeyer,* but Dr. Balfour remarks: "as we never have mitral stenosis without regurgitation, some degree of hypertrophy of the left ventricle is almost always present, etc."† The left auricle is dilated and hypertrophied, and the right side of the heart also. The pulse is occasionally regular, but often weak, rapid, and irregular. Mitral obstruction and regurgitation may exist together.‡ The murmur of mitral stenosis is heard at the left apex and inclining towards the right apex; whilst a regurgitant murmur is carried towards the axilla, or behind from the left nipple to the mesial line at the back. It is heard over a less area than that of regurgitation. It is generally, but certainly not invariably, limited to the mitral area, "that is, within a circle of about an inch, described round the point where the apex impinges as a centre."§ An attack of pulmonary catarrh, with elevation of temperature, will often render the murmur softer and more diffused.

The *causes* which induce valvular diseases of the heart in children are acute rheumatism, chronic albuminuria, chorea, and the

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* Practical Medicine, 1875, vol. i, p. 353.

† Diseases of the Heart, 1876, p. 153.

‡ A girl, æt. 13, of rickety constitution, was admitted into the Samaritan Hospital, under my care, in November, 1878, with symptoms of mitral stenosis. There was no history of rheumatism or chorea, the disease being probably congenital. Two years previously she had a severe cough, and threw up a good deal of blood. The lungs gave some proof of hyperæmia and congestion. The heart's action was thumping and sudden; dulness extended to the sixth interspace below, a little external to the nipple line, and in the direction of the epigastrium. There was some hypertrophy and dilatation on the left side of the heart. There was no thrill, but a very distinct presystolic murmur, limited to the area of the cardiac apex, of a cantering sonorous character, fading in force towards its termination, like a sound dying away in the distance. It was well vocalized by the letters *Rrrb* or *Voot*, as Dr. Balfour has pointed out (op. cit., p. 110). A louder and different murmur was heard posteriorly, and in the axillary line, also in diminished force over the right chest and back; it was systolic and had all the characters of a mitral regurgitant murmur. The pulse averaged 90; it was jerking, weak, and wavy, but regular.

§ Balfour, op. cit., p. 103.

specific fevers, especially scarlet fever; indeed, any circumstance which will set up pericarditis and endocarditis may lead to dilatation or contraction of the cardiac orifices, and to adhesion and rigidity of the valves which guard them. Dr. Hayden considers the poison of scarlet fever as next in frequency to that of rheumatism in producing heart disease. "Many of the most formidable examples of valvular lesion that I have met with owed their origin to scarlatina. The patients are generally children, and rarely survive the second period of life. The complication is usually declared in the second week of the fever, but occasionally in the first week, or the stage of desquamation."* Endocarditis is set up as we have already seen (*vide* Endocarditis), and the valves, more especially the mitral valve, become involved in structural change. Of thirteen cases of heart disease associated with *scarlatina*, which came under Dr. Sansom's care, there were three cases of *pericarditis;* one case was uncomplicated, and two cases were complicated with *endocarditis* (mitral regurgitation). There were ten cases of endocarditis, inducing mitral regurgitation in eight cases, one case of dilatation of left and right cavities, mitral stenosis in one case, mitral stenosis and regurgitation one case. In six cases of heart disease associated with measles, there was *pericarditis* with *endocarditis* (mitral regurgitation) in one case; *endocarditis* inducing mitral regurgitation in three cases. In one case hypertrophy and dilatation; in one case tricuspid insufficiency; in one case mitral stenosis; in one case mitral stenosis and regurgitation.†

Dr. Dyce Duckworth has collected eighty cases of mitral stenosis, of which only seventeen were males; the oldest patient was 63, the youngest (a girl) 14. He arrives at the conclusion that two-thirds of the cases had a rheumatic origin, and that fright, strain, and other injuries are to be enumerated among the list of causes, or rather, as the writer observes, the valve not being healthy, these special causes were enough to aggravate the condition which already existed. Slow degenerative changes in the mitral valve leading to stenosis are, I think, rightly considered not uncommon.‡ In the case of two girls affected with mitral stenosis, who came under my notice, aged respectively 13 and 17,

* Diseases of the Heart and Aorta, 1875, p. 315.

† Clinical Lectures on Diseases of the Heart in Childhood, Med. Times and Gaz., October, 1879, p. 471.

‡ On the Etiology of Mitral Stenosis, St. Barth. Hosp. Rep., vol. xiii, p. 263.

there was no history of rheumatism, nor of any illness that could account for this grave cardiac condition. Of the above eighty cases, six only were traceable to chorea. Of sixty-one fatal cases of chorea mentioned by Dr. Hilton Fagge, there were only two in which all the valves of the heart were perfectly healthy.*

Treatment of Valvular Diseases.—This is at best but unsatisfactory. We cannot restore the injured valve in its integrity; but we can foster the growth of hypertrophy, and in some fortunate cases even restore the ventricular chamber to its normal size. The symptoms which arise as a consequence of these organic changes are best relieved by rest and the avoidance of exercise and excitement. By maintaining the general strength and guarding against local congestions and inflammatory attacks, we may often succeed in giving a fair share of health and comfort to children; while warm clothing (particularly cotton-wool or flannel worn over the chest), nutritious food, and active aperients will tend to keep in check some of the worst symptoms, as dropsy, when they show themselves. If congestion of the lungs, or bronchitis occur, squill, carbonate of ammonia, belladonna, strychnia, and other stimulating expectorants and sinapisms, will be indicated.

When the heart is getting weak and quick in mitral disease, and there is a tendency to dilatation of the right cavities, tincture of digitalis, administered in gradually increasing doses, will improve the tone and fulness of the pulse-beat, reduce the frequency of the heart's action, and cause the overdistended cavities to contract more vigorously on their contents. Instead, therefore, of blood accumulating in the heart during diastole, a larger quantity is expelled at each contraction of the ventricle. Digitalis has been said to increase the discharge of urine, but there is some doubt about this so long as low arterial tension remains unaffected. I carefully measured the quantity passed in two cases of mitral regurgitation in children with dilatation of the right ventricle, yet in neither was there any appreciable difference in the amount passed, nor any change in its quality. They were in no way improved by the drug. Traube first noticed that the fall of the pulse-rate, and the rise of arterial tension during the employment of digitalis, are attended with an increased amount of urine.

* Reynolds's System of Medicine, Diseases of the Valves of the Heart, vol. iv, p. 169.

In nearly all the cases in which I have given digitalis for the heart affections of children, I have combined it with iron, and frequently with strychnia also. Iron improves the quality of the blood and the muscular power of the heart. Digitalis is of most value in simple dilatation from debility in the cardiac muscle, and in both forms of mitral disease, where weakness and irregularity of the pulse are present. It may be given with advantage in dilatation with hypertrophy, but not in the latter form of heart affection alone. If nausea, headache, or unsteadiness of pulse should come on during the employment of digitalis, the drug should be intermitted for awhile.

In certain rickety children, with thoracic deformity and twisting of the aorta, hypertrophy of the left ventricle is early developed (Rokitansky), and in some cases even valvular disease (Hilton Fagge).

Heart cough is common in adults in the failing stages of heart disease, and is usually found in children at any stage. It is the result of congestion of the pulmonic circulation; it is aggravated by sedatives, such as paregoric, and even by bromide of potassium; it is effectually relieved by cardiac tonics like digitalis combined with iron, and when very troublesome it is well to put the patient to bed with complete rest for a week or two.

Hypertrophy and Dilatation.—Hypertrophy of the heart, which consists of an increase in its muscular tissue, is owing to the greater effort which the organ makes to overcome the obstruction of blood through its cavities.

In children it is noticed as a consequence of valvular disease (especially of mitral obstruction or regurgitation), adherent pericardium, emphysema of the lungs, and chronic renal disease.

The *physical signs* are heaving impulse, diffused over a large space, visible to the eye, and raising the head of the listener when the ear is applied to the cardiac region. The apex-beat may be seen and felt between the sixth and seventh ribs, or even lower. The pulse is full and strong in simple hypertrophy, but if accompanied with dilatation, the force of the arterial stream is considerably lessened. The heart's sounds are dull or muffled, and very rarely accompanied by murmur. The area of dulness is increased laterally, and to the left of the sternum when the left ventricle is involved. When pulmonary emphysema is present, the percussion dulness is masked through the margins of the lungs

overlapping the heart. In rickety subjects the præcordial region is sometimes rounded or prominent. When the right ventricle is affected, which is common in long-standing cases, there is epigastric pulsation, and the margin of the ventricle can be felt to the left of the ensiform cartilage. When obstruction exists at the mitral orifice (most common in children), the left auricle becomes overfilled with blood and its cavity enlarged. As the blood accumulates in the pulmonary circuit, the right ventricle gradually becomes hypertrophied and dilated, so that one cavity after another is more or less affected. In mitral disease, the left ventricle may remain stationary or contract in size, whilst the left auricle is enlarged; the heart is globular or rounded in form, and the apex chiefly consists of the right ventricle.

The *constitutional symptoms* vary according to the mischief which has produced the hypertrophy. The walls yield and the cavities undergo *dilatation* when the heart is enfeebled from over-exertion. The diaphragm is depressed and the enlarged heart tends to displace the lungs. General dilatation of the cavities is usually seen in fat and feeble adults who have suffered from menorrhagia, chronic bronchitis, or other exhausting illness, but in children it is most frequently the result of mitral regurgitation.

Hypertrophy of the heart, associated with more or less dilatation, is a common attendant on chronic kidney disease. The left ventricle is most frequently involved. It arises from overgrowth of muscle, in consequence of an obstacle in the smaller arteries and capillaries, which the heart is striving to overcome.* These vessels become contracted and cause high tension in the vascular system, because the structural change in the kidney prevents the elimination of urea, and other products of metamorphosed tissue. These accumulate in the blood and lead to thickening of the smaller bloodvessels, hypertrophy, dropsical effusion, and hæmorrhages.

The *general* signs of *dilatation* are a frequent, weak, or irregular pulse; the veins of the neck are often prominent when the right side of the heart is affected, and if the case proceeds from bad to worse, there is dyspnœa, bloated face, anxious countenance, and finally œdema or dropsy. The *physical* signs are a thumping action of the heart, if there is much hypertrophy, but if not, those

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* See Chap. XXIV, On Chronic Desquamative Nephritis.

of dilatation may prevail, and then the impulse is weak, short, or tremulous. The first sound is feeble and diffused.

The causes of dilatation, pure and simple, are anæmia and general debility, bronchitis and emphysema of the lungs, but it is usually associated with valvular diseases, as we have seen, and then the symptoms vary according to the orifices affected, and the degree of hypertrophy.

The *treatment* is that of valvular disease of the heart, with which both conditions are so closely associated.

With respect to malformation of the heart, the septum which divides the ventricles is occasionally deficient, and the two cavities communicate. The foramen ovale is also large and open in some cases, or the folds of membrane are not sufficiently developed to close the orifice, so that the blood passes from the right auricle into the left auricle. For an interesting account of these various irregularities, the reader is referred to Dr. Peacock's excellent work.*

With this condition there is often contraction at the orifice of the pulmonary artery, which may be so reduced in size, as barely to admit a quill. If the contraction is considerable, and the foramen ovale large, the right ventricle is small, and there is hypertrophy and dilatation on the left side.

Cyanosis.—The symptoms of this peculiar affection are a blue tint of the skin, tongue, and lips, and a general coldness of the surface. The patient is subject to palpitation and violent action of the heart, faintness, and syncope; the pulse is feeble and sometimes irregular, and bronchitis, congestion of the lungs, hæmoptysis, and serous effusions are apt to suvervene, when the disorder is of any considerable duration.

Among the physical signs, the existence of a murmur is generally to be detected over the point of communication. In the following case there was no bruit.

N. C——, aged 3, was admitted into the Samaritan Hospital under my care, October 22d, 1877, with well-marked symptoms of cyanosis. The mother attributed the symptoms to the shock of the gunpowder explosion in Regent's Park, but the child had suffered from whooping-cough shortly after birth, and at the time of the explosion had a severe cough. On admission, the countenance was deeply congested, and the lips were of a claret hue; the

* On Malformations of the Heart, 2d edit., 1866, p. 107.

swollen eyes stood forward in their sockets, and the eyelids were œdematous; the feet and hands lacked warmth, and presented the same venosity as the face. The child was constantly turning and twisting about in bed to obtain ease, and when fretful and irritable was darkest in color. Sometimes she would lie on her face, sleeping for hours together, and resenting any interference. The pulse was 140, contracted and small; respirations short and shallow. The chest, both in front and behind, was resonant. The bowels were regular; urine, sp. gr. 1018, fair in quantity, pale, slightly clouded, non-albuminous, and of neutral reaction.

No murmur could be heard over any of the heart's orifices, the sounds being distinct throughout the cardiac region, as well as posteriorly. The action resembled an excited and palpitating heart, and was much worse at one time than at another. The temperature on admission was 100°, at the end of ten days it fell to 98.4°, when the mother took the child out of the hospital. Death took place a month afterwards.

The *causes* are a communication between the auricles, or a single auricle and ventricle, or narrowing of the pulmonary artery, and mitral orifice. Opinions are much divided on the causes which induce this discoloration of surface. The case of a male infant, nine months old, is recorded by Dr. Cayley, in which the aortic valves were extensively diseased. From birth the child was short of breath, and when first brought for treatment there was dyspnœa, but no cyanosis. The cardiac impulse was much increased, and there was a loud systolic murmur over the cardiac region. Before death there was some degree of cyanosis. "On post-mortem examination the left ventricle was found much hypertrophied. The aortic orifice was much constricted, and the valves were covered with large, firmly adherent, fibrous vegetations, evidently of long standing."* It has been attributed by some authorities to general congestion of the venous system from obstruction at the pulmonary orifice (*pulmonary stenosis*),† by others to the admixture of

* Path. Trans., 1875, vol. xxvi, p. 33.

† Dr. Peacock showed a specimen before the Pathological Society (October 15th, 1878) of stenosis of the pulmonary artery from disease of the valves, which he believed to be congenital. The boy was 13 years of age, always livid, and never strong. Dyspnœa and increased lividity came on a short time before he was admitted into hospital. "There was a loud double murmur over the pulmonary cartilage, and a distinct thrill." The patient was dropsical and died. After death the right ventricle was found dilated and hypertrophied, and the orifice of the pulmonary artery narrowed and funnel-shaped.

venous with arterial blood; whilst there are those who contend for the presence of venous blood in the arteries and general circulation, as the true explanation of the lividity. It has been stated by Dr. Stillé that cyanosis may exist without the intermixture of the currents of blood, and that intermixture may take place without any cyanosis. M. Valleix does not think that a communication between the right and left cavities of the heart is a certain proof of cyanosis. It is, however, generally regarded as due to venous congestion and the mixture of arterial with venous blood. The latter hypothesis seems the most correct, for, as Dr. Walshe truly remarks, the most intense venous obstruction may exist in the adult without producing cyanosis. Dr. Peacock regards cyanosis as due to congestion of the venous system. Though it would seem difficult to determine the exact condition, it is not improbably due in some instances to fulness of the venous radicles, and imperfect aeration.

The *prognosis* is most unsatisfactory. The child may die from syncope, or in a fit of coughing and urgent dyspnœa from congestion of the lungs. Instances are mentioned of adult life being attained, "and in one case, recorded by Louis, the age of fifty-seven was reached."*

The *treatment* consists in rest, pure air, and warmth, careful diet, and attention to the digestive organs.

CHAPTER XLII.

ON DISEASES OF THE BRAIN.

SIMPLE MENINGITIS. PIA ARACHNITIS. ENCEPHALITIS (PHRENITIS OF CULLEN). INFLAMMATION OF THE BRAIN AND MEMBRANES: *Its proneness to attack the convexity of the cerebral hemispheres—Simple meningitis—A less frequent disease than the tubercular form.* CAUSES: *Exposure to cold, heat, and privation—General debility—Traumatic origin—Effect of otorrhœa and foreign bodies in the ear in setting up meningitis—Specific fevers—Blood-poisoning.* SYMPTOMS: *Headache and vomiting—Heat of head—Quick pulse and fever—Convulsions—Delirium—Loss of speech—Character of the pulse and respiration—Elevation of temperature—Coma—Difficulties in forming a differential diagnosis—Ophthalmoscopic signs.* TREATMENT: *To lessen vascularity in the inflamed part by depressing the circulation with aconite and tartar emetic, to soothe and calm the excited and inflamed encephalic centres—Iodide of potassium and*

* Hooper's Vade Mecum, by Dr. Guy and Dr. Harley, 1874, p. 425.

hydrate of chloral—Use of mercury as a purgative, and to increase biliary discharge—Continuous application of cold to the head —Leeches—Salines—Bromide of potassium —Tonics—Stimulants and counter-irritation in coma. TUBERCULAR MENINGITIS OR ACUTE HYDROCEPHALUS: *Pathology of the affection and common seats of the miliary granulations which excite inflammatory and degenerative changes in the brain and ventricles—Their size, structure, and composition—Distinctive pathological characters of tubercular meningitis.* SYMPTOMS: *Gradual impairment of the general health—Insidious character of the vomiting—Constipation—Albuminous urine —State of the pulse and pupils—Unsteadiness and irregularity in the force and frequency of the respiration —Hydrocephalic sighs—Relation between the pulse, respiration, and temperature—Headache often mistaken for neuralgia—Hemiplegia and paralysis—Cases of tubercular meningitis—Post-mortem appearances.* CHRONIC BASILAR MENINGITIS. DIAGNOSIS: *Use of the ophthalmoscope in the detection of intracranial disease.* TREATMENT: *General hygienic rules to be strictly observed in the threatening stage—Risk in hastily healing active eruptions of the scalp—Antiphlogistic remedies in the early stages—Importance of calomel where the bodily powers are not too much reduced—Cold to the head —Iodide and bromide of potassium—Occasional value of morphia to insure rest and sleep.* CHRONIC AND CONGENITAL HYDROCEPHALUS: *Meaning of the terms and situation of the fluid in the brain and membranes—Pathology—Shape and size of the head—Composition of the fluid—Alteratives—Mercurial inunction—Leeches—Tonics—Compression—Puncture.*

Simple Meningitis.—Inflammation of the pia arachnoid is now known as leptomeningitis. The arachnoid and pia mater are in such close relation to each other that it is not always possible to separate them in the morbid changes to which they are liable under the inflammatory process; neither are we clinically able to describe, with anything approaching exactness, the symptoms of inflammation of the membrane apart from inflammation of the cerebral mass itself: "There is no symptom which, during life, could help to distinguish between inflammation affecting the pia mater and inflammation involving the arachnoid alone; and as the treatment in either case would be the same, there would be no practical advantage gained by such distinction."* I do not happen to have met with an instance in which the arachnoid membrane has been inflamed and the pia mater not implicated also (*pia arachnitis*); but cases of the kind are recorded in the history of medicine. If the meningitis has been due to traumatic causes, then the dura mater is involved in the inflammatory process, and a circumscribed patch of fibrinous exudation or purulent matter may be seen lying upon it. According to Dr. Greenfield, the pia mater is "primarily and chiefly affected" in secondary meningitis,

* Simple Meningitis, by J. Spence Ramskill, M.D., Reynolds's System of Medicine, vol. ii, p. 267.

or that arising from contaminated blood, whilst "in traumatic meningitis, the dura mater and arachnoid, or the arachnoid itself, is chiefly involved."*

"Dura-arachnitis, or pachymeningitis, with its effusion between the arachnoid surfaces, is an affection intimately connected with disease of the dura mater, and arises from some external cause; whilst the effusion beneath the arachnoid, and immediately in connection with the cerebral substance, has its cause within, and constitutes the idiopathic inflammation of the membranes. In ordinary idiopathic meningitis, the effusion, be it lymph or pus, is poured out from the pia mater, a structure which consists of a most rich plexus of vessels, held together by delicate areolar tissue, following all the inequalities of the convolutions, and lying beneath the level surface of the visceral arachnoid membrane, with which it is connected by fine filaments, forming a delicate texture that crosses the subarachnoid surface."†

The anatomical appearances of simple or acute meningitis, then, are great hyperæmia and vascularity of the pia mater and arachnoid, with the effusion of serum, or the exudation of lymph, or seropurulent matter, or pus itself, in patches of variable size, occupying the subarachnoidean space, dipping into the sulci, and obliterating the convolutions.

When the dura mater is removed, the membrane beneath is seen to be vascular and congested, either generally, which is very rare, or in patches over the superficial portion of the hemispheres. It sometimes presents a glistening whitish look, and is thin and almost transparent; or it is thicker, with an opalescent or faint milky appearance. Sometimes it is greenish-yellow, and does not exceed the thickness of a line. When the membrane is removed, distended vessels and inflammatory exudation may be seen dipping down between the convolutions and depressions of the brain; but in many cases the congestion is not more than may be observed in children who have died of fever or some other acute disease in which the brain has only shown signs of exhaustion during life. Occasionally the under surface of the arachnoid is covered with exudation, or false membrane, which contracts adhesions between it and the brain. This transparent fluid may also be seen in the ventricles, varying from one drachm to an ounce or more; and an

* St. Thomas's Hospital Reports, vol. viii, 1877, p 145.

† Pathological Anatomy, by Wilks and Moxon, 1875, p. 208.

opaque, gelatinous fluid may, in some cases, be observed at the base of the brain. Purulent matter is an occasional but rare occurrence. In some cases that have set in suddenly and terminated in a few days, the vessels of the scalp will be found distended with blood, and the brain and membranes turgid; lymph may be seen scattered over the convolutions, so as nearly to conceal them, and the substance of the brain is generally soft and vascular, whilst the serum in the ventricles is turbid or purulent. Some of these cases have received the name of "water-stoke" by Gölis.

Simple leptomeningitis generally selects the convexity of the cerebral hemispheres, whilst the base of the brain is the chosen seat of the exudation in the tubercular variety. The convexity of the anterior lobe is more frequently affected, but the exudation may run along the surface of the brain posteriorly, and attack the inferior aspect of the cerebellum and the medulla oblongata. It may involve the upper portion of the spinal cord, and be surounded by a considerable quantity of turbid serum. The lateral portions of the hemispheres, and still more rarely the under surface, are more affected in this form of meningitis; at the same time the extent and locality of the inflammation are variable, and the symptoms are much more acute in some cases than in others. The disease has many points which resemble tubercular meningitis; but it is not so common, and is less frequently met with in children than that affection. It occurs occasionally among infants, but is very rare after the age of two years. I have seen two cases in single young women; one seventeen, the other twenty years of age. Exposure to cold and privation seemed to be the cause in the younger case, and debility and anæmia after typhoid fever the cause of the other. Simple or idiopathic meningitis, not arising from local irritation or injury, tumors or other morbid growths in the brain or its membranes, must be considered as a rare disease.

Causes.—Injuries of the head may set up meningitis in children. A young lady, aged 11, previously in good health, told her mother that she had had a fall on returning from school. She then ate a good dinner, but was sick in the evening; had severe headache and fever next day; the pain began on the *left* side of the head, extending in a few hours to the opposite side, and along the upper part of the spine. She died rather suddenly little more than forty-eight hours after the fall. The arachnoid was dry and

rather opaque, with numerous yellowish-white patches between it and the pia mater. The vessels on the surface of the brain were much distended. No disease of either tympanum or petrous bone could be detected. Dr. Crisp was "disposed to think that the fall, which might have been more severe than at first supposed," was the cause of the meningitis, which was remarkably localized (as the brain-substance was healthy) and unusually rapid.* Meningitis may ensue from concussion of the brain at once, or follow it after weeks or even months, if the child has attempted to exert its brain too soon after apparent recovery. Immoderate reading, extremes of heat and cold, checked eruptions about the head and face, are also to be enumerated among the causes. A frequent cause is the extension of the inflammation from the internal ear. "Otitis interna is probably often the unsuspected cause of meningitis, for it is not necessary that external discharge or obvious caries of the bone should occur, a far slighter degree of inflammation sufficing to set up the disease."† "Sometimes the symptoms of otitis distinctly precede those of meningitis. Sometimes the meningitis sets in without any precedent symptoms of otitis; and when this is the case, sometimes the symptoms of otitis show themselves in the course of the meningitis; sometimes the otitis is latent and undiscoverable throughout."‡ But long-standing otorrhœa, which has led to disease of the petrous portion of the temporal bone, the exanthematous fevers, and especially scarlet fever, are causes of the affection. If in a child so suffering, delirium, high fever, convulsions, or coma result, we may suspect the supervention of meningitis. Erysipelas probably induces the complaint in a similar manner. A case is recorded of fatal meningitis in a child which was induced by the rough measures which were employed to extract a stone from the ear.§ It may occur as an epidemic in conjunction with inflammation of the spinal meninges, constituting cerebro-spinal meningitis.‖ The action of the poison is directed to the meninges, just as the blood infection of septi-

* Trans. Path. Soc., vol. xxvii, p. 28.

† On Simple Meningitis, by W. S. Greenfield, M.D., St. Thomas's Hospital Reports, 1877, p. 143.

‡ Meningitis and Otitis Interna, St. Bartholomew's Hospital Reports, vol. viii, p. 25.

§ Contributions to Aural Surgery, by W. B. Dalby, F.R.C.S., M.B., Lancet, Sept. 25th, 1875, p. 447.

‖ Meigs and Pepper, Diseases of Children, p. 509.

cæmia, albuminuria, syphilis, rheumatism, or the specific fevers, may originate meningitis or pleurisy, or any other form of serous inflammation. Simple meningitis may follow whooping-cough and bronchopneumonia.

Simple meningitis, when it does not result from traumatic causes, must not be considered beyond the possibility of recovery. The exudation poured out under the inflammatory process slowly contracts into a fibrous structure, and the pia mater into a whitish firm membrane, adherent to the brain on one side and the under surface of the arachnoid on the other. This disease may begin with acute and active symptoms, and in the course of two days attains its climax. Strong and healthy children are more frequently attacked than those who inherit delicate constitutions. Some cases set in slowly and insidiously, and the most careful and experienced practitioner may be deceived as to what is about to happen. This difference in the symptoms is chiefly owing to the circumstance that the disease may come on primarily, or in consequence of other diseases. In the latter case there may be nothing but great depression of the vital powers, and eventually paralysis, while where it is primary, it is usually ushered in by rigors and heat, with high temperature, and a quick pulse.

One reason why meningitis is apt to be overlooked in these cases arises from the absence of the whole train of symptoms which are said to belong to that state. The symptoms are more developed in some cases than in others; but it must not be supposed that we are not dealing with meningitis because a few of the symptoms only are present, and have not succeeded one another in any regular order. Each case has its separate commencement and class of symptoms—it may have a tardy and obscure beginning, of days and even weeks, or be sudden and fierce in its development. If a child with febrile symptoms has headache, nausea, and vomiting, and brings up bile, we must be careful lest we direct our attention to the stomach, and neglect the head. If the belly is soft, and free from tenderness and distension, the bowels costive, and the tongue clean, the signs are of still more ominous omen. If they vanish for a time and recur again, and there has been no indiscretion or irregularity of living to account for it, we must exercise caution in the expression of an opinion. There are cases of cerebral disease to be met with in young children, preceded by such insidious indications of failing health that the possibility of

brain affection is overlooked altogether, and the symptoms are either attributed to fever, to some pulmonary disorder, or they are so obscure that the practitioner is unable to form any diagnosis. At this early period it is doubtful whether the symptoms are due to any morbid change in the membranes or cerebral tissue. It is indisputable that some of the symptoms which spring from eccentric sources of irritation, propagate an indirect influence to the brain, and give them the semblance of issuing direct from the brain itself. Moreover, any long-continued illness in a badly nourished child exposes him to the danger of cerebral disease, especially if he is the offspring of tubercular or syphilitic parents. Approaching dentition renders him more susceptible through the irritation it excites—a tedious attack of diarrhœa still further impoverishes the brain, and reduces the general health. Croup, bronchitis, or any other acute disease, will be equally powerful in disturbing the equilibrium of the circulation, and fretting the nervous system till it culminates in an actual outbreak. Watch the out-patient department of any London hospital where there are a fair number of children, and we shall often find that a child who is recovering from diarrhœa, or has an eruption of the scalp, or suffers from general debility, or has been exposed to great heat, and the scorching rays of the sun, is suddenly seized with a fit of convulsions, followed by inflammation of the brain.

Symptoms.—In most examples of simple meningitis, languor, drowsiness, and symptoms of excitement will manifest themselves for some days before the accession of more dangerous symptoms. Severe headache is one of the most constant and persistent symptoms. It may be so acute as to cause the child to utter a piercing cry. The eyes have a wild and glistening look, the pupils are contracted, and the child shuns the light. Strabismus of one or both eyes is sometimes present, the vessels of the conjunctivæ are injected, and the temporal arteries throb. The pulse is frequent, sharp, and incompressible. It is sometimes slow at the commencement of the illness, but accelerated after food, or any attempt to examine the child. The breathing may be soft and regular at this stage. The child may draw a deep sigh now and then, and move its head about on the pillow as if in uneasy sleep. The head is hot, and the veins about the temples swollen and dilated in some cases, whilst in others the face presents a pallid look, alternating with an occasional flush over the malar

bones and upper portion of the cheeks. Then follow wandering and delirium at night, with intervals of consciousness during the day, to be shortly succeeded by convulsions, or increasing exhaustion and death. The temperature is generally elevated, though it is not always so in the early stages of meningitis. In some cases it runs exceedingly high. It may vary three or four degrees during the day when there are relapses and exacerbations. Thus in the morning it may be normal, and by the evening reach 103° or even 106°, especially if the case has succeeded scarlet fever, otorrhœa, or pneumonia. The tongue is natural, or white and moist; and thirst is frequently complained of whilst intelligence remains clear. Vomiting, of sympathetic origin, is very often present, and when associated with meningitis is usually accompanied by constipated bowels.

Some cases set in with a paroxysm of convulsions, especially in very young children, which, according to Andral and Sir Thomas Watson,* denote greater certainty of cerebral inflammation than delirium. But cases so beginning have shown, after death, the brain-substance to be free from inflammation altogether, and no lymph in the arachnoid cavity. Both Andral and Abercrombie have seen instances in which loss of speech was the first indication of the illness. In the case of a child, aged three years, whom I attended, the first symptom to direct attention to the brain was the sudden loss of speech, or rather an imperfect guttural articulation. This was followed in the course of a few days by headache, pyrexia, and vomiting; quick pulse; ptosis and partial hemiplegia, and no amendment in the power of speech. The urine was slightly albuminous. When the little child was asked a simple question it moved its lips sluggishly, and the tongue performed a peculiar rolling motion, but nothing like an articulately pronounced word could be uttered. When nausea and vomiting are the earliest symptoms the inflammation is said by Sir Thomas Watson to have originated in the substance of the brain; when convulsions have attended the outbreak of the symptoms, it has originated in the arachnoid or pia mater, and when early and fierce delirium are present, the gray portions of the convolutions or superficial parts of the hemispheres are first invaded. This is highly probable, and it accords with my experience that delirium is a striking feature of irritation or excitement of the membranes, whilst convulsions

* Practice of Physic, vol. i, p. 395, 4th edit., 1857.

are oftener associated with cysts and deepseated tumors, or such changes as occur at the base of the brain in some forms of chronic and tubercular meningitis.

In cases less violent than those I have described, some increase of irritability, shyness of manner, uneasy sleep, headache and sickness, will on inquiry, in most instances, be found to have preceded an actual outbreak. In young children all these symptoms are common to intestinal derangement, and hence they increase the difficulty of forming a differential diagnosis.* Headache and sickness are among the earliest symptoms, inviting our attention to the brain as the organ primarily at fault. If these two symptoms were absent we might very naturally overlook the disease. As the disease advances towards a fatal termination the breathing is irregular and often sighing; it is sometimes so tranquil that it seems to have suddenly stopped. The expression is bewildered and confused, and the eyes are fixed and staring. The pupils may be of equal size, even if convulsions and restlessness are present; but if the child becomes unconscious, and there are any symptoms of paralysis, then one or both may become widely dilated and insensitive to light. When comatose symptoms occur at a later stage of the illness, the pupils become dilated, or one is more dilated than the other, and there may be squinting and partial ptosis. The temperature is at first increased, and in the later stages of the disease lowered, ranging between 94° and 104°.

The condition of the eyes, as revealed by the ophthalmoscope, is referred to in the next chapter, but I may here quote Dr. Greenfield's experience: "Optic neuritis is absent in the larger number of cases of acute meningitis of the vertex, whether simple or tubercular, if the cases in which there is a tubercular infiltration or tumor, or a coincident basal meningitis are excluded. Where any affection of the eye exists in meningitis of the vertex, it is more commonly only swelling of the papilla, or choked disk, and only reaches any further stage in the cases of localized meningitis (oftenest syphilitic) which run a subacute course."† In a case of meningitis complicated with otorrhœa, in which after death the membranes were found thick and opaque, the optic nerve was covered with a whitish cloud partially hiding the vessels, and there was optic neuritis from congestion of the vessels along the

* See Chap. VIII, On Typhoid Fever.

† St. Thomas's Hospital Reports, 1877, p. 160.

optic nerves. (Gee, op. cit.) The pulse may now become so rapid that it cannot be counted, and the heart's action may be feeble and tumultuous. The radial pulse is not to be detected at each fluttering cardiac contraction. Instead of the fierce delirium of the early stage, the child may now be observed to roll its head from side to side, and there is flushing of one or both cheeks, as is frequent in the evening paroxysm of typhoid fever in young subjects. Add to this catalogue of symptoms the presence of stertor, and indications of gradual effusion going on at the base of the brain, and we complete the description of a hopeless condition. The belly is sunken and retracted, the motions are dark and offensive; and as the disease advances they may be passed in the bed unconsciously. In those exceptional cases that recover, signs of improvement either set in early, or the disease does not reach the severe stage I have been describing. It is more chronic and obscure, and does not run on with the velocity of the fatal forms.

Some cases recover, under great care and patience, if the disease has not set in with fierce delirium or convulsions, and the fever is moderate. But death at the end of a week is the rule. In some cases the disease terminates fatally in less than forty-eight hours. The general intelligence is defective in the very few cases I have seen get well, and the memory and power of attention are impaired. Whether the brain is ever again able to bear full intellectual tension is an open question; but morbid anatomy reveals nothing incompatible with it in the case of young and otherwise healthy children. I have met with two cases of recovery from a subacute form of simple meningitis in children in whom the temperature at no period of the illness exceeded the normal point, though the head became large in both cases from effusion. In one of the cases there was hemiplegia, strabismus, and evacuations were passed unconsciously. The morbid changes in the brain and membranes must have been unusually slow and chronic.

Treatment.—A child suffering from acute meningitis should be seen at least every four or six hours, to watch the effect of the progress of the disease on the one hand, and the action of the remedies on the other. The principle of treatment is comparatively simple. It should combine two elements. 1. To lower the vascularity in the inflamed part by depressing the circulation, and for this end we possess two well-known agents, aconite and tartarated antimony. 2. To soothe and calm the excited or inflamed

encephalic centres, and this is best attained by the use of iodide of potassium. These agents then may be combined. Chloral hydrate probably produces both of these affects. It must, however, be borne in mind that all depressants in children are apt to produce varying results, even ordinary doses will induce at times an unanticipated degree of prostration, out of all proportion to the dose employed. Careful observation and repeated attention, at comparatively short intervals, are therefore demanded, in order to note if the remedies are exercising too great an effect.

Each case having special and peculiar features, no plan can be laid down as suitable for all. In the acute and early stages of the disease, mercury is a remedy of undoubted value, and ought to be employed, but only as a purgative to thoroughly empty the bowels, and to insure a free discharge of bile. The bodily powers must be carefully estimated before we resort to it. It is essential that the bowels be kept freely open, and the renal secretion encouraged, as tending to lessen cerebral congestion. The employment of calomel on the plea of preventing exudation is an exploded theory. After this, iodide of potassium is the remedy to rely on in meningitis.

The head is to be shaved, and cold affusion applied, either by ice in a bladder, with the effect vigorously watched, whilst the delirium is fierce and active, or what is preferable, the ice-cap, as employed at the Samaritan Hospital in cases of surgical fever and cerebral congestion. At the same time mustard poultices may be applied to the calves of the legs.

Leeches have been used, but they are not very satisfactory, and can scarcely be advocated in young children, the loss of blood not being well borne, except in very special cases. The pallor of the face, and frequency of pulse that follow their use, should make us extremely timid of their application; and yet, from the cerebral congestion witnessed in some fatal cases, the abstraction of blood appears warrantable. When used they should be applied to the vertex, or close behind the ears, where pressure can be readily applied, if the bleeding is too active, and there is fear of the child losing too much blood. They may be employed with greater chance of good than in the tubercular form of the disease, where the evil might be aggravated. Dr. Wilks is in favor of leeching. He says, "I believe, therefore, that at the present day, if you think a child has acute meningitis setting in, you will have no

better treatment at hand than the application of leeches, and the saline with antimony."*

Salines, as chlorate and citrate of potash, are to be recommended when the more acute symptoms are lessening, or the urine is turbid and high-colored. Hydrate of chloral is sometimes useful, and especially bromide of potassium in large doses when a sedative is indicated. The latter remedy will often check the tendency to convulsions (Ringer). Small quantities of milk, and beef tea later on, are fitting forms of nourishment. In the early stages the diet should be low and unstimulating. Cold drinks may be given freely. For the debility and emaciation that result, an ordinary tonic treatment, including ammonia, quinine, iron, and strychnia are to be employed.

When coma has set in, a blister at the nape of the neck, or behind the ears is advisable, and stimulants, as ammonia, spirit of chloroform, etc., should be given in the place of mercurials and purgatives.

Acute meningitis runs a rapid course in spite of bleeding, leeching, and the most active treatment. It may destroy life in twenty-four hours, and the patient never recover consciousness from the time of the attack, or it may last some weeks in exceptional cases.

Tubercular Meningitis.—The pia mater is the membrane in which the deposition of tubercle takes place in the form of miliary granules. According to some pathologists they are not seen on the free surface of the arachnoid, or in any way connected with it; but this to me is a doubtful point, seeing the affinity which tubercle has for serous membranes in other parts of the body. Unlike its loose investment around the spinal cord, the arachnoid is closely adherent to the pia mater, except where the latter membrane dips into the convolutions, and the arachnoid stretches across them. Here the tubercles in cases of meningitis are most abundantly seen, and they are often found in this situation when they cannot be detected in any other. This looks as though the arachnoid had some attraction for the deposit, as the pia mater quits its fellow-membrane at the base of the brain, where its uneven surface admits of the divergence being readily traced. The connective tissue of the arachnoid resembles the delicate structure of the pia mater itself, which is made up of flat membranous cells,

* On Diseases of the Nervous System, 1878, p. 157.

connective-tissue bundles, and elastic fibres,* so that where the two membranes are firmly united, it is not possible to say which was the most attractive to the morbid change. The arachnoid, then, having all the characters of a serous membrane, and presenting tubercular deposit at its freest part, seems to be as much a factor in the process as the pia mater. It is important to exercise great care in looking for these small granules lest they escape notice; they should be diligently sought for wherever any exudation of yellow fibrinous or amorphous matter is found. These miliary granulations may be observed in the Sylvian fossa, and the longitudinal fissure, and in the course of the vessels along the base of the brain to the medulla oblongata, especially about the cerebellum, where the eighth and ninth pair of nerves may be concealed by a semi-gelatinous effusion. I have seen the origin of the olfactory nerves, the tuber cinereum, locus perforatus, the commissure of the optic nerves, and the anterior half of the pons varolii completely hidden by this exudation. The growths are the size of pins' heads, of a grayish-yellow, semi-transparent color, and have long since been ascertained not to depend on any inflammatory products, as was formerly supposed. Sometimes they may be observed adherent to the pia mater, where it dips down between the convolutions; but at the base of the brain, where the arachnoid covers the cerebellum, they may be detected clustering together in the greatest numbers—not, however, that, as far as we know, the number of these tubercular granulations bears any corresponding relation to the extent of inflammation, or the rapidity with which the symptoms are developed. These tubercular growths appear to be in intimate relation with the smallest arteries, on the sides of which they form a distinct projection. They consist chiefly of small cells, a little larger than a blood-corpuscle, and numerous free nuclei.† The inflammation associated with these small bodies has no distinctive character from ordinary inflammatory changes. Sometimes caseous and degenerative products are set up, as may be observed in scrofulous inflammation; or they undergo similar changes themselves, and lead to effusion of serum or seropurulent matter in the ventricles, which is one of the com-

* Frey's Histology, by Barker, 1874, p. 599.

† For an interesting account of the minute anatomy of meningeal tubercle, I refer the reader to Jones and Sieveking's Pathological Anatomy, by Dr. Payne, 1875, p. 242.

monest consequences of acute hydrocephalus. The choroid plexus is full and vascular in a few cases, and the walls of the ventricles present a faint pink hue. The plexus may be pale, however, and the surface of the corpus callosum and optic thalami soft and eroded. Tubercular meningitis is not invariably associated with the deposit of tubercle in other parts of the body. Though we should carefully look for tubercular deposit, or some signs of strumous inflammation in the lungs and bronchial glands, yet such are not always found in the most marked cases of tubercle in the meninges; and it is strange that the connection, close as it certainly is, should be set down by many authors as of almost invariable occurrence.

"The distinctive characters of tubercular meningitis are the absence of lymph on the surface of the brain (in this it differs from simple meningitis), a flattening of the hemispheres, lymph at the base, tubercles in the pia mater following the course of the vessels, and increased fluid in the ventricles, with softening of their walls. Even if tubercles were not visible to the naked eye, the rest of these characters would at once indicate the nature of the disease, and the microscope will always find the tubercles along the vessels."*

Symptoms.—This disease is usually met with in children of from one to seven or eight years of age. Of 48 males affected at the Children's Hospital between August, 1862, and March, 1871, 35 were under five years of age; and of 33 females, 23 were under five years of age.† It may happen to children of a few months old; but the ages I have given are the most frequent. When children grow older the lungs are more likely to be attacked than the brain. As in some other forms of nerve disorder, the child usually exhibits evidence of impaired health for some time before the outbreak of cerebral symptoms. "The disease is less acute than that last mentioned (acute meningitis) generally running a course of three or four weeks, with symptoms less violent."‡ But the symptoms may arise suddenly, and run a fatal course in a few days. There is an absence of animation and habitual liveliness about the child. It throws its amusements abruptly on one side,

* Wilks and Moxon's Pathological Anatomy, 1875, p. 212.

† Reynolds's System of Medicine, article Tubercular Meningitis, by Dr. Gee, 1872, vol. ii, p. 384.

‡ Wilks and Moxon's Pathological Anatomy, 1875, p. 210.

as if they tired or annoyed it, and it falls asleep in the daytime. It cries without reason, and quarrels with its companions. It is morose, shy, and timid; and becomes inconsolable if its mother leaves it or intrusts it to the care of a stranger. It may have been losing flesh, and looking delicate and pallid; but not more than is constantly observed in young children who are otherwise in average health. In this premonitory stage there may be simple irritation or congestion of the brain, and until some inflammation occurs, the child may go on in this condition for an indefinite period. If these threatening symptoms attract attention they may sometimes be subdued by appropriate treatment, and weeks of careful watching and strict diet may postpone the coming evil; for it is doubtful whether true meningitis ever develops itself suddenly, some obscure symptoms of a local or general nature may have escaped observation. The symptoms that demand especial notice are vomiting, constipation, alteration of the pulse and respiration, strabismus, and local or general convulsions and paralysis. In a diagnostic point of view there are several considerations to be analyzed and dwelt upon.*

Vomiting is a frequent symptom, and often steals on insidiously. The child takes its food as usual, but rejects it the instant it is swallowed, yet it is willing to eat again immediately afterwards. It may be sick only once in the day, or oftener; but as the disease advances sickness becomes more frequent, and the stomach will reject plain water. This form of vomiting is unaccompanied by pain or gastric disturbance. Where this symptom has been of some duration the eyes are sunken and have a languid look, whilst the face is pinched and thin. It may be present in the subacute as well as in the acute varieties of meningitis, and may, in the former cases, have lasted some considerable time without attracting notice. In the absence of headache it is often overlooked, but having once set in it usually goes on, the appetite diminishing meanwhile; the belly is flattened and concave, the edges of the receding ribs have a sharp outline, and the intercostal spaces are sunken and retracted. Vomiting, however, is not invariably present, and a case of tubercular meningitis may run its course from beginning to end without this symptom.

Constipation, as in simple encephalitis, is the rule, and a full dose

* The diagnosis from pneumonia, pleurisy, and typhoid fever, is given in the chapters on these subjects.

of aperient medicine is required to move the bowels. The character of the motions is subject to much change. They are generally dark, or clay-colored, and fetid; but they may be healthy-looking and only diminished in quantity. Still there may be diarrhœa, and this circumstance should not beguile us into looking elsewhere for an explanation of the head symptoms. Diarrhœa and fever in meningitis are confessedly embarrassing signs, as they are the two characteristic and concomitant symptoms of typhoid fever. As the disease advances the motions may be passed unconsciously.

There is not much thirst in the absence of febrile phenomena, except in those cases of tuberculosis in other organs in the body, when the evening temperature runs up to 105° or 107°, and the skin is hot and pungent; in the latter stages of uncomplicated meningitis the febrile phenomena are high. As the disease advances and sensibility is blunted, the bladder is apt to become paralyzed, and the urine ammoniacal and albuminous. I have seen the bladder distended up to the umbilicus, and requiring the use of the catheter. Vogel* says he has not found albumen in the urine of these patients; but if it is searched for carefully, we shall detect it frequently in this, as well as in many of the congestive and inflammatory diseases of children. When it is small in amount, and the solids of the urine are sufficiently eliminated, it is of no great import, and does not add to the gravity of the case.

The *pulse* deserves our closest attention in this disease. It is variable in force and frequency; and this fluctuation may be taken to indicate pressure, either from fluid slowly poured out into the ventricles, or from increasing congestion of the cerebral vessels. In the early stage of the disease the pulse may be quickened, but it is usually regular; later on it lessens in frequency, and we have the slow pulse of hydrocephalic disease. It may be slow one hour and quick another, and become rapid or irregular after food, and whilst digestion is proceeding. If that stage of the disease is reached when it is fluttering and too rapid to be counted, it is significant of great danger, and the end is not far distant. We cannot infer with anything like accuracy that the state of the pulse or pupils is indicative of effusion or congestion, nor can we make out with certainty what changes have occurred in the consistence of the brain.

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* Diseases of Children, p. 364, 1875.

The character of the *respiration* is a most significant sign. It is similar to what is observed in simple meningitis, irregular or fluttering—*hydrocephalic sighs*—tranquil, as if momentarily arrested, then gasping as if death were at hand. This is an indication of nervous exhaustion and unsteadiness in the respiratory centre. When the pulse is quick the respiration is also accelerated in many cases; but these functions do not hold the close and orderly relationship which is generally assigned to them. The temperature may run up to 104° in cases of surgical pyrexia without any increase of respiration—it may be 101° and the respiration 42—and when the temperature reaches 103° it may fall to 20. So with the impulse, when it has fallen as low as 68 strokes in a minute, the temperature has been known to reach 104°. Some allowance must be made for the difference in this class of cases, since in tubercular meningitis, with increasing venous congestion, the respiratory movements are excited to greater frequency.

Headache is a frequent symptom at one or another stage of the disease. I have met with it at the period of invasion, and noticed in one well-marked case how the little boy carried his hand to his head when he was too young to speak. When the pain is paroxysmal, or one day present and another absent, it may be mistaken for neuralgia; and in the absence of fever I have had my doubts of its exact nature. When it is continuous or severe, the child will cry out with it, and if old enough will tell you that his head aches.

In genuine meningeal inflammation the muscles of the neck are contracted and the head is thrown back. In states of simple irritation and passive effusion, the muscles are relaxed and the child cannot support his head. When laid down to sleep he will rotate it from side to side and utter piercing cries of pain. He has startings and tremors in his restless sleep, and the pupils turn upwards under the half-closed eyelids and reveal the conjunctiva. Squinting may be observed in the early periods of the disease when it is acute, and also, in many slow and chronic cases, long before the brain is suspected of going wrong; but, as a rule, it is a late symptom of the disorder, and is complicated with inequality of the pupils, and the absence of sensibility in the conjunctiva, when the finger is passed across the eyeball in sleep.

Hemiplegia and *paralysis* of one arm and leg are to be noticed as occurring in the latter stages.

The two following cases of tubercular meningitis exemplify some of the leading features of the complaint to which I have referred.

Case I.—G. C——, æt. 4, was one of two children. The child had sharp features, dark hair, and prominent forehead. Father and mother healthy; no others in family. When brought to Dr. Wynn Williams as an out-patient, May 16th, 1877, it was stated that the child was perfectly well till a fortnight before, and since then she was faint and could not eat; she was generally hot, and the tongue furred. A mercurial purge and a saline mixture were ordered. On June 2d there were signs of low fever, and quinine was ordered three times a day. On the 9th there was some diarrhœa.

On the 11th, when admitted into the Dorset Street Hospital, the temperature at 1 P.M. was 100.2°; at 5 P.M. 101°; pulse 88; respiration quiet. The child appeared very languid, the tongue was furred, the skin hot, and the bowels costive. A mixture of citrate of potash and sulphate of magnesia was ordered.

On the 12th at 8 A.M. the temperature was 100°, and the bowels had acted twice. At 5 P.M. she could protrude her tongue, and was sensible; temperature 102.2°, pulse 126. 8 P.M. she had a convulsion, and was not sensible afterwards; temperature 102.2°. 12 P.M., temperature 103.6°, breathing heavily and quickly.

13th.—1.30 A.M. died.

Post-mortem Examination (eighteen hours after death) by Mr. A. Doran.—Body generally pale, except some marks of hypostatic congestion on the back and posterior part of shoulders. The calvarium was adherent to the dura mater. In the anterior portion of the right hemisphere, at the part corresponding to the posterior aspect of the frontal bone, two or three of the convolutions at this part were separated, and a cavity filled with serous fluid was seen large enough to contain a walnut. There was no pus or lymph in the cavity, but at its base a few enlarged vessels ramifying in the pia mater. The cavity immediately became apparent when the arachnoid covering it was opened, and this portion of the membrane, unlike the rest, was of a tawny yellowish color, resembling a weak solution of iodine or wash leather. At the central line of the longitudinal fissure, at the upper part of the cerebrum, was a patch of yellow, purulent-looking lymph, the size of a fourpenny

piece, and a smaller patch near it. The brain was generally much congested, especially posteriorly; at the base around the optic commissure was a layer of lymph and shreddy tissue, with small dots, common enough in tubercular meningitis. There was a large amount of subarachnoid fluid of a pale, serous, milky color. There were about two ounces and a half of serous fluid in the lateral ventricles.

The *mesentery* was studded with enlarged glands, the average size being that of a small nut. The *liver* was generally pallid and studded with tubercles, it extended into the left hypochondrium, touching the ribs on either side, and there was not a quarter of an inch of healthy liver free from these granulations; the peritoneum generally was studded with them, but especially that which covered the diaphragm, where they were seen in large patches, the size of the palm of the hand at the centre, and honeycombed. The *spleen* was thickly covered with them; intestines distended with gas; no peritoneal effusion. Both lungs were also irregularly studded with tubercles, but not more at the apex than the centre or base. The central lobes were most congested.

