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STUDENT'S GUIDE SERIES

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THE STUDENT'S GUIDE TO MEDICAL DIAGNOSIS

BY THE SAME AUTHOR

Outlines of Medical Treatment; Intended as a Companion to THE STUDENT'S GUIDE TO MEDICAL DIAGNOSIS. Second Edition, fcap. 8vo, 7s.

THE STUDENT'S GUIDE TO MEDICAL DIAGNOSIS

BY

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Sixth Edition, Revised and Enlarged

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PREFACE TO SIXTH EDITION.

THE whole of the volume has been carefully revised, and some additions have been made in various chapters.

29 HARLEY STREET,
CAVENDISH SQUARE,
January 1, 1886.

PREFACE TO FIRST EDITION.



The following pages were originally designed to assist the students attending the medical out-patient department of the London Hospital. The plan of instruction generally pursued there is to give to each pupil a succession of cases of a similar character. In this way, whilst one is practising the laryngoscope, another is studying auscultation, a third affections of the nervous system, and so on. After examining a case, the student is expected to state his diagnosis, and the treatment he would adopt. Although this method of *individual* instruction is doubtless more beneficial than the practice of teaching in classes, yet it necessarily involves a constant repetition on the part of the teacher. To obviate the loss of time thus incurred, I commenced to write out some general rules for diagnosis, which the student might keep beside him as a guide in his examinations. It was afterwards suggested to me to elaborate the idea, and hence the appearance of the present volume.

As the pupils have been supposed not to have yet acquired any professional knowledge, except in

anatomy and physiology, all technical words have been avoided as far as practicable, and the explanations have been given in the plainest language. Drawings and diagrams have been employed whenever the nature of the subject permitted their use.

It will be observed that I have confined myself to the general rules of diagnosis, and taken but little notice of the exceptions to them that are met with in practice. This has arisen, partly from a desire to keep the volume within a moderate compass, but mainly because exceptional, or as they are generally termed, "interesting cases," form the usual texts for clinical lectures, and are therefore less required by the student in an elementary work.

29 Harley Street,
Cavendish Square,
October 1, 1869.

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GUIDE

TO

MEDICAL DIAGNOSIS.

CHAPTER I.

INTRODUCTION.

It is evident that before any one can successfully treat a disease he must be acquainted with its nature and the symptoms it produces. For instance, before prescribing for a patient suffering from pain in the head, you must ascertain from what the pain arises. It may result from the irritation of a decayed tooth, the extraction of which will give relief; or from inflammation of the periosteum, in which case you prescribe iodide of potassium with success; or from constipation of the bowels, for which a purgative only is required; or again, it may be symptomatic of an incurable disease of the brain, which might be aggravated by many of the remedies well fitted for the cure of a less formidable disorder. Diagnosis is the science which teaches us thus to distinguish one disease from another, and to trace symptoms to the causes from which they spring.

Now, diagnosis is not only valuable for treatment, but it enables you to form an accurate opinion as to the future course of a disease. For example, two persons complain of palpitation of the heart: in the one you may be able to prove that the organ is healthy

in its structure, but unduly excited by disordered digestion; in the other you may find it affected with an incurable disease that may at any moment terminate the patient's life.

Before commencing to study the method of diagnosing the diseases of an organ, you should acquaint yourself with its healthy structure and with the various morbid conditions to which it is liable. You will not be able to understand why the chest should give a clear sound when struck with the fingers in a patient suffering from bronchitis, and a dull sound in a case of pneumonia, unless you are aware that the resonance of a healthy chest depends on the air contained in the cells of the lung, and that these cells are unaffected in bronchitis, but are filled with fluid or solid matter in pneumonia. Refresh your memory, therefore, as to the anatomy and physiology of each organ, and carefully read over the description of the different diseases to which it is liable, before you attempt to diagnose them. You should also take every opportunity of comparing the remarks on morbid anatomy with the appearances presented to you at the post-mortem examinations, so as to make yourself familiar with the structural changes produced by disease.

Diseases are distinguished from each other either by such alterations in the organs themselves, or their secretions, as can be ascertained by the senses of the observer (physical signs); or by changes in the functions of the parts affected (symptoms).

The physical signs of a disease are least liable to mislead us, inasmuch as in regard to them we are independent of any misconception or exaggeration on the part of the patient. Thus, when we hear a murmur in the region of the heart, or find the lung dull on percussion, or discover blood in the urine, we know there must be some abnormal condition of the heart, lung, or urinary organs. Great attention has been given of late years to this part of diagnosis,

and various instruments have been invented—such as the stethoscope, laryngoscope, &c.—for the purpose of enabling us more accurately to appreciate the nature and extent of morbid changes. Care and patience are, however, required before you will be able to use these instruments with advantage, and I have therefore placed at the commencement of each chapter an account of the different methods of physical examination required, and a few directions as to the best mode of conducting them.

Physical signs cannot be exclusively relied upon for the formation of a diagnosis: the symptoms and history of the case must be also taken into consideration. It is generally difficult for a young student to guide the patient's account of his complaint in such a way as to derive the necessary information from it. Most persons ramble in describing their symptoms, and many insist on giving their own or other persons' opinions as to the nature of their disease, instead of confining themselves to the narration of facts. You will best overcome these difficulties by conducting your examination in a systematic manner, and by having a definite aim in every question you ask.

Students generally expect that some particular sign or symptom is sufficient to indicate each disease; but unfortunately this is not the case: on the contrary, we can rarely diagnose any morbid condition without taking into consideration a number of symptoms; indeed, we are often forced to determine the nature of a malady by proving what it is not rather than what it is. The plan of diagnosis adopted in the following pages has been to divide all the diseases of each organ into groups, by fixing upon some well-marked character which is possessed by some in common, but which is wanting in others; and in the same way to divide and subdivide each group. Thus, the diseases of the liver are first grouped into acute and chronic affections; the latter are again separated from each other, according as the organ is enlarged

or diminished in size; and the enlargements are further subdivided into those in which there is, and into those in which there is not, either pain or tenderness on pressure.

The art of diagnosis would be readily acquired if the symptoms of a disease were always the same, but this is not so. Although, therefore, the rules laid down will generally suffice, yet you will occasionally meet with cases in which the ordinary indications are absent, or in which unusual symptoms are present. For instance, no complaint has more strongly marked signs than peritonitis—the excessive and general pain of the abdomen, the great tenderness on pressure, the rapid, wiry pulse—and yet you may meet with fatal peritonitis with scarcely any pain, or with only trifling tenderness, or with a pulse not above the normal standard.

In order to obtain the necessary skill in diagnosis, it will be requisite that you should practise the "taking of cases." You should record the symptoms and physical signs present in each case, the order in which the symptoms have been developed, the treatment adopted, the progress of the disease, and, if it terminate fatally, you should add the morbid appearances discovered after death. You will readily understand that unless some plan is adopted, there is a great probability that you will either encumber your description of the disease with a number of unnecessary details, or overlook important facts. I have therefore added the following suggestions for a plan, which you will find useful until experience enables you to form one more suitable.

Commence with the name and address of your patient, his age, and occupation.—The age is important, because many diseases, such as cancer, are more apt to occur at certain periods of life. The nature of the occupation often gives a clue to the complaint; as, for instance, painters and other workers in lead are especially liable to colic, paralysis, gout, and disease of the kidneys.

Note the position of the patient.—In pleurisy, with effusion, he usually rests on the affected side ; in many diseases of the heart and lungs he prefers the sitting posture ; whilst he lies flat and helpless in fever and other diseases attended with great weakness.

The condition of the body.—Emaciated, as in phthisis, œdematous in diseases of the heart, kidney, &c.

The state of the skin.—Yellow, as in jaundice, dry and harsh as in some diseases of the kidney, soft and perspiring in rheumatic fever, &c.

The features and expression.—Every feature may furnish important indications of disease. The arcus senilis often accompanies fatty degeneration of the heart ; the nostril is dilated where the breathing is difficult ; the angle of the mouth drops in palsy, it is fixed in a rigid smile in tetanus.

Whilst noting the above or any other peculiarity, avoid all unnecessary staring at your patient ; educate your eye to catch the smallest deviation from the normal condition, and, at the same time, try to put the patient at his ease, so that he may be more ready and willing to answer your questions.

Next, inquire as to the manner in which the complaint commenced, whether suddenly or gradually ; if it followed some other disease, such as scarlatina or rheumatic fever ; or if it could be reasonably attributed to any particular cause, as exposure to cold, accidents, &c. Ascertain also if any of the patient's family have been subject to any particular malady, and if he himself generally enjoyed good health before his present illness.

The best way of commencing your inquiries as to the organ more especially affected is to ask if the patient suffers pain. If, for example, he complains of the right side of the chest, you know the lung is situated in that part, and you should inquire into the state of the functions of that organ and ask if he suffers from cough, expectoration, dyspnœa, hæmoptysis, &c.

Having determined which organ is diseased, ascertain the nature of the ailment by the rules laid down in the chapter referring to it, and note the symptoms and physical signs present in the case.

It is seldom that any organ remains long diseased without implicating others. You must therefore inquire into the manner in which the functions of all the chief organs are performed, paying more especial attention to those which are most liable to suffer along with that primarily or chiefly affected. Thus, if you should suspect lardaceous disease of the liver, you would particularly examine the state of the spleen and kidneys; or in a patient suffering from contracted kidney you would investigate the condition of the heart and retinæ.

In every case it is important for you to note the state of the pulse, respiration, tongue, and appetite, together with the condition of the bowels and the amount, appearance, and chemical composition of the urine, and, when any fever is present, the temperature in the axilla.

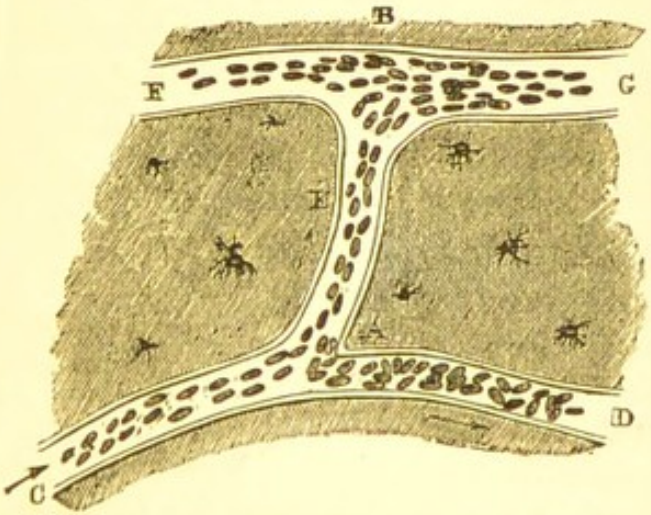
Remember to commit all your observations to writing. A number of well-recorded cases is invaluable, and forms the best "practice of physic" for your future reference and guidance. Describe only what you see and hear, do it in the simplest language, and do not allow your expressions to be influenced by any preconceived opinion as to the nature of the disease you are investigating. Be exact in your description of physical signs, and, as much as possible, employ your pencil in marking out on diagrams of the body the precise spots at which you discover any signs of disease. In this way, with ordinary industry in collecting cases, and perfect honesty in recording your observations, you cannot fail quickly to surmount the difficulties of medical diagnosis.

As inflammation is the cause of so many of the morbid changes that occur in every organ of the body,

it will be necessary to make some preliminary observations in order that you may understand the microscopical appearances of the parts affected by it. This process has been carefully studied with the microscope in the transparent parts of several of the lower animals; the wing of the bat, the mesentery, tongue, or web of the frog, being generally selected for this purpose.

As soon as inflammation has been set up, either by exposure to the air or the application of some irritating substance, the smaller arteries are seen to dilate, the blood is observed to flow with increased speed through them, and the vessels become elongated and more tortuous than in their normal state. The

FIG. 1.



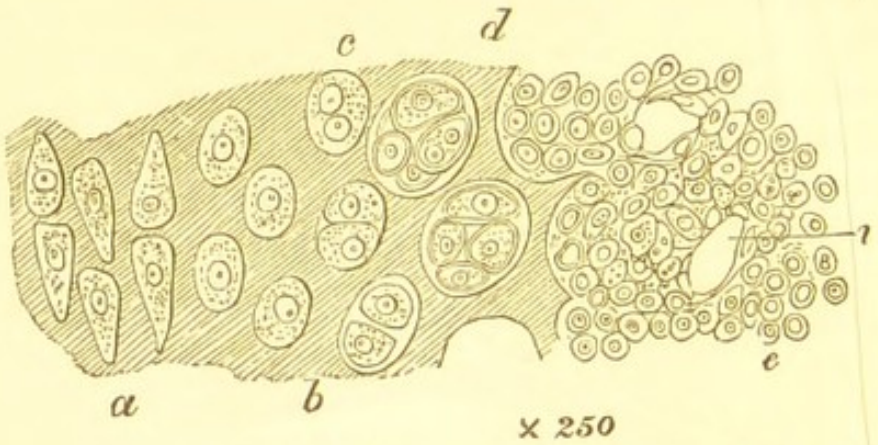
Production of stasis in inflammation. (WHARTON JONES.)

dilatation soon extends to the neighbouring capillaries and veins, and is at first accompanied by an acceleration in the rate of their contents. After a time the current of the blood gradually becomes slower, the retardation being first perceptible in the veins, but gradually increasing, until, towards the centre of the inflamed part, obstructions may be observed in some of the capillaries, and after many oscillations to and fro, the further progress of the blood in them is completely arrested.

As soon as the circulation begins to slacken, an in-

crease in the number of the white globules of the blood (leucocytes) is observed to take place in many of the veins and capillaries. They collect at the sides of the dilated vessels, whilst the red globules are crowded together in the centres, and form a mass, in which their individual shapes can no longer be recognised. The stasis of the red blood-cells usually first occurs at a bifurcation of a vessel. Thus, in fig. 1, the blood-cells passing along the vessel C, strike against the wall of the capillary at its bifiurcation, and block up the vessel at D. Finding their way through the communicating branch, a crowd of cells meet at B, from both F and C, and eventually block up the vessel F G also.

FIG. 2.



Microscopical appearances presented by cartilage when inflamed. *a*. Normal cartilage cells. *b*, *c*, *d*. Cartilage cells increasing by division. *e*, *i*. Groups of newly formed cells. (CORNIL and RANVIER.)

You will readily understand that the liquid part of the blood (the liquor sanguinis), being subjected to the pressure of the heart behind at C and F, and arrested in its onward progress at D and G, will strain through the sides of the distended vessels, and thus, in part, produce the swelling which is so constant an accompaniment of inflammation. But the white corpuscles of the blood have been also seen by the microscope to pass through the walls of the capillaries and veins into the surrounding structures, where they travel

from place to place, and by their division, reproduce numerous other cells like themselves. When the inflammation is intense some of the red blood-cells also escape from the vessels, but in smaller quantities than the leucocytes.

Some physiologists are inclined to refer all the newly formed cells in the neighbourhood of an inflamed part to the white globules of the blood, thus exuded and multiplied by self-division. Others, on the contrary, contend that the elements of the tissues themselves increase by division, and assist in the production of the pus-cells and other products of inflammation. This process is shown in fig. 2, as it appears in inflamed cartilage. The multiplication of cells is most clearly seen when the skin or a mucous membrane is affected. Thus the cellular casts of the uriniferous tubes in acute tubular nephritis, and the mucus secreted during an attack of bronchitis, afford good examples of this result of the inflammatory process.

CHAPTER II.

DISEASES OF THE HEART AND PERICARDIUM.

The chief diseases of the heart are pericarditis, myocarditis, hydropericardium, hypertrophy, dilatation, fatty degeneration, endocarditis, and diseases of the valves.

1. Pericarditis, or inflammation of the pericardium.—When death occurs in the early stage the lining membrane is of a red colour, it is rough, pulpy, dry, thickened, and is usually covered with a thin layer of lymph. At a later period the pericardium is distended with a turbid fluid, having flakes of lymph floating in it, whilst the surface of the serous membrane is thickly coated with lymph, which is often arranged in the form of little hillocks, or like the sand on the sea-shore, or it may be loose like thread. These appearances are produced by the motions of the heart continually separating the opposed surfaces of the serous membrane when covered with the soft lymph. In mild cases the inflammation may be confined to one part of the membrane, but usually it affects both the visceral and parietal surfaces; being most intense in the former. In some instances the fluid is stained with blood or mixed with pus. Occasionally there are minute tubercles on the pericardium, when the disease is named *tubercular pericarditis.*

The first effects of pericarditis are to excite the action of the heart and to set up general fever. Where a large quantity of fluid is effused the power of the heart is enfeebled, and thus congestion of the

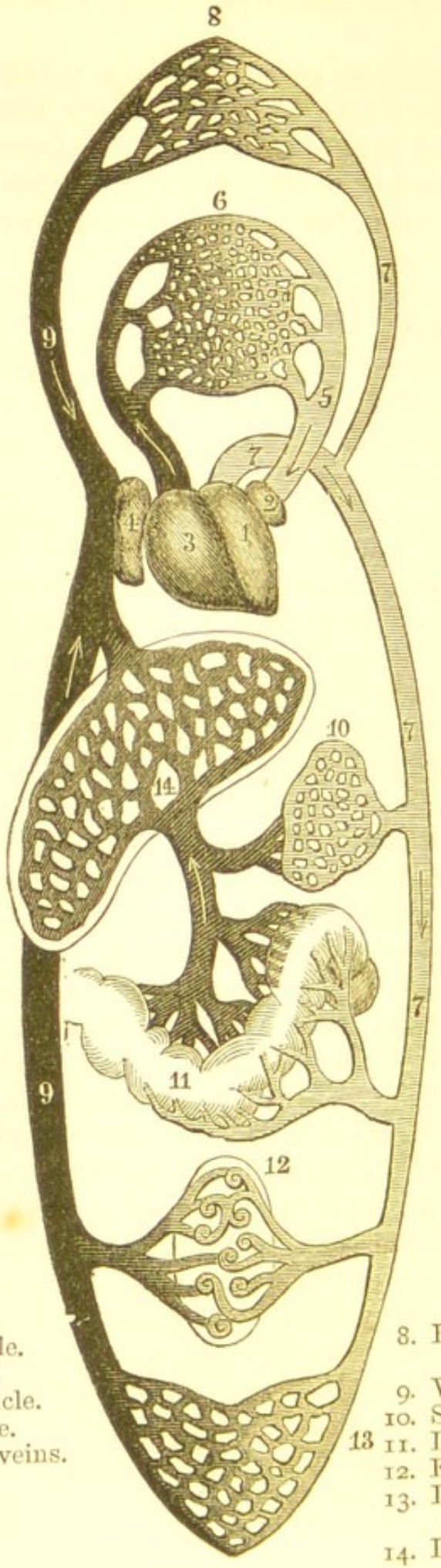
lungs and other important organs is induced. After the cessation of the inflammation we often find bands of connective tissue between the opposed surfaces of the pericardium, or its cavity obliterated by general adhesions. (For the microscopical appearances see Pleurisy.)

Idiopathic pericarditis is a very rare disease; it usually results from acute rheumatism, pyæmia, eruptive fevers, such as scarlatina, or from diseased kidneys; or it may follow injuries to the chest or inflammation of the lung, or pleura.

2. Hydropericardium, or dropsy of the pericardium.—A small quantity of fluid is commonly found in the pericardium after death, but in hydropericardium the cavity is distended with fluid of an amber colour, without the lining membrane being thickened or inflamed. It chiefly arises from diseased heart or kidneys. The compression caused by the fluid, when this is present to a large amount, prevents the free action of the heart, and may thus give rise to congestion of the lungs.

3. Hypertrophy of the Heart.—When the whole organ is affected it is of a globular shape and is greatly increased in size; often double or treble the normal weight. The thickness of its walls is also much increased. In some cases only one of the cavities is thickened; the left ventricle being most frequently affected. When the left ventricle is alone or chiefly hypertrophied the heart is elongated; if the right ventricle is alone hypertrophied, the apex is partly or wholly formed by it, and the organ assumes a square shape. The substance of a hypertrophied heart feels hard and stiff, and the walls do not collapse when the cavities are emptied of blood. Microscopically, unless fatty degeneration is also present, the edges of the fibres are sharp, and their transverse striæ well defined, but the fibres do not appear to be thicker than in their normal condition. After the disease has existed for some time the hypertrophied

FIG. 3. *Diagram of the Circulation.*—(DALTON.)



1. Left ventricle.
2. Left auricle.
3. Right ventricle.
4. Right auricle.
5. Pulmonary veins.
6. The lungs.
7. Aorta.
8. Brain and upper extremities.
9. Venæ cavæ.
10. Spleen.
11. Intestine.
12. Kidney.
13. Lower extremities.
14. Liver.

muscle often becomes affected with fatty degeneration.

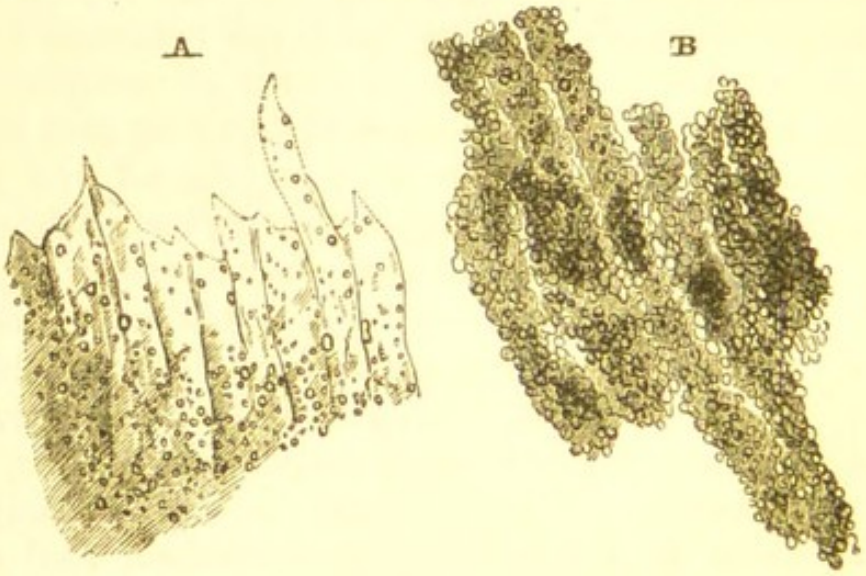
There are three forms of hypertrophy—1. *Simple* hypertrophy, where the wall is thickened, but the cavity is not enlarged. 2. *Eccentric* hypertrophy, known also as *hypertrophy with dilatation*, where the wall is thickened and the cavity also enlarged. 3. *Concentric* hypertrophy, in which the wall is thickened and the cavity lessened. The second is much the most frequent; indeed, many deny the existence of the third form.

Hypertrophy is caused by any obstruction to the current of blood that is sufficient to call forth an increased action of the heart to overcome it—in other words, by overwork. Thus the right ventricle (see 3, fig. 3) is chiefly affected in cases of emphysema, chronic bronchitis, and disease of the left side of the heart, which obstruct the free course of the blood through the lungs (6, fig. 3); the left ventricle (see 1, fig. 3) by an obstruction in the aorta (see 7, fig. 3); the left auricle (2, fig. 3) by a constriction of the mitral valve. The increased force of the heart's action, when it is hypertrophied, tends to produce disease of the brain and other important organs.

4. Dilatation of the Heart.—The capacity of one or more of the cavities is increased, and when the whole organ is affected it is of a square shape, and is, of course, much enlarged. Dilatation usually involves both ventricles, but is most common in the right when one only is affected. The auricles generally participate in the increase in size. Microscopically, the striæ of the fibres often appear indistinct and granular; in other cases they seem to be in a state of fatty degeneration. There are three forms of dilatation—1. *Simple dilatation*, when the cavity is enlarged but its wall is of normal thickness. 2. *Dilatation with hypertrophy*, when the cavity is enlarged and the muscle is thickened. 3. *Dilatation with thinning of the wall.*

Dilatation may be caused by any circumstance that prevents the complete emptying of one of the heart's cavities; thus it affects the left ventricle when an imperfect closure of the aortic valves allows the blood which had been just expelled to flow back again into that cavity; or it may be caused by loss of tone resulting from myocarditis or general debility, or from fatty or other degenerations of the muscular structure of the heart. In consequence of the feeble contractions of the organ, the lungs and liver are apt to be congested, and dropsy is produced.

FIG. 4.



Specimens of fatty degeneration of the heart. A. Heart fibres taken from the columnæ carneæ of the mitral valves. B. An extreme case of fatty degeneration, showing an entire conversion of the muscular fibre into oil molecules, still retaining a linear arrangement. (JONES and SIEVEKING.)

5. FATTY DEGENERATION.—The heart is of a pale yellow colour, it feels soft, flabby, and greasy, and tears readily. Microscopically, the fibres have lost their sharp edges and striæ, and are more or less loaded with oil; in other cases the sarcolemma is filled with granular matters. (See fig. 4.) Fatty degeneration occurs under four forms—1. Confined to the superficial layers of the muscle immediately

below the pericardium, arising from pericarditis. 2. As white dots or marks, immediately below the endocardium, common in valvular and other cardiac diseases. 3. As a single, isolated part, usually in the wall of the left ventricle, resulting generally from imperfect nutrition consequent on an obstructed state of the coronary arteries by atheroma. 4. As a general affection of the whole organ, as in fevers, cancer, and other diseases affecting the general nutrition of the body.

The left ventricle and the carneæ columnæ are most liable to fatty degeneration. This condition sometimes follows myocarditis, fevers, or poisoning with phosphorus, but it is most commonly found in persons of old or middle age, and is generally associated with other diseases of the heart or coronary arteries. Its chief effect is to greatly diminish the energy of the heart's contraction, so that the brain and other organs are imperfectly supplied with blood.

6. Fatty Infiltration must not be confounded with fatty degeneration. It is merely a form of local obesity, and consists in the accumulation of fat below the pericardium, and between the muscular fibres. The fibrils themselves appear healthy when viewed microscopically, and are capable of performing their functions during life.

7. Endocarditis, or inflammation of the endocardium.—In the early stage of this disease the lining membrane of the heart is reddened, roughened with lymph, and projections like small warts, named vegetations, are often found on the valves, being most thickly placed on the lines where the segments of the valves come into contact with each other during their closure. In other instances the segments of the valves are united together, or the chordæ tendineæ or valves are softened and torn, or, more rarely, ulceration of the endocardium, or perforation of a valve, takes place; or the valves are opaque, thickened, or contracted. The inflammation may be of a chronic

character, and in old persons the valves of the heart often become thickened, atrophied, contracted, or ossified from degeneration.

The left side of the heart is almost always the seat of endocarditis and of other forms of valvular disease, and the mitral is more frequently affected than the aortic valves.

These various morbid changes in the valves either narrow the openings of the heart, and thus obstruct the free passage of blood through them, or they prevent the perfect closure of the valvular apparatus, and thereby allow a portion of the blood to flow back into the cavity from which it had been just expelled (regurgitation). In these ways an imperfection in a valve leads eventually to hypertrophy or dilatation of the heart.

8. MYOCARDITIS, or inflammation of the muscular substance of the heart, may occur as an idiopathic and general inflammation, or may be limited to the strata of muscular fibres, situated immediately below the pericardium or endocardium. The former is exceedingly rare, the latter more common, chiefly as an accompaniment of endo-pericarditis. Myocarditis in rare instance results from pyæmia and pneumonia. The muscular structure is softened, it is of a dark red colour, and in pyæmic cases often presents numerous spots of pus scattered through the affected part. In chronic myocarditis, which is most commonly the result of syphilis, the structure is hard and dense, from the formation of fibroid tissue between the bundles of the muscular fibres. Microscopically, in the acute cases the fibrils are seen to have lost their transverse striæ, and appear to consist chiefly of granular and fatty matters.

As inflammation diminishes the contractile power of a muscle, the action of the heart is weak and irregular in myocarditis, and the circulation of the blood is feebly carried on. It may terminate in abscess, or may give rise to dilatation of the heart.

9. Cancer of the Heart only occurs when other important organs are similarly affected, or as an extension of malignant disease of the pericardium or mediastinum.

10. Tubercle of the Heart is very rare, and presents itself chiefly in children, along with general tuberculosis.

11. Thrombosis.—The blood occasionally coagulates in some part of the vascular system during life, just as it does when drawn from the body by venesection. Such a coagulum, which is termed a *thrombus*, may take place in the arterial system, as in an aneurism, but more commonly it occurs in one of the cavities of the heart or in a vein. It may result either from a retardation of the current of the blood, or may occur where the surface of the lining membrane with which it is in contact has become roughened, as in endocarditis. A thrombus may become organized, or it may soften. In the former case blood-vessels are developed in it, and it is eventually converted into connective tissue that firmly adheres to the vessel. In case of softening the change usually begins in the interior of the clot. This breaks up into a soft pulpy mass that often presents the appearance of pus to the naked eye, but under the microscope is seen to consist only of granular matter, fat globules, and altered blood-cells.

12. Embolism.—In case a thrombus or a vegetation on one of the valves of the heart is detached, it is swept onwards by the force of the blood until it reaches a vessel through which it is unable to pass; it then becomes wedged in its new position and is termed an *embolus*. Of course this is most liable to occur in that part of the vascular system which the thrombus has first to traverse after its detachment. Consequently the vessels of the brain are most apt to be obstructed in diseases of the mitral and aortic valves; the pulmonary circulation where coagulation has taken place in the right side of the

heart, and the liver in affections of the organs whose blood is returned by the vena portæ. The first result of an obstruction to the current of blood by an embolus is a loss of functional power in the parts thus deprived of their nutriment. Thus, paralysis takes place when a portion of the brain has in this way been suddenly rendered anæmic. If the circulation is restored by the blood finding its way through collateral branches no permanent injury is

FIG. 5.



Diagram of an embolic hyperæmia (of the lung). A. Small artery occluded at E by an embolus. V. Vein. filled with a blood-clot arising from the stoppage to the circulation. The arrows show the collateral routes by which the congestion is produced. (RINDFLEISCH.)

produced, but if such is not the case the neighbouring vessels become congested and hæmorrhage usually occurs (see fig. 5). The structures permanently deprived of blood either soften or suppurate. Softening takes place most frequently in the brain, because the emboli entering its circulation are usually vege-

tations or clots washed from the heart. Suppuration is more common in the lungs and liver, on account of the clots arrested in their vessels being more generally derived from veins obstructed by blood in a state of decomposition, as in the case of puerperal inflammation or dysentery.

13. Make yourself acquainted with the size of the healthy heart, which you can ascertain by observing where the apex strikes the walls of the chest and by percussion. The impulse should be about one inch-and-a-half below, and three-quarters of an inch to the right of the nipple in the male, and at a corresponding distance from the edge of the sternum in the female, in whom the nipple is an uncertain guide. To estimate the size of the heart by percussion, you place the patient on his back, with the head slightly raised. Then tap lightly on the back of the forefinger of the left hand laid over the heart's region with the pulp of the forefinger of the right hand. If you percuss forcibly, you bring out the dulness where the heart is covered by the lung. Commence where the sound is dullest, and gradually proceed outwards until the clear sound shows you that you have reached the edge of the lung. Mark the boundaries with a pencil or ink. You will find that the right boundary of the superficial dulness over a healthy heart is a vertical line through the middle of the sternum extending downwards from the level of the fourth costal cartilage. The left boundary extends in a waving line from the sternum, opposite the fourth costal cartilage, to the apex of the heart. The inferior boundary is on a line extending from the lower edge of the sternum along the sixth costal cartilage to the place where the apex strikes the walls of the chest.

14. You must next accustom yourself to the normal sounds of the heart, and for this purpose a stethoscope is required. A word of advice, therefore, may be useful as to the choice of a stethoscope. The

wooden stethoscope is best fitted for the ordinary examination of the heart. Before buying one, see that the ear-piece is sufficiently large and accurately fits your ear, and that the opposite end is of moderate size. The flexible stethoscope of Dr. Cammann, in which an ear-piece fits into each ear, can be used for the examination of the heart, but it is better fitted for auscultation of the lungs. The double or differential stethoscope of Dr. Scott Alison is exceedingly useful in many diseases of the lungs, and may be also employed with advantage in the diagnosis of valvular disease. If, for instance, you wish to ascertain whether a murmur you hear originates in the mitral or the aortic valves, place one cup over the apex of the heart and the other on the sternum, just above the third costal cartilage. If the murmur originates in the mitral, the sound will be heard only, or most plainly, through the cup placed on the apex of the heart, but if it arises in the aortic valves it will be most plainly audible through the other tube.

15. There are two sounds of the heart. You hear the first most distinctly by placing your stethoscope over the apex; for the second listen at the middle of the sternum, just above the third costal cartilage. The first sound is duller and longer than the second, coincides with the impulse of the heart, and is a little before the pulse at the wrist; the second coincides with the closure of the semilunar valves and the passive flow of the blood from the auricles into the ventricles. Ordinarily, the sounds are best explored when the patient is erect, but in cases of disease you may require to examine him in different positions.

16. As, however, the sounds of the heart are produced by the action of the valves, there are in reality four, and not two. But as the valves lie alongside, and even behind, each other, and are covered by the lungs, we can best distinguish the sounds by listening at those parts of the chest to which they are most readily conducted by the currents of the blood. Thus,

we hear the mitral sound best at the apex; that of the tricuspid at the right border of the sternum at the level of the fifth rib; that of the aortic valves on the right margin of the sternum, between the second and third ribs; whilst the sound of the pulmonary valves is most distinct in the second left intercostal space close to the sternum.

17. In case a valve acts imperfectly the normal sound is, of course, altered, and a *murmur* is produced. Murmurs are longer than the healthy sounds, and vary greatly in pitch; some being so faint that they are difficult to distinguish, whilst others are so loud and harsh they can be scarcely overlooked. You may, however, mistake a sound originating in the bronchial tubes or pleura for a murmur. In order to distinguish between them you ask the patient to stop his breathing for a few seconds; if it be produced in the lungs, it will of course immediately cease along with the respiration, but will persist if connected with the action of the heart.

18. To ascertain which valve is affected, you must listen at the places at which the normal sound of each valve is best heard (16) and find where the murmur is loudest. Place the stethoscope, for example, over the apex; if the murmur is loudest there (A, fig. 6), and inaudible, or only faintly audible, at the ensiform cartilage, and if it can be heard at the inferior angle of the left scapula, you know that the *mitral valve* is diseased, or is incompetent to perform its functions. If its intensity is greatest at the ensiform cartilage (C, fig. 6), and it is only faintly heard or inaudible at the apex, the *tricuspid valve* is the seat of the murmur. If it is loudest at the middle of the sternum, just above the third costal cartilage, it depends on an affection either of the aortic or pulmonary valves (B and D, fig. 6); if loudest above the second right costal cartilage, the *aorta or its valves*, if above the second left costal cartilage, the *pulmonary artery or its valves*, is the seat of the murmur.

19. Next, while listening through the stethoscope, place your finger on the carotid artery, and find whether the murmur corresponds with its pulsation (systolic), or whether it just precedes the impulse of the heart (pre-systolic), or occurs with, or directly

FIG. 6.

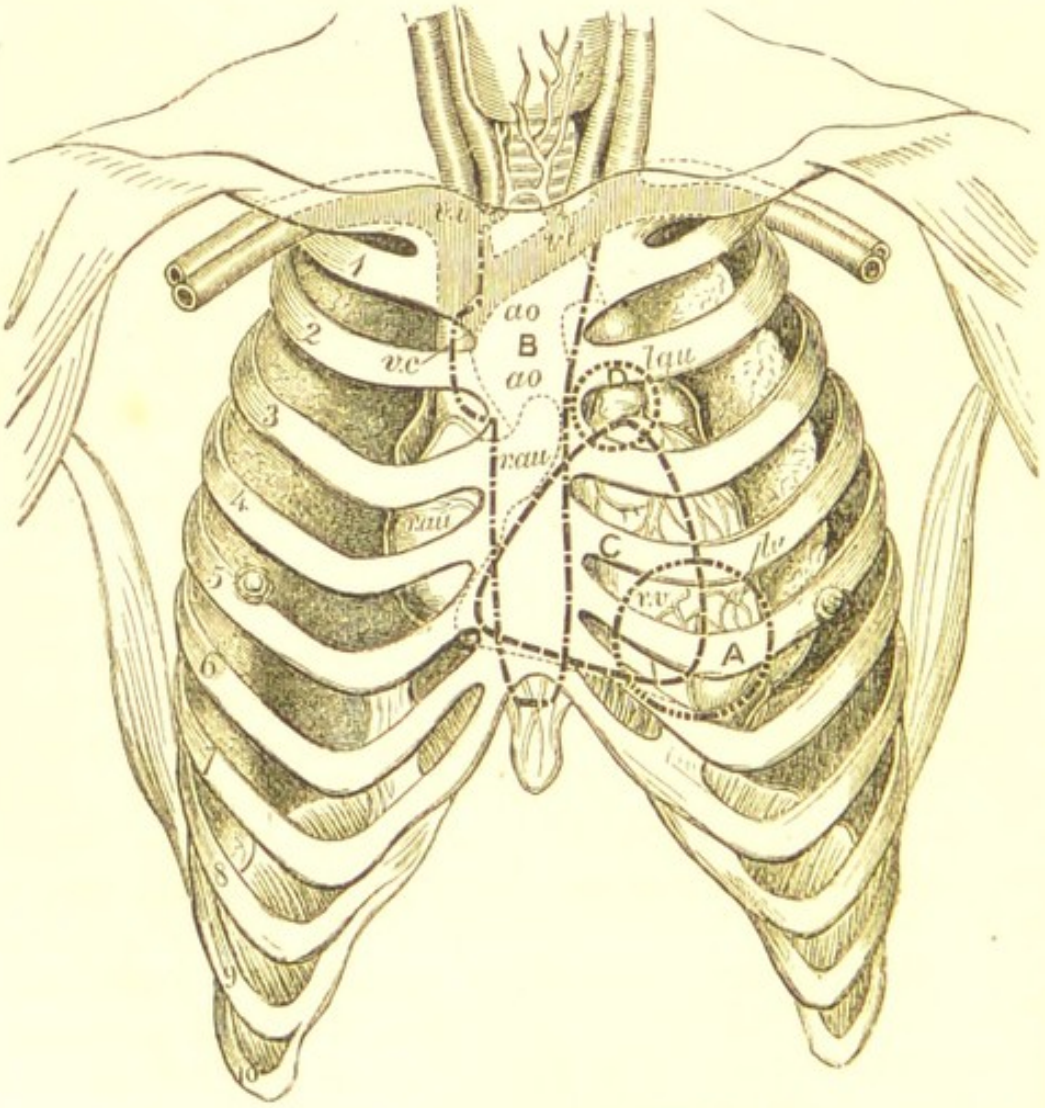


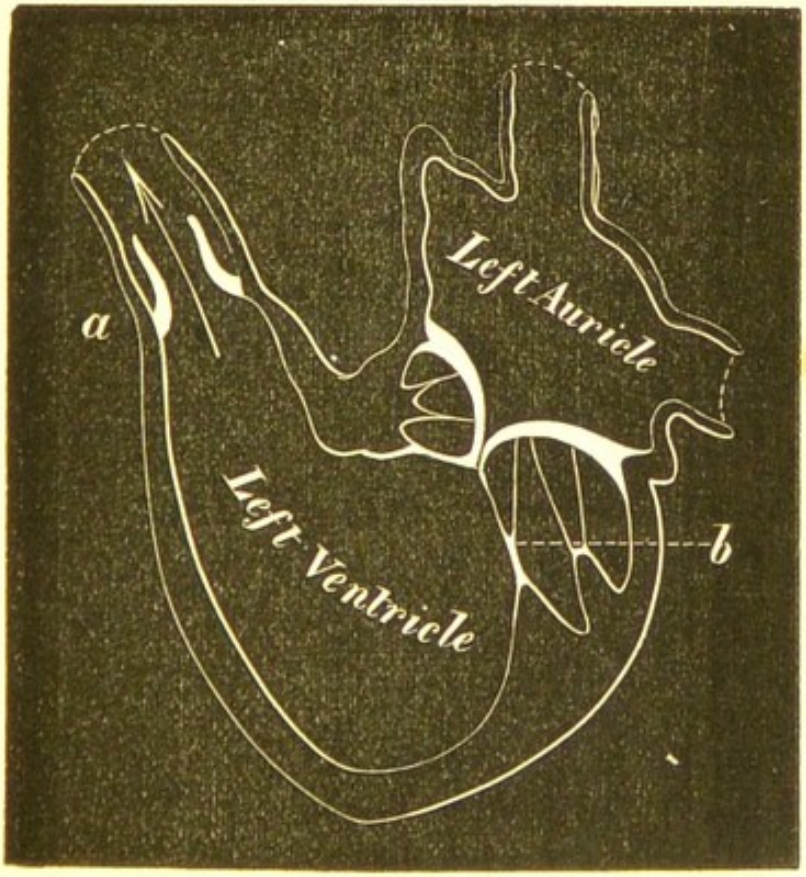
Diagram showing the areas over which the murmurs produced in the different valves of the heart are chiefly audible. A. The seat of the mitral murmur. C. The seat of tricuspid. B. Seat of the aortic. D. Seat of pulmonary murmur. *r. v.* Right ventricle. *l. v.* Left ventricle. *l. au.* Left auricle. *r. au.* Right auricle. *ao.* Aorta. *v. c.* Vena cava. (GAIRDNER.)

after, the second sound (diastolic). The pulse at the wrist is not to be trusted, as it is rather later than

the pulse in the carotid, and the interval between it and the heart's impulse is much increased in some diseases of the valves.

20. Some students fail to understand how the cardiac murmurs are produced, from not keeping clearly in their minds the actions of the heart that correspond to the two sounds. To assist you in this,

FIG. 7.



Shows the ventricle in the act of contracting (first sound). Semilunar valves, *a*, open. Auriculo-ventricular valve, *b*, closed. Blood passing into arteries, *a*. Pulse at the wrist a little afterwards. Auricle refilling with blood. (DALTON.)

the following diagrams are added. You will observe (fig. 7), that with the first sound the contraction of the ventricles takes places, the semilunar valves (*a*) are open, the blood is poured through them into the vessels, so that the pulse is produced in the arteries, and the auriculo-ventricular valves (*b*) are closed to

prevent the blood being driven back into the auricles. As soon as the ventricles cease to contract (fig. 8) the semilunar valves (*a*) are closed to prevent the reflux of the blood from the aorta and pulmonary artery into the ventricles, whilst the auriculo-ventricular valves (*e*) are opened, so that the blood may flow from the auricles into the ventricles. You will now under-

FIG. 8.



Shows the ventricle after its contraction (after the second sound). Semilunar valves, *a*, closed. Auriculo-ventricular valve, *e*, open. Blood flowing from auricle into ventricle. (DALTON.)

stand that if a murmur accompanies or replaces the first sound, that is to say, occurs during the contraction of the ventricle, it must be produced either by the blood in its passage through the normal channels (*a*, fig. 7) or by its being forced through a chink left by the imperfect closure of the auriculo-ventricular valves (*b*); or in other words it is either

direct (*b*), or regurgitant (*a*) (fig 9). If the murmur follows or replaces the second sound, it must arise either from the reflux of blood through a chink in the semilunar valves (fig. 8, *a*) or be produced by the blood flowing from the auricles through a constricted auriculo-ventricular valve (*e*); or, as seen in fig. 10, it must be regurgitant at the semilunar valves (*b*), or direct (pre-systolic) at the auriculo-ventricular valves (*a*).

21. *A mitral systolic murmur*, therefore, arises from the blood being forced by the ventricle through a mitral valve, incapable of perfect closure, into the auricle (regurgitant murmur), or sometimes it merely indicates a roughness, swelling, or deposit on the valve itself, without any imperfection in its function (see *a*, fig. 9).

22. *A mitral pre-systolic murmur* is always the result of the blood passing through a constricted mitral valve from the auricle into the ventricle (direct murmur). This murmur is usually most intense at, or a little within, the point at which the apex beats; it is of a grating character, is ended suddenly by the first sound and impulse of the heart, and is generally attended by a thrill; it indicates constriction of the auriculo-ventricular opening, and consequently an obstruction to the entrance of the blood into the ventricle (see *a*, fig. 10).

23. *A tricuspid systolic murmur* arises from regurgitation of the blood from the right ventricle into the right auricle (regurgitant murmur). It is much more rare than the mitral murmur, and is scarcely audible above the third rib (see C, fig. 6).

24. *An aortic systolic murmur* is produced by the blood passing along the aorta or its valves (direct murmur); it is almost inaudible at the apex, but can be generally heard in the carotid arteries (see *b*, fig. 9).

25. *An aortic diastolic murmur* from reflux of the blood from the aorta into the ventricle (regurgitant murmur). It is heard loudly down the sternum, is

FIG. 9.

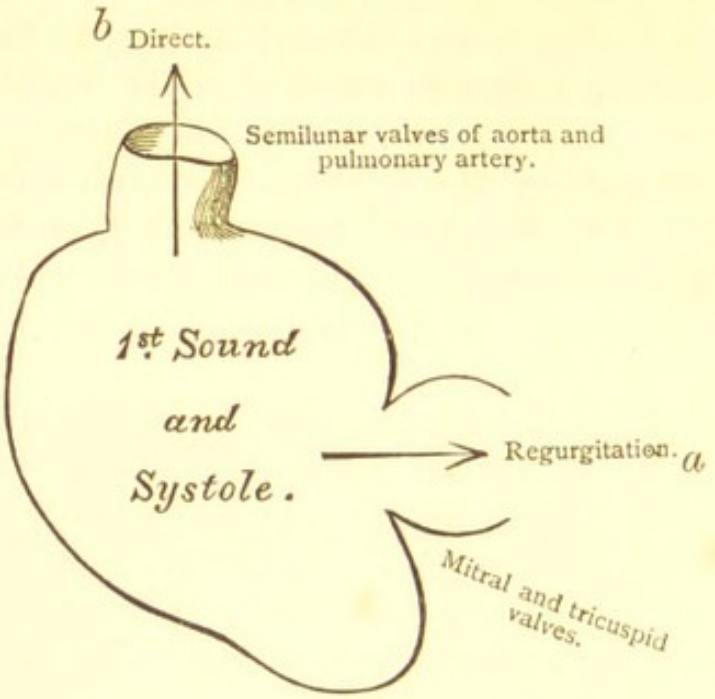
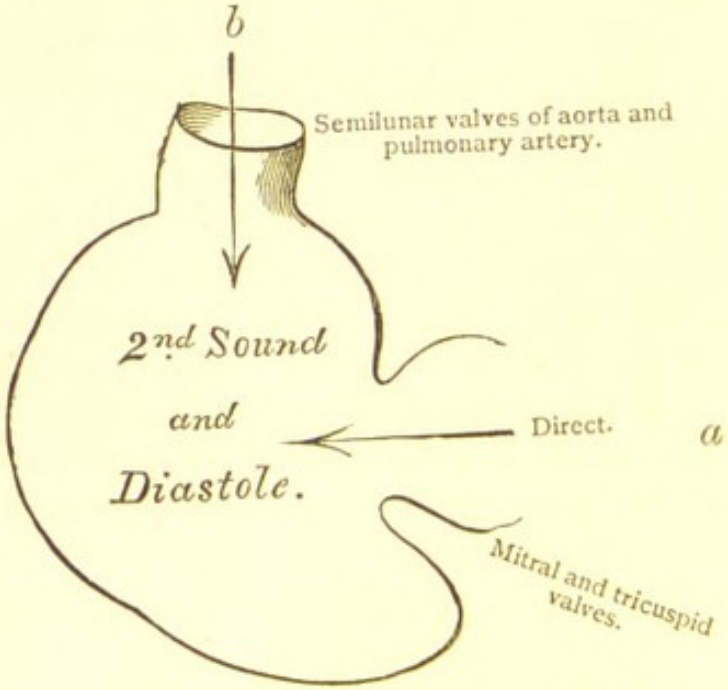


FIG. 10.