Case II.—A. F., æt. 2½ years, was admitted into the Samaritan Hospital under Dr. Wynn Williams, May 24th, 1877, suffering from synovitis of the right knee-joint, of seven months' standing. The child had been brought up by hand, and much neglected; she was thin and delicate, had fair hair, and refined features. A splint was applied to the joint in order to keep it at rest; the temperature was normal, and there was nothing apparently wrong about her besides. On the 27th, happening to be in the ward, I observed that she was partially asleep and restless, crying out at intervals in sharp, piercing tones. The pulse was quiet and the temperature normal. I made the observation that I feared head symptoms were threatening. On the 29th the temperature was still 98.8° and the pulse 100, but the child was constantly sleeping and apparently indifferent to all that went on around it. On the 30th ordered calomel gr. iss., jalapin gr. i. At six in the evening I saw the child, with Dr. Williams, and made a note to the following effect: "Temperature 100°; pulse 120, small and thrilling; respiration 24, irregular and sighing; the pupils are of medium size, but eyes half open and unconscious since yesterday morning. Tongue covered with a creamy fur; belly concave; respiration

abdominal (probably effusion into ventricles); bowels freely moved from powder."

June 1st.—Temperature at 8 A.M. 99°; at 2 P.M. 99.6°, was much convulsed; at 8 P.M. 99.2°. During the night, alternate flushing and pallor of the cheeks—eyes half open, but resists when eyeball is touched, and remains sleeping in a semi-comatose state—moving hands about and eyes squinting; lower eyelids shrunken, head hot, pulse 170, very small; respiration quiet; bowels again open twice.

2d.—Temperature at 8 A.M. 98.8°; at 8 P.M. 98°. During the night the child was much convulsed in the limbs, and was never at any moment conscious; veins of forehead and scalp much distended; pulse 160; respiration 20, a quarter of a minute sometimes elapsing before a respiration was taken; lips and teeth dry from the mouth being half open. The tongue was covered with a thick whitish fur; eyes staring; thumbs fixed in palms of hands; can swallow a little milk when put into her mouth. 4.30 P.M. pulse 136, weaker; constant twitching of right eye and arm. The motions and urine passed unconsciously for two days.

3d.—Temperature at 8 A.M. 99.4°, at 1 P.M. 100.6°; pulse 164; respiration 20. The child now lay in an unconscious state, and the right cheek was much flushed; the respiration was irregular, but extremely quiet, a quarter of a minute sometimes elapsed before an inspiration was taken. When turned on her side and the thermometer was introduced into the rectum she offered no resistance, and appeared not to feel it. She was quite insensible, with her eyes half open, though when the eyeball was touched she appeared to feel it, and moved her head a little; motions and urine still passed under her. Made an effort to swallow when a little milk was put into her mouth. Temperature at 5 P.M 101°; at 8 P.M. 101.6°.

The breathing now became heavy and stertorous, with mucus rattling in the throat, and the cheeks were livid; the lips were also dusky and the nostrils quiet. The pulse was too rapid to be counted; the temperature was taken in the axilla immediately before death at 10.30, when it reached 105.6°.

Post-mortem Examination (twenty hours after death) by Mr. Alban Doran.—Tibia slightly displaced backwards; no excessive synovial fluid was found, nor any adhesion but synovial fringes were vas-

cular and hypertrophied, invading the margins of the condyles of the femur, which were softened.

On removing the scalp the calvarium had a dark venous appearance; there was perfect union of the fontanelles. The dura mater was everywhere distended and adherent along the line of the longitudinal sinus; there was great congestion of all the veins of every magnitude, including venous capillaries. The meningeal artery and veins accompanying it were distended. The convolutions were flattened, and milky patches of whiteness were seen over the arachnoid; texture of brain very soft. In the subarachnoid spaces there were about four ounces of fluid (clear and serous) from the locus perforatus to the medulla oblongata, the arachnoid was infiltrated with small specks of tubercle. On cutting into the hemispheres the gray matter was slightly congested, the puncta of the white matter exuded freely. About half an ounce of serous fluid in both lateral ventricles. The sensorial ganglia, the pons, the crura, and medulla oblongata were all firm and free from congestion.

The right lung was moderately congested, with miliary tubercle disseminated throughout, less at apex, where the congestion was slight, than at the base, where the lung was very dark; the left lung was still further congested from the presence of tubercles. Right cavity of heart distended. *Liver* and *kidneys* healthy. *Mesenteric* glands all enlarged, the largest the size of a *French bean*, with caseous tubercle in the larger ones.

Microscopical examination of the lungs: Adenoid cells very freely deposited in stroma; no proliferation of epithelial lining of pulmonary vesicles, characteristic of acute tuberculosis; death before secondary catarrhal pneumonia. Adenoid cells so abundant as to cause collapse and occlusion of vesicles.

Chronic Basilar Meningitis.—There is a *variety of acute and chronic meningitis* attacking the base of the brain (*basilar meningitis*) very well described by Dr. Cross, of New York.* In the adult it is not a common affection; in forty-seven cases of this localized affection forty-three were acute, four only chronic, as proved by post-mortem examination. Gintrac says, "This species is distinguished by its seat at the inferior surface of the brain, by its circumscribed extent, and especially by the relation of the affected

* On Chronic Localized Basilar Meningitis, Psychological and Medico-Legal Journal, April, 1875, p. 220.

part with the central region and with the cerebral ventricles."* The symptoms depend on the intensity of inflammation, as well as on its seat and extent. When a small portion of the membranes at the base of the brain are involved, the symptoms are not so severe as when a larger extent of brain is implicated. Thus, the optic nerve of one side may be atrophied, whilst the other is normal, and the inflammatory exudation or softening may extend to the third, fourth, fifth, sixth, seventh, or eighth pair of nerves, and so set up a different set of symptoms—symptoms of a local character, shifting from one side to the other. The third nerve, in the majority of cases of basilar meningitis, is paralyzed.

In thirteen cases recorded, the third nerve was partially paralyzed in nine, and in most cases on the left side; in nine cases there was strabismus, and in five of these it was external and on the left side; the pupils were dilated in eight cases, and contracted in one; there was obscureness of vision in four; ptosis in five; blindness in one case; in another loss of sight in both eyes. Headache was a prominent symptom, not confined to any particular locality; in twelve cases generally severe, dull, and throbbing, and ushered in gradually; once it was developed suddenly. Vertigo was present in seven cases, paralysis in eight cases. In acute cases, paralysis is the exception, exclusive of the muscles of the eye. In the chronic form it is most frequently marked.

Chronic basilar meningitis is very prone to change its position from one side of the head to the other. The symptoms may be well defined on the left side, as ptosis, strabismus, dilatation of the pupil of the left eye, and headache may be marked on the left side. These may disappear, and the paralysis be cured, and after the lapse of three months the patient may have the same symptoms on the other side. In one case the disease was ushered in by epileptiform convulsions, and once by the loss of consciousness. Anæsthesia was present in six cases, sometimes confined to one side of the face, generally to one arm or leg; once in the left limbs, and in the right arm; hyperæsthesia in no instance. The above are the most important symptoms of chronic basilar meningitis; but the following symptoms are related in the thirteen cases alluded to: vomiting, twice; thirst, thrice; trismus, thrice; fever, once; supination, once; opisthotonos, twice; nausea, once; eyes closed, twice; coma, once; dyspnœa, once; convulsive movements, once; aphasia, once. The chronic form is most common

* Maladies de l'Appareil Nerveux, vol. ii, Paris. Quoted from Dr. Cross.

between the ages of twenty-five and thirty-five; the acute most frequent between one and ten years of age.

The diagnosis is sometimes attended with perplexity, as there is no one pathognomonic symptom we can rely on. The ophthalmoscope is a great aid to diagnosis; and if the eyes are in a normal state, and there is no disease of the orbit, we may reasonably conclude that the disease is central.* The difficulties, however, are not so great as they are sometimes made to appear, for in nearly all cases I have seen of chronic meningitis, or tubercular meningitis, there are symptoms present that point to the base of the brain as involved in the irritation, and I have never seen a case after death where the post-mortem has not revealed exudative changes in the latter situation. This exudation of coagulable lymph may have an affinity to gather round the great nerves, at the base of the brain. Even where tumors or cysts in the brain are supposed to be present, or softening or embolism or hæmorrhage to have happened, the duration of the symptoms, the localized pain, and the implication of nerves would assist the diagnosis.

Treatment.—This disease is so uniformly fatal that if the practitioner is sure that the meningitis arises from tubercles in the membranes he cannot hope to save his patient. I have never known a case recover. We have already seen that in simple meningitis death usually takes place in a few days, and in the graver disease under consideration we have not only cerebral in-

* The utility of the ophthalmoscope in elucidating the intracranial diseases of children is shown in the following passage: "L. Heingel (Jahrbuch der Kinderheilkunde, vol. iii), in sixty-three cases of intracranial disease in children, found in forty-seven affections of the optic nerve or retina, or of both. There were eighteen cases of neuroretinitis; thirteen of neuroretinitis with congested papilla; four of congestion of the optic nerve; four of optic neuritis with congested papilla; two of consecutive atrophy of the optic nerve; six of atrophy (genuine?) of the optic nerve; and in sixteen the ophthalmoscopic appearances were normal. The cases are thus classified according to the disease; in thirty-one cases of tubercular meningitis of the base of the brain: fifteen of neuroretinitis, five of neuroretinitis with congested papilla, four of congestion of the optic nerve, two of incipient atrophy, one of atrophy, and four with normal fundus of the eye. In ten cases of the same disease with tuberculosis of other organs: three of neuroretinitis, one of optic neuritis with congested papilla, three of atrophy of the optic nerve, and four normal. In fourteen cases of cerebral tumor: five of neuroretinitis, two of neuroretinitis with subsequent atrophy, four of atrophy, and three normal. In two cases of œdema cerebri—congestion of the optic nerve. In the remaining seven cases (œdema and hyperæmia of the meninges, sclerosis of the brain, cerebro-spinal meningitis, and effusion in the cord), the fundus of the eye was normal. It was observed that neuroretinitis frequently appeared within a few days, and that in all cases it affected both eyes alike."—*British Medical Journal*, October 16th, 1875, p. 492.

flammation to contend with; but an inflammation kept up by the irritation of tubercular deposit. When the disease is threatening, every attention should be directed to remove all sources of irritation that lead to cerebral congestion. The mental powers should not be taxed by lessons, and active remedies should be discontinued. The head should be kept cool, and the bowels gently stimulated by the mildest laxatives; the diet should be nourishing and unstimulating, and the heat of the sun avoided. Pure air, lively companions, and cheerful surroundings are important; running and active physical exertion should be discountenanced.

The occurrence of porrigo and obstinate eruptions of the face and head require careful management, especially during dentition. In the autumn of 1874 I met with a fair and delicate child, two years of age, who had an active eczematous eruption of the whole scalp. It had remained obstinate for months, sometimes being dry and covered with crusts, and at other times discharging freely under an oil-skin cap. When the eruption eventually healed the child developed strumous symptoms, and the health began slowly to decline; the face shrank in size, and the veins in the head were fuller; sleep at night was restless and unrefreshing, and the child refused his food. After several convulsive seizures an attack of meningitis supervened, and death occurred in the course of a week. No post-mortem was allowed.

These cases I now regard with caution, and prefer the continuance of a mild skin affection, even if disfiguring, to the dangers incident on suddenly healing it.

Antiphlogistic are the chief, if not the only, remedies by which we can hope to afford relief. When the earliest symptoms are threatening, as heat of head, peevishness, and irritability, a grain of calomel alone, or the hyd. c. creta, with a few grains of rhubarb, will be necessary for two or three nights in succession, or the dose may only be required twice a week. A mixture of sulphate of magnesia is useful during the day, with a small quantity of the tincture of bark or nitrate of potash, if the skin is hot and the urine scanty. The infusion of calumba and syrup of rhubarb, in equal proportions, is a good stomachic and laxative. If there is any tendency to vomiting or headache, calomel at the outset is the best remedy, as it is retained on the stomach when other drugs are expelled; not that its good effects are attributable to any specific action, but it thoroughly unloads the liver and small intestines, and so indirectly relieves cerebral congestion. With regard to de-

pletory measures we have to remember that the subjects are delicate and of strumous constitution, and therefore the administration of mercury and purgatives, important as they may be at the onset of the disease, will need great care and judgment as the disease advances. Whatever is done in this way must be done early. The same remarks, as in simple meningitis, are applicable to leeches; they require to be employed with the utmost caution, and are only of use in the early stages of the affection, even if they are then demanded. If employed at a later stage, when the mind is getting confused, and there are convulsive movements, the loss of blood will hasten the fatal issue. Cold to the head, when there is active congestion in the early stages, as I have previously recommended, is a remedy of great value. In the stage of effusion, when there is restlessness and sleeplessness, iodide and bromide of potassium will be found valuable because of their power in diminishing excitability and tranquillizing the nervous system. These two remedies given together may control secretion, and even favor absorption if it has occurred; bromide of potassium administered alone is capable of lessening reflex action, of controlling convulsive seizures, and of reducing to some extent arterial tension and vascular excitement, when the more depressing action of chloral might be considered hazardous. Morphia or an opiate in some form may be required when there is excitement and wandering, and the little patient can obtain no sleep. But great caution is necessary in administering these remedies from the cerebral activity to which they give rise at first, and the danger of subsequently depressing the circulation, and lessening respiratory action. Opium acts equally upon every nerve-cell, and also equally upon every nerve fibre; . . . . it not only lessens cerebral receptivity, but it also deadens nerve conductivity.* A sedative will sometimes be borne well after the action of calomel and purgatives, if there be scarcely any heat of the head, and the pulse be quick and feeble.

Chronic hydrocephalus, or dropsy of the brain, consists in a collection of serous fluid within the head. It may commence in utero and seriously impede the progress of labor, when it is termed congenital hydrocephalus, or the head may not begin to enlarge till after birth. In most cases the fluid is effused into the ventricles (internal hydrocephalus), but it may collect between the dura mater and the cranium, or between the dura mater and the arachnoid, or between the latter membrane and the brain—external hy-

* Brit. Med. Journ., vol. i, 1876, p. 16.

drocephalus.* Wherever the accumulation takes place the symptoms are nearly if not quite alike in all instances. Where it is effused between the arachnoid and the brain, the effect is to flatten the convolutions, if not to obliterate them, and to expand and increase the width of the head, which also becomes elongated, and the base of the skull depressed and hollowed out. When the accumulation takes place in the ventricles the brain becomes thin, and spread out so as to be almost obliterated; and if the fluid meets on the two sides, the hemispheres are pressed asunder, and the distension stretches the pia mater so that it can scarcely be seen; the cerebral tissue being infiltrated by the effused fluid, becomes soft and pultaceous, and otherwise altered. The bones entering into the formation of the skull become thin and friable from the diminution of bony matter, and ossification is incomplete at the anterior fontanelles, and along the line of the coronal suture. The water may go on increasing till the sutures separate, and the ventricles become distended with as much as three pints of fluid, without any water exterior to the brain. Such a case is related by Dr. Underwood.† The effusion is greatest in the earlier months of life, and lessens or remains stationary as the child grows older. When it is congenital, it is due to some morbid state of the membranes, or ventricles of the brain, and is either observed at birth or soon after.

The fluid consists chiefly of water; traces of albumen, phosphate and carbonate of lime, and potash are found. It is transparent or slightly yellowish, and the specific gravity is lower than the serum of the blood from a deficiency of solid constituents. In the well-known case of Cardinal, who was hydrocephalic from infancy, and attained the age of twenty-nine years, the composition of the fluid was found to be:

Specific gravity,	1011–38.
Water,	982.6
Albumen,	6.0
Chloride of sodium,	7.0
Soda,	1.4
Urea and osmazome,	3.0
Sulphuric acid, lime, potash (a trace).	
	1000 0‡

* "Of 200 cases of hydrocephalus I have found 100 to be of the internal variety, 80 to be œdema of the pia mater, 10 to be cases of external hydrocephalus, and 10 cases of simple cerebral œdema."—Steiner's *Diseases of Children*, by Lawson Tait, p. 44.

† On the Diseases of Children, by Dr. Davies, 1846, p. 373.

‡ Jones and Sieveking's Pathological Anatomy, by Dr. Payne, p. 248.

Causes.—The disease is frequently hereditary, and is met with in the families of drunkards, and those affected with syphilis and consumption. Children laboring under mesenteric disease are liable to be attacked, and dentition is an exciting cause, as also rickets, by preventing or retarding the ossification of the skull; an attack of bronchitis or diarrhœa will awaken the disease in a child predisposed to it, and some parents profess to trace it to a troublesome catarrh. Excess or deficiency of blood in the brain, impeding the cerebral circulation; hæmorrhage into the sac of the arachnoid, morbid growths, or a slow form of inflammation, have been enumerated as common causes.*

Symptoms.—Some enlargement of the child's head before the health begins to fail is generally the first symptom to attract notice, but a strange movement and unsteadiness of the eyes, which is set down to gastric disorder, may be among the early indications. In some instances, nothing is observed till a convulsion happens, and from that moment some marked signs ensue. The face has an old and shrivelled look, and is very small when compared to the size of the head, the chin being pointed, and the angles of the lower jaw sharp in outline. The appearance of teeth is delayed, and children often reach their first year without any traces of them. The eyes at an early stage have a slow rotatory movement, and the veins of the head become distended, as though about to burst when the child cries; the skin of the neck and body is loose and wrinkled, and the stomach is noticed to be large, whilst the extremities waste; the bowels are irregular, being sometimes constipated and at other times loose; the motions are light or dark and offensive, or clay-colored and sticky, or they are greenish and contain undigested matter like curdled milk. There is apparent discomfort about the head, and the child is constantly raising his fingers to his eyes, or passing his hand across his forehead; he is frequently sick during the day, and retains nothing on his stomach. In some cases the appetite is ravenous, and the child is only quiet when he is eating; in other cases the appetite will depart for days together. Having reached this stage there are striking changes to be observed in the size and shape of the head. It may have been noticed to be larger at birth, or to have commenced to grow disproportionately within a fortnight; but notwithstanding this, the child may be plump and healthy-

* West, on Diseases of Children, fourth edition, p. 117.

looking, able to suck, and apparently well nourished. Soon, however, and frequently between the ninth and twelfth month (when the mother leaves off suckling, or the diet is changed) nutrition is interfered with, and the child begins to lose flesh and grow weakly. If he is older, and has been able to walk, he totters, and his legs cannot support him; he is wearied after exertion, and falls off to sleep in the daytime, and is unable to support his head; he is uneasy and restless at night, and the pillow has a wet circle where the head has laid. As the cranial bones yield to the increasing fluid, the veins of the scalp become distended, the temples sink in, and the forehead is arched, whilst the anterior fontanelle is open, and the frontal bone itself is only completely ossified at the lower half. In one case under my care two large veins ran down the groove, and when the child cried they looked about to rupture. As the effusion advances, the parietal and frontal bones become more separate, and their edges are to be felt if the distension is moderate; the eyeball is now prominent and thrown downwards and forwards, and the sclerotic between it and the upper eyelid is very prominent, whilst the lower eyelid conceals the pupil. If the fluid increases rapidly the child may become drowsy and heavy, and symptoms of compression ensue, followed by squinting, convulsions, irregular pupils, and coma. In the course of hydrocephalus, before the head is much enlarged, Dr. West has noticed in several instances, spasmodic attacks of difficult breathing and crowing inspiration like spasmodic croup.*

Treatment.—This is a most unsatisfactory disease to treat, at whatever stage it comes before us; not, however, that it is always incurable, as instances of recovery are recorded, and hydrocephalic children have reached manhood. Where the cerebral functions are not seriously implicated, and convulsions and paralysis do not arise in the course of the disease, we may hope for benefit from treatment if we see the case early, and the child's constitution is tolerably robust.

The strenuous employment of mercurial inunction for weeks, in the shape of one or two drachms of the mild unguentum hydrargyri, rubbed in daily over the shaven scalp, has proved beneficial. It is a plan recommended by Professor Gölis, of Vienna, and approved of by Dr. West.† The head is to be kept constantly covered

* Diseases of Children, fourth edition, 1859, p. 120.

† Ibid., p. 128.

and protected from the cold by means of a tightly-fitting flannel cap. A quarter to half a grain of calomel is to be given twice a day, unless diarrhœa comes on, when it is to be discontinued, and inunction alone trusted to. If at the end of six or eight weeks no benefit results, diuretics and other remedies are to be used, and issues or blisters applied to the back of the neck. A very instructive and apparently hopeless case is recorded by Dr. Underwood.* After leeching and purgation, two drachms of strong mercurial ointment were rubbed in daily for three weeks, and a powder consisting of a grain each of squill, digitalis, and calomel was given night and morning. An improvement soon commenced and gradually continued; the child passed through dentition well, and at twenty-one years of age was a fine young man. Mercury, like other exhaustive measures, must be used with the utmost caution, as prostration of strength is easily induced. If there be restlessness, great heat, and turgescence about the vessels of the head, leeches have, according to some authors, been repeatedly used with advantage, but I have had no experience of the plan, never having seen a case in which I should have felt justified in employing them. The treatment found most serviceable is to meet the chief symptoms that are present in each individual case; if there is diarrhœa, or bronchitis (not unfrequent complications), it must be subdued before any active measure are adopted, or the child may die of convulsions or syncope. Where the symptoms are chiefly cerebral, and the child is well nourished, mercury is best tolerated; but if there is much wasting and emaciation, and the pulse is feeble or irregular, it cannot be trusted to. Looking at the cases as a whole, I have found small doses of the hyd. c. creta of benefit, continued every night for a week, and then left off for a short time and resumed again. If the strength is equal to it, I prefer the sixth of a grain of calomel night and morning for a few days, when the head becomes cooler, and congestion and sickness are relieved. Where mercury appears to be indicated, we may obviate the dangers of depression by employing small doses of the solution of perchloride of mercury with the tincture of cinchona. As in some other cerebral affections it will be found a valuable combination.

The iodide of potassium is another remedy on which I repose

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* Diseases of Children, by Dr. Davies, 1846, p. 374.

considerable faith in the management of these cases; it is of undoubted value where there is irritability, and the head is slowly getting larger; it should be given in small doses, one or two grains three times a day, in a little syrup and water, and then it does not disorder the stomach, and cause sickness, as it might do in larger doses. I sometimes add a few drops of sal volatile to obviate any depression. In cases complicated with secondary syphilis and affections of the periosteum and joints, it is a valuable alterative, lessening irritation of the cerebral membranes, and promoting the absorption of chronic or inflammatory effusion. If there is restlessness and headache, then a few grains of the bromide of potassium may be advantageously added to it.

Compression is a remedy suggested on the view that a certain degree of pressure is conducive to health. It can only be safely employed when the disease is chronic and stationary, and there are no active signs of cerebral disturbance. When the child is pale and languid, and fluctuation is distinct between the imperfectly ossified bones, the head may be strapped. Narrow strips of plaster are made to encircle the head from one mastoid process to the other, and from the nape of the neck to the root of the nose. If symptoms of pressure at the brain or heat of head follow the application they must be loosened or removed altogether. Whilst this local treatment is being carried out, the functions are to be stimulated by diuretics, alteratives, and an occasional purge. Preparations of iron and cod-liver oil are generally needed, sooner or later.

Puncture.—This should be done at the coronal suture with a fine trocar and canula below the anterior fontanelle, avoiding the longitudinal sinus and large veins, gradually withdrawing the fluid and keeping up pressure on the head as it discharges, lest the pulse become weak and feeble, and the child faint.* I knew of one case in the practice of a medical friend in which a cure was said to have followed this method, but I have had no such experience myself, and I should be reluctant to adopt it unless all other means had failed.

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* Medical Times and Gazette, March, 1838.

CHAPTER XLIII.

EPILEPSY.

DEFINITION OF—VARIETIES OF: *Epilepsy proper or idiopathic epilepsy—Epileptic vertigo—(Epilepsia gravior—Le grand mal)—Slight epilepsy—(Epilepsia mitior—Le petit mal).* SYMPTOMS: *Of the true or idiopathic form—Duration of the fit—Headache and vertigo—Night alarm in children—Character of the urine—Aura epileptica—Its nature—Association of epilepsy with chorea—Perversion of the moral sense—Le petit mal a less severe and frequent form than le grand mal—Slightness of the spasms.* CAUSES: *Predisposing and exciting—Hereditary influences—Weakness of the nervous system—Syphilis—Rickets—Heart disease—Phthisis—Tumors of brain—Injuries of the head—Relation to carpo-pedal contractions (congenital talipes).* MORBID ANATOMY: *Congestion of the brain—Thrombosis or embolism of the small cerebral arteries—Exalted sensibility of the medulla oblongata.* DIAGNOSIS: *From hysteria—Paralysis—Convulsions—Difficulty in forming a differential diagnosis between le petit mal and epileptiform seizures—Resemblance to eclampsia—Means of distinguishing the two convulsive attacks—Epileptiform seizures—Symptoms and diagnosis from true epilepsy—Resemblance in some cases to attacks of angina pectoris.* PROGNOSIS: *Favorable in early life when the cause admits of removal—Unfavorable when the constitution is syphilitic or scrofulous, or there is a history of nervous disease.* TREATMENT: *During the fit, and in the interval—Attention to the digestive organs and the removal of all sources of irritation—Purgative medicines—Counter-irritation—Necessity to observe a simple diet and to avoid wine and stimulants—Importance of hygienic treatment—Care in education—Bromide of potassium—Iron—Iodide of potassium in syphilitic cases—Nitro-muriatic acid—Phosphorus—Ergot—Ammonio-sulphate of copper—Oxide of zinc—Prophylactic measures—Hyoscyamus and digitalis in epileptiform seizures.*

IT is wellnigh impossible to frame the definition of a disease so variable in its manifestations as epilepsy, the severe forms bearing but a faint resemblance to the milder varieties of this affection.

Epilepsy consists in the occurrence of fits at more or less regular intervals with entire loss of sensibility and consciousness. In its severe form it is accompanied with general convulsions, and spasmodic contraction of the voluntary muscles. It is frequently followed by deep sleep or coma. Males are said to be more subject to the disease than females, but Russell Reynolds considers the two sexes about equally liable. Except when occurring in imbeciles, severe epilepsy in children is of very serious omen.

It is important to remember that the spasmodic action may vary from slight twitching of the arm or leg to the most severe convulsion, and that the degree of consciousness may range from mere bewilderment and confusion of ideas to the most profound coma.

Epilepsy is divided into two varieties. 1. Epilepsy proper, or

idiopathic epilepsy (Le grand mal). 2. Slight epilepsy (Le petit mal).

Epilepsy may be centric or excentric. When centric it may depend upon irritable areas in the brain; irritable by some inherited tendency, or some accidental injury or morbid growth. When of excentric origin it may arise from peripheral irritation, as a tapeworm in the intestines, or some abnormal condition of the viscus. "Scientifically, I should consider epilepsies on the basis of each being dependent on excessive paroxysmal discharge of some part of the cerebral cortex."*

The epileptic discharge, though single, if severe may produce the same shock to the rest of the brain, as is the common result of a series of rapidly repeated fits; the "*status epilepticus*" or condition of complete prostration following a series of repeated fits is strictly analogous to the condition of exhaustion produced in the electric eel (Gymnotus) after repeated discharges, or the condition of fish after the explosion of gunpowder or dynamite in a pool.

Death from the first epileptic discharge is exceedingly rare. When it does so take place, the brain and membranes are found enormously congested if the seizures are prolonged. The heart is arrested and brought to a standstill, either from exhaustion due to the violence of the fit, from paralysis of the medulla, or from the circulation of carbonized blood producing asphyxia.

The *symptoms* of the so-called true or idiopathic form of epilepsy are sudden loss of consciousness, "a paroxysmal loss of consciousness" (Hughlings Jackson), the patient frequently screams out in a loud voice, as if alarmed or terrified, and usually falls with his face forward to the ground in an instant if standing up or walking across a street or room. He may, however, fall backwards or to one side. Proximity to a fire or water at any moment may put his life in jeopardy. He is likewise at the risk of injuring himself by coming in contact with some hard body or sharp surface. Cuts and bruises are common enough under these circumstances. Terror and a sense of fear frequently precede an attack. In the seizure the child throws his arms about and kicks violently, the muscles being tense and powerfully contracted; the convulsions may be general, but as a rule, one side of the body is more affected than

* Lectures on the Diagnosis of Epilepsy, by Hughlings Jackson, M.D., The Lancet, 1879, p. 43.

the other; the eyes are wild and fixed, or so hidden by the upper lids that the sclerotic is only exposed. The pupils are usually dilated and insensible to light, but at an early stage they are often contracted, and of variable size during the continuance of the paroxysms. The pulse may be so variable that it is scarcely perceptible, or it is not altered from health, whilst the heart is felt to be violently beating and the carotids are equally active. The expression is greatly distorted; the face is pallid at first, from tonic contraction of the vasomotor nerves, but it soon becomes livid, and the superficial veins, including those of the head, are turgid, and the muscular coats of the bloodvessels are involved in spasm. Sometimes mucus mixed with blood issues from the mouth. Small extravasations of blood on the surface of the face and forehead are occasionally seen resembling petechiæ. The tight closure of the jaws often causes the patient to bite the tongue or the under lip. The contraction of the flexor tendons is always great, the fingers being clenched in the palms of the hands, the foot arched, and the toes bent.

The insensibility may be so profound that the patient cannot be roused by any means at our command, and even reflex action cannot be excited in severe cases by tickling the feet, or irritating the conjunctiva. When the paroxysm has subsided, the skin is bathed in perspiration, consciousness returns, and the patient may seem none the worse for the seizure; but in many cases there follow profound sleep, and on awaking the child may be torpid, and his memory and ideas confused for a day or two. He complains of frontal headache, and the features are so congested and bloated as to be almost characteristic. "Headache and vertigo are the two forms of disturbance the most frequently complained of by epileptics."* Headache is common both before and after the seizure. Dr. Sieveking met with it in 56 out of 104 cases. He speaks of it as "*Cephalalgia epileptiformis*,"† and says, although the pain may affect any part of the head it chiefly attacks the vertex. In the cases I have observed there have been the usual characters of congestive headache from excitement of the circulation and fulness of the cerebral vessels.‡ Sometimes the contents of the bladder

* A System of Medicine, article Epilepsy, by J. Russell Reynolds, M.D., vol. ii, p. 313.

† On Epilepsy, 1861, p. 56.

‡ On Headaches, by W. H. Day, M.D., 1879.

and bowel are passed involuntarily during the fit. The tonic convulsions continue for a few minutes, and then pass away, leaving the muscles more or less flexed and extended. Sleep may continue for some hours afterwards, the muscles being completely relaxed or tremulous. The fit usually lasts two or three minutes altogether, but it may continue for a quarter of an hour. "The first or tetanic period is generally the shortest, lasting from a few seconds to half a minute or one minute; while that of the clonic convulsions is the longest, and lasts from three to six minutes." (Althaus.) In some cases of epilepsy the patient is no sooner free from one fit than another supervenes. When this happens, the brain suffers from these repeated shocks, and in the intervals of the paroxysms the child is torpid and prostrated. There may be several fits in the course of the twenty-four hours, or the interval may extend over months and years. "The number of attacks in a given time ranges between very wide limits, from two to two thousand in a year; but half the cases are found to have a rate of recurrence ranging from one attack in fourteen to one in thirty days."*

"What is called night-alarm or nightmare in children is often an incomplete epileptic attack. The children go to bed and sleep in the usual manner, but after a time scream, endeavor to get out of bed, stare at some imaginary object, break out into a profuse perspiration, fall back exhausted and relaxed, and go to sleep again. Such attacks may be repeated several times in the night, and the little patients have no recollection of them on waking in the morning."† A child aged three years, suffering from rickets and cerebral exhaustion, was under my care in November, 1879, and the nurse found him night after night in the condition described, but he never had a genuine convulsion or epileptic paroxysm. Bromide of potassium and henbane relieved the symptoms.

In some cases the urine contains an abundance of phosphates, alternating with an equal quantity of lithates. "Frequently there is an excess of phosphates; oxalates are often seen; and I have repeatedly found the urine of epileptics exhibit persistently so large a quantity of urea, that, on the addition of equal parts of

* Russell Reynolds, op. cit., p. 315.

† Lectures on Diseases of the Nervous System, by Julius Althaus, M.D., Medical Examiner, Feb. 7th, 1878, p. 112.

nitric acid, the whole of the liquid was almost solidified by conversion into urea."*

An epileptic seizure does not always commence in the same way. Before the attack, in some instances, there is pain in the stomach, nausea, or vomiting, headache, and restless sleep. In other cases there are pain in the præcordial region, and palpitation of the heart, bright colors appear before the eyes, there are noises in the ears, and nervous apprehension. The patient often looks wild or vacant, and the mouth and lips are in constant movement. If the tongue is protruded there may be seen on its surface a foamy saliva, which is not infrequent among adults who suffer from nervous disorders. "Children particularly show the alarm they experience by running to and clinging to their nurses and mothers."† A peculiar feeling of cold, or tingling, or numbness, or vaporish sensation, creeping from the lower extremities, is felt along the spine to the back of the head (termed the "*aura*"), when the patient becomes insensible, and falls down in the fit.

The *aura epileptica* is a curious physiological phenomenon which indicates the approach of the paroxysm. It is a premonitory symptom, occurring in about one-half the cases, and is subject to much variation in its character. Sometimes it is motor in its origin—convulsions seizing on a certain set of muscles, as those of one arm, or leg, or foot, or finger. Many years ago, a young lady came under my notice, where the paroxysm was preceded by incessant tremor of the right leg. She called out, "I am going to have ague!" and then the fit followed. There was probably vasomotor disturbance, and a sense of chilliness at the same time extending upwards from the limb to the brain. Some auræ seem to affect the nerves of special sense, as when offensive, strong, or disagreeable odors excite a paroxysm, or flashes of light are seen before the eyes. Occasionally the aura may be visceral, as when it affects the stomach, heart, or intestines. Any sudden shock, as calling aloud, tying a ligature round the limb, or giving a stimulant, may arrest a seizure even when the aura is present.

Dr. Handfield Jones mentions the case of an epileptic boy, 13 years of age, in which the fits began with a sinking sensation of the stomach, then giddiness and falling down, but there was no unconsciousness. After a "fright" he got well-marked chorea, but he was free from epilepsy. The author remarks that "the

* On Epilepsy, by E. H. Sieveking, M.D., 1861, p. 119. † Ibid., p. 19.

transmutation of the malady into chorea is a point of much interest, marking the affinity which subsists between the several neuroses."* The aura or reflex action in such a case would probably travel to the medulla oblongata by means of the sympathetic and pneumogastric nerves. There is a similar relation to asthma.

Not unfrequently the disease is preceded by a voracious appetite or constipation, in others, on the contrary, by a total dislike of food. In most cases there is no notice of the fit before it occurs. Agitation and excitement are instantly followed by swimming in the head, the room appears to go round, and the patient falls down.

An epileptic fit may be preceded or followed by spitefulness, anger, and violence. The child is shy, fretful, suspicious, wilful, disobedient, or morose. Dr. Sieveking has observed "thieving propensities and other mischievous tendencies, such as setting fire to dwellings." Dr. Althaus has recorded a case, in a boy of 7, who had regular attacks of destructiveness, tearing sheets, blankets, clothes, and everything within his reach. "After a particularly bad outbreak he was put in a strait waistcoat, and managed to tear it to pieces with his teeth."† In another case under his care, a girl of 9 was a "fearful liar," stole money, and was daring and defiant. A girl, 9 years of age, was brought to me by her mother, in 1872, who was in the habit of suddenly rushing at her sisters and brothers before the paroxysm, and biting them, after the fashion of a ferocious dog which had been teased and irritated. The arms of one sister showed indentations caused by the patient's teeth.

The *petit mal* is a less severe and frequent form of epilepsy, consisting in giddiness and confusion of ideas, or sudden and transient loss of consciousness, accompanied with symptoms of faintness or of syncope. There is slight convulsive movement of the facial muscles, eyes, and hands, or may be not even this, followed by stupor and sleep. The patient may stagger, and even fall down, or may exhibit such a wild and vacant look that a bystander thinks a fit is about to happen. "To prevent a possible misunderstanding, let me remark that the terms 'slight' and 'severe' refer to quantity of manifestation, not to gravity of the case, the slight

* On Functional Nervous Disorders, 1870, p. 293.

† Medical Press and Circular, July 16th, 1879, p. 45.

seizures are the worst for mind."* When the convulsions are severe, the insensibility complete, and there is biting of the tongue and foaming of the mouth, the diagnosis of epilepsy is easy enough, but epileptic vertigo with partial suspension of reason is apt to perplex us in diagnosis. In some of these attacks the spasm is scarcely obvious. The respiration may be momentarily suspended, and the face at first pallid becomes livid, whilst the urine is frequently discharged during the seizure. "A boy, 10 years of age, had been subject to fits for two years. At the first they were so slight that his mother said they thought he was in a 'deep study;' he used to sit 'as if he were thinking.' The attack was only of a few seconds' duration, and no alteration of complexion was noticed. Later on in his fits he would turn up his eyes—slight spasm of very small muscles. Later still, there was, besides this, occasional shaking of the body (imitated before me by tremor). I saw one. Whilst sitting the boy blinked his eyes; he did not alter in color; he then drew in a deep breath, and rapidly all was over. The paroxysm was so sudden and short that I could not make any special investigations. Attacks of epilepsy may be so slight that strangers sitting opposite a patient at dinner may observe nothing, although there is absolute, though transient loss of consciousness."† These slight seizures may come and go, and then be replaced by the severe forms of epilepsy. "Le petit mal" may occur with or without spasm. In the former there is a sudden or temporary loss of consciousness lasting for a few seconds, and then passing off without the patient knowing that anything has happened. In the latter there may be slight spasm of the facial or laryngeal muscles, or the spasm may be brief and slightly involve the whole voluntary muscles of the body. "The most common combination and degree of symptoms may be thus described,—a feeling of giddiness, faintness, or discomfort; slight twisting of the neck, with anxious lachrymose expression of the face, dilatation of the pupils and pallor, accompanied, or quickly followed by entire loss of consciousness, which lasts for two or three seconds; the patient becoming himself again after making

* Hughlings Jackson, op. cit., p. 42.

† Dr. Hughlings Jackson, On the Diagnosis of Epilepsy, The Lancet, 1879, vol. i, p. 43.

a few sighing sounds, but feeling faint and bewildered, and often perspiring freely."*

The *causes* that predispose to epilepsy are various. The disease can often be traced to hereditary influence, the parents or some member of the family having suffered from it; or there is a history of insanity or some other neurosal affection—such as an originally weak or susceptible condition of the nervous tissue, liable to morbid action. Long-continued debility and gastric irritation, or any source of exhaustion, as chronic diarrhœa, albuminuria, masturbation, etc., are among the factors which lead to the epileptic paroxysm. Hereditary syphilis is another cause. Rickets would also appear to be a cause, just as it is of eclampsia. "At least three-fourths of the cases of epilepsy, dating from infancy, are believed to be the consequence of rickety convulsions."† The relation between heart disease and epilepsy is also very close, as out of sixty-six cases observed by Dr. Gowers, in which the two diseases were conjoined, in twenty-five there was mitral or aortic disease.‡ He thinks the cardiac disturbance is due to one of three causes. 1. Irregular action. 2. Simple dilatation. 3. Valvular disease. These several conditions would appear to be either the consequence of the epileptic paroxysm, which puts a violent strain on the heart, or the fits arise from the cardiac affection.§

In a boy, 9 years of age, who came under my care in 1875, there were the symptoms of pulmonary consumption. I have observed the connection before, though not often enough to justify me in saying that it is more than casual. Phthisis is far more common than epilepsy, and when the two diseases occur together there is probably a state of the nervous system which readily invites an epileptic paroxysm. The patient had been losing flesh and strength, was much wasted, and coughed chiefly at nights. Whilst under treatment a fit occurred for the first time, lasting an hour and a half. This was followed by hæmoptysis to nearly a pint, with the physical signs of tubercular disease of the lungs. These various influences reduce the bodily health in such a manner

* A System of Medicine, article Epilepsy, by J. Russell Reynolds, M.D., vol. ii, p. 303.

† On Some of the Causes of Epilepsy, by J. R. Gowers, M.D., Medical Society's Proceedings, vol. iv, p. 259.

‡ Ibid., p. 259.

§ Heart Disease and Epilepsy, Brit. Med. Journ., 1877, vol. ii, p. 730.

as to enfeeble the nervous system and determine an outbreak in susceptible subjects.

The *exciting* causes are fright and terror, outbreaks of passion, masturbation, anæmia, and intestinal worms. "A boy, 13 years of age, was frightened a year ago by a snake; a month after the fright he had a strong epileptic fit. He is now a confirmed epileptic; his manner is sullen and dogged, he refuses to take his medicine, 'because he does not like it;' he has on several occasions threatened his sister's life, by brandishing a knife; he presents a physiognomy indicative of mental aberration, and will have to be removed to an asylum. There is no family history of neurosis, and the mental condition appears to have been produced by fright."* In a child aged 4, who came under my care in 1875 for epilepsy, the fits commenced at the eleventh month, during dentition; another fit recurred at two years of age, and there was an interval of two years before the next came on. The child had enlarged cervical glands, and a severe eruption of impetigo. In another case under my care in 1876, a girl, 10 years of age, had an occasional epileptic seizure, which followed scarlet fever three years previously; still there was no kidney disease.

It is also to be borne in mind that there may be a tumor, or an abscess, or a spicula of bone growing from the skull and irritating the membranes.

An accidental blow may drive down a spicula of the brittle inner table of the skull, or produce a spot of localized inflammation and adhesion which may lead to repeated epileptic fits. "A boy received a violent blow on the head from a cricket bat. He did not appear to suffer any inconveniences from the injury until *ten* or *eleven* years afterwards, when he became subject to paroxysmal attacks of headache, associated with extreme vertigo, clearly of an epileptic character. He eventually had a succession of severe attacks of epilepsy, which continued for a period of five years. He ultimately died in a violent epileptic paroxysm."† Many cases of epilepsy are traceable to blows and injuries of the head.

There is a close relationship between the convulsive affections of children and congenital talipes. Operations for the cure of these

* Phenomena accompanying Epilepsy, by Dr. Buzzard, Brit. Med. Journ., 1877, vol. ii, p. 729.

† On Obscure Diseases of the Brain and Mind, by Forbes Winslow, M.D., 1860, p. 674.

deformities have been followed by epilepsy. Just as in some adult women, the subjects of hysteria, distortion of a limb will follow repeated paroxysms, demanding mechanical treatment till the irritation subsides. Mr. Brodhurst records the following instructive case: "February, 1852, I divided the tibial tendons and the tendo Achillis of a strong plethoric infant, fourteen months old, for the removal of congenital varus. Both feet were nearly equally distorted. I had scarcely commenced the operation, when the child, crying violently, was seized with a fit; and I then learned that, when seven months old, the child had whooping-cough, which was followed by a succession of slight fits; and that, at intervals, on coughing or crying violently, the fits recurred. The feet were after some months perfectly restored, and the supports were at length removed and discontinued. Seventeen months after the operation the child again had a fit, when both feet were drawn into the same distorted positions as at birth. The father of this child was epileptic."*

Mr. William Adams has pointed out that it is only in cases of rigid muscles that epilepsy occurs, the muscles being rather spasmodic and spastic than flaccid, as in the truly paralytic class, where they take on fatty degeneration.† The author describes a most interesting case of a boy, 14 years of age, who fell under his care for rigid muscular contraction of both legs, and deformity of the feet. The affection commenced from infancy. "He had been for several years subject to epileptic fits, the continuance of which had, to a slight extent, weakened his mental vigor, although his bodily health remained good. At the time I saw him the fits occurred regularly once a month."‡

Morbid Anatomy.—The brain is sometimes congested, and the vessels are too full of blood, but the pathological changes may be entirely negative, there being no relation between them and the violent symptoms that have been noticed during the seizure. Dr. Hughlings Jackson thinks there is thrombosis or embolism of the small arteries in most cases; and he bases this opinion on the fact of having found epileptiform seizures common in those patients suffering from valvular disease of the heart. He is of opinion that there is evidence to show that the pathology of the disease is more "arterial" than "nervous."§ There are many cases in which

* On Club-foot, 1856, p. 57.
† Ibid., 1873, p. 61.
‡ Ibid., p. 392.
§ Op. cit., p. 113.

more or less hemiplegia is induced by epilepsy. "In these cases I do not doubt that there is embolism or extravasation. The frequent presence of external extravasation justifies the view that a similar condition occurs in the brain. The hemiplegia is sometimes very evanescent" (Sieveking).

Schroeder van der Kolk thinks that the loss of consciousness in epilepsy is due to the excited action of the ganglionic cells in the medulla oblongata, which extends its influence to the vasomotor nerves of the brain; and he believes, moreover, with Kussmaul, that in an epileptic fit the whole brain participates more or less in the change; the commencement of the fit or of the discharge is to be referred to the exalted sensibility of the medulla oblongata.*

Diagnosis.—True epilepsy in its severe form, as it ordinarily occurs in childhood, is not difficult of diagnosis; the complete insensibility, the brief duration of the fit, the general convulsions, and the absence of stertorous breathing and paralysis render it impossible to confound it with hysteria or apoplexy. The milder cases, in which there is confusion of the mind, without complete loss of consciousness, where there is reverie or forgetfulness, and peculiar sensations are complained of, the diagnosis is not so easy to establish.

Between le petit mal and epileptiform seizures the diagnosis is often impossible.

Eclampsia is the most likely disease to be mistaken for epilepsy, the convulsive paroxysms being in both instances much alike There are, however, a few distinctive features which may be considered diagnostic. Convulsions are most common in infancy. They occur in connection with dentition and are repeated frequently; they are sometimes observable at the beginning of acute febrile disorders, and particularly scarlet fever, which does not apply to epilepsy. The latter affection is often very sudden, the child at the time of the seizure being in apparently good health, whilst convulsions are often preceded by some previous illness. In convulsions the movements are more confined to the eyes and facial muscles than to the limbs. The frequency of the convulsive attacks disturbs the nervous centres, interferes with the respiration, and terminates fatally in asphyxia. Children seldom die in an epileptic attack.

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* On the Spinal Cord and Medulla Oblongata, New Syd. Soc., 1859, p. 230.

Epileptiform seizures resemble the true form of epilepsy in some respects, and differ from it in others. The distinctive features, as pointed out so clearly by Dr. Hughlings Jackson, are chiefly in respect to consciousness and convulsion. In true epilepsy consciousness is lost the first thing, or very soon after the commencement of the seizure, and the convulsions are also general from the beginning. Epileptiform seizures usually begin with spasm of one hand or foot (or side of the thorax, as I have observed), consciousness is lost later on, or not at all if the seizure is slight; the convulsions are local or one-sided before they become general. When consciousness is not entirely abolished the symptoms are said to be frequently induced by some organic disease of the brain, as a cyst or tumor, which is not the case with true epilepsy.* A case is related by Trousseau, where a little boy who died from epileptiform seizures, had tubercles in the brain.†

A very excitable and passionate girl, nine years of age, was admitted into the Samaritan Hospital under my care, with epileptiform seizures, December 30th, 1878. The fits resembled the petit mal where the seizures are slight. She never fell down, although she would stagger as if about to fall. Before the fit happened she was drowsy, strange and absent in her manner; she could not speak distinctly for some hours before the attack, and there was a difficulty in engaging her in conversation. To prevent the possibility of falling she was laid on a bed, when she soon became gradually convulsed, the right arm first, then the right leg, and then the other leg in precisely the same order. If the eyeballs were touched there was no reflex excitement induced; there was no biting of the tongue, and no foaming of the mouth. The face underwent no change in color, and the pulse averaged eighty per minute. The head shook tremulously from side to side, and the eyes were closed; the tremor would sometimes continue for a quarter of an hour, then it would subside, and the child fall asleep for some hours before a return to consciousness. The arms and upper portion of the trunk of the body were chiefly affected. The patient would have as many as three attacks in one day, then not another seizure for a week; and then an interval of seven weeks elapsed. Every fit was of the same character, but stronger each time. It was not influenced by diet, or any cause that could be

* Lectures on the Diagnosis of Epilepsy, The Lancet, 1879, vol. i, p. 42.

† Clinical Medicine, 1867, vol. i, p. 62.

ascertained. Bromide of potassium in gradually increasing doses, phosphorus, cod-liver oil, etc., gave no relief. Thirty minims of the tincture of henbane, gradually increased to sixty, in half an ounce of camphor-water three times a day, completely arrested the fits during the time she took the remedy. A return of the fits came on when it was omitted, and again departed on resuming it.

The following is a case of interest in which the "aura" was cardiac. The seizures were of a doubtful nature at first, and I was inclined to regard them as due to *angina pectoris*, but they terminated in true epilepsy.* E. B—, æt. 6, was admitted under my care into the Samaritan Hospital on December 6th, 1876, suffering from what her mother called "spasm of the heart when she awoke in the morning." She was a nervous and timid child, and easily moved to tears. In infancy she suffered from convulsions, and ever since then had been periodically subject to these seizures. From the age of two years the attacks had been more confirmed and regular, coming on about once a month. Six weeks previous to her admission she was found insensible in the street by a policeman, and she so continued for three hours. The attacks began with pain over the cardiac region, and a tremulous and throbbing action of the heart, followed by pallor and faintness; the eyes were wild and staring, and if no one was near to support her she would fall. Partial consciousness was preserved. The heart's sounds were normal, and the rhythm regular. Pulse 100; respiration 24; temperature normal. The urine was of high specific gravity (1034), clear, acid, non-albuminous, but containing much urea.

After being under observation for three weeks, the report states that every other morning she had an attack on waking about 7 A.M., which lasted from three to five minutes. There was tremor of the facial muscles, which were partially convulsed. She was put on a milk diet, and ordered a mixture containing phosphoric acid and strychnia. No fit occurred for a month, and then in my presence she suddenly screamed out, put one hand over her heart, and the other against the right wall of the chest, both being firmly clenched. She did not fall. Her eyes were fixed and staring, and she understood nothing that was addressed to her. Her face was slightly reddened, and the lips were compressed, as if in pain. The heart's action was rather tumultuous and thumping, and the

* A good many cases of angina pectoris are certainly a form only of partial epilepsy.—Trousseau's Clin. Med., vol. i, 1867, p. 65.

pulse was weak and intermitted every fourth beat. The nurse, who had seen her in several attacks, had always felt the heart thump and beat against the thorax at the time of the seizure. A week later, without any previous intimation, she had another and more severe seizure. It began with general convulsive movements of the upper and lower limbs, working of the facial muscles and eyelids, foaming at the mouth, but no biting of the tongue; she tossed and kicked about incessantly for nearly two hours, and then she fell into sound sleep for nine hours. On awaking she was partially conscious, and seemed to recognize the nurse. Every day following, for the next week, there was a fit of a similar character. Tincture of digitalis in five-minim doses was now ordered three times a day, and then the fits entirely ceased for the next month. She left the hospital on March 4th, with directions to continue the remedy which had apparently kept the fits in abeyance.