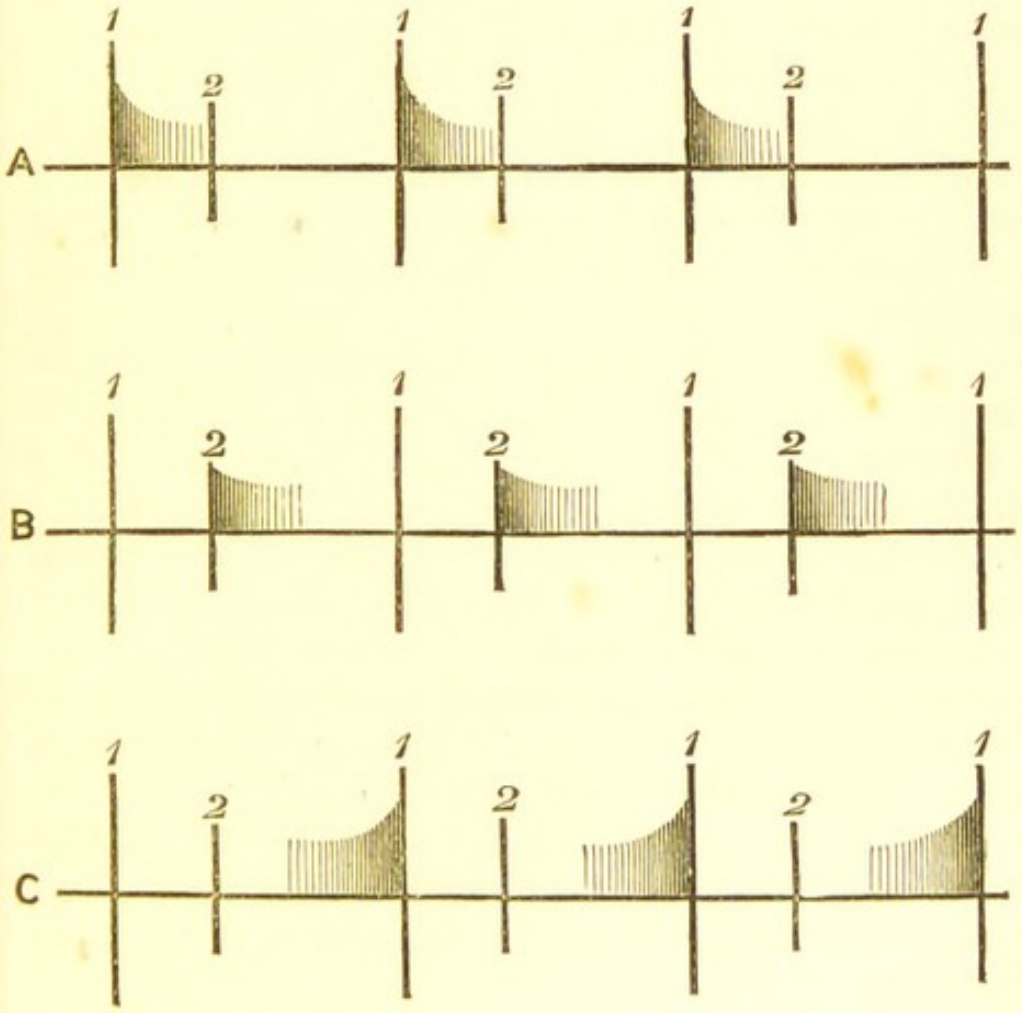


Showing the murmurs that may arise in the systole and diastole of the heart. (After HOPE.) The arrows point the directions which are taken by the currents of blood; thus it is seen in fig. 9, that with the systole you may have a direct murmur in the aortic or pulmonary artery, *b*, or a regurgitant murmur in the mitral or tricuspid valves, *a*, whilst, as in fig. 10, these may be observed to be reversed in the diastole of the heart.

usually audible at the apex, and fills up the interval of silence that, in the normal condition, exists between the second and the first sounds of the heart (see *b*, fig. 10).

26. *A pulmonic systolic sound* from the blood passing into the pulmonary artery (direct murmur); see *b*, fig. 9.

FIG. 11.



A. Shows the relation of the systolic murmur to the sounds of the heart. B. Shows the relation of the diastolic murmur. C. Shows the relation of the pre-systolic murmur. (GAIRDNER.)

The *tricuspid pre-systolic*, and *pulmonic diastolic* murmurs are so rare that the student need not regard them.

27. There is often much difficulty experienced, at first, in distinguishing between the mitral pre-systolic

and the mitral systolic murmur, and between the mitral pre-systolic and the aortic diastolic. Keep your finger on the carotid artery whilst you are listening to the heart, and carefully watch what relation the murmur bears to the pulse, or in other words to the first sound of the heart. In the accompanying diagram (fig. 11), copied from Dr. Gairdner, you will observe that at A a systolic murmur *directly* follows the first sound, and (as shown by the diminished depth of the shading) gradually lessens in intensity until it ceases just before the second sound. At B, the diastolic murmur *directly* follows the second sound, and dies away before the next systole of the heart. At C, on the contrary, the pre-systolic murmur begins after the second sound, and increases in intensity until it is suddenly arrested by the contraction of the ventricle. In addition to this the mitral pre-systolic murmur is of a grating character, is usually attended by a "thrill" perceptible to the hand, and is confined to a limited space about the apex. The systolic murmur is soft, seldom attended with thrill, and may be generally heard towards the axilla and at the angle of the left scapula. When a systolic and pre-systolic mitral murmur coexist, listen for the former towards the axilla, for the latter at, or to the right of, the apex. The diastolic aortic is soft, is heard loudly at the sternum opposite the fourth left costal cartilage, is attended with a jerking pulse, and usually the second sound is inaudible at the root of the neck.

28. The state of the pulse affords the best indication of the manner in which the heart is performing its office. Never feel the pulse when you begin to speak to the patient, but wait until he has overcome any nervousness your visit may have excited. The application of a single finger to the artery is sufficient to enable you to count the rapidity of the pulse, but it is better to apply two or three fingers when you wish to estimate its other conditions.

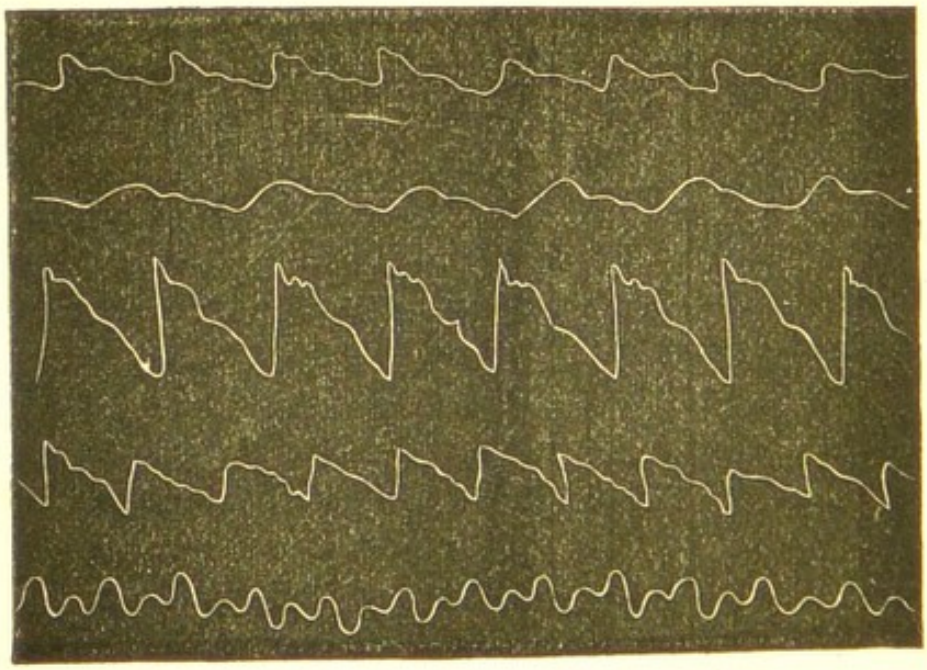
29. In feeling the pulse you must take notice of its frequency, regularity, fulness, strength of pulsation, and its resistance to pressure. It is most frequent in infancy (110–120 in the minute), in children of three years of age it ranges from 90 to 95, and in adults is usually about 72. It is generally very slow in compression of the brain; quick in fevers, in inflammation, and where there is great debility. The pulse is said to intermit when a beat ceases to be felt every few pulsations. It is irregular when the beats occur at irregular intervals. The strength and fulness of the pulse are of great importance, as they indicate the force with which the circulation is being carried on. It is strong in young persons and in hypertrophy of the heart, feeble in dilatation of that organ and in those weakened by disease. The compressibility of the pulse must always be considered. If the pulse ceases to be felt on a slight pressure of the finger, you may be sure that the circulation is in a feeble state. In old persons you may mistake a feeble pulse for a strong one, from the coats of the artery being thickened. To ascertain if this is the case, compress the vessel and then move your finger along it, when you will readily detect any hardness of the coats that may be present.

30. The condition of the pulse is best shown by the sphygmograph, and as this instrument is often of use in the diagnosis of diseases of the heart and the larger arteries, you should practise yourself in its employment. The instrument consists of a flexible steel spring, having at its end a small plate of ivory for the purpose of resting on the radial or other artery. The movement communicated to the spring by the pulse is transmitted to a light lever which registers the motions of the artery upon a piece of paper or smoked glass, travelling at a uniform rate by means of clockwork.

31. The chief difficulty in the use of the sphygmograph is the exact application of the spring to the

pulse, and Dr. Sanderson gives the following directions to facilitate this: "The artery can be best explored just as it passes over the ligament which extends across the most projecting part of the styloid process of the ulna; for above it is surrounded by a quantity of fatty cellular tissue, and lies on the surface of the *pronator quadratus* muscle, whereas beyond, in the interval between the ligament and the scaphoid prominence, it sinks below the tendon of the *flexor longus pollicis*. In order that the centre of the convex ivory plate which shields the end of the spring may

FIG. 12.



Sphygmographic tracings in different diseases.
(SANDERSON and FOSTER.)

press on the artery at the point indicated, the best rule to follow is to make the edge of the block next the spring coincident with a line drawn across the wrist from the radial spine, while its inner edge rests upon the tendon of the *flexor longus pollicis*, and on the prominence of the scaphoid."

32. In fig. 12, No. 1, you see a tracing of the normal pulse, and you will remark that there is a succession of curves, each one of which presents an

ascending line, a summit, and a descending line. As the ascending line is produced by the left ventricle throwing its contents into the arteries, it is evident that the more quickly the heart overcomes the forces opposed to it—viz., the elasticity of the vessels and the tension of their contents—the more vertical will be that line. Thus, in No. 3, the line is vertical; the case was one of aortic regurgitation, and the heart was able to throw its blood rapidly into the vessels partially emptied by the escape of their contents into the ventricle: but it is oblique in No. 2, where an obstruction at the entrance of the aorta caused a difficulty in the distension of the arteries. At No. 4 a tracing is given of the irregularity of the pulse caused by disease of the mitral valve.

In the normal pulse the line of descent is more oblique than that of the ascent, because the tension of the arteries gradually subsides in proportion as the elasticity of the vessel enables it to empty itself through the capillary system. In aortic regurgitation the fall is sudden; in cases where the arteries are thickened it is usually very oblique.

In certain cases strongly marked undulations occur in the line of descent (dicrotism). The best marked examples are to be found in typhus (No. 5). In aneurism of the descending thoracic aorta the dicrotism is often much increased in both pulses, particularly in the right.

33. You may suspect disease of the heart if the patient complain of pain in the left side, if there is either palpitation, blueness of the lips and face, difficulty of breathing, cough, expectoration, dropsy of the limbs, or if he has an irregular or intermitting pulse. Ascertain if the symptoms of the disease have commenced suddenly (acute disease), and if so, begin at (34); but if gradually (chronic disease), pass on to (45).

SECTION I.

Acute Diseases of the Heart.

The acute diseases include pericarditis (first and second stage), endocarditis, and nervous palpitation. It will simplify your diagnosis to begin with percussion, for if the cardiac dulness is much enlarged you have to deal with pericarditis accompanied by effusion; if not, any of the others may be present.

34. *a.* You find the dulness over the heart's space increased and of a pyramidal shape, the apex being above; the heart's sounds, especially the first, are diminished, the impulse lessened or imperceptible. The apex often beats above and to the left of its normal position (see fig. 13).

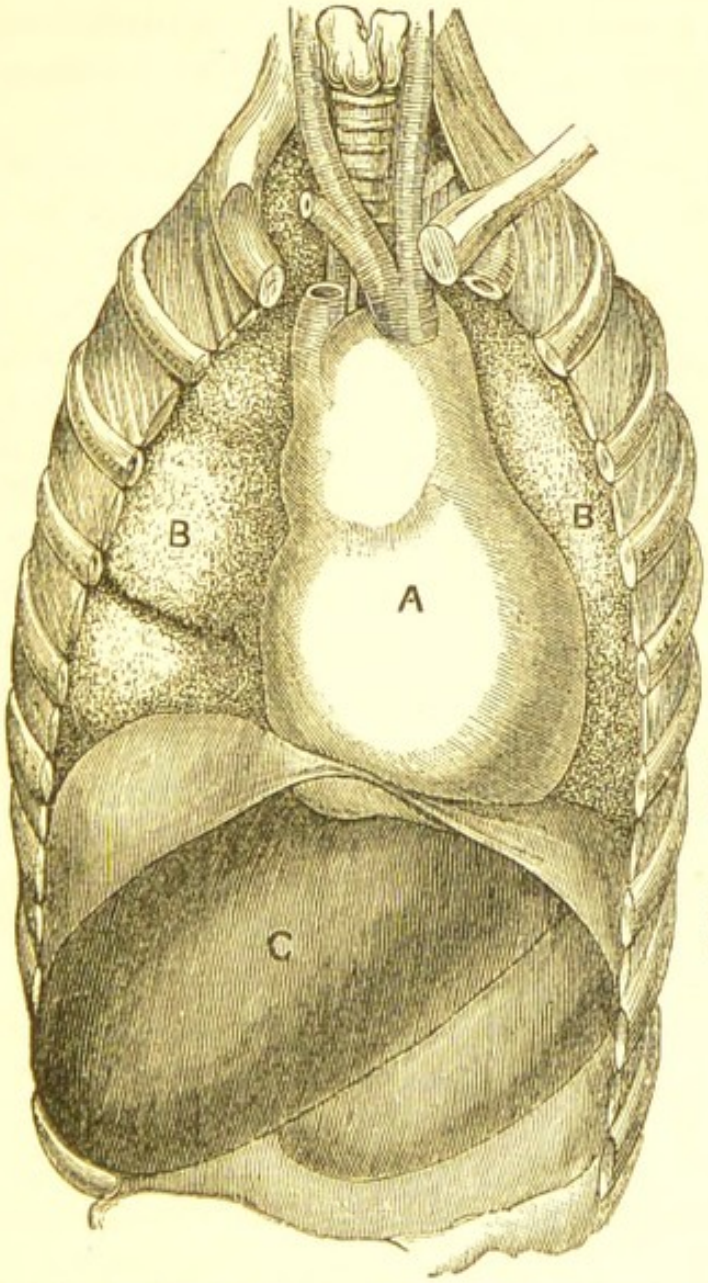
The disease is *pericarditis with effusion of fluid.*

In this stage there is rarely much pain or tenderness, but difficulty of breathing and anxiety are usually complained of. The pulse is rapid, sometimes irregular, and the patient lies on his back, and is unwilling to change his position. The sounds are diminished on account of their being transmitted through fluid; the apex is raised by the pressure of the fluid. The upper border of the dulness reaches, when the effusion is moderate, to the second or third costal cartilage, but, when more extensive, the whole sternum may be dull on percussion. The extension of the dulness to the left beyond where the apex beats is one of the most certain indications. The line of dulness varies with the position of the patient, and it is wider when he lies down than when he sits upright. You should mark out with ink the area of dulness, and daily observe its increase or diminution.

35. You are most likely to mistake hydropericardium for this stage of the disease. Pericarditis is usually attended in the early stage with fever, pain and tenderness on pressure, and friction sound, none

of which are present in hydropericardium. Pericarditis is almost always the result of acute rheumatism, kidney disease, pyæmia, or scarlatina, but dropsy

FIG. 13.



Shows the position of the pericardium when distended with fluid. A. The heart. B. The lungs. C. The liver. (SIBSON.)

of the pericardium seldom occurs except as an accompaniment of general dropsy. An increased area of dulness in the heart's region may arise from pleurisy, but there is then also dulness behind and at the side

of the left chest, attended with absence or diminution of the vocal fremitus, and of the sounds of respiration.

36. *b.* The dulness over the heart's space is not much, if at all, increased in extent, the sounds are normal, but are attended with a double, superficial, creaking sound; the impulse of the heart is usually increased.

The disease is *pericarditis with exudation of lymph.*

Pericarditis in its early stage is generally attended with pain over the heart, increased by pressure, movement or deep inspiration. There are anxiety, difficulty of breathing, fever and quick pulse. Remember that the disease may be present without pain or any other symptom pointing to the heart, or the patient may suffer only from delirium, or be affected with severe and persistent vomiting. Therefore frequently examine the heart in all cases of rheumatic fever and kidney disease.

37. The creaking or rubbing sound is produced by the surfaces of the pericardium roughened with lymph rubbing against each other. You may mistake this sound for a murmur arising from endocarditis. You must therefore note that in pericarditis the sound is usually audible during the whole period of the heart's action, that it is superficial, is apt to vary in its character, and is confined to the region of the heart; that by pressure with the hand or stethoscope you may often alter the character of the sound, or make it louder, and that pericarditis is generally attended with pain and tenderness. Pericarditis and endocarditis, however, frequently occur together.

38. A friction sound in the heart's region often arises from pleurisy. When you suspect this to be the case, make the patient stop his breathing, and the creaking will usually cease if it arises from inflammation of the pleura only.

39. There are no signs which certainly indicate the existence of pericardial adhesions. The most impor-

tant are, that the area of the heart's dulness does not alter, either with a change in the patient's position or on deep inspiration; that the point at which the apex strikes the chest is unaffected by change of position or full inspiration; and that one or more intercostal spaces, or the epigastrium, seems drawn in along with each pulsation of the heart. All of these signs are, however, of doubtful value.

40. *c.* One of the heart's sounds, or both, is accompanied or replaced by a lengthened blowing sound (a murmur).

The disease is *endocarditis.*

The murmur is the result of thickening, roughening, or imperfection of one of the valves. Endocarditis is accompanied by anxiety, hurried breathing, increased impulse of the heart, rapid and often irregular pulse, cough, and fever. Like pericarditis, it is generally developed in the course of rheumatic fever or diseased kidneys, and may be present without any symptoms likely to direct attention to the heart, so that you have to trust to physical signs alone.

41. You should bear in mind that persons suffering from endocarditis are liable to embolism (12), the symptoms of which vary according to the organ chiefly affected. Thus, when a vessel in the brain has become suddenly plugged there may be hemiplegia, or, in rare cases, only delirium and high fever, unaccompanied by paralysis. When the kidney is involved, the urine may be bloody or albuminous; in the case of emboli in the spleen, the organ usually enlarges, and rigors and elevations of temperature closely simulating attacks of ague may present themselves. If the main artery of a limb is obstructed, there are usually pain and tenderness over the vessel, and its branches cannot be felt to pulsate below the plug, whilst the limb becomes pale, cold, and numb. In some cases the circulation of the limb is gradually restored, in others gangrene is the consequence.

42. The chief difficulty is to ascertain whether a

murmur arises from *recent* endocarditis, or is produced by old valvular disease. The diagnosis is determined by the presence of fever in endocarditis, and by the absence of the enlargement of the heart that always follows long-standing alterations in the valves. The murmur is usually loudest at the apex, because the mitral is most frequently attacked. In both endocarditis and pericarditis, increased action of the heart often precedes the development of the stethoscopic signs.

43. *d.* The heart's sounds are too loud and clear, the impulse increased, but abrupt, quick, and brief, the apex beats in its natural place, and the pulse is not permanently irregular.

The disease is *nervous palpitation.*

Nervous palpitation arises from sympathy of the heart with some other derangement, and is more especially apt to occur during the night, or shortly after meals. The beating of the heart is generally more distressing than when organic disease is present. The most common causes of the complaint are indigestion, gout, rheumatism, disordered menstruation, or the excessive use of tobacco, tea, or alcoholic stimulants.

44. Palpitation is a prominent symptom of *Graves's disease* (*exophthalmic goitre*), and is accompanied by enlargement of the thyroid gland and protrusion of the eyeballs. The heart beats strongly and rapidly, a murmur can be heard at its base, and over the thyroid, where a thrill is also generally perceptible by the fingers. The disease is attended by anæmia and loss of strength, and takes place in young women who also usually suffer from amenorrhœa. It is supposed to arise from an affection of the sympathetic system, but its exact nature is still a matter of doubt.

SECTION II.

Chronic Diseases of the Heart.

The chronic diseases of the heart are hypertrophy, dilatation, hydropericardium, diseases of the valves, and fatty heart. Observe where the apex strikes the chest, and mark out by percussion the size of the organ; the first three diseases are always attended by an enlarged area of dulness; disease of the valves and fatty degeneration are not necessarily attended with increased dulness, although this is usually the case, as they are so often associated with the former conditions.

A. *You find the area of dulness increased.*

45. *a.* The first sound of the heart is dull, muffled, and prolonged; the second rather lower pitched than natural, the impulse increased, slow and heaving, the apex beats at a lower space than in the normal condition.

The disease is *hypertrophy of the heart.*

The pulse is generally firm and strong. The increased impulse arises from the greater strength of the organ, and the sounds are deadened because transmitted through so large a mass of muscle. Hypertrophy of the heart is generally accompanied by cough, expectoration, and dyspnœa; but as it seldom exists alone, but is usually the result of some disease of the valves, lungs, or kidneys, the physical signs and the symptoms vary according to the existing complications. Thus, we usually find murmurs from valvular affections, or the symptoms of kidney disease present themselves. When the left ventricle is chiefly affected, the apex beats below its normal position, and the carotids pulsate violently; when the right ventricle is mainly diseased, the pulsation of the apex is diffused and ill-defined, but it is strong at the lower end of the sternum, the second sound is louder over the pulmonary than over the aortic valves, and

there are often swelling and pulsation of the jugular veins, which are most plainly seen when the vein is compressed in the middle of the neck. In hypertrophy of the left auricle there is well-marked pulsation to the left of the sternum above the fourth costal cartilage.

46. *b.* The first sound of the heart is clear, short, and sharp, resembling the normal second sound, the heart's action often irregular, the impulse feeble, and sometimes slightly undulatory; the apex beats at a lower point or more to the left than natural.

The disease is *dilatation of the heart.*

The pulse is small, feeble, or irregular and intermitting. The most prominent symptoms are distressing palpitation, dyspnœa, cough, expectoration, blueness of the face and lips, dropsy, disordered digestion, and scanty urine. All these symptoms result from the enfeebled action of the heart. The feeble impulse and clear sounds arise from the opposite causes to those of hypertrophy. Murmurs are often present from co-existing affections of the valves. The most common causes of dilated heart are disease of the valves and emphysema of the lungs. Emphysema masks the enlargement, by causing the heart's region to be abnormally clear on percussion; it also pushes the heart, even when healthy, downwards towards the epigastrium.

47. Hypertrophy and dilatation generally coexist; when the hypertrophy is greater than the dilatation, the dulness of the heart's space is chiefly increased from above downwards, but when the dilatation is in excess, the dulness is greater transversely.

48. *c.* The heart's sounds are feeble and distant; the impulse lessened; the shape of the dulness on percussion is pyramidal, the apex of the pyramid above.

The disease is *either hydropericardium or chronic pericarditis.*

Hydropericardium seldoms occurs except as an

accompaniment of general dropsy. For its diagnosis from pericarditis with effusion, see (35). Chronic pericarditis may be confounded with dilatation of the heart as in both there are an increased area of dulness and feeble impulse of the heart; but in pericardial effusion the shape of the dulness is pyramidal, and the sounds are feeble; in dilatation the dulness is square, and the sounds are clear and sharp. Pericarditis commences as an acute affection, and in it dropsy is rare, whereas in dilatation the disease is chronic, and is usually accompanied by swelling of the legs.

B. *The area of dulness is not necessarily increased.*

49. *a.* One of the sounds of the heart, or both, is replaced, or accompanied by a blowing sound (a "murmur").

There is disease of *one of the valves of the heart.*

As a general rule all presystolic and diastolic murmurs indicate an organic change in the valves in which they are produced, but systolic murmurs may arise from functional causes as well as from structural disease. Thus a systolic murmur audible above the third costal cartilage is very frequently produced by anæmia. If the patient is young, if the lips and conjunctivæ are pale, and he has no general symptoms of heart disease, the murmur is probably from a deficiency in the quantity of the blood, or an alteration in its quality; but if the heart is enlarged or other valves are diseased, if the patient has suffered from acute rheumatism, or is at or past middle life, the sound probably arises from disease of the vessel or its valves.

50. A systolic mitral murmur usually indicates regurgitation into the left auricle, but this is not always the case. As, however, a valve seldom, remains long imperfect without giving rise to hypertrophy and dilatation, your diagnosis must be determined by the presence or absence of these conditions. If, for instance, you should find, along with a mitral

systolic murmur, increased impulse of the heart and accentuation of the second pulmonic sound in a person suffering from cough, expectoration, difficulty of breathing, or general dropsy, you would conclude that there was regurgitation, whilst if the murmur had existed for some length of time without changes being produced in the chambers of the heart, you would suppose the valve was capable of performing its functions. Imperfection of the tricuspid is usually the result of dilatation of the right ventricle, and produces general dropsy; the external jugular veins can be seen to pulsate along with the arteries; the liver is usually enlarged, and the urine often albuminous.

51. *b.* The sounds of the heart are feeble, impulse very weak. When along with these physical signs, and without other apparent cause, the patient is exceedingly feeble, subject to palpitation, severe attacks of dyspnœa and *faintings*, and has either a very feeble and quick, or a very slow or irregular pulse, you may suspect *Fatty Degeneration of the Heart.*

I have put *suspect:* for the positive detection of fatty heart is very difficult, and in many cases, with our present means of diagnosis, impossible. It is stated by some authors that a white ring round the cornea (arcus senilis), when it is accompanied by other signs, renders the existence of fatty degeneration of the heart probable. Rupture of a fatty heart sometimes occurs, generally of the left ventricle. Death usually takes place instantaneously, from hæmorrhage into the pericardium. In rare cases severe pain is suddenly experienced in the region of the heart, and the patient suffers from intense dyspnœa until his death.

52. *Angina Pectoris* is a neuralgic affection of the heart. It is accompanied by an agonizing pain of the chest and arms, coming on suddenly; the pulse is small and rapid, the breathing hurried and laborious, the face pale, the patient maintains the sitting posture

and is unwilling to make the slightest exertion. The attacks are liable to recur, are very dangerous, and chiefly affect those who are suffering from diseases of the valves, fatty degeneration of the heart or ossification of the coronary arteries, but they also occur in persons who are free from cardiac disease.

53. Angina Pectoris may be confounded with spasm of the stomach or the passage of a gall stone. Gastric spasm usually occurs in young females, angina pectoris in males of middle or advanced age; in the former the suffering is less severe and more confined to the chest or epigastrium, the heart's action is less depressed, and there is not the same disinclination to movement as in the latter; there is also usually a history of dyspepsia, palpitation, and of hysterical symptoms, and the physical signs of heart disease are absent. In biliary colic the pain is usually situated in the epigastrium or near the navel, and when it affects the chest, it seldom extends to the arms, vomiting is apt to occur, the pulse is less feeble, there is less disinclination to movement than in angina pectoris, and there is often a history of previous attacks followed by jaundice, or by the passage of a biliary calculus.

SECTION III.

Aneurism of the Aorta.

54. You will often find morbid changes in the aorta after death, even in persons who have manifested no symptoms of disease of the heart or arteries. The most important of these is atheroma. It commences as a thickened patch in the internal coat (the intima). It is generally of a cartilaginous consistence, and is slightly raised above the level of the surrounding membrane. Microscopically, the lamellæ of the intima are separated from each other by a collection of cells, intermixed with thin layers of newly formed connective tissue. These little masses of cells may

soften and be converted into a soft, greasy pulp, to which the name of *atheroma* is given. If the layers of the intima covering these patches ulcerate, the soft parts below them are washed away by the current of blood, and an "*atheromatous ulcer*" is produced. Instead of softening, the cells sometimes calcify, by the deposition of the earthy salts of the blood, and small bony plates result. The above changes are usually referred to chronic inflammation (chronic endo-arteritis). You will also meet with spots and patches of an opaque yellow colour in the lining membrane of the aorta and other large arteries, arising from a fatty degeneration of the intima, unconnected with the inflammatory process. Old persons and those who have suffered from gout, rheumatism, and syphilis are most liable to disease of the arteries.

55. Morbid changes in the arterial coats lead to a diminution of the elasticity of the vessel. It is consequently apt to yield to the distending power of the blood, and become dilated. This may occur in any part of the course of the aorta, but more especially where the impact of the blood is most forcible, as at the origin of its larger branches, and at the curvature of the arch. When its calibre is uniformly enlarged and its coats remain intact, the artery is said to be *dilated*. If the dilatation occur at one side only it is termed an aneurism. A dissecting aneurism is produced by the blood escaping through a fissure in the middle and internal tunics, separating them from the outer coat. An aneurism usually continues to increase in size, and the blood admitted into it forms layers of fibrine, partly from the irregularities on its inner surface affording favourable points on which it may be deposited, and partly from the state of rest to which the blood is reduced whilst it remains in the sac.

56. The first effect of an aneurism is to cause pressure upon some of the structures by which it is surrounded. If situated in the ascending aorta, it may

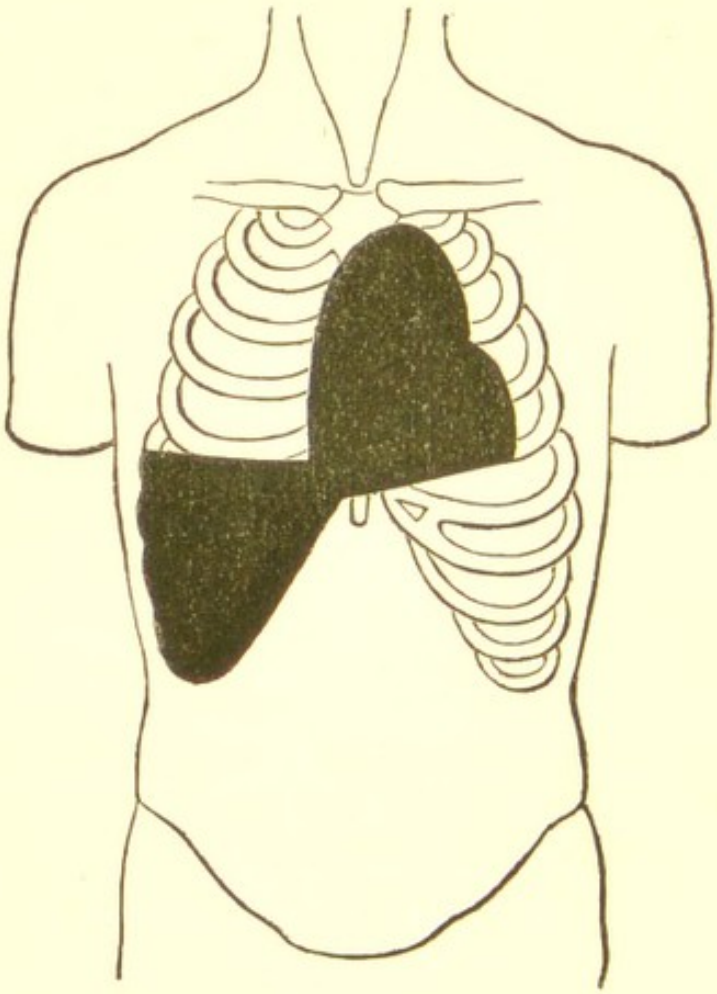
force itself outwards and cause absorption of the ribs and sternum, forming a tumour visible on the surface of the chest, or in the descending aorta it may produce caries of the spine or ribs. In other cases it compresses the trachea, bronchi, or œsophagus, obstructs some of the large arteries, distends the veins of the head, neck, and chest, or paralyses the recurrent nerve or sympathetic. Ultimately it may cause death by bursting into the pericardium, pleura, œsophagus, or other parts, or the patient may sink from exhaustion.

57. The diagnosis of aortic aneurism is often very difficult, and not unfrequently you have to surmise its presence from the absence of all other morbid conditions capable of giving rise to the symptoms of the patient. When the aneurism has proceeded so far as to form a tumour on the chest, its detection is easy. You find a pulsating tumour, the force of the impulse being usually greater than that of the healthy heart. It is dull on percussion, often accompanied by a systolic, in some cases also by a diastolic murmur, and is most generally situated on the right side of the sternum, in the second intercostal space. In others, although no distinct tumour is present, you may discover a part of the chest over the aorta dull on percussion, and you may hear a murmur at this part.

58. When the arch is affected you may be unable to detect either dulness or murmur, and then your judgment must be guided by the signs of pressure on some of the parts near the aorta. Thus, dyspnœa is one of the most common symptoms, from pressure on the trachea or bronchial tubes. It often occurs in paroxysms of great severity which may be relieved or aggravated in certain positions. It may be accompanied by spittings of blood, which recur from time to time. Sometimes you find a difference in the loudness of the respiratory murmur, either in one lung as compared with the other, or in one lobe of either

lung. Difficulty of swallowing often occurs, from obstruction of the œsophagus. In many cases this varies greatly in amount; at one time of the day the patient may be able to take solids, while at another even liquids can be scarcely swallowed. Cough is very

FIG. 14.



Pulsating tumour; dulness on percussion; murmur; often diminished respiration and paralysis of the vocal cord on the affected side.

Diagram of a case of aortic aneurism that projected on the left side of the chest, the heart being also enlarged. The dark shading shows the extent of dulness on percussion over the tumour, heart, and liver. (Dr. S. MACKENZIE.)

general, and may come on in severe paroxysms, and in some cases the patient is attacked with pneumonia from pressure on the pneumogastric nerve. Not unfrequently the voice alters, and becomes harsh, whispering, or shrill, from the pressure on the

recurrent nerve producing paralysis of one of the vocal cords, but you will find great variations in tone at different times. An inequality between the pulses in the carotid, subclavian, or radial arteries is a very valuable sign, the most certain indications of which are given by the sphygmograph. The veins of one side of the chest or neck may be greatly swollen, and this frequently gives the first hint of the true nature of the case. A contracted or dilated state of one pupil is sometimes remarked from pressure on the sympathetic.

59. In dilatation of the aorta you have not the signs of pressure that you encounter in sacculated aneurism, but you may sometimes detect the presence of dilatation by an increased pulsation and a thrill above the notch of the sternum. In other cases you may suspect it from a loud, almost metallic second sound of the heart in a person whose radial arteries seem to be thickened and diseased.

CHAPTER III.

DISEASES OF THE LARYNX.

60. The Larynx is subject to acute inflammation (Acute Laryngitis), which, when it proves fatal, causes death by œdema of the glottis. When the mucous membrane alone is inflamed, the disease is termed laryngeal catarrh. Chronic inflammation and ulcerations are chiefly the results of syphilis or phthisis. Tumours are not unfrequently found, generally in the neighbourhood of the vocal cords (see fig. 17).

61. Croup is characterised by the formation of a false membrane in the larynx and trachea, which sometimes extends into the bronchial tubes. When the membrane is peeled off, the surface looks red, rough, and swollen. *Croupous inflammation* is more generally observed in the larynx and trachea than on any of the other mucous membranes. The epithelium is stripped off at the commencement of the inflammation, and an exudation takes place that coagulates as soon as it comes into contact with the air. There is not, however, so close a union between the false membrane thus formed and the surface on which it rests, as in diphtheria. Microscopically, the false membrane is found to consist of cells intermixed with layers of fibrine. The disease is often associated with bronchitis or pneumonia, is usually attributable to cold and damp, and the constitutional symptoms are secondary to the local affection.

62. Diphtheria is a contagious, febrile complaint, in which the throat affection is secondary to a disease of the blood. The throat, especially the

tonsils and soft palate, is coated with a thick, rough membrane of a dirty-white colour, that is quickly renewed if torn off. The mucous membrane below the exudation is of a dark red colour, and seems swollen, from the inflammation affecting the substance as well as the surface of the part. Microscopically, the false membrane is found to consist of cells closely united together. They are of different sizes and are intimately connected with the surface of the mucous membrane on which they rest. An infiltration of newly formed cells generally occurs into the connective tissue immediately beneath the epithelium. This may be so abundant as to compress the blood-vessels and so give rise to gangrene.

Some pathologists believe that diphtheria is produced by vegetable organisms (*bacteria*) which can be detected in the exudations. Many look upon croup as in all cases the result of diphtheria affecting the larynx. Although there is no doubt that a false membrane can be formed in the windpipe, as on other mucous membranes, by diphtheria, I am of opinion that most cases of croup originate from a mere local inflammation and are, therefore, unconnected with a general disorder of the system such as diphtheria.

63. *Œdema of the Larynx* consists in an effusion of lymph or serum, resulting from inflammation beneath the mucous membrane of the larynx or epiglottis. It often causes death by obstructing the entrance of the air into the lungs.

64. The laryngoscope is necessary for the examination of the larynx and trachea. It consists of a concave mirror, which is either fixed in a spectacle frame, or is attached to the forehead by an elastic band, and of a smaller mirror mounted on a long handle.

The patient must be placed upon a chair, with a lamp on one side and a little behind him, his neck inclined slightly backwards, and the face turned a

little upward. Seat yourself opposite to him, with the concave mirror adjusted to your eye or forehead, according to the way in which it is mounted, direct him to open his mouth widely, and throw the light reflected from the mirror into the fauces, so that the centre of the disc may correspond with the base of the uvula. Grasp the end of his tongue with the thumb and forefinger of your left hand, enveloped in a fold of soft cloth or towel, gently draw it from the mouth and hold it steadily. Next warm the surface of the small or laryngeal mirror for a few seconds over the lamp, and touch your own cheek with the back of it to prove that it is not too hot. Holding its handle in the right hand like a pen, pass it into the fauces, slightly raise upwards the uvula with its back, direct the light reflected from the concave mirror upon its surface, request the patient to draw a full breath, and then to say "ah," and you will see upon the laryngeal mirror a view of the interior of the larynx.

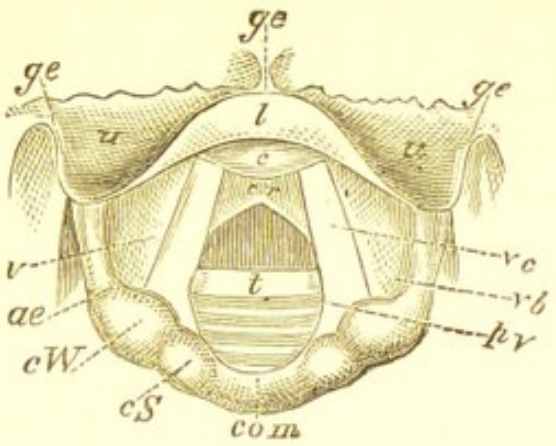
65. In a healthy larynx you will observe that the colour of the mucous membrane is slightly red, and that the vocal cords are white. The following drawings (figs. 15 and 16) show the various parts visible with the laryngoscope. When you suspect disease of the larynx, first remark the colour of the mucous membrane and if there are any ulcerations; see if there is any tumour, either in the neighbourhood of the glottis or upon the vocal cords; afterwards, by directing the patient to say "ah—eh," you will be able to ascertain whether the vocal cords approximate during speech in the normal manner.

SECTION I.

Acute Diseases of the Larynx.

66. *a.* A child is affected with loud metallic cough, crowing inspiration, hoarse voice, dyspnœa, rapid breathing greatly aggravated in paroxysms, quick pulse, thirst, and a hot dry skin.

FIG. 15.

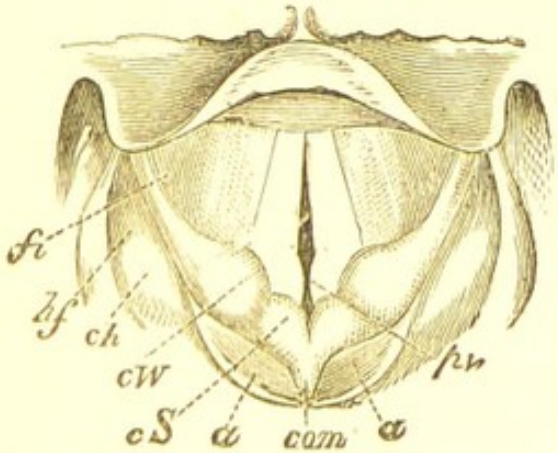


Laryngoscopic drawing, showing the vocal cords drawn widely apart, and the position of the various parts above and below the glottis during quiet inspiration.

g. e. Glosso-epiglottidean folds.
u. Upper surface of epiglottis.
l. Lip of epiglottis.
c. Cushion of epiglottis.
v. Ventricle of larynx.
a. e. Ary-epiglottidean fold.
c. W. Cartilage of Wrisberg.
c. S. Capitulum Santorini.
com. Arytenoid commissure.
v. c. Vocal cord.
v. b. Ventricular band.
p. v. Processus vocalis.
c. r. Cricoid cartilage.
t. Rings of trachea.

(DR. MACKENZIE.)

FIG. 16.



Laryngoscopic drawing, showing the approximation of vocal cords and the position of the various parts in the act of vocalization.

f. i. Fossa innominata.
h. f. Hyoid fossa.
c. h. Cornu of hyoid bone.
c. W. Cartilage of Wrisberg.
c. S. Capitulum Santorini.
a. Arytenoid cartilages.
com. Arytenoid commissure.
p. v. Processus vocalis.

(DR. MACKENZIE.)

The disease is *croup*.

The dyspnœa arises, not only from the presence of a false membrane in the larynx, but also from spasm, or, as some assert, from paralysis of the muscles of the larynx, set up by the inflammation.

Croup is a disease confined to childhood. An attack is usually preceded for a day or two by slight cough and feverishness, but the characteristic cough and dyspnœa generally make their appearance suddenly during the night. In fatal cases the dyspnœa increases, the respiration becomes quick and laboured, the pulse small and thready, the face pale, the lips blue; death is often preceded by convulsions. In some cases cylindrical casts of the trachea are expelled. In adults the symptoms of croup are produced by laryngitis, but no false membrane is formed in the air-passages.

67. Croup differs from diphtheria in the laryngeal symptoms not being preceded by any exudation in the fauces or pharynx, and by the glands below the jaw not being enlarged. The temperature in the former is usually higher and the pulse stronger, there is no diarrhœa, no hæmorrhage, and no albumen in the urine. Croup does not affect adults, is not contagious, does not occur as an epidemic, and in case of recovery is not followed by paralysis.

68. *Laryngismus stridulus* is a term applied to a spasmodic affection of the windpipe, to which young infants are subject. The child awakes from its sleep, or is suddenly attacked when awake, with a loud crowing inspiration which may last for several minutes, and then disappear as rapidly as it came on; in other cases death occurs during the attack from suffocation. It is a nervous disorder, and is liable to recur frequently, being excited by various causes of irritation acting on the nervous system. It most frequently occurs in children who are teething, and in those brought up by hand. It is readily distinguished from true croup, by the suddenness and short duration of

the attack, and by the absence of cough, fever, or alteration of the voice.

SECTION II.

Chronic Diseases of the Larynx.

69. *a.* The mucous membrane of the larynx, or a portion of it, is abnormally reddened, dry, or covered with mucus, or it may present small ulcerations in different parts. The patient complains of hoarseness or loss of voice, cough, and expectoration.

The disease is *chronic catarrh of the larynx.*

Inflammation of the mucous membrane of the larynx may occur as an acute or chronic affection. It often results from exposure to cold, but its most severe forms are met with in persons suffering from phthisis. It may present itself in the early stages of that disease, but it usually occurs towards its close, and adds greatly to the sufferings of the patient. In other cases ulceration is the result of syphilis. Whenever, therefore, you meet with chronic laryngeal catarrh, examine the chest for phthisis, and ascertain if there be any history of syphilis.

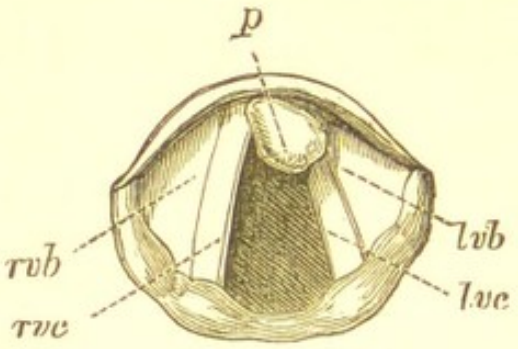
70. *b.* You find a red, semi-transparent swelling of the epiglottis, or of the ary-epiglottic folds.

The disease is *œdema of the glottis.*

Œdema may exist as an acute or chronic affection of this part. When chronic it is most frequently caused by disease of the cartilages; in either case its symptoms are distressing, and its issue often fatal. There are generally present intense dyspnœa, hoarseness or loss of voice, harsh, barking cough, and difficulty of swallowing. The inspiration is loud and noisy, whilst the expiration is tolerably easy. The symptoms of œdema are very similar to those of croup, but croup usually attacks children who are in good health, or are recovering from eruptive fevers; œdema takes place chiefly in adults who are already the sub-

jects of laryngeal disease. In œdema you can almost always feel with the finger the erect and swollen

FIG. 17.



A small polypus attached just above the anterior insertion of the vocal cord.

r. v. b. Right ventricular band.
r. v. c. Right vocal cord.
l. v. b. Left ventricular band.
l. v. c. Left vocal cord.
p. The tumour.
(DR. MACKENZIE.)

epiglottis, which you are unable to do in croup. If you are able to employ the laryngoscope the diagnosis is made still more certain.

71. Various forms of tumours occur in the larynx, chiefly in the vicinity of the vocal cords; they are

FIG. 18.



The appearance presented in a case of paralysis of the adductor of the left vocal cord, when the patient attempted to speak. The left vocal cord was not adducted to the median line: consequently a space remained between the vocal cords, and the voice could not be sounded. (DR. MACKENZIE.)

usually of a warty or fibroid character (see fig. 17), in other cases they arise from hypertrophy of the mucous follicles.

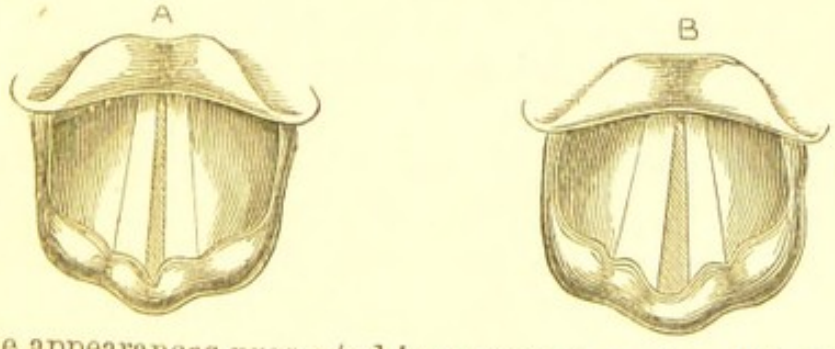
72. *c.* One vocal cord, or both, is motionless, and remains stationary at the side of the larynx when the patient attempts to speak, although the parts seem otherwise normal. The voice is lost, or whispering.

The disease is named *aphonia.*

Aphonia must not be confounded with *aphasia.* The former consists in a mere inability to use the vocal cords in speaking; the latter arises from an injury to that part of the brain whose function it is to express thoughts by words (see Aphasia).

73. If both vocal cords cannot be drawn to the median line of the larynx when the patient attempts to speak, the complaint arises from paralysis of the *adductors* of the vocal cords (crico-arytenoidei laterales, and the arytenoideus proprius). This condition usually arises from debility or hysteria, but in other instances it is the result of phthisis or catarrh. When

FIGS. 19 and 20.



The appearances presented in a case where the adductors of both vocal cords were paralysed.

A. Inspiration. | B. Forced expiration.

(DR. MACKENZIE.)

only one cord moves in the attempt to speak, the crico-arytenoideus lateralis of the opposite side is paralysed. The most common causes are lead-poisoning, syphilis, diphtheria, or phthisis, but occasionally it results from disease of the brain (see fig. 18).

74. *d.* The patient suffers from great difficulty of

breathing, increased on the slightest exertion, and one or both of the vocal cords remain motionless when a full inspiration is taken.

The disease arises from *paralysis of the abductors of the vocal cords*—(crico-arytenoidei postici).

It is rare to find the abductor muscles of both sides paralysed, but it does occasionally occur in disease of the brain. When one side is alone affected, it is usually the result of the compression of the recurrent nerve by an aneurism, or a tumour of a glandular or cancerous nature.

75. The voice may be lost or greatly altered in tone by paralysis of the tensors (crico-thyroidei), or of those whose office it is to relax the vocal cords (thyro-arytenoidei). In the former case the surface of the cords seems to be not quite horizontal and the edges are not perfectly straight; in the latter a minute elliptical opening may often be discovered between the cords.

CHAPTER IV.

DISEASES OF THE LUNGS.

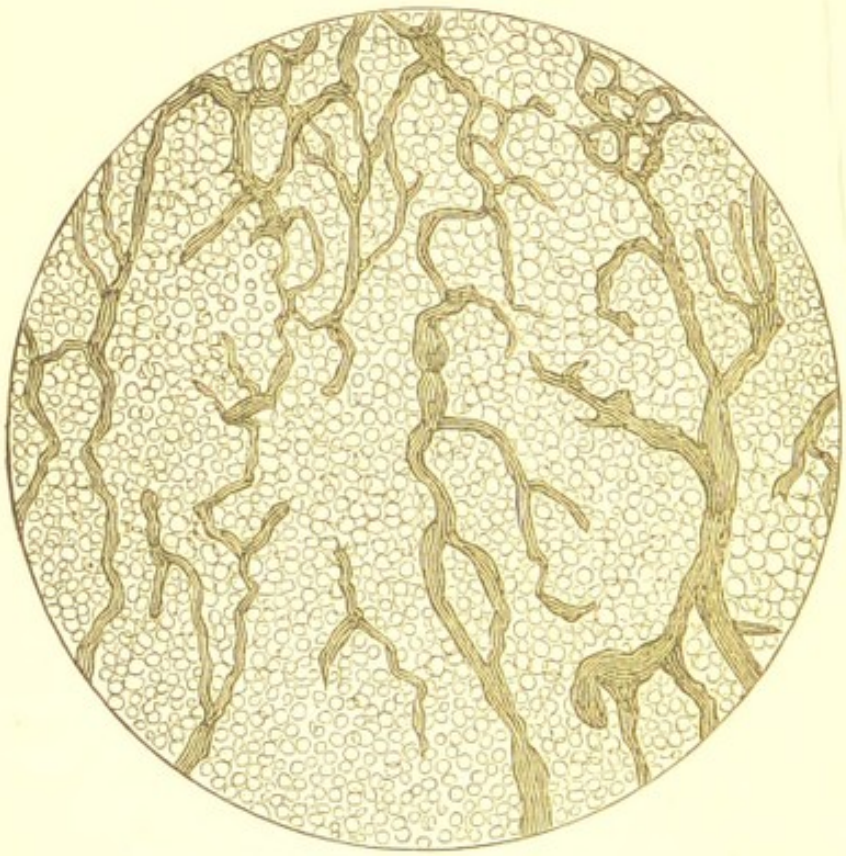
THE principal morbid changes affecting the pleura are, pleurisy, hydrothorax, pneumothorax, tubercular, and cancerous growths; those of the lungs are, bronchitis, dilatation of the bronchi, emphysema, congestion, pulmonary apoplexy, pneumonia, tubercle, and cancer.

76. PLEURISY, or inflammation of the pleura.—In the first or dry stage the surface of the membrane is red, roughened, and covered with a layer of lymph or semi-gelatinous matter. This stage may terminate by recovery or by adhesion of the opposite sides of the pleura; but generally a turbid fluid, mixed with flakes of coagulated lymph, is also effused; in other cases the cavity of the chest becomes distended with pus (*empyema*).

Microscopically, the first change in acute pleurisy consists in dilatation of the capillaries of the serous membrane, producing the redness visible to the naked eye. The epithelium falls off, leaving the membrane roughened, and the bare surface becomes covered by lymph exuded from the dilated blood-vessels. This lymph consists of cells, nuclei, and fine fibres. The fibres result from the coagulation of the fibrine of the liquor sanguinis, the cells and nuclei are exudations from the overloaded vessels, or are derived from proliferation of the epithelial cells. If the opposed surfaces of the inflamed membrane remain in contact, the cells entangled in the fibrine assume a spindle shape, their processes unite and form connective

tissue, blood-vessels are developed from the vessels of the inflamed pleura on either side, and the false membrane becomes organized (see fig. 21). The opposed surfaces become in this way united by a layer of connective tissue, which constitutes what are termed "adhesions."

FIG. 21.



Showing the microscopical appearances of inflammatory exudation in the process of organization (pericarditis in a horse). The newly formed blood-vessels (injected) are seen in the midst of a material composed of cells; they vary in size, and seem more like channels than vessels.

When the opposite surfaces of the inflamed pleura are separated by an abundant sero-fibrinous effusion, union occurs by an action affecting the connective tissue of the serous membrane itself. The false membrane consists externally of coagulated fibrine, but below this of a layer of cells formed by the proliferation of the connective tissue cells of the subepithelial structures. The cellular layer becomes

permeated with vessels, the cells become spindle-shaped, and connective tissue is produced. The shreds and flakes of fibrine in the fluid distending the pleural sac undergo fatty degeneration, soften, and are absorbed along with the fluid. The opposite surfaces are thus brought into contact, and unite as in the former case. If suppuration occurs, the pus-cells are derived in part from the exudation of the white blood globules and their subsequent division, and partly from the proliferation of the cells of the false membrane and of the connective tissue of the neighbouring structures.*

The first effect of pleurisy is to set up fever; afterwards, if the amount of fluid be large, the walls of the chest are pushed outwards, the lung is compressed against the spine, is flattened, reduced in size, and feels tough and leathery, its outer surface is coated with lymph, and, on being cut into, its texture appears to be void of air. The opposite lung is usually much congested. If the effusion be on the right side, the diaphragm and liver are displaced downwards; if on the left, the heart is pushed to the right side of the chest, and the stomach and spleen are depressed. If the fluid is absorbed and the lung is incapable of expansion, the whole of the affected side contracts, and the spine presents a lateral curvature. Pleurisy often occurs in diseases of the kidneys or follows scarlet fever or measles. Its most common exciting causes are—1. Injuries, such as fracture of the ribs, and the bursting of abscesses of the lungs. 2. Inflammations of neighbouring organs — pneumonia, diseased bones, &c. 3. Cancer and tubercle of the lungs or other parts. 4. Exposure to cold.

77. Hydrothorax, or water in the chest.—This is a form of dropsy in which a straw-coloured fluid is effused into the cavity of the pleura. The pressure

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* The microscopical appearances are nearly the same in inflammation of all the serous membranes. The above description may therefore be applied to pericarditis, peritonitis, &c.

of the fluid produces congestion of the lungs by preventing their free expansion. It is distinguished from pleuritic effusion by the absence of flakes of lymph, or of thickening of the pleura. It usually occurs along with disease of the heart, kidneys, or liver.

78. PNEUMOTHORAX, or air in the pleura.—This arises from a communication taking place between the bronchial tubes or air-cells of the lung and the cavity of the pleura. The most common causes are the rupture of a cavity, or the bursting of an empyema through the lung, but in rare cases the air gains an entrance from other organs. The immediate effect of the admission of air into the pleural cavity is to cause collapse of the lung and consequent danger of suffocation. If the patient survives, inflammation is set up, lymph is effused, and fluid or pus collects in the pleural sac.

79. BRONCHITIS, or inflammation of the bronchial tubes.—In the acute stage, the mucous membrane of the tubes is red, rough, soft, thickened, and covered with mucus or muco-purulent fluid; sometimes ulceration takes place. In chronic cases the muscular structure undergoes hypertrophy, and the tubes become thickened and dilated. The microscopical appearances are the same as in inflammation of other mucous membranes. Three forms of inflammation are recognized as affecting any mucous membrane, the catarrhal, the croupous, and the diphtheritic. The catarrhal is most commonly met with in the bronchi.

In *Acute catarrhal* inflammation the blood-vessels are overloaded with blood, and thus produce the redness visible to the naked eye in membranes, such as the throat, that are open to inspection during life. The swelling arises partly from this dilatation of the vessels, and partly from the exudation of the more fluid parts of the blood, producing œdema of the tissues. The lymph follicles become enlarged from an increased formation of cells in their interior. An augmented secretion of mucus takes place which

presents a vast number of cells, which are partly formed by the pre-existing epithelial cells and are in part leucocytes exuded from the distended blood-vessels. When pus-cells exist in large numbers, they are probably also to some extent produced by the proliferation of the sub-epithelial cells of the connective tissue. In *chronic catarrh* the cells of the connective tissue elongate, so as to form new structure, and, in this way, the thickening and increased density of the mucous membrane are produced.

When the smaller tubes are inflamed, the disease is termed *capillary bronchitis*, and the danger to life is in proportion to the minuteness of the tubes affected, because the inflammatory swelling is apt to choke up the openings into the air-cells, and thus prevent the due aeration of the blood. Acute bronchitis in children and old persons often causes collapse of the air-cells. The chief exciting causes of bronchitis are: 1. Impeded evacuation of the bronchial veins, as in diseased mitral valve. 2. Imperfect expansion of the chest, as in dropsy of the abdomen. 3. Irritating dust or vapours. 4. Fevers, such, for example, as measles and influenza. 5. Cold and sudden atmospheric changes.

80. Bronchiectasis (*Dilatation of the bronchial tubes*).—This condition, which is a common result of chronic bronchitis, may occur in different forms. 1. The tubes of a portion of one lung may be uniformly dilated, their walls being either thickened or attenuated. 2. The dilatation may be isolated, of considerable size, round, or irregular in shape, connected with one of the larger tubes, and usually surrounded by condensed lung tissue. 3. There may be very numerous small round dilatations of the terminal branches of the bronchial tubes in a lung affected with emphysema or some other morbid condition.

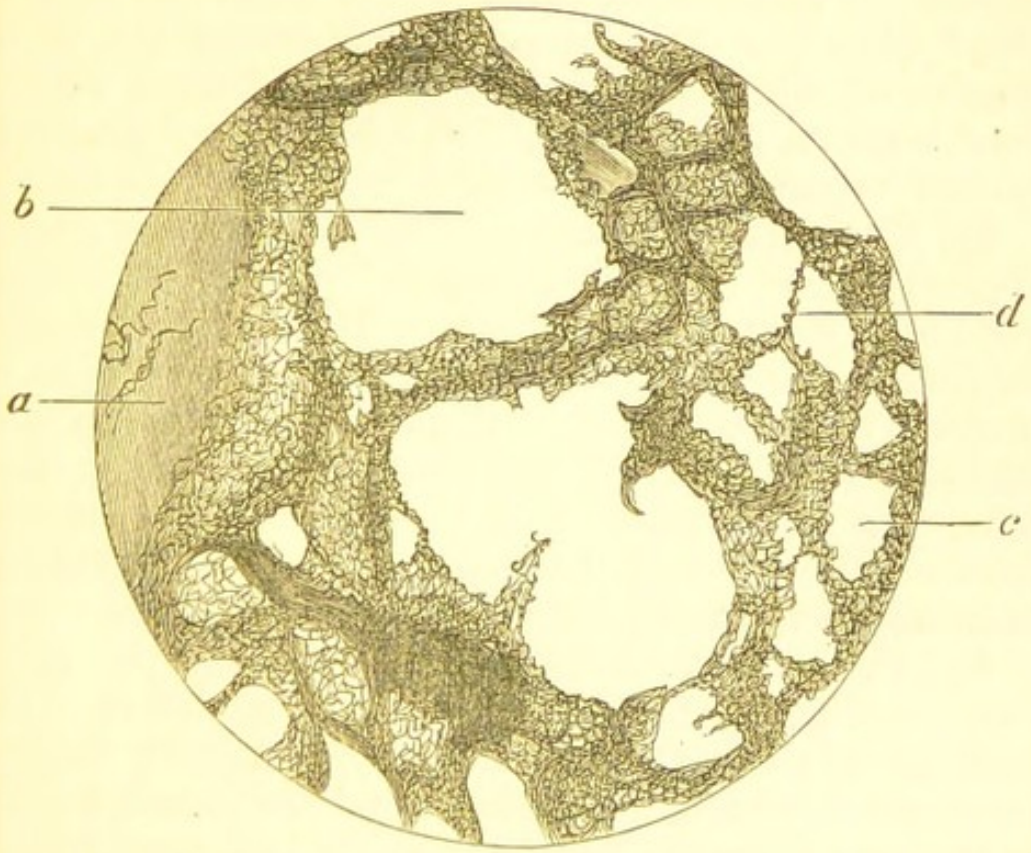
81. Emphysema.—There are two forms of this disease—*vesicular*, in which the air-cells are dilated or a number of them are merged into one: and *inter-*

lobular, when the air has escaped into and distends the connective tissue of the lungs. *Interlobular* emphysema occurs only in childhood, and usually results from whooping-cough or capillary bronchitis. In *vesicular* emphysema the lungs are increased in volume and lose their elasticity, they do not collapse when the chest is opened, the air-cells are greatly dilated, and often appear like little bladders below the pleura. Microscopically, the intercellular passages first appear to be dilated. Two or more having come into contact, an opening takes place between them, and they are gradually fused into one. In other cases, the air-cells present the chief enlargement. The pulmonary capillaries are, by the pressure of the dilated cells, gradually diminished in size, or they become impervious and are represented only by cords (see fig. 22).

The increased size of the lungs presses the ribs outwards so that the chest becomes barrel-shaped; it also pushes the heart and diaphragm downwards. The loss of the elasticity of the lungs calls into play an increased action of the expiratory muscles which become enlarged, and the blending together of many neighbouring air-vesicles compresses the blood-vessels of the affected parts, and thus induces obstruction to the circulation of the blood, which, again, sets up hypertrophy of the right ventricle of the heart (fig. 3). The free edges of the lungs are chiefly affected by emphysema, consequently they overlap the heart, and occupy the upper part of the hepatic region. Vesicular emphysema is said to be *vicarious*, when the affected parts have become dilated to compensate for the collapse or imperfect expansion of some other portions of the lung that have been wasted by previous disease. It is termed *substantive* when it occurs from causes primarily affecting the air-cells. For example, it takes place in whooping-cough, from violent expiratory efforts whilst the glottis is closed, and therefore the parts least supported, such

as the apex and the borders of the lung, are forcibly dilated. Diminished elasticity of the lung or of the parietes of the chest tends to the same result, by allowing the air-cells to remain in an over-distended condition. In some cases emphysema seems to be produced by a softening of the walls of the air-vesicles arising from imperfect nutrition.

FIG. 22.



Microscopical appearance of a section of a lung affected with emphysema. *a*. Bronchial tube. *b*. A space formed by the fusion of a number of air-cells, the walls of which have been destroyed. *c*. A dilated alveolus. *d*. The walls of an alveolus in process of destruction, the blood-vessels being obliterated.

82. CONGESTION OF THE LUNGS.—This is one of the most common morbid appearances found after death. The lung is loaded with blood, is of a dark colour and heavy, but it crepitates under the finger and floats in water; when the part is washed the cellular structure is seen to be unaffected. Œdema, or dropsy

of the lung, results from long-continued congestion; in this condition the lung is red and swollen, and, on being cut into, a large quantity of frothy fluid mixed with blood flows from the bronchial tubes and air-cells.

Congestion of the lungs may be active or passive. The *active* form is most frequently found when the circulation in the opposite lung has been obstructed by inflammation, pleurisy with effusion, or pneumothorax. *Passive* congestion occurs when the flow of blood from the pulmonary veins is obstructed, as in disease of the mitral valve, or from failure of the heart's action in fevers, &c., in which latter case it is named hypostatic congestion.

83. The term, "BROWN INDURATION," has been applied to a form of chronic congestion arising generally from heart disease. Microscopically, the capillaries are greatly elongated and dilated, so as to project into and diminish the cavity of the air-vesicles. The interlobular connective tissue is also somewhat thickened. The brown colour is derived from an alteration of the colour of the blood that has been extravasated by long-continued congestion.

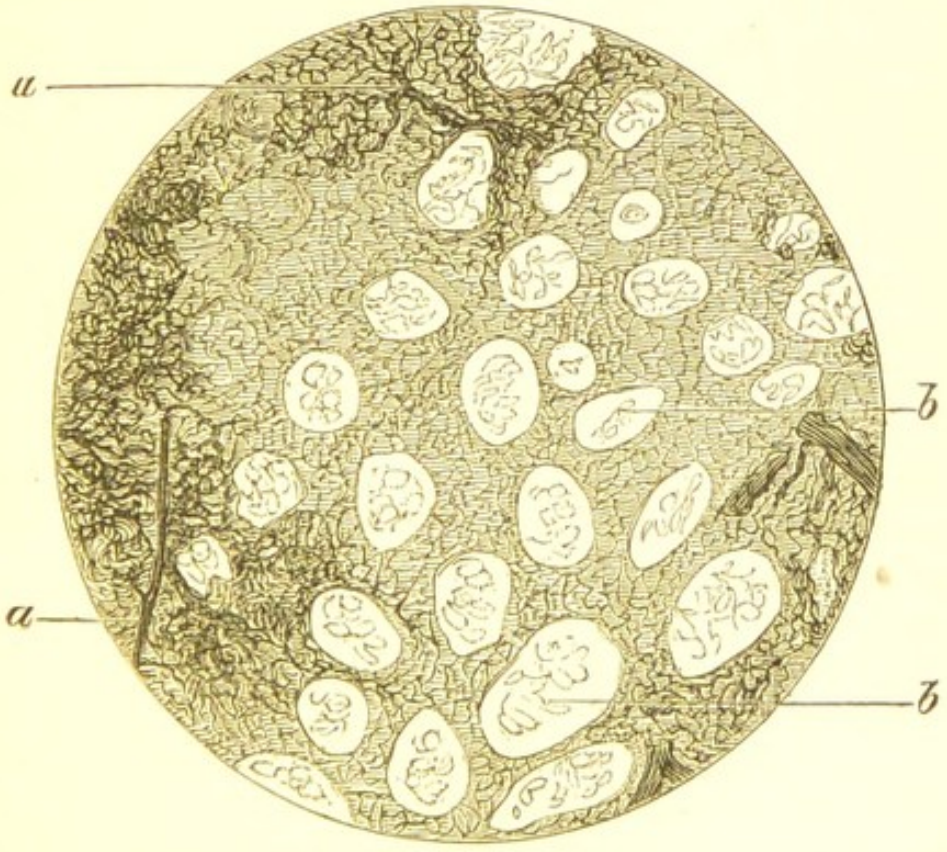
84. PULMONARY APOPLEXY.—The lung is of a dark colour, loaded with blood, and heavy. On making a section of it, numerous sharply defined black patches of extravasated blood are found, chiefly in the lower lobes. These are softer and more friable than the neighbouring parts, do not crepitate on pressure, and sink in water. Microscopically, the air-cells in the dark patches are found to be filled with coagulated blood. Pulmonary apoplexy almost always results from disease of the heart, and notably from disease of the mitral valve; it is usually caused by thrombi, formed in the right side of the heart, becoming impacted in branches of the pulmonary artery.

85. ACUTE PNEUMONIA, or Inflammation of the Lung.—There are three forms of this disease—*croupous*,

or *lobar pneumonia*, *catarrhal* or *lobular*, and *chronic*, or *interstitial pneumonia*.

86. *Acute lobar pneumonia* usually affects a considerable tract of a lung, and is described as having three stages. First, *engorgement ;* second, *red hepatization ;* third, *grey hepatization*. In *engorgement* the appearances are those of an intense degree of congestion. In *red hepatization* the lung is somewhat enlarged ; it

FIG. 23.



Microscopical appearances in commencing red hepatization (in an antelope). *a*. The alveoli completely filled with exudation, so that their walls cannot be distinguished. *b*. Walls of the alveoli still visible, although they contain exudation. The blood-vessels have not been capable of injection, on account of the pressure of the exudation upon them.

is of a red colour, solid like liver, friable, heavy, sinks in water, and appears granular when cut or torn. Microscopically, in *red hepatization* the air-vesicles are seen to be filled with an exudation composed of cells

of various forms, held together by coagulated fibrine whilst the smaller bronchial tubes are usually choked with plugs of lymph (see fig. 23). The walls of the air-vesicles are somewhat swollen by the engorgement of the capillaries, but they are not thickened by exudation. In *grey hepatization* the tissues are of a dirty-grey colour, solid, heavy, easily broken down by the finger, sink in water, and a thick purulent fluid flows from them when divided. Microscopically, an abundant proliferation of the cells of the surrounding connective tissue and of the epithelial cells of the air-vesicles takes place, so that the exudation is loosened from the walls of the alveoli. The contents are further liquefied by changes in the coagulated fibrine, and by fatty degeneration of the cells of the exudation, so that the mass is softened and rendered capable of removal by absorption and expectoration.

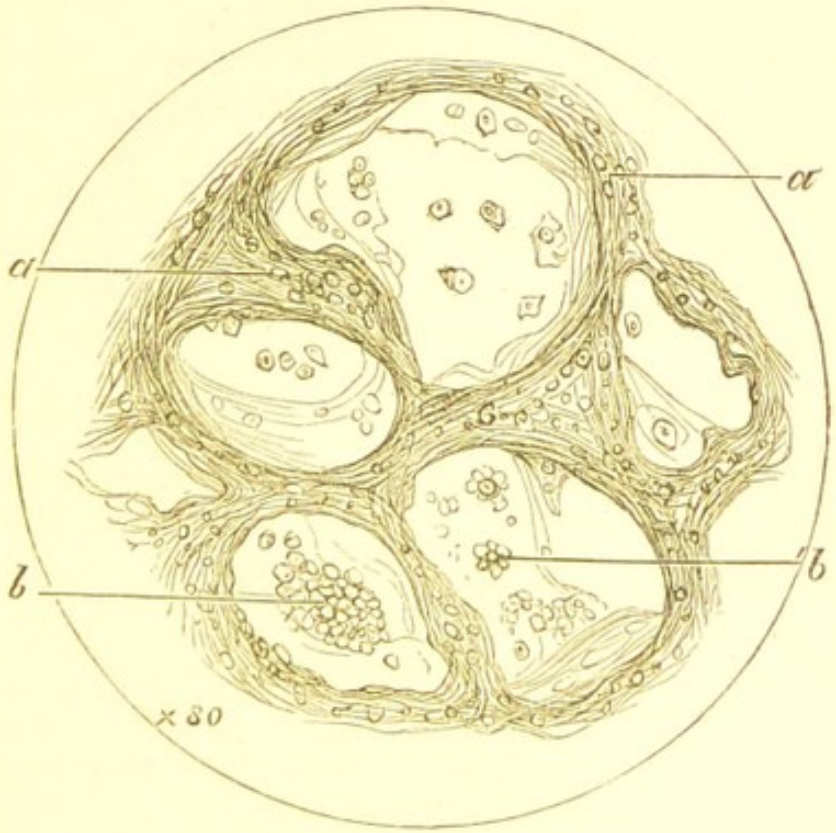
Acute lobar pneumonia is almost always accompanied by a certain amount of pleurisy, the surface of the lung being covered by a layer of lymph. It may terminate by resolution or it may go on to abscess or gangrene, or may leave unabsorbed deposits that become "cheesy," and give rise to phthisis. In abscess, the inflamed part breaks down into an irregular-shaped cavity, filled with pus and the *débris* of lung-structures. In gangrene a portion of the diseased tissue becomes of a dark colour, is very friable, and has a very fetid odour. Croupous pneumonia usually begins at the lower lobes, spreads upwards, and is commonly confined to one lung.

87. *Acute catarrhal* or *lobular pneumonia*, called by some *broncho-pneumonia*, is a disease often observed in children, and in them it usually occurs in the parts that have become collapsed from bronchitis. The morbid appearances are often limited to single lobules, which are firm, and of a red colour; when cut, they present a smooth, not a granular surface, and a bloody fluid can be squeezed out of them. Microscopically, the capillaries surrounding the air-vesicles are dilated

and engorged with blood. The epithelial cells of the alveoli become enlarged, increased in numbers by proliferation, and, along with a serous fluid effused from the vessels, fill up the cavity of the air-cells (see fig. 24).

88. *Chronic interstitial pneumonia* (*fibroid disease or cirrhosis of the lung*).—In this condition the substance of the lung is hard, dense, of a dark grey or black

FIG. 24.

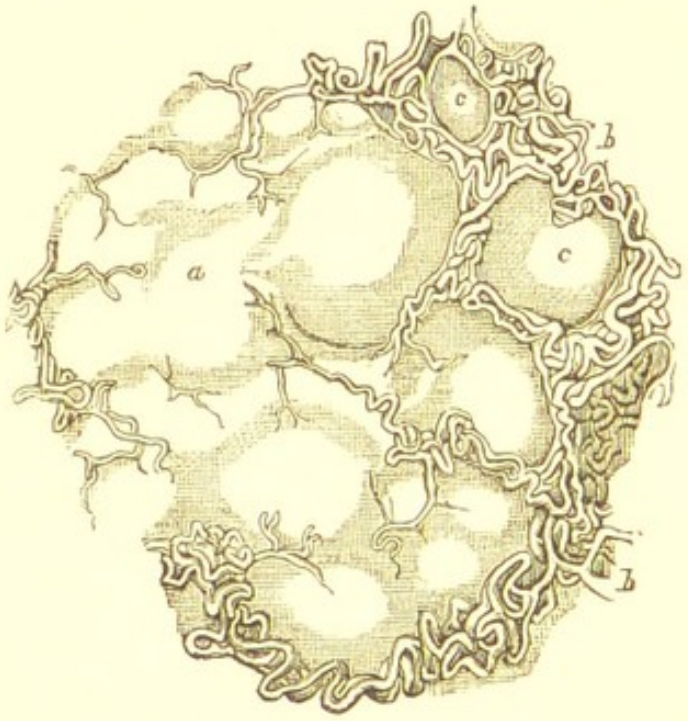


Acute catarrhal pneumonia as seen under the microscope (in a case of dilated bronchial tubes). *a*. The walls of the alveoli somewhat thickened. *b*. Cells which have formed in the alveoli.

colour, traversed by whitish or black bands of fibres, which often surround old masses of tubercle, or the whole tissue may be broken up into cavities. The pleura is generally thickened, the bronchial tubes are dilated, and their walls much hypertrophied. Microscopically, the walls of the alveoli are greatly thickened by newly formed fibrous tissue which replaces the

elastic fibres. This often extends inwardly, lessening the cavity of the air-vesicles, which, in other cases, are blocked up with epithelial and other cells. In some instances the only evidence of this form of pneumonia consists in the increase of the connective tissue situated between lobules which are occupied by

FIG. 25.



Tubercular deposit in the lung, as seen under the microscope. *a*. Tubercle which has broken down the walls of the air-cells in which it was deposited. *b*. Blood-vessels. *c*. Single air-cells filled with tubercular matter. (RAINEY.)

tubercular deposits. A common cause of this complaint is the inhalation of irritating dust, such as occurs in the occupation of miners, flax-dressers, stone-dressers, &c.; it occasionally follows an attack of acute pneumonia or chronic bronchitis, but in other cases it occurs without any apparent reason.

89. TUBERCLE IN THE LUNG constitutes the disease named phthisis pulmonalis (consumption). Tubercle occurs in almost every organ of the body, but is most frequently met with in the lungs. It presents itself

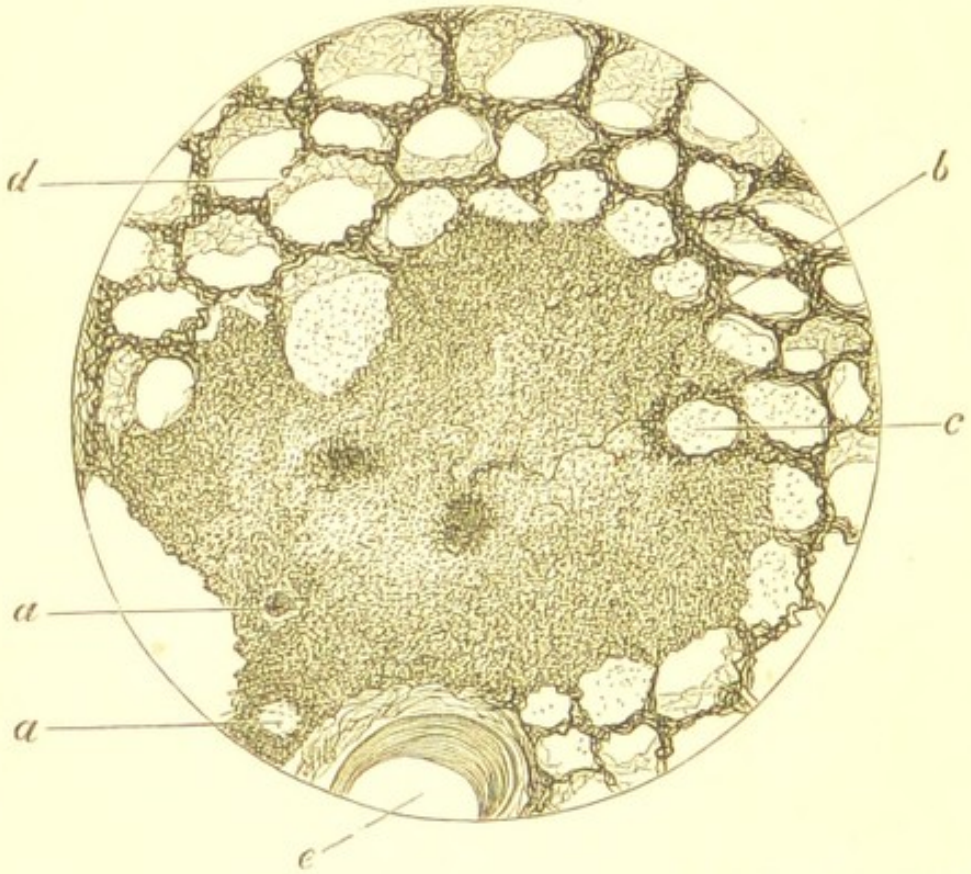
in three stages—*consolidation* or *deposition*, *softening*, *ulceration*. In the stage of *deposition* the tubercle may be scattered through the lungs in the form of small, round, hard, grey, semi-transparent granules (grey or miliary tubercles); or it may be present in the shape of hard opaque, yellow cheesy masses (crude or yellow tubercle). Sometimes the tubercle dries up into a chalky mass (obsolete tubercle). Generally it softens and inflammation is set up in the surrounding structures, which become soft, friable, and loaded with blood: this is the second stage, or that of *softening*. *Ulceration* succeeds, and one or more ragged, irregular-shaped cavities are produced, forming the third stage. The cavities may either increase in size, and be found after death filled with pus and broken-up lung-structures, or an attempt at cure may occur, in which case the inflammation of the surrounding structures subsides, and the cavity becomes lined with a smooth membrane.

90. The opinion of Laennec was that the grey or miliary tubercle and the crude or yellow tubercle were only stages of the same disease, and were, in all cases the results of a similar constitutional affection. This theory was first shaken by the discovery that cheesy-looking masses undistinguishable from crude tubercle may arise from any cellular formation that has perished and remained unabsorbed, and consequently undergone chemical changes. Villemain, next, showed that nodules similar to the grey tubercle can be produced in rabbits and guinea-pigs, by placing beneath the skin minute particles of crude tubercle. Most pathologists now agree in restricting the term *tubercle* to the grey or miliary tubercle, whilst they consider the crude tubercle, when present in the lungs, as merely the cheesy remains of the unabsorbed products of chronic catarrhal pneumonia.

91. *Chronic catarrhal pneumonia* is described as usually commencing in an inflammation of the smaller bronchi. The epithelial cells are increased in number

to such an extent that they block up the interior of the tubes, whose walls also become thickened by the inflammation. If the plug of epithelium remains fixed in its position, the cells of which it is composed perish, and a cheesy mass is the result. This may

FIG. 26.

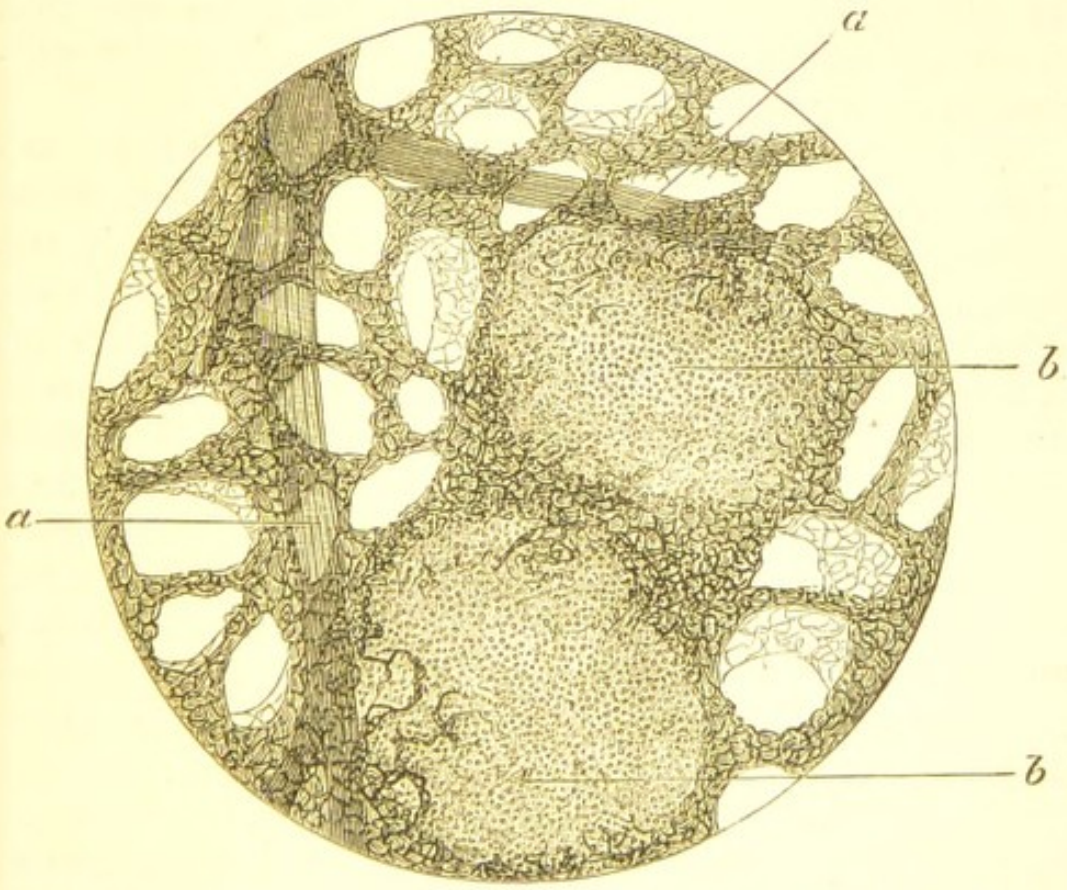


Shows the microscopical appearances of chronic catarrhal pneumonia (crude tubercle). *a*. Small bronchial tubes, some of which are seen to be choked with a mass of cells, others are empty from their contents being displaced in the process of cutting the section. *b*. The alveoli filled with cells. *c*. Alveoli only partially filled with cells. *d*. Alveoli in their normal condition. *e*. Large bronchial tube. It will be remarked in Fig. 25, that only a few blood-vessels could be injected where the alveoli are filled with cells.

either become hardened by a deposit of lime, so that a chalky concretion results, or, as more generally happens, it may act as an irritant, and set up inflammation around it. The access of air to the alveoli being cut off by the plug, they collapse, and become

filled with cells, as in acute catarrhal pneumonia. The alveoli may be the first to inflame, and the morbid action may extend from them to the tubes. In either case, the contents of the alveoli being prevented from escaping through the narrowed bronchi, degenerate, become cheesy, and so form what was formerly called crude tubercle. The pressure of this compresses and obliterates the blood-vessels, as is seen in fig. 26, ulceration occurs and the cheesy mass is removed by expectoration.

FIG. 27.



Showing the microscopical appearance of miliary tubercles in the lungs. *a*. Injected branches of the pulmonary artery compressed by the tubercular formations, *b*, which are also seen to encroach upon the neighbouring alveoli.

92. The miliary tubercle, to which the term *tubercle* is now generally restricted, appears to commence by the growth of cells close to the smaller bronchi and arteries (see fig. 27). Some describe these cells

as arising from the external coat of the smaller arteries; others, as an increased growth of the *adenoid tissue* that normally exists around the vessels and bronchial tubes. (Adenoid tissue consists of a network of fine fibres containing cells resembling those of lymph. It is found in the lymphatic glands, Peyer's glands, and other similar structures). The little clump of cells thus formed compresses the neighbouring alveoli, or sets up chronic catarrhal pneumonia which goes through the same processes of softening and ulceration that were before described. The miliary tubercle itself, not being provided with blood-vessels, softens in the centre, and thus gives rise to a caseous product which may likewise soften and produce a cavity.

You must bear in mind that miliary tubercles are always the result of a constitutional affection. They often occur as an acute disease, in which not only the lungs, but the intestines, pia mater, serous membranes, and, in fact, almost every organ of the body, is found after death to be studded with these minute formations. Such a form of the disease is named *acute tuberculosis*. When miliary tubercles occur in a chronic form, as in consumption, many pathologists believe they have been produced by the absorption into the blood of some cheesy material (crude tubercle), resulting from the unabsorbed products of inflammation of the lungs, lymphatic glands, or other organs.

93. Cancer of the Lung, although a comparatively rare disease, may occur under different forms. *Scirrhus* of the lung forms a hard, firm, white, well-defined tumour, from which a juice can be squeezed, which under the microscope is seen to contain fibres along with elongated or caudate nucleated cells. *Medullary cancer*, which is the most common form of the disease, is soft, friable, often blood-stained, and vascular. Cancer may take its rise in the bronchial glands, in the lung itself, or it may be an extension

of a similar growth situated in the breast or other adjoining parts. It is usually associated with malignant tumours in some other organ of the body. (For the microscopical appearances of cancers see Cancer of the Stomach.)

From the above description of the morbid changes discovered in the lungs after death, you will be able to understand the physical signs indicating their presence during life.

94. When you strike upon a healthy chest, a clear sound is elicited, on account of the large amount of air contained in the lungs. But if the lung is emptied of air by being compressed by fluid, as in pleurisy, or by its air-cells being filled with lymph, as in pneumonia, it is evident that the sound on percussion will be no longer clear, but dull. When, on the contrary, the pleura is filled with air, or the cells of the lung are distended, as in emphysema, it is equally plain that the chest will be more resonant than in the healthy condition. In phthisis the amount of dulness will vary according as the air-cells are completely, or only partially filled with tubercle.

95. A sound named the "vesicular murmur" is produced by the air rushing into and distending the air-cells and bronchi during inspiration. If from any cause the lung, or a portion of it, acts more energetically than usual, the murmur is increased; this is termed "*puerile respiration*," because in children the vesicular murmur is louder than in adults. If in any way the activity of the lung is lessened, the sound becomes feeble. The most common causes of feeble respiration are obstruction of the air-cells by tubercles, a loss of the elasticity of the lungs, as in emphysema, or some stoppage to the free passage of the air through the larynx or bronchial tubes.

96. In a healthy chest the sound produced by the air rushing through the bronchial tubes is masked by the loudness of the vesicular murmur; but if the air-

cells are extensively blocked up, as in pneumonia or phthisis, the bronchial sounds are plainly heard, forming "*bronchial* or *tubular respiration.*" It will be evident that the character of the sound will vary with the size and shape of the passage which the air traverses, and consequently when a bronchial tube is

FIG. 28.

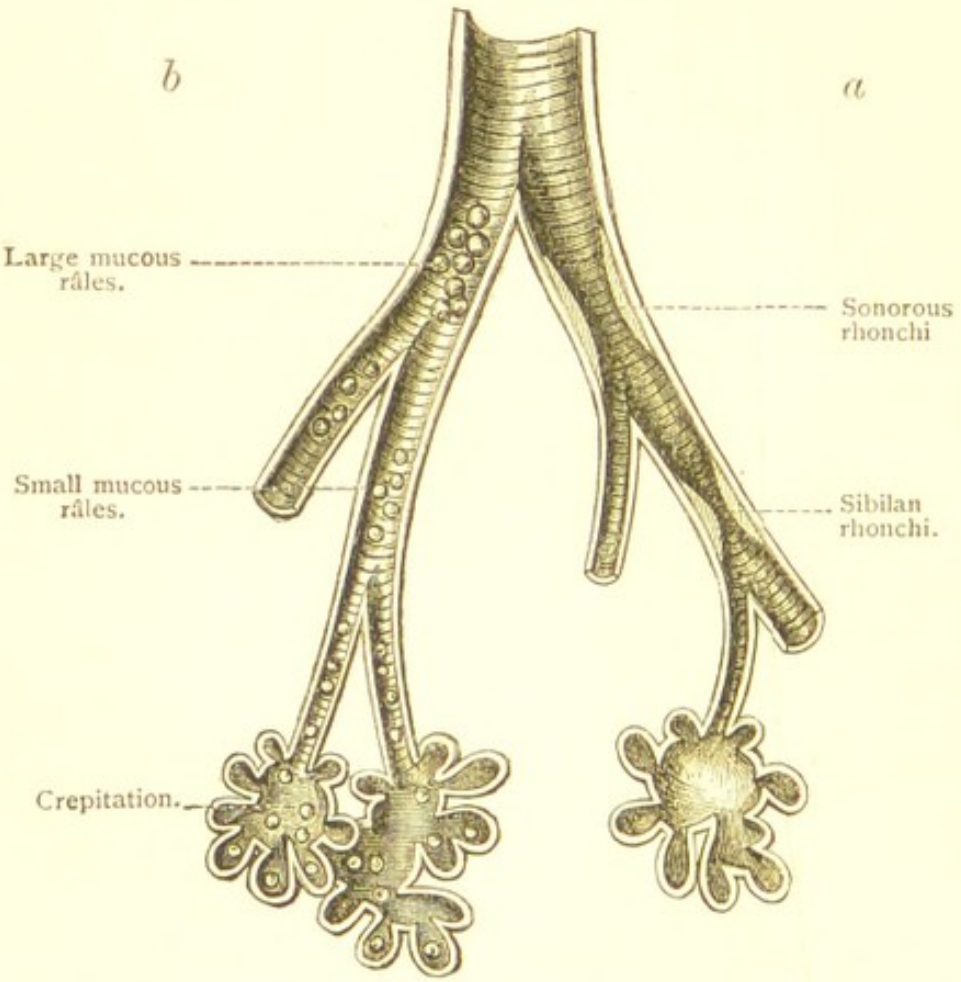


Diagram illustrative of râles in the bronchial tubes. The narrowing of a tube, as seen at *a*, gives rise to sonorous and sibilant rhonchi; fluid contained in a tube as at *b*, to moist sounds. (DA COSTA.)

much dilated, or ends in a cavity, we meet with "*cavernous respiration.*"

97. The voice generated in a patient's larynx is imperfectly conducted by the healthy lung, so that when your ear is placed upon the chest only a buzzing sound is audible whilst he speaks. But if the air-cells are

filled with solid material, as in pneumonia, the voice is conducted to the ear through the bronchial tubes, and you hear the sound more distinctly ("*increased vocal resonance*," or "*bronchophony*"). If a cavity, or very large bronchial tube, is present, the force of the sound is further increased, and "*pectoriloquy*" is the result.

98. When air is forced along the polished lining of a tube, a soft sound is produced; but if the internal surface is roughened or contracted, the nature of the sound is altered. In bronchitis, when the mucous membrane is stripped of its epithelium, or films of hard mucus project here and there, or the calibre of the tube is altered, abnormal sounds, named "*dry râles*," result. The grave sounds generated in the larger tubes are named "*sonorous rhonchi;*" those of a more piping or whistling character, arising in the more minute bronchi, are called "*sibilant rhonchi.*" (See fig. 28.)

99. When the bronchial tubes, or air-cells, are filled with liquid secretion, the air bubbles through it in passing to and from the lungs, and thus "*crepitations*," or *wet sounds* are produced. These are termed large or small crepitations, or "*mucous râles*," according to the size of the bubbles, and therefore of the air-passages in which they are generated. Many persons confine the term "crepitation" to the fine râles heard in pneumonia and produced in the air-cells, and call the other larger moist sounds produced in the bronchial tubes "mucous râles." As small crepitations are not peculiar to pneumonia, I think it is simpler to call all the moist sounds, whether large or small, crepitations.

Accustom yourself to the examination of the *healthy* chest by means of percussion, palpation, and auscultation.

100. You may employ percussion by means of a small hammer and a pleximeter made of ivory, or, what is better, by the fingers. In the latter mode you

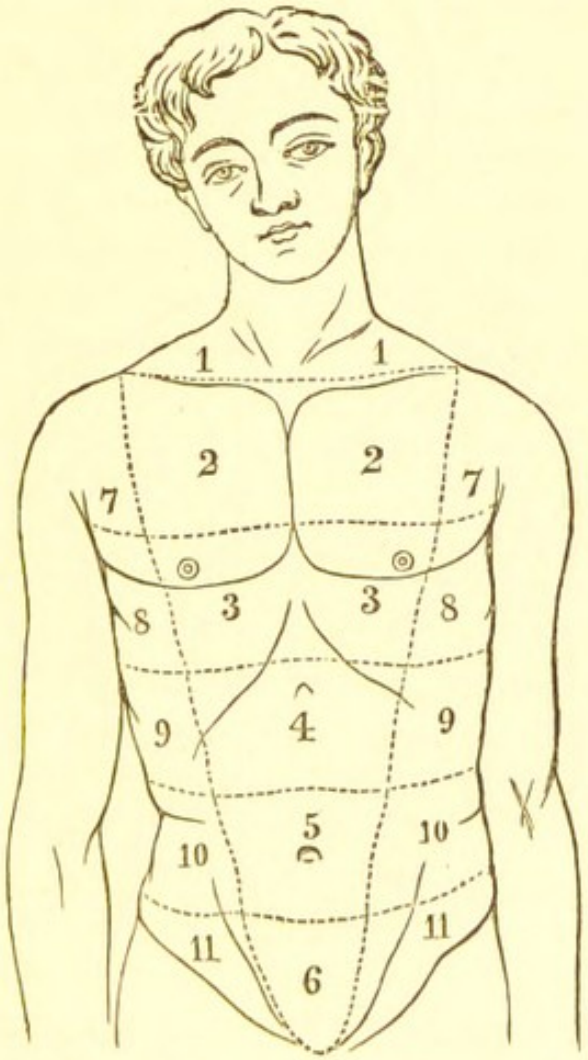
place the forefinger of the left hand quite flat upon the chest, and strike upon it with the tip of the middle finger, or the tips of the middle and forefingers held together, of the right hand. Always strike from the wrist, and not from the elbow; never use more force than is necessary to elicit a clear sound, and compare the corresponding parts of the opposite sides of the chest with each other. By thus using the fingers you can readily ascertain the amount of resistance offered by the parts you percuss, as well as the character of the sound elicited. You should observe that, with the exception of the heart's space, the corresponding regions on each side of the chest sound equally clear. When the patient draws a full breath the percussion note is clearer, and in forcible expiration it is duller than in ordinary respiration. You must percuss more forcibly over and above the scapula, than on the front of the chest.

101. When you place the palm of your hand upon the chest of the patient you will feel a vibration when he speaks. This is termed the *vocal fremitus;* it is a most valuable sign in the diagnosis of pneumonia, phthisis, and other disorders.

102. With regard to auscultation, first place the stethoscope over the *windpipe* of a healthy person. You will find that there are two sounds accompanying the act of breathing, one produced by the air as it enters, the other as it leaves the chest. They are equal in length, and are both rough and harsh, and a distinct interval occurs between the cessation of the former and the commencement of the latter. They constitute what is termed "*tracheal* or *cavernous respiration.*" Next place the stethoscope between the shoulders near the fourth dorsal vertebra, opposite the point at which the trachea divides into the bronchi. Here the inspiratory sound is rather longer than that of expiration, both are softer and less hollow than over the trachea, and they are separated by a slight, but appreciable interval. This is "*bronchial respiration,*"

or "*tubular breathing.*" Again, listen to the breathing in the other parts of the chest, and you will find that the sound of inspiration is soft and breezy; that of expiration is lower in tone, much less prolonged, and follows directly that of inspiration. This is termed the "*vesicular murmur.*"

FIG. 29.