Prognosis.—This is favorable when epilepsy arises from any cause which admits of removal, as worms in the intestinal canal, dentition, etc.; but when it happens in children over twelve years of age, and the constitution is syphilitic or scrofulous, or there is a family history of nervous disease, then the complaint may be incurable. The aspect of epilepsy, however, it must be admitted, has been profoundly modified by the introduction of the bromides into our pharmaceutical armamentaria, and cases now yield to their peculiar action, over which other drugs have no controlling or curative influence whatever. If we have approached towards a correct knowledge of the pathology and causes of epilepsy, and our treatment is far more successful than formerly, it still rests on an insecure and empirical basis. There is no remedy even at the present time that can be positively termed a specific, or that can lay claim to cure the affection.

Treatment.—In the management of epilepsy the treatment divides itself into two stages. 1. During the fit. 2. In the interval.

1. During the fit it is advisable to put the child on a bed, if there be one at hand; to loosen all articles of clothing, especially about the neck, and to insert a piece of wood, or india-rubber, or even a fold or two of linen rag between the teeth to prevent biting of the tongue. Cold may be applied to the head, and a sinapism to the nape of the neck. When the seizure has terminated the

child is usually disposed to sleep, which may be permitted, and when it wakes up, light nourishment may be allowed.

2. In the interval of the fit the aim should be to remove all sources of irritation, as that caused by dentition, worms in the intestinal canal, constipation, congestion of the brain, general plethora, mental emotion, as fits of anger and passion. If there be evidence of plethora and fulness of the cerebral vessels, a non-nitrogenous diet, sleeping on a hard bed, and purgative medicines will be demanded, especially at an early stage. They should be strong enough to be effectual without diminishing vital power; rhubarb and senna, tartrate of soda, taraxacum, or castor oil. In some cases a little Hunyadi Janos or Friedrichshall water may be advantageously given in sweetened milk.

Admitting that it is of the utmost importance to diminish or remove the morbid sensibility and congestion of the medulla oblongata, all agents that excite this must be rigidly excluded, and sources of irritation removed in whatever part of the body they may be discovered.

Except for very special reasons mercury is not to be administered in epilepsy. Where there is a suspicion of worms, or the liver is sluggish, and the chief secretory organs are at fault, a calomel purge, by acting as a derivative and washing away foul matters, will prove serviceable.

Counter-irritation at the back of the neck may be necessary in some exceptional cases; but I have never done more in this way than to apply a stimulating liniment to the back of the neck, which is sometimes serviceable, as the compound camphor liniment and cantharidis, or the compound liniment of mustard, or the liniment of turpentine and acetic acid.

A highly nitrogenized diet, by increasing the exploding tendency of the irritable areas, is very hurtful, and it cannot be too much insisted on to watch children most carefully in this respect. The imposition on the digestive organs of more work than they can comfortably discharge, or the accumulation of indigestible matters in the intestinal tract, impairs the quality of the blood and predisposes to the epileptic paroxysm. Dr. Merson has made some interesting investigations on the effects of diet in epilepsy. He put twelve patients, so suffering, on a nitrogenous diet, and twelve on a farinaceous diet, for four weeks. At the end of this time he reversed the plan, those taking farinaceous food exchanging

it for nitrogenous, and *vice versa*. At the end of another four weeks the patients resumed their ordinary dietary. No decided advantages resulted from following either diet, though there was a slight advantage in favor of the farinaceous regimen. The nitrogenous plan seemed to produce more dulness, stupidity, dreaminess, and listlessness. The mental condition improved under the farinaceous diet, the patients being lively and intelligent, again becoming dull and stupid when the diet was nitrogenous, whilst the number of fits increased. A higher rise of temperature was also observed under the latter diet. The urine contained more urea and salts, and was of higher specific gravity under the nitrogenous diet than under the farinaceous. The number of fits was somewhat less under the latter. On the whole, the writer considers there are fair grounds for believing that a farinaceous diet is likely to be less hurtful than a nitrogenous one.* I think this view of the question will be generally conceded, and that we are right in enforcing a plain, simple, and nutritious diet in epilepsy. Milk and cocoa should be taken in preference to tea and coffee, and wine and stimulants strictly forbidden.

The hygienic treatment of epilepsy in early life claims our first attention. We can scarcely commit a graver mistake than to overlook the lesson it teaches us, that all drugs hitherto selected to cure the malady occupy a subordinate rank to those rules and habits of life which must be observed in the maintenance of health. I strongly entertain the conviction that whatever conduces to the general health, and keeps the various functions of the body in proper working order, does during the period of growth exert such a beneficial influence on the nervous system, as to arrest or cure that peculiar condition of it which invites the epileptic discharge.

When the disease is threatening, or it has developed itself, our first duty is to inquire into the habits and life of the child; to remove it if possible from a bad atmosphere to a healthy one, where light takes the place of darkness; to see that the air is pure and invigorating; the sleeping apartment lofty and commodious; and to surround it with all those influences which elevate its mental and moral tone. The children of the poor shut up in the ill-ventilated apartments of London have an indifferent chance of recovery, and we often witness temporary alleviation in those

* On the Influence of Diet in Epilepsy, The West Riding Asylum Lunatic Reports, 1875, p. 23.

cases which are sent into the country. Impure air retards the physical strength and prevents the child, if old enough, from getting that amount of exercise which diverts the mind and pleasurably engages it; whilst the appetite improves and digestion is strengthened. A seaside residence and high mountain air have proved of incalculable benefit.

Above all, overexcitement of the intellect, in any child who comes of epileptic parents, or who has once had a fit, should be carefully guarded against. The effort to accomplish the routine life of school is a sufficient stimulus in itself to the cerebral circulation, and if there is anxiety added to it, or too much pressure is put upon the child's intellect, the nervous power becomes exhausted, and an epileptic paroxysm is the consequence. Mothers who have the bringing up of excitable or epileptic children, should in this age of pressure and progress encourage mental rest. During the early years of life, when physical growth is most active, and the brain is undergoing expansion and rapid changes, we cannot too strongly insist on preserving the strength of the intellectual powers, that they be not overtaxed in any way.

Bromide of potassium is the great remedy in the treatment of epilepsy, and it is about the only drug on which we can rely for the mitigation of the symptoms, if not for the cure of the disease. It lessens the peculiar excitability of the nervous centres, and probably diminishes the amount of blood circulating in the brain, which may obviate the tendency to congestion, and so ward off the paroxysms when this condition is a factor in the complaint. As a sedative it controls the spasmodic character of the disorder, and, by promoting sleep, gives the brain rest. It is especially indicated if the epilepsy is traceable to masturbation, or to excitement of the sexual organs. Its action varies with different persons. In some it not only lengthens the intervals of the seizures and renders them milder, but it cures the disease. The drug ought to be continued for months, or even for a year, after the epilepsy has ceased, the doses and the frequency of their repetition being varied from time to time according to circumstances. When omitted in some cases, the attacks return with greater obstinacy than characterized the original seizures. In a few cases this remedy fails altogether. "Bromides appear less useful in growing girls and youths than in those who have reached adult age."*

* Russell Reynolds, op. cit., p. 323.

The dose may be, to commence with, small, and increased gradually till the fits yield, or the interval is lengthened. A child at five years of age may begin with five grains three times a day, increasing the dose gradually to fifteen grains in the same space of time. It is important to be aware that large doses of this drug can be borne by children without bad results. "Twenty and thirty grains have been no uncommon dose to reach in patients of from eight to ten, suffering from epileptic seizures, and in them I have never observed any symptoms of bromism."* It may be given in plain water with a little syrup, or in some bitter infusion. When the seizures take place during the night, a full dose of the bromide should be given just before bedtime.

A boy six years of age, who was epileptic from birth, was relieved by the injection of fifteen grains of hydrate of chloral by the rectum, after the inhalation of chloroform and nitrate of amyl had failed. The fits occurred once a fortnight, and both in this case and in other cases related, the drug was sometimes given by the mouth and sometimes by the rectum. The fits were thus controlled in number and severity, the pulse became softer, the respiration free, and sleep was induced.†

Iron may sometimes be combined with bromide of potassium if there is great anæmia,‡ but though it may seem to be indicated, it does not agree well with epileptics. It may improve the general health, but it aggravates the epilepsy (Hughlings Jackson and Brown-Séquard). Iron given alone is of very questionable value, even when there is great anæmia. It must be combined with antispasmodics. Still, I think it should never be overlooked that very deteriorated blood cannot maintain the functions of the nervous system in a healthy state, and for this reason alone a mild

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* Dr. Farquharson, On Some Points in the Art of Prescribing for Children, Brit. Med. Journ., vol. ii, 1877, p. 439.

† On the Therapeutic Value of Chloral Hydrate in Epileptic Convulsions, by J. A. Wallis, M.D., The West Riding Lunatic Asylum Med. Reports, 1875, p. 257.

‡ Formula 82:

℞.	Ferri et amm. citr.,	gr. xvj
	Potass. bromid.,	℈ij
	Syrupi,	ʒiij
	Aquam ad	℥iv.—M.

A tablespoonful three times a day. For children from six to twelve years of age.

and soluble preparation of iron may be of service in some cases. The stronger preparations are too stimulating.

The rapid loss of blood may excite the epileptic state, just as animals die of convulsions who are bled to death. Ligature of the carotids in rabbits, as performed by Sir A. Cooper, produced convulsions, so that it seems necessary to maintain the cerebral circulation as near as possible at a normal standard. Anæmia and congestion of the brain are both excitants of the epileptic paroxysm, but blood may be very deficient in quantity and poor in quality without producing epilepsy; some other factor being needed to invite it.

Where there is a syphilitic taint, mercury or iodide of potassium will be necessary.

When there is dyspepsia or intestinal disturbance, and the urine contains oxalates, pale lithates, or phosphates, nitromuriatic acid should be given alone, or in combination with some bitter infusion.

Phosphorus is a good remedy where nervous exhaustion is well marked.

Ergot is useful in ten to thirty minim doses of the liquid extract, given three times a day. It lessens the hyperæmia of the cerebral bloodvessels, and causes them to contract.

Ammonio-sulphate of copper is another remedy sometimes spoken of, but I have had no experience of it. Dr. Russell Reynolds speaks favorably of oxide of zinc. Bromide of zinc has been given successfully in epilepsy by M. Charcot, either in the form of pill or syrup.*

In regard to prophylactic measures, an epileptic seizure may sometimes be arrested by the application of pressure, as by a bandage between the "aura" and the brain,† or by encircling the throat with a fold of linen rag dipped into hot water. This relaxes the cervical vessels, and also favors the removal of spasm from the vessels of the brain.

A slight stimulant given to a child just before the seizure approaches may possibly ward it off, as is the case with some adults.

I have known epileptiform seizures yield to thirty minims of tincture of hyoscyamus in camphor-water three times a day, after

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* Brit. Med. Journ., vol. ii, 1877, p. 732.

† Russell Reynolds, op. cit., 326.

bromide of potassium had failed. Digitalis with bromide of potassium is also most useful.*

When epilepsy is associated with cardiac disturbance, neurosal or organic, digitalis may be given with advantage, provided there is no hypertrophy or aortic regurgitation. We should, in fact, observe the same rules in prescribing it as in those cases of heart disease uncomplicated with epilepsy.

CHAPTER XLIV.

INFANTILE CONVULSIONS OR ECLAMPSIA.

GENERAL AND PARTIAL: *Inward convulsions (Status convulsivus).* SYMPTOMS: *Subject to much variation—Sometimes preceded by heat of head and febrile disturbance—State of the pupils—Carpo-pedal contractions.* CAUSES: *Predisposing and exciting—Nervous susceptibility and family inheritance—Rickety constitution and delayed dentition—Indigestion—Diarrhœa and improper food—Heat and cold—Foreign bodies in the brain or other organs—The eruptive fevers, especially scarlet fever—Renal disease—Relation to laryngismus.* TERMINATIONS: *In asphyxia—Shock and syncope.* PATHOLOGY AND MORBID ANATOMY: *Congestion of brain and membranes—Paralysis.* TREATMENT: *Removal of cause if possible—Aperient medicines or enema—Warm bath—Chloroform inhalation—Bromide of potassium—Hydrate of chloral—When depending on specific poison, as scarlet fever, elimination should be encouraged and animal food avoided if uræmia threaten—Tonics and sedatives after the fits.*

Night terrors—Mental disorder—Melancholia—Nervous and hysterical symptoms—Cretinism—Idiocy—Backwardness—Imbecility.

THE brain is said to undergo such rapid development during the first few years of life, that by the completion of the second year, when the first dentition is over, its size is doubled; and by the seventh year it has nearly attained its maximum bulk, though its growth, according to Solly, is not completed till the twentieth year. An organ growing so rapidly, and receiving one-fifth of the whole mass of blood circulating through the body when every other organ is in process of active development, must be liable to resent excitement of any kind, and to take on morbid action. The

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* Formula 83:

R. Tinct. digitalis, ...	♏xx–♏xl
Potass. bromid., ...	℈ij
Syrup. aurant., ...	℥iij
Aquam ad	℥iv.—M.

A tablespoonful three times a day. For children from six to twelve years of age.

bones of the cranium are thin in early life, the brain-substance is elastic, and the cerebral vessels do not derive from it the same degree of support as do those of the adult, and therefore increased arterial action, as from cardiac excitement, violent coughing, or the sthenic action consequent on inflammatory fevers, subjects its vessels to fulness. The development of the brain is so great, that whilst on an average in man its entire weight constitutes 1 in 36 to the rest of the body, in the average of mammalia it is only 1 to 186.* When it is considered that the arterial anastomoses are so free, it is evident that any obstruction to the supply of blood through the chief vessels of the brain or their branches, may exert such an influence on the nervous matter as to suspend or derange the activity of its functions.

In consequence then of this highly developed state of the nervous system, convulsions or eclampsia are amongst the most frequent and dangerous diseases which attack the nervous system in infant life. The mortality resulting from them ranks before that of the great majority of other diseases, including atrophy, the specific eruptive fevers, pulmonary disorders, and affections of the larynx and trachea. Up to the age of five years the mortality is enormous; but after the age of nine it is considerably diminished. Males are more subject to the disease than females.

Convulsions consist in spasmodic action and relaxation (independent of the will) of the voluntary muscles, accompanied by unconsciousness. In many respects they resemble epilepsy, from which indeed they cannot invariably be distinguished. "Symptomatic or idiopathic epilepsy is only recurring eclampsia, and eclampsia is merely accidental or transitory epilepsy" (Trousseau). Convulsions constitute in reality a wide term, since they occur in various conditions when the lesions are entirely different; as, for instance, in epilepsy, tetanus, chorea, and tubercle of the brain. They may happen to delicate infants when the supply of blood to the brain is deficient.

Symptoms.—The attack occurs either suddenly, or is preceded by symptoms showing undue excitability of the nervous system. The infant is feverish for a day or so before the seizure, the head is hot, the appetite is gone, and there is thirst. It is restless and starts in its sleep, or wakes up frightened; the eyes are heavy and have a peculiar rolling motion; the respiration is irregular;

* Carpenter's Human Physiology, 8th edit., p. 737.

the thumbs are turned inwards and the wrists bent. In some cases the child is in its usual health when it is suddenly seized; in others the attack comes on during some eruptive disease, or during dentition. On the approach of the attack the child utters a scream and looks vacant; the ball of the eye is tremulous, and the eyeball is turned upwards, inwards, or downwards, so as in some cases to hide the iris entirely. The pupils may be contracted or dilated, or one may be contracted and the other dilated; but there is no uniformity with respect to this symptom. The facial muscles are also involved in the paroxysm, and the countenance becomes terribly distorted and hideous; there is frothing at the mouth and closure of the jaws; whilst the head is thrown backwards or to one side, the cervical and dorsal muscles are rigid, and the lower extremities are agitated and the feet flexed inwards.

Causes.—These may be predisposing and exciting. Among the former, is a nervous susceptibility inherited from the parents. This may not, however, have actually manifested itself in the form of convulsions, but there is, perhaps, a neurosal diathesis on one or both sides, and on inquiry it will usually be found that in other members of the family there is a history of convulsions or chorea in childhood, and of neuralgia, asthma, insanity, or other disturbance of the nervous system in adult life. The children of mothers who have had convulsions themselves in infancy are stated by Trousseau to be liable to a similar affection. He quotes a remarkable case by Dr. Duclos, of Tours. "The case is that of a woman, 34 years of age, the sister of ten children, six of whom died of convulsions, and who herself had had frequent attacks of eclampsia up to the age of seven; these had left behind slight deviation of the mouth and ptosis of the left upper eyelid. This woman had ten children, who all had convulsions; six had died, five in the first two years, and one when three years old. Her youngest, whom she brought to me at the Necker Hospital, was a little girl, six months old; three months previously she had had a first attack, which had lasted about ten minutes, and which her mother ascribed to her having given the breast to the child immediately after a fit of passion, as the convulsions occurred on the ensuing day. Death took place three months afterwards from cerebro-meningitis."* Trousseau also mentions the case of a child who

* Trousseau's Clin. Med., 1867, vol. i, p. 343.

had eclampsia from the nurse going into a fit of passion a moment before giving him the breast.*

Dentition has generally been believed to be the chief cause of infantile convulsions, but recent researches do not corroborate this notion. It is more in consonance with facts to say, that the excitability of the nervous centres is excessive during the first year of life, and that slight causes, which leave hardly any effects in adults, are, in the period of the first dentition and weaning, liable to give rise to convulsive seizures.

Convulsions are frequently to be found in children who are rickety, and in whom dentition is delayed.† Here convulsions have a reflex origin. They may occur in connection with chronic hydrocephalus and struma, where the head is large and the fontanelles are open. They are not infrequently associated with laryngismus. A rickety child, eighteen months old, came under my care in 1876; she had only three teeth; as many as six fits took place in the twenty-four hours, each fit lasting about a minute. The face was drawn to the right side and much distorted, the pupils were dilated. After each fit the child became conscious, but fell asleep afterwards. Sleep and coma are, however, more common after epilepsy.

When severe eruptions of the scalp in children are dried up too quickly, convulsions sometimes follow. I have seen a few cases. A child, ten months old, came under my care in 1875, with eczema of the entire head, the whole scalp being covered with crusts, from beneath which an irritating discharge escaped. When the healing process was nearly completed, and the discharge had ceased, the child had a succession of convulsions, which terminated fatally in three days.

Convulsions may be met with in infants at the breast, who suffer from frequent vomiting and diarrhœa. The fits subside when the functions of digestion are set in proper order. Convulsions may also be observed in children who are thriving and doing well, whose bowels are regular, and whose motions are of proper consistence. Whatever tends to weaken the system, such as improper and insufficient food, or profuse diarrhœa, by lowering the nutritive functions, will exhaust the strength, and by depriving the nervous

* Ibid., p. 345.

† Of 61 eclamptic children, 56 were rickety (Dr. Gee, St. Bart. Hosp. Reports, vol. iii).

system of its proper support, weaken it and render it more unstable. Hence it is that diarrhœa in weakly children may readily provoke a seizure. Losses of blood are equally productive of an attack. Diseases of the intestinal canal, and especially worms in the bowels, are common causes. Hot weather may so lower and exhaust the system as to bring on convulsions. Cold, by paralyzing the vasomotor system, may equally provoke an attack, and exposure to night air is particularly dangerous in this respect.

Convulsions are stated by Trousseau and others to have been set up by a pin or needle, or a fragment of the inner table of the skull, sticking into the membranes of the brain, or even into other internal organs. Blisters, burns, and scalds have likewise caused them. They may occur during the eruptive fevers and acute pulmonary affections. In these cases the febrile disturbance induces hyperæmia of the brain and membranes, the vessels carrying too much blood to the head, and that at an elevated temperature, as may be witnessed in some cases of meningitis. When convulsions occur in association with whooping-cough, organic disease of the heart, and intestinal torpor, the cerebral vessels are probably in a state of hyperæmia. Cerebral anæmia, from loss of blood and deficient vital power, may equally bring on these fits. Convulsions may arise when the urine is albuminous from desquamative nephritis, as in scarlet fever, or in measles and small-pox, where the blood is poisoned, and the renal organs cannot eliminate their morbid products.

One peculiar form of convulsions in children is that known as eclampsia nutans or salaam convulsions, because it resembles the obeisance of an Oriental before his superior. It consists of a bending of the head and body forwards with great rapidity for a certain period, when it ceases. During the time the child seems bewildered, but as soon as the convulsions cease its intellect becomes clear. While they are present the mental and bodily health seem impaired, but no permanent effect in either has been observed. They are not associated with any known changes in the nervous system. They may, however, in certain cases, be the precursor of epilepsy, especially if they are persistent.

Terminations.—Death may be due to asphyxia from the violence of the seizure, or from shock and syncope, but recovery is usual. Dr. West says: "Where the convulsions recur rapidly the prognosis is exceedingly bad, and this is worse in children of three or

four years old than in young infants, as indicating a greater disturbance, and one less likely to pass away." He goes on to say, "Far less hopeless are cases, with which we also meet occasionally, of the exceedingly frequent recurrence of convulsions, five, ten, or more taking place every day, for days or weeks together. Such attacks are seldom or never met with after the completion of dentition. The danger to life seems to lessen with the frequency of their recurrence, but there is danger lest they should end by their becoming habitual; while, further, there seems to be a very decided relation between the liability to convulsions in early infancy, and the development of epilepsy in subsequent childhood."*

Morbid Anatomy.—After death dissection discloses congestion of the brain and membranes, effusion into the ventricles or sac of the arachnoid, and hæmorrhagic points may sometimes be noticed on section of the hemispheres; congestion of the spinal cord is also present. These morbid changes are the consequences of the convulsions; just as they occur in epilepsy, they are not the cause, but the result of the malady. In a single paroxysm such lesions are of no material importance, but where the convulsions recur frequently, then the change that takes place in the cerebral tissues may result in such a degree of congestion or extravasation as to end in some paralytic affection. Anatomical lesions cannot, however, be invariably discovered on the most careful dissection, and when they are found they appear to be rather a consequence than a cause of the seizure. It should not be forgotten that convulsions are not incompatible with an anæmic state of the brain.

Treatment.—This does not differ materially from that of epilepsy and some other allied disorders, but convulsions cannot be dealt with alike in all cases. The first step is to ascertain, if possible, their cause, before aiming at their removal. In the seizure the child should be surrounded by pure air, and any clothes that interfere with the circulation should be at once removed. If it cannot swallow, an enema should be administered, so as to clear the bowels of any source of irritation that may be lurking in them. A mustard poultice may also be applied to the extremities. Placing the child at once in a warm bath, so as to excite the cutaneous circulation and relieve internal congestion, is a

* West, on Diseases of Infancy and Childhood, 1859, p. 194.

common and useful practice, whilst cold water is poured over the head and face at the same time. For the treatment of recurring convulsions, the late Sir James Simpson strongly advocated the use of chloroform inhalations. Dr. Wilks also speaks favorably of the practice. "In those cases where the whole body is constantly distorted, to the great distress of the mother, chloroform will cause the movements instantly to cease, and sometimes with their arrest the child may fall into an apparent sleep. I have given it in many cases with the greatest advantage and relief."* It is not necessary to keep the child deeply anæsthetized, but just to administer it when each fit is threatening. When the paroxysm has subsided, the gums should be lanced if tense; and if the pulse is good and there is sthenic excitement, a grain of calomel on the back of the tongue may be needed, so as to rouse the liver and small intestines to freer action. In the cases of strong and robust children, where the signs of active hyperæmia are present, one or two leeches may be applied behind the ear or on the temple.

To ward off a recurrence of the fits in the intervals, bromide of potassium or ammonium will be necessary to calm the nervous centres, and it may be well sometimes to combine with it a few grains of hydrate of chloral if there is sleeplessness. Children bear hydrate of chloral well. "Given in a dose sufficient to induce sound sleep of some hours, the convulsions cease, and often do not recur when the child wakes. If the child cannot swallow, five grains given by the rectum soon induce a deep sleep, and the convulsions then cease, at least temporarily."†

When the convulsions depend upon toxæmic causes, as from the scarlatinal poison, the bowels must be kept freely open, and elimination encouraged. Above all, nitrogenous food should not be indulged in where uræmia is dreaded. If there are worms in the bowels, such remedies as aid their expulsion must be had recourse to.

After the cessation of the fits, cod-liver-oil and some preparation of iron, as the syrup of the hypophosphite, may be needed, whilst a sedative should be given at bedtime to calm the nervous system and to promote sleep.

Night Terrors.—A child who suffers from this affection generally goes to bed quite well, and after falling soundly asleep, wakes up

* Diseases of the Nervous System, 1878, p. 140.

† Handbook of Therapeutics, by S. Ringer, M.D., 8th edit., p. 371.

in great alarm in the course of an hour or two, screaming in the most terrified manner. The child fails to recognize the nurse, and refuses to be appeased. It has probably been dreaming that a cat is on the bed, or that it is pursued by a savage dog or other animal, from which it cannot escape. After a time the nurse or parents succeed in pacifying the child by petting it and carrying it up and down the room. Then it falls off to sleep tranquilly, and wakes up as well as usual. Sometimes there is no recollection whatever in the morning of what had occurred during the paroxysm of terror. It is consolatory to parents to be assured of the harmlessness of these attacks.

Causes.—These are chiefly indigestion and constipation, but diarrhœa and dentition are also capable of exciting an attack. Worms, injudicious feeding, and hereditary syphilis may provoke it. Dr. West relates the case of a boy who had "night terrors" for a year before cutting his first molar teeth.* Some seizures would appear to be of an epileptic nature,† and others are allied to hysteria.‡ It seems certain that weakly and nervous children are most prone to suffer. These terrors are sometimes traceable to the cruelty of nurses, who frighten children, and create a fear of being in the dark. Overwork at school is another cause, of which the following appears to be an example: A boy, 12 years of age, of anxious and nervous temperament, was brought to me in 1879, who, four years previously, was seized with somnambulism and "night terrors;" after being asleep for three-quarters of an hour he would wake up and get out of bed, then walk out of the room, and if at all interfered with would shriek and become very violent; when his father and mother came into the room he knew them, but seemed terror-stricken, and asked for their protection. The attacks were attended with cold hands and feet, clammy skin, and a thumping action of the heart. When away from home he never had any seizure. A year before I saw him he had several attacks whilst his examination at school was going on, and there was some evidence to show that his brain had become irritable and exhausted. The urine contained phosphates; the motions were large and costive; the abdomen was full and hard.

Diagnosis.—These nocturnal seizures make friends anxious, fear-

* Diseases of Infancy and Childhood, 1859, p. 239.

† See Chap. XLIII, p. 588, On Epilepsy.

‡ Handfield Jones, op. cit., p. 452.

ing that some cerebral affection may be impending, but if the attacks recur from time to time, yet each morning finds the child free from headache, and there is no intolerance of light or sound, no drowsiness or stupor, and, moreover, the pulse is quiet and regular, and the belly hard and of normal shape, then we are correct in attributing the symptoms to sympathetic disturbance in the abdominal organs.

Treatment.—In the management of this peculiar state, the digestive functions should be carefully regulated, and all sources of irritation removed from the intestinal canal, by mild aperients of soda, rhubarb, and taraxacum (Form. 19–26), after which, bromide of potassium to allay nervous excitement, and iron to restore the strength, will be required. The room should have a light in it, and the nurse or the mother be near when the child awakes frightened. Mental discipline is most important. The child requires to be treated with kindness, yet firmness, and if old enough, reasoned with on the nature of his ailment. He should be taught not to give way to every impulse, or to become petulant on slight provocation.

Mental disorder is much less frequent in children than it is in adults, still instances now and then occur, and the practitioner ought to be acquainted with the symptoms and the forms it may assume. Cases are recorded in which acute mania was set up by the exanthemata, typhoid fever, and cerebral tumors.

Melancholia is a state of mental depression occasionally met with in delicate children whose education has been defective, and whose parents are morbid or hereditarily nervous. Steiner mentions the case of a boy, six years of age, whose only playmate, his sister, died of tubercular meningitis. He grew melancholy, lost his appetite and sleep, and was tormented with the idea that he must die soon. This sad condition lasted two years, when he recovered.* In the adult, cases of mental shock are recorded, the death of one sister being soon followed by that of the other; and the death of one twin adult so affected the other that he has succumbed to the same disease in a few weeks.†

Nervous and hysterical symptoms in boys sometimes occur, just as they do in girls and young women, owing to some unhealthy morbid condition of the nervous system. Dr. Wilks relates the

* Steiner's Diseases of Children, by Lawson Tait, 1874, p. 57.

† Diseases of the Nervous System, by S. Wilks, M.D., 1878, p. 398.

case of a boy who said he was paralyzed, and that he could neither see nor hear. When it was proposed to apply a red-hot iron up and down his spine, he got up and escaped at the door.* A morbid excitability of the nervous system shows itself in attacks like croup, anorexia, hyperæsthesia, nervous dyspnœa, and the like.

Cretinism is a very peculiar disease allied to idiocy. It is an epidemic affection which prevails in Alpine districts, more especially among the inhabitants of some parts of Switzerland, the Pyrenees, and the Tyrol. But it is met with in all quarters of the globe, in the Himalayas, Chinese Tartary, Madagascar, the Rocky Mountains of North America, and in a small proportion of cases in Derbyshire, Somersetshire, and some parts of Yorkshire. "It is, however, most common in shut-up valleys, and has a close connection with goitre. Nowhere does cretinism occur where goitre is absent, but goitre may occur where cretinism is unknown or rare."† It is commonly accompanied by an enormous goitre, and is usually congenital. Cretins appear to escape the ordinary ailments of childhood, but they are liable to diseases of the nervous system, as convulsions, hydrocephalus, asthma, and apoplexy. Rickets ending in lameness is a frequent complication.‡ The cretin is so debased, and his habits are so low and disgusting, that he is hardly raised above the animals that surround him. He is obstinate, malicious, and sensual. Cretinism is a species of idiocy, accompanied by small stature, mostly under four feet, large and square head, vacancy, and want of expression. The sufferer from this disease is sometimes blind or deaf and dumb. Life may extend to old age. Dr. Güggenbuhl, in 1841, established a hospital in the Canton of Berne, for the purpose of educating these poor creatures; and the experiment was attended with some considerable success.

Idiocy.—An idiot may be defined as a person of unsound mind, whose moral and intellectual faculties are more or less destroyed, or have never been perfectly developed. Drs. Bucknill and Tuke define idiocy as "a congenital deficiency of the mental powers."§ Dr. Ireland gives the following definition: "Idiocy is mental deficiency or extreme stupidity, depending upon malnutrition or

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* Op. cit., p. 385.

† Idiocy and Imbecility, 1877, p. 174.

‡ Ibid., p. 192.

§ Psychological Medicine, 3d edit., 1874, p. 162.

disease of the nervous centres, occurring either before birth or before the evolution of the mental faculties in chidhood."*

It may show itself soon after birth as a consequence of organic disease of the brain. The affection is incurable, though something may be done in the way of discipline and training. Some idiots can scarcely speak, whilst others articulate a few words, and to some extent are capable of improvement. They are not able to acquire knowledge like other children; the mind remains childish, and the countenance is void of expression and intelligence; the forehead is low, the mouth open, the ears large, the lips are thick and everted, and the teeth are decayed. There is deafness and imperfect articulation, whilst the hands are used awkwardly. The functions of organic and animal life are more or less impaired, nutrition is imperfect, and the motions are frequently passed involuntarily. Idiocy may be associated with stunted growth, rickets, goitre, etc.

The expression of the idiot is good-natured and confiding. Idiocy is frequently seen in the families of those in whom the neurosal tendency has been manifest, by such diseases as epilepsy, insanity, and imbecility. Dr. Ireland says, "Idiocy is of all mental derangements the most frequently propagated by descent."† Of 2000 cases, 45 per cent. presented well-marked neuroses in one or both parents.‡

"Out of 420 cases of congenital idiocy examined, some information was obtained respecting the condition of the progenitors of 359. Now, in all these 359 cases, *save only four*, it is found that one or the other, or both, of the immediate progenitors of the unfortunate sufferers had, in some way, widely departed from the normal condition of health, or violated the natural law. That is to say, one or the other, or both of them, were very unhealthy or scrofulous; or they were hereditarily predisposed to affections of the brain, causing insanity; or they had intermarried with blood relatives; or they had been intemperate, or had been guilty of sensual excesses which impaired their constitutions."§

Backwardness.—There are some defective children who cannot be truly denominated idiots. They are slow to learn; "back-

* Idiocy and Imbecillity, 1877, p. 1.

† Op. cit., p. 17.

‡ Brit. Med. Jour., Oct. 11th, 1873.

§ Report of Commissioners of Massachusetts on the Causes of Idiocy, 1848, p. 3.

ward" is the term used here, "*enfans arrières*" as the French term it; they cannot keep pace with other children at school, at least when small. Some of them, however, brighten up considerably when the pubertal changes are completed, and in ordinary matters can take their part in life fairly well, but they are incapable of any great mental effort. Others are not so fortunate, and continue conspicuously defective throughout the whole of life. Where the parents possess sufficient means, it is well to place these children under skilled supervision, as the training to which they are subjected is of the most vital importance to them.

Imbecility is a term used to denote a minor degree of mental deficiency than idiocy (Bucknill and Tuke). Some imbeciles know those about them; they are affectionate, and are capable of taking care of themselves, but passionate and inclined to theft. Others are shrewd and witty, jocular in their conversation, and cause much amusement. There are those again who are dangerous to society, liable to commit acts of murder or incendiarism.

"At a very early age the functions of the brain—at least in regard to its intellectual operations—appear to have stopped; hence we see a school full of grown-up boys and girls, sometimes of the age of eighteen or twenty, no more capable of taking care of themselves than children of three or four. They cannot use their hands in any ordinary operation; sometimes they do not know the way to eat with a knife and fork, and as a rule, the newcomers are utterly incapable of dressing or undressing themselves. Their very actions are those of little children; their emotions and fears, their joys and sorrows, remind us most forcibly of those we witness in a nursery of little ones."*

Treatment of Idiocy and Imbecility.—A great deal can be done for these unfortunate children in the way of education. Institutions like Earlswood and Normansfield in this country, and many in the United States, fully prove that the treatment pursued there has been attended with the best results. The aim should be to put the bodily health into the best possible state, and then, by a specially moral and judicious course of teaching, to improve the mental condition.

Parents in the upper walks of life are frequently disinclined to part with children thus afflicted, but it will be well to strongly advise the placing of such cases under proper training, as it is

* Borderlands of Insanity, by Andrew Wynter, M.D., 1875, p. 167.

impossible to obtain for them at home the same beneficial influences as they would from those who have made the subject a study. Moreover, it will always be of great importance to isolate an idiotic child from the other children of a family, as the healthy will ordinarily tease and tyrannize over the weak, whilst the contact with imbecility cannot be otherwise than detrimental to the more fully developed minds.

CHAPTER XLIV (*continued*).

CONGESTION OF THE BRAIN.

VARIETIES OF: 1. *Active or arterial.* 2. *Passive or venous—Congestion of the membranes—Hyperæmia of the gray matter.* CAUSES: *Heart disease—Vitiated states of the blood—Dentition—Injuries of the head—Violent fits of coughing—Prolonged vomiting.* SYMPTOMS: *Febrile disturbance—Heat of head—Quick pulse—Headache—Constipation—Sickness—Restless sleep—Hallucinations or delusions in some cases.* TREATMENT: *Venesection or leeching—Purgatives—Starvation—Cold applications to the head—Action of aconite—Bromide of potassium—Hydrate of chloral.* APOPLEXY OR CEREBRAL HÆMORRHAGE: *Causes—Symptoms—Treatment.*

THIS may be active or arterial, passive or venous; active congestion being that in which an actually larger quantity of blood is supplied to the brain and its membranes, and passive congestion existing where there is no increase in the supply, but an impediment to the return of the blood from the brain and its membranes to the right side of the heart. It occurs in so many diseases both of functional and organic origin, that it must be viewed more as a symptom than anything else. Still, I believe it to be an independent affection, an uncomplicated condition, which does occur now and then in infants and young children.

The amount of cerebral congestion varies a good deal in different cases. The membranes of the brain are almost always congested at the same time, as the same causes act upon both parts. There is a simple post-mortem hyperæmia, which occurs from gravitation of the blood to the lowest level, and is seen after death from febrile diseases where the blood remains unusually fluid. Post-mortem examination shows the vessels of the brain to be full and enormously congested in some cases, where this has not been suspected during life. There may have been no stupor,

no headache, no convulsions—no symptoms, in fact, to call attention to this morbid state. When congestion is severe, not only is the brain more turgid, but its volume is actually increased. The gray matter appears dark red or violet, and where the hyperæmia has been severe, as in infants soon after birth, the white matter may appear almost as dark as the gray. On cutting through the brain-substance, drops of blood are seen to ooze in profusion from numerous small points, which are the mouths of open bloodvessels.

Causes.—Active congestion may occur in hypertrophy of the left ventricle, in connection with valvular disease, which is seen in children after rheumatic fever. Whatever excites the circulation propels more blood to the brain, and overfills the vessels and sinuses. If it be vitiated by the absorption of the scarlatina or small-pox poison, we have a most efficient cause of congestion. How far again may not cerebral congestion be a consequence of the convulsive paroxysm rather than a cause, due in part to some disturbance of the nervous system, which deranges the cerebral circulation? A child three years of age, who was in good health, was taken out in extremely cold weather, and when brought home was drowsy, and the extremities were cold. It soon relapsed into an unconscious state and died, death being preceded by a convulsion. No post-mortem examination could be obtained, but the cerebral symptoms were in all probability due in great measure to congestion of the brain and its membranes. This pathological state, too, probably exists in the preliminary stage of many diseases, as small-pox and scarlet fever. Congestion of the brain occurs in the disturbance caused by dentition, injuries of the head, or exposure to heat, and also in consequence of violent fits of coughing, as in whooping-cough, and from severe or prolonged vomiting.

Symptoms.—The symptoms of cerebral congestion are generally those of increased excitability. There is febrile disturbance, heat of head, quick pulse, and disinclination to encounter the light. If the child is old enough it complains of pain in the head, and is fretful and irritable, any noise or excitement in the room aggravating the symptoms. Sleep is disturbed by sudden starts and muscular twitchings. The bowels are generally constipated, and sickness and headache often precede the outbreak for some days. Such symptoms as these are common enough during dentition, and

under careful diet and suitable medicines they pass off; but when they are present we are never certain what the issue may be; not infrequently a fit of convulsions ensues, consequent on the cerebral congestion. On the other hand, the case may drag on, and the child, though recovering from the more acute symptoms, becomes listless and torpid; it ceases to have an interest in persons and things; it often vomits its food, and the pulse is habitually quickened. We apprehend the supervention of meningitis, though the temperature may be scarcely if at all elevated till a later stage.* The case continues, and either a convulsion or drowsiness, succeeded by heavy restless sleep and comatose symptoms, precedes death. In other cases the principal symptoms are delusions or hallucinations, and the severest degree of cerebral congestion causes symptoms of apoplexy.

In 1863 and 1864 I had under my care two children of the same family, aged respectively two and three years. After being taken out in very cold weather they were seized with symptoms of cerebral congestion, followed by drowsiness and collapse, with coldness of the extremities. The symptoms were alarming for a time, but a warm bath and a stimulant in both cases brought about recovery. The children were both well till the exposure, and they have since grown up strong. On the whole the disease is not very fatal, but repeated attacks of it lead to the transudation of serum and œdema of the brain, which may result in imbecility or paralysis.

Treatment.—This is similar to that which has been recommended in simple meningitis. In severe cases that are seen early, where the pulse is strong, leeches to the scalp may be necessary. Dr. West records the case of a little girl two years of age, who was seized with convulsions and congestion of the brain preceding the eruption of small-pox. He bled to three ounces, then applied eight leeches to the head, and gave active cathartics without much benefit. The restlessness, squinting, and rolling of the head continued, notwithstanding he applied eight more leeches to the head, which "bled profusely, and the bleeding was followed by great diminution in the convulsive movements."† The eruptive disease ran its course favorably, and the child recovered. Bloodletting, as a rule, will not be necessary. It is important to be extremely cautious in the abstraction of blood, for young children bear the

* See Chap. XLII, pp. 564 and 572.

† On the Diseases of Infancy and Childhood, 1859, p. 40.

loss of it badly, and we commit a serious error if we draw too much. When the symptoms are relieved we should at once arrest the bleeding, but if they return, and the head is hot, or there is drowsiness, convulsion, or threatening coma, then we must repeat the bleeding; but never unless the strength of the child seems to warrant it. A dose of calomel to act as a purgative is often advisable. The syrup of senna, or the sulphate of magnesia and nitrate of potash mixture (Form. 8) will be necessary, and if these are not effectual then an active enema may be needed. Starvation or little else than cold water to drink, must be enforced. The head should be shaved and elevated, and cold applications applied and cautiously proceeded with. The ice-cap is excellent, and where this is not at hand, pounded ice, applied in two bladders, and placed one on either side of the head, behind the ears, will be advisable. The patient's room should be dark, quiet, and cool. If the head symptoms are owing to the exanthemata, as soon as the eruption of the particular disease has appeared they usually subside; and the case from that time pursues a favorable course. When they appear to be the consequence of indigestion, or an overloaded state of the stomach, they pass away as soon as this organ is once again put in right working order; but the cause must be ascertained lest we commit an error in management.

In these cases, the first point to be attended to is the tension of the artery, which must be our guide. If it is full and incompressible then it is clear that our treatment must be directed towards the lowering of this arterial tension. To dilate the arterioles of the rest of the body is one means towards attaining this end; to abstract blood is another. Formerly the practice would have been to bleed the child, or to apply leeches, probably also to purge freely. Now we would prefer to deplete the congestive brain by vascular depressants, Rasori's plan of the free administration of tartarated antimony held its ground for many years, but disastrous consequences often resulted from the free use of it. Then comes the treatment of Fleming, viz., that of lowering the heart's action and dilating the arterioles by the exhibition of aconite. Aconite lowers the heart's action at the same time that it dilates the arterioles, and thus lowers arterial tension—otherwise the blood pressure in the arteries.* It is well, also, to act freely on the bowels, and therefore a purgative should be added to the vascular

* See The Action of Aconite, Chap. XI, p. 128, and Chap. XXXVIII, p. 460.

depressant. This is the more necessary as constipation is frequently associated with the head affections of children. Purgation ought to be maintained until all the symptoms of congestion have passed away. When the congestion is accompanied by chronic spasms, heat of head, and injection of the conjunctivæ, then it is well to give bromide of potassium, or even chloral hydrate.

Apoplexy, or cerebral hæmorrhage, sometimes occurs in infancy and early life. Excessive congestion of the sinuses of the brain, and of the vessels which ramify over its surface, takes place, and this is followed by rupture. When the brain is sliced, numerous small red spots are seen in all directions, from which blood oozes, and the white substance has in some cases a pale pinkish tinge. The hæmorrhage may take place into the cavity of the arachnoid (*meningeal*), or the substance of the brain, or very rarely into the ventricles (*cerebral*).

This affection is most common during the first few weeks of life, but it may come on during many diseases, as whooping-cough, convulsions, and any complaint in which there is a strain thrown upon the cerebral vessels, or the blood is impeded in its return from the head, as in congenital heart disease, or affections of the bronchial glands pressing upon the large vessels. It is possible, too, that the brain may have sustained some injury during parturition, when the head in its slow transit through the pelvis has been subjected to long-continued pressure, the face and the scalp attesting what has taken place within the skull. After a protracted confinement, or where the mother has been subject to puerperal eclampsia, the child may be born with hemiplegia of the face, arm, and leg, showing that hæmorrhage has taken place into the corpus striatum.

The condition of the cerebral vessels in early life is entirely different to that of the adult; the arteries being elastic and yielding, congestion is favored, but rupture is less likely to occur, because their coats have not undergone the degenerative changes which are common in mature life. It is true that the coats of the cerebral arteries are very thin, since, owing to the unyielding structure of the cranium which encapsules the brain, they are more protected against blood pressure than in softer parts of the body, where the arteries can expand to a greater extent. Morbid conditions, such as unusual softening of the substance of the brain, may allow of expansion of its thin-walled arteries to a dangerous extent. Fits

of convulsion, attacks of violent coughing, which produce enormous fulness of the chief vessels of the brain, rarely lead to rupture, but the smaller vessels may give way, and cause hæmorrhage. The hæmorrhage varies in extent. When there are a few dots, the size of a pin's head, it is termed capillary hæmorrhage.

The *symptoms* which denote this condition vary according to the suddenness or gradual approach of the seizure. It would be impossible to enumerate conclusive symptoms. When sudden, there are stupor and convulsions. "The sudden occurrence of violent convulsions, and their frequent return, alternating with spasmodic contraction of the fingers and toes in the intervals, appear to be the most frequent indications of the effusion of blood upon the surface of the brain."*

When an extravasation is small, the symptoms may be obscure or even absent; but when large, and it occurs in the substance of the brain, or in the cavity of the arachnoid, the usual symptoms of compression may be looked for. The child lies in an unconscious state, with a dusky face and contracted pupils, the eyes are dim, the pulse small and slow, the respiration is irregular and usually slow and superficial. Vomiting is often present, and the bowels may be constipated or loose. A severe attack of cerebral hæmorrhage is always accompanied with involuntary evacuation of the urine and fæces. If the child is fed at the breast, it loses its hold of the nipple, and cannot retain it in the mouth. In larger effusions in older children, the attack is usually sudden; headache, restlessness, and disturbed sleep, unconsciousness, loss of speech, convulsions, and irregular breathing, may be the precursors of death. In the commencement of the attack, the temperature generally falls to 96° or 95°, from irritation of the controlling centres of heat production; while later on, more especially when the blood breaks into the lateral ventricles, the temperature begins to rise. Where this rise is sudden and extensive, as when the mercury runs up to 103° or 105° in a few hours, it is a sure sign of impending collapse and death.

Treatment.—When the case is seen early, leeches to the head have been recommended, but, as a rule, this will be rarely necessary, a dose of calomel and purgative enemata being usually active enough for a child. Under this mode of treatment the symptoms

* West, On the Diseases of Infancy and Childhood, 1859, p. 61.

may disappear. The head should be shaved and cold applied. If the gums are distended they should be lanced.

CHAPTER XLV.

CHOREA OR ST. VITUS'S DANCE.

DEFINITION AND SYMPTOMS: *Sometimes begins insidiously, or with convulsive movements of face—Difficulty of speech and deglutition—Inability to stand or walk—Shuffling movements as if paralyzed—Quietude during sleep as a rule—Disorder of digestive organs—Foul breath—Constipation—Hemichorea—General chorea—Cardiac murmurs—Palpitation—State of the urine.* CAUSES: *General debility, anæmia, worms in the intestinal canal—Irritability of the nervous system—Female sex most liable—Fright, anger, blows, or injury—A sequence or association with rheumatism—Masturbation, its association with epilepsy—An occasional consequence of the eruptive fevers.* PATHOLOGY: *Theory of embolism—Hyperæmia of the nerves centres—Thickening and vegetations of mitral valve—Congestion and hæmorrhage of corpora striata and thalami optici—Congestion of spinal cord.* TREATMENT: *Rest in bed—Utility of purgatives—Conium—Hypodermic injection of curara—Hyoscyamia—Hydrate of chloral—Iron—Bromide of potassium—Arsenic—Strychnia—Sulphate of zinc—Phosphorus—Hypophosphite of soda—Cod-liver oil—Quinine and bark—Tartarated antimony—Sea-air—Shower-baths—Galvanization—Faradization.*

CHOREA may be accepted as one of the most singular of the numerous disorders which affect the nervous system. It is substantially allied in some respects to other neurosal conditions; but it is so variable and capricious in its manifestations that it may be clinically recognized as possessing peculiar and independent phenomena, which distinguish it from all other affections.

Chorea is a functional derangement of the motor nerves, causing irregular movements of the muscles, and influencing voluntary action. It is a common disorder in nervous and sensitive children, from the greater excitability of the nerve-cells in youth. It is not accompanied by fever. With it there is no defect of consciousness or volition, as is the case with epilepsy.

Symptoms.—The disease occasionally creeps on slowly and insidiously, the child being out of health for some time before any choreic movement is observed. The first symptoms are restlessness and inability to sit still for even a short time, and the parents not unnaturally ascribe this to a fidgety habit, which may and ought to be controlled by discipline. In other cases the disease begins with a slight twitching of the muscles of the face, the

patient putting the mouth into the most grotesque forms and contortions, as if mocking or "making mouths" at you. In other instances the facial muscles escape and the tremulous agitation is confined to the limbs. When asked to put out the tongue it is accomplished suddenly, or with a peculiar rolling motion, and then withdrawn in like manner; but it is sometimes protruded with ease, and kept out for a short time. Eating and swallowing are performed with difficulty, and the food drops from the mouth because there is no control over the tongue and pharyngeal muscles. The speech is often thick and hesitating, and the child twists and turns its mouth and head in the endeavor to get out a sentence. There is a general unwillingness to utter a word, and the tongue is sometimes bitten in the attempt to speak. After a time the disease extends to one or both arms, and later on to the legs, and thus all the voluntary muscles become implicated in spasmodic action. The child, if a female, will perpetually pluck at her dress, raise her hand to her head as if to play with her hair, or rapidly put it behind her; she will be noticed at this stage to drop things out of her hand, and to be unable to hold or direct her pencil when at school. In walking she leans on one side, drags one leg, or raises it awkwardly. Her walk is a jumping, unsteady, sudden, shuffling kind of gait, as though the joints hung loosely, and she was compelled to put herself together before making the attempt. The manner of locomotion is ludicrous and fantastic in the extreme, the writhing of the shoulders, the careless semi-drunken sway, and the peculiar grimace, or fatuitous expression of the features, are all characteristic. The movements cease with sleep and the abolition of consciousness.

In severe cases the patient is unable to stand or walk. If she can manage to walk, she shuffles along in a nervous hesitating manner, as if afraid of falling down every moment. The knees and elbows may be polished from friction, and even the skin abraded; the chin is red, and the lips sometimes bleed from biting and friction against the pillow. So violent are the paroxysms that the back may be arched one moment, and stiff and straightened the next. The speech may be unintelligible, and the emaciation become extreme if the case goes on. The pulse is not accelerated except from debility and nervous agitation. In some cases it is slow, and may not exceed sixty beats a minute in a child thirteen years of age. Irregularity and intermission of the pulse

are often present.* The tongue is sometimes furred, the breath foul, and the bowels constipated. The patient is liable to great variation in the progress of the malady, being sometimes better and sometimes worse. When the attacks are threatening there may be mental irritability, and evidence of spitefulness. In one case that came under my notice a child, whose intellect was below the average, was unable to restrain herself from kicking and biting those about her. In chronic cases, parents can often judge when an attack is threatening, or when the case is becoming worse, from the altered manner and disposition of the child. Timidity, caprice, and wilfulness are noticeable when the intellectual faculties are disordered, and it is in such cases as these that we may see fits of passion pass into temporary unconsciousness. I have known the symptoms much aggravated by another patient in the same ward practicing these extraordinary movements and mimicries, or suffering from a painful disease which has irritated the child. This is the only explanation I can furnish of a choreic child's temperature going up to 102° for three nights, and falling next day to normal when removed into another ward. Sir T. Watson mentions in his lectures that "chorea is liable to be propagated by a species of contagion, or rather involuntary imitation."†

Sometimes the loss of power of co-ordination is so great that the patient cannot pick up an object with the fingers, or even grasp anything with the hand.