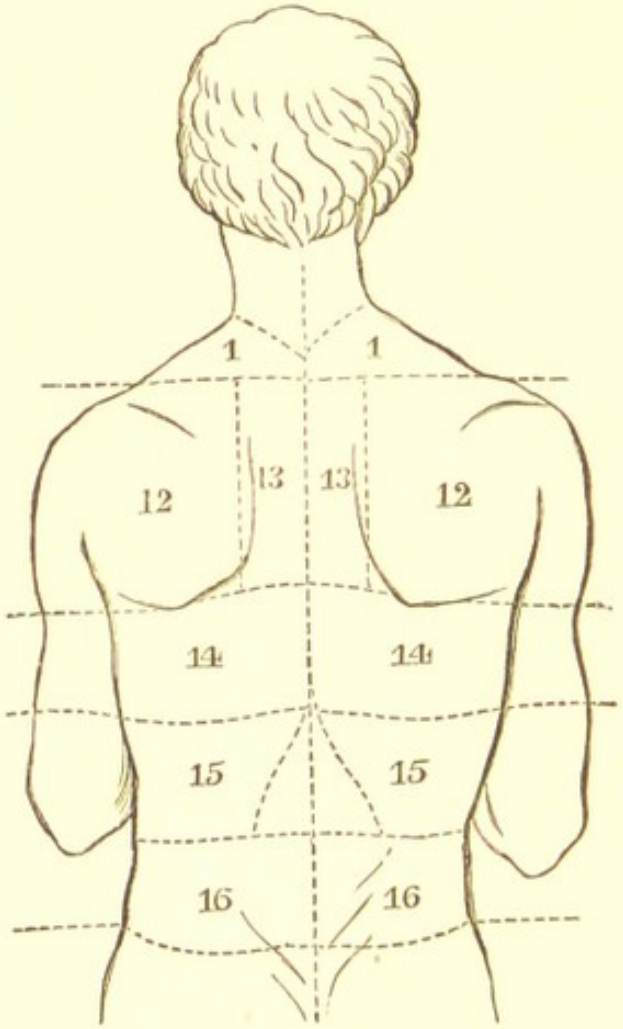
1. Supra-clavicular.
2. Infra-clavicular.
3. Mammary.
7. Axillary.
8. Infra-axillary.

(PAXTON.)

103. Direct the patient to speak when your stethoscope is on the above situations; over the trachea the words seem as though spoken into the ear, and even a whisper is distinctly heard. This is "*pectoriloquy.*" Over the upper bone of the sternum, and in the inter-

scapular region near the fourth dorsal vertebra, the sound seems to be heard at the lower end of the stethoscope. This is "*bronchophony*." In the other parts of the chest the voice produces a buzzing sound, which is often scarcely audible.

FIG. 30.



1. Supra-spinous.
12. Scapular or sub-spinous.
13. Inter-scapular (right and left).
14. Infra-scapular.

(PAXTON.)

104. If possible, examine your patient when in a sitting position, and let him keep his mouth closed so as to breathe only through the nostrils. Where the respiratory murmur is feeble, it is often necessary to make him walk about to increase it. Take care that such of the clothes as are not removed are loose,

for the rustling of flannel may be readily mistaken for sounds produced by disease.

105. The walls of the chest vary in size, shape, and mobility, in accordance with the condition of the organs they contain. You will therefore find it necessary to measure it in different diseases. The affected side is expanded in pleurisy with effusion and in pneumothorax; it is contracted when a lung, compressed by effusion, has been incapable of expansion after absorption of the fluid. In phthisis the upper ribs generally fall in, and their mobility is lessened, from the summits of the lungs being affected with tubercle. In measuring the chest, mark with ink the central points over the spinal vertebræ and sternum, and between those points stretch a graduated tape on each side, taking care that the patient holds his breath in a forced expiration. Instruments have been invented to make the measurements more exact, but they are seldom required. The shape of any part of the chest can be ascertained by means of a *cyrtometer*. This consists of two bands made of pewter, graduated in inches, and joined together by a hinge. To use it, fix the hinge firmly over the spine and bend the band on each side round the chest, observing where the ends meet in the middle line in front. When you remove the instrument, place it on a book or table, and join the ends at the point at which they met when on the chest. By using the bands as a ruler, you can mark with a pen or pencil the shape of the chest, and thus record any difference that may exist between the sides of the thorax.

106. For the purposes of diagnosis the chest is supposed to be divided into regions with which you should make yourself acquainted. Figures 29 and 30 will enable you to understand the limits of these regions.

The symptoms that should lead you to suspect the presence of disease in the lungs, are—pains of the

chest or side, cough, expectoration, spitting of blood (hæmoptysis), dyspnœa, sweatings at night, loss of flesh.

Before examining a patient who is suspected to have a disease of the lungs, inquire if his complaint came on suddenly (*acute*), or if its development was slow and gradual (*chronic*), or if he is subject to *occasional* attacks, his health being good during the intervals. If the disease is acute begin at (107); if chronic, pass on to (120); if occasional, pass on to (131).

SECTION I.

Acute Diseases of the Lungs.

The acute diseases of the lungs are pneumonia, pleurisy, pneumothorax, bronchitis, whooping-cough, acute phthisis. In all these complaints direct your attention first to the lower and back parts of the chest below the scapulæ. Begin your examination with percussion. If there is distinct dulness begin at (107); if there is no dulness, pass on to (114); or if you find abnormal clearness of sound pass on to (119).

A. *You find distinct dulness on percussion.* The disease is either pneumonia, pleurisy with effusion, or hydropneumothorax.

107. *a.* You hear tubular breathing alone, or accompanied by a fine crackling, or a bubbling sound during inspiration; there is increased resonance of the voice, and increased vocal fremitus.

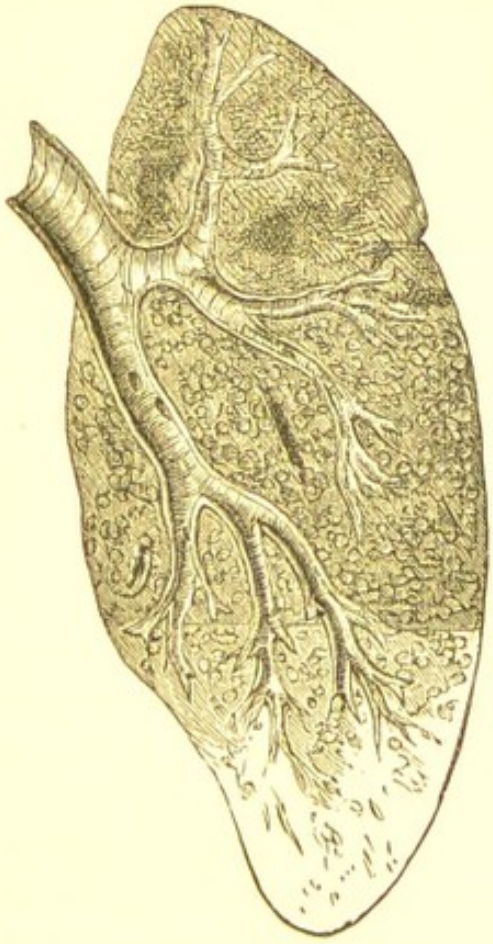
The disease is *pneumonia.*

The crackling and bubbling sounds are termed "*crepitations.*" They arise from bubbles of air passing through the fluid present in the air-cells and smaller bronchi, or, according to others, pneumonic crepitation is produced by the separation of the walls of the air-cells glued together by exudation, by means of the air entering the lung in inspiration. They are heard in the beginning and decline of the disease.

As soon as the lung becomes solid (red hepatization), you have tubular breathing, or an absence of the respiratory sounds. The increased resonance of the voice and the increased vocal fremitus arise from the solid lung conducting the sounds of the voice better than a healthy lung.

Pneumonia is ushered in by a severe shivering fit,

FIG. 31.



Illustrating the stages of acute pneumonia.

followed by pain of the side, which is not, however, of a sharp or cutting character, as in pleurisy, unless this disease be also present. There are thirst, hot dry skin, white tongue, little or no appetite, confined bowels, thick scanty urine. The patient generally lies on his back, has a frequent, short cough, attended with *gluey, rusty-coloured, or bloody expectora-*

tion, dyspnœa, very rapid breathing, quick but soft pulse, and often delirium at night.

The average temperature in the axilla in pneumonia is 104°, average rapidity of the pulse, 120, accompanied by about forty respirations in the minute, during the height of the disease; if these are exceeded the case is severe, if they are below, the case is slight. During the height of pneumonia there is an absence or great diminution in the amount of chlorides in the urine: you ascertain this by adding a solution of nitrate of silver to the urine, previously acidified by nitric acid, and observing that a slight or no precipitate is produced. A crisis or sudden subsidence of the fever is apt to occur on the fourth, sixth, or seventh day of the attack, and is often accompanied by diarrhœa, severe sweatings, or the passing of a large quantity of thick urine. Albumen is often present in the urine, and if it occurs before the crisis, is an unfavourable sign. Jaundice occasionally presents itself, and there is usually an eruption of herpes on the lips.

You may suspect that an abscess of the lung has formed, if severe shiverings occur in the later stage of the disease, and if, at the same time, the expectoration becomes yellow and contains lung-tissue. Gangrene is indicated by a very foul smell in the breath and expectoration, accompanied by a sudden and very marked prostration of the strength of the patient. When the fever persists for some length of time, becoming increased at nights, and followed towards the morning by profuse perspirations, at the same time that the dulness on percussion remains; or if the disease has been ushered in with profuse spitting of blood, it is probable that the case will terminate in consumption.

108. Œdema of the lung presents small crepitations and bubbling sounds, attended by dyspnœa, cough, and profuse expectoration, but the expectoration is frothy and thin, and there is an absence of decided

dulness on percussion and tubular breathing. Œdema generally arises from diseases of the heart, kidneys, or liver.

109. You may have dulness on percussion and absence of respiration from collapse of the air-cells, as a sequence of capillary bronchitis or fever. This is chiefly met with in children and old people. You distinguish this condition from pneumonia by the history of the case, the absence of rusty-coloured expectoration, and the rapidity with which the affection commences.

110. *b.* You find a diminution or absence of respiratory murmur, of vocal resonance, and vocal fremitus.

The disease is *pleurisy with effusion.*

The dulness and absence of respiration are caused by the lung being compressed against the spine by the fluid in the pleura. Consequently, the extent of the dulness corresponds with the amount of fluid. The respiratory sound is louder than natural on the opposite side of the chest. When there is a small quantity of effusion, the dulness may be only perceptible when the patient stands, and may disappear when you make him lie upon his face. In other cases the whole side is dull. If the left side is affected the heart is displaced, and can be heard and felt to beat on the right of the sternum, whilst the semilunar space occupied by the stomach at the lower part of the left hypochondrium, which ordinarily gives a clear sound, is dull on percussion: when the right side has been attacked, the liver is pushed downwards, and can be felt below the ribs. The affected moves less and measures more than the healthy side, and the spaces between the ribs are wider, flatter, or more bulging. In most cases tubular respiration can be heard in the interscapular region, and occasionally a peculiar bleating sound (ægophony) may be distinguished at the inferior angle of the scapula when the patient speaks. Friction sounds may be generally heard at an early period of this stage of pleurisy; as the fluid is

absorbed the physical signs diminish. Eventually the affected side may be found shrunken in size and distorted, and the heart may be permanently displaced.

FIG. 32.

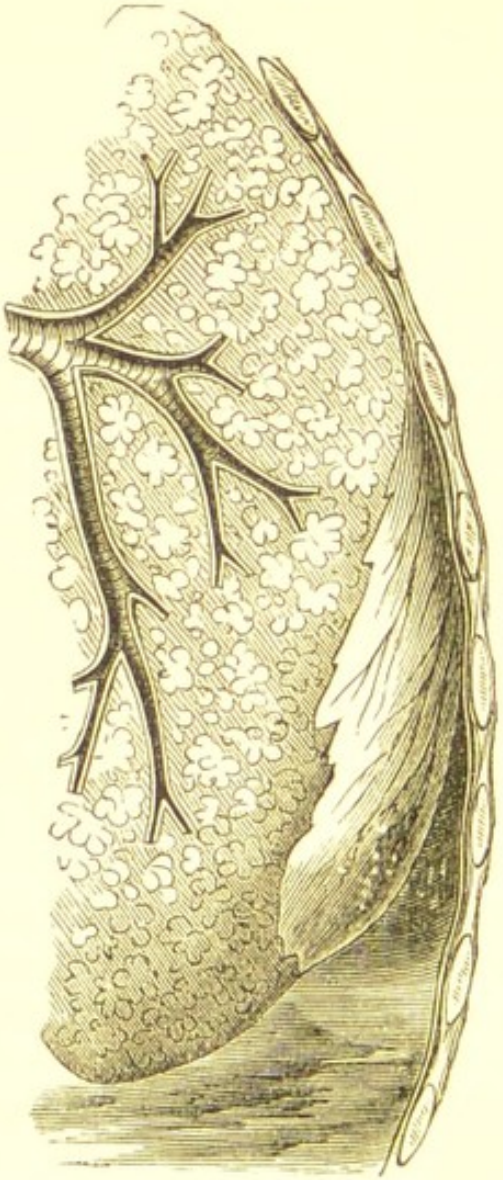


Diagram showing roughening of the pleura at the middle, and effusion of fluid at the lower, part of the chest. (DOBELL.)

If suppuration takes place (empyema), you will find the patient complain of shiverings and night sweats; the pulse becomes small and frequent, and there is rapid loss of flesh. The matter may burst externally, or it may perforate the lung and cause sudden and profuse expectoration of pus.

111. The liver when enlarged may project upwards as far as the fourth rib, and thus simulate a partial effusion into the right side of the chest. You will find, however, that the line of dulness in such a case is higher in front than behind, that it descends on a full inspiration, and rises in full expiration, which is not the case in pleuritic effusion.

112. Medullary cancer of the whole lung also produces dulness on percussion, and absence of vesicular murmur; the dulness is, however, seldom quite uniform, small spaces being comparatively clear on percussion, there is not such a complete loss of vocal fremitus, the sputa are often bloody or like currant jelly, and there may be evidence of malignant disease in other organs; there is also a more cachectic aspect than in pleurisy.

113. You distinguish pleurisy with effusion from pneumonia by the history of severe pain of the side and the absence of rigors in the former complaint, and by the very rapid respiration, severe cough, the tough, blood-coloured expectoration and higher temperature of the latter. In pleurisy the chief physical signs are—Enlargement of the affected side and dilatation of the intercostal spaces, displacement of the heart and dulness of the semilunar space occupied by the stomach on the left side, and depression of the liver when the right side is affected, diminution or absence of vocal fremitus and respiratory sounds; in pneumonia they are—crepitations, increased vocal fremitus and bronchial respiration.

B. There is no dulness on percussion. It is either pleurisy without effusion of fluid, bronchitis, whooping-cough, or acute phthisis.

114. *a.* The breath and voice sounds are normal, but you hear a superficial rubbing or grating sound accompanying the respiration.

The disease is *pleurisy without effusion of fluid.*

The creaking is occasioned by the rubbing together of the roughened surfaces of the pleura (see fig. 32).

Usually it accompanies both inspiration and expiration, but sometimes it can be only heard on full inspiration. It may be mistaken for the sonorous rhonchus of bronchitis, and if there is any doubt on this subject, direct the patient to cough; this generally alters the sound in bronchitis, but leaves that of pleurisy unaffected. On account of the pain, the movements of the chest are quick and constrained, and the sounds of respiration are feeble.

The complaint is generally ushered in by chilliness or shivering. The patient complains of dyspnœa and sharp pain of the side increased by breathing or coughing. He lies on the unaffected side. The pulse is quick, often hard. There are fever, and a short, hard cough, but no rusty-coloured expectoration. This stage of the complaint is generally followed by effusion into the pleura. Pleurisy sometimes occurs as a chronic disease, but the physical signs are the same as in the acute form.

115. You must remember that the sharp pain of pleurisy may be simulated by rheumatism of the muscles, and neuralgia, and that severe pain in the side may be the precursor of an attack of herpes (shingles). In none of these are there fever, friction sounds on inspiration, or dulness on percussion.

116. *b.* You hear the breath sounds accompanied by dry or moist râles, and there is no alteration either in the voice or vocal fremitus.

The disease is *acute bronchitis.*

Accustom yourself to distinguish the dry from the moist sounds of bronchitis. Crepitations may be simulated by the rubbing of the stethoscope on the hair of the chest, by rustling of the dress, and by air in the subcutaneous tissue (emphysema). The crackling produced by the pressure of the stethoscope upon hair can be lessened or removed by wetting the part with water.

The patient complains of more or less fever (the temperature rarely, however, exceeding 101°), dull,

oppressive pain, or soreness of the chest, often referred to the sternum, cough and expectoration. The expectoration is at first glairy, or frothy, semi-transparent mucus; afterwards opaque or puriform. It is never rusty-coloured, as in pneumonia, although it may be streaked with blood. When bronchitis of the smaller tubes (*capillary bronchitis*) attacks children, there is greater fever, difficulty of breathing, and altogether more serious symptoms than in the case of adults. When you observe that the epigastrium sinks in, and that the lower ribs are drawn inwards during inspiration, you know that the entrance of the air into the pulmonary vesicles is seriously obstructed. Capillary bronchitis is apt to occasion *collapse* of portions of the lung.

117. *c.* The patient is frequently attacked with short fits of violent, rapidly interrupted coughing, alternating with long drawn, shrill, crowing inspirations; the seizures usually ending with the expectoration of a thick, glairy mucus, or in vomiting. During the fits the features become red or bluish, the eyes start, and the child seems on the verge of suffocation.

The disease is *whooping cough.*

This complaint is most common in childhood, it occurs as an epidemic, is very infectious, and usually affects a person only once in his lifetime. It often follows measles or scarlatina. The whoop is produced by spasmodic closure of the glottis. The disease is preceded for many days by fever, discharge from the nose and eyes, and the other symptoms of a "cold." This is succeeded by decline of the fever, and the appearance of the characteristic cough (convulsive stage). After some time the violence of the attacks declines, and the expectoration becomes less viscid and smaller in quantity (stage of decline). The disease is often attended with bronchitis, and, as the smaller tubes are frequently affected, in fatal cases the air-cells are generally found to be collapsed

in different parts of the lungs. Sometimes the patient afterwards suffers from emphysema or phthisis, occasionally death occurs from convulsions.

118. *d.* If along with the physical and general signs of bronchitis the patient has severe fever, an unusual amount of difficulty of breathing, a brown tongue, rapid loss of flesh and strength, and profuse night sweats, you may suspect *acute phthisis.*

Acute phthisis usually runs its course in from three to ten weeks, and often presents no physical signs of consolidation of the lungs; if you cannot discover these and fail to find lung tissue in the expectoration, you are not justified in giving a positive diagnosis of acute phthisis.

C. Percussion elicits a clear note, like that of a drum over one side of the chest (tympanitic sound). You can have only one acute disease of the chest—viz., *pneumothorax.*

119. *a.* The respiratory sounds, vocal resonance, and fremitus, are greatly diminished or are absent, there is convexity of the affected side, bulging of the intercostal spaces, immobility or diminished motion of the ribs, and often displacement of the heart.

The disease is *pneumothorax.*

The air in the pleura compresses the lung, and thus prevents the respiration in the same way as the fluid of pleurisy does. Inflammation is usually set up in the pleura, and you therefore often find dulness on percussion from fluid at the base of the chest, and abnormal clearness above. The limits of the dulness usually vary greatly with the position of the patient, being much higher in front when he is sitting upright than when he lies upon his back. Sometimes you will find a loud echo with the voice ("amphoric voice"), and a tinkling sound as if produced by the falling of drops of fluid in a cavity. In other cases, when the patient moves or is shaken, a loud splashing sound is produced.

In the majority of instances the air is admitted into

the pleura by the bursting of a small cavity; consequently the signs of pneumothorax are usually preceded by the symptoms of phthisis. When the rupture occurs, as it generally does, during a fit of coughing, the patient is seized suddenly with severe pain of the side, intense dyspnœa and great faintness, the pulse

FIG. 33.

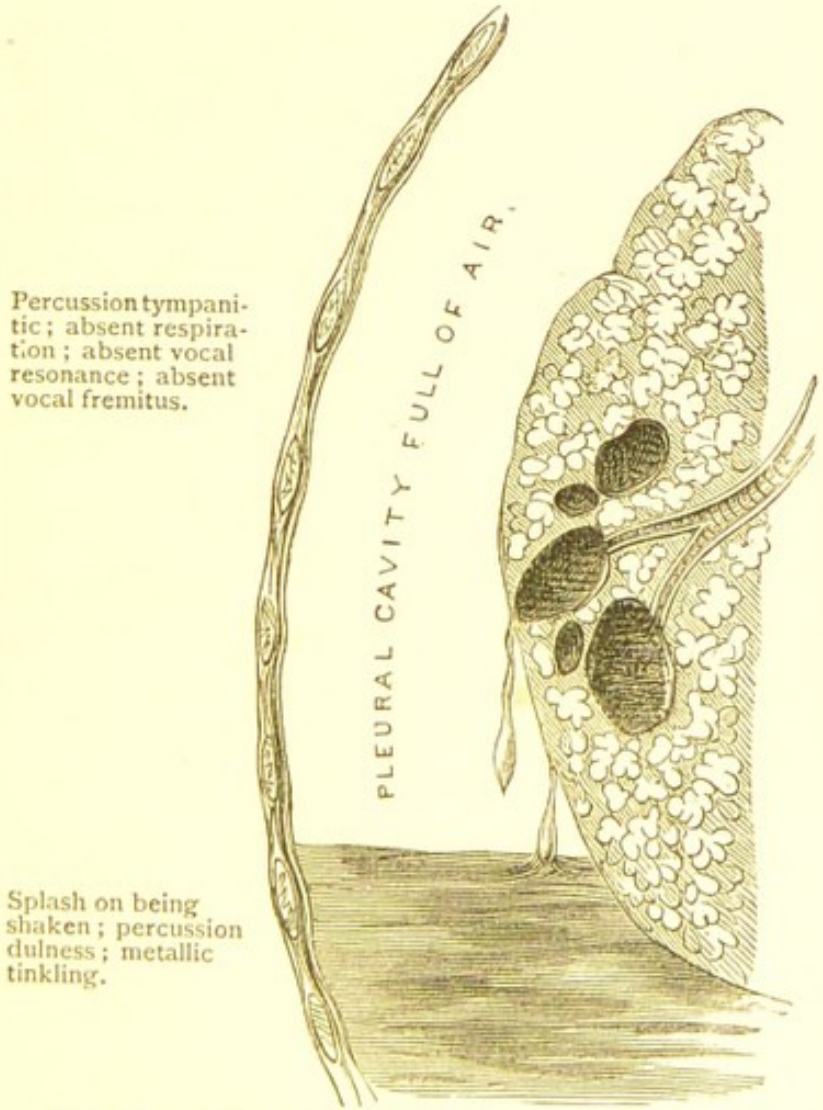


Diagram of the physical signs in pneumothorax. (DOBELL.)

being weak and fluttering. Afterwards he sits upright or lies wholly on the affected side; there are blueness of the face and lips, profuse sweating, and more or less swelling of the face and limbs. The accident usually ends fatally. The percussion note is abnormally clear only in emphysema and pneumothorax,

but emphysema is a *chronic* disease in which both sides of the chest are affected, the intercostal spaces are normal, and the respiration audible though feeble; pneumothorax is an *acute* complaint, in which only one side is affected, the intercostal spaces are dilated, and the respiratory murmur is absent.

SECTION II.

Chronic Diseases of the Lungs.

The chronic diseases of the lungs are—chronic pleurisy, hydrothorax, phthisis, chronic bronchitis, and emphysema.

Commence your examination with percussion. If you find dulness on percnssion begin at (120); if you find no dulness, pass on to (128); if the percussion is abnormally clear, pass on to (130).

A. You find dulness on percussion.

120. *a.* The dulness is chiefly or entirely confined to the lower and back parts of the chest, and is associated with absence of respiration, of voice sound, and of vocal fremitus.

The disease is either *chronic pleurisy* or *hydrothorax.*

As there is effusion of fluid into the pleura in hydrothorax, the physical signs are similar to those of pleurisy with effusion (110). To distinguish between these, remember that pleurisy generally affects only one, but hydrothorax both sides of the chest; that the invasion of pleurisy is sudden, attended with pain, and in the first stage it presents a friction sound, whilst hydrothorax occurs only as a part of general dropsy, or as a consequence of disease of the heart, kidneys, or liver; also that in hydrothorax you do not find the intercostal spaces obliterated or the heart displaced as in pleurisy.

121. If you find no dulness at the lower part of

the chest, percuss very carefully the clavicles, the subclavicular and supra-spinous regions. Compare the resonance of the corresponding regions on each side, and if you have any doubt as to the existence of dulness, percuss *during full inspiration and forced expiration.* Observe also whether both infra-clavicular regions expand equally during inspiration; this can be done by placing the hand on the part, or by measuring with a tape or callipers. Compare the relative lengths and the tones of the inspiratory and expiratory murmurs in the infra-clavicular, supra-clavicular, and supra-spinous regions on either side. This you can do, either by placing the ordinary stethoscope alternately on the same region on each side, or by listening to both sides at the same time with Dr. Scott Alison's "differential stethoscope." Remark if the inspiratory sound, instead of being continuous, proceeds in a "jerking" manner, or if it be in any place "tubular;" also if after a full inspiration a slight "click" occurs at the end of it. Compare also the resonance of the voice on each side. You will generally find it useful to direct the patient to cough, and directly afterwards to draw a full breath.

122. *b.* The dulness is in the upper regions of the chest, and is attended either with feeble inspiration, increased expiration, harsh inspiration, jerking inspiration, tubular respiration, dry clicking, increased vocal resonance, lessened mobility, or diminished fulness below the clavicles.

The disease is probably *consolidation of the lung by tubercle.**

You must not diagnose phthisis merely because you discover one or more of the above signs, but should always take into account the general condition of the

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* Of course the physical signs of consolidation of the lung are the same, whether this arises from chronic catarrhal pneumonia alone, or, as is generally the case, combined with miliary tubercle.

patient. On the other hand, you must not conclude that tubercular consolidation is absent because you do not at once detect the physical signs of this condition. If the general symptoms are indicative of phthisis you must examine the chest from time to time before giving a decided diagnosis.

FIG. 34.

Slight percussion dulness; feeble inspiration; increased expiration; increased vocal resonance, &c.



Tubercle in first stage (consolidation).

a. Bronchial tubes. *b*. Tubercles filling up the air-cells of the lungs.

The general symptoms of the first stage of tubercle in the lungs (consolidation) usually come on very gradually. They are cough, chiefly in the mornings, expectoration, generally small in amount, of ropy or glairy mucus, hæmoptysis, shortness of breath on exertion, general languor, pains in the side or below the clavicles, loss of flesh, night sweats, pulse increased in frequency. Examine the gums and see if there is a red line round the teeth, also the nails if they are curved downwards at their sides and ends (filbert nails); for both of these signs are apt to accompany phthisis. Hæmoptysis is the most suspicious symptom; if the patient is free from heart disease, and if, in the case of a female, she is not suffering from disordered menstruation, the occurrence of hæmoptysis almost always indicates the presence, or the future occurrence, of tubercle in the lungs. In-

quire if any other members of the patient's family have suffered from phthisis, and in all cases of doubt examine the expectoration for lung tissue. Ascertain also the temperature, for if it be persistently high, and no other disease likely to account for the increased heat be present, there is a great probability of tubercle.

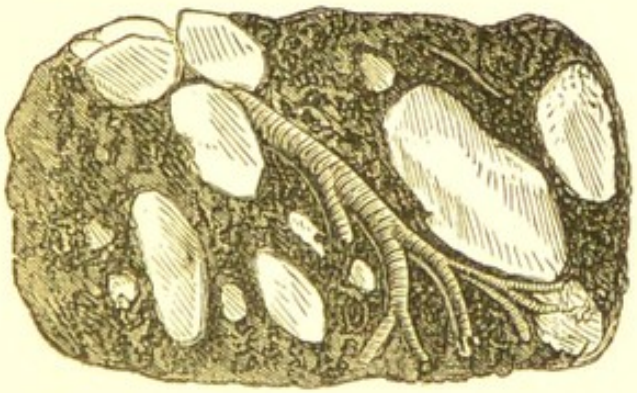
123. *c.* The dulness on percussion is over the upper part of one or both lungs, and is accompanied by crepitation, tubular breathing, and increased vocal resonance.

The *tubercle is in the stage of softening.*

The crepitation arises from the air passing through

FIG. 35.

Percussion dulness; tubular breathing; crepitations; increased vocal resonance.



Tubercle in the lungs in the second stage (softening). (DOBELL.)

tubes, and minute cavities filled with fluid. The dulness and increased vocal resonance show that the disease is not simply bronchitis. In case you have only doubtful dulness, and find crepitation confined to the upper parts of the lungs, examine the sputa for lung-tissue. In this stage you can generally detect a certain amount of flattening below the clavicle, and deficient movement of one or both sides (fig. 35).

124. Cancer of the lung may present the general symptoms of phthisis with dulness on percussion, and tubular respiration. It is, however, usually attended with more persistent hæmoptysis, no lung-tissue can

be found in the sputa, and in most cases cancer exists at the same time in some other organ of the body.

125. *d.* The dulness on percussion is over the upper part of one or both lungs, and is accompanied by tracheal sounds of the breathing (cavernous respiration) and voice (pectoriloquy), or by a splash when the patient coughs.

There is *a tubercular cavity of the lung.*

The tracheal sounds of the breathing and voice

FIG. 36.



Cavity of the lung opening into a large bronchial tube.
a. Bronchial tube. *b.* Cavity.

show that the cavity is, at least partially, empty; when there is a splash (gurgle) on coughing, the cavity contains both air and fluid (fig. 36).

When a large empty cavity exists near the surface of the lung, you often have a very clear sound on percussion, and amphoric respiration and voice.

Remember that pectoriloquy is best heard when the patient whispers. The "cracked pot" sound on percussion occurs not only over superficial cavities, but occasionally in pneumonia, in pleurisy with effusion, and even in healthy children, the walls of whose chests may be unusually yielding.

As phthisis progresses, the cough and expectoration increase, the emaciation becomes more rapid, the night sweats more regular and profuse. There are frequent attacks of pain in the chest or sides from pleurisy, the pulse rises in frequency, the voice is often indistinct and whispering, the tongue is covered with aphthæ, vomiting distresses the patient, especially in the morning, and swelling of the feet, and severe attacks of diarrhœa occur.

126. The physical signs of this stage are the same as when a cavity has been produced by pneumonia, which is, however, rare. In such a case the cavity is usually at the base of the lung, and you have the history of pneumonia to guide you (107).

127. You may have the physical signs of a cavity in cases of dilated bronchus; but the general symptoms are of less severity, the signs indicating the existence of a dilatation are usually confined to the base of the lung or mammary region, the fits of coughing, although violent, are apt to recur only at long intervals, the expectoration is often of a very fetid smell and contains cheesy plugs of a putrid odour, and, above all, no lung-tissue can be discovered in it by the microscope.

128. *B. The percussion note is normal*, but you find the respiration accompanied by dry or moist sounds.

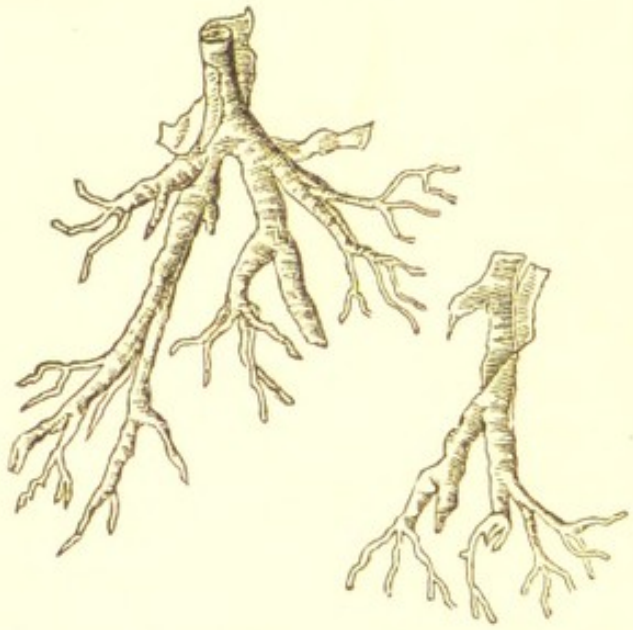
The disease is *chronic bronchitis*.

Chronic bronchitis differs from the acute form of the disease in its slower progress, and in its symptoms being less severe. It is very apt to recur, at first every autumn, disappearing in the summer months, but the attacks become more frequent, until the cough and expectoration persist through the

whole year. When the dry or moist sounds are confined to the apices of the lungs, even if there be no dulness on percussion, you ought to suspect the presence of tubercle, and should examine the sputa for lung-tissue. Sometimes tree-like casts of the ramifications of the bronchi are expectorated. Such cases are usually very chronic, and are often attended with severe spittings of blood. This form of the disease is termed *plastic bronchitis* (see fig. 37).

129. All the *general symptoms* of phthisis may be present in chronic bronchitis (night sweats, emacia-

FIG. 37.



Casts of the bronchial tubes expectorated in a case of plastic bronchitis. (PEACOCK.)

tion, &c.), excepting profuse hæmoptysis; the difference in the physical signs, and the absence of lung-tissue in the expectoration, will serve to distinguish these diseases.

130. *C. The percussion note is abnormally clear on both sides of the chest*, the respiratory sounds are feeble and indistinct, or they may be attended with the sounds of bronchitis, or there is a prolonged and hoarse sound on expiration: the resonance of the voice is

lessened, the shape of the chest is spherical or barrel-shaped, and the ribs move but slightly.

The disease is *emphysema.*

The heart's space is clear on percussion, and posteriorly a clear sound is elicited, even to the lowest ribs. The upper part of the hepatic region is also clear on percussion, and the liver may be often felt below the ribs on the right side, whilst the heart is pushed downwards, so that, though its impulse cannot be detected in its usual place, it is seen to pulsate in the epigastrium. These changes result from the increased distension of the lungs. As bronchitis is usually also present, the auscultatory signs of this affection are generally associated with emphysema, and are most distinct at the bases of the lungs.

The chief symptoms of emphysema, are dyspnœa, attacks of asthma and bronchitis, cough and expectoration. In the later stages, dilatation of the heart often takes place, and blueness of the lips, pulsation of the jugular veins, dropsy, and other symptoms of that disease show themselves.

SECTION III.

The Attacks of the Disease are only Occasional.

Attacks of bronchitis may be occasional, but asthma is the disease usually included under this head.

131. *a.* During the attacks the percussion note is clear, the respiratory murmur is very feeble, or mixed with sonorous and sibilant rhonchi.

The disease is *asthma.*

The attacks of dyspnœa are generally followed by bronchitis, from which the patient recovers for a time, until a fresh seizure again prostrates him. Asthma is produced by the spasmodic contraction of the

muscular coat of the bronchial tubes, the calibre of which is thus so much diminished, that the air is unable freely to enter the air-vesicles of the lungs.

An attack of asthma generally comes on suddenly, usually during the night or early morning, being in some cases preceded by the passing of an unusual amount of urine, or a sensation of tightness of the chest or wheezing, whilst in others it occurs without any warning. During the attack there is a feeling of compression of the chest and inability to breathe, which is often to such an extent that the patient lays hold of any steady object near him so that he may bring into play all the muscles of inspiration; the face is pallid and expressive of the utmost anxiety, perspiration stands upon the face, the pulse is weak and small, and the distress is so extreme that you might suppose that death would take place from suffocation. The complaint often accompanies heart disease and emphysema of the lungs.

132. The spirometer is sometimes used to ascertain the state of the lungs in suspected cases of phthisis. It consists of a vessel filled with water, to which a scale is attached. When a person blows through the tube leading into it, the water is displaced, and the vessel on rising marks on the scale the number of cubic inches of air expelled from the lungs. The patient before blowing must take as full an inspiration as possible. Dr. Hutchinson laid down the rule that the breathing volume for a healthy man five feet high is 174 cubic inches, and that eight cubic inches should be added to this for every inch above five feet. The spirometer is not much to be depended upon as a means of diagnosis, for the above rule is not trustworthy, and few persons can expire to their full extent without some practice.

133. The microscope is a most valuable aid in the diagnosis of phthisis—indeed, in many cases its indications are more reliable than those of auscultation

FIG. 38.



Drawing of a group of air-cells as seen under the microscope.

FIG. 39.



Drawing of single air-cells, the fibres of which are unravelled, as seen under the microscope.

and percussion. Whenever ulceration takes place in the lungs, minute particles of these organs are expelled in the sputa, which can be separated for examination by the following method:—

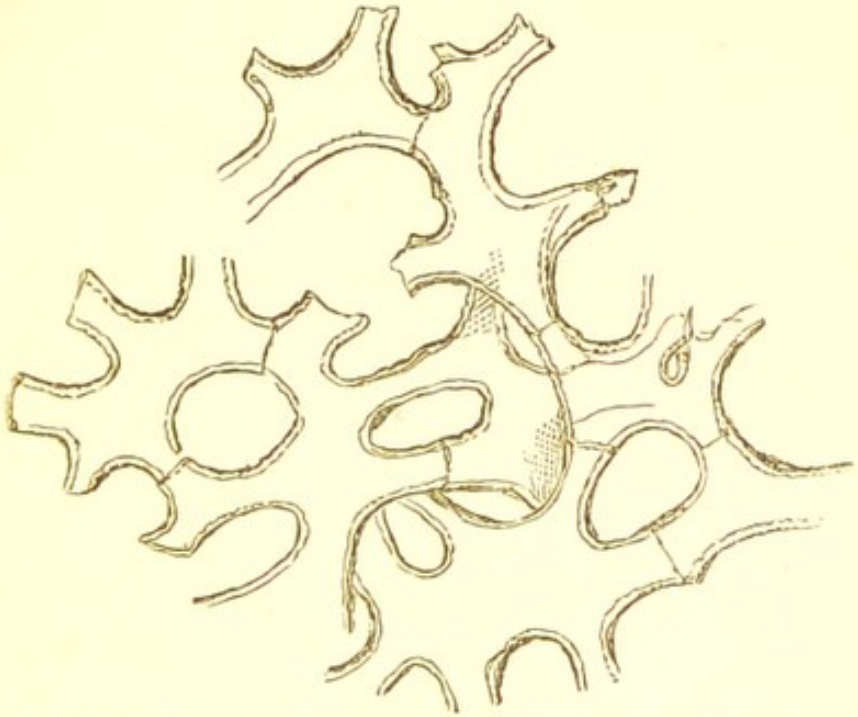
Prepare a solution of caustic soda, about twenty grains to an ounce of distilled water. Collect all the patient has expectorated in twelve or twenty-four hours—from ten at night to ten the next morning being the best period. Pour this, previously mixed and well shaken with an equal quantity of the soda solution, into a glass beaker, and boil it over a gas or spirit lamp, stirring it occasionally with a glass rod. A test-tube does not answer so well as a beaker. As soon as it boils pour it into a conical glass and add four or five times the amount of cold distilled water. If the mucus is still gelatinous after boiling, you have either added too little soda or not boiled it sufficiently. The cold water carries down to the bottom of the glass any lung-tissues that may be present, where they form a slight deposit in about a quarter of an hour; if no deposit is visible, put the glass aside for two or three hours. Remove the deposit with a dipping-tube, place it in a glass cell,* cover it with a piece of thin glass, and examine it with a one-inch object glass. The lung-structures will be often found clinging to hairs and other foreign bodies present in the sputa.

134. The air-cells have the appearance presented in figs. 38 and 39, and are distinguished by the number and arrangement of the fine fibres of which they are composed; sometimes they are expelled in groups of twenty to thirty air-cells, at others only portions of single cells are visible. Bronchial tubes may be recognized by their branching form, and are sometimes accompanied by fragments of blood-vessels. When only small crepitations can be heard in the

* Proper cells and the other apparatus may be obtained of Messrs. Murray and Heath, opticians, Jermyn Street.

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 blood-

FIG. 40.



Portions of vegetable structure as seen under the microscope, liable to be mistaken for air-cells.

FIG. 41.



Portions of fascia as seen under the microscope.

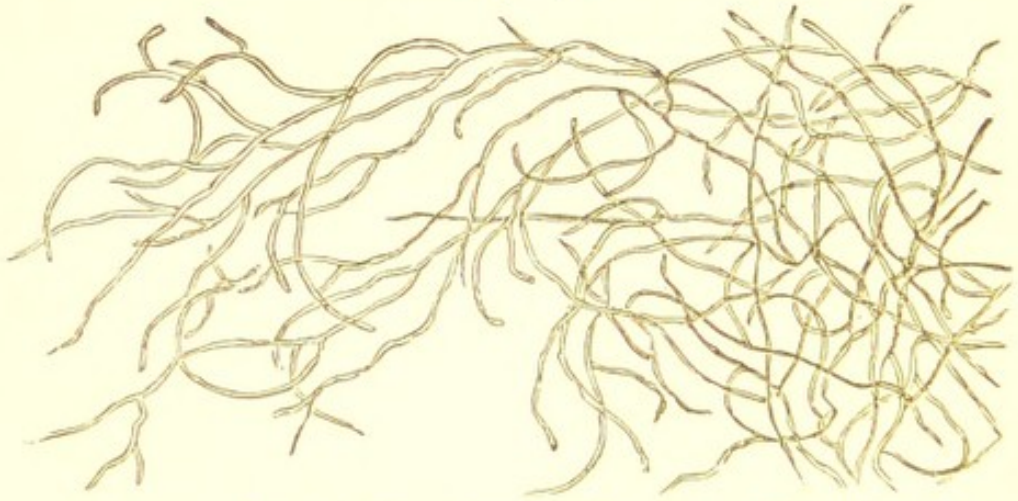
vessels can be rarely detected excepting just before or during an attack of hæmoptysis.

A few examinations will enable you to recognize

quickly and certainly the air cells: but at first you must be careful not to confound them with portions of vegetable and animal structures that may be present in the sputa. A piece of the cellular part of a vegetable is represented in fig. 40; you will observe in it the regularity of the size and shape of the cells, the thickness of their walls and the absence of fine fibres. Portions of the fibrous structures of other organs may be generally distinguished by the coarseness of their fibres and the want of cellular arrangement (fig. 41).

You will find this method of examination most useful in acute phthisis, when other means afford you only uncertain results; in chronic catarrh and emphysema where tubercle has been slowly developed

FIG. 42.



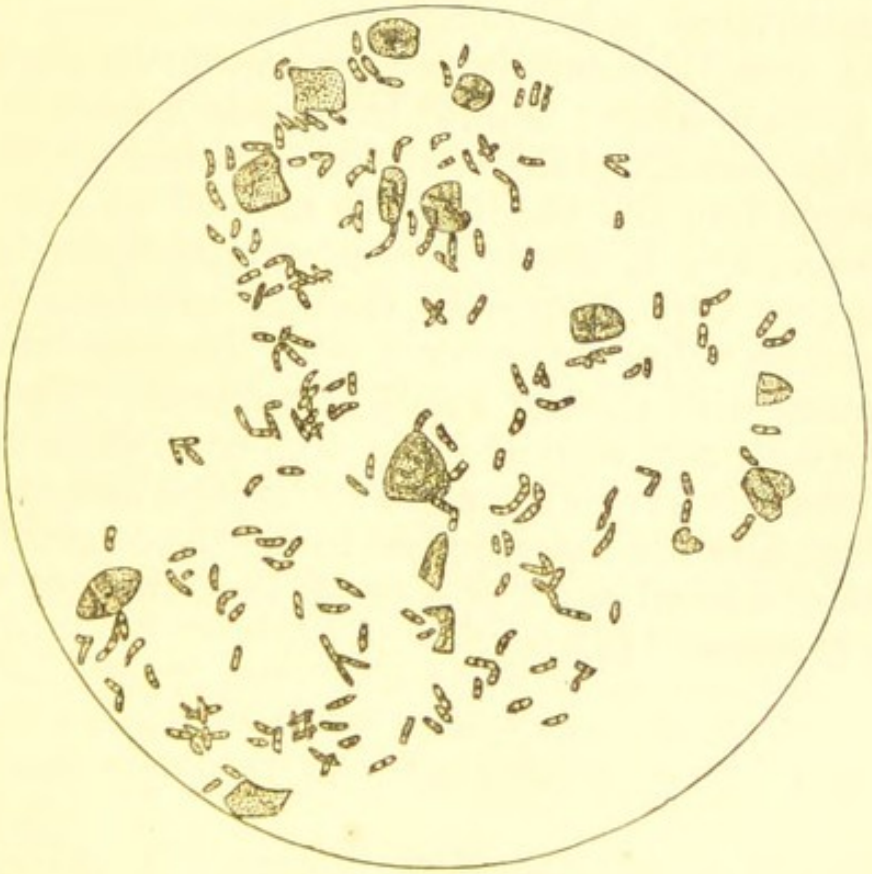
Portions of fungi, often found in sputa, as seen under the microscope.

and its signs are masked by those of the previous disease; and in that large and difficult class of cases in which the physical signs point only to bronchitis, while the symptoms indicate phthisis. It is also very valuable where frequent hæmoptysis and other symptoms leave you in doubt whether you have to deal with phthisis or cancer of the lung, and it is often the only means of diagnosing with certainty a tubercular cavity from a dilated bronchial tube.

135. It is often desirable to ascertain whether the bacteria peculiar to tubercle are present in the expectoration. Various methods have been proposed, but the following, recommended by Dr. Heneage Gibbes, is the most simple :

"The stain is made as follows : take of rosanilin hydrochloride two grammes, methyl blue one gramme; rub them up in a glass mortar. Then

FIG. 43.



Bacillus tuberculosis in phthisical sputum. (ZIEGLER.)

dissolve anilin oil 3 c.c. in rectified spirit 15 c.c. ; add the spirit slowly to the stains until all is dissolved, then slowly add distilled water 15 c.c. ; keep in a stoppered bottle."

"To use the stain, spread a little sputum on a cover-glass, and allow it to dry in the air protected from dust. When a specimen is wanted for diagnostic purposes at once it may be dried over a small

Bunsen, but for preparations that are to be kept for reference, it is better to dry the sputum slowly in the air. The sputum used should be that coughed up by the patient the first thing in the morning, as later on it may only come from the back of the throat. The sputum having been thus dried on the cover-glass, a few drops of the stain are poured into a test-tube and warmed; as soon as steam rises pour into a watch-glass, and place the cover-glass on the stain. Allow it to remain for four or five minutes, then wash in methylated spirit until no more colour comes away; drain thoroughly and dry, either in the air or over a spirit lamp. Mount in Canada balsam.

"This process gives the most satisfactory results. It brings out the bacilli quite as well as the other processes, and it stains all putrefactive bacteria and micrococci very deeply, so that in one field of the microscope blue micrococci and bacteria may be compared with the red bacilli of tubercle. The stain can be used cold equally well. The cover-glass in that case must be left in the stain for at least half-an-hour. High powers are not required to see these bacilli: for ordinary clinical work a $\frac{1}{2}$ or $\frac{4}{10}$ is enough to verify their presence" (fig. 43).

CHAPTER V.

DISEASES OF THE KIDNEYS.

The chief diseases to which the kidney is liable are congestion, pyelitis, suppurative nephritis, acute and chronic Bright's disease, fatty and lardaceous degenerations, dilatation, tubercular and cancerous diseases.

136. Congestion of the Kidney.—The organ is of a dark red colour, is much increased in size, and the structure is tough when the congestion has been of long standing. On a section being made, blood flows freely from it, and its substance, as well as the mucous membrane of the pelvis and calyces, is much congested. Microscopically, the toughness is found to arise from an increased growth of connective tissue which chiefly occurs in the cortical part. Congestion of the kidney generally arises from disease of the heart or lungs, or from some other cause preventing the ready return of the venous blood from the organ.

137. In Pyelitis, or inflammation of the mucous membrane of the pelvis and calyces of the kidney, the membrane is red, thickened, sometimes ulcerated, and covered with muco-purulent secretion or with pus. It is generally caused by the irritation of a stone in the kidney, the extension upwards of inflammation of the bladder or urethra, the accumulation and decomposition of urine in the pelvis, or by tubercular deposits in the mucous membrane. It is apt to give rise to dilatation of the organ, and it is usually present in all cases of dilated kidney.

138. Suppurative Nephritis, or inflammation of the substance of the kidney terminating in suppuration, is a rare disease, excepting as the result of some affection of the bladder or urethra, of pyæmia,* or of irritation set up by a calculus. The morbid appearances are those of congestion, attended by deposits of pus, chiefly in the cortical part. It is generally accompanied by pyelitis. The pus is usually discharged with the urine, but abscess of the kidney may open into the pleura, colon, or other neighbouring organ, or in rare cases it may make its way to the surface of the body and burst externally.

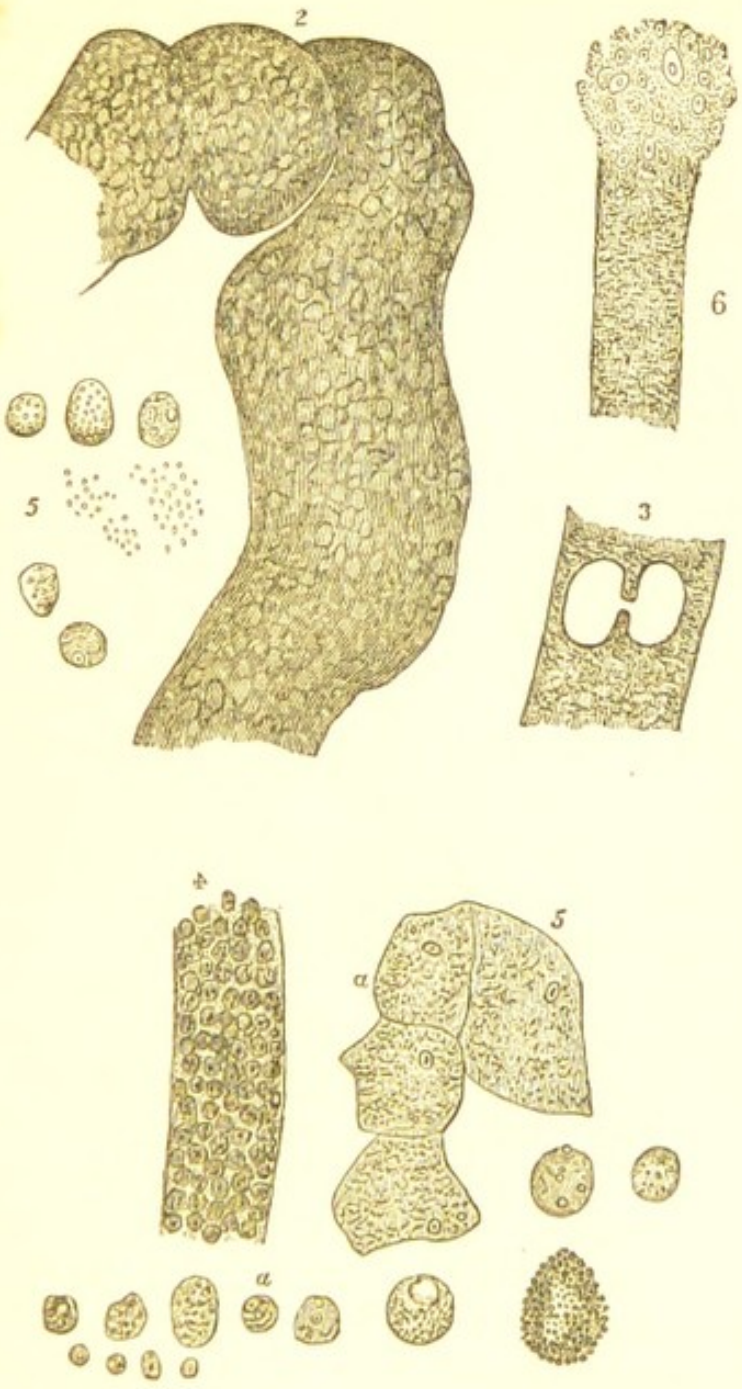
139. Acute Tubular Nephritis, or Acute Bright's Disease.—The kidney is much increased in size and weight, its capsule is readily removed, in some cases the organ is of a deep red colour, but in others of a light yellow, or the surface is irregularly congested and displays here and there minute red spots or patches. The surface of a section may be of a dusky red, studded with red spots, or the cortical part may be pale and the pyramids red and striated. Microscopically, the tubes are distended with large and granular epithelial cells, intermixed with, and cemented together by fibrine and blood-corpuscles, by which their channels are partially or completely obstructed. The contents of the tubes, when washed away by the urine, constitute the fibrinous and cellular casts characteristic of the disease (fig. 49). The capsules of the Malpighian bodies are sometimes filled with blood; in other cases the Malpighian bodies appear dense and granular, whilst their capillaries are greatly congested. This complaint not unfrequently gives rise to chronic Bright's disease. It is usually the result of scarlatina or exposure to cold.

140. Chronic Nephritis.—Much confusion has

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* A febrile affection produced by the entrance of pus into the blood, and resulting in the formation of abscesses in the viscera, joints, and other parts.

FIG. 44.



Showing the tubes of the kidney in chronic tubular nephritis. 2. Cortical tube, distended with epithelium, and bulged in a good part of its extent. 3. Cortical tube, containing a dumb-bell crystal of large size. 4. Cortical tube, distended with epithelium; at *a* below it some of the separate cells are shown more highly magnified. 5. Bulky epithelium from cortical tube; the group at *a* are remarkably enlarged, those below them are more or less fatty. 6. Medullary tube much distended, the contents are seen escaping from the upper end. (JONES and SIEVEKING.)

arisen from various disorders of the kidney having been described under the name of "Bright's disease." At least four different forms of chronic disease appear to have been thus confounded—viz., chronic tubular nephritis, or, as it is called by others, chronic desquamative nephritis, fatty kidney, lardaceous kidney, and intertubular nephritis, or granular kidney. In all of these albumen and casts of the urinary tubules may be found in the urine. All forms of Bright's disease, whether acute or chronic, are apt to give rise to dropsy, which is an effusion of the serum of the blood into the subcutaneous connective tissue (œdema), or into the cavities of the body. This is supposed to take place, either from the blood being altered in its composition through the retention of various excrementitious substances (urea &c.), which the kidneys, when healthy, remove, or from an excess of water arising from its insufficient excretion in the form of urine. The former of these conditions gives rise to uræmic poisoning, of which convulsions and apoplexy are the most serious consequences.

141. Chronic Tubular Nephritis, often called the Large White Kidney.—The organ is much increased in size, the capsule peels off readily, the surface is white and smooth, with patches of a red colour or arborescent veins upon it. On section, the cortical part is seen to be much increased in volume, is of a pale yellow colour, and markedly striated; the pyramids are often congested, but otherwise the medullary part is usually normal. At a late period of the disease the kidney shrinks in size and becomes granular on the surface. Microscopically, the tubes are dilated and greatly distended with cells and fatty and granular materials, by which their channels are obstructed. At a later stage the tubes lose their lining membrane, and become atrophied; the Malpighian bodies are more opaque than usual, and are usually enlarged (see fig. 43).

142. Fatty Kidney presents morbid appearances

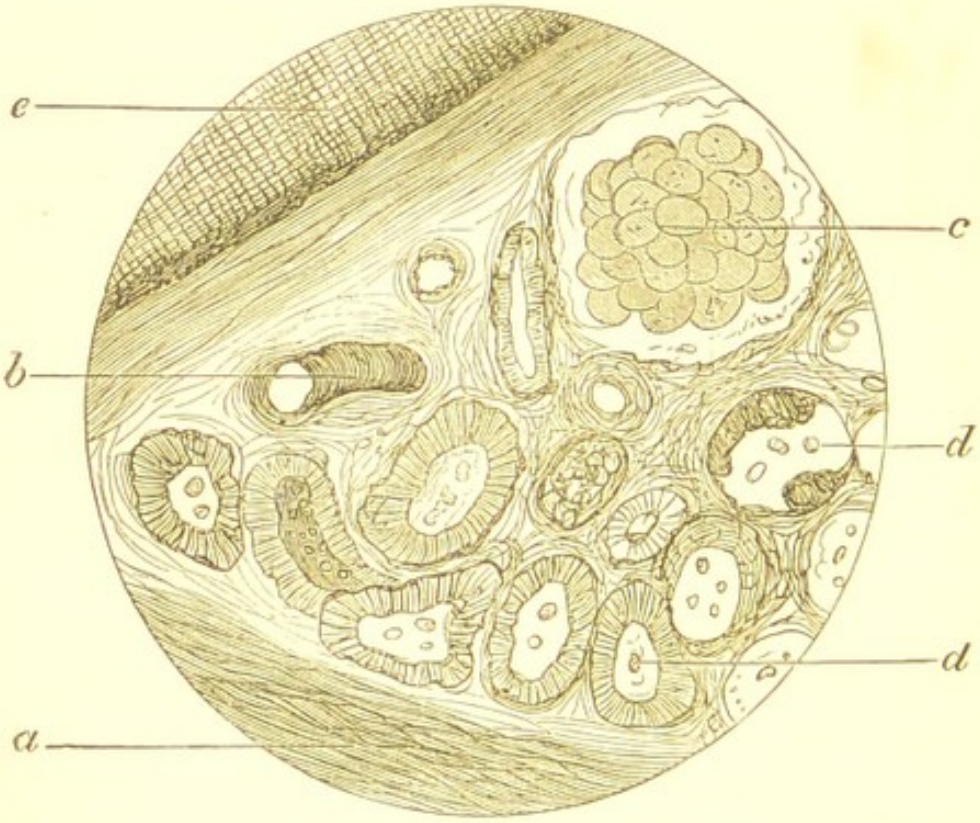
similar to those of chronic tubular nephritis; but on microscopic examination, fatty matters are found in great quantity in the cells of the tubes and upon the capillaries of the Malpighian bodies. The colour of the whole gland is generally very pale.

143. Lardaceous, Amyloid, or Waxy Kidney.—The kidney is usually large and hard, and its capsule is readily stripped off. On section it has a more or less translucent, waxy, bloodless appearance; a solution of iodine stains the tissues of a reddish-brown colour. Microscopically, the smaller arteries are generally thickened, the morbid change first affecting the Malpighian bodies and their vessels, the tubes afterwards becoming implicated. This disease is usually associated with a similar condition of the liver and spleen in persons affected with phthisis, syphilis, caries of the bones, or other wasting disorders. The excretion of urea is less interfered with in this than in the other forms of chronic Bright's disease.

144. Intertubular Nephritis, Granular, or Contracting Kidney.—The whole organ is much reduced in size, the capsule is thickened, adheres firmly, and, on being peeled off, leaves portions of its tissue on the exterior of the gland. The surface is irregularly covered with small prominences; in other cases *cysts* are apparent. On a section being made, the cortical part is seen to be much reduced in thickness, and the whole structure is dense, tough, coarse, and fibrous. Microscopically, in the earlier stages the connective tissue is very vascular and infiltrated with cells, which are afterwards converted into fibrous tissue. The pressure exerted by this new-formed tissue upon the adjoining parts produces atrophy of the Malpighian bodies and shrinking and distortion of the renal tubes, which are often found devoid of epithelium. The arteries are generally thickened and dilated. In some cases cysts exist in such numbers that the whole organ seems to be composed of them.

It may become so greatly enlarged as to be perceptible during life. Cysts seem to originate in the expansion of small portions of the uriniferous tubes which have become blocked up, or in dilated Malpighian bodies.

FIG. 45.



Section of a kidney affected with intertubular nephritis, as seen under the microscope. *a*. Capsule much thickened. *b*. A small artery with thickened coats. *c*. Malpighian body. *d*. Tubes wholly or partially lined with epithelium. The tubes are seen to vary greatly in size and shape, being compressed by the thickened fibrous tissue situated between them. *e*. Large artery much thickened.

145. DILATATION OF THE KIDNEY.—In an extreme degree of this disease the organ is much increased in size, is lobulated, and seems as if converted into a bag containing pus or urine. When the sac contains pus the disease is named *pyonephrosis* whilst the term *hydronephrosis* is applied to it if it is filled only with a watery urine. On a section being made of a dilated kidney, the cortical part may be so

greatly atrophied that it can be scarcely recognized, the medullary portion is compressed and flattened, the pelvis and infundibula are dilated, and their lining membrane is raw and congested from the accompanying pyelitis. It is produced by the flow of urine being obstructed by a calculus, or by some affection of the ureters, bladder, or urethra; in other cases it results from tubercular affection of the pelvis of the kidney.

146. Tubercular Disease of the Kidney.—In some cases the deposits exist in the form of small scattered grey tubercles in the cortical part of the gland, associated with general tuberculosis; in others there are yellow nodules in the cortical part which soften and open into the infundibula, or the whole organ may have been destroyed, and after death you find the capsule enclosing a putty-like mass of tubercular matter intermixed with the scanty remains of the original structures. The disease occasionally commences by tubercular deposits in the pelvis of the kidney. Tubercular disease of the kidney is very often associated with a similar affection of the testicle, prostate gland, bladder, or ureters.

147. Cancer of the Kidney is chiefly of the medullary kind. It generally begins in the neighbouring lymphatic glands, and often forms a tumour in the abdomen of large size, especially in children.

The symptoms that should lead you to suspect disease of the kidneys are, anæmia, dropsy, vomiting in the early morning, attacks of bronchitis, diarrhœa, frequent micturition at night, intractable indigestion, or convulsions. Indeed, as most of the diseases of this organ are unaccompanied by pain, it is advisable for you to ascertain the state of the kidneys in any case in which the symptoms are obscure or threatening. The urine supplies you with the best means of determining if the kidneys are healthy; you should therefore practise yourself in the ex-

amination of it as carefully as in auscultation and percussion.

148. Observe the colour of the urine, whether it is of lighter or darker tint than usual, or if it is tinged with blood or bile.

Ascertain its specific gravity; float a urinometer in it, and observe what number on the scale is on a level with the upper surface of the liquid. The urinometer is so constructed that it floats with the index at zero when placed in distilled water. The specific gravity of healthy urine is from 1015 to 1025. If you multiply the last two figures of the specific gravity by 2, you obtain a rough estimate of the amount of solid materials in the urine—thus, if you have 1000 grains of urine with a specific gravity of 1020, that amount will probably contain 40 grains (20 × 2) of solid matter. But as the density of the urine varies greatly at different periods of the day, it will be necessary to collect all that has been passed during twenty-four hours, before you can arrive at any trustworthy conclusion on this point.

149. Test for the presence of albumen. Boil about a drachm of the urine in a test-tube, having previously added ten or fifteen drops of nitric acid; if albumen is present, the fluid becomes opaque. Observe the proportion of albumen when it has fallen to the bottom of the tube; as, for instance, about one-quarter or one-sixth of the liquid examined. The opacity is most readily seen by inclining the test-tube, partially filled with the suspected urine, over the spirit-lamp, so that the *upper layer* is first heated. Heller's plan is to pour some nitric acid into a test-tube, and then allow the urine to flow gently down the side of the tube, so that the liquids may meet without mixing. At their point of junction an opaque layer is visible if albumen be present. In testing for albumen it is the safest plan to use both heat and nitric acid. Heat alone often fails to produce coagulation when the urine is alkaline, and the presence of

only a drop or two of the nitric acid tends to hinder rather than assist it. On the other hand, a cloudy appearance often takes place in boiled urine from the precipitation of phosphates, which disappears on the addition of an acid. Nitric acid alone sometimes causes turbidity by the precipitation of uric acid, in other cases by the formation of crystals of nitrate of urea.

If you find albumen begin at (151).

150. If you do not find albumen, next test for sugar. Pour into a test-tube a small quantity of the urine, add to it a few drops of a dilute solution of sulphate of copper, and about half as much liquor potassæ as urine. If sugar be present, the precipitate first formed is redissolved, and the liquid assumes a dark blue colour. When boiled, a *reddish-brown precipitate* of oxide of copper will be deposited, and the same change will occur if the fluid be allowed to stand for twenty-four hours without being heated. If the urine contain albumen, this must be first separated by filtration after coagulation by heat and nitric acid, for the presence of albumen prevents the precipitation of the oxide of copper.*

If you find sugar pass on to (176).

151. Although neither albumen nor sugar be present, you may still derive much information from a

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* In testing for sugar it is often more convenient to use Dr. Pavy's solution than the liquor potassæ and sulphate of copper. The solution consists of sulphate of copper 320 grains, tartrate of potash (neutral) 640 grains, caustic potash 1280 grains, distilled water 20 fluid ounces. The tartrate of potash and caustic potash are to be dissolved together in one portion of the water, and the sulphate of copper alone in the other; the two solutions are then to be mixed. Boil a small quantity of this solution in a test-tube and add to it a little of the suspected urine, drop by drop, until you have used rather less than an equal quantity of the solution. If sugar be present, an intense opaque yellow colour is formed; if no such precipitate has taken place when the liquor has become cold, the urine is not saccharine.

further examination of the urine; pour a portion of it into a conical glass, leave it at rest for a few hours, so that any precipitate that may form may have time to subside to the bottom of the glass, and then pass on to (179).

SECTION I.

You find the Urine Albuminous.

152. You must not conclude that the patient has a disease of the kidneys because you find albumen in the urine, for this may arise from fever, gout, cholera, pregnancy, and many other conditions; but if, *after frequent examinations* you find albumen, pus, or blood, or if, along with the albumen, there are "tube casts" in the urine, and the general symptoms of kidney disease are well marked, you may safely diagnose a morbid state of the urinary organs.

153. Before beginning to study the urinary sediments with the microscope, it will be an advantage for you to accustom your eye to the appearances presented by various foreign bodies that are frequently found in urine. Fig. 45 will show you such as are most generally met with.

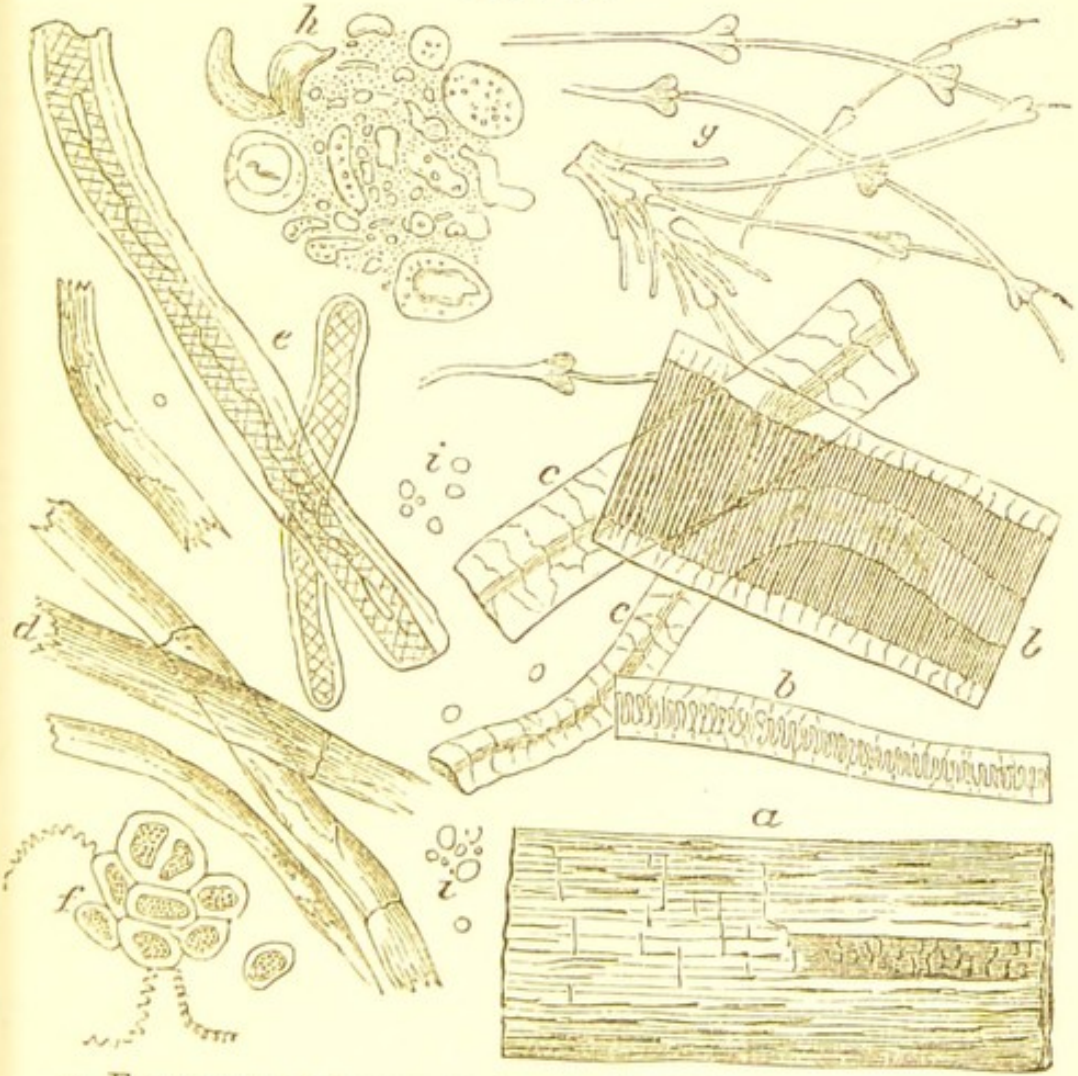
154. To examine the urine for casts of the uriniferous tubes, pour it into a conical glass, and set it aside for a few hours; remove with a dipping-tube a small quantity of the deposit at the bottom of the vessel, place it on a slide, or, what is better, in a shallow cell,* cover it with a piece of thin glass, and examine it with a microscope. You can detect casts of the tubes with a one-inch object-glass, but a quarter inch objective will better enable you to study their characters.

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* Very convenient glass cells are made by Messrs. Murray and Heath, Jermyn Street, by hollowing out the surface of an ordinary slide by a new process. The deeper cells are intended for the examination of sputa, the more shallow for urinary sediments.

The casts appear under the microscope as solid moulds or long narrow tubes; they are formed by the coagulation of the fibrine of the blood in the uriniferous tubes, or of mucus, which, when washed away by the urine, carries with it portions of the epithelium and occasionally blood-corpuscles. Thus you

FIG. 46.



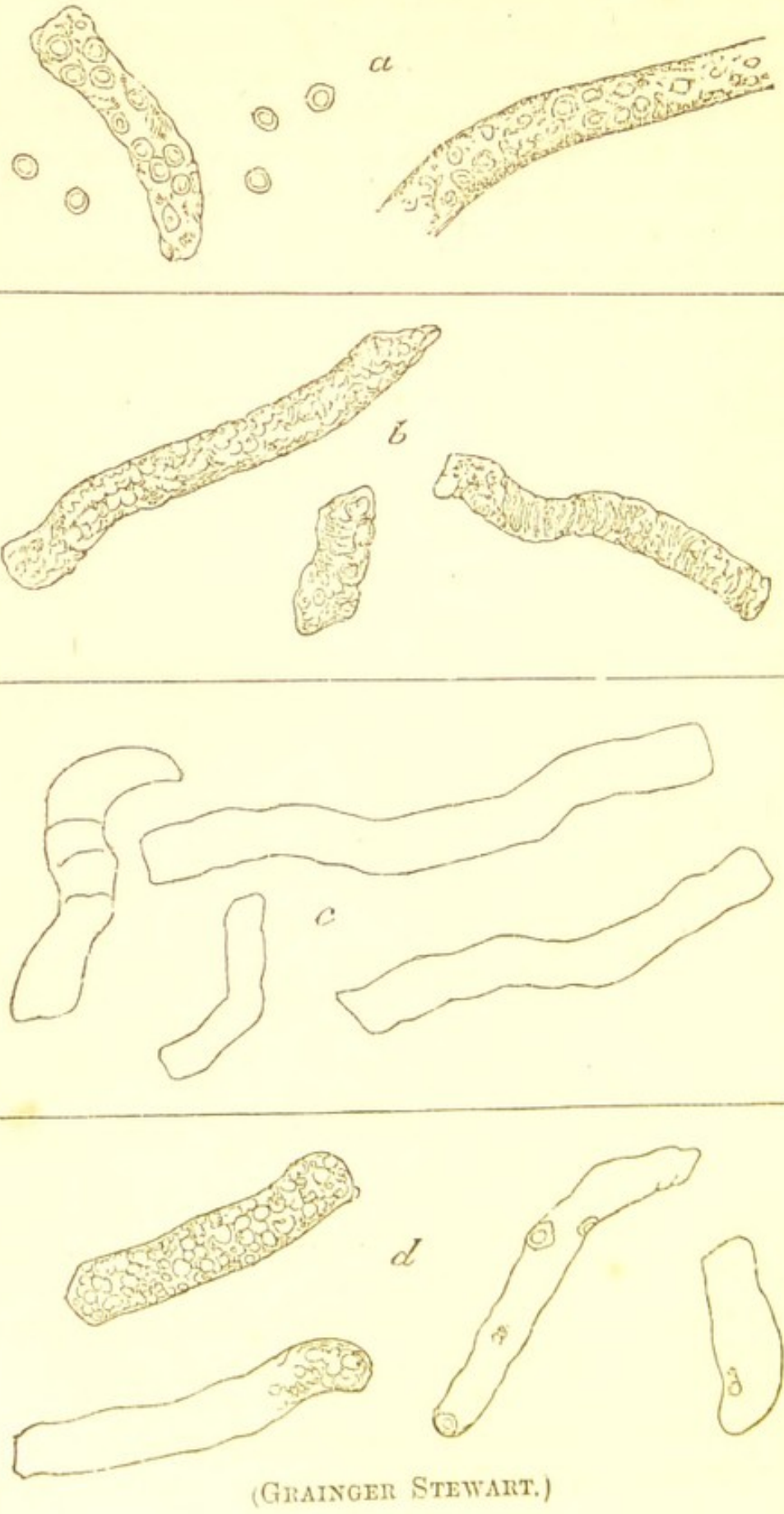
a. Fragment of human hair. *b*. Cat's hair. *c*. Hair from blanket. *d*. Flax fibres. *e*. Cotton fibres. *f*. Fragments of tea-leaves. *g*. Portions of feathers. *h*. Bread crumbs. *i*. Free oil globules. (BEALE.)

may judge, to a certain extent, of the condition of the secreting part of the kidney by the appearances presented by the casts.

155. There are four principal forms of casts.

1. *Transparent hyaline* or *waxy casts*, in which there

FIG. 47.



(GRAINGER STEWART.)

is no trace of structure (*c*, fig. 47). They vary greatly in diameter—from $\frac{1}{3000}$th to $\frac{1}{500}$th of an inch, and probably vary also in chemical composition; they may easily escape observation, and are best brought into view by throwing the light upon them obliquely, or by adding a drop of a weak watery solution of iodine to the specimen.

2. *Cellular casts* are covered by the epithelium cells of the uriniferous tubes (*a*, fig. 47). Their presence shows that the tubes are still lined by epithelium and that the disease is recent. The cells are usually granular and opaque.

3. *Granular casts* have a dark granular appearance, and are usually about $\frac{1}{700}$th of an inch in diameter. They are produced in tubes whose epithelium is undergoing disintegration (see *b*, fig. 47). In many recent cases you may meet with casts which seem granular from the deposition upon them of urate of ammonia, but they become transparent when warmed.

FIG. 48.



Pus cells as seen under the microscope. (BOWMAN.)

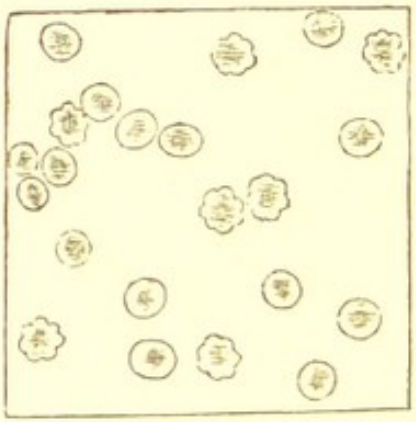
4. *Casts loaded with fat*, or covered with cells containing fatty granules, if *numerous and persistent*, generally indicate fatty degeneration of the kidney (see *d*, fig. 47). Even in recent cases you often see a *few* casts rather oily.

156. Sometimes you find blood (see *a*, fig. 47) or even pus cells, entangled in the tube casts. The size of the casts varies according to the part of the kidney

in which they have been formed, and with the state of the lining membrane of the tubes. If the epithelium be still adherent the cast will be small; if it be detached, the cast will be, of course, larger. The epithelium of the bladder, ureters, and pelvis of the kidney is apt to present itself in the urine, whenever inflammation exists in these parts. The appearance of the cells may be so similar to that of cancer cells, that it may give rise to a mistake in diagnosis (see fig. 50.)

157. Instead of casts you may find the deposit to consist of pus. You detect pus, either by adding to the deposit liquor potassæ, which converts it into a thick, glairy mass, or by examination with the microscope. Pus cells are round, $\frac{1}{2000}$th to $\frac{1}{3000}$th of an inch in diameter, and have a granular appearance. When acetic acid is added they become transparent, and display from one to four nuclei. If the deposit is formed of pus pass on to (169).

FIG. 49.



Blood corpuscles in urine; some have an irregular outline. (BOWMAN.)

158. The deposit may consist of blood, or the urine may be coloured with blood and deposit fibrine of a brownish-red colour. After remaining long in urine, blood corpuscles often have a ragged, irregular outline; they are about $\frac{1}{3000}$th part of an inch in diameter, and have no nucleus. If there be blood, pass on to (173).

A. The urine is albuminous and contains tube casts. Inquire if the disease has taken place suddenly or gradually; if acute it is *acute tubular nephritis:* if chronic pass on to (160).

159. The urine is scanty, high coloured, of high specific gravity, very albuminous, smoky, sometimes bloody, or deposits a dirty brown sediment; the tube casts are cellular, or transparent, and mixed with blood cells and particles of fibrine. The patient has dropsical swellings of the body, face, and limbs, a quick pulse, thirst, dry skin, and temperature above the normal.

The disease is *acute tubular nephritis* (*acute Bright's disease*).

This form of Bright's disease is generally ushered in with chilliness or shiverings, followed by headache, thirst, nausea or vomiting, and pains of the loins. The secretion of urine may be entirely sup-

FIG. 50.



Drawing of a red deposit from urine in acute tubular nephritis. *b.* Fibrinous casts covered with renal epithelium. (JONES and SIEVEKING.)

pressed, but usually a small quantity is passed. In children the complaint generally arises from scarlatina, in adults from exposure to wet and cold. It is frequently complicated with inflammation of the pleura, pericardium, or peritoneum. The presence of blood shows that the affection is recent and the congestion severe. Combined with the dropsy you will generally find cough and dyspnœa, and convulsions are not unfrequent in children. If inflammation of other organs takes place, the symptoms of such affections are of course superadded. Recovery is often accompanied by the passing of large quantities of urine.

160. You must remember that attacks of acute tubular nephritis often occur during the course of the more chronic forms of Bright's disease: you must, therefore, in all cases, carefully inquire into the history of the affection before deciding that the complaint is recent. Acute tubular nephritis often becomes chronic, and then presents the symptoms of chronic Bright's disease.

The chronic diseases under this head are, chronic tubular nephritis (large white kidney), fatty kidney, lardaceous kidney, and intertubular nephritis (granular or contracting kidney).

161. *a*. The urine is not diminished in quantity, is generally of low specific gravity and albuminous, the tube casts are mostly granular, or transparent; there are œdema of the body and limbs, anæmia, debility, loss of appetite, and occasional vomiting.

The disease is *chronic tubular nephritis* (*large white kidney*).

In some cases you may detect enlargement of the kidney in the loins. This is most easily done whilst the patient is resting on his hands and knees, or lying on his face. This form of disease seldom occurs in persons above forty-five years of age. The pallor of the lips and skin, and the swelling of the face and limbs, will at once arrest attention, and enable you to guess at the nature of the disease before you

examine the urine. The dropsy is an early symptom, and begins in the eyelids, feet, and ankles. The complaint is usually accompanied either by bronchitis, hydrothorax, disordered digestion, vomiting in the early morning, or diarrhœa. The patient is liable to inflammation of various organs; therefore, if there be any increased heat of skin or other symptoms indicative of inflammation, carefully examine the state of the heart and lungs with the stethoscope.

162. *b.* If, in addition to the albuminous state of the urine, and the general symptoms of disease of the kidney, you find *numerous* casts loaded with fat, or a quantity of free oil, you may diagnose *fatty kidney.*

163. *c.* If with pale and very albuminous urine of low specific gravity (1005 to 1015), you find a few casts, mostly of the large waxy form, in a person who suffers from diarrhœa, or has diseased bone or phthisis, or enlarged liver or spleen, or has suffered greatly from syphilis, you may suspect the disease to be *lardaceous kidney.*

164. *d.* The urine is pale, increased in quantity, of low specific gravity, and albuminous. The tube casts are mostly large, granular, or waxy. The patient is thin, pallid, feeble, and suffers from dyspepsia, dyspnœa, and from some œdema of the legs. The skin is harsh and dry.

The disease is *granular kidney* (*intertubular nephritis*).

This form of disease progresses more slowly than those before described, and occurs chiefly in persons above forty years of age, or in those subject to gout. It is usually attended with hypertrophy of the left ventricle, and a large incompressible pulse, retinitis, and often by hæmorrhage from the nose or other mucous membranes. As the kidney becomes less able to perform its functions, other organs are implicated. Early in the disease the urine may be free from albumen, but it is of low specific gravity, increased in quantity, and contains a few tube casts, the patient

loses flesh and strength, and is troubled with vomiting and dyspepsia. Dropsy is much less common than in chronic tubular nephritis, in which it is almost always present.

165. Granular kidney is mainly distinguished from the other forms of chronic Bright's disease, by the paleness and increased quantity of the urine, by its low specific gravity (often below 1010) and the small amount of albumen it contains; by the disease occurring chiefly in middle-aged or old persons, and in those who have suffered from, or are hereditarily predisposed to gout, by the slowness of its course, the frequent absence or small amount of dropsy, and its association with neuro-retinitis, hypertrophy of the heart, or cirrhosis of the liver.

166. Lardaceous kidney is characterized by a large quantity of pale urine of low specific gravity, by the small number of tube casts, by its association with diarrhœa and phthisis, or its occurrence in persons who have suffered from syphilis, diseased bone, or other wasting diseases. Dropsy is uncommon unless chronic tubular nephritis is also associated with it.

167. Uræmic poisoning is apt to occur in all the above forms of kidney disease, because the elimination of the solid parts of the urine (urea, &c.) is lessened. It generally shows itself by headache, or a feeling of weight or tightness in the forehead, dimness of sight, or confusion of memory. Convulsions may come on suddenly, or the patient may be attacked with apoplexy. In other cases intense difficulty of breathing occurs from œdema of the lungs, or the patient is prostrated by severe vomiting, or diarrhœa, or signs of acute inflammation of the pleura, pericardium, or peritoneum present themselves.

168. Under the name of *Myxœdema* a form of general dropsy has been described that presents marked differences from that ordinarily accompanying intertubular nephritis. In cases of this kind the body,

face, and extremities are swollen, but do not pit on pressure; the expression of the face is heavy and stupid, the skin is dry and anæmic, the features coarse, the speech hesitating and slow, and the mind inactive. The patient complains of no pain, but she is feeble and deficient in energy, whilst the temperature is almost always below the normal. The progress of the complaint is very slow, the symptoms often remaining with little change for some years; the urine in the early stages is free from albumen, but this usually appears at a subsequent period, and death generally takes place from coma.

The pathology of the disease is doubtful, but some have connected it with atrophy of the thyroid gland. It occurs almost exclusively in females of middle life. In fatal cases the heart has been found to be enlarged, the thyroid gland in a state of atrophy, the vessels atheromatous, the kidneys affected with intertubular nephritis, and the fluid effused into the connective tissue of the limbs has been proved to contain a large amount of mucin.

B. The urine is albuminous, contains no tube casts, and deposits pus.

You may often find, with the aid of the microscope, a few pus corpuscles in the urine of persons in perfect health, or you may see them entangled in the tube casts in cases of acute or chronic nephritis. I here allude only to a deposit of pus large enough to be evident to the eye of the observer.

169. The pus may result from inflammation of other parts of the genito-urinary organs than the kidneys, or from abscesses bursting into them. If the patient is a female, ascertain if she suffers from leucorrhœa, or any other affection of the uterus or vagina. In the male, the urethra, prostate, or bladder may be in fault. Inquire if he has been affected with stricture of the urethra, or stone in the bladder, if there is frequent desire to pass urine, or difficulty in so doing, also if there is tenderness in the perineal

or hypogastric regions. If you can find no evidence of disease in the uterus, vagina, bladder, or urethra, the pus probably proceeds from the kidney.

The two diseases of the kidneys capable of producing pus in the urine are both chronic, and are—pyelitis, with or without dilatation of the kidney, and tubercle of the kidney.

170. *a.* Together with the deposit of pus in the urine, you can feel a fulness, or a smooth immovable tumour in the lumbar region; there is tenderness on pressure, and the patient complains of pain in the loins, thighs, and testis. There are usually fever, shiverings, debility, and night sweats.

The disease is *pyelitis, with dilatation of the kidney.*

The size of the tumour in the loins varies from time to time, and corresponds to the amount of pus discharged with the urine. In stout persons, or where the dilatation is small, you may not be able to feel the enlarged kidney. This disease is generally produced by stricture of the urethra, a stone in the urinary passages, tubercular disease of the kidney, and, in the female, by cancer of the uterus compressing the ureters. When it results from stricture, the diagnosis is very difficult, as the bladder is generally at the same time diseased. If the complaint has been produced by a stone in the kidney, which is the most general cause, you may have a history of severe pain in the loins, attended by occasional attacks of hæmaturia, to guide your opinion.

171. When pyelitis is present without the organ being dilated, there is, of course, no tumour, and you must search in the urine for the epithelial cells of the pelvis of the kidney. If the urine be acid, and there is no disease of the urethra, bladder, or prostate, you may refer the presence of pus in the urine to pyelitis, and the diagnosis will be strengthened if there is tenderness on pressure on the loins, or if the patient has previously suffered from symptoms of a stone in the kidneys.

172. *b.* You find a deposit of pus in the urine of a patient who has not suffered from the causes of dilated kidney, but who presents indications of tubercular disease of the lungs or other organs.

The disease is probably *tubercle of the kidneys.*

This disease is comparatively rare, and seldom exists in adults without the presence of tubercles in the lungs. The kidney may be enlarged, but it is not generally so. Sometimes hæmaturia is the earliest symptom. As tubercular disease occasionally leads to dilatation of the kidney, it is advisable to examine the state of the lungs whenever pus exists in the urine. The presence of a yellow cheesy matter, insoluble in acetic acid, in the urine, is by many considered an indication of the presence of tubercle. This disease is so often associated with a similar condition of the prostate gland and testis, that these organs should be always examined when you suspect it.

C. The urine contains albumen, but no casts, and deposits blood, or is tinged with it.

173. You must first satisfy yourself with the microscope that the colouring matter is really that of blood, as a somewhat similar colour may arise from the patient having taken beetroot, logwood, &c. In the female, blood is often found in the urine from affections of the uterus or vagina; in the male, from those of the prostate and bladder. When it comes from the bladder the blood is not generally diffused through the urine, but is chiefly passed towards the termination of micturition, and is apt to form clots. Having, then, first ascertained that there is no disease of other organs likely to produce bleeding, and remembering that in nephritis the blood is entangled in or accompanied by tube casts, inquire if the disease is acute or chronic (174). The absence of tube casts shows that the secreting portions of the kidney are unaffected. Remember that *hæmaturia*, as the passing of blood in the urine is termed, may arise from

the patient having taken irritating medicines, such as turpentine, &c.

The colouring matter of the blood may be present in urine when no blood-corpuscles can be detected. This may occur in jaundice, typhoid fever, and other diseases. In order to ascertain if blood is present, we are recommended to add acetic acid to the urine, and boil it, when a reddish-brown coagulum will be formed, which becomes almost black when dried.

The only acute affections of the kidneys likely to produce this symptom are the passage of a stone down the ureter and intermittent hæmaturia (178).

174. *a.* The patient suffers excruciating pain in the loin and in the direction of the ureter, with numbness of the thigh and retraction of the testis; there is no fever, but usually vomiting; the urine is passed frequently, is scanty, bloody, or albuminous.

The symptoms are probably due to the *passage of a calculus down the ureter.*

The pain is not always felt in the back, but sometimes in the abdomen or sacrum. It usually ceases directly the stone reaches the bladder. This disease is most likely to be confounded with colic, the passage of a gall-stone, or with lumbago. The suddenness of the attack, the severity of the pain, and the alteration in the urine, distinguish it from the latter. You should inquire if the patient has previously experienced any similar illness.

The chronic diseases capable of producing hæmaturia without tube casts, are, rheumatic, typhoid, and other fevers, purpura, scurvy, stone in the kidney, cancer of the kidney, intermittent hæmaturia. I need only mention the occurrence of blood in the urine of persons affected with fevers, purpura, and scurvy, to put the student on his guard against mistaking this symptom in such cases for one of disease of the kidney.

175. *a.* The urine is bloody and albuminous, chiefly after exertion, the patient suffers from severe pain in

the back, hip, thigh, or testis; the pain varying in degree at different times, and relieved by rest.

The disease is probably *stone in the kidney.*

Stone in the kidney may give rise to pyelitis with or without dilatation of the organ, or the calculus may escape into the bladder. The symptoms vary according to the effect it produces. Inquire if any gravel or small calculi have been previously passed; also ascertain if the urine contains crystals of lithic or oxalic acid, or epithelial cells from the pelvis of the kidney. Nausea and vomiting are often present, and many patients suffer from irritability of temper or mental depression.

176. *b.* The urine almost constantly contains blood; the patient suffers from severe pain in the loins, and a liability to attacks of vomiting: he is thin, pale, sallow, and feeble; a tumour can be felt in the lumbar region.

The case is *probably cancer of the kidney.*

The diagnosis is generally difficult. If there is a tumour in the lumbar region, you have to distinguish between cancer and dilated kidney. Cancer is much more rapid in its course, and is attended with greater loss of flesh and strength; in dilated kidney the urine usually deposits pus instead of blood, and the size of the tumour often varies in proportion with the amount of pus discharged. When you suspect cancer, examine the liver in order to ascertain if it is enlarged with cancerous nodules. In the later stages of cancer you often have dropsy of the legs and abdomen, and occasionally portions of cancerous structure can be detected in the urine; but remember that the normal epithelial cells of the pelvis are not unlike some forms of cancer cells. Most of the cases of cancer of the kidney attended by hæmaturia occur in persons above fifty years of age.

177. *c.* The urine is highly albuminous, of a milky appearance, coagulating either into a mass or forming clots, and often tinged with blood. The patient is

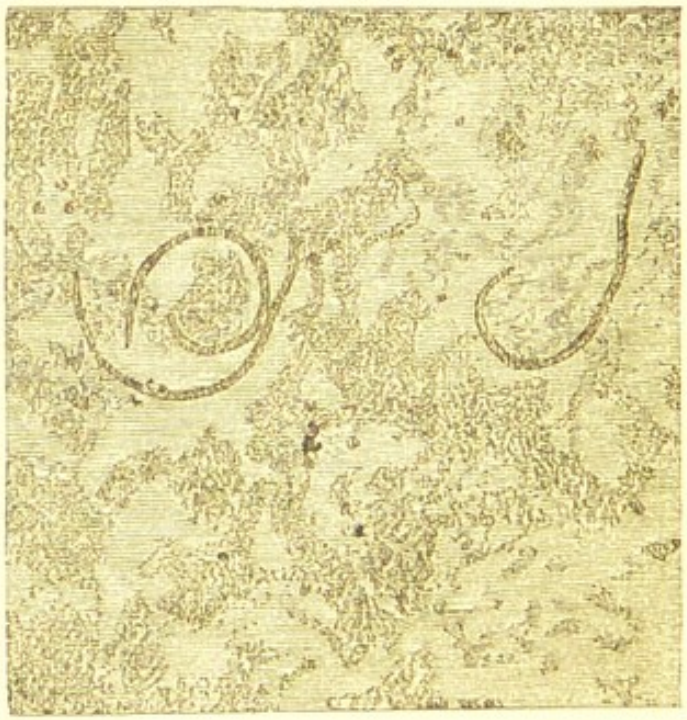
anæmic and feeble whilst urine of this kind is being passed.

The disease is *chyluria*.

When examined with the microscope white and red corpuscles are discovered, but no casts. The milky appearance is removed when the urine is shaken with ether, a layer of oil being left floating upon the surface.

The disease may last for many years, the urine being only occasionally milky, and the patient enjoying good health in the intervals of the attacks. It is

FIG. 51.



Filaria sanguinis hominis. (S. MACKENZIE.)

more common in hot climates than in this country. It was formerly supposed that in these cases some communication existed between the lacteal system and the lymphatics of the kidneys or bladder; but of late years it has been proved that in many, the blood of the patient contains minute nematode worms (embryo filariæ sanguinis hominis). In one instance, treated in the London Hospital by Dr. S. Mackenzie, the

lymphatics of the kidneys were found after death to be enormously dilated, on account of an obstruction of the thoracic duct, and the appearance of the worms in the blood is shown in fig. 51.

178. *d.* The patient suffers from occasional attacks of hæmaturia without apparent cause; the general health is unaffected, and the urine generally contains oxalates. There is no tumour in the lumbar region.

The disease is probably *intermittent hæmaturia.*

The hæmaturia is usually ushered in by rigors or chilliness and depression of temperature, attended by pains of the back and limbs. These symptoms pass away in a few hours and the patient regains his usual health. In most of these cases the attacks have been attributed to cold, but some seem to have been connected with gout or ague. Along with the blood there is generally a large quantity of lithic or oxalic acid crystals.

Hæmaturia is a common complaint in some countries, as at the Cape of Good Hope, and there it often seems to depend on the presence of a parasite in the kidneys (see *Bilharzia Hæmatobia*).

SECTION II.

You find that the Urine contains Sugar.

There is only one disease under this head—viz., *diabetes.*

179. It is found that the presence of chloride of ammonium, urate of ammonia, or other ammoniacal salts in the urine prevents the successful application of the copper test, if the amount of sugar is small.

In any doubtful case, therefore, you may have recourse to one of the following tests:—

Mix a small portion of German yeast with the urine contained in a test-tube, close the open end of the

tube with a small dish, and invert them. Pour a little more of the urine into the dish, and if any air has entered the tube, mark with ink the exact height at which the liquid stands. Set aside the tube for twenty-four hours in a warm place, and if sugar be present, gas will be given off from the urine, and will rise to the summit of the tube.

Or, the urine is diluted with an equal quantity of a solution of carbonate of soda (1 to 3), and a little subnitrate of bismuth is added to it. After boiling for some time, the bismuth will be reduced and deposited as a black powder, if sugar be present.

180. *a*. The urine contains sugar, it is pale, of a straw colour, of high specific gravity (1030–1050), has a faint smell, and is passed in large quantities. The patient has lost flesh and strength, complains of great thirst, sinking at the stomach; he has a dry, harsh skin, pains of the back and limbs; the appetite is voracious, and the bowels are usually confined.

The disease is *diabetes*.

You must examine the urine more than once, with an interval between the examinations, because the presence of the sugar may be only temporary; thus, a small quantity may be the consequence of some improper article of diet, and is occasionally observed in cases of disease of the heart and lungs. Never give an opinion as to the disease without satisfying yourself by careful examination that sugar is present; for there is an excessive quantity of urine secreted in diabetes insipidus, in chronic intertubular nephritis, in hysteria, and other disorders. The quantity of urine passed daily in diabetes varies from 8 to 30 pints, or even more; from 1 to $2\frac{1}{2}$ pounds of sugar may be thus discharged in the twenty-four hours. The disease comes on gradually, and the patient often complains of thirst, weakness, and loss of flesh before he observes the increase in the amount of urine. It is often accompanied by boils or carbuncles, swelling of the legs, sometimes by cataract;

the patient is incapable of bearing much fatigue or exertion, and usually dies of consumption or apoplexy. The sugar frequently disappears from the urine shortly before death.

181. *Diabetes insipidus* is characterized by the passing of a large quantity of clear, colourless urine, of low specific gravity (1003 to 1007), devoid of sugar and albumen. The complaint is usually attended with thirst, dry harsh skin, and feebleness of body and mind.

SECTION III.

You find a Deposit in the Urine.