In one case under my care the choreic movements were preceded by headache of three months' duration—a disorder which had not previously been experienced. The patient was a girl ten years of age, who had become very anxious about her studies. This symptom of headache, according to my experience, is exceedingly rare, except as the accompaniment of anæmia and debility. Sir T. Watson has frequently met with instances of pain in the head in chorea; "and in some of them, with pain on that side *only* of the head which was opposite the agitated limbs."‡

Chorea is very prone to recur, and a child who has had one attack is always exposed to a return at some future period.

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* See a paper by the author, On Neurosal Affections of the Heart in Children, Practitioner, Sept., 1878.

† Principles and Practice of Physic, 4th edit., vol. i, p. 668.

‡ Op. cit., vol. i, p. 673.

When the spasmodic movements are unilateral, affecting the limbs of the same side, the patient is said to have "*hemichorea.*" When this happens, the right side is oftener affected than the left. Both legs may be affected and only one arm; or one arm alone, whilst the legs are free. In rare cases, one arm and the leg of the opposite side of the body may be involved. When all the voluntary muscles are implicated there is "*general chorea.*"

Cardiac murmurs are sometimes present in this affection, and in the early stages of the disorder they are often overlooked. In some cases we may find exaggerated action and impulse of the heart, or a bellows murmur at the left apex, with other accompaniments of mitral regurgitation. When the heart is so affected it is often traceable to rheumatism. In other cases the heart is healthy, but the neurotic disorder has implicated the cardiac plexus, and produced irregularity in frequency, and deficiency of power; or there are to be discovered merely the evidences of palpitation, with prolongation of the first sound both at apex and base—a soft systolic murmur, in fact, which, though often significant of organic change, may happen in some examples of simple anæmia and general debility.

Sometimes palpitation is very severe and violent, and there may be a systolic mitral murmur of dynamic origin, which passes away with the seizure as the general health is restored.

The urine is often found to be of high specific gravity, excessively acid, turbid, and containing an excess of urea, and sometimes phosphates. In the twelve cases I have alluded to below, the highest specific gravity was 1032; there was a copious deposit of whitish lithates in three, phosphates in four, and in the remaining five (which were mild cases) the urine was normal.* In one case under my care the urine contained copious phosphates for five

* In twelve consecutive cases admitted under my care into the Samaritan Hospital, ten were females; the eldest, a girl, was fourteen years of age, and the youngest a boy of seven. Four cases were traced to fright, two followed measles, one arose from bad living and deficient food, one occurred in a cachectic and strumous child, two came on gradually from general debility, one from school work and punishment, and one case occurred suddenly, the child falling down in the street in a species of fit, followed by general chorea. In this case there was a loud systolic murmur of long standing, not traceable to rheumatism. In six cases the left side was attacked, in three the right, and in the remaining three the movements were not more on one side of the body than on the other.

"Among eleven chorea patients which I noted in my diary, I find only one boy affected."—Vogel, *Diseases of Children*, 1874, p. 398.

days in succession, and the specific gravity was never below 1030. During this time the child was taking from eighteen grains to one drachm of sulphate of zinc in the twenty-four hours. When she took eighty grains in the day, the urine suddenly became loaded with lithates, and the day following, when the zinc was reduced, it was normal.

Causes.—Age has a great influence on the production of chorea. Two-thirds of all cases occur between the second dentition and the development of puberty, between five and fifteen years of age. The influence of sex is also considerable, as girls suffer from it more than boys, the proportion being about three girls to one boy.

Among the causes of this affection are to be reckoned defective nutrition, general debility, and anæmia, worms in the intestinal canal, and disorder of the digestive organs. In fact, any circumstances which tend to lower the standard of health in debilitated subjects, such as bad air and food, are likely to generate the disease in children of delicate nervous organization. These causes most probably account for the great frequency of chorea among persons engaged in pottery manufacture, as stated by Dr. Arlidge.* Irritability of the nervous system is among the most frequent causes, and hence this is assigned as one reason of its frequency in the female sex.† Overanxiety in school-work is another cause.

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* The Pathology of Chorea, Brit. Med. Journ., 1877, vol. ii, p. 799.

† "But though the fact of the greater liability of the one sex to chorea is undoubted, so that of 775 children suffering from it who were admitted as in or out-patients of the Children's Hospital, 499, or 64 per cent., were girls; still, not only were all of these children under the age of ten, but 66 out of 102 of the number were under the age of five."—*On Some Disorders of the Nervous System in Childhood,* by C. West, M.D., F.R.C.P., 1871, p. 47.

"Of 422 cases occurring up to twelve years of age, 122 were males, and 300 females. Between the ages of four and five the proportion of males to females was as 4 to 16, and between ten and twelve, as 23 to 81. Again, when chorea occurred after puberty, it was among women that it was principally seen; yet as chorea was not confined exclusively to females, we must seek the cause in a factor common to both, but especially intense or prominent in the female."—*Croonian Lectures,* by J. Braxton Hicks, M.D., F.R.S., 1877.

"Up to nine years of age the two sexes appear to be equally liable; after this age females become much more liable than males, in the proportion of nearly 5 to 2."—*Chorea,* by C. H. C. Radcliffe, M.D., Reynolds's System of Medicine, vol. ii, 2d edit., p. 188.

"The '*chorea of childhood*' has come largely under my notice at the Stafford County Infirmary, and drawing my conclusions from cases seen at that institution, I am dis-

Nervous disease in the family especially predisposes to it. Hysteria in the mother, or epilepsy in the father; melancholy, suicide, or insanity in the parents, can be frequently traced.

Fright, anger, and injury may also induce chorea. Several cases have come before me in which the disease has been traceable to terror and alarm. One of the worst cases I ever saw came on suddenly in a girl, 10 years of age, from seeing a dead person. In another case which came under my notice in February, 1879, a girl, eight years of age, had three severe seizures: the first from grief at the death of a sister; the second from seeing a lady killed in the street; and the third from hearing of the sudden death of her grandfather. Chorea sometimes arises during convalescence from acute rheumatism; it is seen in secondary syphilis and other toxic changes in the blood. It may result from embolism in connection with rheumatic endocarditis, but the concurrence of chorea with rheumatic fever is not quite so frequent as is supposed, though it cannot be denied that the rheumatic constitution is sometimes associated with it.* In the twelve cases referred to there was no history of rheumatic fever in any of them, and in a large number of cases I have failed to discover anything more than a casual relationship.

Of 66 cases of chorea observed by Dr. West, 16 were accompanied or preceded by rheumatic symptoms, and in 11 of these there was a systolic bruit persisting after convalescence in 10. In one of the 16 cases, rheumatic symptoms and heart disease *followed* in the course of the chorea; in all the other cases the rheumatism preceded it. In 9 cases, although there was no rheumatism present, nor any history of rheumatism, the heart was the seat of valvular affection when the patients came under observation.†

A case of chorea is related by Dr. Althaus, where it came on from masturbation at fifteen years of age, and after lasting for six years, it became complicated with epilepsy. Arsenic, bromide of potassium, and various nerve tonics and sedatives failed. Hydrate

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posed to fix the age at which it is most frequently met with as being between *six* and *eleven* years, the generality of cases occurring somewhere midway between these ages."—*On Certain Convulsive Disorders*, by H. Day, M.D., F.R.C.P., Medical Society's Proceedings, vol. iv, p. 85.

* "Chorea is apt to supervene in young subjects after the cessation of the febrile disturbance in rheumatic fever where the heart has been implicated."—*Rheumatism*, by A. B. Garrod, M.D., F.R.S., Reynolds's System of Medicine, 1876, vol. i, p. 931.

† West, op. cit., p. 52.

of chloral checked the restlessness and general convulsion till the patient got into the habit of taking immoderate doses, and at last died in 1874.*

We may sometimes witness chorea in children who have been badly fed, and who have had their health reduced by scarlet fever and measles, and whose parents are nervous and consumptive. In a case under my care in 1875, with such a history, two children out of a family of four died of convulsions. In a family with whom I was once acquainted, one daughter had severe chorea, the other died of convulsions, a son perished from phthisis, the father hanged himself, and the mother died of paralysis.

(Chorea presents some points of difference when it occurs in old people. The disease in them appears to be remarkably rare, but to be incurable. The movements of the face and limbs are not so active, and the disease is more chronic. According to Charcot, chorea in old people is an emotional disease, and is unaccompanied by any cardiac lesion. The subject of it often labors under more or less dementia, and it has no connection with rheumatism, like chorea in early life.)†

Pathology.—There are two theories extant, one in which the disease is attributable to embolism, and the other to hyperæmia. Both have found able advocates. Dr. Dickinson is opposed to the embolic theory, and it appears to me inconsistent with the history and clinical features of the disorder. Of seven fatal cases in which Dr. Dickinson made post-mortem examinations, he found no plug of fibrin in any of the arteries. Of twenty-two fatal cases which he examined, the frequency of mitral endocarditis was noticeable.‡ He believes the disease to consist in hyperæmia of the nervous centres, particularly of the corpora striata and thalami optici, and that congestion in the cervical, dorsal, and lumbar portions of the spinal cord is frequently to be detected. Dr. Broadbent has seen "one fatal case of rheumatic chorea with delirium, in which there was plugging of minute vessels of the brain with decolorized clots."§ Dr. Hughlings Jackson has met with emboli in the small arteries, and others have seen them in the corpora striata.‖ The slow manner in which the disease so fre-

* Clin. Trans., vol. xi, p. 62.

† On Chorea in Old People, by Prof. Charcot, Med. Times and Gazette, March 9th, 1878, p. 245.

‡ On the Pathology of Chorea, Med.-Chir. Trans., 1875.

§ Lancet, Oct. 16th, 1875, p. 560. ‖ Ibid.

quently creeps on, and returns from time to time at uncertain intervals, the occasional sudden disappearance of the disorder, and the seizures being often general instead of onesided, are not consistent with the theory of embolism. Dr. Handfield Jones truly observes, "that there seems no more reason for requiring a demonstrable lesion in chorea than in many cases of insanity or delirium tremens, between which and chorea a considerable analogy certainly exists.*

In two cases of "canine chorea" there was found after death, in one case, a granular and swollen condition of the nerve-cells of the spinal cord, and in the second case there was seen, in addition, a similar lesion in the medulla oblongata and cerebellum, while the corpora striata and hemispheres were free from it.†

When the chorea is associated with temporary loss of consciousness and with convulsive seizures (hysterical or epileptoid), Dr. Gowers thinks the disease may depend on an unstable condition of the nerve-centres, or on imperfect development or nutrition of these centres. He mentions several cases illustrating the association of chorea with epilepsy.‡

In some fatal cases, evidences of inflammatory lesion have been found in the lungs, pleura, brain, peritoneum, and spinal cord (myelitis), and there have been also noticed hyperæmic patches of extravasation in the coats of the aorta and endocardium, when these did not depend on rheumatism. The chorea probably possesses the tendency to so affect the nervous centres as to destroy the balance that normally exists between them and their vascular supply. Perhaps the most frequent change is that of "vegetations," or fibrinous deposit on the valves of the heart. In 34 fatal cases, 18 presented these alterations, and there was scarcely one of them in which the changes could be traced to embolism (Handfield Jones).

Treatment.—Rest in bed is the first and most important step to observe, and with rest alone there is no doubt that many cases recover. Drugs exert only a secondary influence. Where the convulsive movements are incessant, splints softly padded should be applied to the limbs, and it may be even necessary to cover the

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* On Functional Nervous Disorders, 1870, p. 355.

† The Pathological Anatomy of Canine Chorea, by W. R. Gowers, M.D., and H. R. O. Sankey, M.R.C.S., Med.-Chir. Trans., 1877, p. 229.

‡ Brit. Med. Journ., April 6th, 1878, p. 481.

body with cotton-wool to prevent the patient from sustaining bruises and excoriations. It is then advisable to remove any eccentric source of irritation wherever it may exist. If there is feculent matter in the bowels, and constipation, as frequently happens, mild purgatives, such as rhubarb and castor oil, are to be selected. In some cases where the muscular agitation is great, free purging will be followed by rapid improvement, and this preliminary treatment ought never to be omitted if there is any reason to suppose that the intestinal tract is disordered. Unhealthy motions, scanty and high-colored urine, demand this treatment.* A case of acute chorea in a girl of nine, which had lasted a month, is referred to by Dr. Handfield Jones. The attack was very aggravated. The movements were incessant, and there were sordes on the lips, a bedsore, rapid feeble pulse, and a tendency to sinking. After a dose of male fern, a tapeworm seven yards long came away, and in a few days the convulsive movements ceased and the child recovered completely.†

To relieve the dryness of the skin, which is frequent in chorea, and to produce moisture, a warm bath at bedtime should be employed, and this has been recommended and adopted both by English and Continental physicians. Sulphur baths have been highly spoken of by French writers.

Succus conii has been recommended, but my experience does not enable me to speak in its favor. We do hear of and see cases where two drachms have produced certain physiological effects, as dimness of vision and dilatation of the pupil, but I have given sixteen drachms in the space of twenty-four hours without producing any sedative effects whatever; indeed, in the case to which I refer, of chronic chorea, the child, aged ten years, was no more affected than if she had taken water only. Dr. West gives similar evidence regarding the use of this drug, and also of henbane and belladonna. He has known them to be tolerated in poisonous doses without any result for good or evil.‡ Curara is another remedy.§

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* Formula 84:

℞. Potass. sulphat., ... gr. x
Pulv. rhei, ... gr. iv.—M.
To be taken in the early morning. For a child ten years of age.

† On Functional Nervous Disorders, 1871, p. 355. ‡ Op. cit., p 72.

§ Dr. Drummond, of Newcastle-on-Tyne, succeeded in curing an obstinate case of general chorea in a girl seven years of age, by the subcutaneous injection of curara.

Dr. Pulmont found that gr. $\frac{1}{3}$ of hyoscyamia augmented to gr. $\frac{1}{3}$ twice a day, proved very efficacious in chronic cases in adults, the improvement usually setting in in the course of eight or nine days. Symptoms of intoxication were occasionally observed, indicated by dryness of the mouth and dilatation of pupils.*

Chloral hydrate has been recommended in large doses in violent chorea.† The principle of treatment was to give thirty grains, and to repeat the dose, or half of it, if the patient did not obtain ten hours' sound sleep in the twenty-four hours. On waking, a second dose was given in proportion to the ascertained effect, but always less than the first. On waking again another dose less

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He commenced with an aqueous solution of gr. $\frac{1}{40}$ for two days, increasing the dose on the third day to gr. $\frac{1}{20}$, and the next day to gr. $\frac{1}{10}$, on the fifth day to gr. $\frac{1}{8}$, and on the sixth day to gr. $\frac{1}{5}$, by which time the patient had recovered complete power over the voluntary muscles. Two days later gr. $\frac{1}{4}$ was administered, and then there was no return. (Brit. Med. Journ., June 15th, 1878, p. 857.) In a chronic case of chorea, which was admitted into the Samaritan Hospital under my care, in October, 1878, I determined to try the curara. The patient was a girl eleven years of age, and had been under my care on three previous occasions for the same disease. There was incessant agitation of the arms and legs, and it was necessary to keep her in bed. The heart's action was rather thumping and excited, and there was a soft systolic bruit over the apex. After taking hypophosphite of soda and iron, as well as cod-liver oil, she was not manifestly better, and any excitement or talking would make her very fidgety, and increase the muscular movements. On the 15th of October I injected into the right forearm gr. $\frac{1}{80}$ of curara with the following effect: 16th.—10 A.M., no effect; 11 A.M., gr. $\frac{1}{40}$ injected; 2.30 P.M., no change, pulse 72, gr. $\frac{1}{30}$ injected; 6.45, since the injection she has been much quieter, and lying perfectly still with complete command over the limbs, pulse 80, inclined to sleep. 17th.—She had an excellent night, and slept better than she had done for some time past, but agitation was returning in the arms, and I now injected gr. $\frac{1}{20}$ at 10.45; at 6.45, as there was no further improvement, I injected gr. $\frac{1}{10}$. 18th.—Slept well, quite steady in arms and legs; injected gr. $\frac{1}{10}$. 19th.—2 P.M., she had remained quiet; gr. $\frac{1}{10}$ injected. 20th.—No injection used, but after 2 P.M. the limbs became more agitated, and the muscles of her face were more in action. 21st.—The mouth, hands, and legs were moving more. The effect of the curara has been to keep her quiet for twenty-four hours, and then it passed off. I must admit that the drug partially answered my expectations, and I should be disposed to employ it again when the agitation is great, because it controlled the movements, and caused neither headache, sickness, nor any unpleasant symptom. One difficulty is the alarm which the injection causes. I now gave sulphate of zinc, beginning with three grains three times a day, and gradually increasing to forty grains twice a day, without causing sickness, nausea, or loss of appetite. The effect of this treatment was to cause a great deposit of phosphates in the urine, but the remedy in these large doses did more good than any other that was employed.

* Bull. Génér. Thérapeutique, Aug. 3d, 1876.—Quoted from the Practitioner, October, 1876.

† Practitioner, March, 1877, p. 173. By Robert Bridges, M.B., Oxon.

than the second, and so on till the amount of sleep had been obtained, when the chloral was discontinued till the next night. Of two patients so treated, aged 18 and 20, one was completely cured in one day, and the other on the fourth day. In a case of acute chorea in a girl, aged nine, I found five grains every night produce most tranquil sleep, and it was not necessary to continue it after one week. In another case, a girl of 13, took ten grains every two hours at first, and afterwards every four hours. The effects were to procure sound sleep, which she had not obtained for a week before admission into hospital, to raise a small and weak pulse of 64 to 76, and to calm the muscular movements. Good diet, and four ounces of sherry, were given daily. When sleep was obtained, the cure was completed with iron, and large doses of sulphate of zinc.

There is no question whatever that hydrate of chloral is a valuable remedy in some cases of chorea, particularly in those where vascular excitement is present, and the pulse is good. Dr. Althaus considers that the theory of chorea is explained by active hyperæmia of the corpora striata, and the parts surrounding the fissure of Sylvius, and that the beneficial action of hydrate of chloral is to be attributed to the anæmia which it produces in these structures. Its dangers as a depressant are nothing compared to the repose and rest which it insures to the nervous system, lessening as it does in suitable doses the extreme agitation of the limbs, and the violence of the choreic movements. Sleep so obtained gives the necessary time for repair to the overexcited parts, and will be found to succeed when morphia yields no result. The patient wakes able to swallow food, which he may not have done for weeks or months. If then there is delirium or sleeplessness, chloral, opium, or morphia, to allay mental excitement and procure rest, will be needed.

In some cases, where the disease has lasted a very long time, the patient passes into that stage of chronic chorea or agitation which is likely to become permanent, and there is no further prospect of benefit from treatment. The only thing to be done in these cases is to maintain as far as possible the general health, and to avoid the strain of school-work; and as puberty is reached the disease may be thrown off altogether. Bearing in mind that the disease is one which rapidly induces exhaustion, the constant supply of nutritious food, easy of digestion, is imperatively demanded. The

free employment, too, of stimulants may be necessary to support the nervous waste. I found the liberal use of brandy prove of great benefit to a girl, eight years of age, who was much exhausted from perpetual agitation of the limbs.

Iron is one of the best remedies we possess in chorea, and mild cases, especially if there is anæmia, often yield to it. Where the movements are slight, some preparation of iron may be given alone, and most of such cases will be cured by it. When the movements are frequent, the addition of bromide of potassium is an excellent formula. The bromide may be combined in these cases with the ammonio-citrate of iron, the syrup of phosphate of iron, or the citrate of iron and quinine. The syrup of the iodide of iron is a preparation very highly recommended by some authorities. It was first proposed by the late Dr. Barlow, and given by him with great success.

Arsenic is a valuable remedy, improving nutrition and acting as an admirable tonic. Children bear comparatively much larger doses of this drug than adults, five minims being generally the minimum dose. Several cases have appeared to me to yield to arsenic when given in plain water, and there is certainly evidence to show that it is a very efficacious drug when continued long enough and in sufficient quantities, small doses sometimes failing when large succeed. Dr. Ringer says, that "in simple uncomplicated cases of chorea, arsenic is by far the best remedy."* Dr. Begbie, after an experience of nearly thirty years, never knew this remedy to fail.† Few physicians can, I think, speak in such enthusiastic terms of it. Although in my hands it has failed over and over again, I am quite ready to admit that it sometimes proves successful after other drugs have been tried in vain, if given in sufficient doses. A choreic girl, nine years of age, who was under my care in 1880, took ten minims three times a day for twenty-three successive days, when recovery was complete. Five-minim doses did no good whatever. Where anæmia is present, the citrate of iron and quinine, or the ammonio-citrate of iron, or steel wine, may be combined with the arsenic.

Strychnia has been employed by Trousseau, and as a nerve tonic it is rational to suppose that it will prove serviceable in certain cases. But its tendency to cause twitching of the muscles, which

* Handbook of Therapeutics, 4th edit., p. 260.

† Contributions to Practical Medicine, 1862, p. 90.

it will do in some cases, even in very small doses, renders it a doubtful remedy in this affection.

Sulphate of Zinc.—I have given this drug in doses of from one to five grains three times a day, and continued it for a week without producing any effect, and the remedy so repeatedly disappointed me that for some time I ceased to employ it. This most likely arose from giving it in too small a dose. Sir T. Watson gave it successfully in ten-grain doses three times a day in a severe case which had resisted other remedies. There can be no doubt that zinc sometimes succeeds where iron and other remedies fail. In prescribing it, the dose should not exceed a grain three times a day to begin with, and should gradually be increased till there is nausea or vomiting, or an amelioration of the symptoms. In a chronic case, which was temporarily relieved by the hypodermic injection of curara, I began with two-grain doses twice a day, increasing the dose daily, till on the ninth day, the girl, seven years of age, was taking eighteen grains. For the first time this controlled the agitation, improved her voice and appearance, and caused no sickness. On the tenth day, she took twenty grains three times a day, and on the twelfth day forty grains twice a day, without causing the least unpleasant symptom. The heart, which on admission was rather unsteady, with a soft apex bruit (owing to debility), became quiet and regular, and the murmur entirely disappeared. Among the chief signs of improvement was the strength of her voice, the ease with which she answered questions, and the control she had over the tongue and facial muscles. In another similar case no benefit resulted, and the patient only became a little sick after taking ninety-six grains in one day.

Sulphate of copper is used by Italian physicians for chorea.

Phosphorus in combination with iron is a good nervine tonic, and when persistent anæmia is present it should be employed. It often takes the place, or even supersedes the use of iron, restoring the tone of the nervous functions, and improving the quality of the blood. Dr. Radcliffe speaks highly of the hypophosphite of soda. He says, "I have given for some time from five to eight grains, three times a day, of the hypophosphite of soda to children in cases of chorea, without any harm certainly, and, as I think, with unmistakable benefit, and I have not yet found any reason to change this practice for another." In ordinary cases he also gives cod-liver oil with the hypophosphite of soda, and adds cam-

phor, or carbonate of ammonia, or both, according to circumstances. Of sixty cases so treated, the average duration of treatment was under one month.* I have frequently given, with advantage, five grains of the hypophosphite of lime and one drachm of the syrup of phosphate of iron in a tablespoonful of water twice a day.

Quinine and bark are useful in their turn, and cod-liver oil is one of the best remedies.

I have never employed tartarated antimony in any dose, nor can I see a reason for supposing that it could prove of real utility. It seems a remedy likely to do harm from its depressing effect, though cases are recorded in which it has done good. Dr. West has given "as much as nine grains of it in one day for three days together, with no sensible influence on the pulse, no sickness, and no diarrhœa, but with very remarkable abatement of the movements."†

Finally, sea air, shower-baths, cold-water douches, gymnastic exercises, are useful in properly selected cases. Galvanization and faradization are also to be recommended. A gentle constant current, applied for four or five minutes to the suffering portion of the brain, generally arrests the choreic movements at once. In hemichorea the opposite side of the brain must be galvanized.

CHAPTER XLVI.

DISEASES OF THE SPINAL CORD.

SPINAL IRRITATION. SPINAL HÆMORRHAGE. SPINAL MENINGITIS: *Symptoms—Pathology and treatment.* MYELITIS: *Symptoms—Causes and treatment.* CEREBRO-SPINAL MENINGITIS (CEREBRO-SPINAL FEVER).

AFFECTIONS of the spinal cord are obscure at all ages, and they are more so in young subjects than in adults; for whilst in the latter any impairment of motor power or abnormal sensations would be at once complained of, in the former, serious mischief might proceed for some time before we are able to detect it.

It must also be admitted that examination of the spinal cord and its membranes after death is most unsatisfactory. The body

* Chorea, by C. H. B. Radcliffe, M.D., Reynolds's System of Medicine, vol. ii, 2d edit., p. 220.

† On Some of the Disorders of the Nervous System in Childhood, 1871, p. 73.

allowed to remain on the back facilitates the gravitation of blood and fluids into the most depending parts, by which the nervous tissue itself is altered, and the evidences of congestion and effusion, which are hastily attributed to disease, may be entirely due to position. This fact has struck most observers, and rendered an explanation of the changes discovered after death very confusing, and calculated to mislead. "First of all, as regards the much-abused hyperæmia, all post-mortem appearances must be excluded as spurious where the body was not placed upon its face immediately after death, and the autopsy was performed later than twenty-four hours after life terminated. Without this precaution there will be found in every case, even in the most normal, extensive post-mortem hypostasis, imbibition of the coloring matter of the blood, and putrid softening, by which it becomes totally impossible to establish the previous existence of any actual disease in the medulla spinalis."*

Spinal Irritation.—"We have no more right to refuse to spinal irritation the claim to a separate existence, simply on the ground of the want of a known basis of anatomical lesion in the cord, than we have to do the same in acute ascending paralysis, in tetany, and many other diseases which betray an equally imperfect knowledge of pathological anatomy."† The symptoms that denote this condition are more or less impairment of motion in the upper or lower extremities, according to the seat or degree of mischief that may be present. There is pain of an obscure character in the cervical or lumbar region, languor, and failing health. In some cases the pain is severe enough to simulate disease of the vertebræ; there may be tenderness along the spine, and even some puffiness, and the degree of congestion may be sufficient to produce more or less stiffness of the neck, and pain on moving the head.

Dr. West describes the case of a little boy, two and a half years old, who had *irritation of the spinal cord* from masturbation; he tottered in his gait, was indisposed to move, and at last almost entirely ceased to walk. When the bad practice to which he was addicted was put a stop to, he soon regained his health and the power of walking.‡

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* Vogel, Diseases of Children, 1874, p. 376.

† Ziemssen's Cyclopædia of Medicine, 1878, vol. xiii, p. 359.

‡ Diseases of Infancy and Childhood, 1859, p. 162.

He also relates two other cases in children of four and five years of age. In one case the symptoms began with failing health and stiffness of the neck, succeeded by the head being thrown back and motionless, pressure over the cervical vertebræ gave pain, and the appearance and manner of the patient seemed to point to disease of the cervical vertebræ. The application of four leeches to the back of the neck was followed by sleep, and next morning there was no pain in the head, or tenderness of the spine, and complete power over the muscles of the neck.

In the other case, the child had a fall on her back ten days before she was seen by Dr. West. The day following the fall she was unable to stand or move without support, and had continued in the same state ever since. There was heat of skin, frequent pulse, loss of appetite, thirst, and furred tongue; the bowels were constipated, but the urine was normal. The integuments from the tenth to the twelfth dorsal vertebræ were puffy, and there were pain and tenderness over the spine in this situation. Cupping to four ounces over the loins was followed next day by relief of the pain, and the power of moving her legs more readily. She recovered in a few days.

Spinal Hæmorrhage.—Cases of spinal apoplexy in children are on record. "Dr. Abercrombie gives a single instance, which occurred under his own observation, in a child aged seven years, in whom, after an illness of three days, death ensued from violent convulsions. A long and very firm coagulum of blood was found, external to the cord, extending the whole length of the cervical portion."*

Apoplexy of the spinal membrane (like the cord itself) is so rare that Wilks and Moxon have never met with it.† Still it occasionally occurs, causing paraplegia and other symptoms, arising from pressure. The symptoms are violent pain in the region of effusion, general convulsions, and speedy death.

Spinal Meningitis.—As the membranes of the brain are liable to acute and chronic inflammation, so are those that invest the spinal cord. Spinal meningitis appears to be more common in new-born infants than in adults, and is considered to be pyæmic. "Billard found that in thirty cases of convulsions there was meningitis of

* Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 292.

† Pathological Anatomy, 1875, p. 246.

the cord in twenty, only six of which presented inflammation of the cerebral meninges."*

Acute inflammation of the dura-arachnoid (*pachy-meningitis*) is rare; it may arise from disease of the vertebræ extending to the membranes, or from exposure to damp and cold, and from injuries. Meningitis, with an effusion of pus and fibrinous serum, has followed acute articular rheumatism.†

Spinal meningitis, causing paralysis, has followed diphtheria, typhoid fever, small-pox, and occasionally scarlet fever. An excellent paper has been written on this subject by Dr. Althaus.‡

"A lad received a blow over the loins; an abscess formed which involved the vertebræ, and the purulent matter entered the spinal canal, so that when he died, three weeks afterwards, the arachnoid cavity was filled with pus, and the inflammatory process had proceeded upwards to the brain, and there produced also an arachnitis."§ Spinal meningitis, in two cases of infants aged respectively three and four weeks, followed the injection of Morton's fluid by Mr. Callender, for the cure of spina bifida.‖

The *symptoms* are pain in the course of the spine, which may be limited to the cervical or dorsal region, and increased on movement; spasms of the muscles, eventual loss of motion, and paralysis. This latter is owing to compression of the cord by the effusion, and is often combined with bed-sores. Sometimes the disease extends upwards along the spinal canal, and produces inflammation of the cerebral membranes. The disease is not easy to distinguish from inflammation of the cord itself.

Pathology.—After death in these cases the dura-arachnoid is found thickened, the vessels are congested, and there is an effusion of serum and puriform lymph. When the pia-arachnoid is likewise involved (*lepto-meningitis*) the cord has an irregular appearance, owing to the effusion of lymph within the arachnoid space. Where the inflammation arises from disease of the vertebræ, and other neighboring structures, it appears localized in certains portions of the spine; but when, owing to a general cause, it may spread throughout the length of the spine, it selects always the posterior rather than the anterior surface. On cutting the arachnoid lymph

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* Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 294.

† Steiner's Diseases of Children, by Lawson Tait, 1874, p. 66.

‡ Brit. Med. Journ., vol. i, 1881, p. 51.

§ Wilks and Moxon, Pathological Anatomy, 1875, p. 243.

‖ St. Bart. Hosp Rept., vol. xv, p. 51.

is found beneath of a yellowish-green hue, toughish, or softer, or even puriform.*

Treatment.—Leeching over the seat of pain and mischief in the spinal cord, a judicious and unstimulating diet, and the hypodermic injection of morphia to relieve pain, are the only measures to adopt.

Myelitis, or inflammation of the spinal cord, is a very rare disease; it generally follows an injury or pyæmia, or exposure to cold. Myelitis can be produced in rabbits by freezing the hind legs with ether spray, and according to Dr. Althaus, the first effect of the irritation is to cause spasm and then paralysis of the bloodvessels by vaso-motor influence.† The inflammation may attack the whole or a portion of the cord, and hence the symptoms vary according to the seat of the disease. There is pain in the back, and if the mischief is in the cervical region, difficulty of breathing. The disease may be attended with inflammation of the brain owing to the extension of inflammation from the cord, and the sympathy existing between the brain and spinal system. With the advance of the disease, paralysis, sloughing of the skin, alkaline and albuminous urine, supervene. Death takes place sooner or later, and if life is prolonged, there is paralysis of motion and sensation in the parts below the seat of the disease. It often terminates in softening of the cord, but never produces pus, except from pyæmia.

An interesting case of *acute softening of the spinal cord* is recorded of a female child, 11 years of age, who was admitted into the Bristol General Hospital, with paraplegia, under the care of Dr. Clark, December 31st, 1873. The disease began a week before admission with shivering and pains in her limbs, but she went about till three days previous to entering the hospital, when she suddenly lost the use of her legs. She never had convulsions, and there was no history of any injury to the back. There was pain along the vertebral column which was worse in the cervical region. It was not increased on pressure, and she could move her head about freely. There was complete paralysis of motion of the lower extremities. Sensation was diminished in the right lower extremity, and there was no sensation in the left. There was com-

* Wilks and Moxon, op cit., p. 245.

† Medical Society's Proceedings, vol. iv, p. 76.

plete loss of power over the bladder and rectum, uric acid, lithates, no albumen. Optic disks normal. The highest morning temperature was 99.4°; the highest evening 101°. The third day after admission there was partial paralysis of the upper extremities. On the fifth day there was more pain in the cervical region. On the sixth day, the urine was alkaline, ammoniacal, and contained pus and albumen. On the seventh day, the paralysis of the extremities had increased, difficult breathing and congestion of the lungs came on. On the tenth day, difficulty of breathing increased, and death took place.

Post-mortem Examination.—The cerebral veins were congested and there were several points of injection in the brain, which was otherwise pale. "The spinal cord weighed ¾ ounce; the membranes were healthy; there was a quantity of serous fluid in the arachnoid sac; the cervical portion of the cord was firm, but on making a transverse section there were several points of injection in it; lungs congested; pleuritic adhesions on the right side. The heart weighed 4½ ounces, and was healthy. Liver, spleen, and kidneys normal, but intensely congested. Stomach, intestines, uterus, and ovaries normal. The bladder was in a state of acute suppurative inflammation; the coat was very much thickened, and the mucous membrane lining the interior was covered with a yellowish-gray slough."*

Treatment of Myelitis.—The subcutaneous injection of ergotine, as in the inflammatory stage of infantile paralysis, is recommended by Dr. Althaus,† and when inflammation has subsided, iodide of potassium to promote the absorption of any effused fluids and morbid products. Later on, cod-liver oil, phosphorus, friction, shampooing, and electricity will be found serviceable.

An interesting case of *elongated cavity in the spinal cord* (*Syringomyelus*) is recorded by Dr. Frederick Taylor, of a female child, aged eighteen months, who was well till the age of five months, when it could not hold up its head, and from that time the head enlarged. On admission into the Evelina Hospital, November 19th, 1877, the arms became completely paralyzed. The head presented the characteristic signs of chronic hydrocephalus, and was very large. The anterior fontanelles and anterior sutures were widely open; the eyeballs prominent, optic disks white, and vessels of the

* Acute Softening of Spinal Cord, Lancet, vol. i, 1874, p. 442.

† See Chap. XLVII, On Infantile Paralysis.

usual size. Arms motionless and flaccid, legs distinctly rigid. The child got an attack of measles in November, and died of bronchopneumonia on December 5th.

The post-mortem revealed pleuritic effusion on both sides, and lobular pneumonia at the base of the lungs. A pint and a half of fluid was obtained by a trochar through the anterior fontanelle; the ventricles were greatly distended, and the fourth ventricle was large enough to contain a small walnut. "The membranes of the spinal cord were healthy. The cervical and lumbar regions had their usual consistence, but the dorsal region was quite flaccid, and on making transverse sections it was seen that in this region the cord was hollowed by a considerable cavity. The largest cavity (for there were altogether three) was of irregular size and shape, and altogether extended from the lowest part of the cervical to the highest part of the lumbar region, and was two and a half inches in length."* These cavities did not correspond with the central canal of the cord. Dr. Taylor quotes observations of other authors on this rare condition. This case is essentially, as far as clinical features show, an instance of hydrocephalus. No symptoms that were observed can guide us to the suspicion of a similar state of the cord in other patients; neither must we forget that in making post-mortem examinations of the brain, the cord is seldom examined, hence the presence of cavities may be more common than is supposed.

Cerebro-spinal Meningitis.—This formidable and fatal disease is of sufficient frequency and importance to be alluded to. Young persons are most liable to it, and children are not infrequently attacked. The disease has prevailed in the chief countries of the Continent, as well as in England, Ireland, and America.

It would seem to be entitled to rank among the specific diseases, for it often occurs as an epidemic; it has a fatality like typhus, which it resembles; it is due to blood-poisoning, and not infrequently there is a petechial rash.

The *causes* appear to be due to cold and exposure, fatigue, bad living, and insanitary conditions, like typhus, but it is not contagious.

The *symptoms* begin with rigors, followed by fever, severe pain in the back of the head, extending along the spine, and stiffness of the cervical muscles. Nausea and vomiting are usually severe.

* Pathological Transactions, vol. xxix, p. 21.

In some cases described, the child falls into a state of stupor, moans or cries, and then becomes unconscious, with a dusky countenance, from which state it does not recover. In other cases the intellect remains clear. The head is thrown backwards towards the spine, and there is tetanic stiffness of the muscles, paralysis, and even convulsions. Disordered vision is not uncommon. The temperature runs up to 104°, or even higher in some cases; the pulse is quick and small; the tongue furred, the urine scanty, and sometimes albuminous. Petechial spots are seen over the face, neck, chest, and limbs, of variable size, and disappearing on pressure. Herpes on the lips is often noticed in connection with the disorder, particularly in mild cases. The disease may terminate fatally in a few hours, or it may last over a week.

"Spinal meningitis is by no means rare in association with tubercular cerebral meningitis; and it is quite possible that some cases of so-called 'cerebro-spinal fever' in children are really dependent upon tuberculosis, just as others may originate from traumatic causes."*

From a number of cases admitted into the Dundee Infirmary, in December, 1877 and 1878, Dr. Maclagan regards the disease as contagious, and bearing a great resemblance to typhus. It sets in with rigors, intense headache, pains in the neck, limbs, and trunk. There is fever, and the respiration is quick and cerebral in character; the patient is restless; the tongue dry and furred; urine high-colored, deficient in chlorides, and sometimes contains albumen. When an eruption is present on the skin it resembles the rash of typhus, but it appears earlier, and is lighter in color. The cuticle desquamates freely after cerebro-spinal fever. The writer says it is distinguished from typhus by more sickness at the onset and more headache, the intellect is often clear throughout the illness, and there is a less tendency to delirium.† The resemblance, however, appears to me very close. The morbid appearances found after death were inflammation of the membranes of the nervous centres, lymph, and fluid effusion into the arachnoid, and intense injection of the vessels of the pia mater. The veins in the spinal cavity were full, and there was vascularity of the membranes of the cord. One case terminated fatally in rupture of the spleen."‡

* Cerebro-spinal Meningitis, editorial, the Lancet, 1876, vol. ii, p. 57.

† Cerebro-spinal Fever, the Lancet, vol. i, 1878, p. 219.

‡ Ibid., 1878, p. 822.

In a case recorded by Dr. H. Vandyke Carter, of Bombay, the patient was semiconscious from the first. On the third day he became insensible, and died on the fifth day. At the post-mortem examination the meninges were greatly congested, and over the convexity of the hemispheres was a layer of greenish-yellow pus; the spinal subarachnoid space was occupied with puriform lymph like that in the brain, and the effusion was almost limited to the posterior surface of the cord.*

The favorable symptoms which precede recovery are a cessation of pain and fever, relaxation of the muscles of the neck, undisturbed sleep, and returning appetite.

The *diagnosis* is mainly grounded on the typhoid symptoms, the epidemic character of the disease, and the cerebral and spinal symptoms. The *prognosis* is extremely unfavorable.

The *morbid appearances* found after death are great congestion of the cerebral vessels, and effusion into the ventricles; coagulated blood in the sinuses of the dura mater, and an exudation of serum or pus among the meninges of the brain. Very similar appearances are presented in the membranes of the spinal cord. "But when the case is as usual of mitigated, yet fatal, severity, you find it a pia-arachnitis, the lymph lying chiefly on the dorsal surface of the pia mater. Only in the very rarest cases do any products appear in the arachnoid space. The spinal cord itself in this disease is often quite free from change."† There are also sometimes evidences of congestion and inflammation in the lungs, pleura, and pericardium, enlargement of the spleen, fatty degeneration of the liver and kidneys, and occasional enlargement of Peyer's patches.

Treatment.—Hitherto this has been most unsatisfactory, various methods having been tried, with small success. Leeches behind the ears, or cupping along the spine may be demanded in some cases. Cold applications to the head and spine have also been found serviceable. At the onset, where there is high fever and delirium, the head may be shaved, cold applied, and calomel given every four hours. The hypodermic injection of morphia to relieve

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* Note on the Occurrence of Cerebro-spinal Meningitis, Lancet, vol. ii, 1878, p. 730.

† Wilks and Moxon's Pathological Anatomy, 1875, p. 246.

In the case of a girl, 13 years of age, admitted into the Hitchin Infirmary, the spinal cord in the lower cervical and upper dorsal vertebræ was softened, and about the consistence of cream.—*Lancet*, vol. i, 1876, p. 814.

pain, hydrate of chloral to procure sleep, and bromide of potassium to quiet the nervous system are severally indicated according to the peculiar circumstances of each case. If typhoid symptoms are present, quinine should be resorted to, and as a rule, enemata, nutritious food, and stimulants will be required.

Sexual precocity or aberration is found in some children. The subject is a very disagreeable one, but its consideration cannot be entirely omitted from a work of this kind. In boys the practice of masturbation may be caused by irritation produced by a long prepuce; in girls it is undoubtedly due in many cases to the irritation of ascarides, especially when they escape at night from the anal ring and wander into the vaginal orifice. The little girl is thus induced to scratch herself, and so in time the habit is gradually formed. In both, the practice may be communicated by other children, who have acquired the vicious habit; at other times it is to be feared the practice is brought about by the improper conduct of nurses, and especially Indian *ayahs*. When a child is fretful, the irritation of its genitals distracts it, and the excitement so produced is followed by languor and sleep. Occasionally, in girls, it results from vaginitis, as a result of dirty habits and general neglect. In such cases, carelessness on the part of the mother is much to blame. Where clonic spasms and paralysis are the consequence of this habit in boys, to touch the meatus by a probe is usually followed by almost instantaneous erection of the penis, and by convulsive movements. The increasing development of the nervous system in both sexes, and the consequent tendency to precocity, makes one fear that this evil practice is becoming more common. If such is the case, it is highly incumbent upon parents and guardians to recognize the fact, and to give assiduous attention to the *morale* of their children and their associates.

CHAPTER XLVII.

INFANTILE PARALYSIS—ACUTE ANTERIOR POLIO-MYELITIS.

CAUSES: *Teething—Exposure to damp and cold—Eruptive fevers—Blows or injuries to the hip—Chronic illness.* SYMPTOMS: *Sudden or gradual loss of power in all or some of the muscles of one or several limbs—Debility and slight fever—No headache, sickness, or convulsion except by pure coincidence—Paralysis sudden or gradual, but at length complete—In some cases transitory.* PATHOLOGY: *Diffuse acute inflammation of the anterior cornua of the spinal cord—Changes rather obscure than positive.* TREATMENT: *Rest in bed—Calomel—Leeches and cupping to spine recommended—Subcutaneous injection of ergotin—Injection of strychnia* (Barwell)*—Belladonna—Ergot of rye—Iodide of potassium—Constant galvanic current—Cod-liver oil—Phosphorus—Sea-air—Good diet.* DUCHENNE'S PARALYSIS: *Causes—Symptoms—Pathology—Treatment.* NEURALGIA: *Rare in children—Causes—Treatment.*

THERE are four principal forms of paralysis in children:

1. Obstetrical paralysis.
2. Paralysis from brain disease.
3. Infantile paralysis properly so called.
4. Duchenne's paralysis.

1. *Obstetrical paralysis* sometimes occurs from pressure of one blade of the forceps on the portio dura at its exit from the stylo-mastoid foramen. During the operation of turning, from undue violence the brachial plexus may be torn or injured, and paralysis of the upper extremity is produced. If any undue impairment of the cerebral circulation takes place, there may be hæmorrhage of the corpus striatum, producing all the ordinary symptoms of cerebral hemiplegia.

2. *Paralysis from brain disease* may be the result of hydrocephalus, meningitis, apoplexy, and cerebral tumors. I once met with a case of hemiplegia, in a child nineteen months old, who had a subacute attack of meningitis and recovered. Paralysis is sometimes the result of rheumatism, typhoid fever, diphtheria, and especially scarlet fever. Disease of the petrous portion of the temporal bone may produce facial paralysis. Paralysis may occur during dentition, and be associated with convulsions and laryngismus stridulus.

3. *Infantile, or infantile spinal paralysis*, is a disease occurring in young children, the nature of which has not been satisfactorily investigated. It is particularly apt to attack children under two

years of age.* It is a motor paralysis only, sensation being in no way affected. It is generally sudden in its accession, is attended with febrile symptoms, and ends in complete paralysis and waisting of the muscles. The limbs are not necessarily alone affected; the muscles of the back may be involved, and the spine more or less curved. It is generally the right lower extremity that is attacked. The brain and cranial nerves exhibit no morbid appearances.

Causes.—The disease may appear suddenly in children who have not been previously out of health, or who have not suffered from any nervous or febrile disorder. Teething is not an uncommon cause. A child who came under my care with infantile paralysis in January, 1879, walked when he was a year old; he then partially lost the use of his left leg, whilst cutting a tooth. At two years old, when I first saw him, he could walk, but was lame, and the muscles of the affected limb were wasted. I have known the attacks follow cold and ulceration of the throat, diphtheria, and the eruptive fevers. Blows and falls upon the hip have produced this form of paralysis. In rickety subjects, with delayed dentition, a child may suddenly lose the use of a limb, and wasting and contraction continue until there is permanent deformity, such as clubfoot, necessitating division of the tendons. A child, two years of age, had bronchitis followed in six weeks by measles. A fortnight later paralysis of the lower limbs came on. He recovered quickly under the use of iron, strychnia, and shampooing. The disease may succeed convulsions in children, and irrecoverable paralysis may ensue. It creeps on insidiously in some cases, especially in excitable children who come of nervous parents. A little girl, aged seven years, under my care in February, 1878, with paralysis of the left arm, had lost two brothers—one of some cerebral disorder, and the other of convulsions, each at the age of one year.

Symptoms.—These often set in suddenly, the paralysis coming on in a few hours. A child may be playing about in his usual health, go to bed apparently in all respects well, and wake up next morning paralyzed in one limb or more; most frequently in the lower extremities, so that on attempting to stand or support himself he falls. The paralysis, or inability to stand, is the only symptom in many cases. There is no pain whatever. A male child, aged four

* Clinical Lecture on Cases of Acute Atrophic Paralysis in Infants and Adults, by T. Buzzard, M.D., the Lancet, 1880, vol. ii, p. 925.

years, of pale and delicate appearance, came under my notice in September, 1875, with complete paraplegia. Two months before I saw him, he was playing on a lawn one evening in his usual health. Next morning he could not use his legs, and he was unable to do so for some months afterwards. The muscles of the calf became flabby and the joints relaxed; his appetite was excellent, and he had (as is most usually observed in these cases) perfect control over the sphincters. The urine was healthy, the temperature normal, and there was no tenderness in any part of the spine. He was ordered friction with bay salt for the limbs, flannel clothing next the skin, and the syrup of the hypophosphite of iron twice daily, as he was weak and pale. A fortnight later there was some improvement, for when his feet were allowed to touch the ground he could move one foot in advance of the other. He also crawled about the floor with greater ease than at first, and did not allow his legs to remain so long at rest. A month afterwards he moved his legs with still more freedom when supported, with his feet touching the ground, and he had more confidence in himself. The muscles of the calf in both legs were much less firm than those of the nates and thigh, which were in no degree wasted; the loins were well developed, and the patient sat up fairly well in a chair. The spine was nowhere prominent, nor was any tenderness felt on percussion. He could move the left leg with the greatest ease when sitting down, pulling it up rapidly under him, but he could do nothing with the right leg in the way of lifting it up like the other, though he felt the ground with it, and when the sole was touched with a pin, or tickled, he complained, but not the least reflex action was induced. The right foot was colder and more swollen than the left. Iron and strychnia were prescribed.

In 1878 the child could walk when taking any person's hand, but the muscles were still wasted and weak, and he moved along timidly and insecurely. There was a tendency to diarrhœa.

In some cases there is febrile disturbance, which may last several days, with thirst, loss of appetite, headache, screaming, convulsions, and loss of consciousness. These symptoms may rapidly develop themselves after the paralysis has been established. In other cases again there would appear to be no fever.

The arms may be alone affected, but more commonly the legs, sometimes one arm or one leg, or one arm and leg of the same side,

or opposite sides. In very exceptional cases both arms and both legs are affected, but, as previously stated, the right leg is the most frequent seat of infantile paralysis. When the paralysis occurs in one arm, say the left, the patient will use the right hand to eat or drink, and make no use of the left whatever. The thumb and fingers may be widely separate, and the back of the hand when extended has a rather concave appearance. The hand drops at the wrist as if useless, the thumb is flexed inwards towards the palm, and the phalangeal articulations are all loose. On attempting to take up anything the child will slide the object to the edge of the table before it can be grasped. The hand will swell when cold and look bluish. If the leg of the same side is also affected, so as to constitute hemiplegia, or indeed if it be alone affected, the child, even with assistance, walks unsteadily, the limb being moved with less freedom than the sound one. He turns out his foot, the ankle-joint being bent inwards at the same time, so that he rests chiefly on the inner border of the foot. On looking upwards the patient is afraid to venture to walk; he requires to watch his foot at every step.

Considerable wasting in the muscles of the gluteal region and thigh may often be observed. In some cases it is chiefly noticeable in the gastrocnemius, and the muscles of the foot, especially the small interossei. The affected limb, from diminished size of the bloodvessels, generally feels much colder than its fellow, and is damp; the toes too present a bluish aspect, and there is a liability to chilblains (Buzzard, op. cit.). The paralysis is attended with flaccid muscles, and signs of atrophy; the muscular tissue undergoes degeneration or absorption, so that in severe cases it almost entirely disappears, and leaves the skin in close contact with the bone. The ligaments are relaxed, and deformity of one or both feet is not uncommon. The patella tendon reflex is absent in the affected limb. The extensors in infantile paralysis are more frequently affected than the flexors, and as a result of this the flexors become permanently contracted. Reflex excitability is soon abolished, and the muscles do not contract under the employment of faradization. "Many of the muscles paralyzed lose their faradaic excitability entirely within a week, and rapidly waste. But although they fail to respond to the strongest induced currents they react to slow interruptions of the constant current (reaction of degeneration). The nerves to the muscles, on the other

hand, lose their excitability to both forms of electrical excitation. Some, again, of the muscles whose faradaic excitability has been lowered, but not lost, are not long in regaining the power of contraction to voluntary impulses."* In mild cases, the use of the battery maintains the contractility of the muscular fibre till the fundamental cause of the disease is remedied, thus preventing permanent and irremediable muscular atrophy. In this disease there is an absence of pain, and a freedom from irritation of the skin, and bedsores, a fact which distinguishes it strongly from other forms of paralysis.