182. Observe whether the urine you placed in the conical glass remains clear or has deposited a sediment. If there is a deposit, pass a piece of glass tube, the upper end of which is closed by your forefinger to the bottom of the glass, raise the finger for a moment so as to allow a small quantity of the deposit to rise in the tube, close again the end of the tube, and place a drop of the deposit, thus obtained, on a clean glass slide, or shallow glass cell, cover it with a piece of thin glass and examine it with the microscope, a $\frac{1}{2}$ or $\frac{1}{4}$-inch object-glass being best fitted for the purpose. When you wish to ascertain the effects of reagents on the deposit, place a drop near the covering glass and watch the results.

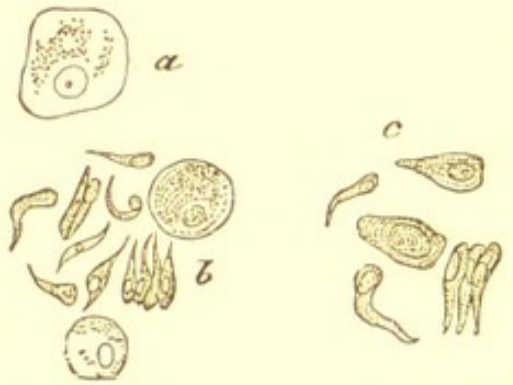
183. In perfectly healthy urine you may have a slight cloudy deposit of mucus, and on examining this with the microscope, you will generally find epithelial cells from the bladder and urethra. Those from the general surface of the bladder are flat and scaly, from the urethra columnar (see figs. 52 and 53).

In diseases of the kidneys you often find a quantity of epithelium from the renal tubes. These cells are small, round, or polygonal, and have a well-defined nucleus (*a*, fig. 44). The epithelial cells from the

ureters and pelvis of the kidney are of the columnar form, and often adhere together in small pieces (fig. 52).

184. In some cases spermatozoa are present. They are oval in form, with long delicate tails, and require a $\frac{1}{4}$-inch object-glass for their detection. It is only when numerous and constantly passed that they can be looked upon as indicating disease (see fig. 54).

FIG. 52.



a. Epithelial cells from the general surface of the bladder. *b*. From the fundus of the bladder. *c*. From the ureter. (BEALE.)

FIG. 53.



a. Epithelium from the urethra. *b*. Vaginal epithelium. (BEALE.)

In examining a urinary deposit, observe whether it is composed chiefly of crystals, or is granular and amorphous. If crystalline, begin at (185); if amorphous, pass on to (190).

A. *The deposit consists of crystals.*

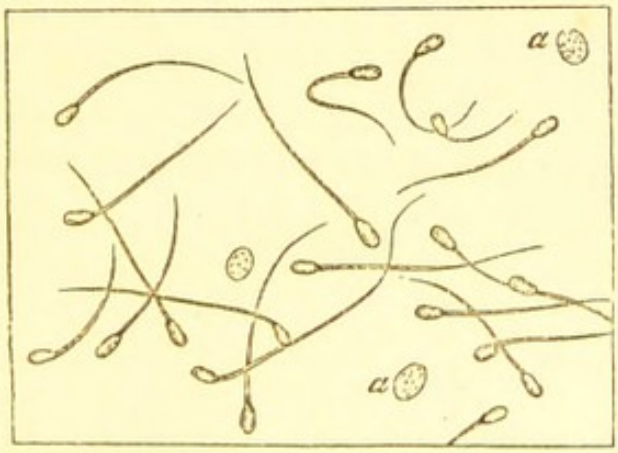
The crystals generally met with are those of lithic acid, oxalate of lime, triple phosphate, and cystine.

185. *a*. The deposit is red, and in grains not unlike cayenne pepper. Under the microscope the crystals are reddish, or yellow rhombic plates, like lozenges (see figs. 55 and 56).

They are composed of *uric acid* (*lithic acid*).

In case of doubt, add a drop or two of nitric acid to a little of the deposit placed upon a glass slide; dry it over a spirit lamp, and add to it when cold a drop of ammonia or liquor potassæ; if it is composed of lithic acid, a beautiful purple colour will be produced.

FIG. 54.

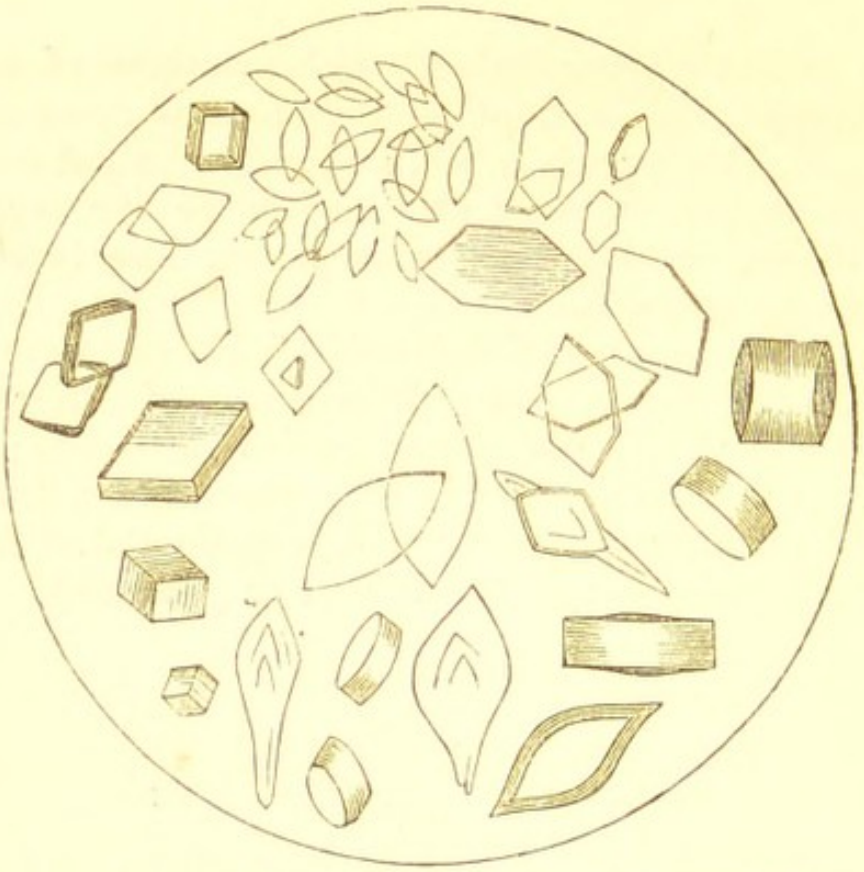


Spermatozoa and spermatic granules, magnified 400 diameters.

This deposit does not, except when in large quantity, necessarily indicate an *excess* of uric acid, for it is thrown down in any normal urine, when an acid is added to it. When the amount is large and constant it is associated with an increased acidity of the urine; it is therefore present in a number of different disorders, such as indigestion, rheumatism, gout, fevers, &c. If the deposit occurs *directly* after the urine is passed, you may suspect a tendency to the formation of uric acid calculi in the kidney.

186. Urate of soda is occasionally deposited in a crystalline form in the febrile diseases of childhood.

FIG. 55.



The simpler form of uric acid crystals. (ROBERTS.)

FIG. 56.



Rarer forms of uric acid crystals. (ROBERTS.)

The crystals present spines which may be either straight or curved (see fig. 57).

Urate of ammonia sometimes appears as globular masses, or in the shape of minute and slender dumb-bells (see fig. 58).

FIG. 57.



Hedgehog crystals of urate of soda spontaneously deposited from the urine of a child. (ROBERTS.)

187. *b*. Microscopically, the crystals are octohedral (like envelopes), or dumb-bell shaped, and of various sizes.

They are composed of *oxalate of lime*. (Figs. 59 and 60.)

This deposit is usually scanty, and looks to the naked eye like mucus. The crystals are insoluble in acetic acid or liquor potassæ, but dissolve in dilute nitric acid. It is very common to find oxalate of lime crystals in small numbers in the urine of healthy persons, and a deposit of them may be produced by certain articles of food, such as rhubarb. When numerous and persistent they generally indicate irritability of the nervous system and feeble digestion.

FIG. 58.



Urate of ammonia in the crystalline form. Spheres and globular deposits. Dumb-bells, crosses, rosettes. (ROBERTS.)

188. *c*. The crystals are in the form of transparent prisms or feathery bodies. (Figs. 61 and 62).

They are composed of *triple phosphate*.

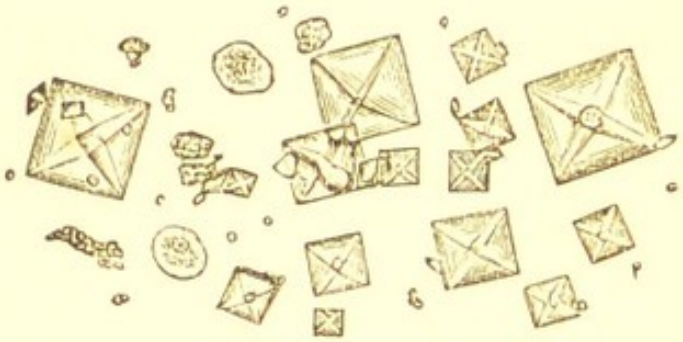
These crystals are soluble in acetic acid. They are associated with a neutral, or alkaline state of the urine, and may be produced by the decomposition of

the urine set up by the mucus secreted by a diseased bladder. When there is no local cause for their production, they generally indicate a feeble state of the system.

189. *d.* The crystals are six-sided plates, very sparingly soluble in hot water, but readily so in ammonia, and are deposited unchanged upon the spontaneous evaporation of the solution. (Fig. 63).

They are composed of *cystine*.

FIG. 59.



Octohedral oxalate of lime crystals. (BOWMAN.)

FIG. 60.



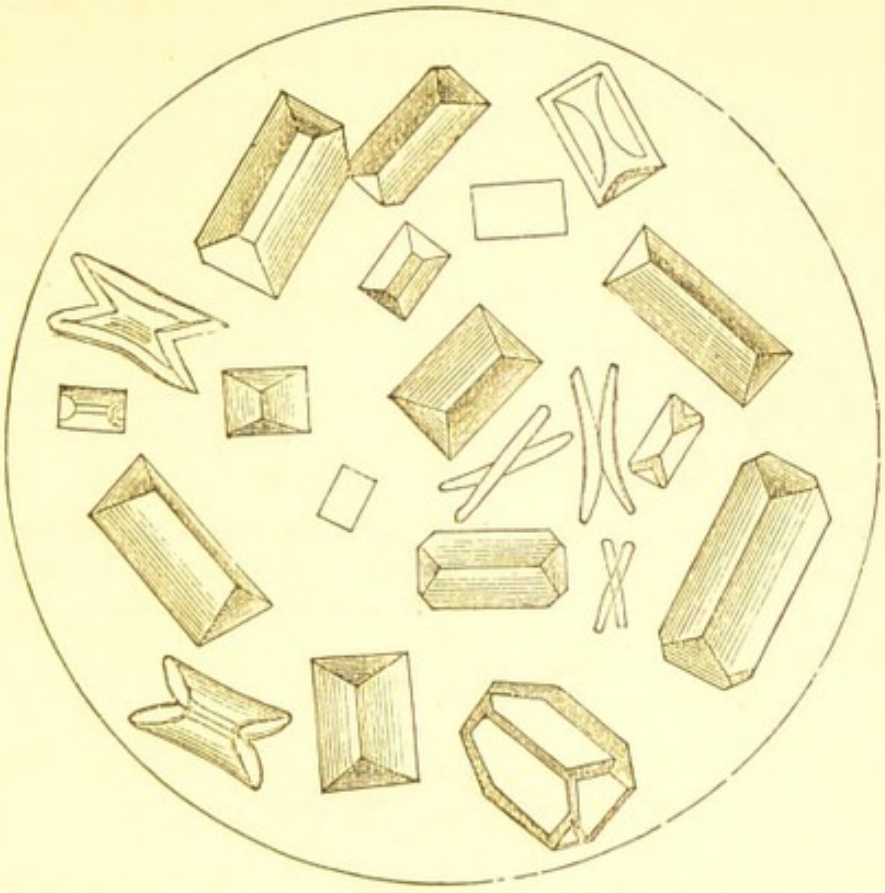
Dumb-bell shaped crystals of oxalate of lime. (BOWMAN.)

The ammonia is used to distinguish cystine from lithic acid, the latter being deposited in a *granular* form from its solution in ammonia.

B. *The deposit is amorphous.*

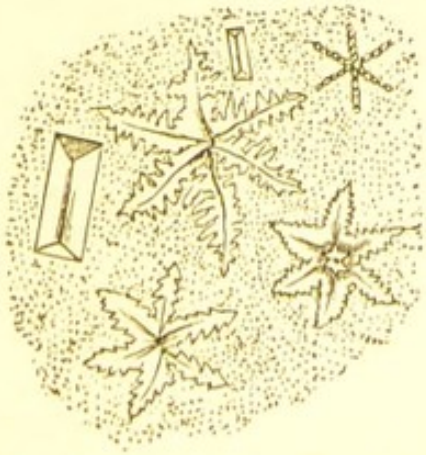
The substances likely to form this deposit are pus, urate of soda or ammonia, and earthy phosphates. Add

FIG. 61.



Different forms of triple phosphate crystals. (ROBERTS.)

FIG. 62.

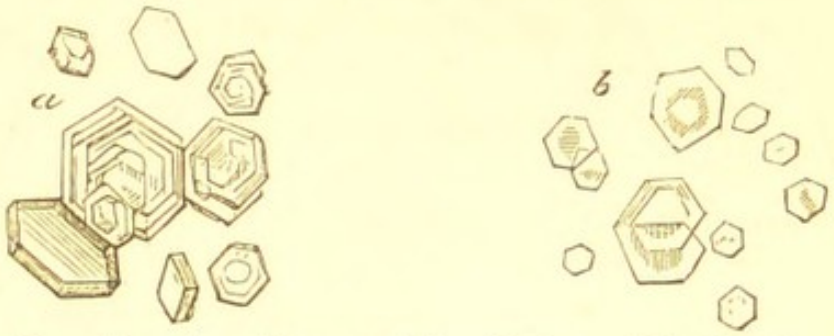


Feathery forms of triple phosphate crystals. (BOWMAN.)

to the deposit in a test-tube half its bulk of liquor potassæ, and shake it briskly.

190. *a.* *Pus* is distinguished by the microscope (fig. 47), and forms a glairy mass when shaken with liquor potassæ.

FIG. 63.



a. Crystals of cystine. *b.* Six-sided crystals of cystine formed from a solution of the crystals in ammonia. (BEALE.)

FIG. 64.



Microscopic appearance of amorphous urinary sediment, consisting of urate of soda. *a.* A few fermentation fungi intermixed with it. (NEUBAUER and VOGEL.)

191. *b.* The deposit dissolves in liquor potassæ. It is formed of *urate of soda, ammonia, or lime.*

192. The urates are the most common of the urinary deposits, and are of very slight clinical importance. They indicate that the urine is acid and concentrated, and they are most readily deposited in cold and damp weather (see fig. 64).

193. *c.* The deposit does not dissolve in liquor potassæ.

It is formed of *earthy phosphates.*

CHAPTER VI.

DISEASES OF THE LIVER.

THE principal diseases to which this organ is liable are—congestion, acute hepatitis, abscess, acute atrophy, cirrhosis, hydatid tumours, cancer, and fatty and lardaceous degenerations. In addition to these, we have to consider inflammation of the hepatic ducts, dilatation of the gall-bladder, and biliary calculi.

194. CONGESTION OF THE LIVER.—The liver is liable to three forms of congestion. 1. *Passive congestion*, arising from an obstruction to the flow of the blood into the heart. 2. *Active congestion*, from too large a quantity of blood entering the liver. 3. A state in which the ducts become gorged with bile. In the first two forms the whole organ is enlarged, smooth on the surface, of a dark-red colour, its anterior margin hard and prominent; if cut into, blood flows freely from the section. When passive congestion has been maintained for some time, "nutmeg liver" is produced. In this state the liver presents, on section, the appearance of a nutmeg—viz., red spots or patches, surrounded by spaces of a yellowish or dirty-white colour. Microscopically, in passive congestion the hepatic veins are much dilated and their walls thickened. By the pressure of the enlarged veins upon the surrounding parts, the cells in the interior of the lobules are reduced in size, and are of a dark-yellow colour, whilst those on the exterior are large, pale, and fatty. In some cases the cells in the centre of the lobules are absorbed, and only dark-coloured granular matter remains.

The most common causes of passive congestion are—valvular diseases and dilatation of the heart, emphysema and other diseases of the lungs which obstruct the flow of the venous blood through the right side of the heart (see fig. 3). *Active* congestion is generally the result of intermittent fevers, or immoderate eating or drinking. The bile-ducts become distended and the liver enlarged, when any circumstance, such as a stone in the duct, prevents the flow of bile into the intestine.

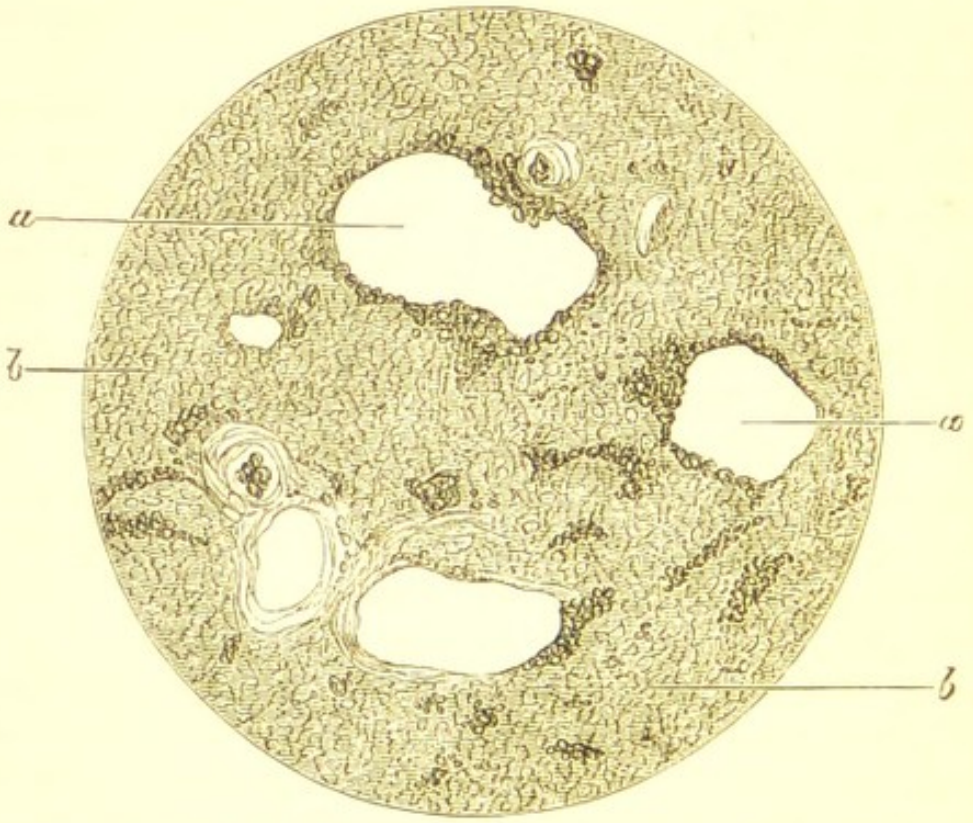
195. Acute Hepatitis, or acute inflammation of the liver, although rare in this country, is not uncommon in tropical regions; the only stage in which you are likely to meet with it is abscess. Abscess usually presents itself in this country either in connection with disease of the colon, or as the result of pyæmia. In the former case the abscess is usually single and of large size, and the pus may be surrounded by an uneven, ragged boundary of softened hepatic tissue, or it may be enclosed by a thick, tough membrane. When it results from pyæmia, a number of small abscesses occur in the course of the portal veins. A hepatic abscess, when single, generally presents itself in the right lobe. It may point externally, or may burst into the peritoneum, into the chest, or into some part of the intestinal canal; or more rarely the pus may dry up, and leave a cheesy mass of white, dry matter.

196. Thickening of the Capsule of the Liver (Perihepatitis) is the result of inflammation, and is usually accompanied by adhesions to some of the neighbouring organs. It may occur along with general peritonitis, or it may result from the irritation set up by an abscess of the liver, or by a cancerous or hydatid tumour.

197. In Acute Atrophy the liver is much reduced in size, it is of a greenish-yellow colour, and is soft and flaccid in its texture. Microscopically, the lobules cannot be distinguished from one another, the

hepatic cells have vanished, and are replaced by a confused mass of pigment, granular matter and oil globules (see fig. 65). In the early stage of the disease there appears to be an exudation around the lobules which compresses the smaller branches of the biliary ducts. The spleen is usually enlarged. Crystals

FIG. 65.



A section of the liver in a case of acute atrophy, as seen under the microscope. The divisions between the lobules have disappeared, and the whole structure seems to be composed of granular and fatty matters. *a*. points to the intralobular veins, the openings of which, on account of the softness and atrophy of the texture, are seen to be very large, of an irregular shape, and very close to each other. A few fatty cells can still be seen at different points.

of tyrosine and leucine are found both in the liver and the urine, and sometimes in the blood of the hepatic veins (see figs. 70 and 71). The cause of this disease is unknown, but most pathologists look upon it as a variety of acute hepatitis.

198. CIRRHOSIS OR CHRONIC HEPATITIS is a form of chronic inflammation, in which the fibrous

covering of the liver and the connective tissue which accompanies the vessels into the interior of the organ become thickened, and thus atrophy of the secreting substance is produced. The liver is irregular on the surface, being usually covered with protuberances of various sizes ("hob-nail liver.") It is of a light yellow colour, hard, tough, and leathery, and is much reduced in size, especially the left lobe, which is often shrivelled to a mere membranous appendage, the capsule is opaque and closely adherent. Microscopically, the main portion of the structure is formed of connective tissue produced by inflammation around the portal canals. By the shrinking of this new-formed tissue the lobules are compressed and the liver cells become fatty, or are absorbed and disappear. The branches of the hepatic artery are often enlarged, and ramify in the thickened structure, but the ramifications of the portal vein are compressed and in many cases obliterated. The protuberances on the surface are formed of groups of lobules isolated and constricted by the new-formed connective tissue (see fig. 66).

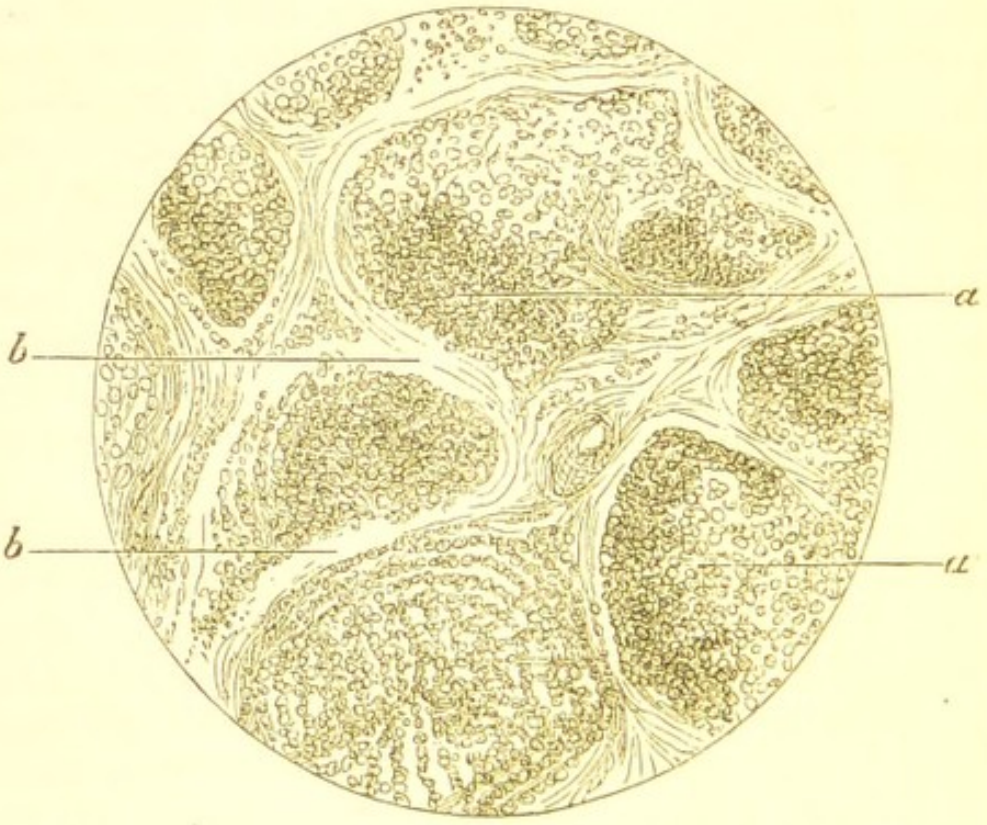
In the early stage of the disease the liver is usually enlarged; it is also enlarged when cirrhosis is combined with fatty or lardaceous degeneration. From the compression exercised on the ramifications of the vena portæ in the liver the whole of the blood-vessels of the portal system become overloaded with blood. Hence the serum exudes into the cavity of the peritoneum, causing dropsy (ascites), the spleen is generally increased in size, and the mucous membrane of the stomach and bowels is so much congested that severe hæmorrhages often take place.

199. Hypertrophic Cirrhosis. The organ is much enlarged and is dense and hard. Microscopically, the disease appears to originate in chronic inflammation around the smaller biliary ducts situated between the lobules. Consequently, obstruction of these ducts takes place, producing jaundice, whilst the

obstruction to the portal circulation, and the resulting ascites so common in ordinary cirrhosis is usually absent.

200. Hydatid Cysts (Parasitic Disease) occur more frequently in the liver than in any other organ, and often attain an enormous size. The usual seat of a cyst is in the right lobe. The whole liver appears enlarged; the increase in size is not uniform, however, but is greatest near the part affected. The

Fig. 66.

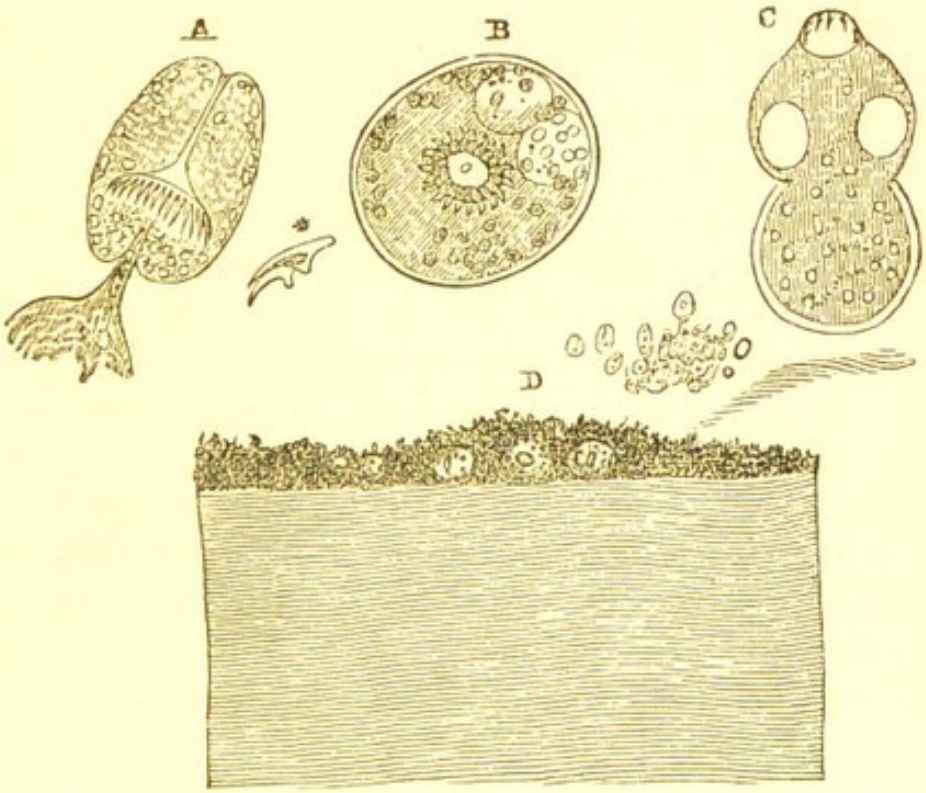


Section of the liver in a rather early stage of cirrhosis, as seen under the microscope. *a*. Lobules of the liver, the cells being in a state of fatty degeneration. *b*. Newly formed connective tissue between the lobules, originating in inflammation of the portal canals, and compressing both the vessels and the secreting structures.

structure of the organ is healthy. The lining membrane of the cyst is soft and gelatinous, and contains a clear fluid, and usually other smaller cysts, which vary greatly in size and float in the fluid. The cyst is surrounded by, but does not adhere to, an envelope

of condensed areolar tissue that is closely connected with the hepatic tissue. Attached to and growing from the lining membrane are minute bodies, which, on microscopic examination, are seen to be oval in shape, and to possess a head surrounded by a crown of minute calcareous hooks (fig. 67). In

FIG. 67.



A. Echinococcus, the head retracted. B. Echinococcus, the head and coronet of hooks facing the observer. C. Echinococcus, the head extruded. D. Section of wall of the cyst, in the lining membrane of which are seen several Echinococci. (JONES and SIEVEKING.)

some cases the hydatid dies and is converted into a putty-like mass, which you can distinguish from the remains of an abscess by finding amongst its contents the hooklets of the "echinococci," as these minute animals are named. Hydatid cysts are developed from the ova of a tapeworm (see *Tænia echinococcus*), which probably enter the veins from the intestines and thus find their way to the liver.

201. The FATTY LIVER is uniformly enlarged, and has round edges, feels greasy, is pale in colour,

and soft in texture. Microscopically, the hepatic cells are filled with oil, and their nuclei are obscured or have disappeared. In the earliest stage the cells on the exterior of the lobules, where the ramifications of the portal vein are distributed, are alone affected, but as the disease progresses the morbid change spreads also to the centres of the lobules.

The disease is generally found in connection with phthisis, or some other wasting disorder. It is supposed that the fat is absorbed from the tissues of the body, which are rapidly undergoing disintegration, and is deposited in the cells of the liver.

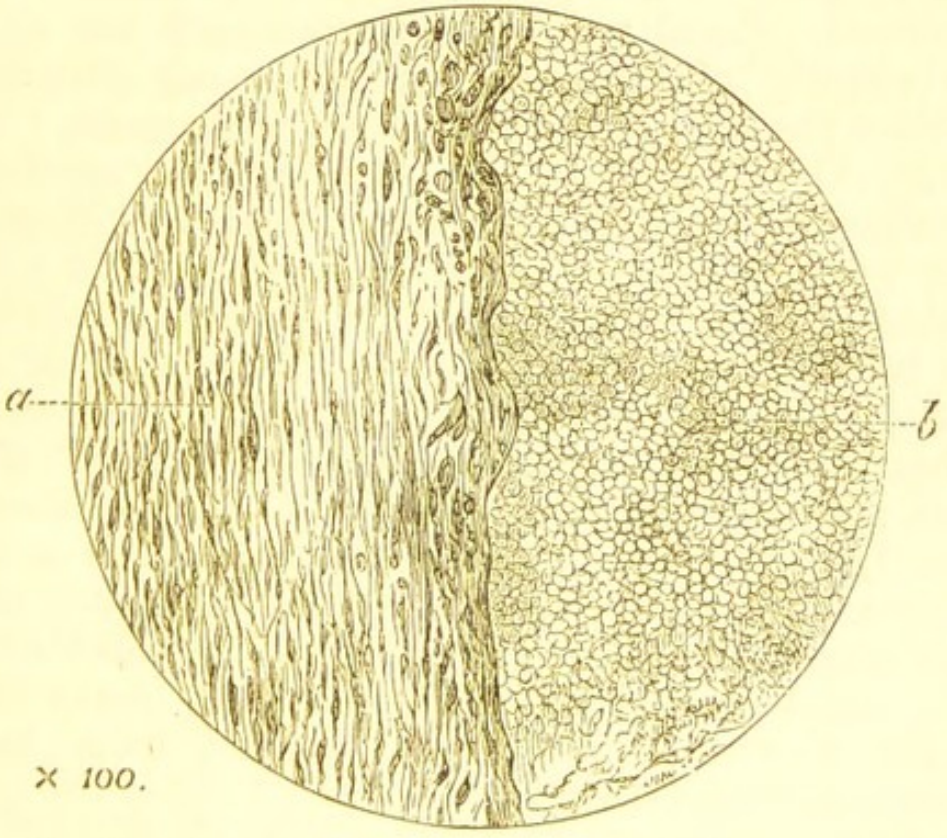
202. Lardaceous Liver, Amyloid or Waxy Degeneration, depends on the presence of a substance in the coats of the smaller blood-vessels and in the secreting cells, that becomes of a blue colour when treated with iodine and sulphuric acid. It was supposed from this reaction that the morbid material was of a starchy nature, but it is now known to be a modification of fibrine. The whole organ is uniformly enlarged, it is very heavy, firm, smooth, and pale on the surface. A section is dry and bloodless, and has a translucent appearance. A solution of iodine gives a reddish-brown colour to the tissue. Microscopically, the cells are very coherent, their granular contents are seen to be replaced by a clear substance, the nucleus is invisible, and the walls of the smaller blood-vessels are hard and thickened. The cells in the middle of the lobules are first affected, because the ramifications of the hepatic artery are chiefly distributed there; afterwards, the morbid change spreads towards the centres of the lobules. In other organs also the walls of the smaller arteries first afford evidence of amyloid degeneration.

The disease is sometimes associated with fatty degeneration, and it generally occurs, along with a similar condition of the spleen and kidneys, in persons who have suffered from long-continued suppuration

of any part, scrofula, affections of the bones, syphilis, or phthisis.

203. Syphilis often affects the liver, giving rise to well-defined tumours, of a yellowish-white colour and firm consistence. They are usually situated on the external part of the organ, extending from the capsule inwards. At an early period of the disease the whole organ is often increased in size. Microscopically, the external part of the tumour consists

Fig. 68.



Section of a syphilitic tumour of the liver, as seen under the microscope. *a*. Margin of the fibrous part of the tumour where the development of the fusiform cells into fibres is seen. *b*. The softer cellular part of the structure. The line dividing these two parts has been engraved much too distinctly.

of fibres, whilst the softer structure towards the centre presents to the view cells, granular and fatty matters, and in some cases, plates of cholesterine (see fig. 68). Of the internal organs syphilis chiefly affects the liver, brain, testis, and kidney.

204. Cancer of the Liver is rare as a primary affection, but is frequently met with as the result of malignant disease in other organs. In *medullary* cancer, which is the most common form, the liver is usually much enlarged by growths from the parts affected. In *scirrhus*, hard slightly projecting nodules are scattered through the organ. *Colloid* and epithelial cancers are very rare, and seem only to occur as an extension of disease from other parts. Cancer of the liver usually produces ascites, and very frequently gives rise to jaundice, by compression of the bile-ducts. Local peritonitis is commonly set up in the vicinity of the tumours, producing adhesions between the liver and the neighbouring organs.

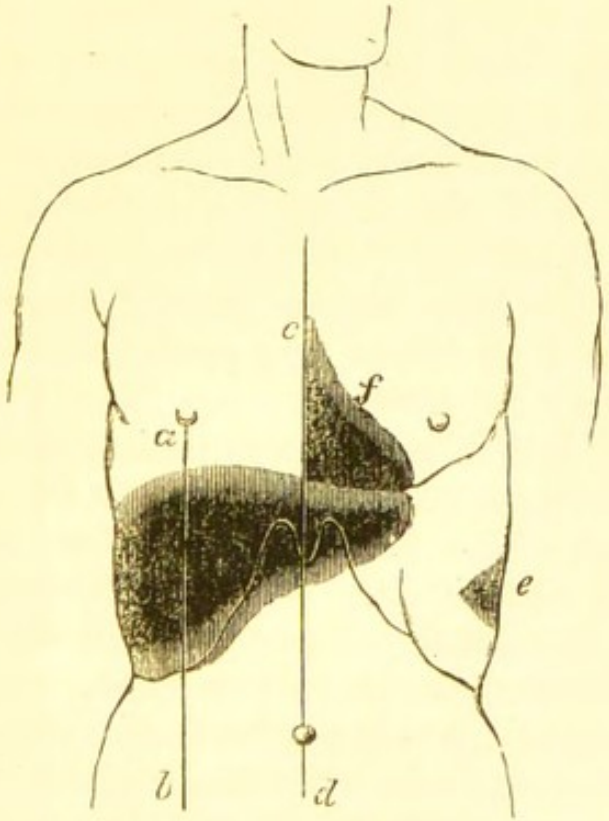
205. The Gall-ducts and Gall-bladder are liable to inflammation and malignant disease, and thus we meet with thickening, ulceration, stricture, and other morbid changes in them. If the passage of the bile has been obstructed, the gall-bladder becomes distended, and may attain a considerable size. Gall-stones are often found in the gall-bladder after death; they are chiefly composed of cholesterine (usually 80 to 90 per cent.), bile-pigment, and earthy matters. They vary in size from a hempseed to a hen's egg; when only one exists in the gall-bladder it is round or oval, but when there are many they usually present smooth, flat surfaces, from their friction on each other.

The symptoms that should lead you to suspect an affection of the liver are—pain, or a feeling of weight, in the epigastrium, right side or shoulder, pale-coloured stools, jaundice, vomiting, flatulence, dropsy of the legs or abdomen, or hæmorrhage from the stomach or bowels. You should also always examine the state of this organ in cases of disease of the heart and kidneys.

206. You ascertain the size and shape of the liver by percussion, auscultatory-percussion, and by palpa-

tion. Trace the upper border first, and mark the outline with ink, beginning where the sound is clear, and continuing downwards until you bring out a dull note. You will remark that before you find the sound *quite dull* there is a portion where, from the upper edge of the liver being covered by a thin layer of lung, the sound is more resonant than that just below it.

FIG. 69.



Area of hepatic dulness, viewed anteriorly. *a—b.* Right mammary line. *c—d.* Median line. *e.* Splenic dulness. *f.* Cardiac dulness. (MURCHISON.)

Both borders of the liver are curved; the upper partially dull line extends from the tenth or eleventh dorsal vertebra behind to the seventh intercostal space on a line with the centre of the axilla, and to the fifth intercostal space on a line with the right nipple, from which the dulness is prolonged to the apex of the heart. The lower border corresponds, below the right nipple, with the lower margin of the ribs; in the epigastrium it generally extends two or

three inches below the junction of the sternum with the lowest costal cartilage (see fig. 69). To define the upper border percuss strongly; at the lower press the finger or pleximeter firmly down and strike lightly. You will often find auscultatory-percussion of great use in defining the lower border. Whenever the liver is diseased, ascertain also the dimensions of the spleen.

207. You will gain valuable information by feeling the liver when it is enlarged. Place the patient on the left side, with both knees bent, and the back supported by a pillow. Slide the tips of your fingers or the edge of your hand from below upwards beneath the lower edge of the liver, and instruct the patient to draw a full breath. In this way you will often be able to examine both the inner and outer surfaces of the organ, and to detect any projections or irregularities that may be present.

208. Jaundice often accompanies disease of the liver, and is produced by the presence of bile-pigment in the blood. The yellowness is seen in the skin, conjunctivæ, and urine. In some diseases the colour of the skin simulates jaundice, but in the latter only the conjunctivæ have a yellow tinge. As the urine may be coloured by other substances, you should test for the presence of bile with nitric acid. Pour a little of the urine on a white plate, and drop into it a small quantity of nitric acid; if bile pigment be present a play of colours will appear round the acid—brown, green, violet, red, and yellow.

209. Jaundice may be caused either by the absorption of bile from the liver, or by the retention and decomposition in the blood of substances that, in a healthy state, are secreted by that organ. Absorption of bile occurs whenever the hepatic or common ducts are greatly narrowed or completely closed by a gall-stone, the pressure of a tumour, a plug of mucus, or by inflammatory swelling of the mucous membrane; or again, when any of the larger ducts within the

liver are compressed, either by vascular congestion or other causes. The second form of jaundice occurs in pyæmia, acute atrophy of the liver, and some other febrile diseases. When the common duct is closed the stools are white, since no bile can enter the intestine, but in the second form of jaundice they are not necessarily altered in colour. The condition of the heart, kidneys, and right side of the chest should be always ascertained when jaundice is present.

First inquire if the disease has begun suddenly or gradually. If suddenly, begin at (210); if the appearance of the symptoms has been gradual, pass on to (217).

SECTION I.

The Disease has commenced Suddenly.

Under this head you have acute congestion, abscess of the liver, jaundice arising from obstruction of the common gall-duct, and acute atrophy of the liver. In the three first the area of hepatic dulness is increased, in acute atrophy it is diminished.

210. *a*. You find the liver increased in size, a little tender, and smooth on its surface. There are pain or weight in the right side, pain in the right shoulder, slight jaundice, headache, nausea or vomiting, the tongue is foul, there is loss of appetite, and the bowels are usually confined; there is little or no fever.

The disease is *acute congestion of the liver*.

This affection is often the result of disease of the heart, but it may be also produced by blows on the side, ague, and the abuse of alcoholic stimulants. It not unfrequently precedes or accompanies cirrhosis, and other disorders of the liver. Always examine the right lung in these cases, for very similar symptoms, accompanied by jaundice, sometimes present themselves in pleuro-pneumonia.

211. *b*. In addition to signs of acute congestion you find considerable pain and tenderness on pressure

over the liver, vomiting, often urgent, shiverings, profuse sweats during sleep, thirst, quick pulse, and emaciation. Sometimes delirium is present.

The disease is probably *abscess of the liver.*

Abscess of the liver occurs either singly as the result of acute inflammation, or as the consequence of pyæmia, when there are generally numerous deposits of pus. The former in this country is rarely met with, excepting in those who have lived in the tropics, and have suffered from dysentery. When a single abscess is present you may have bulging, tenderness, and obscure fluctuation over some portion of the liver, but in other cases you have no physical signs, and the symptoms may be absent or so obscure that you can only guess at the nature of the disease. The pyæmic form usually results from external injuries and surgical operations, or from some internal abscess or ulceration. It may arise from ulcers of the stomach, intestines, or pancreas.

212. *c.* You find yellowness of the skin, and conjunctivæ, the urine is yellow or like porter, and often deposits a thick sediment, the stools are pale, the heat of skin is not increased, the pulse is not quick, and there are no head symptoms; there is increased dulness over the site of the gall-bladder.

The disease is *jaundice from obstruction of the common gall-duct.*

Jaundice is attended with emaciation, flatulence, loss of appetite, and other signs of indigestion; there is usually drowsiness, and itching of the skin is a very common symptom. This form of jaundice may be temporary or permanent. In the former case it is mostly due to the irritation set up by the passage of a gall-stone, or to catarrh of the ducts originating in the duodenum. In the latter it may be caused by the impaction of a calculus, stricture or thickening of the duct, by carcinomatous or other tumours, or by adhesions resulting from perihepatitis contracting or closing the duct. From whatever cause the common

gall-duct may have become obstructed, the liver can be generally felt to be enlarged, but after this has lasted for some time contraction commences and the organ becomes reduced in size.

213. When the jaundice arises from a gall-stone it is preceded by very severe pain, aggravated in paroxysms, referred to the gall-bladder or right scapula. During the paroxysms, the face is pale and covered with sweat, the pulse slow, and the pain is not increased by pressure; vomiting of an acid fluid often takes place. The pain generally terminates suddenly, and jaundice occurs a day or two afterwards. In such cases the stools should be well mixed with water and strained through muslin, so that any calculus that may have been passed may be discovered. Gall-stones are most common in persons of middle or advanced age, and are more frequent in females.

214. If the closure of the gall-duct has arisen from inflammation of the mucous membrane extending from the stomach and duodenum, the jaundice is preceded by tenderness of the epigastrium, bilious vomiting or diarrhœa, white tongue, and loss of appetite. When repeated attacks of jaundice, unaccompanied by other disease of the liver, occur in a young person they usually depend on inflammation of the ducts; when in one of middle or advanced age, on the irritation excited by gall-stones.

215. In some cases the gall-bladder, from long distension, forms a pear-shaped tumour, extending downwards. It is most likely to be mistaken for a hydatid tumour, but its situation, the presence of jaundice, and the probable history of gall-stones, cancer, or other disease of the liver will serve to distinguish it.

216. *d.* You have jaundice, *attended with diminution of the area of hepatic dulness*, pain in the epigastrium, vomiting, often of blood, restlessness, delirium, or coma, rapid pulse, increased temperature, thirst, dry brown tongue, and hæmorrhages from the nose,

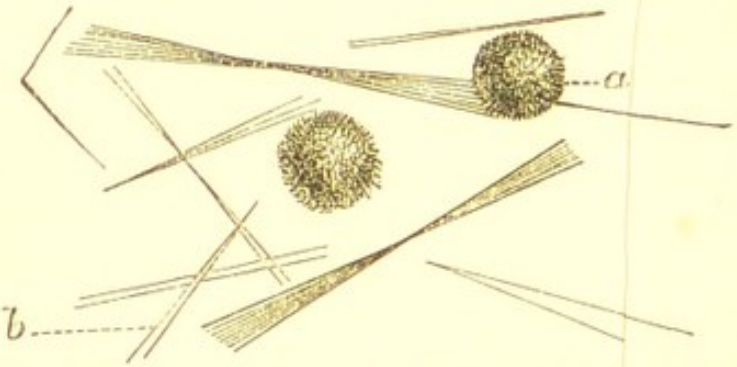
stomach, bowels, or uterus, or extravasations beneath the skin. The urine generally contains leucine and tyrosine.

The disease is *acute atrophy of the liver*.

The complaint is generally ushered in with headache, nausea, vomiting, foul tongue, and rapid pulse. It is usually fatal, and is most common during pregnancy. It ordinarily runs its course within a week.

The amount of urea in the urine is much diminished in the early stage, towards the close of the disease

FIG. 70.



Crystals of tyrosine obtained by the evaporation of urine. (FRERICHS.)

FIG. 71.



Crystals of leucine. (BEALE.)

it is replaced by tyrosine and leucine. These are found by evaporating the urine, when, if present, they form crystals, which can be detected by the microscope. Tyrosine forms needle-shaped crystals, arranged in bundles or stellate groups; leucine occurs in laminated crystalline masses (see figs. 70, 71).

SECTION II.

The Disease has commenced Gradually.

First ascertain if the area of dulness of the liver is increased or diminished. If enlarged begin at (217); if it is smaller than in its normal state, or attended with dropsy, pass on to (226). In all cases examine and mark out the size of the spleen.

A. The liver is increased in size.

In this case, ascertain whether there be pain and tenderness on pressure, if so, pass on to (221); but if there is neither pain nor tenderness, begin at (218).

217. I must caution you against certain errors to which you may be liable in estimating the size of the liver. Sometimes its lower edge is ill-defined, from impaction of fæces in the colon. Auscultatory-percussion will usually prevent your making a mistake in this particular, but if you have any doubt, the colon should be emptied by an enema or purgative. Or the liver may be pushed downwards by pleurisy, emphysema, dilated heart, distended pericardium (see fig. 13), or by the use of tight stays or belts. To diagnose pleurisy with effusion from enlarged liver, remember that the upper border of the dulness in pleurisy is plane, not arched, and that the liver is not depressed on forced inspiration. Where tight-lacing has been practised, you will generally find some external evidence of it.

a. You find the liver increased in size, but there is neither pain nor tenderness on pressure. Under this head you have fatty liver, lardaceous liver, and hydatid tumour. In the two first the enlargement is *uniform*, in the third it is irregular in shape.

218. *a. a.* There is no pain in the right hypochondrium or epigastrium, the liver is *uniformly* enlarged, feels smooth and rather soft, but is not tender on pressure; the spleen is not enlarged; there is neither

jaundice, dropsy, nor albumen in the urine; the patient is usually feeble and liable to diarrhœa.

The disease is probably *fatty liver*.

This affection most commonly occurs in persons labouring under phthisis, in drunkards, in patients who have suffered much from syphilis or other exhausting diseases. Perhaps its chief characteristic is the absence of all symptoms leading to a suspicion of hepatic disorder.

219. *b. b.* There is a feeling of fulness in the right hypochondrium, the liver is *uniformly* enlarged, it feels hard and smooth, but is not tender on pressure; the spleen is enlarged, jaundice is rare, but dropsy of the abdomen is often present; the urine is copious, and generally contains albumen; the patient is pale and anæmic, and is liable to nausea, vomiting, and diarrhœa.

The disease is probably *lardaceous degeneration of the liver*.

This malady generally occurs in persons who have suffered greatly from syphilis, scrofula, disease of the bones, or phthisis, or in those who have had long-continued suppuration from other causes. The conditions of the spleen and urine are the most important points in the diagnosis, and it should be remembered that the lardaceous attains a greater volume than the fatty liver. In some syphilitic subjects the shape of the enlarged liver is not uniform, the organ being divided by one or more deep cicatrices.

220. *c. c.* There is no pain or tenderness on pressure, but the liver is enlarged, *not uniformly*, but it presents a swelling or tumour at some part of its area. The tumour is smooth, elastic, and sometimes gives a peculiar vibration to the fingers on percussion. There is no enlargement of the spleen, jaundice, nor dropsy, and the patient's general health is unaffected.

The disease is probably *hydatid tumour of the liver.*

When tapping is performed the fluid removed is found to be transparent, its specific gravity varying from 1008 to 1013; it contains an abundance of chloride of sodium, but no albumen, and when examined with the microscope often shows echinococci or microscopic hydatids. If not relieved by treatment, the tumour may cause death by bursting through the diaphragm, or into the peritoneal cavity, or it may evacuate its contents through the gall-ducts or some part of the intestinal canal.

221. Hydatid tumour may be confounded with abscess of the liver, enlarged gall-bladder, or cancerous tumour. The history and the absence of constitutional symptoms distinguish it from abscess; the jaundice, site of the tumour, and perhaps a history of previous colic, serve to diagnose the enlarged gall-bladder; whilst malignant disease will be recognised by the irregularity of the surface of the tumour, the pain and tenderness, and the rapid loss of flesh and strength that accompany it, and often by the presence of cancer in some other organ of the body.

b. You find a chronic enlargement of the liver, attended with pain in the right hypochondrium or epigastrium, and tenderness on pressure.

Under this head are chronic congestion, abscess, cancer, and hypertrophic cirrhosis (228). You may meet with *jaundice* in all of these, and in abscess and cancer the outline of the organ is in most cases *irregular*. Dropsy is usually present in cirrhosis, and often also in cancer of the liver.

222. Chronic congestion presents the same symptoms as when it is acute (210), but they are generally less severe; it results from diseased heart, ague, or the abuse of ardent spirits. Although acute hepatitis begins suddenly, yet an abscess produced by it may remain for a length of time. In such a case you

will find enlargement with irregularity in the shape of the liver, and pain and tenderness on pressure; but, besides the history of the disease, your diagnosis will be assisted by the presence of fever, shiverings, sweatings, and emaciation.

223. *a. a.* There is severe pain in the right hypochondrium or epigastrium, with tenderness on pressure. The liver is enlarged, its shape irregular, and the edge of the surface uneven; the spleen is seldom enlarged, but jaundice, and dropsy both of the abdomen and legs are frequently present. The patient is sallow, feeble, and emaciated.

The disease is *cancer of the liver.*

In three-fourths of the cases there is also a cancerous tumour of some other organ, usually of the breast, uterus, or stomach, and the glands of the neck are often enlarged. It rarely occurs below forty years of age, and the patient usually dies within twelve months. The jaundice, when present, is commonly produced by the pressure of enlarged glands upon the common bile duct. In some cases there is little or no pain.

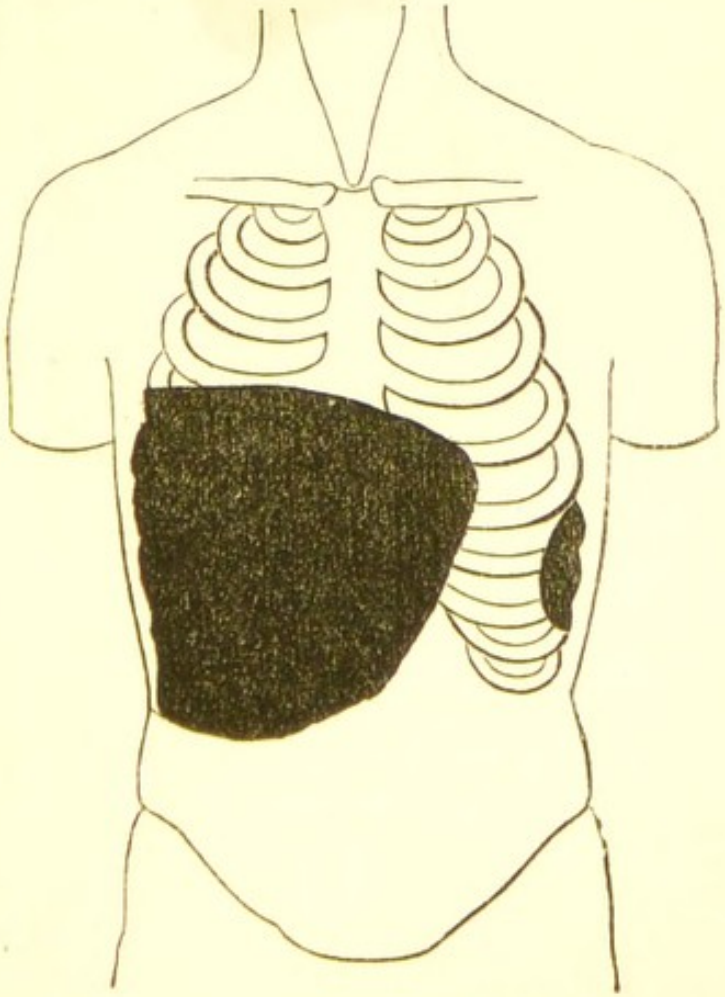
224. Cancer of the liver is most liable to be mistaken for lardaceous and syphilitic disease of the liver, hydatids, or cirrhosis. In lardaceous degeneration the progress is slow, there is no pain or tenderness, the spleen and kidneys are generally affected, and there is a history of caries of the bones, constitutional syphilis, or long-continued suppuration. In syphilitic disease there is seldom much pain or tenderness; jaundice and dropsy are usually absent; there is not the same amount of wasting, anæmia, or feebleness as in cancer, and the patient has suffered from eruption on the skin, ulcers of the throat or tongue, or has had affections of the bones or periosteum. When the cancer is of a medullary character, it may be confounded with hydatid tumour, but the smoothness of the surface, and the absence of pain and con-

stitutional symptoms will enable you to diagnose the latter affection. The enlarged state of cirrhosis will be recognised by the smaller amount of pain, the slowness of the progress, the absence of other malignant tumours, and the history of intemperance. When jaundice arises from malignant disease, the colour of the skin is frequently of a very deep yellow, tending to a greenish-brown.

225. You may also divide the enlargements of the liver into two chief groups: one where the organ is uniformly increased in size, the other comprising those in which the shape is irregular.

FIG. 72.

Shows the diseases in which the liver is uniformly enlarged.



Not painful.

Fatty liver.
Lardaceous liver.
Hypertrophic cirrhosis.
Obstruction of the gall-duct.

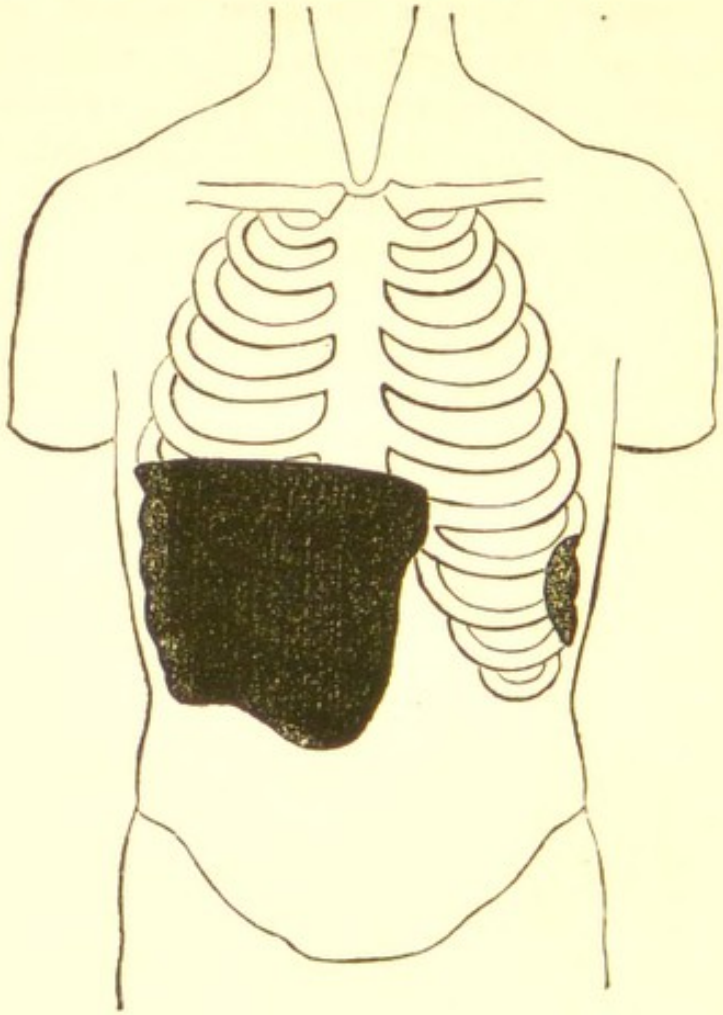
Painful.

Congestion.
Cirrhosis in early stage.

(Dr. S. MACKENZIE.)

FIG. 73.

The enlargement is irregular in shape.



Not painful.
Hydatid tumour.

Painful.
Abscess.
Cancer.
Diseased gall-bladder.

(Dr. S. MACKENZIE.)

B. The liver is diminished in size.

Before concluding that the liver is diminished, you must bear in mind the possibility of mistakes through the following conditions:—The stomach and colon may be so much distended that you are unable to mark out the lower edge of the liver, or a portion of intestine may lie across and conceal it. If the lower border is very thin, and you percuss strongly, the resonance of a portion of gut below it may deceive you as to its actual size. Again, in some cases the front of the liver is puckered up by cicatrices, whilst the posterior part is enlarged. In all doubtful cases you should lay the patient on his face, and mark out the organ behind, as well as laterally and in front.

226. *a.* The area of hepatic dulness is diminished, especially over the smaller lobe; if the lower border can be distinguished, it feels rough and uneven. There is usually ascites, and the superficial veins of the abdomen are enlarged. The patient is dyspeptic, sallow, and much emaciated; hæmorrhages are apt to occur from the stomach and bowels.

The disease is *cirrhosis.*

In the early stages the size of the liver is often increased, and its uneven surface can be felt below the ribs, and even in the later stages the edge may project below the hypochondrium on account of the organ being fixed by adhesions; there are pain in the right hypochondrium, emaciation, feverishness, loss of appetite, flatulence, pain after food, and irregularity of the bowels; the urine is loaded with lithates. The disease occurs almost entirely amongst spirit-drinkers. The ascites arising from cirrhosis may be mistaken for that depending on tubercular or cancerous peritonitis. In cirrhosis you have a history of an habitual indulgence in ardent spirits, the urine is loaded with lithates, and the dulness in the region of the spleen is increased, none of which are generally present in the latter diseases. In cancerous peritonitis there are frequent attacks of pain, tenderness on pressure, rapid loss of strength and flesh, an early development of ascites, and tumours can be often felt in the abdomen.

227. There is a form of atrophy of the liver which sometimes follows the chronic congestion produced by diseased heart; and another variety results from chronic peritonitis. The symptoms in both are similar to those of cirrhosis, but there is no history of indulgence in ardent spirits.

228. In *hypertrophic cirrhosis* there is loss of flesh and strength, along with dyspepsia, but permanent jaundice is present, whilst ascites and hæmorrhage from the stomach and bowels are generally absent and it does not appear to have arisen from intemperance.

CHAPTER VII.

DISEASES OF THE MOUTH AND THROAT.

229. Oral Catarrh.—The mouth and gums are liable to inflammation, in which the mucous membrane is red, swollen, and tender on pressure, and pain and soreness are felt in chewing, or other motions of the tongue and lips. The saliva is not necessarily increased in quantity, and is not fœtid. The complaint is most common in childhood, but may occur at any age from atmospheric changes, irritation of the teeth, or after the application of hot or irritating liquids.

230. Thrush commences as small isolated spots of a white colour, like pieces of curdled milk, upon the mucous membrane of the mouth, lips, or tongue. They are easily removed, when the subjacent membrane appears to be red and inflamed. When viewed with the microscope, the material is seen to be composed of the spores of a cryptogamic plant (*Oidium albicans*). The complaint is most common in the early months of childhood, but occurs also in adults who have become enfeebled by any chronic malady, such as phthisis or cancer.

231. Aphthæ.—This complaint consists in the formation of small, flat, yellow-coloured ulcerations, which are chiefly situated at the junction of the gum and the mucous membrane reflected on the lower lip, but which also present themselves in different parts of the mouth. They seem to begin in ulceration of the mucous follicles. Microscopically, the spores of the *Oidium albicans* are absent. They are most common

in children, but also occur in persons who suffer from dyspepsia, or whose strength has been reduced by previous illness.

232. Aphthæ are distinguished from ulcerative stomatitis by the latter being situated along the edges of the gums, by the fœtor and by the increase in the quantity of the saliva.

233. Ulcerative Stomatitis.—This usually begins near the lower incisor teeth, but rapidly spreads from thence along the gums. The gums are covered with patches of ulceration, which have a greyish white exudation upon them; the saliva is greatly increased, and the breath fœtid. If the disease is not checked the teeth may become loosened and may fall out. It is chiefly a disease of childhood, but may occur as an epidemic amongst adults. Ulcerations of the lips, tongue, and cheeks, are very common in syphilis, in other cases they result from the use of mercury.

234. Noma.—This begins as a hard swelling in one cheek near the angle of the mouth, which is quickly followed by gangrene of the affected part and of the gums below it. If the patient survive long enough, necrosis of the jaw takes place, and the teeth fall out. There is seldom any pain or fever, but death seems to take place from exhaustion. It scarcely ever attacks healthy children, but usually those who have recently suffered from measles, scarlatina, or other depressing febrile disorders.

The fauces are very liable to inflammation. You will meet with it in catarrh, scarlatina, phthisis, and other diseases.

235. Tonsillitis, or inflammation of the tonsil, occurs both as an acute and chronic affection. In acute tonsillitis the gland is greatly swollen, and the neighbouring mucous membrane is of a bright red colour and covered with mucus. It generally terminates in abscess, which bursts into the throat.

Chronic inflammation of the tonsil is not attended

with suppuration, but the tonsils often remain permanently enlarged. Microscopically, they present a considerable quantity of fibrous tissue in addition to an increase in their normal glandular structure. The surface of the gland is often covered with small pits containing plugs of cheesy secretion.

Cancer occasionally affects the tonsils, forming a hard swelling firmly connected to the adjoining structures.

236. DIPHTHERIA is a contagious febrile complaint, in which the throat affection is secondary to a disease of the blood. The throat, especially the tonsils and soft palate, is coated with a thick, rough membrane of a dirty-white colour, that is quickly renewed if torn off. The mucous membrane below the exudation is of a dark red colour, and seems swollen, from the inflammation affecting the substance as well as the surface of the part. Microscopically, the false membrane is found to consist of cells only, closely united together. They are of different sizes, and are intimately connected with the surface of the mucous membrane on which they rest. An infiltration of newly formed cells generally occurs into the connective tissue immediately beneath the epithelium. This may be so abundant as to compress the blood-vessels, and to give rise to gangrene.

237. STRICTURE OF THE ŒSOPHAGUS is rare, excepting as the result of cancer or aortic aneurism. In some cases ulceration is caused by the patient swallowing a corrosive fluid; when the ulceration heals, a contraction takes place which produces the stricture. Occasionally, you will find a small cancerous tumour developed in the coats of the œsophagus, but this part is generally affected with the epithelial form of cancer. In epithelial cancer you meet with an elevated, warty tumour, of irregular shape, surrounding the tube, sometimes uniting the œsophagus to the spine, at other times ulcerating into the trachea or neighbouring organs.

SECTION I.

Diseases of the Throat and Œsophagus.

238. The diseases of the thyroid body usually come under the care of the surgeon, but there is one of great interest that you will meet with in the medical wards, which is termed *exophthalmic goitre*, or *Graves's*, or *Basedow's disease*.

The characteristic symptoms are an undue prominence of both eyeballs, enlargement of the thyroid body, palpitations of the heart, and an increase in the rapidity of the pulse (usually 90 to 120). The carotids pulsate with increased force, a thrill can be felt over the thyroid, and the stethoscope detects a murmur which is usually loudest at the edges of the swelling.

The disease is almost always chronic, and palpitation is usually the earliest symptom, the patient is sallow and anæmic, generally irritable, often sleepless; the temperature is slightly elevated (100° to 101°), and in the case of the female the catamenia are usually irregular or absent. The progress of the complaint is very slow, but the result is only occasionally fatal.

Graves's disease is much more common in the female than in the male, and occurs chiefly in the earlier part of middle life. In some fatal cases the cervical sympathetic has been found diseased, but in others no anatomical change could be discovered in the nervous system.

The chief symptoms that should induce you to suspect disease of the throat or œsophagus are pain or soreness of the throat, swelling of the glands below the jaw or in the neck, difficulty or pain in swallowing. You must examine the throat in all cases in which you suspect it to be affected, by depressing the tongue with a spoon or spatula, whilst your patient is sitting opposite a bright light.

239. *a.* You observe the mucous membrane of the throat of a red colour, with or without patches of ulceration; swallowing is painful and difficult. The tonsils are not greatly enlarged, but the uvula is elongated.

The disease is *inflammation of the throat.*

The general symptoms vary according to the cause producing the inflammation. Thus, it may have arisen from catarrh, from the application of irritating substances, or from constitutional diseases, such as diphtheria, scarlatina, measles, syphilis, phthisis, or gout. In eruptive fevers the state of the skin, and in diphtheria the presence of the false membrane, is sufficient to show the nature of the throat affection; syphilis is generally attended with ulcerations, round, deep, and with elevated edges, or they are superficial and irregular in shape; chronic inflammation of the back of the pharynx is a very common accompaniment of phthisis. An elongated uvula often keeps up a chronic cough.

240. *b.* One tonsil, or both, is of a deep red colour, greatly swollen, and tender on pressure, the uvula is enlarged, and the fauces are filled with mucus; there is great pain and difficulty in swallowing, and the patient speaks through his nose. The pulse is quick, the tongue foul, the skin hot, and the glands at the angle of the jaw are enlarged and tender.

The disease is *tonsillitis* (*quinsy*).

The amount of fever varies greatly in different cases, but it is usually severe, and is often preceded by chilliness or shivering; the temperature may be 104° or upwards; the disease often terminates in suppuration. Relief is obtained as soon as the abscess bursts, but the complaint is apt to recur from time to time. There is no fever with *chronic* enlargement of the tonsils, the glands project into the fauces and obstruct free respiration, and it is often accompanied by deafness.

241. *c.* You see the palate, fauces, or pharynx of a

vivid red colour, coated in parts with a thick greyish-white exudation, which, when peeled off, leaves the subjacent membrane red and bleeding, and is soon renewed. There are great depression of strength, a quick, small pulse, increased temperature of the skin, thirst, and loss of appetite.

The disease is *diphtheria.*

The disease is ushered in with fever, swelling of the submaxillary and cervical glands, soreness of the throat, difficulty of swallowing, and sometimes fœtor of the breath; it usually terminates in from eight to fourteen days. The false membrane may extend into the larynx and bronchial tubes, causing the symptoms of croup, or the complaint may attack the nostrils, producing great discharge of mucus or hæmorrhage; in other cases it is complicated with pneumonia. The urine is often albuminous, sometimes bloody. Diphtheria is most common in childhood. It is very contagious; the period of incubation is said to vary from a few hours to a week. Convalescence is commonly slow. Within three weeks after recovery diphtheria is sometimes followed by paralysis of the throat, face, eye, or limbs. You must be on your guard not to mistake the little patches of mucus that form on the throat and tonsils in inflammation of these parts for the false membrane characteristic of diphtheria. The former are soft and readily removed, and are not quickly renewed, as in the latter.

242. *d.* There is no apparent affection of the throat, but the patient is unable to swallow solid food, excepting in small morsels. A bougie passed down the œsophagus meets with an obstruction.

The disease is *stricture of the œsophagus.*

Stricture of the œsophagus generally comes on gradually, and is attended with great emaciation. The attempt to swallow produces pain, and usually the food is rejected immediately. Before introducing a bougie, be careful to ascertain that the symptoms are not produced by an aortic aneurism (58). In

cancer you will generally find a large quantity of mucus rejected with the food, the examination of which with the microscope may enable you to discover particles of cancerous growths.

243. Difficulty of swallowing may, however, arise from paralysis, hysteria, or dyspepsia, without any narrowing of the œsophagus; but the other symptoms of these diseases, and the ease with which the bougie can be passed, will prevent mistakes. In hysteria the symptoms come on suddenly, recur from time to time, and are generally connected with some uterine disorder.

CHAPTER VII.

DISEASES OF THE STOMACH.

The principal diseases of the stomach are—congestion, acute, sub-acute, and chronic gastritis, ulceration, dilatation, cancer, and fatty and lardaceous changes.

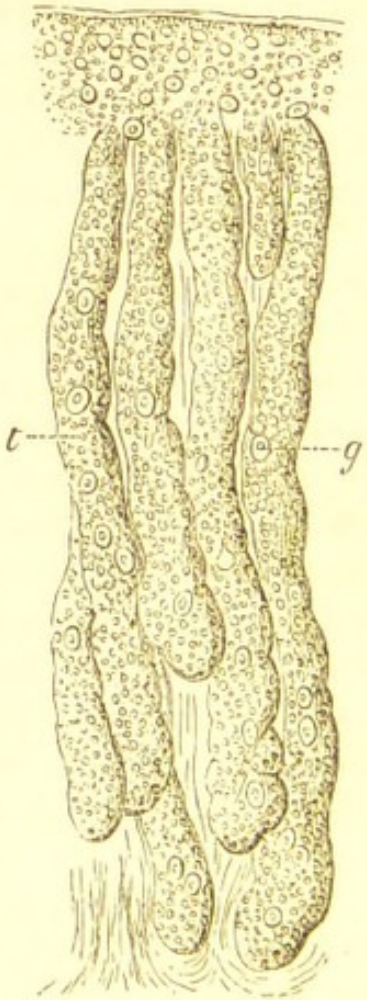
244. If digestion has been in progress at the time of death, the mucous membrane will be found partially or wholly dissolved by the gastric juice. You must be careful not to mistake the changes thus produced for those of disease. When post-mortem solution has taken place, the mucous membrane is smooth, very thin, more translucent than usual, softened, or so entirely dissolved that the subjacent muscular coat is left bare, the veins are filled with black blood, and their contents can easily be squeezed out. The splenic region is most commonly affected, and a well-defined line often shows the height to which the digestive fluids have reached. Sometimes only the summits of the rugæ are softened, but in other cases the whole of the coats are dissolved, and the contents of the stomach may be found in the peritoneal cavity, or even in the pleura. The extreme degrees of softening are most common in children, in persons dying of brain diseases, or in those in whom death has taken place whilst digestion was in progress.

You must remember that the mucous membrane of the stomach is almost entirely composed of glands of a tubular form. From the loose manner in which these are united together, the first appearances of disease can be readily distinguished, and you have,

therefore, in the stomach, a favourable opportunity of studying morbid changes as they affect glandular structures in general.

245. Congestion of the Stomach.—The mucous membrane is covered with a tenacious layer of mucus, it is thickened and of a deep red, almost purple colour;

Fig. 74.



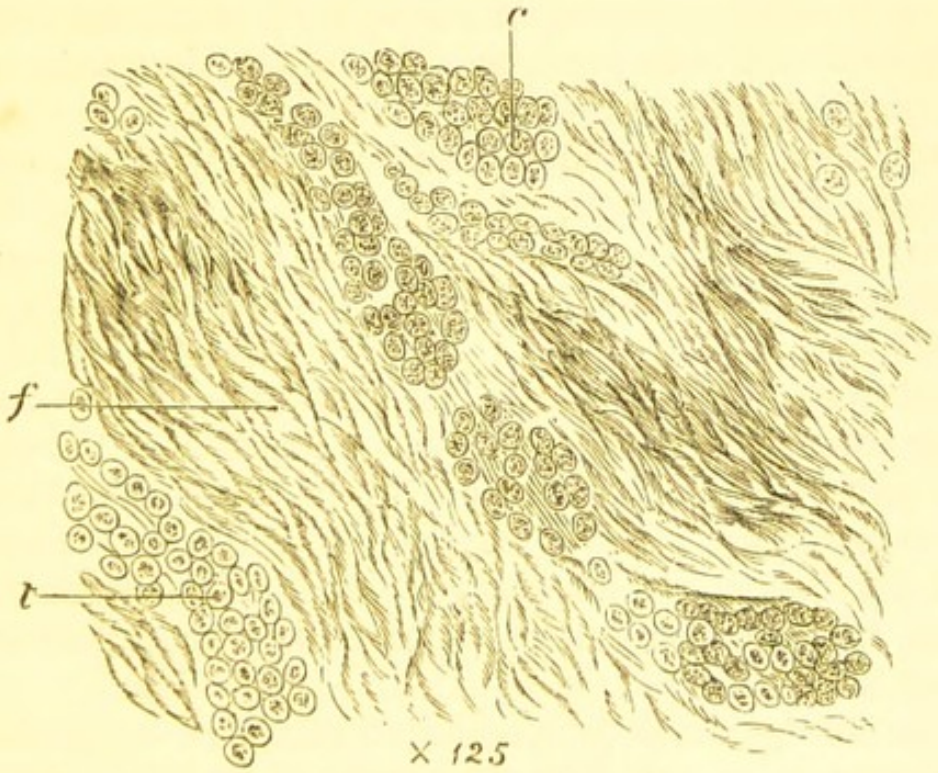
Showing the microscopical appearances of a section of the stomach in sub-acute gastritis (in a case of scarlatina). *t*. Gastric tubes much distended with cells, fatty and granular matters. *g*. Gastric cells are seen here and there, but most of them are concealed from view by the material that has been effused by the inflammation.

its rugæ are very prominent, and the vessels seem enlarged and full of blood. Small, round, dark-coloured spots present themselves, chiefly in the

pyloric region. Microscopically, the vessels are much congested, the coats of the veins often thickened, but the contents of the tubes are composed only of gastric cells.

The effect of congestion is to lessen the amount of gastric juice secreted, and thus to impair digestion. It is generally the consequence of some obstruction to the escape of the venous blood from the stomach, produced by disease of the heart, liver, or lungs.

FIG. 75.



The microscopical appearances of a section of the stomach in chronic gastritis. *t.* Gastric tubes drawn from their normal positions and altered in shape. *f.* Fibrous tissue between and below the tubes. *c.* Cells of the gastric tubes.

246. SUB-ACUTE GASTRITIS, or sub-acute inflammation of the mucous membrane of the stomach, is much more common than *acute gastritis*, which is rarely met with, excepting as the result of irritant poisons. In *sub-acute gastritis* the stomach is small and contracted, the morbid appearances are those of congestion, often attended by superficial ulcerations. Microscopically, the blood-vessels are injected, the gastric

tubes are filled with cells, granular and fatty matters, and in some cases with blood. The disease is often met with in persons affected with anæmia, disease of the kidneys, heart, or uterus, and is almost always found in those who have died of scarlatina, measles, or other eruptive diseases (see fig. 74).

You will remark that the morbid changes are analogous to those that occur in the kidney in tubular nephritis (see fig. 45).

247. CHRONIC GASTRITIS occurs under different forms. When present in an extreme degree the whole organ is small, globular in shape, very much thickened, and does not collapse when cut open; but this kind of thickening is usually limited to the pyloric region. When the mucous membrane is alone affected with chronic inflammation, it is of a slate, grey, or dark colour, uneven on the surface, as if warty ("*mammillated*"), thickened, and dense. Microscopically, the gastric tubes are at first firmly united together, the blood-vessels are enlarged and often thickened; at a later stage the tubes are replaced by fibroid tissue, or are only represented by irregular lines of cells (see fig. 75). The solitary glands are generally enlarged and filled with nuclei and cells, and the gastric tubes seem frequently to be atrophied by the pressure of these bodies.

Chronic gastritis is a common result of long-standing congestion, and is therefore a frequent accompaniment of diseases of the liver and heart; it is also generally present in those who have been in the habit of indulging to excess in ardent spirits. In the growth of connective tissue between the gland structures and the atrophy of the secreting tubes by the subsequent contraction of the newly formed fibres, we have a morbid process analogous to what occurs in the kidney in intertubular nephritis (fig. 45), and in the liver in cirrhosis (see fig. 66).

248. ULCERATION OF THE STOMACH presents itself under different forms. 1. As *superficial erosions*,

resulting from the ulceration of the round, dark spots that so often accompany congestion and sub-acute gastritis. 2. The *perforating ulcer*. You meet with one or several circular ulcers penetrating the coats of the stomach. Their edges are as sharp as if they had been punched out and the circumference of the sore decreases as it proceeds outwards, so that if it has passed through the peritoneum, the perforation of that membrane may be a mere pinhole or chink. This kind of ulcer is chiefly met with in young persons, and may give rise to fatal peritonitis by perforation. 3. The *chronic gastric ulcer*. In this the edges are raised, and the surrounding structures are hard and condensed, the surface is formed by the coats that are not perforated, or by some other organ, such as the liver or pancreas, to which adhesions have extended. It varies greatly in size, and is most common in the smaller curvature near the pylorus. 4. *Sloughing ulcers* are occasionally found in persons much reduced by syphilis, or diseased kidneys, who may have during life presented no symptoms of gastric affection.

Ulcers of the stomach may heal, and, if of large size, their cicatrices may contract and greatly distort the shape of the organ, and thus give rise to dilatation. They may produce death by exhaustion, by hæmorrhage caused by the ulceration of a large blood-vessel, or by peritonitis set up by perforation of the peritoneum.

249. Fatty Degeneration of the Stomach is a common affection; the mucous membrane is pale, soft, and easily torn. Microscopically, the gastric tubes are filled with large, fatty, and granular gastric cells; the basement membrane is thin and very transparent; at a later stage the whole structure seems to be composed of fat. This condition often accompanies cancer, phthisis, and other wasting disorders.

250. Lardaceous Disease of the Stomach is usually associated with a similar state of the liver,

spleen, and kidneys. It is recognized by the brownish-red tint given to the tissues by a weak solution of iodine. The smaller arteries are generally thickened, and are the parts chiefly affected.

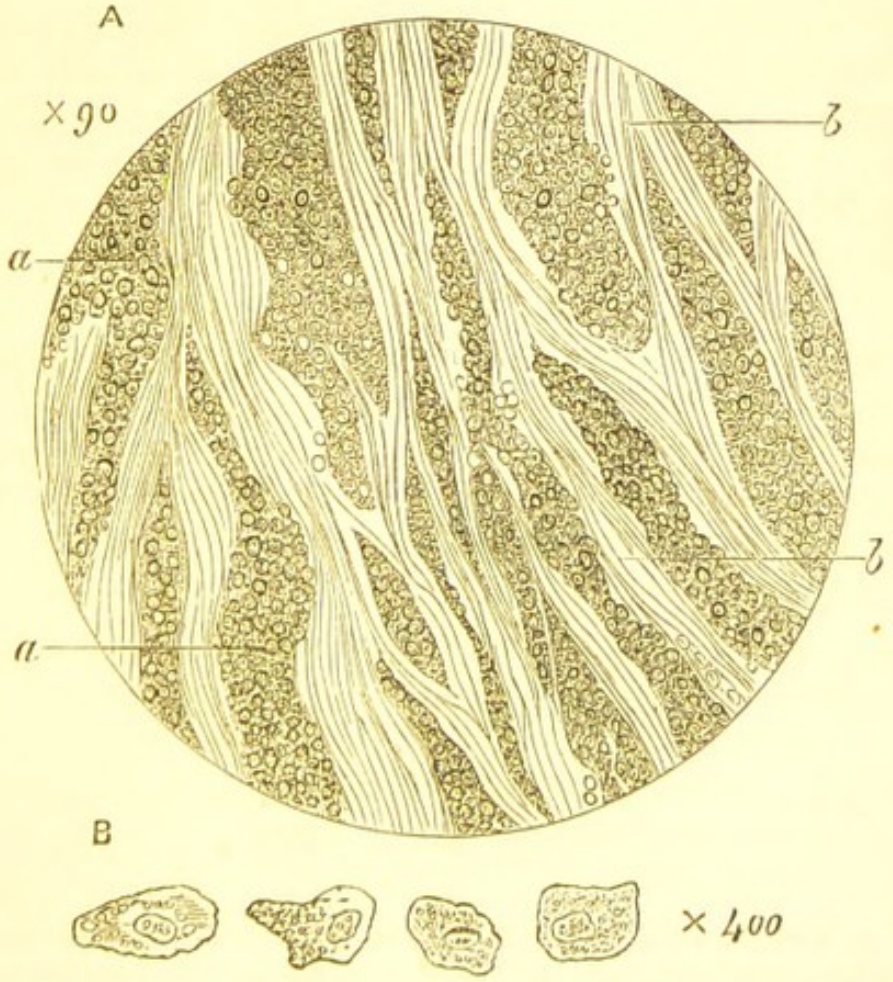
251. In DILATATION OF THE STOMACH the organ is greatly enlarged, sometimes so much so as to fill the whole abdominal cavity (fig. 82); its coats are thin, and, when examined with the microscope, the gastric tubes are often found widely separated from each other, and in a state of fatty degeneration. Dilatation is usually produced by a narrowing of the pylorus or duodenum, which prevents the free evacuation of the contents of the organ. This may arise from fibroid or muscular thickening of the part, from the cicatrix of an ulcer, from enlarged glands or other tumours compressing the orifice of the stomach.

252. The stomach is a frequent seat of CANCER, and as its structure affords a very favourable opportunity for investigating the mode of growth of cancerous tumours, it will be advisable here to describe their microscopical characters. Microscopically, all cancers agree in presenting cells of various shapes and sizes, having large and distinct nuclei, often nucleoli. The cells are of the epithelial type, and are grouped together *without any intervening structure between them.* It is this absence of fibres or other material between the individual cells that serves to distinguish cancer from many other forms of tumours. The cancer cells are contained in hollow spaces formed by connective tissue, which spaces communicate freely with each other. Blood-vessels are contained in the connective tissue, but do not penetrate amongst the cells. All cancers are malignant—that is, they implicate the neighbouring structures, usually recur after extirpation, have a tendency to affect lymphatic glands, and give rise to structures similar to themselves in other organs of the body. Other tumours of a different structure may present the characters of malignancy, so that the mere recurrence of disease after a surgical operation does

not prove it to have been cancer. Cancers are usually divided into four principal groups:—

253. *Scirrhus* forms a dense, hard tumour, which presents on section a fibrous, glistening surface. Microscopically, the cells are of various shapes and sizes, and are included in hollow spaces formed by thick connective tissue. In the earlier stage the cells are abundant, but afterwards they undergo fatty degene-

FIG. 76.

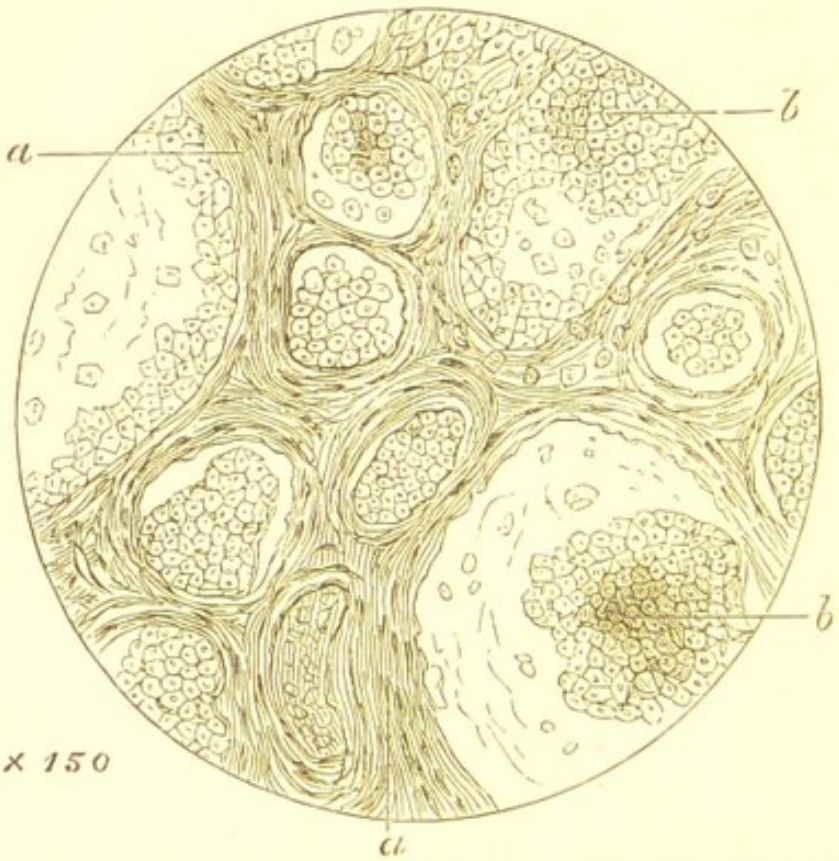


A section of a scirrhus cancer of the breast, as seen under the microscope. A—*a*. Cells enclosed by the bands of firm connective tissue, *b*. B. The individual cells showing the variety of shapes they present.

ration, so that eventually the structure seems to consist chiefly of hard, thick bands of fibrous tissue. The favourite seats of this form of cancer are the breast, stomach, and liver (see fig. 76).

254. *Encephaloid, Medullary, or Soft Cancer.*—This forms a soft tumour, not unfrequently presenting the appearance of the human brain on section; it grows much more rapidly than scirrhus. Microscopically, nucleated cells of various shapes and sizes form the greater portion of the morbid growth, and the hollow spaces enclosing them are composed of fewer and thinner fibres than in scirrhus. Blood-vessels are often very abundant. This form

FIG. 77.



A section of an encephaloid cancer (of a bone) as seen under the microscope. *a*. Connective tissue fibres enclosing masses of nucleated cells, *b*. Spindle-shaped cells will be observed at *a*, intermixed with the fine fibres.

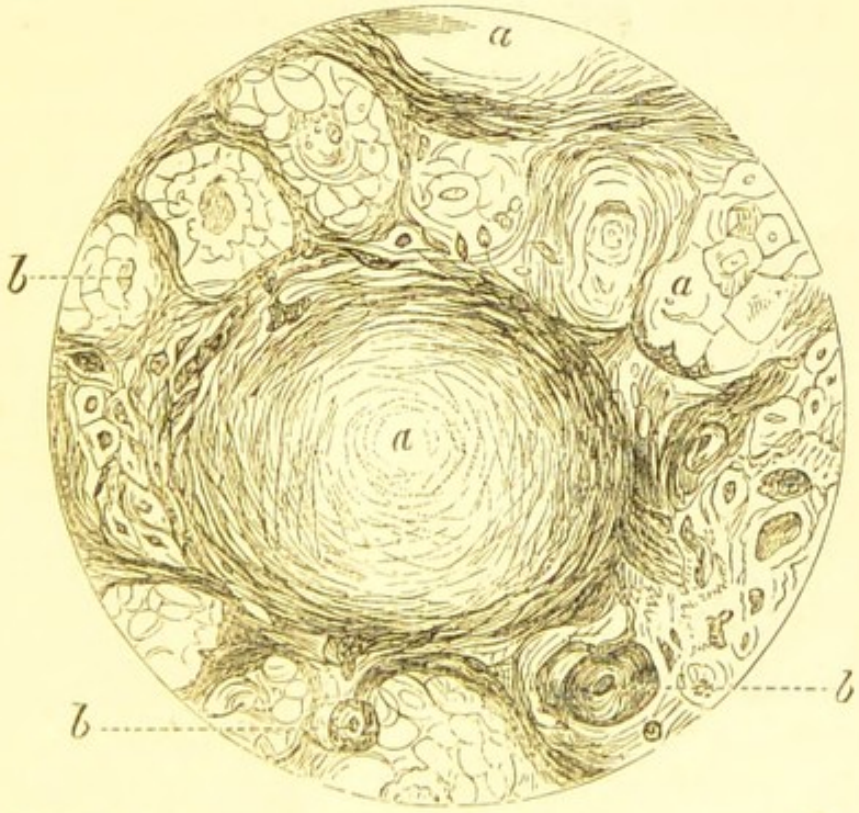
of cancer is very malignant, and occurs in the testis, ovary, breast, stomach, and many other organs (see fig. 77).

255. *Colloid Cancer* usually commences in the serous membrane; it exhibits numerous cavities filled with a gelatinous material. Microscopically, the cavities

enclose nucleated cells, which contain and are also intermixed with the gelatinous matter. Some pathologists look upon this as originating in one of the previously described varieties of cancer, in which colloid degeneration has occurred (see fig. 78).

256. *Epithelial Cancer, or Epithelioma*, always occurs near a mucous or cutaneous surface. It at first forms a small hard tumour, which subsequently ulcerates.

FIG. 78.

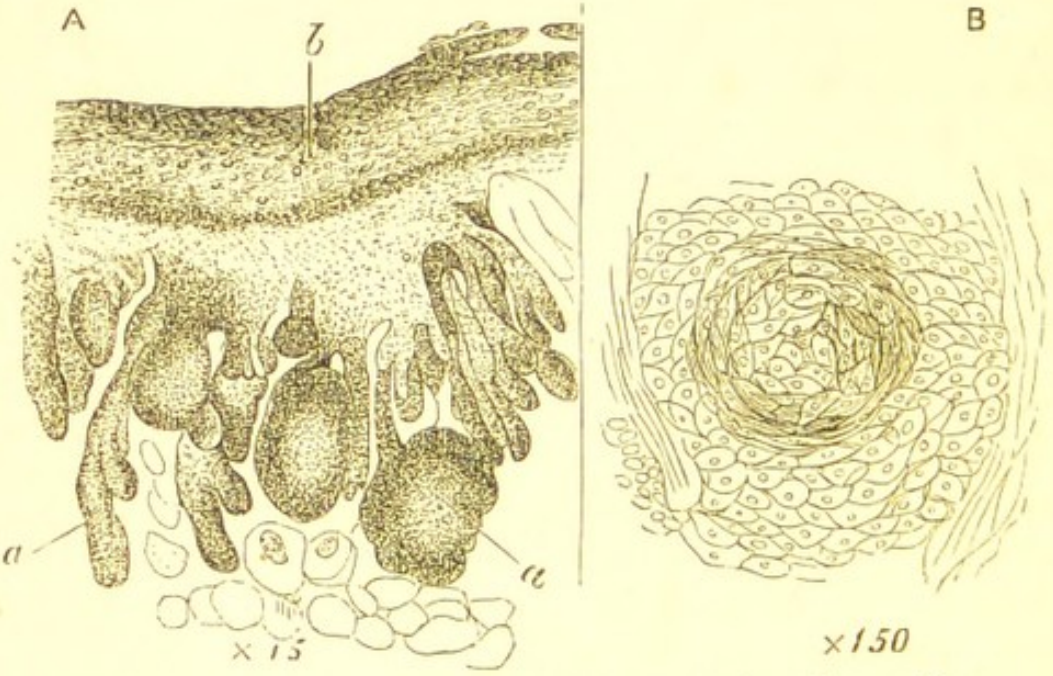


Shows the appearance presented by a section of colloid cancer under the microscope. *a*. A large alveolus. *b*. Smaller alveoli enclosing nucleated cells. (The engraver has expressed the fibres at *a* far too strongly.)

Microscopically, a section shows a number of nests of cells, in which the outer cells are flattened in a circular form, the inner being round or oval. Fig. 79 shows the disease commencing in the sebaceous glands, from which masses of cells have sprouted in different directions, the appearance of the nest of cells being produced by a cross section of these masses projected laterally.

257. Cancer of the Stomach is most commonly met with at the pyloric or cardiac orifice, or at the lesser curvature. *Scirrhus* is most common at the pylorus. It forms a hard tumour, like cartilage, encircling and constricting the opening into the duodenum. When a section is made, the mucous membrane is generally found to be ulcerated, the tumour presents a fibrous appearance, traversed by bands; the ulcer has hard, round, projecting edges and an uneven surface. *Medullary cancer* is most frequent at the cardiac orifice, where it forms a soft, fungoid, vascular tumour.

Fig. 79.



Shows the appearance presented by a section of an epithelial cancer (of the penis) under the microscope. A. General view of the section under a low power. *a*. Sebaceous glands greatly enlarged, and distorted by the outgrowth of the cancer cells. *b*. The surface of the cancer. B. A more highly magnified representation of one of the nests of cells as seen on the section of the enlarged sebaceous gland *a*, in the figure A.

You not unfrequently meet with two of these forms of malignant disease associated together: thus a tumour may be scirrhus with a medullary projection. Cancer of the stomach is very liable to affect the neighbouring glands, the liver, pancreas, and peri-

toneum. Adhesions are usually formed to the surrounding structures, even when the cancer has not extended to them. When the cardiac orifice is obstructed the stomach is reduced in size, on account of the small amount of food that enters it. When the pylorus is constricted the whole organ enlarges, from the food being retained for a length of time.

The stomach sympathizes with almost every organ, and you will consequently find it frequently in an abnormal condition. The symptoms that should direct your attention to it are—pains or uneasiness in the epigastrium or in the left or right hypochondrium, loss of appetite, nausea, vomiting, waterbrash, eructations, or excessive flatulence.

258. The tongue affords most valuable indications of the condition of the gastro-intestinal tract, and also of the system at large. The chief points of which you must take notice are its size and colour, whether it is moist or dry, and the amount of epithelium or "coating" covering it. It is large, flabby, or indented with the teeth at its sides, in persons suffering from general debility, and in many chronic affections of digestion; in cases of sub-acute gastritis it is often small and sharp at its extremity. Paleness is associated with general anæmia; redness of its surface, tip, edges, or papillæ usually accompanies sub-acute or chronic gastritis. When the tongue is covered with a thick fur, there is generally a similar condition of the mucous membrane of the stomach; where, as in scarlatina, it looks raw, the other parts of the gastro-intestinal tract are also affected. Always remember, however, that the abnormal appearances of the tongue may be produced by local causes, such as inflammation of the throat or gums, or by the habit of sleeping with the mouth open. In cancer and ulcer of the stomach the tongue seldom presents any characteristic appearances.

259. You may employ the following means of phy-

sical diagnosis to ascertain the state of the stomach :— palpation, percussion, auscultatory-percussion, and the microscopic examination of vomited matters, stools, and urine.

260. You make pressure in order to find if there is any tenderness in the region of the stomach ; the sense of touch is employed to discover if a tumour is present. Tenderness is best ascertained by pressure with the tip of the finger successively applied to each portion of the epigastrium. Often the patient, especially if a female, will shrink from nervousness when the whole hand is applied to the region of the stomach ; in such cases conduct your examination whilst her attention is diverted by conversation. A tumour is most readily felt when the patient lies upon the back, with the head and knees well raised. Always observe the shape and consistence of a tumour, whether it is fixed or movable, if it is tender to the touch, and if it pulsates.

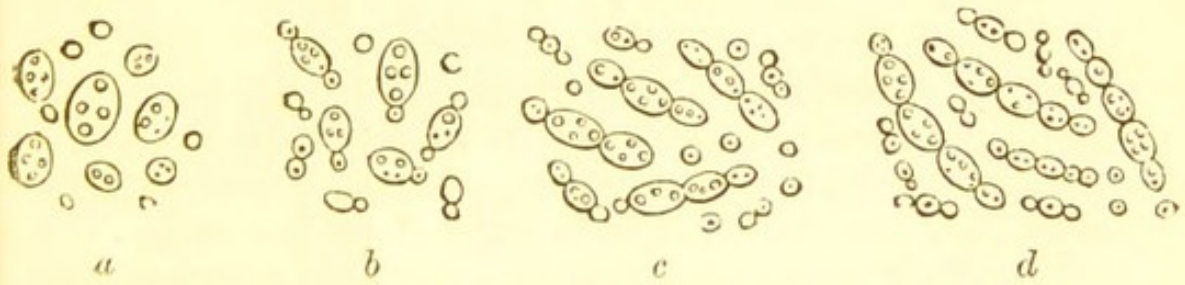
261. In estimating the size of the stomach, first percuss the lower edge of the liver and the right side of the spleen. The clear sound of the stomach is heard between these organs ; it is distinguished from the colon by the clearer character of the sound elicited by percussion. Auscultatory-percussion of the middle and pyloric regions is practised by placing the patient on his left side, and applying the stethoscope to a spot in the epigastrium, where you have previously ascertained by percussion that a clear sound exists ; you then mark with a pen the point at which the impulse of the stroke of the finger ceases to be conveyed to the ear with equal force ; next let the patient turn to the opposite side, and in a similar manner mark out the larger end of the stomach. In all doubtful cases examine both when the organ is full and empty ; and you will often find it an advantage to have the bowels previously emptied by a purgative or an enema.