The urine often contains excess of phosphates. These were present in two cases under my care at the same time.

A remarkable case is recorded by Dr. Andrew and Dr. Dyce Duckworth, shows that a form of "all but universal paralysis" may occur in childhood from exposure to heat, and be followed by complete recovery. The patient was a little girl two and a half years old. There was almost complete loss of motor power in her arms and legs, and anæsthia of the affected parts. The muscles were soft, wasted and flabby, and the urine and fæces passed involuntarily. The authors considered that the case differed from essential infantile paralysis in the affection of the sphincters, and the disturbance of sensation. They were of opinion that the symptoms were due to profound nervous exhaustion, affecting the spinal marrow as well as the muscles. Steel, cod-liver oil, and belladonna were prescribed. Faradization was practiced daily. The child recovered in two months.†

Pathology.—The disease is attributed by recent observers to inflammation of the anterior cornua of the *gray matter* of the spinal cord, whence the motor roots of the spinal nerves spring. The large cells become atrophied and at length disappear. According to Charcot, the disease begins in an inflammation of the ganglionic cells of the anterior cornua of the gray matter of the spinal cord, which gradually spreads to other parts. The recovery of the limb depends upon the recovery of these cells. It may affect any portion of the cord, cervical, lumbar or dorsal, but the latter is the most rarely involved. Alluding to the morbid changes Dr. Bristowe says "the diseased cornua ultimately shrink in proportion to the degree and duration of the morbid process."‡

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* Buzzard, op. cit., p. 925. † Med.-Chir. Trans., 1877, p. 273.

‡ Principles and Practice of Medicine, 1877, p. 981.

The muscles do not shrink in all cases. "Occasionally they present a positive increased bulk, owing to the accumulation between their fibres of adipose or fibrous tissue."* Dr. Althaus writes: "Infantile paralysis is an extremely acute myelitis of moderate intensity which is either diffuse, or occurs in circumscribed areas, and affects more particularly the cervical and lumbar enlargements of the cord."† In cases that terminate fatally after a lapse of years, the anterior cornua are found wasted and the cells disintegrated, whilst the posterior cornua are healthy. The muscles are soft and atrophied, more or less replaced by fat, and the interstitial tissue hypertrophied; the tendons are smaller, the bones shorter, and the medullary canal is enlarged ‡

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* Principles and Practice of Medicine, 1877, p. 981.

† On Infantile Paralysis, 1878, p. 15.

‡ Some interesting microscopical specimens of the spinal cord were exhibited before the Pathological Society (February 8th, 1879). The spinal cord in the *first* case was from a child, three years old, who had suffered from infantile paralysis since the age of fifteen months. There was a history of a blow on the hip, followed in three days by pain in the left leg, paralysis, and feverishness. Pain lasted ten days, and then paralysis remained. The child died of bronchopneumonia. The muscles of the left leg were pale in color, and soft and gelatinous in consistence. The lumbar portion of the cord was diminished in size on the left side, and the interior roots of the lumbar nerves were smaller. Microscopically there was almost complete absence of motor ganglion cells in the left anterior cornu; the substance forming the basis of the gray matter had lost its open spongy texture, and presented a uniform feltlike appearance. In the *second* case a child, two and a half years old, had a fall which did not appear to hurt it; thirteen days afterwards the *left* arm and leg became paralyzed. Then both legs lost motion and sensation, both arms were powerless, but had not lost sensation. The evacuations were involuntary. The child took measles, and died of bronchopneumonia nine weeks after the accident. The spinal cord was much diseased, and the gray matter was thick, and there were patches of red softening in the anterior cornua in the lumbar regions. Above the softened parts there were a large number of leucocytes in the perivascular spaces. There were no ganglion cells on the left side; exudation corpuscles, granular bodies, and free nuclei took their place. The posterior horns were diseased, but more on the right side than the left. The changes were most marked in the cervical portion of the cord, then in the lumbar, and less in the dorsal; there was distinct sclerosis in the antero-lateral columns of the cord, especially on the left side. In the *third* case the child, aged three and a half years, died of scarlet fever. At seventeen months old she fell ill with "relaxed bowels," and was unable to walk, which she had previously done. The power of walking soon returned to a limited extent. Weakness was especially noticeable in the left leg. The lumbar region of the spinal cord was found on section to be smaller on the left than on the right side, and it was most marked in the interior cornu; the posterior cornu were equal in size on the two sides. On the left side the ganglion cells of the anterior cornu had nearly disappeared; there was no sclerosis of the anterior horns or of the antero-lateral columns.

Treatment.—The fact that several distinguished authorities speak of very different remedies is conclusive that no specific has yet been discovered; which is not to be wondered at considering the obscure origin of the disease. In the early stages, where there are febrile symptoms, saline aperients and medicines which control fever are necessary. Two or three leeches to the spine, and counter-irritation are serviceable. Nothing can be done without the most absolute rest. When febrile symptoms have departed, we must endeavor to restore the power of the paralyzed muscles.

One of the most recent writers on the subject (Dr. Althaus) holding the theory that the disease commences in inflammation of the anterior cornua, strongly recommends the subcutaneous injection of ergotin. He proceeds on the principle that this alkaloid contracts the minute bloodvessels of the spinal cord, and controls the hyperæmia. "I used a solution of Bonjean's ergotin in distilled water, which, if thoroughly pure, is generally not irritating; and the dose I inject is one-fourth of a grain for a child from one or two years of age; one third of a grain from three to five years; half a grain for children from five to ten years of age; and a grain for patients upwards of ten years. These injections must be repeated according to the symptoms which may be present, either daily or twice a day. Our guide of action in the matter should be the thermometer and the pupil. In severe cases, where the thermometer runs up to 103° or 104°, the remedy should be used more freely than when the thermometer shows only a rise of one or two degrees. The fever being in all these cases a secondary phenomenon, consequent upon local inflammation, may be rapidly reduced by the use of the ergotin, which thus proves a truly antiphlogistic remedy; and its employment should be continued until the temperature has fallen to the normal standard. Where the pupil remains much contracted after the use of the remedy, some time may be allowed to elapse before it is again injected, but where it is large, the dose may safely be increased and repeated. The injection is not painful if well performed, and is quite as easily done, even in restless children, as it is to make them swallow a dose of medicine. The place of injection is a matter of indifference. I generally inject into the legs, as most convenient."*

I have had no experience of the subcutaneous injection of strychnia, recommended by Mr. Barwell.

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* On Infantile Paralysis, 1878, p. 52.

Belladonna is useful by controlling a hyperæmic condition of the cord, and its membranes. "In consequence of this influence, it diminishes the amount of blood in the vertebral canal, and in so doing produces a relative diminution of the vital properties of the spinal cord and its nerves."* Ergot of rye has a similar action.

When the incipient or inflammatory condition is reduced, small doses of iodide of potassium in combination with bark are serviceable, and the remedy should have a fair trial. It checks inflammatory effusion, and lessens the growth of connective tissue.

Where the disease is advanced it is generally admitted that no benefit can be afforded except by galvanism and faradization. A continuous current, from ten to twenty cells of a Stöhrer's battery, to the spine or extremities, sometimes causes no muscular response, and the cutaneous sensibility may be diminished. This treatment, however, will often have a wonderful effect in restoring the tone of the muscles and nerves. In those cases in which redness of the skin is excited, and the feeling of pins and needles is produced, recovery may be generally anticipated. The utility of the faradization lies in its maintaining the functional activity, and with it the nutrition of the muscles, until the nervous disease is recovered from. When it is employed early, before degeneration or atrophy has reached any important stage, the disease may be arrested, and the deformity removed. It is a good sign when the paralyzed muscles contract and become warm under the influence of faradization, and the child shows indications of pain by drawing up the leg or arm as the case may be. A child may cry from the first two or three applications, but he soon gets accustomed to the peculiar sensation. The operation should be continued for ten minutes daily.

After this form of paralysis has lasted some time and the muscles have recovered their tone and strength, the patient may be unable to exercise the will, so as to bring the hand, or the legs, properly into use. This complication must be overcome by careful drilling. "When any amount of voluntary power has been restored by electricity, it is most important that the child should be encouraged to use the limb, and practice various movements."†

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* Paralysis of the Lower Extremities, by E. Brown-Séquard, M.D., F.R.S., 1861, p. 111.

† A Handbook of Medical and Surgical Electricity, by Herbert Tibbits, M.D., 1877, p. 161.

Infantile paralysis is a very chronic and tedious disorder, and in some instances the treatment has to be persevered with for months or even years. Muscles which seem almost hopelessly wasted and paralyzed, sometimes completely recover their size and form under a steady continuance of local and constitutional measures.

The use of iron, strychnia, and cod-liver oil, where there is general anæmia, and an absence of congestion and spinal irritation, ought to be steadily continued for weeks or months together. It is an excellent plan to immerse the affected limb in hot water for ten or fifteen minutes daily, before shampooing is commenced, and both night and day, to maintain the warmth of the affected muscles by a stocking of "pure spun silk" or "chamois leather," as recommended by Dr. Tibbits. Cold affusion and friction of the limbs are useful in restoring the tone of the wasted muscles. Mountain air, or a seaside residence, is advisable in some cases.

The deformities that result from infantile paralysis will require surgical treatment.

Duchenne's Paralysis (pseudo-hypertrophic muscular paralysis).—This disease is now well known to the student of medical literature, from the researches of the late Dr. Duchenne, of Boulogne, whose name is, at least at the present time, always associated with it. Since that physician and later observers turned the attention of the profession to the complaint, it has been found to be less rare than was at first supposed. Butlin had the opportunity of making observations on four cases, all under treatment within the same year at the Children's Hospital, Ormond Street. The disease is most frequent among boys. Of twenty-three cases mentioned by Dr. Gowers, eighteen occurred in boys.

It is a rare form of paralysis accompanied by enlargement or hypertrophy of certain muscles. It may occur in children who are born healthy and vigorous, and who have passed through the period of dentition well. The majority of cases begin about the sixth year, and death occurs between 14 and 18. The rich are more prone to suffer than the poor. It would also seem to come on after any severe illness, as measles. The disease is slow and chronic, and unattended by fever. No definite cause has ever been assigned, but authorities generally agree that it is most frequent in dull and idiotic children. Six cases are mentioned as

having occurred in the same family, and in another instance eight brothers died of the disease.*

Symptoms.—These are, first those of weakness in the lower limbs, and finally loss of reflex excitability. If the child is old enough to walk, he moves along with a shuffling gait, placing his feet timidly and cautiously on the ground. He sways his body from side to side, and swings his arms at every step he takes. The belly is prominent or arched forward, the shoulders are thrown back, and there is a curve along the spine (lordosis). He is apt to tumble down if he meets with any impediment in his way, and cannot get up again without assistance. He stands with his feet apart to balance himself, with the toes averted. In attempting to rise from the ground, the movements are very peculiar; the patient bends one knee, first placing his hands on it or some object near by for support, he then bends the other knee into the kneeling position, and so grasping his thighs from below upwards, gradually raises his shoulders and body to an upright position, proceeding in a very cautious and gradual manner, as if in fear of falling. This peculiar action has been considered pathognomonic. "Attention was called to it by Duchenne, and I have never seen it absent in a case so long as the patient possessed the necessary muscular power. I have never seen it in any other disease, and every doubtful case in which it was present ultimately proved to be an example of the affection. Its diagnostic importance is thus very great."†

The disease first shows itself by the child being quite unable to walk when old enough to begin to do so, or if it has reached the age at which it can stand by itself, or walk, or run, it becomes very weak on its legs. This weakness continues for many months, progressing slowly, when the careful medical attendant, on examining the patient stripped, will at once recognize the disease if he finds that, after months of muscular weakness, the muscles of the leg have become larger and not smaller. In a few more months the hypertrophy extends to the buttocks, or even to the loins, the weakness increasing rapidly. The great firmness of the affected muscles when set into action would puzzle the uninitiated as it resembles what is seen in muscles hypertrophied by healthy exercise.

* Pseudo-hypertrophic Paralysis, by W. R. Gowers, M.D., 1879, p. 8.

† Pseudo-hypertrophic Muscular Paralysis, by W. R. Gowers, M.D., 1879, p. 4.

This hypertrophic stage lasts several years, and is followed by gradual and complete paralysis ; the unaffected muscles lose motor power; those involved in the characteristic enlargement all diminish in size. The patient, now perhaps grown out of childhood, ultimately dies through falling a prey to some visceral affection, as is the case with most patients attacked by the other rarer and slower forms of paralysis.

Pathology.—In this peculiar form of paralysis, the muscles of the calf of the leg become enlarged and overgrown, and present a remarkable contrast to the muscles of the thigh and other parts of the body. In one case the gastrocnemii were abnormally firm when at rest, and during contraction, hard and knotted as the biceps of a blacksmith.* Dr. Gowers found that on cutting into the gastrocnemius in one instance, it presented the appearance of a fatty tumor. It was a mass of greasy fat without any muscular redness.† The microscope reveals a degeneration of the muscular fibres, both in size and number, and a great overgrowth of the connective tissue between the bundles of fibres; fat is also deposited freely over the affected part of the muscle, but the fibrous hyperplasia is the primary morbid change.

In one case related by Dr. Ord, there was increased temperature in the affected legs, compared with the thighs, of from 1.8° to 3.9°.‡ In another case, also described by him, the thighs were warmer than the calves.§

Prognosis.—This is extremely grave. The patient may possibly recover if the disease should become stationary, but it generally extends upwards, and the functions of deglutition and respiration becoming involved, death takes place from exhaustion or asphyxia. The fatal result is not due to the disease itself, but, according to Dr. Gowers, to some intercurrent malady. "The weakness and wasting of the thoracic muscles, for instance, gradually lessen the respiratory power. The patient is thereby weakened, and is rendered an easy prey for the maladies which lie in wait for the infirm. The most common cause of death, indeed, is the direct interference with the action of the lungs. As the patient becomes weaker, bronchial râles are heard through the chest, dyspnœa comes on, and is rather increased than lessened by the patient's feeble at-

* Med.-Chir. Trans, 1877, p. 21, Pseudo-hypertrophic Paralysis, by W. M. Ord, M.D.

† Op. cit., p. 40. ‡ Med.-Chir. Trans., 1874, p. 16. § Ibid., 1877, p. 19.

tempts to cough. Pyrexia may be developed, and the patient dies with the signs of a chronic bronchopneumonia, which has in many cases been found after death."*

Treatment.—This is in the highest degree unsatisfactory, and must be chiefly symptomatic or palliative during the later stages. When the disease has lasted only a short time, it may sometimes be retarded or arrested by friction, galvanism, and muscular exercises. Arsenic and phosphorus are among the best remedial agents; cod-liver oil is preferable to either.

Neuralgia is rare in children, but the practitioner should be aware of its occasional occurrence. I have met with a few cases of facial neuralgia in young children, apparently independent of gastric disturbance. One, a most severe case, in a girl nine years of age, which yielded to good food and quinine. I am assured by the mother that her child, four years of age, suffered from paroxysms of severe pain in the right leg and heel, which medical men thought was neuralgic. Genuine neuralgic, or one-sided headache (supraorbital neuralgia) is equally rare in children; but it is occasionally met with in anæmic subjects if badly fed or overworked at school.† Neuralgia sometimes attacks the intercostal nerves, producing pleurodynia, or the brachial plexus, causing brachial neuralgia. Attacks of pain over the cardiac region in delicate children are often of neuralgic origin.

CHAPTER XLVIII.

RHEUMATISM.

Definition—Symptoms—Occasional high temperature—Pathology—Causes—Prognosis and consequences. TREATMENT: *Importance of rest—Free purgation at the early stages—Sedatives to relieve pain—Alkalies, when to be employed—Salicin and its compounds—Their action in reducing temperature and shortening the seizure—Efficacy of the cold bath in hyperpyrexia—Lotions—Small blisters to the joints—Bark—Preparations of iron—Cod-liver oil and warm clothing in the convalescent stage.*

GOUT: *Its occasional occurrence in children.*

ACUTE rheumatism is a most painful disease which attacks the larger and smaller joints, but especially the former; it is accompanied with fever, and is prone to involve the fibro-serous struc-

* Gowers, op. cit., p. 40. † Headaches, by W. H. Day, M.D., 3d edit., p. 306.

tures of the heart and pericardium. Rheumatism is not so frequent in childhood as in youth and adult life.* The youngest child I have seen with rheumatic fever was nearly six years old. Vogel has met with a case in a child one year and nine months old, who succumbed to disease of the heart after three months.† It closely resembles the acute rheumatism of adults, but it is usually less severe and protracted. It is essentially a disease of the joints and of the heart, the structure of its lining membranes being, as Mr. Hilton points out, like that of a joint,—fibro-serous.

Symptoms.—These begin not unlike a common cold, with pain in the back and limbs, followed by shivering and feverishness. After the lapse of a day or two, or it may be a week, one or more of the larger joints become swollen and painful, the surface is hot and inflamed, and the tenderness so great that the least movement of the bed will aggravate the suffering. The pain in some cases is most erratic, it may begin in the side, and the next day attack the knees, ankles, shoulders, or fingers; one day it may be confined to the feet or knees, and the next day it may seize nearly all the joints, lingering for an uncertain time in one or more; and the child suffers from restlessness and sleeplessness, or delirium at night. It should be borne in mind that delirium in the course of rheumatic fever is usually the consequence of exhaustion, and if the pulse is at all unsteady, and the skin freely sweating, stimulants may be needed. There is loss of appetite and thirst; the neck is so stiff in some cases from implication of the cervical muscles, that the child cannot bear the head elevated to swallow food, the slightest movement increasing the torture. Even inspiration is painful if the pectoral muscles are implicated.

The temperature varies from 101° to 103°, or more, and there are few diseases in which it may run so high. Dr. H. Weber has recorded an interesting case where the temperature reached 108.2°, with delirium, and other brain symptoms, in a lad 16 years of age. The patient recovered under cold baths and cold affusion.‡ The pulse is full and soft; at times hard and bounding, from 100 to 120; the tongue is coated with a thick white fur, the bowels

* "Of the ages of patients affected with acute rheumatism, out of 159 cases admitted into the London Hospital, two were between 5–10, nineteen between 10–15, seventy-seven between 15–25, forty-three between 25–35, twelve between 35–45, and six between 45–55."—*Report of the Medical Registrar for* 1876, by G. E. Herman, M.R.C.P.

† Diseases of Children, 1874, p. 232.

‡ Clin. Trans., 1872, p. 136.

are costive, and the skin is bathed in perspiration of a sour and sickly smelling character, which brings no relief to the pain and suffering. Everything about the body of the patient is acid, the saliva is acid, the sweat from all parts of the body is acid, and even the breath has an acid odor. The urine is high-colored, intensely acid, and scanty. On standing in a deep vessel for a short time it throws down a copious pink deposit of urate of ammonia. The chlorides are deficient. It is occasionally albuminous both in adults and children. This arises from congestion and renal irritation, due to the rheumatic poison, or perhaps the high temperature; just in the same way as it often occurs in some other acute diseases marked by pyrexia, as scarlatina, measles, and bronchitis. It must not be inferred in such cases that the kidneys are really unsound. The high specific gravity is a proof of temporary congestion, caused by the increased work thrown upon the kidneys.

As regards the *pathology* of the disease, it appears to depend on an excess of lactic acid in the blood. Dr. Balthazar Foster has recorded several cases where the symptoms of acute rheumatism were produced by lactic acid, given for the treatment of diabetes.* If blood be drawn from a vein it is found to be both buffed and cupped, the fibrin being in excess.

The date when improvement commences is uncertain. It may commence in a few days after the disease has begun, and the duration of it is certainly shorter than it is in adults, but it may be delayed longer, and last from a month to six weeks. The symptoms that indicate the decline of the disorder are an abatement of the pain, calm sleep at night, and a free and copious discharge of urine, which throws down a deposit of lithates.

Relapses are common; a little boy, aged eight years, was admitted on five separate occasions into the Samaritan Hospital with acute articular rheumatism, and an aggravation of mitral mischief consequent on the first attack.

In many cases the heart becomes involved during the progress of the articular inflammation, and the younger the patient the more likely is this to occur. The symptoms which indicate this serious complication are not always obvious. The cardiac affection may steal on imperceptibly, and be overlooked till the joint affection subsides, and there is an abatement of the pain. A

* Brit. Med. Journal, Dec. 23, 1871.

moderate degree of febrile disturbance, and a slight affection of the joints, afford no guarantee that the heart will not become implicated in the course of the rheumatic affection; indeed, it may be the first organ seized upon in these young subjects, before there is any pain or swelling in the joints. So much is this the case, that the heart affection may be the first symptom to raise suspicion of the nature of the malady, and it is, therefore, wise in all cases of obscure febrile attacks in young children, to auscultate the heart carefully and frequently lest the disease be overlooked. But, as a rule, if endocarditis or pericarditis is about to happen, there will be restlessness, or even convulsions, dyspnœa, pain in the cardiac region, oppression, and inability to lie on the left side.* In other cases, bronchitis, pneumonia, or pleurisy supervene, and even inflammation of the brain.

Causes.—The disease generally follows exposure to cold and wet in delicate constitutions, especially if there is insufficient clothing. A previous attack renders a child susceptible to a return. The rheumatic diathesis, too, is very marked in some families. "Of twelve children of a mother who had suffered from acute rheumatism and heart complication, eleven had the disease before they were 20 years of age.† This is probably as remarkable a record as could be found in the history of the disease. Acute rheumatism sometimes follows scarlatina.

Prognosis and Consequences.—If the disease is confined to the joints, and the urine throws down a copious lateritious sediment, with an abundance of uric acid, the case is favorable; but if the articular inflammation suddenly becomes less, and inflammation is lighted up in the heart or brain, then the prognosis is less favorable. The disease rarely terminates fatally, if uncomplicated, but is apt to lead to valvular disease of the heart (especially mitral mischief), to be followed by a chronic form of the complaint. As relapses are very common in rheumatic fever, the treatment should not be abandoned too soon. Injudicious feeding, and especially overindulgence in animal food, frequently invite a return. The younger the patient the greater the liability to heart affection.

Treatment.—The most absolute rest should be maintained, for any movement not only amounts to torture, but relapse is less likely to ensue when patients are kept long enough in bed, and on

* See Pericarditis in Chap. XLI, p. 532, On Diseases of the Heart.

† Steiner's Diseases of Children, by Lawson Tait, 1874, p. 336.

a liquid diet. "Extreme repose is worth all the other means of relief put together."* So that the earlier the child suffering from the disease comes under treatment the shorter is the probable duration of the complaint. The sheets to be removed, and the patient clothed in flannel, whilst the diet should be a fluid one, consisting of milk, light broths, and arrowroot.

The chief object at the beginning of treatment, is to encourage a free action of the skin and kidneys, to unload the bowels by a freely acting purge, in order to drain the mucous membrane effectually. For this purpose a dose of calomel, followed by an aperient mixture (Form. 8–41), or compound jalap powder, or compound liquorice powder (Ger.), will be necessary. So long as there is high sthenic action, the bowels must be kept open; yet, active purging necessarily involves movement. The necessity for purging is often very obvious, whilst its disadvantages are equally so, and therefore it becomes a difficult question in practice to decide whether the patient should be purged or not. If there are pink lithates in the urine, a copious supply of potash is needed. If there is severe pain, opium, or some preparation of it, as Dover's powder, ought to be given freely to relieve it; either alone, or with alkalies in large doses.† For the relief of thirst, barley-water flavored with lemon, seltzer-water, toast and water, or plain water are indicated.

There is much to recommend the view that, when the urine is alkaline, the heart is generally safe. The late Dr. Fuller said, "In no single instance has a patient of mine been attacked with endocarditis or pericarditis after the urine has shown an alkaline reaction."‡ This may be effected in the space of twenty-four hours, if large doses are given at intervals of three hours during that

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* On the Treatment of Acute Rheumatism, by T. K. Chambers, M.D., The Lancet, vol. ii, p. 199, 1862.

† Formula 85:

℞. Pulv ipecac. co., ... grs. iij.—M.

To be taken in a little water-arrowroot and repeated when necessary.

Formula 86:

℞. Potass. bicarb., ... ℥ij
Potass. nitrat, ... ℈ij
Tinct. opii, ... ♏xvj
Syr. limonum, ... ℥ss.
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful every three or four hours. For a child six years of age.

‡ On Gout, Rheumatism, Rheumatic Gout, and Sciatica, The Lancet, vol. ii, 1862.

time. Alkalies appear to possess the power of keeping the fibrin in a soluble condition, and so preventing its deposition on the valves of the heart, whilst they tend at the same time to purify the blood by increasing the action of the kidneys. According to Dr. Richardson, carbonate of ammonia possesses this power of maintaining a fluid condition of the blood in a greater degree, and although it has not the same influence over the rheumatic affection as potash, it may sometimes be combined with it advantageously when there is depression.* Antimony acts in a similar manner, and likewise controls the force of the circulation. "Still, there are a certain number of instances where true rheumatic inflam mation is very obstinate, and does not yield to the alkaline method. And in these you will find the periosteum and perichondrium affected. When, then, after five or six days the patient is no better, or but little better, I add iodide of potassium to the potash, and in a few days more continue it alone during the convalescence. And, of course, if I am enabled to make out this condition of periosteum at the first visit, I begin such treatment straightway."†

During the last few years the introduction of salicin and its compounds into practice has found some warm advocates. These preparations possess the power of reducing the high temperature of acute rheumatism, and the pyrexia of some other diseases. Salicin, salicylic acid, and salicylate of soda, have a very decided effect in shortening the duration of the pain and fever, and in reducing the percentage of heart disease; but of all the three remedies employed, the last is perhaps the best.‡

Salicin was first introduced by Dr. Maclagan, of Dundee. He recommends that it be given in large doses, twenty to thirty grains every two hours for an adult till the pain abates. Of course smaller doses will be required for children. "We are indebted to

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* "When fibrin is as yet in solution in the blood, it is the easiest matter in the world to keep it fluid; the addition of a very small quantity of alkali, say two parts of alkali to a thousand of blood, is sufficient for this purpose. But, when fibrin has separated, its resolution is a difficult matter."—*On Fibrinous Deposition in the Heart*, 1862, p. 40.

† On the Treatment of Acute Rheumatism, by T. K. Chambers, M.D., The Lancet, vol. ii, p. 200, 1862.

‡ Of 89 cases of acute rheumatism, treated by salicin and its compounds in the London Hospital, in 1876, the average stay in the hospital was 36.1 days, and those treated otherwise 41.8 days. The symptoms yielded sooner under the first mode of treatment; the duration of the pain and pyrexia was shorter, and there was a less liability to heart disease. Relapses, however, were rather more common.

C. W. Brown, late House Physician at the Boston City Hospital, for the most valuable and extensive investigation into the action of salicylic acid on rheumatic fever. He records 160 cases, taken indifferently, the patients being of each sex, and of all ages between 13 and 61. The drug gave considerable relief from pain on an average in 1.46 days, and complete relief in 2.8 days. The average time of treatment was 6 days, and the average number of days in hospital was 18 days."*

All authorities agree that salicylic acid has a remarkable effect in reducing the temperature of rheumatic fever. This it does effectually and rapidly, but relapses, as vomiting, vertigo, profuse sweating, and collapse do sometimes attend its employment, and, therefore, it is well to be prepared for these symptoms. Dr. Whipham, of St. George's Hospital, and Mr. Poole Collyns, resident Medical officer at the Atkinson Morley Hospital, Wimbledon, treated at the latter institution twelve cases of acute rheumatism with salicin, salicylic acid, and its salts, with a view of arresting the disease at its onset. In some of the cases the disease yielded after a few doses, and in others the pains were relieved in a few days. In two of the cases, attended by a pericardial friction-sound, the symptoms passed away in four days after commencing the treatment.† Dr. Greenhow considers that salicin and salicylate of soda do not prevent complications arising in the course of rheumatic fever, which are equally frequent during this treatment; the patient is neither better nor worse, nor is he disabled for a longer or shorter time after it. Anæmia appears to follow the salicylate of soda treatment, and health and strength are slowly regained. The pain and distress of the patients are lessened by both these agents, but the duration of the illness is not shortened. Dr. Greenhow expresses his conviction that the weakening of the first sound of the heart indicates an influence upon the muscular structure of that organ. He prefers blisters in the vicinity of the painful joints as affording speedy relief, and not producing so much subsequent debility.‡

In the selection of salicin, salicylic acid, and its salts, some difference of opinion prevails amongst medical men, as to which is the

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* Handbook of Therapeutics, by S. Ringer, M.D., 8th edit., p 597.

† On the Effect of Salicin, Salicylic Acid, and its Salts, in the early manifestations of Rheumatism, St. George's Hosp. Rep., 1874–76, p. 173.

‡ Clin. Soc., vol. xiii, p. 244–262.

best of these remedies. Salicin is more soluble than salicylic acid, it is less likely to cause sickness, and is not so unpleasant to the palate; it may be given with a little syrup and aromatic water.* Salicylic acid may be combined with the liquor ammoniæ acetatis,† or the bicarbonate of potash.‡ Salicylate of soda may be given in plain water, with a little simple syrup.§ It is now generally admitted that the last is the best form of administration, owing to its solubility and the rapid manner in which it is absorbed. Respecting the use of salicylate of soda, Dr. Cavafy says: "With regard to dose and mode of administration, I am convinced that the best plan is to thoroughly saturate the patient with the remedy at the commencement, and then to gradually diminish the dose and lengthen the interval after a distinct result has been produced. Relapses are best avoided by continuing the drug in small doses during convalescence, in just sufficient quantity to cause the urine to give a violet tint with perchloride of iron."‖ Dr. S. J. Sharkey says "that the presence of albumen in the urine does not contraindicate the exhibition of salicylate of soda,"¶ and Dr. Theodore Ackland "observes that of five cases of acute rheu-

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* Formula 87:

℞. Salicin, ... ℈ij
Syr. aurant., ... ℥ss.
Aquam cinnamomi ad . . . . . ℥iv.—M.

A dessertspoonful to be taken every four hours. For children six years of age.

† Formula 88:

℞. Liq. amm. acet., ... ℥ss.
Acid salicylic, ... ℈ij
Syr. aurant., ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

‡ Formula 89:

℞. Potass. bicarb.
Acid. salicylic, āā . . . . . ℈ij
Syrupi, ... ℥iij
Aquam anethi ad . . . . . ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

§ Formula 90:

℞. Sodæ salicylat., ... ℈ij
Syrupi, ... ℥iij
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

‖ Rheumatism treated by Salicylate of Soda, St. George's Hosp. Reports, 1874–76, p. 199.

¶ St. Thomas's Hosp. Reports, 1877, p. 81.

matism with albuminuria, the albumen disappeared in each case while the drug was being administered."* Nervous symptoms, in the form of headache, deafness, singing in the ears, and occasional delirium, as well as nausea and vomiting, have been observed to follow the use of these remedies. It is also worthy of especial notice that their exhibition does not prevent the occurrence of heart complication, and that the liability to relapse is considerable.

When pericarditis supervenes in the course of rheumatism, and acute pain is referred to the cardiac region, no time should be lost in applying three or four leeches, if the patient has a hard pulse, and is strong enough to bear depletion. Heaviness of manner, heat of skin, and any degree of pulmonary congestion, with a dry cough and quick breathing, are among the indications for their employment. Moreover, the pain in the chest alone sufficiently justifies the practice, for its continuance further excites the action of the heart, and aggravates the serous inflammation already begun, by accelerating the circulation, and permitting that extra motion to the walls and valves of the heart which, in the progress of pericarditis or endocarditis, are so much in need of rest. Generally, I believe, a mustard poultice, or repeated linseed poultices, will supply the place of leeches; still they are useful in the cases I have pointed out. Opium, or hydrate of chloral, must be resorted to whilst pain and sleeplessness are leading symptoms. Opium, especially, soothes the nervous system, controls the hurried circulation, and reduces the frequency of the pulse.

In cases where the temperature suddenly rises very high, and death threatens from delirium and exhaustion, no remedy is so likely to save life as the cold bath. It has been employed, with the best results, by Dr. Wilson Fox, and some others in cases of hyperpyrexia in acute rheumatism, when the thermometer registered 107°, 108°, 109°, and in one instance, recovery took place after the temperature had reached 110°.

These cases were complicated with endocarditis, pericarditis, rigidity of the muscles, delirium, and coma. Dr. Fox put his patient with a temperature of 110°, into a bath of 96°, and reduced it gradually by adding lumps of ice, and pouring iced water over the patient rapidly. The average temperature of the

* St. Thomas's Hosp. Reports, p. 402.

bath was 66°. In this remarkable case, the patient, a female aged 49, took each day for two days, eighteen ounces of brandy in the twenty-four hours, sixteen ounces of beef tea, four pints of milk, and seven eggs.* It seems that we possess a remedial agent in the cold bath of extreme value, when venesection, salicin, and large doses of quinine, have signally failed. When a child has this very high temperature, and life is despaired of through the failure of other remedies, I should unhesitatingly have recourse to it.

Local applications are of great value in relieving pain. The affected joints should be swathed in cotton-wool, and then covered with oil silk, a plan which conduces to the repose of the parts and to the comfort of the patient. A piece of linen rag saturated in a solution of bicarbonate of potash and laudanum may be had recourse to if the pain is severe and the joint hot. The solution must be warm, and cotton-wool afterwards applied to the joint.

The plan of blistering the joints, as recommended by Dr. Herbert Davies, is an excellent one, and, speaking from my own experience, I should say that nothing relieves the pain more effectually than the application of strong blistering fluid to the affected part. After the application, the joint should be protected with cotton-wool as just described. The discomfort caused by the blistering soon passes off.

As soon as the more acute symptoms begin to subside, bark should be given, and if the urine is still high-colored, potash should be added to it.† When the alkaline treatment is changed for the tonic, the ammonio-citrate of iron with the bicarbonate of potash is very useful,‡ and later on the syrup of the iodide of iron may

* On Hyperpyrexia, by Wilson Fox, M.D., 1871.

† Formula 91:

℞. Potass. bicarb., ... ℥j
Tinct. cinch. co., ... ℥ij
Syr. zingib., ... ℥iij
Aquam ad . . . . . ℨiv.—M.

A dessertspoonful three times a day. For children from eight to twelve years of age.

‡ Formula 92:

℞. Potass. bicarb., ... ℥j.
Ferri et amm. citr., ... gr. xx
Syr. aurant., ... ℥iij
Aquam cinnamomi ad . . . . . ℨiv.—M.

A dessertspoonful three times a day. For children from eight to twelve years of age.

be substituted with advantage. Cod-liver oil, too, is a valuable remedy to children of a strumous diathesis.

Too much care cannot be exercised in restricting the use of animal food, for fear of increasing the lactic acid in the blood, and either fostering the disorder, or bringing on a relapse, as I have already noticed; hence the propriety of giving suitable food sparingly, and of a non-nitrogenous character. Dr. James Andrew has written an interesting paper on the subject.* An abundance of milk, together with vegetable and farinaceous food, such as gruel, arrowroot, rice, and tapioca pudding, are the safest kinds of nourishment till every relic of the disorder has disappeared. When the complaint has vanished, white fish, chicken, sweetbread, etc., should be taken in preference to the stronger forms of animal food.

The whole question of rheumatic fever is beset with difficulties, owing to the opposite opinions that prevail as regards the best mode of treating it, and the complications that may spring up in its course. It behooves us to provide against the latter difficulty by attacking the inflammation of internal organs vigorously, and without loss of time, by subduing pain, and therefore preventing exhaustion, and above all to enforce such rules of living as shall modify that state of constitution favorable to the development of lactic acid in the blood, which favors the disease, promotes its relapse, and encourages its continuance.

We may repeat that it is well to make the alkaline and chalybeate treatment overlap. Thus the bicarbonate of potash may be continued some time after the acute symptoms have passed away, combining it with the ammonio-citrate of iron.

During convalescence we cannot overestimate the importance of maintaining the warmth of the patient by suitable clothing, and by guarding against cold.

Gout.—Although gout does not occur, as a rule, before the age of puberty, it has been met with in young children. "Sir C. Scudamore was assured by a gentleman whose mother labored under this malady, that he was atttacked in the great toe at eight years of age, and medical friends have informed me of cases having occurred at a still earlier period of life. For my own part I con-

* On the Treatment of Rheumatic Fever by a Non-nitrogenous Diet, St. Bartholomew's Hospital Reports, vol. x, p. 359.

fess I have not seen a case of true gout, that is, an articular affection implicating the great toe, in patients much under the age of twenty."* Trousseau calls attention to the fact of an asthmatic Moldavian boy, aged five, having a characteristic fit of the gout in the big toe, and that it was the only instance he had ever seen at such an early age.† We find urine laden with urates, scalding and excoriating the external parts in young children, where fond and foolish parents give them too much meat, under the impression that this will make them strong.

CHAPTER XLIX.

RICKETS OR RACHITIS.

Nature and Definition—Physical and constitutional manifestations—State of the cranium—Changes in the thoracic walls and long bones—Delayed dentition—Impairment of digestive functions—Character of the urine—State of the intellect. CAUSES AND COMPLICATIONS: *Congenital history—Period of commencement—Influence of damp and cold—Association with general debility, bronchitis, cerebral exhaustion, laryngismus and hydrocephalus—Its relation to constitutional syphilis—Parental manifestations.* DIAGNOSIS: *From tuberculosis—Scrofula—Syphilis—Hydrocephalus.* MORBID ANATOMY: *Deficiency of earthy salts in the bones, which are soft and light—Increase of fat and watery elements.* TERMINATION: *In recovery, or death from disease of the lung—Spasm of the glottis—Convulsions.* TREATMENT: *Importance of milk and fresh air—Cold douche to the head and belladonna to allay sweating—Hypophosphite of lime biscuits—Iron—Quinine—Arsenic—Cod-liver oil the chief remedy—Sea-air and sea-bathing.*

RICKETS is a constitutional malady manifested by depraved nutrition, and an alteration in the shape and composition of the bones. It is "the most common, the most important, and in its effects, the most fatal of diseases which exclusively affect children" (Jenner).

"Rickets," according to Holmes Coote, "though not unknown to the ancients, seems to have been scarcely recognized in Northern Europe till the beginning of the seventeenth century, when it spread over England and other European countries."‡

We find on the authority of Whistler, Glisson, Bate, and others, that when the disease first appeared in the western parts of

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* Gout and Rheumatic Gout, by A. B. Garrod, M.D., 1859, p. 256.

† See Chapter XXIV, p. 397, On Asthma.

‡ St. Bartholomew's Hospital Reports, vol. v, p. 125.

England, at the period just alluded to, it was called the English malady.* A term still retained in Germany, at least in the lecture-room, at the present day.

In England, Holland, and some districts of France, it is now one of the commonest diseases of children. It is occasionally met with among the rich, and those who are reared in luxury, but it occurs more frequently among the poor, and is best studied in hospital practice. It may be witnessed among strumous and tubercular children, but whether this is accidental, or whether rachitis holds any direct relation to these diatheses, or is a special diathesis, is a matter not yet settled. Opinions are divided on the question. Certainly we often see rickets occur independently of struma or tubercle. It is not, strictly speaking, a disease of the osseous system, but one of malnutrition, and it belongs to an unhealthy state of the constitution. "Rickets differs from scrofulous affections in this respect, that while frequently associated with inflammatory conditions it is not essentially an inflammation."†

Rickets is a non-febrile malady, and sufferers from it have a bodily temperature according to some authorities a little below the normal. In twenty cases under my care, I found the morning and evening temperature so nearly normal that the difference was not worth notice. The features which indicate the affection are now very well recognized, owing to the clinical researches of Kolliker, Virchow, Jenner,‡ Gee,§ Volkmann, Rokitansky, Holmes Coote, and other authorities. There is, in the first place, always more or less cachexia, the child never looking thoroughly healthy. The head in some cases is markedly deformed, and looks unusually large; but this is to some extent deceptive, because the face is so shrunken and imperfectly developed that it makes the upper part of the head look larger than it really is. In seventeen cases of rickets, the average age being 4.72, the average circumference of the heads was 21.22. In an equal number of non-rachitic children, with an average age of 6.05, the average circumference was 19.95.‖ The bones of the face grow more rapidly in children than the bones of the cranium; on the other hand, in overgrown men

* Dictionary of Medicine, vol. iii, 1858, p. 643.

† Jones and Sieveking's Pathological Anatomy, by Payne, 1875, p. 845.

‡ Medical Times and Gazette, 1860.

§ On Rickets, St. Bartholomew's Hospital Reports, vol. iv, 1868.

‖ Discussion on Rickets, Pathological Society, The Lancet, 1880, vol. ii, p. 1017.

or giants, the skull appears small and the forehead low, because the bones of the face, like those of the limbs, have increased out of all proportion to those of the cranium. In rickets, nutrition and growth are checked, hence the face is small.* The sutures are depressed, and feel open when the hand is passed along them; the fontanelles remain unclosed, often to the middle of the second year. The bones of the cranium become abnormally thickened, and the whole skull appears flattened at the vertex, and also at the sides, so as to lose its vaulted form and become boxlike. The head is also long and broad, and the width between the eyes is increased. The size of the cranium is therefore large, the sutures remain open, and the parietal and frontal bones are largely developed. Between the ill-developed cranium and the equally ill-nourished brain, there is often fluid, simply filling up the space, and not the result of any inflammatory effusion. Hence this condition has been termed "*spurious hydrocephalus.*" In rachitis the cranium is frequently unsymmetrical, a matter worth attending to in diagnosis.

The next characteristic feature of rachitis is found in the osseous walls of the thorax. Owing to the softness of the ribs (for the imperfect ossification of certain bones is a pathological feature of this disease) they yield to the external pressure of the atmosphere during inspiration, and hence become flattened laterally and bent inwards; a transverse constriction is often seen at the level of the junction of the sternum and ensiform cartilage, due to the great difficulty of thoroughly filling the lowest part of the lungs with air. "A second cause is the outward pressure on the lower ribs, caused by enlargement of the liver and spleen, often present in these cases; and a third (which seems rather theoretically probable than absolutely proved) is the inward traction upon the cartilaginous extremities of the ribs by the attachments of the diaphragm. The result is a constriction of the chest, much as though a string had been tied round it below the heart, whilst its apex is distended. Except in very severe cases, this deformity of the chest may be expected to be effaced as the child recovers from the constitutional taint."†

In a rickety child, under my care in 1874, aged 11 years, with

* See Mr. Shaw's Observations on Lateral Curvature and Rickets, Holmes's System of Surgery, vol. v, second edit., p. 871.

† Surgical Treatment of Children's Diseases, by T. Holmes, 1868, p. 343.

congenital hypertrophy of the heart and mitral disease, the whole left side of the sternum was rounded and elevated, and extremely convex, whilst the thorax generally, from the amount of emphysema present, was very barrel-shaped and prominent. In a rickety boy, aged nine, under my care in 1878, with mitral regurgitation and hypertrophy after rheumatic fever, the cardiac region was also very rounded and elevated, but, as in the former case, there was a considerable depression or groove running backwards longitudinally from the sternum below the nipples—a groove arising not so much from deficiency of air entering the chest, as from the softening of the bones and their tendency to fall inwards. The common changes are a lateral flattening of the chest, and a prominence of the sternum—in many cases, instead of being nearly circular as in health, it becomes triangular, and the patient presents the well-known appearance of "pigeon breast." This condition is alluded to under chronic enlargement of the tonsils.*

From the weight of the body the bones of the extremities yield, and the ligaments, bearing an unequal strain, cause the articulations to become distorted, and hence we meet with weakened joints and bow-legs; the femur and the tibia are bent forward, the arch of the foot is destroyed, while the outlet of the pelvis is narrowed. The limbs become so weak that a child of four or five years of age may not be able to walk, and if it can, it will fall down on meeting with any obstacle in its way. The bones too, from being soft, readily fracture from slight blows.†

The ribs and long bones undergo enlargement, and become soft, spongy, and light, whilst the parietal and temporal bones also become thick and spongy, and the vertebral column often yields and becomes curved. The gravest result of the osseous lesions of rickets lies in the ill-development of the pelvis, the cavity of which may be simply narrow from malnutrition of its bony walls, or absolutely deformed, from the softened bones falling in and narrowing the brim. Hence follows in after-life a frequent cause of difficult labor in women; and even in the male, the extraction of large calculi during lithotomy may be impeded by rachitic deformity of the pelvis. In the case of a boy, aged three years, under

* See Chap. XIII, p. 159.

† The incomplete or "green-stick" fractures frequent in rickety children are well known to the surgeon. They usually involve the radius and the ulna, but are not rare in other long bones.

my care, both clavicles stood out at a sharp-pointed angle in the centre, as though they had been fractured and badly united. The lower ribs were nodulated where they joined their cartilages, and pressed out in a fanlike shape from the enlarged viscera beneath; the upper part of the chest was narrow and contracted, the axillary and infraclavicular regions shrinking in, the spine was curved, the scapulæ were deformed, and the joints of the larger articulations so loose that they could be twisted in any direction without difficulty.

But the most pathognomonic symptom is the "row of beads" along the junction of the ribs with their cartilages, caused by slight enlargement of the ends of the ribs; this has been termed "the rachitic garland." Dr. Hilton Fagge states that "the enlargement is often much more marked on the pleural side than towards the surface."* The articular parts of the bones of the extremities enlarge, causing a "double-jointed" appearance very conspicuous at the wrists, due to the enlargement of the epiphyses.

Rickety children are short and of stunted stature. This would appear to depend on an arrest in the growth of the bones; dentition is delayed and irregular, the teeth not appearing in some cases till the fifteenth or twentieth month. In a case under my care in 1874, a child, said to have been three years old, had no appearance of a tooth. In a case of well-marked rickets in a boy, "the first tooth did not appear till he was four years old."† The teeth are small, black, ragged, and pointed, they decay early and soon fall out.

The constitutional symptoms are very marked. The children are pallid, with prominent veins; they shrink and fall away, and become thin. There are thirst, accelerated pulse, and flushing of the face at night, with broken sleep in all aggravated cases. Fretfulness and irritability are common. Some children almost cry when looked at, and are very timid and alarmed when approached. Such cases are sometimes followed by squinting, defective vision, and hesitation in speech, which gradually disappear as the general condition improves. Headache after exertion, or inability to take food, is a common and persisting symptom. The child yawns and

* Discussion on Rickets, Pathological Society, Nov., 1880.

† Steiner's Diseases of Children, by Lawson Tait, 1874, p. 222.

sighs repeatedly in the daytime, puts his hand to his head as if to remove something, and then closes his eyes and falls off to sleep with one or both eyes half open, for a few minutes, easily waking up again from any noise or disturbance, and uttering a distressing cry. If toys are offered to appease him, he angrily tosses them on one side, and refuses to be friendly with those who have shown him uniform kindness. These symptoms may of course be seen in cerebral exhaustion from other causes, and they are probably rather more common in true hydrocephalus than in rickets.

Should an eruptive illness, as scarlet fever or measles, supervene, the rachitic condition becomes aggravated.

The abdomen is usually large* and distended. The Germans call it *Froschbauch* (Frogbelly), which accurately describes the appearance; the liver may be felt projecting sharply below the ribs, and the spleen is often very large. The lymphatic glands may sometimes be felt enlarged and indurated in the neck, groins, and axilla. Children in some cases have a sallow, greenish, or chlorotic tint. This was very noticeable in a little girl I saw, who was suffering from tubercular disease in the lung at the same time.

The head becomes unusually large, and perspires remarkably; beadlike drops may be seen standing on the face, whilst the trunk and limbs are hot; the veins are prominent over the temples and forehead, and sometimes in the neck and thorax. Occasionally the carotid arteries pulsate strongly, and the heart's action is irritable and excited; but these symptoms are absent in some cases marked by great deformity, while found at other times in less-pronounced cases. The child kicks off the clothes at night, and exposes his limbs. These are among the earliest symptoms.

The appetite is capricious, and there is oppression and uneasiness after food. The motions are like those observed in some forms of diarrhœa (*lientery*), being curdy and whitish; because the food

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* "The abdomen is very large, and often appears enormously distended when compared with the narrow and distorted chest. This enlargement of the belly is due to depression of the diaphragm and diminished capacity of the thorax, which force down the liver and spleen below the level of the ribs, to increased shallowness of the pelvis, to the flabby condition of the abdominal muscles favoring the accumulation of flatus generated by the digestive derangement, and in some cases to actual increase in size of the liver and spleen."—*Wasting Diseases of Children,* by Eustace Smith, M.D., 2d edit., p. 113.

passes through the bowels partly unchanged, the digestive functions having exerted little influence upon it.

According to Frerichs, both the liver and spleen, in some cases of rickets, are affected with amyloid degeneration.*

Dr. Dickinson regards the swelling of the abdominal organs as much a part of rickets as the changes in the bones, and he believes the two to be closely analogous. The spleen, liver, and lymphatic glands become enlarged, the spleen most, the mesenteric glands least so. "There is no new growth or deposit, only an irregular development of the proper tissues of the organs. . . . The earthy salts would seem to be diminished in the viscera as in the bones."†

The urine may contain phosphates and urates, but it is usually clear and pale, even when the appetite is most morbid. When there is diarrhœa the motions are green, slimy, and offensive, or deficient in bile; and it is in these cases with chronic dyspepsia that the urinary secretion is most affected. In twelve consecutive cases of rickets admitted under my care at the Samaritan Hospital, I found the urine of acid reaction in all; five contained urate, and in three of these the deposit was very copious; two contained phosphates, and the remaining specimens were clear and normal. The highest specific gravity was 1030, the lowest 1020. "The phosphates are more abundant than in health, and a considerable sediment of oxalate of lime is not unfrequent; and it has been observed that urinary calculi are frequent in rachitic children." (Copland.) My colleague, Mr. Alban Doran, in 1877, removed an oxalate of lime calculus from the bladder of a rickety girl, who was admitted into the Samaritan Hospital under my care with symptoms of vesical irritation.‡ Large quantities of uric acid crystals have also been noticed (Hilton Fagge).

The swollen joints and distorted limbs are very painful. The little patient screams even when lifted up gently, which is probably due to tenderness of the periosteum, where morbid changes are going on; it is subject to slight muscular spasms, clenching its hands tightly, and prefers to sit and lie about instead of joining in the play of its companions. These spasms may be taken for slight convulsions from cerebral disease, especially if there be malformation of the skull, which has been erroneously attributed to true hydrocephalus.

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* Diseases of the Liver, New Syd. Soc., 1861, vol. ii, p. 175.

† Discussion on Rickets, Pathological Society, The Lancet, 1880, vol ii, p. 938.

‡ See Chap. XXIV, p. 264, On Diseases of the Urinary Organs.

As regards the state of the intellect, rickety children are generally dull and stupid, and in some cases there is an approach to idiocy; there is lethargy in all their movements and actions, and they do not exhibit the precocity of the tuberculous. Their powers of memory are defective, and they have a difficulty in acquiring knowledge; even when the desire is great they fail under the strain, and headache, restless nights, and exhaustion are common manifestations of the constitutional taint. When precocity of intellect is shown (which I think very rare), the explanation offered is, that the open sutures allow the brain to expand, and its circulation and development proceed more rapidly than when the cranial bones have been unyielding; but this does not seem to me a satisfactory solution, for when the head is disproportionately large, my experience is in favor of a tardy and not a precocious development of the mental faculties.

Causes.—Parents from constitutional infirmity, excesses of all kinds, and living in crowded and unhealthy localities, impart a general debility to their offspring, which favors the development of scrofulous disease, and in a less degree, of rickets. Early marriages of the artisan classes, and long hours of labor passed in overcrowded and badly-ventilated workrooms, are powerful factors in provoking the disorder; for, in addition to the physical exhaustion of the parents, there is also a mental disquietude which has a similarly exciting tendency in the development of rickets. When, as too frequently happens, the children of such parents are not properly fed, or a farinaceous diet takes the place of the maternal milk, or they are prematurely weaned and neglected, then rickets is invited. Rickets is intimately associated with bad feeding and faulty assimilation. According to Mr. Hutchinson, it is a diet disease, defective food being probably the main cause. In 92 per cent. of Dr. Baxter's cases farinaceous food of one kind or another had been given before the age of twelve months.* "Whatever external or extrinsic circumstances are favorable to the formation of watery blood (hydræmia) in a child, seem favorable to the development of rickets."†

Though rickets is a disease peculiar to infancy and very early life, there is evidence to prove that it is sometimes congenital. From constitutional vice of the parents it may show itself in the

* Discussion on Rickets, Pathological Society, the Lancet, 1880, vol. ii, p. 1017.

† Rickets, by Dr. Aitken, Reynolds's System of Medicine, vol. i, p. 801.

offspring, and cases are recorded where it has attacked the fœtus in utero.* But the evidence is not very confirmatory of such a fact. Hilton Fagge and Dr. Baxter are of opinion that an infant is never born with so-called "fetal rickets."† Rickets would appear to be most common up to the second year. It is rare after the period of the first dentition in healthy children. "Rickets," says Holmes Coote,‡ "commences at the time of life when the growth of bone is most active, namely, in many about the first or second year." According to Guerin, "in 346 cases the disease commenced 98 times in the first year, 176 times in the second year, 35 times in the third year, 19 times in the fourth year, 10 times in the fifth year, twice in the sixth year, extending to the twelfth." He mentions that in three instances it was congenital. Mr. Stanley reckons the most frequent period from the eighteenth to the twenty-fourth month.§ It is common in damp and cold climates, where children are not enough in the open air, and hence it may be that the disease is of greater frequency in northern than in southern latitudes.

There is often a hereditary history of phthisis and brain disease. Three children out of five in one family I heard of were all rickety, and died of mesenteric disease and convulsions. One case came under my own notice, a boy who was a twin, aged five years, was admitted under my care at the Samaritan Hospital, in June, 1877, with a deformed chest and loose joints. I received the following history: His mother was delicate, and there was phthisis on the father's side of the family. The child had a convulsion during delayed dentition; since then he had been losing flesh, and was weak, irritable, and spiteful. His appetite was ravenous, and he was never satisfied with the food given him. He brought up a great deal of blood, and though the evening temperature reached 102.6° and the pulse 140, no organic change could be detected. After a few days he began to whoop, but the temperature gradually fell to normal, and the cough subsided; the belly was large, the teeth black and decayed, and there was ulceration of the gums. He left the hospital much relieved.

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* "Rachitis is sometimes developed in the fœtus whilst yet in its mother's womb, even when her health does not appear changed. The museums of pathological anatomy contain several skeletons of those children rachitic from birth."—M. Bouchut, *On Diseases of Infants and Children*, 1855; translated by Peter Hinckes Bird, F.R.C.S.

† Op. cit., p. 1018.

‡ Loc. cit., p. 128.

§ Diseases of Bones.

Whatever reduces the general strength, or interferes with digestion and assimilation, may induce rickets. "Thus it is particularly remarked among the children of the poor, who are weaned early, and who are before the proper age placed at the family table to be fed with soups, broths, vegetables, meats, etc." (Bouchut.)

The rickety condition is associated with general debility, and is often complicated with bronchitis, pneumonia, whooping cough, the eruptive fevers, tubercular disease of the thorax or abdomen, laryngismus, and hydrocephalus. Any of these disorders have an unfavorable effect upon the progress of the malady, for whatever reduces the general strength and weakens the constitution is certain to retard recovery when favorable symptoms have commenced.

Vogel believes that constitutional syphilis in the parent may cause rickets in children, and he is also under the impression, which I think cannot be altogether denied, that rickets is sometimes hereditary. "In these cases the father and mother usually display the peculiarly shaped rachitic head, with its boldly projecting tuberosities of the frontal and parietal bones."* Of 100 cases of cranio-tabes collected by Drs. Barlow and Lees, 70 showed a marked degree and 30 a slight degree of the affection. There were proofs of syphilis in 47 instances, 35 of these being among the well-marked cases of cranio-tabes. The authors came to the conclusion that syphilis was the largest factor in the production of cranio-tabes. It would seem that the connection between cranio-tabes and rickets is very close, and that both affections may originate in syphilis.† M. Parrot believes syphilis to be a cause of rickets.

The *diagnosis* of this disorder is not difficult. The diathesis of rickets may be confounded with that of tuberculosis and syphilis, yet their local distinctive characters are clear, and can hardly be mistaken when carefully compared with one another. The general symptoms are different, the progress of the disorder is different, and the changes in the bones are absolutely pathognomonic; but since tubercular and syphilitic children may become rickety through a want of vital power to carry on healthy nutrition, these disorders ought not to preclude the idea of their occasional presence in common. We have already seen that they do occur with rickets, and that the existence of either may induce rachitic

* Vogel, Diseases of Children, 1874, p. 532.

† Pathology of Rickets, Brit. Med. Jour., November 20th, 1880.

changes. I have seen a few instances. Tuberculosis is more hereditary than rickets, but the latter disease is, nevertheless, very often transmitted from parent to offspring. An important point in the diagnosis from hydrocephalus is that the fontanelles are depressed; they do not rise above the level of the rest of the scalp, and the opening is simply due to an arrest in the osseous development. The antero-posterior diameter is longer than in hydrocephalus; whilst in the latter affection the head is wider, and the face smaller. The change in the articulations, the large joints, the beaded ribs, and the alteration in the contour of the thoracic walls, are all distinctive marks of rickets, which show themselves early, and cannot be mistaken for any other disease. "It is strange to see a little child sitting placidly on the bed, without moving for hours together—its legs placed so as to escape pressure, its spine bowed, its head thrown backward, the chief weight of its body cast on its arms; and to know that, notwithstanding the apparent calm, the tiny thing is indeed fighting the battle of life; for it is striving with all the energy it has, to keep in constant action every one of its muscles of inspiration—endeavoring so to supply the mechanical defects of its respiratory apparatus, due to the softening of the ribs. It wants no toys. It is the best of children if you only leave it alone; move it, and you inflict pain upon its tender frame; show it the horse or the doll that was once its delight, and it turns away its head, or stares vacantly; to notice would divert its attention too much from the performance of those respiratory movements which are essential to its existence."*

Morbid Anatomy.—The composition of the bones shows a deficiency of lime salts, and an increase in fat, watery elements, and carbonic acid. The bones are soft, light, and easily bent or broken. They contain a deficiency of earthy salts, because those salts have never been deposited in them; just as in *mollities ossium* the bones are soft, because their earthy salts have been removed by absorption. The lacunæ are enlarged, and there is a great thickening of the periosteum. The malnutrition of the system interferes with the gradual conversion of the deeper layers of the periosteum and articular cartilage into bone; the bone when formed is imperfect, and softer than it should be. The morbid condition of the osseous system brings about visceral changes, especially in the thorax,

* Rickets, by Sir W. Jenner, Bart., Med. Times, 1860, p. 415.

where respiration is so much impeded, but special changes in the internal organs due to rickets have not been very clearly made out. The wrists are the first parts of the body generally to show these changes, the ends of the radius being large and distorted; and then come the sternum and ribs, often irregularly projecting and flattened.

Dr. Goodhart has noticed the blood in many cases of rickets to be deficient in corpuscles in some and in coloring matter in others.*

In mild cases rickets is capable of recovery and cure, the disease being arrested as the general health improves; but there will be no chance of this whilst the first dentition lasts. The softened bones may become firm and consolidated, but the deformity remains for years or through life. Ultimately the distortion of the long bones is in natural course remedied by their concavities filling with osseous buttresses.

If disease of the lungs ensue, and the state of the thoracic walls leads to imperfect expansion of the pulmonary lobules, emphysema or chronic solidification of the lung-tissue may arise, and cause dyspnœa and chronic catarrh, which are apt to slowly wear out the child's strength. Bronchitis, when at all acute or recurrent, is usually fatal to rickety children; the ribs fall in with the increased respiratory efforts required, and the feeble heart cannot overcome the blood stasis in the lungs. In one case under my care, where the constitution was lowered by convulsions and laryngismus, the infant, seven months old, died from spasm of the glottis. Laryngismus stridulus is always associated with rickets. "I have seen acute rickets twice fatal in children affected by constitutional syphilis."†

Treatment.—In attempting to cure, or arrest the disease, the first and most important point is to ascertain the cause in operation which has produced it. If it has appeared during the time when the child is still suckled at the breast, it may be that the mother or the nurse cannot nourish it, and then proper food must be supplied. To speak generally, it may be said that the victims of this disorder should be at once supported by plain and simple food—such food as can be assimilated and easily digested, according to the age and strength of the sufferer. Milk should

* The Lancet, 1881, vol. i, p. 40.

† Steiner's Diseases of Children, by Lawson Tait, p. 311.

enter largely into the diet at all stages. If the child is an infant, and the mother's milk is good, it should be kept at the breast for the full period; if it has been weaned, and is not more than two years old, there is no better form of nutriment than a plentiful supply of good cow's milk. Beef tea, or other animal broths may be given according to the discretion of the physician.

In the south of France it is found that puppies fed on human milk become rickety, and recover when again fed on their mother's milk. It has been proposed to try bitch's milk for the treatment of rickets in the human infant.

Pure bracing air and warm clothing are important, and a seaside residence, when it can be obtained, will improve the general nutrition. When there are no contraindications such children should be out of doors in the daytime. These patients should lie on mattresses instead of soft beds, and the pillow should be so arranged that the head does not sink into it, as this is certain to increase the restlessness and sweating. To arrest the exhausting perspirations, the head may be douched with cold water night and morning, and the body quickly immersed in a tepid bath containing Tidman's sea salt.

The tincture of belladonna is useful in combination with iron to allay sweating.

The hypophosphite of lime biscuits prepared by Van Abbott, Princess Street, London, at the suggestion of Mr. W. Adams, may be given with advantage. Each biscuit contains five grains of the hypophosphite of lime, and one may be taken three times a day.

If the bowels are deranged, and digestion is not satisfactorily proceeding, it will be advisable to correct the disordered state by a few grains of bicarbonate of soda and rhubarb, or sulphate of potash and rhubarb (Form. 84). It is sometimes necessary to give a grain or half a grain of calomel, or two or three grains of gray powder. In this way the slimy or pasty motions will be altered, and the evacuations be rendered more natural and healthy. Some caution is required not to mistake the whitish motions caused by undigested milk for the absence of bile. Mercurials and alteratives, if prescribed, would do an infinity of harm, and we should trust in such cases to giving milk in smaller quantities or with limewater, and such simple remedies as will correct

flatulence and acidity, or we must even suspend the milk altogether for a time, and substitute weak beef tea and barley-water.

If diarrhœa should be troublesome, a drop of laudanum with an alkaline and bismuth mixture will be very useful (Form. 25).

When there is sickness, high-colored urine, and mental irritability, bromide of potassium, with sal volatile and citrate of potash, will be useful followed by quinine in small doses; and later on the citrate of iron and quinine, the ammonio-citrate of iron, the solution of dialyzed iron (liquor ferri dialysati) or the syrup of the phosphate of iron, or Parrish's Chemical Food.

"Steel wine, though it contains very little iron, is extremely useful. I think it one of the very best forms for administering iron to rickety children. A teaspoonful or two of steel with half a grain of quinine, and a drop or two of dilute sulphuric acid, constitutes a capital mixture for such cases. It should be taken just before meals."* I have found this preparation of iron very serviceable when combined with arsenic in the formula recommended by Mr. Erasmus Wilson.† Arsenic promotes appetite and increases the tone of the digestive functions; moreover, according to Ringer, it is of service in chronic dyspepsia and diarrhœa, where the motions contain undigested food.‡

But cod-liver oil is our chief remedy in this disease, and it has taken the place of almost every other. It should be prescribed as early as possible, there being scarcely any complication which prevents its administration. Cough and diarrhœa yield to it, and the secretions improve under its steady continuance. It should be given in milk, orange wine, or orange juice, twice a day, after food. I am satisfied with half an ounce in the course of twenty-four hours, and I never exceed this quantity. Dr. Norman Moore mentions the fact that some beagle pups, fed on dog biscuits, soon after birth were noticed to have their legs bent, their joints en-

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* On Rickets, by Sir W. Jenner, Bart, op. cit., p. 467.

† Formula 93:

R.	Vin. ferri,	℥iss.
	Syr. tolut.,	℥iij
	Liq. fowleri,	℥j
	Aquam ad	℥iv.—M.

A teaspoonful in a tablespoonful of water twice a day after food. For a child from five to ten years of age.

‡ Handbook of Therapeutics, 4th edit., p. 253.

larged, and their ribs beaded, but under cod-liver oil they soon ceased to show any signs of rickets.*

Cough must be treated in accordance with the pulmonary complication that is present. Depressing drugs, like antimony and mercury, are never justifiable for the bronchitis and pneumonia of rickety subjects, but in place of them, ipecacuanha, carbonate of ammonia, citrate of potash, and senega should be given.

If laryngismus should arise (and the association is not uncommon), then iron, cod-liver oil, and bromide of potassium will be useful, and nutritious food and fresh air will be equally important. It is in these cases, especially if the child remains delicate, that sea-air, or even sea-bathing, is so valuable; Yarmouth or Lowestoft in the summer; Clifton, Eastbourne, or the Isle of Wight in the winter may effect a more rapid improvement than any drugs.

In many cases, the inuction of cod-liver oil, olive oil, or neats-foot oil is very useful.

Where the deformity of the joints and bones is great the child should be prevented from walking, and properly adapted splints employed. A bandage, worn around the lower ribs and abdomen, gives great support to the weakened muscles. In the case of female children afflicted with rickets, particular care must be taken to keep them off their feet, until some suitable apparatus has been applied, so as to avoid the characteristic deformity of the pelvis, which would expose them to great dangers should they live to bear children. These deformities consist in a diminution in the antero-posterior diameter, due to the sacrum and lower lumbar vertebræ projecting too far forward, and to a further narrowing of the inlet from the approximation of the acetabula.

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* The Cause and Treatment of Rickets, 1876, p. 32.

CHAPTER L.

SYPHILIS IN CHILDREN.

HEREDITARY SYPHILIS: *Its source—Rarity in the upper classes—Frequency in the lower classes—Quite distinct from acquired syphilis in children—Symptoms—External, well marked and well known—Internal, less constant—Dr. Coupland's remarkable case of hereditary visceral syphilis—Enlargement of the spleen—Later symptoms of hereditary syphilis—Malformed teeth—Interstitial keratitis.* PRIMARY SYPHILIS *through direct infection—Through vaccination.* DIAGNOSIS AND PROGNOSIS. TREATMENT: *Mercury the only reliable remedy—Mercurial inunction—Good feeding important during the administration of mercury—Iodide of potassium.* VAGINAL DISCHARGES *in female children—Diagnosis from gonorrhœa, with which it is so often confounded by parents—Its relation to debility and the strumous diathesis—Treatment.*

ONE of the saddest facts revealed by medical and surgical research is the transmission of syphilis from a parent to an innocent child. However clear may be the origin of the disorder, whatever form the disease may assume in the father or mother, it is now well known that in infancy it appears in a distinct character, differing from what may be termed the adult variety in many points; though it is only of late years that infantile syphilis has been thoroughly investigated.

The manner in which syphilis is transmitted to a child is obvious; and it is now admitted that a syphilitic father may beget an infected fœtus, which infects the mother. Hence healthy women may give birth to syphilitic children, and they may suffer from secondary symptoms, even though they have never had the disease in its primary form. Inoculation of the mother through the fœtus has been experimentally proved by Mr. Savory. But, of course, direct infection from the mother is equally possible, and it is probably the ordinary mode by which an embryo is syphilized.

In constitutional syphilis the child becomes infected through the vitiated blood of the parents, or the semen of the father. The symptoms that ensue are altogether different from those which follow secondary syphilis in the adult.

Hereditary syphilis is very rare in the upper classes, even among the children of men who have been avowedly profligate before marriage, and who admit that they have suffered from syphilis. Careful attention to medical advice, and good feeding help to eradicate the disease, or to destroy its property of transmission.

The disease must be distinguished from the primary form which a child may contract from a diseased nurse, or in vaccination.

Women affected with secondary syphilis are very liable to miscarriage; but some surgeons, defective in gynæcological knowledge, are too apt to attribute abortion to the existence of syphilis. Still, when a child presents signs of the disease, a history of frequent abortions in its mother is significant.

Intrauterine syphilis may, and frequently does, kill the fœtus, or the child may be born alive with symptoms of the disease. But, strange to say, as a rule, the disorder does not manifest itself till nearly a month or six weeks after birth.* At this period the child, previously well nourished, begins to lose flesh and is affected by constant snuffling, due to some morbid change in the mucous membrane of the nasal fossæ. This symptom becomes very troublesome and seldom fails to attract the attention of the child's nurse and mother. The "snuffles" is a name in common use for the complaint. It signifies a kind of coryza, a discharge from the nose of a semi-purulent, or sanguineous nature, which in some cases blocks up the nostrils and prevents the child from sucking. This is a very grave condition. The patient is now found to be covered with a dull red eruption in large patches. The spots are of a coppery hue on the skin, though sometimes bright, resembling roseola. Large leprous patches, inclined to be dry and scaly, may be often seen at the outer and upper parts of the thighs, and ragged ulcers and condylomata extending in males from the base of the scrotum to the anus. There are fissures at the bend of the joints, mucous patches of redness, pemphigus, and even ulcerative ecthyma in some instances where the taint is severe. Large ulcers are sometimes seen on the buttocks and inside of the nostrils in severe cases, and superficial ulceration is often present on the fingers and toes. Ulcers or patches of ulceration often form on the mucous membrane of the mouth and the angles are often fissured. In a few weeks the child becomes thin, its skin appears deeply wrinkled, and of a dirty soot color where not covered by the eruption. The

* Out of 158 cases collected by Diday, 131 children presented symptoms before the end of the second month, 110 had symptoms before the end of six weeks, and 86 before the end of the first month. He concludes: "1. That the greater proportion of outbreaks of constitutional syphilis in newborn children occur before the completion of the first month of their existence. 2. That when the third month is once past there is no longer much probability that any symptoms of this kind will manifest themselves."—*Infantile Syphilis*, p. 102.

color has been said to resemble that of coffee mixed with milk, and this is most apparent in the face and forehead. These children have "the look of little old men."* The hair is scanty, the eyebrows and eyelashes being often absent; the child is affected with "a peculiarly hoarse cry," or a modification of the voice not unlike the changed voice of syphilis in the adult. He is restless and fretful, and cannot obtain sleep, particularly at night, because the pains are then more severe.

Vaccination frequently brings out a specific rash in children congenitally syphilitic, who may not have exhibited before that period any evidence of the taint. A very general rash of characteristic form and hue may show itself as early as the fourth day after the act of vaccination. This at once demonstrates that the taint was not conveyed in the vaccine lymph employed.

An infant in this condition is well known to all medical men who attend out-patient practice at a London hospital. The little sufferer seldom, if ever, fails to exhibit the characteristic external appearances of this disease. The syphilitic affection can readily be distinguished from any other form of marasmus; the snuffling and wasting always predominate at first over symptoms of internal derangement. The disease may be followed, but is not usually preceded, by vomiting or irregular action of the bowels. When, however, syphilis is suspected, but there is no marked rash, mucous tubercles may often be detected around the anus and pudenda, and desquamation of the palmar and plantar cuticle generally exists, or scales like those in psoriasis and lepra peel off the hands and feet. One of the most absolutely pathognomonic evidences of congenital syphilis is a coppery blush extending from the anus to the nates; it is found only during the early months of infantile life.

We have been speaking of the external symptoms of hereditary syphilis. The next question that naturally suggests itself is: what internal lesions occur in this malady? But this question is hard to answer, for visceral symptoms are seldom well marked in these cases. Mr. Holmes, after describing the well-known external signs of hereditary syphilis, remarks: "Finally, certain lesions or degenerations of the principal viscera have been pointed out as peculiar to congenital syphilis; but I cannot say that the evidence on this subject appears to me very conclusive, at any rate,

* Diday, op. cit., p. 86.

these lesions are of little moment in practice, inasmuch as no means exist of recognizing them before death."*

Diday admits the difficulty of recognizing the syphilitic changes. Sometimes the enlarged and indurated liver may be felt through the thin parietes, and peritoneal effusion, anasarca, and other symptoms indicating obstruction to the circulation through the organ have occurred; but neither, according to his experience, nor that of Gubler, whom he quotes, has jaundice in any instance been seen.† A most interesting case, showing to what extent the viscera may be implicated in this disease, even in an infant of three months, has been described by Dr. Coupland.‡ It must be remarked, however, that the sole evidence of syphilis rested on the fact that the child's mother had been five times pregnant; the first born alone surviving. Two children were still-born, once the mother miscarried, but the fifth confinement resulted in the birth of the patient, who "had been to all appearances healthy to within three hours of its death, when it began to suffer from shortness of breath." The visceral lesions were those seen in tertiary forms of syphilis among adults. Large gummata were found in the liver, and a small gummatous nodule was detected in the right lung. The cortical portion of the kidneys and the walls of the heart were infiltrated with small round cells. The singular cardiac complication accounts for the sudden death of the patient.

Dr. Gee observes that the spleen is much enlarged in about one-fourth of the cases of hereditary syphilis, and that sometimes enlargement of the liver and lymphatic glands is superadded.§ Whether the relation will hold generally good may admit of some doubt, because it may possibly arise from the cachectic condition of the system attendant upon the syphilitic infection. Still, there can be no doubt of the frequent association. Wilks and Moxon say: "In syphilis we often meet with hypertrophic enlargement of the spleen."‖

An infant afflicted with hereditary syphilis is remarkably amenable to treatment, the more so because mercury is not liable to act

* System of Surgery, art. Surgical Diseases of Childhood.

† Diday on Infantile Syphilis, New Sydenham Society, 1859, p. 94.

‡ Trans. Path. Soc., vol. xxvii, p. 303.

§ On Enlargement of the Spleen in Hereditary Syphilis, and in some other Diseases of Children, Roy. Med. and Chir. Soc., Lancet, April 13th, 1867.

‖ Pathological Anatomy, by Wilks and Moxon, 1875, p. 475.

prejudicially on very young subjects, on whom it exercises its anti-syphilitic tendencies as well as on the adult. But the mortality among syphilitic children is known to be high. As they grow older, if they survive, several fresh symptoms develop themselves. The milk teeth are brittle, and very prone to caries. The permanent canines and incisors develop very characteristic peculiarities, first pointed out by Mr. Hutchinson. The upper middle incisors are the most characteristic in these cases. They are smaller than usual, wide apart, and their edges are deeply crescentic. When first cut small friable tubercles project from the crescentic borders, but these are soon broken off. Deafness, both from disease of the tympanum and affections of the labyrinth, is frequent among syphilitic children. Another symptom, also first detected by Mr. Hutchinson, is a disease of the cornea, termed "*interstitial keratitis.*" This disorder is almost always accompanied by the characteristic deformity of the teeth. It appears after the fifth year. The cornea becomes uniformly hazy, with a few interspersed whitish dots; it is found to be also singularly vascular. According to Mr. Holmes, iritis is a rare symptom of infantile syphilis.* There are also to be noticed some prominence of the forehead, flattening of the bridge of the nose, linear cicatrices at the angles of the mouth, and the palate presenting the form of the Gothic arch.

Primary chancres occurring on the genitals of children from direct infection through brutal outrage, or early depravity, do not differ from the same sores seen in adults. They are of interest from a medico-legal point of view. Where a sore exists on the genitals at the time of parturition, a child may become infected, but it is exceedingly rare, and the evidence furnished on this point is by no means conclusive.

Infection from the nipples of diseased nurses, produces in childhood the symptoms of primary, followed by secondary syphilis, without the distinguishing features of the hereditary type of the disease.†

Lastly, syphilis may be communicated through vaccination, a

* Surgical Treatment of Children's Diseases, 1878, p. 351.

† In the tenth volume of the Clin. Soc. Trans., will be found a remarkable case recorded by Dr. Dowse. A girl, ten years of age, contracted syphilis from an infant she was nursing, through a slight abrasion on her forearm. The disease was very severe, and proved fatal.

chancre appearing at the point, touched by virus from a syphilitic subject. Of course, this terrible complication suggests great caution in guaranteeing the purity of lymph, as insisted on by Mr. Henry Lee. It must be taken from the vesicles not later than the eighth day, unmixed with blood, or any other secretion. Of the manner in which syphilis is propagated by vaccination, it is recorded "that in a district of Piedmont, in the year 1861, where syphilis, if not unknown, was at any rate so rare that the medical men in the neighborhood had no opportunity of seeing it, forty-six children, of various ages, were simultaneously attacked with well-marked syphilis, proceeding in all the cases which could be properly examined, from chancres in the arms, followed by buboes in the axilla; and that all these children had been vaccinated, directly or indirectly, from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and, further, that these children transmitted the same disease to a number of children, their wet-nurses, mothers, etc., and even to children who nursed and played with them; that the women so infected, in turn infected their husbands; and finally that the disease yielded in all cases to the usual remedies for syphilis."* Several similar cases are recorded.

Diagnosis.—The general history of the case, the "snuffles," the eruption of the skin, and the sallow parchment-like hue of the countenance, distinguish it from all other diseases. There is not much fear of confounding noma pudendi with venereal phagedena, though dishonest parents might falsely give a syphilitic history to the former complaint.

In respect to *prognosis*, many syphilitic children fall into such a bad state of health that they slowly waste and die. When the nose is obstructed by mucus in infants, so that they are unable to suck, the complaint often proves fatal. Then, too, if a child is attacked with an inflammatory or eruptive disease, or even a mild form of diarrhœa, it is prone to succumb from exhaustion.

Treatment.—Mercury is an invaluable remedy in congenital syphilis, and without it there is no probability of eradicating the disease. It should be employed in every case, and if there be any doubt in diagnosis it should not even then be withheld. Every night and morning a grain or two of the Hyd. c. Creta should be

* Surgical Treatment of Children's Diseases, by T. Holmes, 1868, p. 353.

given, to which a little Pulv. Cretæ Arom. c. Opio must be added, if the bowels are inclined to be loose; or what is preferable, the Pulv. Ipecac. co. Children during the time they are under a mercurial course ought to be well fed, otherwise the prejudicial effects of mercury upon nutrition are apt to be manifested.

The tincture of bark and small doses of the perchloride of mercury form a good combination when there is considerable debility and cachexia. Mercurial inunction has some very warm advocates, and among them the late Sir B. Brodie, who contended that mercury, internally administered, seldom cured the patient, whilst externally applied, he had never known it to fail. It simply consists in smearing about a drachm of the Ung. Hydrargyri on a piece of flannel every night, and applying it round the thighs or arms for the usual period of treatment, viz., six weeks. The child must be well washed before every fresh inunction, otherwise troublesome rashes are liable to appear at the seat of application.*

Iodide of potassium is seldom necessary, for most cases are readily and thoroughly cured by mercurials, still that salt has been used with excellent effect. This drug has cured obstinate ulcers about the tongue and fauces in children affected with hereditary syphilis. In "interstitial keratitis" the use of iodide of potassium is advisable. When the syphilitic taint has disappeared, and debility is the chief symptom to contend with, the syrup of the iodide of iron is an excellent remedy. Cod-liver oil is sometimes of great service, given in small doses, with milk and lime-water.

When the nostrils are obstructed, they may be syringed out with warm water twice a day, and in some cases a mild astringent lotion is useful; but the influence of mercury is generally sufficient, and is most to be relied upon.

For the ulcerations that form on the body and about the anus, zinc ointment, a lotion of carbolic acid (1 in 50), or the black wash will be found useful. Of greater service still is an application composed of oxide of zinc and starch, with a fourth part of calomel.

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* "A late discussion in the Lyons Medical Society disclosed the fact that the following opinions were held by members: 1. Healthy children can be procreated by diseased parents in the intervals of syphilitic recrudescence. 2. The syphilitic mother should always be made to suckle her child. 3. Mercurial treatment of the mother during pregnancy may give rise to an abortion, apart from the constitutional disease. Mercurial treatment at such times is best conducted by the process of inunction."—*The American Practitioner*, Feb. 1880, p. 115.

The diet should consist of a liberal allowance of milk, and the child should have free access to pure air.

Up to the period of the second dentition, conditions of anæmia in the subjects of congenital syphilis are not improved by iron, unless it be combined with mercury.

Vaginal discharges of a muco-purulent character are frequently observed in female children who are delicate, and of a strumous habit. The complaint occurs during dentition, from intestinal irritation, ascarides in the rectum, and after scarlatina and other fevers. These discharges are almost invariably attributed by parents to some specific taint, and they sometimes imagine the child has been brutally treated. The symptoms are much less severe than in gonorrhœa. The complaint occurs in children of a few months old, though it is more often observed in those of six or seven years of age. The disease is obstinate in character, and may persist in spite of cleanliness and the most careful treatment.

The *symptoms* are redness of the vulva, and the lower part of the vagina, as may be seen on separating the labia. A thick muco-purulent discharge issues from the vagina, and the source of the disease is higher up than is generally imagined. Sometimes there is no local discomfort, but if the discharge has been of any considerable duration, then the parts are sore and there is pain during micturition.

The *treatment* best adapted to cure the complaint is to well foment the parts, night and morning, with warm water. When there is much local irritation and redness it should be continued till relief follows. Sitting the child for a few minutes in a hip-bath before going to bed is soothing and comfortable. After this a lead lotion should be applied twice or three times a day. The child should not be permitted to run about till a piece of cotton wool, well spread out, has been laid between the labia, so that the contiguous sides do not approximate. The discharge is then soaked up by the wool instead of trickling around the perinæum and adjoining parts, which increases the irritation. When the inflammation has subsided, an astringent injection of alum and zinc may be employed, and if the disease should prove rebellious to treatment, a nitrate of silver lotion may be substituted, and tonics, cod-liver oil, and sea-air will be advisable.

CHAPTER LI.

ANÆMIA.

DEFINITION OF—DIVISION INTO. 1. ACTIVE ANÆMIA: *Symptoms—Causes—Treatment.* 2. CHRONIC ANÆMIA: *Causes—General and physical signs—"Humming-top sound," how produced—Effect of pressure with the stethoscope in increasing or diminishing the intensity of arterial and venous murmurs—Case in illustration—Death sometimes results from deterioration of the blood alone, without any organic change—In some cases there is fatty degeneration of the heart.* TREATMENT: *Importance of rest if the heart is feeble—Preparation of iron, especially the ammonio-citrate of iron—Syrup of hypophosphite of iron—Iron lozenges—Belladonna—Schwalbach water—Change of air.* IDIOPATHIC ANÆMIA: *Enlargement of the cervical lymphatic glands.* LYMPHADENOMA (*Hodgkin's disease—Adénie Trousseau—Anœmia lymphatica*): *Leucocythemia.*

THE composition of the blood is perpetually undergoing alterations, due to differences in the nature and quality of the food that is consumed, and to the changes that ensue in the functions of assimilation and digestion. Liable, then, as this fluid is to alteration, it may abound or be deficient in one or more of its elements. There may be an excess of blood (*hyperæmia*) or a deficiency of blood (*anæmia*). It is with the latter condition that we have now to deal.

Anæmia or spanæmia may be defined as a state of the system arising. 1. From deficiency of the volume of blood itself. 2. From a deficiency of the red corpuscles in the blood. Other solid constituents of the circulating fluid may be also more or less deficient, and the proportion of water increased. This morbid state occurs sufficiently often among children to justify special notice. It may be termed "*simple anæmia*" or bloodlessness, there being in other respects no actual disease.

Anæmia may be divided into. 1. *Active or acute anæmia*, where the volume of the blood is lessened. 2. *Chronic anæmia*, where the red and white corpuscles are deficient, as well as the solid constituents of the blood in general.

1. Acute anæmia is the condition which results from violent epistaxis, or when severe hæmorrhage occurs from wounds, ulcers, mucous membranes, or internal organs; or it supervenes in the course of an acute disease.

2. Chronic anæmia comes on more gradually from insufficient food and starvation. We have examples of special forms of the

affection where the blood is deteriorated from long-standing debility, general exhaustion, fevers, albuminuria, tuberculosis, etc.

The symptoms of the *acute* form are those of syncope, the weakened heart being insufficiently stimulated to action by the diminished quantity of blood pressing through its cavities. There is extreme pallor of the face, feeble or suspended respiration, cold clammy skin, and a small feeble pulse. After a time the patient may show signs of rallying, and the features assume a brighter look; the skin becomes warmer, the pulse returns, he stares about as if in bewilderment, and sighs deeply, or is sick. If he attempt to walk before reaction is re-established the faintness returns, and in grave cases where the hæmorrhage has been profuse, the face becomes paler and more ghastly, the extremities are cold, and the pulse cannot be felt. The patient is incessantly restless, tossing about in bed from one side to the other, unable to swallow, and incapable of being roused. Convulsions ensue, followed by coma and death if the loss of blood continue. After death, in these cases, the cavities of the heart are found empty, and the lungs and internal viscera are pale.

The *treatment* consists in placing the patient in a recumbent posture, with the head low, as in the management of syncope; and in endeavoring to restore the warmth of the surface by friction, and the internal use of stimulants, such as wine, brandy, or ammonia, if the patient can swallow. A mustard poultice applied over the cardiac region and to the calves of the legs will be sometimes necessary. To moderate nervous excitement, and to subdue restlessness and delirium, opium may be needed, either in one full dose or in smaller doses, repeated according to the discretion of the practitioner. Where the patient is unable to swallow, brandy or beef tea may be thrown into the rectum.

Simple chronic anæmia may result from the acute condition which has preceded it, or it steals on gradually from chronic diarrhœa, scanty food, and a deficiency of light and air. When children are confined to unhealthy dwellings, which abound in London and large towns in general, they often present a striking contrast to those who are reared in the pure air of the country. A condition of chronic anæmia is often observed in children who are naturally delicate, or who, after being reared in the country for the first few years of their lives, are transferred to London or some other large city, and are placed at school in crowded rooms, and in an impure

atmosphere. In this variety of anæmia the blood is also impoverished and deficient in red corpuscles.*

The *general* symptoms, which may have come on in the most gradual and imperceptible manner, are great pallor of the skin, mucous membranes, gums, and conjunctiva. The ruddy complexion of health has departed, and the fine network of capillaries is no longer visible. There is debility, with exhaustion, and a tendency to faint after excitement or slight illness. The heart is agitated, and palpitates on the least exertion or excitement; the impulse is diffused, and appears to strike against the hand very suddenly, whilst the apex beat can often be recognized outside the nipple line; and the aortic valve sound is sharp and abnormally clear. The pulse is small and weak from deficiency of blood, and exertion or fatigue increases its frequency at once; the tongue is extremely pallid, and usually smooth, but in some cases it is slightly furred, flabby, or even œdematous, with indentations along its sides, caused by contact with the teeth. Intercostal neuralgia and pain over the cardiac region are frequently to be observed, as well as a sense of heaviness and weight in the limbs; there is headache, chiefly affecting the forehead and vertex in many cases.† The carotids pulsate strongly, the appetite is imperfect, the bowels are torpid, and the secretions scanty.

When extreme anæmia in children is attended with loss of flesh and symptoms of general cachexia, there are grounds for the suspicion of tubercle, and very often disease of the mesenteric glands, even in the absence of fever and cough. The bloodless condition and waxy tint of these children encourage the idea that some organic lesion has arisen, and what so likely to complicate the anæmia as the tubercular dyscrasia.

Three kinds of murmurs may be heard in anæmia. 1. Cardiac murmurs. 2. Arterial murmurs. 3. Venous murmurs.

The *physical* signs heard over the cardiac region, and the great arteries and veins of the neck, are probably owing to the normal

* Even "in that temperament which when exaggerated becomes anæmic," as Dr. Carpenter remarks in his Principles of Human Physiology, "there is a marked diminution of the corpuscles, the number contained in a cubic centimeter falling from 5,000,000, which is the normal amount, to about 2,000,000." This reduction affects the red corpuscles, for the white corpuscles and fibrin are unaffected whilst the water is increased.

† See Chap. I, On the Headache of Cerebral Anæmia, On Headaches, by W. H. Day, M.D., 3d edit., 1880.

relations being destroyed between the blood and the muscular tissue of the heart; the former being thin and deficient in red corpuscles, and the latter having become flabby and lost its tone. The murmurs heard are "blood sounds," and do not actually owe their existence to any obstruction in the course of the circulation.

The most frequent cardiac murmur is that heard over the pulmonary artery, coincident with the heart's systole. It is soft, of low pitch, and localized over the second and third left intercostal spaces, where the cartilages join the sternum. The artery, at its origin, is superficial, and near the sternum, so that the sound is easily heard when the blood passes through it. A deep inspiration, which fully inflates the lung and elevates the chest-wall, may cause the sound to disappear, but pressure with the stethoscope over the vessel, whilst the patient holds his breath, will increase its intensity. I have seen two or three instances where the lung was retracted in adults, and the murmurs, which were loud, disappeared when the lung was fully inflated on a deep inspiration.

Similar murmurs can be heard over any of the heart's orifices in extreme anæmia in children and delicate persons—in the course of the aorta, and throughout the cardiac area, or even the entire sternum, but they are generally loudest at the base of the heart, and are single, soft, and blowing. This single murmur is readily transmitted through the walls of the heart when its muscular tissue is relaxed, and the blood is impoverished and thin.

The *bruit de soufflet* (bellows murmur) is an endocardial murmur, and is usually considered diagnostic of organic change. When very soft, and occurring even at the apex in anæmic subjects, it may be simply the expression of debility and relaxation of the mitral orifice without any roughing or contraction of the valves guarding the aperture of the heart. Although opinions are not unanimous on the mode of production of this murmur, it accords with my experience that it is sometimes heard in children who are anæmic, and whose blood is so watery that it is readily thrown into vibration as it passes along the vessels. If deterioration in the quality of the blood can lead to arterial and venous murmurs, we are bound to accept this as a reasonable explanation in some cases.

Over the large arteries in the neck, and synchronous with the pulse, another soft, single, intermittent blowing murmur is heard when the stethoscope is applied. These murmurs are common after great losses of blood, but no exact conclusions can be drawn from them alone.

In severe cases of anæmia, where the blood is much changed and attenuated, there may be heard over the jugular veins, just above the clavicles, and especially over the right jugular vein, a continuous hum or "humming-top" sound (*bruit de diable*, as the French call it). According to Dr. Gee, pressure with the stethoscope will produce the murmur in a certain number of cases, but a venous hum in chlorotic persons is independent of pressure, and is due to the anatomical relations of the parts concerned.* "These venous murmurs are seldom absent in well-marked anæmia; nevertheless, anæmia is not to be positively inferred from the mere presence of any one of these murmurs."†

When these symptoms continue for a long time, and the heart is perpetually agitated, some dilatation of its walls is apt to ensue. Among children, the heart's area is frequently increased without murmur, but in long-standing cases the increased impulse, which is sudden and slapping, may eventually lead to hypertrophy, the stroke of the heart after a time becoming longer and heaving. Although this morbid state is not so frequent among males as females about the time of menstruation, it is sometimes met with in boys who are brought up in unhealthy homes, breathe bad air, and are deprived of good food.

The *diagnosis* of blood-murmurs from those due to organic change may be briefly summed up as follows. In the former case, as we have seen, anæmic murmurs are either arterial or venous; they are chiefly heard over the base of the heart, and at the pulmonary orifice; and although we cannot state positively the causes on which they depend, we are probably right in supposing that the very soft character of the murmur precludes any likelihood of a roughened or constricted aperture, which is known to produce a rough, grating, musical, or prolonged murmur over the situation of particular valves. The presence of a diastolic bruit also would indicate valvular disease. When the murmur is soft and blowing, and is diffused over the entire cardiac region, fading

* Auscultation and Percussion, 1877, p. 182.

† The Science and Practice of Medicine, by Dr. Aitken, vol. ii, p. 83, 1872.

in intensity towards the apex, it is due to blood change; when it is localized over one or more of the heart's orifices, and cannot be detected above the third rib, it is presumably due to organic change. Irregular action of the heart, feeble pulse, congestion of the lungs from regurgitation through the mitral orifice, blueness of the fingers, and hypertrophy following rheumatism, also point to organic change.

The following is an excellent example of chronic anæmia of a most severe type, lasting a long time without any real change for better or worse:

G. W—, æt. 9, was admitted into the Samaritan Hospital under my care on October 4th, 1877. He came of a delicate family, and his mother was highly nervous. The house in which he resided was said to be unhealthy. It was very small, and situated immediately above stables. He began to droop two months before admission, complaining of pain, either in his head, chest, or side. The boy presented on his admission a yellowish, waxy pallor, with dark eyelids and bloodless lips, the gums and conjunctiva were very pallid, the pulse was quick and small, the temperature was normal. The heart's area was increased, and the apex beat was below and to the left of the nipple, so that dilatation most probably existed to some extent. A soft murmur was heard over all the orifices of the heart, weakest at the apex, and loudest below the left clavicle. The murmur was not audible at the back. A venous hum in the neck was very distinct. The percussion note was not so clear under the right clavicle as the left, and expiration was longer on both sides than in health, which is by no means uncommon in states of debility. The liver was of full size, but no enlarged glands could be felt through the abdominal walls, nor in the neck.

A mixture containing the ammonio-citrate of iron and Fowler's solution was given three times a day, and eggs and beef tea prescribed as the patient's diet.

On the 30th, without any ascertainable cause, he became very feverish, and between 6 P.M. and 12 P.M. the temperature fluctuated between 102.6° and 104.0°; the pulse reached 134; the skin was burning hot and dry; he complained of pain in his abdomen, was sick, and wandered when he slept; next day the temperature fell to 100.2° and two days later it was normal.

Mr. Alban Doran examined the blood and found it deficient in

red corpuscles, but the white corpuscles were not in excess, nor were they large nor unusually granular.

On the 15th of November it was recorded that the least thing agitated and excited the patient; he became sick without cause, and a full meal sent up his temperature two or three degrees. Fifteen minims of Liquor Ferri Dialyzati were ordered in a tablespoonful of water three times a day.

On the 23d, the report states that his anæmia was extreme, he had a chlorotic tint, the gums, lips, and mucous membrane of the mouth and conjunctiva being absolutely colorless. There was no confusion of ideas, giddiness, or headache. He had a little hacking cough, with some whistling rhonchi over the front of the chest, but no dulness. The temperature had averaged 98.4° during the preceding three weeks. For some days he had been taking half a pint of milk, beef tea, eggs, and two ounces of port wine daily. He was now ordered to take half an ounce of essence of meat three times a day, and the solution of iron to be increased to twenty minims for a dose.

December 21st.—He had improved in strength and general appearance. His friends took him home.

Readmitted February 26th, 1878, feeling ill with severe headache and exhaustion; temperature 103°, pulse 128, respiration 40. The murmurs were louder over the heart and cervical vessels. He had not lost more flesh. Cold sponging was ordered to reduce the febrile condition, and a grain of quinine was given three times a day. In five days, the temperature was normal.

March 4th.—A phosphorus capsule, containing grain 1.30, was ordered daily after the midday meal. Orange juice with milk was also prescribed.

9th.—He took his food better, and the pulse fell to 96, but he had a vitiated appetite, desiring the most indigestible and unwholesome articles of diet. The heart was less tremulous; the apex beat was an inch external to the nipple line (dilatation), and the sounds were the same. There was no enlargement of the spleen, liver, or lymphatic glands. When he remained in bed he was tolerably well, but when he got up and walked about he was ill from the fatigue and excitement. He weighed 3 stone 3 pounds (45 pounds).

Two ounces of cod-liver oil were ordered to be rubbed into his

body daily, and reduced iron and pepsin to be taken in a powder, three times a day.*

A pint of supercarbonated Schwalbach water was ordered daily.

May 14th.—He improved for a few days, and then became worse again—he had been occasionally sick, but the temperature was normal. He had lost four pounds in weight since last report. There was dulness below the left clavicle, and some harsh breathing. The dulness was more perceptible over the left suprascapular ridge; below this and between the inner border of the left scapular and spine the respiration was sniffling and tubular. The appetite was poor, the pulse quick and agitated, the face more angular, and there was cough.

The asthenia was so great, and the child so exhausted, that an attack of diarrhœa or inability to take food might have induced dangerous syncope, and if he escaped this, then the morbid action might have originated tubercular disease. But fatal cases of simple anæmia do occur in which no disease can be found after death. The bloodless condition extends over a period of weeks or months, and no remedy has the least effect in improving its quality. The internal organs are pallid, and in some instances there may be slight effusion into the serous cavities or subcutaneous tissues of the body. "We have now seen several of these cases; the blood resembled pink water, and formed no coagula in the vessels or heart. The latter organ exhibits, in a marked degree, that form of fatty degeneration where the internal surface, especially the left ventricle, presents the peculiar mottling from change in the muscular fibre."†

October 22d —He went to Kingston-on-Thames in June, 1878, and stayed there two months. He had resumed school, and although very pale, there was some return of color in the lips, and he had gained in flesh. The harsh breathing below the left clavicle had departed, but the cardiac and cervical murmurs were the same.

The *treatment of chronic anæmia* will depend upon the cause and the condition of the patient. If the strength is much reduced,

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* Formula 94:

℞. Ferri redacti,
Sacchar. pur.
Pepsinæ porci, āā . . . . . gr. ij.—M.

† Pathological Anatomy, by Wilks and Moxon, 1875, p. 636.

and the heart weakened, we should keep the patient as much as possible in the prone position till he has regained a little strength, and the heart is steadier. If this precaution be not observed, there is the possibility of frequent faintings, and even fatal syncope, if the disease has been of long standing, and the nutrition of the heart has suffered.

Foremost in the list of remedies for the treatment of anæmia are preparations of iron.* They have an astringent, a stimulating, and a tonic action; some are irritating to the mucous membrane of the stomach, causing pain and uneasiness when it is weak, and others are easily soluble, producing no unpleasant effects. It is, therefore, very important to make a careful selection when any salt of iron appears to be indicated. In the anæmia of which we have been speaking, the ammonio-citrate of iron is one of the best remedies. It scarcely ever disagrees, and may be continued for weeks together with the best results. It produces neither pain, constipation, nor sickness, and in my experience, I look upon it as the best blood restorer we possess in simple anæmia. It may be given in syrup and water, with or without a grain of carbonate of ammonia (Form. 95).† This is a good combination where, in addition to the anæmic state, the child is depressed and languid. When there is great debility, characterized by a hæmic murmur over the base of the heart, and the tongue is flabby and indented by the teeth, the tincture of the perchloride of iron with glycerin and water is an excellent tonic (Form. 96).‡ Half a grain, or a

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* "Iron possesses the power of augmenting the number of the blood corpuscles as well as increasing the hæmoglobin. This is perfectly effected, according to Dr. W. R. Gowers, by the chloroxide of iron (dialyzed iron). In the course of five weeks under the use of this remedy the corpuscles increased greatly in number, followed by recovery of the patient, who suffered from pallor, shortness of breath, and giddiness on exertion."—*The Numeration of Blood Corpuscles*, The Practitioner, July, 1878, p. 10.

† Formula 95:

℞. Ferri et amm. citr. . . . . gr. xvj
Amm. carb., ... gr. viij
Syrup, ... ℥iij
Aquam ad . . . . . ℥iv.—M.
A dessertspoonful three times a day.

‡ Formula 96:

℞. Tinct. ferri perchlor, ... ♏xl
Glycerini, ... ℥iij
Aquam cinnamomi ad . . . . . ℥iv.—M.
A dessertspoonful three times a day.

grain of quinine may sometimes be advantageously added to each dose of the mixture.

There are other forms of iron which children take readily enough, and as it is advisable to change the preparation from time to time where the blood remains impoverished long together, we possess valuable remedies in the syrup of phosphate of iron, the syrup of hypophosphite of iron, Parrish's chemical food, steel wine, and the syrup of the iodide of iron. Iron lozenges (*Troch. Ferri Redact.*) will be found useful in some cases after the chief meals of the day. They are tasteless, and the mode of administration is most convenient. One grain of reduced iron is considered by Messrs. Squire to be equivalent to five grains of citrate of iron.*

In those cases of anæmia where children have not lost flesh, but are puffed and flabby, the muscles soft, and the bowels torpid, a mixture containing a few grains of sulphate of magnesia with sulphate of iron, or the solution of the perchloride (Form. 97),† will sometimes rouse the digestive functions, regulate the bowels, increase the appetite, and prove highly beneficial.

Belladonna may be given with the tincture of the perchloride of iron when the action of the heart is quick and fidgety. It is of benefit in two ways, it reduces the frequency of the heart's beats, by which it has time to gain tone, and it probably has the effect of counteracting the constipating effects of the iron (Form. 98).‡

The supercarbonated Schwalbach water is an excellent chaly-

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* Companion to the British Pharmacopœia, 11th edit., 1877, p. 143.

† Formula 97:

℞. Magnes. sulph., ... gr. xvj
Acid. sulph. dil., ... ♏iij
Ferri sulph., ... gr. iv
Vel tinct. ferri perch., ... ♏xl
Syr. zingib., ... ʒij
Aquam carui ad . . . . . ℥iv.—M.

A dessertspoonful three times a day. For children from five to ten years of age.

‡ Formula 98:

℞. Tinct. belladonna
Tinct. ferri perch. āā., ... ♏xl
Spt. chloroform, ... ♏xvj
Glycerini, ... ʒiij
Aquam ad . . . . . ℥iv.—M.

A dessertspoonful three times a day. For children from five or ten years of age.

beate tonic, improving the quality of the blood in these states of anæmia, and exercising a beneficial influence over the digestive and assimilative functions. For hospital purposes, however, it is too expensive.

Pernicious or idiopathic anæmia is a disorder first described by Dr. Addison in 1843. I may refer to it in this place, partly because it is a form of anæmia which relatively speaking is acute, partly on account of cases being recorded among children. Moreover, it has recently occupied much attention. Dr. Addison termed it "*idiopathic anæmia*," Biermer called it "*progressive pernicious anæmia*." Practically it may be described as a disease where anæmia sets in without any appreciable cause, and is unattended by glandular or visceral disease, or even by loss of flesh. It progresses rapidly, and destroys life in from six to twelve months, and is most rapidly fatal in young subjects. It is, however, usually observed in patients past the middle period of life. Dr. Stephen Mackenzie, in an interesting lecture on the subject, describes a case of idiopathic anæmia in a schoolboy, aged 10 years, who died five months after the onset of the symptoms. At first he became white, "like wax," and the pallor rapidly increased, with great perspiration, giddiness, and chilliness. Admitted into hospital two months and a half before death, he was found to have optic neuritis, and a systolic murmur loudest at the apex. His blood contained very pale red corpuscles, some of which were not more than a quarter of the usual size, and of these some were tailed. There was no increase of white blood cells. He died, after several attacks of uncontrollable vomiting, epistaxis, and bleeding from the gums.*

A case of idiopathic anæmia is recorded by Sir William Gull, in which he states his belief that "the line of morbid action seems to be through the nervous system interfering with the functions of digestion, or, more generally speaking, of hæmapoiesis."† I think this view is in a great measure the correct one, looking at the high temperature which is so often noticed in children, the subjects of confirmed anæmia, after food, fatigue, or excitement, changes in the weather, and so forth.

Simple enlargement of the cervical lymphatic glands along with anæmia occurs so often in delicate and strumous children, that

* The Lancet, vol. ii, 1878, pp. 797–833.

† Trans. Path. Soc., vol. xxix, p. 383.

some special notice is needed of its nature. The complaint is exceedingly common in hospital practice. Cold, impaired health, and the irritation arising from the exanthemata, and particularly scarlet fever and diphtheria, excite the lymphatic vessels, and cause the glands to inflame and swell. The hyperplasia is inflammatory, the cell elements and connective tissue being increased. The glands so affected may remain for an indefinite time enlarged and tender; then they gradually shrink, and resolution takes place, if the general health and constitution are good. They sometimes give rise to neither pain nor inconvenience of any sort. They occur to children in fair health, who get an occasional sore throat, the swelling subsiding in the course of a few days. If the child is delicate, and comes of a strumous family, we speak of "scrofulous" enlargement, so common in the out-department of our hospitals. A gland swells, and remains enlarged for some time; then another gland, or, indeed, several glands, become implicated, the morbid process spreading from one to the other, and suppuration occurs in them one by one, till they either ulcerate and discharge a caseous kind of pus, or it may be considered advisable to open them. In either case a puckered and ugly scar remains for life. When the suppurating glands are not opened by the surgeon, it sometimes happens that the matter within becomes absorbed, leaving a hard concretion in the neck. These enlarged glands may be seen sometimes in children who are tuberculous, showing no tendency to suppurate. It is in such cases as these, that the cervical glands remain large, uneven, and irregular in shape, without any tenderness or discoloration of the skin. They are freely movable and non-adherent. The glands usually affected, are the cervical, inguinal, axillary, and mesenteric. In the neck, they are often found inflamed and tender from sore throat, dentition, and catarrh.

The *treatment* varies with the condition of the gland. When the enlarged glands have passed into a chronic and indolent state, they are very obstinate in yielding to any method of treatment. If the source of irritation can be ascertained, it should be, if possible, cured or removed; as eczema of the scalp, decayed teeth, etc. Then we may proceed to deal with the enlarged glands. The application of a weak solution of tincture of iodine night and morning, or slight friction with iodine ointment, are common and useful applications. I greatly prefer the former. When suppuration threatens, a poultice is necessary, and as soon as fluctuation

is detected, a small opening should be made horizontally with a lancet, which will often accelerate the cure, and cause the abscess to contract. But if matter threatens to burrow, the abscess must be laid open freely. The constitutional treatment consists in prescribing good food, syrup of iodide of iron, phosphate of iron, cod-liver oil. Above all, children suffering from these chronic glandular affections should have the benefit of sea-air if it can be obtained.

Lymphadenoma is allied to leukæmia. It may be described as a morbid affection of a scrofulous character, attended with great enlargement of the lymphatic glands, and a peculiar deposit in the Malpighian bodies of the spleen. There is either a new growth or hypertrophy of the normal lymphatic tissue. In a histological point of view it resembles leukæmia, but it differs from it in that there is no excess of white corpuscles in the blood, and from tubercle in having only a slight disposition to undergo the like degenerative changes. But it may ulcerate and become the seat of hæmorrhage, or fatty change, or caseation. Suppuration, which, as we have already seen, is so common in the idiopathic or simple inflammatory enlargement of the cervical glands in young strumous subjects, with which affection lymphadenoma is anatomically allied, does not occur.

The lymphatic glands increase rapidly in size, forming tumors of brainlike consistence, elastic, of a whitish-yellow color, and adherent in masses. The disease involves the lungs, liver, kidneys, stomach, muscles, bones, and subcutaneous tissues, in which a new growth of lymphatic tissue is either infiltrated through them, or deposited as a mass or tumor in the substance of these different organs.

Another characteristic feature of the disease is the effect it sometimes produces on the blood, the red corpuscles being diminished and the white increased, so that in such a case lymphadenoma may be said to produce leucocythemia.

The disease commences gradually in the lymphatic glands about the neck, and after a time it spreads and involves other organs in a similar morbid process. It is associated with failing health and cachexia, and it pursues the same fatal course as malignant growths generally, with which it has a close and intimate connection.

"A case of rapidly fatal lymphadenoma" is described by Dr.

Garlick.* A male child, aged seven, was admitted into the Hospital for Sick Children January 5th, 1878. There was a family history of phthisis and struma. A large mass of glands appeared on the left side of the neck two months and a half before death, with rapid deterioration of health ; at the last there was asthenia, dysphagia, occasional dyspnœa, and diarrhœa, with high temperature. On a post-mortem examination, twenty-five enlarged and vascular cervical glands were seen on the left side of the neck, the tracheal and bronchial glands were enlarged, and there was a large vascular lymphatic gland in the hilus of the kidney ; in the spleen enlargement of the Malpighian bodies from new cell growth in the sheaths of the vessels ; in the liver lymphoid growths, the largest the size of a hemp-seed, the adjacent liver cells in a state of fatty degeneration.

Another case of interest is described by Mr. Macnamara.† "A fair-haired, blue-eyed, intelligent lad" had been admitted into the Stepney Sick Asylum. The general health was good till June, 1878, when rapid enlargement of the right cervical glands commenced. There was a history of hereditary tuberculosis. On admission into hospital the glands on the right side of the neck felt like a firm sarcomatous growth, with here and there soft patches. The glands were also enlarged on the left side. There was neither albuminuria, dropsy, nor leucocytosis. Pleurisy came on soon after admission, and he sank from impeded respiration and effusion into the pleura, five months after the commencement of the symptoms. After death all the lymphatic glands in the body were found to be hypertrophied ; yellowish-gray nodules were found on the surface of the liver, spleen, and base of both lungs. Mr. Macnamara detected remarkable changes in the medulla and periosteum of the bones.

Mr. Alban Doran gives me the following particulars of a case which he closely observed when house-surgeon to Mr. Holden, at St. Bartholomew's Hospital, the subject being a boy, A. P——, aged 11 years. At Christmas, 1872, a tumor began to appear on the right side of the neck, below the lower jaw. It rapidly grew larger. When admitted into the hospital on June 10, 1873, there was a great mass of enlarged glands on the right side, from the chin to the sternum. The whole growth felt lobular, firm under

* Trans. Path. Soc., vol. xxix, p. 355.

† Ibid., vol. xix, p. 360.

the jaw, soft in the middle, and at the lowest part was a fluctuating projection the size of a marble. The skin over the tumor was red, and a week after admission it became adherent to the glands, though when first examined it was quite free. Considerable enlargement of the upper cervical glands on the left side existed. One gland in the right axilla was enlarged. There was impaired resonance and feeble respiration over the front of left lung. No enlargement of the liver could be detected, nor was there any preponderance of white cells in the blood. On applying a trocar to the lowest part of the tumor on the right side of the neck, chocolate-colored fluid escaped, consisting of red corpuscles with numerous white blood-cells. The tumors rapidly increased; for two nights (June 28th and 29th, 1873) he suffered from dyspnœa. Late in July the tumor on the right side ulcerated, and hæmorrhage followed, checked by cold. This tumor at length sloughed away, the patient became extremely emaciated, and died on September 10th.

Post-mortem Examination.—The tumor on the right side was reduced to a flaccid bag of sloughs extending from the zygoma to the clavicle. The tumor on the left side was smaller; the upper portion resembled on section an ordinary enlarged gland; the remainder was softer, very vascular, and deep red. The bronchial glands and one mesenteric gland presented the same appearance, being red and almost pulpy. The spleen was very pulpy, the size of a small orange, and deeply lobulated. The glands in the transverse fissure of the liver were pale and slightly enlarged; the heart, lungs, liver, and kidneys were normal, but the left kidney was indurated by the enlarged spleen, and slightly congested. There was intussusception of about two inches of ileum.

The treatment consisted in the administration of cod-liver oil, and ferruginous tonics. Dr. Gowers relates two cases where the blood-corpuscles in this disease increased 20 per cent. during the administration of phosphorus.*

Leucocythæmia (*leucocytosis—leukæmia of Virchow*)† is occasionally

* The Numeration of Blood-Corpuscles, The Practitioner, 1878.

† As pointed out by Dr. Hughes Bennett and Dr. Parkes, leukæmia ("white blood") is not a good term, because if the blood be drawn from the arm it is red. Leucocythæmia; λευκὸς, white, κυτος, cell; and αἷμα, blood—white-cell blood, expresses the true pathological fact, viz., that the blood abounds in colorless corpuscles. Principles and Practice of Medicine, by J. Hughes Bennett, M.D., 1857, p. 858.

According to Dr. Michael Foster the white cells in lukæmia are in the proportion of one to ten red.

met with in children. It is a peculiar disease of modern discovery, consisting of an increased number of white corpuscles in the blood, and the formation of a new lymphatic tissue in the spleen, lymphatic glands, liver, kidneys, and various other organs of the body.*

"It is probable that the power of the white blood-corpuscles and lymph-corpuscles to form red corpuscles is diminished. Possibly also the white corpuscles may increase by multiplication in the blood."† The disease is unconnected with inflammation, but sometimes associated with tuberculosis, Bright's disease, and cancer. It has been estimated by some writers that the proportion of red and white corpuscles is about the same, the red being arranged in rouleaux, and the white filling up the spaces between them. Many of the white corpuscles are larger, more granular, and contain a single, a double, or a treble nucleus.

The constitutional symptoms of leucocythæmia vary in severity; they are, extreme pallor and cachexia, a blanched conjunctiva, languor on exertion, frequent vomiting, thirst, diarrhœa, or constipation. There is generally enlargement of the spleen, liver, and lymphatic glands. There may be œdema of the lower limbs, or ascites, and owing to the changed state of the blood, epistaxis, and bleeding from the gums sometimes happen. The urine is often loaded with lithates. When the liver is enlarged at an early stage there may be jaundice. Dr. Greenfield describes a case of leucocythæmia in a female child, aged four and a half, which proved fatal. The leading symptoms were extreme pallor, and large bruised-like spots appeared on the limbs. After death, extensive infiltration of leucocytes were found in the liver, kidneys, and heart. In this case, however, there was a distict history of syphilis in the father and mother, with the ordinary hereditary symptoms in the patient herself.‡

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* Next to the spleen, the liver is most commonly found diseased in leucocythæmia. Ibid., p. 873.

† Pathological and Morbid Anatomy, by T. H. Green, M.D., 1871, p. 140.

‡ Trans. Path. Soc., vol. xxix, p. 298.

CHAPTER LII.

DISEASES OF THE EAR.

Frequent in childhood—Peculiarities of the ear in childhood—Catarrhal deafness—Its relation to coryza, tonsillitis, etc.—Evil effects of obstruction of the Eustachian tube—Treatment. OTORRHŒA: *Its causes—Cases illustrating extreme results of suppurative inflammation of tympanum, etc.—Diagnosis simple.* AURAL POLYPI: *Frequency of perforation of membrana tympani—Examination of the ear—Detection of perforation—General and local treatment—Injections—Management of perforation—Artificial membrana tympani.* ECZEMA OF AURICLE. ABSCESS OF MEATUS. *Causes and treatment.*

Two diseases of the organ of hearing are so far more frequent in childhood than any other disorder of the ear that they should be described before all others. These diseases are catarrhal deafness and otorrhœa.

The middle and internal ear is very similar in childhood and in adult life, owing to the early development of its structures. The three little auditory ossicles are almost full grown at birth, so that the stapes of an infant is very little smaller than that of a giant trooper in a Guard regiment.

On the other hand, the outer bony structures of the ear are very different at birth to what they are in youth and in the adult stage. There is absolutely no bony external meatus, but a mere ring of bone in the new-born infant, destined to enlarge externally so as to form that osseous canal. Hence, in very young children the membrana tympani is much nearer the surface than in adults. The plane of that membrane, too, is nearly horizontal, so that it lies almost level with the base of the skull, as may be seen on examining the under surface of a fetal skull.

The membrana tympani cuts off the external meatus from the cavity of the tympanum. This membrane is vascular, and readily conveys inflammation from one side to the other. Hence the frequency of inflammation of the tympanum when its external membrane has inflamed from cold, damp, or some injury on its outer aspect. The tympanic cavity communicates with the pharynx by the Eustachian tube, and is lined by mucous membrane. That canal is opened during every act of swallowing. The sound of air rushing into the tympanic cavities can be recognized as two simultaneous clicks, during the act of swallowing a little water, and this becomes more manifest when the nose is closed. The presence of air on the inner as well as on the outer side of the

membrana tympani is absolutely necessary for the exact transmission of vibrations. It is doubtful whether the air in the tympanum be of the same density as the external atmosphere.*

Frequent attacks of acute coryza, or of sore throat, so common in childhood, cause thickening of the mucous membrane of the Eustachian tube, which thus becomes obstructed. Simultaneous enlargement of the tonsils generally exists, but this complication does not much increase the defect of hearing. The child complains of a heavy feeling in one or both ears, and becomes decidedly deaf. Incipient deafness is often mistaken for dulness of intellect or wilful inattention to the commands of a teacher, and so the poor child is often unfairly ridiculed or punished. From the tubes the inflammation extends to the tympanic cavity. Pain in the ear then becomes frequent, and through exposure to damp, the mild inflammatory stage assumes an acute form, with increase of suffering. The blocking of the Eustachian tube causes great external concavity of the membrana tympani, owing to atmospheric pressure being greater without than within the tympanum. This may permanently damage the membrane.

All these common forms of "*catarrhal deafness*"—whether due to chronic inflammation of the Eustachian tubes, or to chronic or subacute inflammatory processes going on within the tympanum, may come under the notice of the physician. Some of the most necessary curative measures—particularly for inflation of the Eustachian tubes—must be left to the surgeon. But the same general and local measures that are of benefit in tonsillitis and coryza will be required when the mucous membrane of the auditory apparatus is involved. Without them, surgical interference will, at most, insure only temporary improvement. Hence tonics, cod-liver oil, weak astringent applications (as in tonsillitis), and fresh air are imperative.

The most troublesome of all diseases of the ear in childhood is purulent inflammation of the tympanic mucous membrane, with perforation of the membrana tympani and escape of unhealthy pus by the external meatus. Circumscribed suppuration within the tympanum is very rare. An interesting case of acute otitis, terminating in abscess of the tympanum, is related by Dr. Moorhead, in a boy, 15 years of age. It commenced with acute pain in the left ear, the temperature rose to 102°, and the pulse to 120.

* See Keene, On Middle-Ear Deafness, The Lancet, vol. ii, 1878, p. 690.

Hearing was impaired, and the membrana tympani became opaque. Under the use of leeches and antiphlogistic remedies, the pulse and temperature fell to normal. The breath was very fetid, and it soon became evident that pus which had been pent up in the tympanic cavity had found its way through the Eustachian tube into the throat. Three weeks later, the deafness being still extreme, the patient suddenly heard a loud noise in the affected ear, followed by an escape of fetid pus through the Eustachian tube, and the restoration of hearing.*

Otorrhœa must always be regarded with suspicion; it may lead to meningitis, facial paralysis, or other grave affection.†

Otorrhœa often commences as a low form of catarrhal deafness in sickly strumous children. But it also very frequently appears as a local result of great general impairment of health after the exanthemata, particularly scarlatina, and other acute diseases. Field remarks: "The mucous membrane is liable to inflammations, usually of a catarrhal kind, which are analogous with the changes seen in other mucous membranes. The most severe forms are those which are extensions of the inflammations occurring in the mucous membrane of the fauces and pharynx in diphtheria and scarlet fever; these pass along the Eustachian tube, and affecting the tympanum with the same severity they do the throat, often work terrible havoc there; for not only will they fill it with pus and produce perforation, by inflammation and overdistension of the drum-membrane, but frequently the deeper structures are also involved, so that the periosteum becomes injured, and caries or necrosis of the bony walls ensue, producing in many cases an utter destruction of the organ, if not of the individual. The perils of meningitis, phlebitis, abscess of the brain, pyæmia, and the like, are all threatening when this most severe form of disease in the tympanum occurs. We may consider it fortunate sometimes when the cavity becomes blocked with a mass of cheesy material which may become quiescent; though unfortunately remaining as a hidden danger, which at any time may develop into an active centre of infection, and cause a general tuberculosis. This form of disease is most frequently seen in young children, and it often affects both ears at once; when this happens they generally grow up as deaf mutes."‡

* British Medical Journal, vol. ii, 1878, p. 313.

† See Chap. XLII, p. 561, On Meningitis.

‡ Diseases of the Ear, 2d edit., p. 221.

A child of four, admitted into the Samaritan Hospital, in the autumn of 1878, with acute tuberculosis of both lungs, was found to have a discharge from the meatus on both sides, a few days after admission. Noma followed, attacking the integuments behind the ears; and after the patient's death the right petrous bone was found to have become necrosed, both tympanic cavities to be full of pus, and the ossicula quite loose. Not a trace of the membrana tympani could be found on either side. This case illustrates, in a very aggravated form, the etiology and course of otorrhœa. In ordinary cases, the discharge may last for months or years, issuing through a small hole in the membrana tympani; but caries or necrosis of the neighboring bones is fortunately rare.

The constant purulent or muco-purulent discharge from the meatus renders the diagnosis of otorrhœa very simple. The discharge often smells offensively when no disease of the bone exists. A copious secretion from the external meatus alone is so unusual, that a free escape of any morbid fluid from that passage implies, as a rule, perforation of the membrana tympani. This complication, or rather, this constant feature in chronic otorrhœa, is not in itself serious, as the tympanic cavity thereby becomes accessible to injections.

A purulent discharge from the meatus often gives rise to polypoid growths, and according to the author just quoted, "Polypi frequently occur in the middle ear, and are, perhaps, invariably the results of inflammation. Their structure and history vary with the severity of the inflammation, and the parts from which they spring. The most common is the ordinary mucous polypus, of a similar nature to those seen in the nose and uterus. These spring from the mucous surface, and are formed of soft cellular tissue; they contain reduplications of the epithelial surface forming glandlike tubes or sacs. The surface of the growth is covered with ciliated cylinder epithelium, which changes sometimes at its extremity to a mixed or pavement epithelium. More rare are the fibromata developed from the periosteal layer." Aural polypi arise almost invariably from the walls of the tympanic cavity and may easily be removed by Wilde's polypus snare.

The existence of a hole in the membrana tympani in cases of copious discharge is indisputable, from clinical evidence and from the anatomical peculiarities of the tympanum. Matter escapes

through the least-resisting structures in its neighborhood. In the tympanum the Eustachian tube and the membrane are the least-resisting media for the discharge of secretions. But the tube is, in these cases, almost always partially obstructed, and the membrane, on the other hand, is softened by inflammatory changes, so that it first bulges externally, then yields at one point. This perforation may for some time remain very minute, as though a pin had been pushed through the membrane, but it may be so extreme that nothing remains but a crescentic ridge or elevation at the bottom of the external meatus to mark the site of the membrana tympani.

Hinton, speaking of catarrhal inflammation of the meatus, with "more or less profuse semi-purulent discharge," asserts that "so far as I have observed, this condition is a concomitant of a similar affection of the tympanic cavity. Many cases also of apparent catarrh of the meatus are really cases of minute perforation of the membrane."* Von Troltsch, in reference to what he terms chronic suppurative aural catarrh, remarks very positively: "Perforation, or partial destruction of the membrana tympani, is always present in these cases."†

Enlargement of the upper cervical glands is a very general symptom of otorrhœa. More or less deafness always exists, but very irregular in degree, for it may be extreme in a mild attack, whilst it is sometimes but slight after destruction of the greater part of the membrana tympani and loss of the ossicles. It has long been a truism that, if the stapes fall out, inevitable and complete loss of hearing must follow. Still, we must remember that in all things the most experienced men are the most sparing in very positive assertions. And it is well to notice that in this matter Hinton observes: "Whether total deafness necessarily results from loss of the stapes, involving, as it must do, the discharge of the perilymph from the internal ear, is as yet undecided."‡

In chronic otorrhœa, the pain is slight, as a rule, but occasionally it becomes severe, if the discharge be very copious, and unable to escape freely.

Diagnosis.—The muco-purulent discharge is pathognomonic of otorrhœa, but it is necessary to ascertain the amount of mischief

* Holmes's System of Surgery, 2d edit., vol. iii, p. 266.

† Surgical Diseases of the Ear, trans. by J. Hinton, New Syd. Soc., vol. lxii.

‡ Loc. jam. cit., p. 314.

existing in any given case. On inspecting the meatus the discharge prevents any clear view of the deeper parts. So the ear should first be syringed out with lukewarm water, and the meatus cleared by means of a piece of wool twisted on the end of a quill pen. If the membrana tympani be nearly destroyed, the tympanic cavity may then be clearly seen through a speculum, the malleus standing out boldly in relief if it has not fallen out, and the promontory will be covered with bright-red granulations. But more usually, the membrana tympani can be distinguished, vascular in appearance, and showing a small perforation. Yet in many instances the aperture is so minute that it cannot be seen at first. If, whilst the medical attendant looks through the speculum the patient be directed to make a forcible expiration, with his mouth and nose firmly closed, some of the discharge will be seen issuing through the aperture. Under similar circumstances the noise of air rushing through the perforation may be heard when the Eustachian tube is patent, particularly if a tube be placed with one end in the patient's ear and the other in that of the medical attendant, during the inflation of the Eustachian tube. In cases of minute perforations, invisible on first inspection, their presence may be suspected by a pulsating movement in the film of fluid covering the outer side of the membrana tympani.

Treatment.—Although otorrhœa often disappears, after lasting for years, it seldom fails to produce permanent mischief to the sense of hearing, and, besides its offensive character, the results may be serious, or even fatal.* Fortunately, few local diseases are more amenable to general treatment. Cod-liver oil and steel wine, judiciously administered, seldom fail to check the discharge. But this benefit is effected slowly by such drugs, so that it is always necessary to remove daily the morbid accumulation that already fills the meatus. The ear should be syringed out with tepid water several times daily, at the risk of causing occasional faintness, for the disuse of the syringe involves worse results. A little carbolic acid (1 in 40 or 50) should be added to the water when there is fetor. After the syringing, a few drops of a weak astringent solution should be poured into the meatus. Sulphate of zinc (gr. j to v in ℥j of water with ℥j of glycerin) is very efficacious. Acetate of lead is objectionable, as it forms a precipitate

* See an instructive chapter On the Results of Suppurative Inflammation, Field's Diseases of the Ear, 2d edit., p. 136.

in the ear. Alum may be used for a short time, but its effects must be carefully watched, as it irritates the meatus. Strong caustics have been used with great success, but the general physician and surgeon should not attempt to employ them unless he has had unusual clinical experience of ear diseases.

When the discharge is checked the cure of the perforation may be undertaken, but not till then. The edges of the aperture should be touched, through a speculum, with a stick of nitrate of silver. If the membrana tympani be quite or almost completely destroyed, an artificial membrane should be worn. The more simple contrivance of Yearsley—a plug of moistened wool—is often very efficacious. Its application is best performed in the way described by the late Mr. Hinton.

For the cotton-wool I prefer glycerin to water, as it will then retain sufficient moisture not to need changing for four or five days; and in most cases I add to the ounce of glycerin from five to twenty grains of sulphate of zinc. Being rolled up into a small spindle-shaped plug, about half an inch long, it may be introduced either by a pair of forceps or threaded through a narrow silver tube. I think it is best to direct whatever form of artificial membrane is used towards the upper and posterior part of the tympanum, so as to touch, if it be present, the head of the stapes. A little pain is sometimes complained of, but if the attempt succeeds well the patient is immediately conscious of hearing better, and the cotton or disk should then be left *in situ* and the tube or forceps carefully withdrawn. After a little instruction from the surgeon, the patient soon learns to apply it himself, and if care is taken to prevent accumulation of discharge or epidermis, the effect continues indefinitely, and often becomes, even in cases of otherwise extreme deafness, so permanent as to render the discontinuance of the wool possible.

Thus, after careful local and general treatment, otorrhœa may be cured in a few months. It is always likely to recur during childhood and adolescence, and each recurrence must be treated like the original attack. Symptoms of sudden feverishness and headache, denoting the possibility of intracranial inflammation, may come on at any stage, and require prompt surgical assistance. But this grave complication is very rare, considering the great frequency of otorrhœa.

Eczema of the auricle is very common in infancy. It is an un-

sightly affection, and causes great irritation. It is generally associated with eczema capitis, or it may be produced by the irritation of dirt or of coarse soap, or of otorrhœal discharge. The best local treatment consists in the application of equal parts of glycerin and liquor calcis saccharatus. If very obstinate and chronic, a solution of nitrate of silver will prove beneficial. The lotion should be very dilute at first (gr. ij ad ℥j), and gradually increased to gr. x or xx to the fluid ounce. A coating of vaseline protects the sore ear from irritation when the child is taken out of doors. But all these applications are useless when the rash arises from constitutional derangement, unless alteratives be given, and these be followed by tonics.

Abscess, or small pustules in the meatus, cause great suffering and irritation. They arise from constitutional debility, or from the irritation of injections, or the presence of dirty wool in the meatus. The parents of a child should be directed never to plug the ear except when ordered to do so by the medical attendant. They should also be reminded that the meatus must not be washed out with water, and dried with the corner of a towel forced into it. Well-intentioned mothers and nurses often produce earache, inflammation of the meatus, or blocking of that passage by accumulated cerumen, etc., by this mistaken practice. The meatus is naturally meant to be dry, the cerumen constantly falling off in fine powder. If it be moistened the cerumen cannot escape; it accumulates and forms a moist, clammy mass. It ultimately dries, sticking fast in the meatus, so that it can only be removed by syringing.

An abscess in the ear is very painful, and must be treated with warm fomentations, early incision, together with constitutional remedies.

CHAPTER LIII.

DISEASES OF THE SKIN.

ERYTHEMA: *Two forms recognized*—1. *Erythema simplex*—2. *Erythema nodosum*—*Use of tonics and quinine.* CHILBLAINS: *Use of nitrate of silver.* URTICARIA: *Use of quinine and arsenic in recurring chronic attacks.* ROSEOLA: *Some of its forms are only varieties of urticaria*—*Change of air, mild tonics, and sea-bathing are serviceable.* LICHEN: *Value of arsenic in chronic cases.* PSORIASIS: *Use of arsenic in.* ECZEMA *divided into two forms*—1. *Acute*—2. *Chronic*—*Treatment of both forms.* HERPES, *two forms*—1. *Herpes labialis*—2. *Herpes zoster.* ECTHYMA.—IMPETIGO.—LUPUS VULGARIS: *Rarely seen under two years of age.* DISEASES OF THE SCALP: 1. *Alopecia areata, or tinea decalvans*—2. *Tinea tonsurans, or common ringworm*—*Scabies*—*Phthiriasis.*

THE skin is supplied with bloodvessels, nerves, and glands, and it performs a most important part as an exhalant surface. It is the common seat of touch and sensation, and it has direct relation with the internal organs.

The skin is much more susceptible in some persons than it is in others, and readily takes on morbid action. Its diseases are numerous and variable, some being inflammatory, as erythema, erysipelas, urticaria, etc., and others being of a parasitic or contagious nature. Some are local and others are constitutional, each demanding a separate line of treatment. Diseases of the skin are of such frequent occurrence, and they come before the practitioner so constantly in daily practice that he ought to possess a fair knowledge of their pathology, diagnosis, and treatment.

The skin diseases of children should be looked at from a constitutional point of view, except in specific affections. They are mainly due to malnutrition, to errors of diet, to parasites, and to scratching. I propose to discuss only the most common types, leaving the more unusual ones for the specialist to deal with.

Those diseases of the skin in children with which the practitioner most frequently meets, are:

1. Those of the general surface of the body.
2. Those of the scalp.

The chief cutaneous diseases affecting the body are: Erythema, urticaria, roseola, lichen, psoriasis, eczema, lupus vulgaris, and scabies.

Erythema consists in inflammation or hyperæmia of the integument, which disappears on pressure, and of some swelling, arising from the exudation of serum into the subcutaneous cellular tissue.

The inflammation is superficial, and bears in a slight degree a resemblance to erysipelas, though it never leads to destruction of tissue, as in the latter affection. "The following are the chief points which distinguish erythematous inflammation: (1.) Its superficial character. (2.) Its tendency to invade new tissue, but not to return to that previously affected, in which respect it contrasts remarkably with eczema. (3.) Its liability to attack symmetrical parts of the body. (4.) The marked tendency there is to slight cutaneous hæmorrhage in the course of the inflammatory process. (5.) The very slight constitutional disturbance."*

There are only two varieties of erythema deserving notice in a work like the present.

1. *Erythema Simplex* is that which has just been described.

2. *Erythema Nodosum.*—In this peculiar affection oval and red patches, varying from half an inch to two inches in diameter, having their long axes downwards, are seen on the front of the legs in the course of the tibia. They more rarely appear on other parts of the body. These patches are swollen and elevated from puffiness of the cellular tissue beneath, and are very tender on pressure. The patches, which at first are red, gradually become of a purple or dark congestive hue, in fact, passing through the stages of an ordinary bruise. The constitutional symptoms are languor, lassitude, headache, disordered digestion, pain in the limbs, and slight febrile disturbance. In some cases under my care it was distinctly associated with rheumatism, but Dr. Liveing considers the articular pains not unfrequently belong to the disease itself.†

There is a form of erythema due to local causes—*erythema intertrigo*, which arises from the friction of opposed folds of skin, and is very common in fat children. It is seen at the upper parts of the thighs, on their inner aspect, and between the nates. The parts at first become red, and then a serous, or sero-purulent discharge takes place. The treatment consists in the application of a little red lotion, or dusting the part with starch or oxide of zinc powder. "The saliva will often cause erythema around the mouths of children, especially when cold winds prevail. There is also a chronic form of erythema, which is common on the face and about the lips and noses of children. This variety is also

* Diagnosis of Skin Diseases, by R. Liveing, M.D., 1878, p. 53.

† Op. cit., p. 59.

accompanied by cracking, which is very irritable and troublesome."*

Treatment.—In severe cases this consists in rest in bed, with such remedies as correct the general health. Tonics are valuable in erythema nodosum, and quinine has in my experience acted as a specific.

Chilblains consist of a localized erythema of the skin, chiefly affecting the hands and feet, as well as some other parts of the body most distant from the centre of the circulation, as the nose and lobes of the ear. Among children they are common in the winter season of the year when the weather is cold. The first action of cold is to produce a degree of numbness and insensibility of the affected part, a stiffness in motion, and more or less pallor from an impediment to circulation. When reaction is established, itching and tingling are experienced in the part, which soon becomes red, hot, and swollen. An abrupt line marks the limit of the inflammation. After the chilblain has continued a few days, the redness is exchanged for a bluish or livid appearance, in consequence of congestion, dilatation of the capillaries, and slowness of the circulation. A chilblain may, however, reach another stage.

Mr. Erasmus Wilson has described three degrees of severity:

1. The *Erythematous chilblain.*
2. The *Vesicated chilblain.*
3. The *Gangrenous chilblain.*†

1. The *Erythematous chilblain* is that which has just been described.

2. The *vesicated* or broken chilblain may be a consequence of the former variety, or arise from a greater degree of cold. The itching, swelling, and congestion are greater, and the chilblain is of a dusky purplish tint. The cuticle is raised by effusion of serum beneath which forms a vesicle, and, when it bursts, the surface is livid or gray, exposing an ulcerated or sloughing surface. Such chilblains are very tender and painful, the child cannot walk, and if the weather be severe and the health impaired, they may last all the winter.

3. The *Gangrenous Chilblain.*—In this variety the surface of the skin is destroyed by the action of the cold, gangrene follows, and

* Handbook of Skin Diseases, by Dr. Hillier, 1865, p. 41.

† Diseases of the Skin, 1863, p. 314.

a slough separates. Sometimes the constitutional symptoms are severe, there is great prostration of strength, and, according to Mr. Erasmus Wilson, the brain is particularly liable to be affected, and the complaint sometimes to end fatally.

Treatment.—For the ordinary *erythematous chilblain*, a mild stimulating liniment of camphor, ammonia, etc., will sometimes restore the circulation in the affected part, or one composed of soap liniment and tincture of cantharidis. Mr. Erasmus Wilson says: "One of the most useful remedies for the above purpose is a liniment composed of the white and yolk of two eggs, two ounces of spirits of turpentine, and two ounces of distilled vinegar, well shaken together."* I have never found any remedy so uniformly successful as painting the affected parts with a solution of nitrate of silver (gr. x–xx ad ℥j) night and morning, and keeping them warm and protected from the air. The *vesicated* and *ulcerated* chilblains are to be treated according to their inflamed or indolent condition. If inflamed, water dressing will be of service, or a lead lotion; if the sores are torpid, the benzoate of zinc ointment, calamine ointment, or the resin ointment, with or without spirits of turpentine, will be demanded.

Urticaria, or nettlerash, is so called from an appearance of the skin similar to that caused by the sting of the common nettle. Wheals form on the skin, accompanied by burning and stinging, and they rapidly disappear without desquamation. They may be round, oval, or irregular in shape, and pale red or dusky in color. Urticaria often comes on after a meal, accompanied with symptoms of indigestion, weight and pain at the epigastrium, nausea or even vomiting, the eruption lasting a short time, and then disappearing to recur again after taking food. The disease is sometimes very chronic and obstinate. "It is not uncommon for urticaria to occur in the course of other diseases, febrile and nonfebrile. I have seen it during as well as after scarlatina, and occasionally in connection with other exanthemata, and whooping-cough."† The disease may be combined with erythema and prurigo.

Causes.—The disease may arise from the stings of insects or fleas, from mental emotion, or fear, or anger, and from certain articles of diet, as shell-fish, lobsters, pork, mushrooms, cheese, etc. Worms in the intestinal canal are said to produce it.

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* Op. cit., p. 315.

† Handbook of Skin Diseases, by Dr. Hillier, 1865, p. 51.

Treatment.—When the disease is *acute*, and there is gastric disturbance, an emetic is the best remedy, followed by an aperient. The diet should consist of mutton, milk, bread, and fresh vegetables. Citrate of potash, bicarbonate of soda, and the carbonate of ammonia will be useful. In the *chronic* form the diet must be carefully attended to, and the general health looked after. Quinine and arsenic are of use in recurring attacks.

Roseola or rose-rash consists of red spots of eruption, and is frequently seen in infants and young children. It resembles an ordinary inflammation of the skin, a state of hyperæmia in which the capillaries are more or less distended. There is one form called *Roseola annulata* consisting of red rings with healthy skin between them; when seen in infants it is called *Roseola infantilis;* that which accompanies the premonitory fever of variola is called *Roseola variolosa*, and that following vaccination *Roseola vaccinia.* The disease resembles in some instances *measles*, and in others *scarlatina*, but unlike the former affection the spots are not elevated, and it is usually limited to one limb, or to the trunk of the body. It may disappear in a few hours or last several days. It is wanting in the bright scarlet hue of scarlatina. The eruption is generally attended with itching. Many of the so-called roseolas are only varieties of urticaria.

The *causes* which give rise to the affection are disturbance of the digestive organs, especially in hot weather, drinking cold water when the body is heated, dentition, etc.

Treatment.—The digestive organs must be regulated by mild aperients and a simple diet. If the gums are inflamed and tender from the pressure of teeth they should be lanced. Change of air, mild tonics, and sea-bathing are serviceable.

Lichen is recognized by numerous small red papules occurring on any part of the body; but the back of the hands, the neck, and the trunk are the most frequent sites. The affected parts itch intolerably, and at last the papules desquamate and the eruption vanishes.

In *Lichen urticatus* the papules are larger, inflamed, and prominent. They are like the bite of a gnat or bug, and the surface is apt to bleed if there is much scratching. "The disease seems to be peculiar to children, and is remarkable for its obstinacy."*

Treatment.—This consists in the administration of alkalies and

* Wilson, On Diseases of the Skin, 1863, p. 161.

aperients. For the relief of itching, and to soothe irritable parts, lotions of borax and hydrocyanic acid with glycerin; belladonna, and hydrocyanic acid, or bicarbonate of soda and hydrocyanic acid are recommended. When the disease becomes chronic, arsenic should be given for some time.

Psoriasis or lepra is not common before five years of age. It is characterized by small white spots which increase in size and then run together, forming white and scaly patches. These patches are nothing more than layers of epidermis. There are neither vesicles nor pustules. The parts below the patella and elbow are most liable to be attacked, and sometimes the nails. Two forms are described. 1. That unattended with itching. 2. That attended with itching, which is often called *gouty psoriasis*, and rarely met with in children.

The disease is said to be hereditary. It is often seen in delicate and cachectic young persons whose digestion is at fault; and it is exceedingly liable to recur from time to time. Indigestion, constitutional debility, rickets, and tuberculosis are common causes.

Treatment.—Remedies both of an internal and external character are needed. A careful regulation of the diet and attention to the bowels are in all cases demanded. After this arsenic, as in many other chronic diseases of the skin, is useful; it acts as a tonic and alterative. The constitutional effects of the remedy are well known, as quickness of the pulse, heat, and itching of the eyelids, dryness of the throat, and a silvery film on the tongue. Sickness and diarrhœa sometimes ensue, and when any of these effects are produced, the remedy should be discontinued, at least for a time. Arsenic should be given after meals, either in plain water or some bitter infusion, made agreeable by the addition of a little simple syrup. "Children bear arsenic very well, and one minim of Fowler's solution may be given twice or three times a day to a child of from one to two years old, and the dose gradually increased up to three minims. In the case of infants at the breast, small doses of arsenic may be administered to the mother."* As to local treatment this is very important. The scales when abundant should be removed by friction with soft soap and water, after which Dr. Liveing recommends the surface to be dressed with tar oint-

* Notes on the Treatment of Skin Diseases, by R. Liveing, M.D., 1875, p. 61.

ment,* and when the skin becomes dry it should be smeared with grease to keep it soft. "A solution of salicylic acid in alcohol (1 in 16), when rubbed over the psoriasis patch, removes the scales in a few minutes, and then prepares the skin for further treatment."† When the joints are cracked and sore, the application of olive oil will be necessary, the limb being afterwards protected with flannel.

Eczema, which is one of the most common diseases of the skin, may be divided into: 1. Acute. 2. Chronic. The acute variety consists in an eruption of small and slightly elevated vesicles, situated on patches of inflamed skin, and attended with severe smarting and itching. It is not contagious, but in a pustular form, inoculable. The fluid contained in the vesicles becomes opaque and thick, then it is discharged and dries into a superficial yellowish scab. The skin immediately surrounding the affected parts becomes similarly involved, and vesicles form on it to follow the same series of changes. The discharge coming in contact with a scratch or sore may produce the disease.

According to the late Dr. Tilbury Fox, vesicles are not always seen, but their formation shows the "full height of the disease eczema."‡ There is an *erythematous* eczema, a *vesicular* eczema, a *squamous* eczema, and a *pustular* eczema. He says some eczemas are almost entirely local, being caused by local irritants, having scarcely any inflammatory action, and yielding to local remedies. Then there are other cases in which the local mischief is severe; there is a sensation of heat, itching, and burning, the subcutaneous tissue is implicated, and the discharge is copious and irritating to the parts around. "In a third class of cases, occurring in young and lymphatic children, there is very free and early formation of pus, out of proportion to the degree of inflammation, as compared with the last form of eczema, indicating a pyogenic habit of body well marked. There is also free crusting, and often distinct evidence of the scrofulous diathesis in the family history. Now, though these now and then run the one into the other—and there are no hard and fast boundary lines in medicine—yet, on the

* Formula 99:

℞. Picis liquidæ, vel.
Olei rusci, ... ℥ss.
Glycerini amyl., ... ℥ij.—M.

† The American Practitioner, Feb., 1880, p. 115.

‡ Eczema; its Nature and Treatment, 1870, p. 12.

whole, the distinctions are clear, and the terms simplex, rubrum, and impetiginodes, accurately portray these clinical varieties."*

Children who are subject to eczema are generally pale, thin, and imperfectly nourished; the skin is dry and irritable, and the nervous system is wanting in tone. There is also an element of debility about them. In 1872, I had a very obstinate case of subacute bronchitis under my care, associated with chronic eczema, in a child twenty-one months old. The child, who presented a strumous aspect, had all her teeth but two; the lips were thick and bloodless, and the face, back of hands, and the flexures of the joints were covered with an irritating eruption. Under careful medical and hygienic treatment the child eventually recovered, though for some time after, exposure to cold brought on the eruption and renewed the bronchitis. About the same time I saw a delicate boy, aged eight, who had subacute eczema and bronchitis of a tedious character. He was treated carefully for two years, and then made a good recovery.

The treatment of acute eczema consists in the observance of rest and quiet. As articles of diet, milk and water, farinaceous food, eggs, etc., should be prescribed. Stimulating food and spirits should be avoided. In the shape of medicines, sulphate of magnesia, with a few grains of nitrate of potash may be needed (Form. 8). A powder of scammony with calomel, or a little of the latter with the compound liquorice powder may be useful as an active purgative. Cold-water dressings, or the lotio plumbi are the best applications when there is heat and inflammation. They should be changed as often as they become dry. If there is great tingling of the skin, alkaline lotions, or the decoction of poppy-heads may be necessary. It must be borne in mind that ointments are most useful in the scaly, and lotions in the discharging stage. Fluid applications are, however, sometimes difficult of employment in young children, and then, under these circumstances, Dr. R. Liveing recommends that the skin be powdered with equal parts of oxide of zinc and starch, to which a few grains of powdered camphor are added.† In some cases linseed-

* Op. cit., p. 20.

† Formula 100:

℞. Zinci oxyd.,
Pulv. amyli, āā . . . . . ℥ij
Pulv. Camphoræ, ... gr. v.—M.
To form a powder.

meal poultices should be afterwards applied. When the eruption is very irritable, covering the parts affected with benzoated zinc ointment and sleeping in an old linen shirt are advisable. The ung. plumbi applied on rag and kept on by a bandage is very serviceable; it was highly recommended by the late Dr. Tilbury Fox. Calamine and oxide of zinc form a good lotion in acute eczema.* In regard to constitutional remedies, aperients and alkalies may be required whilst the stage of excitement lasts. Later on, the mineral acids, with a bitter, are serviceable (Form. 14–20). Arsenic, too, with or without the vinum ferri, is useful (Form. 93).

Chronic eczema is sometimes a consequence of the acute variety. The skin is roughened and in a state of chronic inflammation, whilst at the bends of the joints there are cracks and fissures with silvery shining crusts upon them. The skin is very irritable and smarting; if the eruption be situated near the vulva or anus, the itching is distressing, and patients cannot prevent scratching themselves when warm in bed at night. The disease may continue for months and years. I have seen a few obstinate cases in young children not exceeding seven years of age, in whom the paternal parents, and their ancestors for two or three generations, were gouty, and some of them had suffered from eczema.

Treatment.—Coffee and stimulants should be avoided, and the diet should be light and nutritious. The bowels should be regulated by gentle aperients, and all sources of irritation, as worms, be removed. Arsenic alone, or in combination with iron, will be found most serviceable (Form. 93). Cod-liver oil, malt extract, etc., may be given to weakly and strumous children. To remove the crusts which collect on the head they should be well moistened with oil, and then a poultice of bread and water applied afterwards. Later on the ung. hyd. cum plumbo, or diluted nitric oxide of mercury ointment with creasote, will be beneficial.

Obstinate and chronic as this disease is, it is generally curable if the treatment adopted be judicious, carried out regularly, and for a

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* Formula 101:

℞. Pulv. calam.,
Zinci oxid., āā . . . . . ℥ij
Liq. calcis, ... ℥ss.
Glycerini, ... ℥ij
Aquæ rosæ ad . . . . . ℥vj.—M.
Fiat lotio.

sufficient length of time. Each stage must be watched carefully, and the treatment varied according as it is inflammatory, vesicular, or squamous; in one stage the skin is too active, in the other it requires to be roused into activity and energy. Constipation, dyspepsia, hepatic disorder, renal inadequacy, and general debility, have all to be considered in carrying out the treatment.

Herpes, or tetter, consists of a cluster of globular vesicles situated on an inflamed base, the contents of which soon change from a clear to a milky fluid, and then dry up, leaving a brown scab. Two kinds are generally described:

1. Herpes labialis.
2. Herpes zoster.

1. *Herpes labialis* is usually seen in catarrh, and in pulmonary affections. It may last two or three weeks, and is unattended with any constitional disorder.

2. *Herpes zoster* is almost unknown in infants at the breast. It is rare under five years of age. It is characterized by the vesicles encircling one-half of the body, and being attended with intense heat and itching, Severe neuralgia sometimes follows after the eruption has healed.

The *treatment* consists in the use of mild aperients, warm baths, and plain diet. Lead lotion, and the ung. zinci benz. are both serviceable for the relief of pain and local irritation.

Ecthyma is a disease in which large pustules form situated on an inflamed portion of the skin. They break and dry into thick scabs, and when they fall off there is ulceration beneath. When this has healed the neighboring skin is of a purplish tint. The disease is seen in strumous and badly nourished children, and it is an occasional sequela of scarlatina and measles. The disease may be *acute* or *chronic*. The acute form of the affection is attended with slight febrile disturbance, headache, loss of appetite, heat, and itching. It may last two or three weeks. Tartar emetic ointment produces a similar eruption. The chronic form is often seen in delicate infants and young children. There is no fever and no pain. The pustules are very large, and successive crops may spring up, and continue for two or three months.

Treatment.—The scabs should be removed by poulticing, or moistening with warm oil. The ulcers should be dressed with lead lotion, or water-dressing if inflamed, and if indolent with the nitric

oxide of mercury ointment, or some similar application. Good food, cod-liver oil, mild aperients, will be needed. The mineral acids and bark, the vinum ferri and arsenic (Form. 93), are also serviceable.

Impetigo.—This disease is more common than that which has just been described (ecthyma). In most cases these are forms of pustular eczema. The disease consists in the appearance of small pustules, which come to maturity in the course of a day or two. They then burst and discharge thick pus, which becomes transformed into a browish-yellow scab. Pus often continues to ooze from under the scab or crust, and when the scab finally separates, a red mark is left.

Impetigo may be seen on the arms, legs, face, or scalp. "When it attacks the face of children it is known as *crusta lactea.*"*

The disease is generally due to debility, and is of frequent occurrence in children. Pediculi of the head by causing irritation may excite it.

Treatment.—The diet should be plain, simple, and nutritious, all stimulants being avoided. Aperients, followed by tonics, as quinine, will be serviceable, and if the disease threatens to become chronic, iodide of potassium with bark will be necessary, and baths to improve the state of the skin. Locally, poultices to remove crusts will be required, and the sores should be dressed with dilute citrine ointment, or the white precipitate ointment.

Lupus vulgaris is a chronic disease of the skin, non-contagious, and, though common in early life, is rarely seen in children under two years of age (Liveing). It usually attacks the face, and more particularly the nose, but it may occur on any part of the body. It begins with small reddish tubercles, which increase in size, and then ulcerate. The disease is associated with the strumous diathesis. It may be mistaken for syphilis, and in older persons it has been confounded with cancer.

Treatment.—This consists primarily in constitutional measures, fresh air, animal food, and a liberal diet, of which milk should form a chief part. In respect to medicines, cod-liver oil is most essential, and iron and arsenic are valuable remedies. The local treatment consists in the application of some caustic, as the acid nitrate of mercury.

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* Hillier, op. cit., p. 163.

Diseases of the scalp may be thus arranged:

1. Alopecia areata, or tinea decalvans.
2. Tinea tonsurans, or common ringworm.

1. *Alopecia areata* is a non-parasitic disease; it consists of an atrophied state of the roots of the hair, which terminates in baldness. The hair first becomes dry, and then it withers and falls off, leaving white and smooth circular patches. The most common site is the scalp.

As to the pathology of the affection, a fungus was formerly believed to be developed within the follicles of the roots of the hair, composed of small, round, oval spores, which form into a layer at the roots of the hair, and then spread to the cuticle. This view is now rejected by the most competent observers.

Treatment.—This is very unsatisfactory; but painting the affected parts with tincture of iodine once or twice a day, or occasionally blistering with the fluid blister of the Pharmacopœia, often brings about a cure. Dr. Hillier recommended rubbing the bald parts with a liniment composed of equal parts of tincture of cantharides and olive oil. Strong carbolic acid is an excellent application.

2. *Tinea Tonsurans* (ringworm of the scalp).—In this disease the roots of the hair become mouldy, and at last break away near the surface of the skin. The hairs are brittle and thickened, readily breaking at the roots, which present a split and ragged appearance. Dry, scaly, and circular patches form, varying from half an inch to three or four inches in diameter. Vesicles are also sometimes seen, and a viscid fluid escapes from the follicles. This disease is contagious, and its origin depends on a fungus with oval or rounded spores

Treatment.—The same as that recommended for the previous disease in an early stage. Later on, if it does not yield, a fairly strong citrine ointment, night and morning, will cure most cases. Carbolic acid, or the carbolized glycerin of the Pharmacopœia, are useful. But the affection is almost always tedious, and if a cure is effected in three months the treatment may be considered satisfactory.

Scabies, psora, or itch, is a disease arising from the acarus scabiei (itch mite) burrowing beneath the cuticle, and there depositing its eggs. It may be seen in this situation as a small body, the skin

presenting at the point of entrance a papular elevation. The spot usually seen is beneath the skin between the fingers and toes, at the bend of the elbow, the axilla, and behind the knee; but it may attack any part of the body, especially in children. When the vesicle is broken, scabs or crusts are formed. In these crusts young animals are contained. The irritation or scratching may occasion various forms of eczema and urticaria, according to Dr. Liveing, especially in long-standing cases in children.

Treatment.—The child should have a warm bath before going to bed, and be washed with soap and flannel. After being well dried he should have the sulphur and potash ointment* rubbed into him. He should then be clothed with flannel, and wear gloves and socks, to prevent the application from rubbing off. The next night the process should be repeated, and it may be necessary to repeat it for a third night. A sulphur bath is also an excellent remedy, and may obviate the use of the ointment altogether.

Phthiriasis—Lousiness.—This disease arises from lice being situated on the body. The most common sites are:

1. The head (*Pediculus capitis*).
2. The body (*Pediculus corporis*).
3. The pubis (*Pediculus pubis*).

The eggs, which are known as nits, bite the skin, and produce a pustular eruption and insufferable itching.

The *treatment*, which is always effectual, consists in rubbing in mercurial ointment or the white precipitate ointment. A few applications generally suffice for a cure. For *Pediculi corporis*, staphisagra ointment (Squire's formula) is the best and safest.

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* Ung. Pot. Sulph., B. P.

FORMULÆ.

NO.		FORM.	PAGE.
1.	*Saline aperient,*	1	40

℞. Magnes. sulph., ℥j
Tinct. rhei., ℥ss. vel
Syr. rhei, ℥ss.
Syr. zingib., ℥ij
Tinct. cinnamomi, ℥j
Aquam anethi ad ℥ij.—M.

One to two teaspoonfuls to be taken at bedtime and in the early morning. For children from six to twelve months old.

2.	*Saline aperient,*	8	109

℞. Magnes. sulph., ℥j
Potass. nitrat., ℥ss.
Syr. limonum, vel
Syr. tolut., ℥iij
Aquam ad ℥iv.—M.

A tablespoonful every four hours. For a child five or six years old.

3.	*Saline aperient,*	41	203

℞. Magnes. sulph., ℥iss.
Syr. rhei, ℥ss.
Tinct. cinnamomi, ℥ss.
Liq. magnes. carb. ad ℥iss.—M.

One or two teaspoonfuls occasionally. For children from six to twelve months old.

4.	*Laxative in constipation and irritable diarrhœa,*	23	184

℞. Ol. ricini, ℥ss.
Magnes. carb., ℥ij
Sacchari, ℥iij
Ol. anisi, ♏ij.—M.

A teaspoonful for a dose.

5.	*Laxative,*	39	203

℞. Mannæ opt., ℥ij
Aquam anethi, ℥j.—M.

A teaspoonful once in two or three hours till the bowels act. For children from four to six months old.

NO. FORM. PAGE

6. *Laxative*, ... 40 203

℞. Potass. bitart., ʒss.
Mannæ, ℥ss.
Aquam anethi ad ℥iss.—M.

About gr. x or gr. xv for a dose, to be repeated occasionally. For children from four to six months old.

7. *Aperient*, ... 84 632

℞. Potass. sulphat., gr. x
Pulv. rhei, gr. iv.—M.

To be taken in the early morning. For a child ten years of age.

8. *Aperient and tonic*, ... 97 701

℞. Magnes. sulph., gr. xvj
Acid. sulph. dil., ♏iij
Ferri sulph., gr. iv
Vel. tinct. ferri perch., ♏xl
Syr. zingib., ʒij
Aquam carui ad ℥iv.—M.

A dessertspoonful three times a day. For children from five to ten years of age.

9. *In some forms of diarrhœa*, ... 24 185

℞. Ol. ricini, ℥ss.
T. opii, ♏vj
Mucilag., ʒij
Syr. zingib., ʒiij
Aquam anethi ad ℥iss.—M.

One teaspoonful to be given occasionally. For children from six to twelve months old.

10. *Astringent*, ... 4 91

℞. Tinct. krameriæ, ʒiij
Liquor. opii sed., ♏xij
Spt. chloroform., ♏xx
Syr. zingiberis, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful after each action of the bowels. For children from five to eight years of age.

11. *Astringent*, ... 16 146

℞. Pulv. cretæ c. opio, ℈ij
Tinct. catechu, ʒij
Aquam menth. pip. ad ℥ij.—M.

Two teaspoonfuls after each action of the bowels. For children five years of age.

NO. FORM. PAGE

12. *Astringent*, ... 28 191

℞. Acid. gallic., gr. viij
Tinct. cinnamomi, ʒj
Tinct. opii, ♏xiv
Syrupi, ʒij
Aquæ cinnamomi, ʒv
Aquam ad ℥ij.—M.

Two teaspoonfuls every four hours. For children a year old.

13. *Astringent*, ... 29 191

℞. Plumbi acetat., gr. vj
Aceti, ♏xx
Tinct. opii, ♏viij
Mucilag. acaciæ, ʒij
Syr. zingib., ʒj
Aquam ad ℥ij.—M.

Two teaspoonfuls every six hours. For children a year old.

14. *Astringent*, ... 30 191

℞. Tinct. opii, ♏vj
Tinct. card. co., ʒj
Syrupi, ʒij
Decoct. hæmatoxyli ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

15. *Astringent*, ... 31 192

℞. Tinct. catechu, ʒj
Syr. zingib., ʒij
Mist. cretæ ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

16. *Astringent*, ... 33 192

℞. Acid. nitric. dil., ♏xxiv
Tinct. camph. co., ʒj
Spt. chloroform., ♏xij
Syr. zingib., ʒij
Decoct. hæmatoxyli ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

17. *Astringent*, ... 34 192

℞. Acid. sulph. dil., ʒss.
Spt. chloroform., ♏xx
Syrupi, ʒij
Aquam ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

NO.		FORM.	PAGE
18.	*Astringent*, ...	35	192

℞. Acid. nitric. dil., ♏xx
Syr. gummi rubr., ℥ij
Spt. chloroform., ♏xx
Decoct. hæmatoxyli ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

19.	*Astringent*, ...	36	192

℞. Ext. belæ liquid., ℥ss.
Syr. gummi rubr., ℥ij
Tinct. camph. co., ℥j
Syr. zingib., ℥ij
Aquam ad ℥iss.—M.

A teaspoonful three or four times a day. For children six years of age.

20.	*Astringent*, ...	37	192

℞. Cupri sulph., gr. ij
Liq. opii sed., ♏xxiv
Spt. chloroform., ℥j
Aquam cinnamomi ad ℥iij.—M.

Two teaspoonfuls three times a day. For children six years of age.

21.	*In round-worm*, ...	48	307

℞. Santonin, gr. iv–vj
Sacchari, gr. ij
Fiat pulvis.

To be taken every third night.

22.	*In round-worm*, ...	49	307

℞. Santonin, gr. ij
Pulv. scammonii co., gr. v
Fiat pulvis.

To be taken at bedtime.

23.	*In round-worm*, ...	50	307

℞. Santonin, gr. xv
Pulv. zingib., gr. v
Pulv. jalapæ, ℥ss.
Sulphuris loti, ℥iss.
Conf. sennæ, ℥j.—M.

℥j three times a day.

NO. FORM. PAGE

24. *In tapeworm,* 51 308

℞. Ext. filicis liquid., ʒss.–ʒj
Syr zingib., ʒj
Pulv. acaciæ, gr. x
Aquam cinnamomi ad ℥j.—M.

Fiat haustus. For a child from five to ten years old.

25. *In ascarides,* 38 194

℞. Ferri sulphat., ʒj
Inf. quassiæ, ℥viij.—M.

Fiat enema. A fourth part to be used every morning.

26. *In ascarides,* 46 304

℞. Sodii chlorid., vel
Ferri sulph., ʒj
Inf. quassiæ, Oj

Fiat enema. A third part to be used every morning.

27. *In ascarides,* 47 304

℞. Liquor calcis, ℥vj

Fiat enema. To be used every morning.

28. *Tonic in some states of typhoid fever,* 6 91

℞. Quiniæ sulph., gr. iv
Acid. phosph. dil., ʒj
Syrupi, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful three or four times a day. For children from five to eight years of age.

29. *Tonic,* 11 133

℞. Amm. carb., gr. viij
Tinct. cinch. comp., ʒij
Syr. aurant., ʒiij
Aquam ad ℥iv.—M.

A dessert or tablespoonful every four hours. For a child four or five years old

30. *Tonic,* 14 145

℞. Acid. nitric. dil.
Acid hydrochl. dil., āā ʒss.
Tinct. cinch. co., vel
Tinct. calumbæ, ʒiij
Syrupi, ℥ss.
Aquam ad ℥iv.—M.

A tablespoonful three times a day. For children five years of age.

NO. FORM. PAGE

31. *Tonic*, ... 20 173

℞. Acid. nit. dil., ♏xij
Acid. hydroch. dil., ♏xxiv
Tinct. calumbæ, ℥j
Syr. aurant, ℥ij
Aquam ad ℨij.—M.

℥j ter die. For children a year old.

32. *Tonic*, ... 22 173

℞. Tinct. cincho. co., ℥iss.
Acid. nucis vom., ♏xij
Syrupi, ℥ij
Aquam ad ℨiss.—M.

℥j ter die. For children a year old.

33. *Tonic*, ... 53 352

℞. Tinct. ferri perchlor., ℥j
Glycerini, ℨss.
Aquam ad ℨiv.—M.

A tablespoonful every four hours. For children five years of age.

34. *Tonic*, ... 54 352

℞. Tinct. ferri perchl., ♏xl
Potass. chlorat., gr. xl
Acid. hydrochl. dil., ♏xl
Syrupi hydrochl. dil., ℨss.
Aquam ad ℨiv.—M.

A tablespoonful every four hours. For children five years of age.

35. *Tonic in some forms of catarrh*, ... 68 426

℞. Syr. ferri iod., ℨss.
Vin. ipecac., ℥j
Aquam ad ℨiij.—M.

Two teaspoonfuls three times a day. For children five or six years old.

36. *Tonic in some forms of pneumonia*, ... 69 464

℞. Amm. carb., gr. viij
Tinct. quiniæ, ℥iij
Spt. chloroform., ♏xx
Syr. tolut., ℥iij
Decoct. senegæ ad ℨiv.—M.

A tablespoonful every four hours. For children five or six years old.

NO. FORM. PAGE.
37. *Tonic in tuberculosis and phthisis,* 73 499

℞. Calcis hypophosphitis, ℈ij
Tinct. ferri perchl., ʒiss.
Quiniæ sulph., gr. vj
Liquor strychniæ, ♏xx
Syrupi, ℥j
Aquam ad ℥vj.—M.

A tablespoonful three times a day.

38. *Tonic in phthisis,* 80 528

℞. Tinct. ferri perchl., ʒj
Calcis hypophosphitis, ʒss.
Glycerini, ʒiij
Aquam ad ℥vj.—M.

A tablespoonful three times a day.

39. *Tonic in phthisis,* 81 528

℞. Sodæ hypophosphitis, ʒss.
Acid. phosph. dil., ʒij
Tinct. quiniæ,
Glycerini, āā ℥ss.
Inf. aurant. co. ad ℥vj.—M.

A tablespoonful three times a day, with one teaspoonful of cod-liver oil. For children from ten years of age and upwards.

40. *Tonic,* 94 699

℞. Ferri redacti,
Sacchar. pur.,
Pepsinæ porci, āā gr. ij.—M.

To be taken twice a day after food. For children ten years of age.

41. *Tonic,* 95 700

℞. Ferri et amm. citr., gr. xvj
Amm. carb., gr. viij
Syrupi, ʒiij
Aquam ad ℥iv.—M.

A dessertspoonful three times a day.

42. *Tonic,* 96 700

℞. Tinct. ferri perchlor., ♏xl
Glycerini, ʒiij
Aquam cinnamomi ad ℥iv.—M.

A dessertspoonful three times a day. For children from five to ten years of age.

NO. FORM. PAGE.

43. *Tonic*, ... 98 701

℞. Tinct. belladonnæ,
Tinct. ferri perchlor., āā ♏xl
Spt. chloroform., ♏xvj
Glycerini, ʒiij
Aquam ad ℥iv.—M.

A dessertspoonful three times a day. For children from five to ten years of age.

44. *Tonic and sedative in epilepsy*, ... 82 604

℞. Ferri et amm. citr., gr. xvj
Potass. bromid., ℈ij
Syrupi, ʒiij
Aquam ad ℥iv.—M.

A tablespoonful three times a day. For children from six to twelve years of age.

45. *Tonic and sedative in epilepsy*, ... 83 606

℞. Tinct. digitalis, ♏xx–♏xl
Potass. bromid., ℈ij
Syrup. aurant., ʒiij
Aquam ad ℥iv.—M.

A tablespoonful three times a day. For children from six to twelve years of age.

46. *Tonic and alterative*, ... 93 682

℞. Vin. Ferri, ℥iss.
Syr. tolut., ʒiij
Liq. fowleri, ʒj
Aquam ad ℥iv.—M.

A teaspoonful in a tablespoonful of water twice a day after food. For a child from five to ten years of age.

47. *Sedative in cerebral irritation*, ... 3 72

℞. Potass. bromid., gr. xx.
Potass. iodidi, gr. iij
Spt. amm. arom., ♏xx
Syrupi amm. arom., ʒiij
Aquam ad ℥iss.—M.

A teaspoonful to be taken every four hours. For children a year old.

48. *Sedative in cystitis*, ... 45 286

℞. Liquor. potass., ʒj
Liquor opii sed., ♏viij
Mucilag., ℥ss.
Mist. Camph., ad ℥iv.—M.

A tablespoonful every four hours. For a child eight or ten years old.

NO. FORM. PAGE.

49. *Sedative in laryngismus,* 56 365

℞. Potass. bromid., ʒj
Tinct. quiniæ, ʒiss.
Glycerini, ʒij
Aquam ad ℥iij.—M.

A teaspoonful three times a day. For a child one year old.

50. *Sedative in whooping-cough,* 57 379

℞. Ext. belladonnæ, gr. j
Aluminis, ʒss.
Syr. zingib.
Syr. acaciæ,
Aquæ, āā ℥j.—M.

ʒj four times in the twenty-four hours. For a child a year old. (Meigs and Pepper.)

51. *In whooping-cough,* 58 380

℞. Cocci, gr. v
Potass. bicarb., gr. xl
Syrupi, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful every three or four hours. For a child two years old.

52. *Sedative and tonic in whooping-cough,* 59 382

℞. Tinct. quiniæ, ʒij
Potass. bromid., gr. xl
Glycerini, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful three times a day. For a child five years old.

53. *Stimulant in some forms of pneumonia,* 71 469

℞. Tinct. cinch. co., ʒiiss
Amm. carb., gr. viij
Tinct. camph. co., ♏xl
Syr. tolut., ʒiij
Aquam ad ℥iv.—M.

A dessertspoonful every four hours. For children five or six years old.

54. *Stimulant and tonic in some forms of pneumonia,* 72 469

℞. Ferri et amm. citr., gr. xij
Amm. carb., gr. viij
Potass. iodidi, gr. iv
Syrupi, ʒij
Aquam ad ℥iv.—M.

A dessertspoonful to be taken three times a day. For children five or six years old.

NO. FORM. PAGE.

55. *Stimulating expectorant in pneumonia,* 70 465

℞. Amm. carb., gr. viij
Potass. bicarb., ℈ij
Vin. ipecac., ♏xl
Syr. tolut., ʒiij
Aquam ad ℥iv.—M.

A tablespoonful every four hours. For children five or six years old.

56. *In some forms of bronchitis,* 65 424

℞. Potass. citrat., vel
Potass. bicarb., ʒss.
T. camph. comp.
Vin. ipecac., āā ʒj
Syr. scillæ, ℥ss.
Aquam ad ℥ij.—M.

A teaspoonful every three hours. For children from one to two years of age.

57. *In some forms of bronchitis,* 66 425

℞. Vin. ipecac.,
Tinct. scillæ, āā ♏xl
Tinct. conii, ʒj
Spt. æther. nit., ʒj
Syr. tolut., ℥ss.
Decoct. senegæ ad ℥iv.—M.

A dessertspoonful every four hours. For children from five to eight years of age.

58. *In chronic bronchitis,* 67 426

℞. Amm. carb., gr. viij
Tinct. cinch. co., ʒij
Syr. tolut., ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful three or four times a day. For children five or six years old.

59. *In bronchitis,* 61 423

℞. Amm. carb., gr. iv
Spt. chloroform., ♏xx
Syr. tolut., ℥ss.
Aquam ad ℥ij.—M.

A teaspoonful every four hours. For a child a year old.

60. *In catarrh and bronchitis,* 63 424

℞. Syr. tolut.,
Syr. scillæ,
Aquam, āā ℥ss.—M.

A teaspoonful when the cough is troublesome.

NO. FORM. PAGE.

61. *In catarrh and bronchitis,* 64 424

℞. Syr. tolut.,
Syr. scillæ,
Senna, āā ℥ss.—M.

A teaspoonful twice or three times a day, or when the cough is troublesome.

62. *In the cough of phthisis,* 74 525

℞. Syr. papav.,
Scillæ,
Limonum, āā ℥ss.—M.
℥j pro re nata.

63. *In the cough of phthisis,* 75 526

℞. Morph. acet., gr. ¼
Acid. hydrocy. dil., ♏xvj
Glycerini, ℥ij
Aquam ad ℥iss.—M.
℥j pro re nata.

For children from five to ten years old.

64. *In some forms of bronchitis and catarrh,* 60 423

℞. Liquor. amm. acet., ℥ss.
Acid. hydrocy. dil., ♏viij
Vin. antimonialis, ♏xl
Syr. scillæ, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful every four hours. For a child five or six years old.

65. *Saline depressant in febrile states,* 62 423

℞. Hydr. chlorid., gr. ij
Pulv. antimonialis, gr. viij
Potass., nitrat.
Sacchari, āā gr. xij.—M.

Et divide in pulveres iv. One every four or six hours. For a child from five to ten years old.

66. *In some forms of diarrhœa,* 27 187

℞. Magn. sulph., ℥ss.
Tinct. rhei, ℥j, vel
Syr. rhei, ℥ij
Tinct. quiniæ, ℥ss.
Aquam menth. pip. ad ℥iss.—M.

A teaspoonful every four hours. For children from one to two years old.

67. *Carminative and aperient,* 26 187

℞. Pulv. rhei,
Sodæ bicarb., āā gr. xij
Spt. amm. arom., ♏xx
Syr. zingib., ℥iij
Aquam menth. pip. ad ℥iss.—M.

A teaspoonful every four hours. For children a year old.

NO. FORM. PAGE.

68. *Alterative and tonic in sluggish liver,* 42 204

℞. Acid. nitric dil., ♏xvj
Acid hydrochl. dil., ʒss.
Succi taraxaci, ʒj
Syrupi, ℥ss.
Aquam ad ʒiv.—M.

A dessertspoonful three times a day. For a child three or four years old.

69. *In diarrhœa,* 25 185

℞. Sodæ bicarb., gr. xij
Liq. bismuth., ʒij
Mucilag., ʒij
Syr. zingib., ℥ss.
Liq. magnes. carb., ℥iv.—M.

A dessertspoonful three times a day. For a child two years old.

70. *In vomiting and flatulence,* 2 71

℞. Acid. hydrocy. dil., ♏vj
Spt. amm. arom., ♏xx
Syrupi. amm. arom., ℥ss.
Liquor. magn. carb. ad ℥iss.—M.

A teaspoonful to be taken every four hours. For children a year old.

71. *In typhoid fever,* 5 91

℞. Acid. hydrochl. dil., ♏xl
Spt. chloroform., ♏xx
Syr. rosæ, ℥ss.
Aquam ad ℥iv.—M.

A dessertspoonful every four hours. For children from five to eight years of age.

72. *In some febrile states,* 7 109

℞. Liquor. amm. acet., ℥ss.
Vin. antimonialis, ♏xl
Syr. tolutani, ʒiij
Aquam ad ℥iv.—M.

A tablespoonful every four hours. For a child five or six years old.

73. *In scarlatina,* 9 111

℞. Potass. chlorat., gr. xx
Acid. hydrochl. dil., ♏xl
Syr. hemidesmi, ℥ss.
Aquam ad ℥iv.—M.

A tablespoonful three times a day. For a child five years old.

NO. FORM. PAGE.

74. *Saline,* 12 144

℞. Liquor. amm. acet., ℥ss.
Spt. æther. nitr., ʒj
Syr. rosæ, ʒiij
Aquam ad ℥iv.—M.

A tablespoonful every four hours. For children five years of age.

75. *Saline,* 13 144

℞. Amm. carb., gr. viij
Liquor. amm. acet.,
Syr. aurant., āā ℥ss.
Aquam ad ℥iv.—M.

A tablespoonful every four hours. For children five years of age.

76. *Saline,* 52 351

℞. Liq. amm. acet., ʒij
Spt. æther. nitr., ʒj
Syr. rosæ, ʒiij
Aquam ad ℥iv.—M.

A tablespoonful to be taken every four hours.

77. *Saline in acute rheumatism,* 88 665

℞. Liq. amm. acet., ℥ss.
Acid. salicylic., ϑij
Syr. aurant., ʒiij.
Aquam ad ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

78. *Saline in acute rheumatism,* 89 665

℞. Potass. bicarb.,
Acid. salicylic., āā ϑij
Syrupi, ʒiij
Aquam anethi ad ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

79. *In acute rheumatism,* 90 665

℞. Sodæ salicylat., ϑij
Syrupi, ʒiij
Aquam ad ℥iv.—M.

A dessertspoonful every four hours. For children six years of age.

80. *In incipient phthisis,* 78 528

℞. Sodæ hypophosphitis, ʒss.
Syr. aurant., ʒiij
Inf. calumbæ ad ℥vj.—M.

A tablespoonful three times a day.

NO. FORM. PAGE.

81. *In incipient phthisis,* 79 528

℞. Sodæ hypophosphitis, ʒss.
Syrupi, ʒiij
Inf. cinch. flav. ad ℥vj.—M.
A tablespoonful to be taken three times a day.

82. *In cough and laryngeal irritation,* 76 526

℞. Potass. chlorat., ʒss.
Liquor. morph. hydrochlor., ♏xx
Syr. tolutani, ʒvj
Aquam ad ℥ij.—M.
ʒj pro re nata. For children from five to ten years old.

83. *Sedative to relieve cough,* 77 526

℞. Liquor. morph. hydrochlor., ♏xx
Vin. ipecac., ʒj
Oxymellis scillæ,
Syr. mori., āā ℥ss.
Mist. acaciæ ad ℥ij.—M.
ʒj pro re nata. For children from five to ten years old.

84. *In acute rheumatism,* 86 662

℞. Potass. bicarb., ʒij
Potass. nitrat., ℈ij
Tinct. opii, ♏xvj
Syr. limonum, ℥ss.
Aquam ad ℥iv.—M.
A dessertspoonful every three or four hours. For a child six years of age.

85. *In acute rheumatism,* 87 665

℞. Salicin, ℈ij
Syr. aurant., ℥ss.
Aquam cinnamomi ad ℥iv.—M.
A dessertspoonful to be taken every four hours. For children six years of age.

86. *In sickness and torpid liver,* 21 173

℞. Acid. hydrocyan. dil., ♏xij
Acid nitric., ♏xx
Syr. nitric., ʒij
Aquam ad ℥iss.—M.
ʒj ter der. For children a year old.

NO. FORM. PAGE.

87. *In indigestion,* 19 172

℞. Sodæ bicarb., gr. xij
Spt. amm. arom., ♏xij
Syr. rhei, vel
Succi taraxaci, ʒiij
Tinct. calumbæ, ʒj
Aquam anethi ad ℥iss.—M.

ʒij ter die. For children a year old.

88. *In some forms of rheumatism,* 91 667

℞. Potass. bicarb., ʒj
Tinct. cinch. co., ʒij
Syr. zingib., ʒiij
Aquam ad ℥iv.—M.

A dessertspoonful three times a day. For children from eight to twelve years of age.

89. *In some forms of rheumatism,* 92 667

℞. Potass. bicarb., ʒj
Ferri et amm. citr., gr. xx
Syr. aurant., ʒiij
Aquam cinnamomi ad ℥iv.—M.

A dessertspoonful three times a day. For children from eight to twelve years of age.

90. *Carminative in flatulence,* 43 206

℞. Potass. bicarb., gr. viij
Ol. cajeputi, ♏viij
Aquæ anethi, ℥j.—M.

A teaspoonful three times a day.

91. *In ophthalmia from small-pox,* 17 147

℞. Zinci sulph., gr. ij
Vini opii, ♏xx
Aquam rosæ, ℥j—M.

Fiat collyrium.

92. *In ophthalmia from small-pox,* 18 147

℞. Sodæ biborat., gr. xij
Zinci sulph., gr. j
Aquæ camph., ʒj
Aquam destill. ad ℥j.—M.

Fiat collyrium.

93. *In diphtheria,* 55 353

℞. Potass. chlorat.,
Boracis, āā ʒj
Glycerini,
Mellis, āā ℥s.—M.

The throat to be mopped out with a little of this solution frequently during the day, in diphtheria.

NO. FORM. PAGE

94. *In scarlet fever and diphtheria,* 10 131

℞. Liq. ferri perchlor., ℥j
Glycerini,
Aquæ, āā ℥ss.—M.

Fiat solutio.—To be applied to the throat in scarlet fever and diphtheria.

95. *In lepra,* 99 713

℞. Picis liquidæ, vel
Olei rusci, ℥ss.
Glycerini amyl., ℥ij.—M.

96. *In eczema,* 100 715

℞. Zinci oxid.
Pulv. amyli, āā ʒij
Pulv. camphoræ, gr. v.—M.

To form a powder.

97. *In eczema,* 101 715

℞. Pulv. calam.,
Zinci oxid., āā ʒij
Liq. calcis, ℥ss.
Glycerini, ʒij
Aquam rosæ ad ℥vj.—M.

Fiat lotio.

98. *In congestion of the liver,* 44 233

℞. Acid. nit. dil., ℥j
Aquam rosæ ad ℥xx.

Fiat lotio. Two folds of linen rag to be saturated with a little of this lotion, and applied to the region of the liver, under oil-silk.

INDEX.

Abdomen, enlargement of, 298
Abscess in the ear, 715
Acid, phosphoric, in phthisis, 528
Aconite in scarlet fever, 129
  in congestion of brain, 621
  in pneumonia, 460
  in tonsillitis, 158
Adenoid tissue, 473
Air, importance of, 44
Alcohol in acute disease, 56
Albuminuria in scarlet fever, 134
  in diphtheria, 338
  in intermittent fever, 253
Almond cakes in diabetes, 291
Alopecia areata (see Tinea decalvans), 727
Alum, 379
Ammonia, carbonate of, 426
  in bronchopneumonia, 464
Amyloid, or lardaceous disease of liver, 239
  of kidney, 269
Anæmia, 697
  idiopathic, or pernicious, 702
  treatment, 699
  varieties of: 1. Acute; 2. Chronic, 699
Anasarca in chronic Bright's disease, treatment of, 273
  drainage-tubes in, 273
Anorexia, 169
Antimony, 48
  in asthma, 402
  in bronchitis, 422
  in chorea, 637
  in croup, 333
  in meningitis, 567
  in pneumonia, 459
  in tonsillitis, 158
Aortic valves, disease, 545
  regurgitation, 546
  stenosis, 545
Aperients, ill effects of, 46
Aphthæ, 148
Apoplexy, 622
Arsenic in chorea, 635
  in chronic urticaria, 720
  in eczema, 724
  in psoriasis, 721
Arterial murmurs, 694
Ascarides, 302
  injections of iron and quassia in, 303
Ascaris lumbricoides, 305
  santonin in, 306
Ascites, 299
  copaiba in, 301
  digitalis in, 301
  paracentesis in, 301
Asphyxia, diseases terminating in, 55
Asthma, 393
  causes of, 393
  diagnosis, 397
  pathology, 399
  treatment, 401
Atropia, sulphate of, 377
  in phthisis, 525
  in whooping-cough, 377
Atrophy, 73
  causes of, 73
  of liver, 235
Aura epileptica, 589
Aural polypi, 711

Backwardness, 616
Basilar meningitis, 577
Bathing, cold, 45
Baths, cold, in fever, 130
  in diarrhœa, 181
  warm, in nephritis, 262
Bael, extract of, in diarrhœa, 193
Belladonna in asthma, 401
  in enuresis, 284
  in laryngismus stridulus, 365
  in phthisis, 524
  in rickets, 681
  in scarlet fever, 136
  in whooping-cough, 376, 382
Bilious diarrhœa, 177
Bismuth in diarrhœa, 191
Blood in anæmia, 692
  in rheumatism, 567
  murmurs, diagnosis of, 696
Boils as a result of small-pox, 145
Borax in stomatitis, 150
Bran-cakes in diabetes, 291
Brain, diseases of, 557
Breathing, harshness of, 513
Bromide of potassium in asthma, 401
  in epilepsy, 601
  in laryngismus stridulus, 365
  in meningitis, 568

Bromide of potassium in whooping-cough, 378
Bronchial glands, enlargement of, 384
in tuberculosis, 478
in whooping-cough, 372
respiration, 518
Bronchitis, acute, 413
symptoms of, 414
chronic, 419
kettles, 320
pathology, 421
temperature of room in, 424
treatment, 422
Bronchopneumonia (see Catarrhal pneumonia), 461
Bronchophony in phthisis, 515
Bronchorrhœa, 427
Bruit de cuir, 534
Bruit de diable, 696
Bruit de frottement, 534
Bruit de soufflet in anæmia, 695
in mitral disease, 548
Bulimia, 169
Bullock's acid glycerin of pepsin, 76

Cajeput oil, 206
Calomel in jaundice, 235
in pleurisy, 435
Calumba, 172
Cancer of the kidney, 278
Cancrum oris, 153
Cannabis Indica, 377
Carbolic acid, inhalation of, in whooping-cough, 382
in phthisis (see Spray inhalation), 525
Carbonate of potash in whooping-cough, 380
Cardiac murmurs, 694
Carpo-pedal contractions, 605
Castor oil paste, 46
in diarrhœa, 185
in dysentery, 199
Catarrhal deafness, 709
phthisis, 506
pneumonia, 461
Catechu, 192
Cavernous respiration, 518
Cephalalgia epileptiformis, 587
Cerebral hæmorrhage (see Apoplexy), 622
Cerebro-spinal meningitis, 643
Chilblains, 718
treatment, 719
varieties of, 719
Chloral hydrate, 378
in asthma, 402
in bronchitis, 424
Chloralum, 136
Chlorate of potash in stomatitis, 154
Chlorine drink, 187, 352
Cholera infantum, 177
Chorea, 624
arsenic in, 635
Chorea, causes of, 628
curara in, 632
hydrate of chloral in, 633
iron in, 635
pathology, 630
strychnia in, 635
succus conii in, 632
sulphate of zinc in, 636
treatment, 631
Chronic phthisis, 507
Chylification, 165
Chymification, 165
Cirrhosis of kidney, 265
of liver, 227
of lungs, 508
Cochineal, 380
Cod-liver oil in atrophy, 76
in chronic bronchitis, 427
in phthisis, 521
in rickets, 682
Coffee in asthma, 402
Colic, 205
treatment of, 206
Collapse, causes of, 55
in diarrhœa, 188
Condy's fluid, 136
Congestion of the brain, 618
causes and symptoms, 619
treatment, 621
Constipation, 200
treatment of, 202
in meningitis, 571
Convulsions, 604
in dentition, 69
in fever, 87
in pneumonia, 455
Copaiba, 301
Copper, sulphate of, in chorea, 636
in diarrhœa, 193
Corrigan's pulse, 545
Coryza, 310
Cough in heart disease, 553
in phthisis, 525
Counter-irritation in pericarditis, 537
Cow-pox, 97
Cranio-tabes (see Rickets), 678
Cretinism, 615
Croton-chloral, 377
Croup, diagnosis from diphtheria, 327
from laryngismus stridulus, 232
tracheotomy in, 334
treatment, 332
varieties of, 322
Croupous pneumonia, 451
diagnosis of, 457
(see Pneumonia), 448
Cupping in acute nephritis, 261
Cyanosis, 555
Cynanche parotidea (see Mumps), 163
tonsillitis (see Tonsillitis), 157
trachealis (see Croup), 322
Cystitis, acute, 286

Debility, causes of, 62
definition of, 63
treatment, 67
Defecation, 165
Delirium in pericarditis, 534
in pneumonia, 455
Dentition, first and second, 68
treatment of, 70
use of gum lancet in, 72
Desquamation in scarlet fever, 117
Diabetes insipidus, 292
pathology and treatment, 293
mellitus, 287
pathology of, 290
skim-milk in, 291
tests for sugar in, 289
Diaphoretics in nephritis, 261
Diarrhœa, 174
bilious, 177
choleraic, 177
chronic, 182
dysenteric, 182
in dentition, 70
in fever, 85
in phthisis, 527
in small-pox, 146
lienteric, 181
muco-enteritis, 179
simple, 176
treatment, 183
varieties of, 176
Digestive ferments, 76
Digestion of starch, of sugar, at time of weaning, 167
Digitalis in ascites, 301
in chronic Bright's disease, 273
in epilepsy, 604
in heart disease, 552
in nephritis, 262
in pleurisy, 438
Dilatation and hypertrophy of heart, 553
signs of, 554
Dinneford's solution of magnesia, 46
Diphtheria, 336
albuminuria in, 338
causes of, 341
diagnosis from croup, 326
diphtheritic paralysis, 343
morbid anatomy of, 346
period of incubation, 337
sequelæ, 343
tracheotomy in, 354
treatment, 350
Disease, acute and chronic, 51
Drainage-tubes in anasarca, 273
in hydropericardium, 540
in pleuritic effusion, 445
Dry crackling rhonchus, 516
Dropsy after scarlet fever, treatment of, 133–255
of the kidney (see Hydronephrosis), 280
Duchenne's paralysis, 655
pathology and treatment, 657, 658
Dura arachnitis (pachymeningitis), 559
Dysentery, 198
Dyspepsia, 169
Dyspnœa in pleurisy, 428
in pneumonia, 457
Dysuria, 274

Ear, diseases of, 708
Ecthyma, 725
Eczema, acute and chronic, 722
of the ear, 714
treatment, 724
Emetics, danger of, in head affections, in peritonitis, and in great debility, 49
in bronchitis, 423
in some acute diseases, 57
safe in croup, whooping-cough, bronchitis, pneumonia, and tonsillitis, 49
Emphysema, occasional coexistence with tuberculosis, 409
treatment, 411
two varieties: 1. Vesicular; 2. Interlobular, 405
Empyema, 445
Endocarditis, 540
treatment, 541
ulcerative, 542
Enemata, nutritive, 77
starch, 90
Entero-colitis (see Muco-enteritis), 179
Enuresis, 282
belladonna in, 284
faradization in, 285
Epilepsy, 585
causes of, 592
diagnosis, 595
diet in, 599
morbid anatomy of, 594
prognosis and treatment, 598
symptoms of, 586
two varieties: 1. Le grand mal; 2. Le petit mal, 585
Epileptiform seizures, 596
Epistaxis, 316
in diseases of spleen, 246
in typhoid fever, 88
plugging nares in, 317
Ergot in epilepsy, 603
in hæmoptysis, 526
Ergotin, subcutaneous injection of, 653
Eruption, character of, in measles, 103
in chicken-pox, 100
in scarlet fever, 116
in typhoid fever, 85
in variola, 138
Rötheln, 112
Eruptive fevers, 97
Erythema, varieties of: 1. Simplex; 2. Nodosum. 3. Intertrigo, 717

Ethyl, iodide of, 403
Exercise, importance of, 44

Faradization in chorea, 637
in enuresis, 285
Fatty liver, 241
Febris ephemera, 82
Fehling's solution, 289
Fermentation test, 289
Fever, intestinal, 83
scarlet, 116
typhoid, 84
Fevers of childhood, 78
Fibroid phthisis, 508
Food, in diarrhœa, 190
insufficiency of, 58
predental period, 165
Frémissement cataire, 548
Frog belly, 674

Gallic acid in diarrhœa, 191
in hæmatemesis, 277
in hæmoptysis, 526
in sweating of phthisis, 524
Galloping consumption, 504
Gangrene of mouth, 154
Gastritis, 194
German measles, 111
Giant cells, 473
Gingivitis, 156
Glands, caseous degeneration of, 390
enlarged bronchial and mediastinal, 383
enlarged cervical, 702
mesenteric, in fever, 85
Gluten bread in diabetes, 291
Glycosuria, 288
Gout, 668
Granular kidney, 276
Growth of children, 20
Guaiacum in tonsillitis, 159
Gurgling rhonchus, 517

Hæmatemesis, 196
Hæmaturia, 277
Hæmoptysis, 511
iron, gallic acid, acetate of lead, ergot in, 526
Hæmorrhage, causes of, 55
in fever, 96
Headache in meningitis, 573
in scarlet fever, 127
Heart cough, 553
Heart, diseases of, 529
functional, 530
neurosal affections of, 531
organic, 532
valvular diseases of, 544
Hemichorea, 627
Hemiplegia in meningitis, 574
Herpes, two varieties: 1. Herpes labialis; 2. Herpes zoster, 725
Honey, as a laxative, 46
Humid crackling rhonchus, 516
Hydatids of liver, 237
diagnosis, 238
treatment, 239
Hyd. c. Creta in cirrhosis, 229
in jaundice, 233
Hydrobromic acid, 383
Hydrocephalus, chronic, 579
compression-puncture, 584
iodide of potassium in, 583
symptoms, 581
treatment, 582
Hydrocyanic acid, 379
Hydronephrosis, 375
Hydropericardium, 539
Hyoscyamus in epilepsy, 604
Hyperpyrexia in rheumatism, 666
Hypertrophy and dilatation of heart, 553
Hypophosphites of lime and soda in phthisis, 522
with cod-liver oil, 528

Icterus, 231
neonatorum, 233
treatment of, 233
Idiocy, 615
Ileum, glands of, in fever, 85
Imbecility, 617
Impetigo, 726
Incontinence of urine (see Enuresis), 282
Incubation-period, diphtheria, 336
measles, 101
scarlet fever, 116
small-pox, 138
whooping-cough, 377
Indigestion, 164
causes of, 170
treatment of, 172
Infantile convulsions, 604
causes, 606
symptoms, 605
terminations, 610
treatment, 611
Infantile paralysis, 647
pathology, 651
symptoms, 649
treatment, 653
Infantile remittent fever, 83
Infection in fever, 134
Inhalation, chloroform, 365
carbolic, 381, 525
in asthma, 402
in pneumonia, 463
of ethyl, 403, 411
Inhalations, in acute disease, 57
Insalivation, 166
Intestinal fever (see Typhoid fever), 83
obstruction, 207
worms, 302
Intussusception, two forms, 211
Invagination, 211

Invagination, diagnosis, 220
medical and mechanical, 222
Iodine, application of, in enlarged bronchial glands, 392
injections of, in chronic pleurisy, 439
in pleuritic effusion, 447
Ipecacuanha, in asthma, 402
in diarrhœa, 191
in pneumonia, 464
Iron, preparations of, 47
syrup of the hypophosphite, Parrish's chemical food, Vinum ferri, Ferrum redactum, Troch. ferri redacti, 47, 48
in chronic Bright's disease, 271
in scarlet fever, 133
tincture of the perchloride in hæmoptysis, 526

Jacket-poultice in pneumonia, 460
Jalap, compound powder of, in nephritis, 261
Jaundice (see Icterus), 231

Keratitis, in syphilis, 688
Kidneys, cancer of, 277
cirrhosis of kidney, 267
congestion, 252
diseases of, 248
granular kidney, cirrhosis of kidney, 267
large white kidney, 265
waxy kidney, 269
Kousso, 309
Krameria in diarrhœa, 193
in dysentery, 199

Lactic acid, in the blood in rheumatism, 660
Laryngeal and tracheal irritation, 317
Laryngismus stridulus, 357
association with rickets, 680
nature of, 360
pathology, 363
treatment, 364
Laryngo-tracheal diphtheria, 322
Lead, acetate of, in diarrhœa, 191
in phthisis, 526
Leeches, in meningitis, 567
in pericarditis, 537
Lepra (see Psoriasis), 721
Lepto-meningitis (see Meningitis), 557
Leucocythemia, 706
Lichen, 720
urticatus, 720
Lime, hypophosphite of, in phthisis, 522, 527
Liquor pepticus, 76
pancreaticus, 76
Liquorice-powder, compound, 203
Lithiasis, 274
Liver, adhesive inflammation of (cirrhosis), 228
albuminoid enlargement of, 230
congestion of, 225
diseases of, 225
hydatids of, 237
scrofulous enlargement of, 240
syphilitic disease of, 229
Lobar pneumonia (see Croupous pneumonia), 451
Lobular pneumonia (see Catarrhal pneumonia), 461
Logwood, 191
Lung, collapse of, 420
Lupus vulgaris, 726
Lymphadenoma, 704

Male fern in tapeworm, 309
Malt extract in phthisis, 525
Manna, 202
Marasmus (see Atrophy), 73
Masturbation a cause of chorea, 629
of epilepsy, 601, 629
Measles (see Morbilli), 102
Mediastinal glands (see Enlarged bronchial glands), 383
Melæna, 197
Melancholia, 614
Meningitis, simple, 557
causes, 559
symptoms, 563
treatment, 566
tubercular, 568
symptoms of, 570
treatment, 577
basilar, 577
Mental disorder, 614
Mercurial salivation, 155
Metallic tinkling, 519
Meteorism, 205
Milk, composition of, 26
condensed, 29
constituents of, 31
evil consequences of impure, 38
in nephritis, 261
in woman, ass, cow, goat, 27
microscopic examination of, 28
utility of, in disease, 34
wet-nurses, 38
Mitral regurgitation, 548
stenosis, 549
Moore's test, 289
Morbilli, causes of, 105
complications of, 103
sequelæ, 108
three varieties of, 102
treatment of, 109
Mouth and fauces, diseases of, 148
Muco-enteritis, 179
Mumps (see Cynanche parotidea), 162
Myelitis, 641

Myelitis, treatment of, 642
Myocarditis, 542

Nasal cavities, diseases of, 310
Nephritis, acute desquamative, 254
chronic desquamative, 264
pathology of—morbid anatomy, 256
treatment of, 261
Nervous and hysterical symptoms, 614
Nettlerash (see Urticaria), 719
Neuralgia, 658
Night terrors, 612
causes, diagnosis, and treatment, 613
Nitrate of silver in dysentery, 199
topical application of, in whooping-cough, 380
Nitric acid in whooping-cough, 379
Nux vomica in asthma, 403

Obstetrical paralysis (see Infantile paralysis), 647
Œdema of lungs, 470
diagnosis from pneumonia, 457
Oil of male fern, 308
Ophthalmia in small-pox, 147
Opium in dysentery, 200
in intestinal obstruction, 210
in intussusception, 222
in peritonitis, 296
Ophthalmoscopic signs in intracranial disease, 579
Optic neuritis, 565
Orthopnœa in pericarditis, 535
Otorrhœa, 710
Oxaluria, 277
Oxyuris vermicularis (see Ascarides), 302
Ozæna, varieties of: 1. Scrofulous; 2. Syphilitic; 3. Traumatic; 4. Idiopathic, 314
treatment, 315

Palpitation, causes and treatment of, 530
Pancreatin, 76
Paracentesis in ascites, 301
in pleurisy, 443
Paralysis from brain disease, 647
in meningitis, 574
Pectoriloquy, 519
Pediculi corporis (see Phthiriasis), 728
Pepsin, 76
Peptonized gruel, 77
milk, 77
Percussion, dulness in phthisis, 514
wooden, 515
Pericarditis, diagnosis and prognosis, 536
morbid anatomy of, 536
treatment, 537
two varieties of:
1. Acute, 532
2. Chronic, 538
Peritonitis, acute, 294
chronic, 296
Peritonitis, diagnosis from colic, 296
Perityphlitis (see Typhlitis), 299
Petit mal, 590
Pertussis, 366
incubation period, 368
treatment, 373
Peyer's patches in typhoid fever, 89
Pharyngitis, simple, 160
Phosphorus in chorea, 630
in epilepsy, 603
Phthiriasis, 728
Phthisical laryngitis, 519
Phthisis, 500
acute forms of, 503, 504
bronchophony, 515
catarrhal, 506
chronic, 507
diagnosis and treatment, 520
dulness on percussion, 514
harshness of breathing, 513
physical signs of, 512
vocal fremitus, 514
Pia arachnitis, 558
Pigeon breast, 159
Pilocarpin in asthma, 404
Pitting in small-pox, 146
Pleurisy, acute, 427
causes, 431
diagnosis and prognosis, 432
dyspnœa in, 428
physical signs of, 429
treatment of, 434
chronic, 437
Pneumonia, 448
three stages of, 429
croupous, 451
apex, 455
pathology, 456
treatment, 458
broncho, 461
pathology and treatment, 463
chronic lobular, 466
Potash, acetate of, in pleurisy, 439
Potassium, iodide of, in chronic hydrocephalus, 583
in meningitis, 579
in syphilis, 690
bromide. See Bromide of potassium.
Pot-belly, 298
Poultices, value of, in the lung diseases of children, 460
Prepuce, removal of, in enuresis, 285
Prolapsus ani, 193
Prune-juice color sputa in pneumonia, 456
Psoriasis, 721
Pulmonary stenosis, 556
Pulse in aortic regurgitation, 546
in aortic stenosis, 545
in cyanosis, 555
in mitral regurgitation, 548
in mitral stenosis, 550
in pericarditis, 534

Pulse in pneumonia, 450, 453
in tuberculosis, 494
Purgatives in acute disease, 57
Pyrosis, 170
Pythogenic fever (see Typhoid fever), 83

Quassia, 303
Quinine in diphtheria, 352
in fever, 83
in tuberculosis, 523
Quinsy (see Tonsillitis), 157

Raw-meat juice, 76, 109, 190
Regurgitation, aortic and tricuspid, 546
mitral, 548
Remittent fever (see Typhoid fever), 83
Renal concretions and calculi (see Dysuria), 274
Respiration, in meningitis, 573
in phthisis, 514
in tuberculosis, 494
Retropharyngeal abscess, diagnosis and treatment, 162
Rhubarb, syrup of, 46
Rickets, 669
cod-liver oil in, 682
diagnosis from hydrocephalus, 678
morbid anatomy, 679
treatment, 680
Rigors in pneumonia, 450
Rheumatism, acute, 658
cold bath in, 666
pathology, 660
treatment, 661
Rhonchus, dry crackling in phthisis, 515
gurgling, 517
humid crackling, 516
subcrepitant, 516
Roseola, 720
Roses, syrup of, 46
Rötheln, or German measles, 111
diagnosis and treatment, 114
Round worm (see Ascaris lumbricoides), 304

Salicin, 664
Salicylate of soda, 665
Salicylic acid, 664
Santonin, 306
Scabies, 727
Scalp, diseases of, 727
Scarlet fever, causes of, 125
mortality, 125
pathology of, 122
precautionary measures in, 135
sequelæ, 127
symptoms of latent, 121
three varieties of, 116
treatment, 128
Sedatives, caution in the use of, 49, 525
Senega, 463
Senna, aromatic syrup of, 46
Sexual precocity, 664
Shower-baths in chorea, 637
Silver, nitrate of, 199
Simple febricula, 80
Skin, diseases of, 716
Small-pox (see Variola), 137
Snuffles in syphilis, 685
Soda, hypophosphite, in chorea, 636
in phthisis, 522, 527
Spinal chord, diseases of, 637
hæmorrhage, 638
irritation, 638
from masturbation, 638
meningitis, 640
Spleen, diseases of, 242
diagnosis of, 246
epistaxis in, 246
in fever, 84
syphilitic disease of, 247
Spray inhalation, in asthma, 404
in diphtheria, 353
in scarlet fever, 132
Squill, 439
Squinting in meningitis, 574
Starch, digestion of, 167
Status epilepticus, 586
Steam-draft inhaler, 131
Stenosis, aortic, 545
mitral, 549
pulmonary, 556
Stimulants, in diarrhœa, 187
in measles, 110
in scarlet fever, 134
in small-pox, 146
in typhoid fever, 91
unnecessary for healthy children, 91
Stomatitis follicularis, 149
fungosa, 150
gangrenous, 154
simplex, 148
ulcero-membranous, 152
Stone in the kidney, symptoms of, 275
in bladder, 276
Stramonium in asthma, 401
Stomach, softening of, 196
of intestines, 197
Strychnia in chorea, 635
in emphysema, 411
in phthisis, 521
St. Vitus's dance (see Chorea), 624
Sugar, digestion of, 167
in the urine, tests for, 289
Sweating in phthisis, 524
Syphilis, 684
diagnosis and treatment, 689
mercurial inunction in, 690
mercury and iodide of potassium in, 690
spleen in, 687
Syncope, 531
Syringomyelus, 642

Tabes mesenterica, 297
diagnosis and treatment, 298
Taraxacum, 172
Tapeworm, 307
kousso in, 307
oil of male fern in, 307
Teeth, temporary and permanent—symptoms of first dentition, 68
convulsions in, 69
diarrhœa in, 69, 186
Threadworms (see Ascarides), 302
Thrush (see Aphthæ), 150
Tinea decalvans, 717
tonsurans, 717
Tobacco in asthma, 402
Tonsillitis, 157
aconite in, 158
antimony in, 158
treatment of, 158
Tonsils, hypertrophy of, 159
Tracheotomy in croup, 333
in diphtheria, 354
Tracheitis (see Croup), 331
Treacle as a laxative, 46
Trichocephalus dispar, 307
Tricuspid regurgitation, 546
Trommer's test, 289
Tubercle of the kidney, 278
Tubercular meningitis, 568
phthisis, 507
Tubercle, gray and yellow, 476
miliary, 478
Tuberculosis, 472
causes of, 481
pulse in, 493
respiration in, 495
sweating in, 64
symptoms of, 488
temperature in, 489
treatment, 520
Tumors, abdominal, 237, 243, 277, 279
Tympanitis in typhoid fever, 87
Typhilitis, 206
diagnosis from intussusception, 221
Typhoid fever, 83
diagnosis from meningitis, 92
from tuberculosis, 94
sequelæ, morbid appearances of, 89
symptoms of, 85
treatment of, 92
Ulcerative endocarditis, 542
Uræmia in scarlet fever, 127
Uric acid gravel, treatment of, 276
Urinary sediments, composition of, 276
Urine, deficiency of chlorides in pneumonia, 454
in chorea, 627
in infantile paralysis, 651
in rickets, 675
specific gravity of, 251
Urticaria, 719

Vaccinia or vaccination, 97
Vaginal discharges, 691
Valves, aortic disease of, 545
Valvular disease of heart, 544
treatment of, 552
Vapor-bath in acute nephritis, 262
Varicella, diagnosis and treatment of, 100
Variola, or small-pox, causes of, 143
morbid appearances, 126
mortality of, 143
ophthalmia, 147
prevention of pitting, 146
prognosis, 143
sequelæ, 145
three varieties of, 138
treatment, 144
varioloid, or modified, 141
Venesection in congestion of the brain, 620
in pericarditis, 537
in pneumonia, 458
Venous murmurs, 694
Vinum antimonialis, 423
Vitiated appetite, 169
Vomiting in diarrhœa, 188
in indigestion, 168
in meningitis, 571
in pneumonia, 454

Waxy kidney, 269
Weaning, state of digestion in, 167
Whooping-cough (see Pertussis), 366

Zinc, bromide and oxide of, in epilepsy, 603
sulphate of, in chorea, 636
in whooping-cough, 376, 382

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