262. You examine vomited matters with the microscope for the purpose of detecting fungi, or any casts

or portions of mucous membrane that may have been thrown off from the surface of the stomach. In the former case, remove a small quantity of the vomited matters with a dipping-tube, place it on a slide or in a shallow cell, and add a drop of a weak solution of iodine. The iodine makes any starch that may be present of a blue colour, whilst it turns fungi brown. The principal forms of fungi you will meet with are torulæ and sarcinæ.

263. Torulæ appear like round or oval vesicles, many of which present little buds projecting from them, or in a later stage of development they unite

FIG. 80.



Torula Cerevisiæ, or Yeast-plant, as developed during the process of fermentation: *a*, *b*, *c*, *d*, successive stages of cell-multiplication. (CARPENTER.)

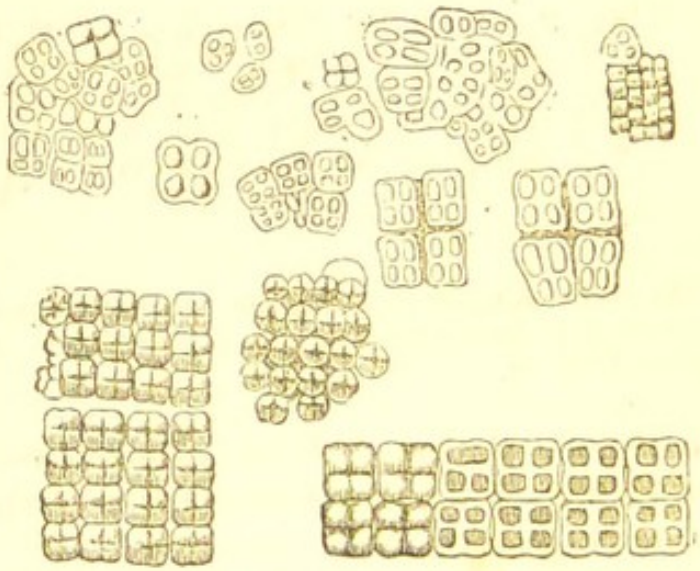
so as to form chains. They appear very rapidly whenever fermentation has taken place in the contents of the stomach (see fig. 80).

264. Sarcinæ are oblong or square bodies, divided into a number of cells of equal size by lines crossing each other at right angles; they are most frequently found in cases of obstruction of the pylorus or duodenum, but they may be present whenever the food is frequently retained in the stomach for an unusually long period (see fig. 81).

265. You can only distinguish casts or pieces of mucous membrane when the fluids vomited are clear and free from food. Place the liquid in a conical-shaped glass, remove any particles that may subside with a dipping-tube, and examine them in a shallow glass cell. "Casts" are of the shape of the pits on

the surface of the stomach, or of the gastric tubes; two or three are often joined together. You may mistake for them the sarcolemma of digested muscular fibres, but the latter are distinguished by their being transparent and often containing a few globules of fat. Particles of mucous membrane detached by ulceration are usually stained with blood, and exhibit the characteristic openings of the gastric tubes. You may mistake particles of bread, which also present little cavities, for them, but the holes are irregular in size and shape, and on crushing them it will be seen that they are not of animal origin.

FIG. 81.



Sarcina ventriculi. (CARPENTER.)

266. The examination of the urine in cases of disorders of the digestion is very important; for instance, in diabetes the patient frequently complains more of disordered digestion than of an increase in the amount of the urine. Ascertain if there is any albumen, take the specific gravity, and note if there is any deposit, and if so, what is its nature (182).

267. The appearance of the stools often supplies important evidence of abnormal states of the digestion. Sometimes the imperfect solution of the albuminous materials of the food is shown by lumps of undis-

solved muscular fibres; at other times (chiefly in children) the evacuations consist of masses of unaltered starch, the nature of which is easily recognised by the addition of a weak solution of iodine. A pitchy appearance of the motions, proving the presence of blood, often assists in the diagnosis of gastric ulceration and cancer.

Commence your inquiries by ascertaining whether the complaint has commenced suddenly, or gradually: if suddenly, begin at (268); if gradually, pass on to (272).

SECTION I.

Acute Diseases of the Stomach.

268. Under this head you have only bilious vomiting and sub-acute gastritis. Both of these affections are usually accompanied by vomiting; but as this symptom is also often present in diseases of the brain, you will frequently find it difficult to determine which organ is in fault. Remember that in gastric vomiting there is generally some tenderness of the epigastrium, nausea, or a sense of weight at the stomach; none of which occur in head attacks. In disorders of the digestion the tongue is foul, and the bowels sometimes purged; in those of the brain the tongue is generally clean, and the bowels obstinately confined; in the former, the headache is less persistent and intense, and giddiness, if present, is relieved by vomiting; in the latter, various other symptoms, such as indistinctness of vision, loss of memory, convulsions, &c., are apt to supervene. When you suspect a disease of the brain, never neglect to examine the optic disc with the ophthalmoscope.

269. *a.* The patient is subject to attacks of vomiting of bile, mucus, or acid, which are accompanied by headache, a foul tongue, loss of appetite, thirst, confined bowels; the urine is scanty and loaded with

lithates, the pulse is seldom quickened, and the heat of the skin is not increased.

The disease is a *bilious attack.*

The illness is often preceded by drowsiness and the frequent passing of pale urine. In the intervals between the attacks there are generally symptoms of chronic gastritis or atonic dyspepsia. The attacks may be only occasional, and may result from some error in diet, or they may occur frequently without apparent cause; in females they are not uncommon at the catamenial periods. If the vomiting should last longer than twenty-four hours, examine the fluids rejected from the stomach for torulæ, the presence of which in some cases keeps up the irritation of the mucous membrane.

270. *b.* The patient suffers from *constant* vomiting, pain, or uneasiness, and also tenderness at the epigastrium; the tongue is red or coated; complete loss of appetite, with thirst, is also present. The pulse is quick and feeble, and there is great depression of strength.

The disease is *sub-acute gastritis.*

The fluid vomited is composed chiefly of ropy tenacious mucus, often streaked with blood; in some cases casts of the gastric tubes or even particles of the mucous membrane can be recognised with the microscope. The severe forms occur most frequently in persons who have long suffered from diseases of the heart, kidneys, liver, or uterus, and often end fatally. A less dangerous variety occurs in rheumatism, gout, and in young females in whom the catamenial functions are disordered. Sub-acute gastritis may persist for many months, especially in young persons, and vomiting of food is in such cases the most prominent symptom.

271. Always examine the state of the heart when the above symptoms are present, for pericarditis may exist without any other signs than pain and tenderness of the epigastrium and vomiting. You dis-

tinguish sub-acute gastritis from a bilious attack by the persistence of the symptoms, the absence of severe headache, and the presence of thirst and quickness of the pulse in the former complaint; in bilious attacks the patient has probably suffered previously in a similar manner, or is able to trace his illness to some indiscretion in diet. Long-continued vomiting, without sufficient cause to account for it, may suggest to your mind the possibility that it arises from the exhibition of some poison: in such a case, ascertain if the vomiting occurs shortly after taking food or medicine, and carefully examine what is rejected from the stomach.

SECTION II.

Chronic Disorders of the Stomach.

Ascertain if there is pain in the region of the stomach, commencing or aggravated shortly after food, and if there is tenderness of the epigastrium. If neither of these symptoms is present, begin at (272); if they are present, pass on to (274). If the stomach is found by percussion to be much enlarged, pass on to (280).

A. Pain is either absent, or, if present, it does not commence, nor is it aggravated, shortly after food, and there is no epigastric tenderness.

Under this head you have atonic dyspepsia and gastric neuralgia.

272. *a.* The patient complains of weight, tightness, or a feeling of discomfort during digestion. The tongue is large, flabby, or indented at the sides, often slightly furred; bad appetite, flatulence, eructations, coldness of the extremities, depression of spirits, feeble pulse and confined bowels are also present.

The complaint is *atonic dyspepsia.*

The pain is seldom severe; it may be caused by flatulence, and relief is obtained when air escapes from the stomach; or it may take place when the

stomach is nearly empty, and is then relieved by food and stimulants; or it precedes the rejection of a thin tasteless fluid (*pyrosis*). There is frequently great nervousness, irresolution, or mental depression. The urine often deposits oxalates or triple phosphates. The complaint is common in the old, and in feeble persons, and is often caused by insufficient food, anæmia, leucorrhœa, the excessive use of tea, and other causes tending to produce debility.

273. *b. Gastric Neuralgia*, unaccompanied by an organic affection of the stomach, is a comparatively rare disease. It usually presents itself in anæmic persons, or in those affected with uterine or ovarian diseases, or who have suffered from gout, ague, or neuralgia in other parts of the body, or have been exhausted by intellectual efforts or distress of mind. The pain is usually very severe and periodical, relieved by food, and not increased by pressure. The diagnosis is mainly determined by the absence of any great loss of flesh or strength, by the pain being relieved rather than aggravated by food or by pressure, by the digestion being good in the intervals of the attacks, by a history of neuralgia in other parts, of gout or ague, and by our inability to discover any other cause to which it can be attributed.

B. Pain is increased shortly after food, and there is tenderness on pressure in the epigastrium.

You may have under this head, chronic gastritis, ulceration, and cancer.

274. *a.* You find a dull pain or oppression shortly after food, sometimes vomiting of acid or mucus. The tongue is coated, and indented with the teeth, or red at the tip or edges. The patient is liable to acid eructations or heartburn, flatulence, thirst, burning of the hands or feet. The bowels are usually confined, the urine is high coloured, and deposits lithates, lithic acid, or oxalate of lime.

The disease is *chronic gastritis.*

The symptoms vary greatly in degree. In some

cases the pain is severe, in others scarcely felt; sometimes there is considerable tenderness, occasionally but little. In all probability, where the pain and tenderness are slight, but the tongue is foul, and the thirst, acidity, and flatulence are well marked, the complaint is rather congestion than inflammation of the mucous membrane. You must remember that when the patient recovers from gastritis the stomach still remains for a time incapable of efficiently performing its functions, and thus many cases are followed by atonic dyspepsia. Chronic gastritis usually accompanies affections of the heart, liver, and kidneys, and is almost always present in drunkards. It often occurs in consumption, and may distract your attention from the real source of danger. Whenever, therefore, you find an obstinate case, attended with much loss of flesh, you must carefully examine into the condition of the lungs.

275. The chief difficulty in diagnosis is to distinguish between chronic gastritis and atonic dyspepsia. In chronic gastritis the uneasiness after food is more severe than in atonic dyspepsia, the epigastrium is tender, the pulse often quickened, slight feverishness is felt, especially towards night, the tongue is foul, and the urine often deposits lithic acid. In atonic dyspepsia there is no tenderness, the pulse is soft and feeble, the feet are cold, the tongue flabby, not much furred, and the urine often deposits oxalate of lime or phosphates.

276. *b.* There are fixed and severe, sharp or cutting pains localized in the epigastrium, back or hypochondrium, commencing or aggravated very shortly after food, also tenderness on pressure of the epigastrium, and vomiting of food with relief to the pain. Blood is sometimes rejected from the stomach, or the stools are of a pitchy character. The patient is emaciated, the pulse feeble, the skin cool, the bowels usually confined.

The disease is probably *ulceration of the stomach.*

In the early stage the pain is only a feeling of tightness after food, but it increases gradually until it becomes a severe wearing or burning sensation. It is sometimes relieved by position; thus, lying on the back gives relief if the ulcer is on the anterior part of the stomach, or leaning over a chair alleviates the suffering produced by one on the posterior surface. Vomiting is sometimes absent during the whole course of the disease. Vomiting of blood (*Hæmatemesis*) occurs in diseases of the heart and liver; but if it takes place where these are absent, and is accompanied by the other symptoms of ulceration, it renders the diagnosis almost certain. Ulceration rarely occurs below ten years of age, but is frequent in females between eighteen and twenty-five. In old or middle age, its duration is generally long, and the indications are well marked, but the symptoms may for a time disappear. It may destroy life by exhaustion, hæmorrhage, or perforation and consequent peritonitis. If the ulcer heals, it may produce contraction of the pylorus and dilatation of the stomach.

277. *Hæmatemesis* is generally preceded by nausea, sinking, and uneasiness at the pit of the stomach, and is accompanied by a feeble pulse, paleness of the face, sighing, and other signs of faintness. It is sometimes difficult to determine whether the blood has come from the lungs or stomach; in the former case it is bright and frothy, in the latter dark, clotted, often acid; in hæmoptysis the attack is preceded by cough and expectoration, and is followed for some days by the expectoration of blood and mucus; hæmatemesis is preceded by pain in the stomach or indigestion, and is followed by dark, pitchy stools, which prove that the blood has passed from the stomach through the intestines.

278. When perforation of the stomach or intestines takes place, the patient is suddenly seized with agonizing pain in the bowels, attended with great prostration of strength, faintness, nausea, or vomiting.

These symptoms are quickly followed by the extension of pain over the whole abdomen, distension and intense tenderness of the abdomen, and by collapse indicated by shrunken features, coldness of the skin, and a rapid, feeble pulse.

279. *c.* There are severe lancinating pains and tenderness in the epigastric or hypochondriac region, often confined to a circumscribed spot. A hardness or tumour can be detected, which is tender on pressure; there is vomiting of fluid, often having the appearance of "coffee grounds," which does not relieve the pain. The patient is feeble and sallow, the appetite is bad, and the emaciation is both marked and progressive.

The disease is *cancer of the stomach.*

The patient seldom lives more than twelve or eighteen months from the commencement of the disease. It occurs chiefly in males and elderly persons; the liver is often secondarily affected, and jaundice takes place. Not unfrequently the complaint is ushered in by waterbrash. The orifices of the stomach are more generally affected than the other portions. If the cardiac opening is attacked, the food seems to stick behind the sternum, and is almost immediately returned; if the pylorus is the seat of the disease, you have pain occurring some time after food, and the stomach is liable to become dilated.

The chief difficulty in diagnosis is between cancer and simple ulcer of the stomach. To distinguish between them, remember that cancer is often hereditary, and seldom occurs below forty years of age, it runs its course rapidly, the pain is more severe, neuralgic, less influenced by food and less relieved by vomiting than in simple ulcer, and the blood when vomited is smaller in quantity and of darker colour. Above all, no tumour can be discovered in simple ulcer of the stomach, whilst the sallowness of the skin and emaciation are strongly marked in cancer. In the later stages of cancer the breath is sometimes fœtid. You

may, however, have cancer of the stomach, *unattended by either pain or vomiting*, but the patient rapidly wastes in strength and flesh, is of a sallow, unhealthy colour, loses all appetite, and is subject to the symptoms of atonic dyspepsia.

C. The stomach is much increased in size.

FIG. 82.

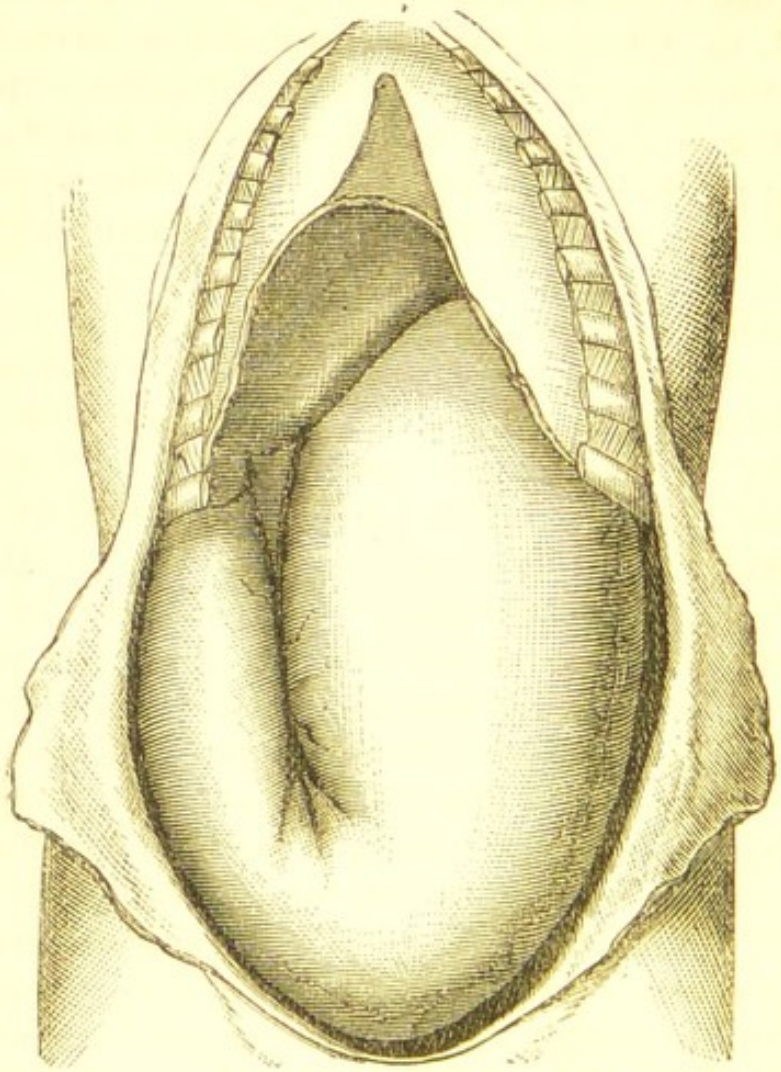


Diagram of a dilated stomach. (HILTON FAGGE.)

280. *a.* The stomach is found by percussion to be much increased in size, the patient complains of a burning pain and of vomiting large quantities of sour, frothy, dark-coloured fluid, along with mucus, in which the microscope detects torulæ and sarcinæ; he is thin, pale, feeble, and emaciated.

The disease is *stricture of the pylorus.*

The stricture may arise from fibroid or muscular thickening, cancer, or a cicatrized ulcer of the pylorus or duodenum; consequently the history of the case varies, but by the previous symptoms you will generally be able to determine the cause of the obstruction. The vomiting does not occur, as in ulcer and cancer of the stomach, shortly after food, but usually takes place only once or twice a day, or it may be absent for many days, when *a large quantity* of frothy, fermenting, sour liquid is rejected, containing sarcinæ and torulæ (figs. 80 and 81). It is usually a very chronic disease, and in some cases can be traced to blows or other injuries to the epigastrium. The abdomen is generally much distended, the superficial veins are enlarged, and in some cases the movements of the dilated stomach can be seen through the abdominal walls. The thickened pylorus can be occasionally distinguished as a hard tumour, but this is not necessarily situated in the epigastrium, for it may be displaced by the weight of the enlarged stomach, and may present itself even in the hypogastric or inguinal region. A few cases have been recorded in which dilatation of the stomach took place suddenly. The symptoms and physical signs were similar to those observed in chronic dilatation (fig. 82).

CHAPTER IX.

DISEASES OF THE PERITONEUM AND INTESTINES.

The most frequent diseases of these parts are—peritonitis, enteritis, typhlitis, inflammation and ulceration of the small intestines, intussusception and strangulation of the intestines, stricture, dysentery, malignant and tubercular disease.

281. In Acute Peritonitis, or inflammation of the peritoneum, the serous membrane is opaque, reddened, and softened; the intestines are more or less adherent and covered with lymph; the abdominal cavity contains a turbid fluid or pus, which when it is small in quantity chiefly occupies the hypogastric and lumbar regions. Purulent exudation is most commonly met with in pyæmic and puerperal cases.

In Chronic Peritonitis the whole of the abdominal viscera may be matted together by adhesions, and pus may be collected between the coils of the intestines, or the inflammation may have been local, and some organ may have been attached to the abdominal walls or to the adjoining parts. Microscopically, the same appearances are presented as in inflammation of the other serous membranes.

The first effect of peritonitis is to set up fever; the muscular coat becomes paralysed, the intestines are consequently distended with gas, the diaphragm is pushed upwards and the breathing impeded. In case of recovery, the adhesions may form loops in which a coil of intestine may become entangled and strangulated. *Acute peritonitis* is generally produced

by the extension of inflammation from some organ covered by the serous membrane, by the escape of the contents of the stomach or intestines into the peritoneal cavity, by wounds or other injuries to the abdomen; or it occurs as a complication of Bright's disease, pyæmia, or tubercular consumption. *Chronic peritonitis* may result from tubercle or cancer. The tubercle is deposited in the shape of small granulations beneath the serous membrane, the folds of intestines are closely united together, and not unfrequently ulceration of the mucous membrane takes place, and fæcal abscess is produced.

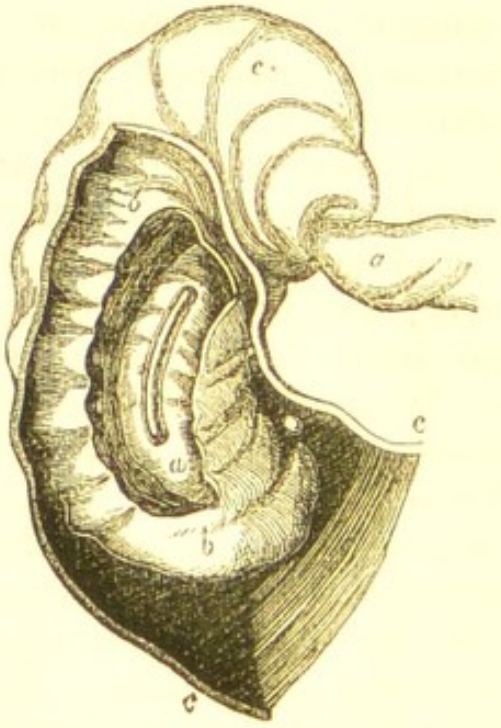
282. The mucous membrane of the intestines presents inflammatory changes similar to those observed in the stomach. *Congestion* is a frequent result of diseases of the heart and liver. In *inflammation* (*intestinal catarrh*) the mucous membrane is soft, of a red colour, and covered with a layer of closely adherent mucus; in chronic cases it is often grey, thickened, and more tough and hard than in the normal state. When the inflammation is acute, the microscope shows the blood-vessels to be congested, the tubes of Lieberkühn choked with cells and granular matter, the solitary glands enlarged, the villi granular, sometimes atrophied, or altogether destroyed. Enlargement of the solitary glands occurs in inflammation of all mucous membranes. The blood-vessels surrounding the follicle become dilated, the cells in its interior increase in number, and thus cause the augmentation in the bulk of the follicle. *Ulceration* most frequently accompanies phthisis and typhoid fever; Peyer's patches and the solitary glands being the parts chiefly attacked. Perforation of the intestine not unfrequently occurs in fever, but is rare in phthisis.

Intestinal catarrh results from venous congestion produced by diseases of the heart, lungs, or liver, from cold and damp weather, or from irritation excited by improper food, or by an abnormal state of

the bile, or other secretions that are poured into the digestive canal. A diseased condition of the mesenteric glands often accompanies inflammation and ulceration of the intestines.

283. The term ENTERITIS is generally restricted to cases in which all the coats of a portion of the intestinal canal are inflamed. The part affected is found after death to be dilated from paralysis of the muscular coat, and usually contains blood or a dark-coloured fluid, the peritoneum covering it is inflamed, some-

FIG. 83.



Intussusception of the small intestine. The layers of the intussusception (*a*, *b*, *c*), are cut open to show their relation; and the inner (*a*) is occupied by a bent probe, the round head of which protrudes from the terminal orifice of the layer, in contact with the inner border of the bowel.

(BRINTON.)

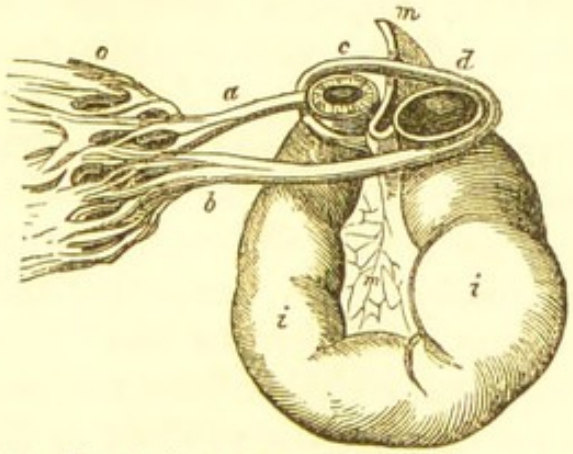
times adherent to the neighbouring portions of gut, the muscular tissue is soft, swollen, and of a dark colour, and the mucous membrane is much congested and covered with a layer of mucus.

284. In INTUSSUSCEPTION one portion of the intestine becomes included within the part immediately

below it; usually the ileum within the cæcum, and this may be again enclosed in the colon. Slight degrees of this affection are often found in persons who have died of diseases of the brain, the condition probably taking place shortly before death. Fatal cases generally occur in children. The peritoneal surface of the tumour thus produced is inflamed, and when it is laid open, the included intestine is found of a dark colour, and not unfrequently gangrenous. In some rare cases sloughing takes place, and the strangulated part of the intestine is discharged by stool. (See fig. 83.)

285. *Obstruction* of the intestine may be also produced by the gut becoming entangled in adhesions

FIG. 84.



Loop of intestine twisted so as to be strangulated by two bands of adventitious tissue. *o*. Omentum giving origin to two bands; passing, *a*, to the free margin; *b*, to the mesentery, *m*, of a loop of intestine, *i*. Of these bands, *a* only completes the noose; *b*, strangulates the bowel in two places, *c* and *d*, the first most seriously. The bowel appears to have dropped into the noose from above. (BRINTON.)

resulting from previous peritonitis, by narrowing of the canal (stricture), by the pressure of tumours, or by twisting of the bowel. The lower portion of the ileum is usually the part entangled in internal strangulation; stricture is ordinarily in the large intestine. (See fig. 84.)

286. INFLAMMATION OF THE CÆCUM is named *cæcitis* or *typhlitis*, that of the colon *colitis*. The mucous membrane of the large intestine presents morbid

appearances similar to those observed in other parts of the intestinal canal; chronic ulcerations are often met with in persons who have died of other visceral diseases.

287. PERITYPHLITIS is the name applied to inflammation of the connective tissue in the vicinity of the cæcum. It usually arises from perforation of the appendix, produced by ulceration, which is occasionally the result of concretions contained in this part of the intestinal canal. The concretions are chiefly composed of fæcal materials, or of phosphate and carbonate of lime. Most of the cases of fatal peritonitis originating in this part of the abdomen are also set up by perforation of the vermiform appendix.

288. DYSENTERY appears generally to commence by inflammation of the solitary glands of the colon; these ulcerate or are destroyed by sloughing, the mucous membrane of the intervening parts being red, thickened, soft, or pulpy, and covered with a purulent mucus. The lower portion of the colon and the rectum are usually most severely affected. It is believed by some pathologists that dysentery commences as a mere catarrhal inflammation, and that the sloughing is set up by the contact of the fæces with the irritated mucous membrane. In persons who have died of chronic dysentery contracted in tropical climates, you will often find the coats of the intestine much thickened and indurated, and large portions of the mucous membrane destroyed by ulceration. When dysentery has been cured, the patients are occasionally liable to obstinate constipation, arising from the contractions caused by the healing of the ulcerations.

Sometimes the colon is affected with *diphtheritic* inflammation, the mucous membrane being covered with a firm coating of lymph, which forms a cast of its inner surface.

289. STRICTURE may occur in the small or large intestine, but it is much more frequent in the latter.

It generally results from cancer commencing in the submucous coat, and is most commonly found in the rectum, or in the sigmoid flexure of the colon. In other cases it is produced by the cicatrization of extensive dysenteric or syphilitic ulcerations. The intestine above a stricture becomes dilated and its muscular coat hypertrophied, whilst below the narrowing it is contracted.

290. Tubercular Affections of the intestinal canal are exceedingly common, ulcerations of this character existing in the majority of those who die of phthisis. The tubercle is first deposited in the solitary and Peyerian glands, softening takes place, and ulcerations are produced. They are most common in the lower part of the small intestine, but the commencement of the colon is also often implicated in the disease. Microscopically, there are generally miliary nodules upon the external coats of the smaller arteries. The new growth is believed to originate in the lymphatic structure, situated close to the walls of the arteries. (See fig. 88.)

The symptoms that should lead you to suspect disease of the peritoneum or intestines are—pain or tenderness of any part of the intestinal canal, swelling of the abdomen, vomiting, constipation, diarrhœa, the passing of blood or mucus by stool.

291. In every case it is necessary to inquire into the manner in which the bowels perform their functions. When constipation or diarrhœa is complained of, you should always ascertain what your patient means by the term he uses. In some persons, when in a state of health, the bowels act only once in every two or three days, in others two or three times a day. Constipation, when long continued, may produce hard swellings in the colon, which may be mistaken for morbid growths. These are most common in the cæcum and sigmoid flexure; they feel generally movable, and not tender, and feel doughy when

pressed by the finger (fig. 85). In cases of diarrhœa always examine the fæcal evacuations, for many patients describe as purging the frequent passing of scanty stools, resulting from constipation.

Ascertain first whether the disease has commenced suddenly or slowly. If suddenly, begin at (292); if chronic, pass on to (305).

SECTION I.

Acute Disorders of the Peritoneum and Intestines.

Inquire if the patient suffers from severe pain, and if so, commence at (292); if pain is absent, or if it is only a slight griping, pass on to (302).

If the pain is severe, observe whether it is continuous or occasional, or if it is aggravated at intervals, and inquire if the patient has had previous attacks of a similar character. In every case of severe pain try whether the abdomen is tender in any part. In some instances slight pressure is sufficient to provoke pain, in others it is necessary to apply the hand firmly before it is complained of.

A. The attack has been sudden, and is attended with considerable pain. Under this head you may have peritonitis, enteritis, typhlitis, colic, intestinal obstruction, dysentery, the passage of a biliary (213), or renal calculus (174).

292. *a.* There is continuous, severe, diffused pain of the abdomen, the tenderness is intense; the abdomen is distended; the breathing is rapid (30 to 40 in a minute) and thoracic; the patient rests on the back, with the knees raised. There are frequent vomiting, foul tongue, confined bowels, quick and wiry pulse, thirst, hot dry skin, and no appetite.

The disease is *acute peritonitis.*

The complaint often commences with rigors and fixed pain in some part of the abdomen, sometimes

with pain and difficulty in passing urine, the pain in either case soon diffuses itself over the whole abdomen. In some instances a friction sound can be detected with the stethoscope placed over the inflamed part. Towards death the face becomes pinched, the pulse rapid and flickering, cold sweats appear on the skin, and constant hiccough occurs. The most common causes of peritonitis are injuries to the abdomen, cold, perforation of the stomach or intestines, pyæmia, puerperal fever, disease of the kidneys, and extension of inflammation from some neighbouring organ. In perforation, the patient is suddenly seized with intense pain of the abdomen, attended with great faintness, the pulse is rapid and feeble, and there is often nausea or vomiting, the countenance is anxious and sunken, the skin cold and clammy and covered with sweat. Usually you have a history of hæmatemesis, pain after food, diarrhœa, or other symptoms of ulceration of the stomach or intestines; but the perforation may occur in persons who have previously appeared to be in perfect health.

293. Acute peritonitis may be confounded with inflammation of the bladder, rheumatism of the abdominal muscles, hysteria, enteritis, and colic. In cystitis the pain is confined to the region of the bladder, and the introduction of a catheter may remove it. In rheumatism the pain is scarcely felt except on motion, the tenderness is as great on slight as on deep pressure; there is neither the fever, rapid pulse, nor the general distress of peritonitis. In hysteria the *surface* of the skin is tender, the pain is comparatively slight, the skin cool, the pulse is not much quickened, and vomiting is absent.

294. Partial peritonitis often occurs over the liver, stomach, uterus, and other abdominal organs, but the pain and tenderness are confined to the part affected, and the fever is comparatively slight.

295. *b.* The patient complains of pain of the abdomen, which is confined to one part, and is increased

by pressure. The abdomen is distended, and there are nausea or vomiting, confined bowels, quick wiry pulse, thirst, hot dry skin, and want of appetite. The patient lies on his back, with the knees raised.

The disease is *enteritis*.

This complaint often commences, like colic, with severe but intermitting pain; it may arise from intussusception, internal strangulation of the intestine, hernia, fæcal accumulations, or from undigested food, such as raw apples, &c. You may mistake acute peritonitis, colic, or intestinal obstruction for enteritis. It is distinguished from acute peritonitis by the more local character of the pain and tenderness, by the pain being generally confined to the neighbourhood of the navel, and by the symptoms being less acute and violent; from colic, by the tenderness on pressure, the quick pulse, fever, and general prostration; from intestinal obstruction, by the early occurrence of pain and tenderness, and the rapid progress of the case. As the bowels are usually confined in enteritis, always examine if hernia is present, for strangulation of the intestine may give rise to similar symptoms. In some cases of enteritis an increased pulsation of the abdominal aorta has been observed.

296. *c*. There is severe pain, occurring in paroxysms, near the umbilicus, usually coming on suddenly, but unaccompanied by tenderness on pressure: often vomiting of bile or mucus; bowels generally confined; pulse little affected, and no great heat of the skin or increased pulsation of the aorta. The patient often groans or screams, rolls about, or presses on the abdomen to relieve the pain.

The disease is *colic*.

Many persons are subject to attacks of colic, especially those whose bowels are habitually confined; it is also one of the most common accompaniments of lead poisoning (*lead colic*), and is therefore often observed in painters, workers in lead factories, and

others whose occupations bring them into frequent contact with this metal; in these cases you will find a blue line on the gums surrounding the teeth.

297. Colic may be confounded with peritonitis, intestinal obstruction, the passage of biliary or urinary calculi, neuralgia of the dorsal nerves, or hernia. From peritonitis it is distinguished by the absence of pain on pressure, and of fever, by the local character of the pain, and the small amount of depression; from gall-stones, by the sudden commencement and termination of that complaint, by the pain produced by the passage of a calculus being in the site of the gall-duct, by the vomiting being generally more severe, and the fluid rejected more acid than in colic, and by the attack being often followed by jaundice. The passage of a urinary calculus differs from colic in the pain affecting the back, thigh, and testis, in the increased frequency of urination, in the small quantity of high-coloured, often bloody, urine that is voided during the attack, and perhaps by a history of small stones or gravel having been previously passed. Neuralgia sometimes simulates colic, but in it there are generally superficial tender spots in the course of the nerves, and the pain is confined to one-half of the body. You seldom find severe pain in hernia, but you should in every case of colic carefully examine all the usual places of hernial protrusions.

298. *d.* The patient complains of constipation of the bowels that has resisted the action of purgatives; the abdomen is much distended, there are urgent vomiting, quick pulse, thirst, and loss of appetite. Usually at some period of the case pain of the abdomen comes on which may be localized or of a colicky character.

The disease is *intestinal obstruction.*

The obstruction may arise from a portion of the intestines becoming strangulated by old adhesions or malposition of other parts of the canal, from intussusception, from stricture produced by cicatrices,

inflammation of the coats of the gut, cancer, &c., and from the impaction of a gall-stone or fæces. When the complaint is produced by internal strangulation the symptoms usually follow directly upon some sudden or severe muscular exertion, and the patient can from the first point out the exact part where the pain is situated. When the gut is twisted the symptoms are more gradually developed, and pain may be absent for many days after insuperable constipation has commenced. When intussusception occurs, the first symptom is usually a colicky pain, followed by the discharge of bloody mucus and ineffectual efforts to relieve the bowels; in some cases a hard, tender tumour can be discovered where the pain is felt; it is, however, rare in adults. If stricture has produced the obstruction, you have a history either of frequent vomiting and loss of flesh, or of obstinate constipation, according as the upper or lower part of the intestinal canal is affected. When the impaction of a gall-stone has given rise to the symptoms, they have generally been preceded by severe pain in the right hypochondriac region and vomiting, followed by jaundice.

If the obstruction is seated in the upper part of the canal, the vomiting begins early and is bilious, the abdomen is not much distended, and the amount of urine secreted is scanty; when it occurs in the large intestine the vomiting is late in beginning, the matters rejected are at first bilious, afterwards stercoraceous, the abdomen is greatly distended, the shape and movements of the bowels can be sometimes distinguished through the abdominal parietes, and the amount of urine is copious. In every case of obstruction of the bowels the patient must be most carefully examined for hernia, and the condition of the rectum and the colon should be ascertained by the finger and a long flexible tube.

299. *c.* There is griping pain of the abdomen with some tenderness in the region of the colon; frequent

desire to go to stool, attended with straining and the passage of blood, mucus, or jelly, mixed with small lumps of fæcal matter (*scybala*). The patient is restless, has a furred tongue and thirst, the skin is cool, the pulse is small, but not much quickened.

The disease is *dysentery*.

This disease is common in hot climates, but it occurs also occasionally in this country. Death may take place at an early period, or the complaint may become chronic. The symptoms usually commence with rigors, chilliness, or diarrhœa; towards a fatal termination the abdomen becomes tender, the pulse rapid and feeble, the tongue dry, red, and glazed, the stools are passed involuntarily, and are of a greenish colour, very fœtid, or like washings of raw meat. In some cases severe hæmorrhage occurs from a large artery being opened by the ulceration, in others (chiefly in tropical dysentery) abscess of the liver takes place.

300. You may for dysentery mistake piles, morbid growths, or cancer of the colon or rectum, but a careful examination of the gut with the finger or bougie, will prevent such an error. It is distinguished from diarrhœa by the constant straining, the severe pain, and the character of the stools. In this country we generally meet with dysentery as a chronic disease and as the result of the acute form contracted in tropical climates. The patient is emaciated, pale, and exhausted, and the disease is usually associated with chronic diarrhœa.

301. *f*. The patient complains of a continuous, dull pain in the right iliac region, increased on pressure or motion; a tumour can be felt in this situation, which is rather dull on percussion, but its borders are tympanitic. The bowels are usually confined, the pulse is quickened, and there are thirst, deficient appetite, and sometimes vomiting.

The complaint is *typhlitis*.

The disease usually is preceded by constipation. It

may produce fatal peritonitis, or may set up inflammation of the cellular tissue round the gut (*peri-typhlitis*) and abscess, which may be discharged externally or through the intestines. Perforation of the vermiform appendix is the most usual cause of peri-typhlitis, but abscess in this situation may result from inflammation of the ovary or disease of the vertebræ, and may burst into the cæcum. If the pus burrows under the iliac fascia there is much pain in moving the right leg. You may mistake for it cancer of the cæcum, but in this disease the progress is slow, the tumour is very hard, and there is often malignant disease of the liver or other organs.

B. The attack has been sudden, but it is not attended with much pain.

You have under this head, Asiatic cholera, simple cholera, and acute diarrhœa.

302. *a.* The patient is affected with constant vomiting and diarrhœa, at first of bilious, afterwards of watery ("rice-water") stools. The face is blue and cadaverous, voice whispering, skin and breath cold, urinary secretion suppressed, pulse exceedingly feeble or imperceptible, but the intellect remains clear. He suffers from violent cramps in the extremities.

The disease is *Asiatic cholera.*

This complaint only occurs in temperate climates as an epidemic, and when once seen can never be forgotten. The patient is usually attacked during the night, or early morning, with a feeling of oppression, nausea, or vomiting, followed by severe diarrhœa. The stage of collapse is commonly preceded for a few days by diarrhœa, in other cases the invasion is sudden. Occasionally there is rapid sinking without diarrhœa. If the stage of collapse be overcome, the patient generally falls into a typhoid state, which often proves fatal. In the stage of collapse the temperature is 90° to 95°.

303. *b.* The patient suffers from constant vomiting and diarrhœa of bilious or of pale, watery stools,

usually preceded, or attended, by griping pain of the abdomen and severe cramps of the extremities. The pulse is feeble, the voice husky, and there are great thirst and depression.

The disease is *simple cholera*.

In children the complaint often proves fatal, but recovery usually occurs in adults, although the symptoms are sometimes apparently as severe as in the Asiatic form of the disease.

304. *c*. The patient suffers from diarrhœa, without vomiting, generally attended with some griping pain. There are often thirst and deficient appetite, but no fever and not much depression.

The disease is *diarrhœa*.

You generally find that diarrhœa is produced by indigestible food; in other cases the stools consist almost entirely of bile.

SECTION II.

Chronic Diseases of the Peritoneum and Intestines.

First inquire if there is severe pain, and if so, begin at (305); if not, pass on to (307).

A. The patient suffers from severe pain.

Under this head you may meet with chronic peritonitis, cancer of the peritoneum and chronic dysentery (299).

305. *a*. The patient has pain, tenderness, and distension of the abdomen, which is clear on percussion, sometimes with intervening portions of dulness, and retains its shape when the body is moved from side to side; the bowels are usually purged, the pulse is quick and feeble, the skin hot, appetite bad, and thirst and emaciation are present.

The disease is *chronic peritonitis*.

Chronic peritonitis sometimes follows acute peritonitis, or it may be produced by an injury to the

abdomen. The most frequent cause is a tubercular affection of the peritoneum. In this case there is but little fluid effused, and the intestines are glued to each other and to the abdominal walls; consequently the abdomen is spherical in shape and clear on percussion, and these signs, together with the absence of the symptoms of disease of the heart, liver, and kidneys, suffice to distinguish the complaint from ascites. Chronic peritonitis is most frequent in children, and the pain and tenderness are in some cases but slight. It is often accompanied by enlargement of the mesenteric glands, but these very rarely form a tumour capable of being distinguished during life.

306. In adults the greatest difficulty is to diagnose it from peritoneal cancer. In cancer there is usually a large quantity of fluid effused, with great emaciation, vomiting, and severe pain and tenderness of the abdomen. In colloid disease there are the same symptoms as in the other forms of cancer, but you more frequently find a tumour in some part of the abdomen, and the fluctuation is often very indistinct. In all cases of suspected chronic peritonitis in adults examine the lungs for tubercle and the urine for albumen.

B. The patient does not suffer from severe pain.

You may have constipation or chronic diarrhœa under this head.

307. Amongst the usual causes of constipation are want of exercise, improper food, lead poisoning, atony of the colon, affections of the brain, stricture of some portion of the large intestine. However produced, it is apt to give rise to flatulence and other signs of indigestion, palpitation, dyspnœa, giddiness, headache, heaviness after meals, coldness of the hands and feet, and inability for much mental or bodily exertion.

308. *Chronic diarrhœa* may result from malaria, improper food, the abuse of purgatives, ulceration of

any part of the intestinal canal, and other general or local causes. It is a common accompaniment of diseases of the kidney and liver, phthisis, typhoid fever, diseased mesenteric glands, chronic peritonitis, and other disorders. When it persists longer than two or three weeks in an adult, we may suspect that it arises from some more serious ailment than intestinal catarrh, which is its usual cause.

CHAPTER X.

ABDOMINAL TUMOURS.

Before entering on the diagnosis of tumours of the abdomen, it is necessary that you should make yourself acquainted with the various morbid changes to which the abdominal organs are liable, and the signs by which these changes may be recognised. Observe if the enlargement of which the patient complains is general and uniform (309), or is confined to one part of the abdomen (317).

SECTION I.

There is a General and Uniform Enlargement of the Abdomen.

The enlargement may be produced by an abnormal amount of air in the stomach or intestines, by fluid in the peritoneal cavity, or by a solid tumour.

309. Commence by percussing the whole of the abdomen, and if you find the sound everywhere tympanitic, the swelling arises from an accumulation of air. If a dull sound is elicited, either over the whole or part of the abdomen, you have to deal with fluid or with a solid tumour. You distinguish the presence of fluid in the following manner:—Place the left hand over a dull portion, and with the fingers of the right tap rather sharply over another dull part; if fluid is present the impulse of the blow will be felt by your left hand. It is easy to detect fluctuation if the peritoneal cavity is filled with fluid, but when this exists only in a small quantity you must adopt the

following method of examination:—Let the patient rest upon one side, whilst you percuss the opposite side of the abdomen, where you will probably find a clear resonance. Make him now reverse his position, and, if fluid is present, you will elicit a dull sound where it was before tympanitic. If you are unable to feel fluctuation, and the swelling is firm and resistant, you have to deal with a solid tumour.

310. *a.* The abdomen is generally and uniformly enlarged, and the sound on percussion everywhere tympanitic.

The enlargement is caused by *an excessive amount of air in the intestines* (*tympanitis*).

Extreme flatulent distension sometimes results from atony of the colon, chronic peritonitis, or intestinal obstruction. In the first the bowels are confined and the patient is liable to colic, but there is neither fever nor emaciation. Chronic peritonitis usually arises from tubercular disease; the abdomen is tender upon pressure, and does not change its shape with an alteration of the position of the patient; there are loss of strength and flesh, diarrhœa, a quick pulse, thirst, and, in most cases, some evidence of disease of the lungs. When the distension is produced by intestinal obstruction you have the other symptoms of this condition to guide your diagnosis (298). Flatulent distension is a common symptom of dyspepsia, and is often very distressing, especially when the patient is stout.

311. *b.* The abdomen is generally and uniformly enlarged, the sound on percussion is dull, and fluctuation can be detected.

There is *fluid in the abdominal cavity.*

When the fluid is contained in the peritoneal cavity the disease is termed "*ascites.*" You may mistake for ascites ovarian enlargement, a cyst connected with the kidney, or a greatly distended bladder.

312. In ovarian dropsy the swelling is first observed in the lower part of the abdomen, and gradually

extends upwards. When the patient lies upon her back the front part of the abdomen is quite dull on percussion, whilst you have a clear sound at the flanks, because the fluid being contained in the cyst does not gravitate. In ascites the flanks are dull when the patient rests on the back, but a clear sound is elicited in the epigastric or umbilical region on account of the intestines floating on the surface of the fluid. If you mark with ink or pencil the point at which the dull line ceases, and then let her sit upright, you will find the line of dulness is altered by the gravitation of the fluid. In addition to this, the history of the case may afford you indications of some visceral disease likely to produce dropsy of the peritoneum, such as disease of the liver, heart, or kidneys.

313. Renal cysts are generally situated at one side of the abdomen, so that percussion affords a clear sound on the opposite side in all positions of the patient's body. If you suspect that the fluctuation arises from a greatly distended bladder, draw off the urine by means of a long catheter.

The usual causes of ascites are, diseases of the liver, heart, or kidneys, chronic peritonitis, and cancer of the peritoneum.

314. Dilatation of the heart or diseased mitral valve frequently gives rise to ascites. In these cases œdema of the feet precedes the abdominal dropsy, and the patient has previously suffered from cough, dyspnœa, and palpitation. Ascites produced by kidney disease is usually associated with œdema of the limbs and face, and effusion into the pleura or pericardium. The state of the urine will enable you to decide as to the nature of the affection (151).

315. Diseases of the liver are the most common causes of ascites, on account of the obstruction to the portal circulation they produce. It is generally the result of cirrhosis, the presence of which must be determined by the enlargement of the superficial abdominal veins, the emaciation of the patient, and

the other symptoms of that disease (226). Ascites may be produced by cancer of the liver, and more rarely by lardaceous degeneration; it seldom arises from chronic congestion, except when this results from disease of the heart or lungs; it is not an accompaniment of hydatids, fatty liver, or hepatic abscess.

316. *c.* When a solid tumour is sufficiently large to fill the whole abdomen it is generally of a malignant nature. Of course pregnancy must be borne in mind.

SECTION II.

The Tumour is Confined to one Part of the Abdomen.

317. Nothing but careful and repeated examinations can prevent you from making mistakes in the diagnosis of tumours of this class. In some persons, especially in women, the recti muscles are apt to contract on the application of the hand, and thus give the semblance of a tumour when none exists. When you suspect this to be the case you must examine the patient in different positions; relaxing the muscles as much as possible, and meanwhile engaging her in conversation. Sir William Jenner recommends that the abdominal muscles should be relaxed by placing the patient on the back with the shoulders somewhat raised, and the back of the head propped up until the chin falls on the top of the sternum, the knees should be bent on the abdomen and supported by an assistant, whilst the feet rest on their soles. In some cases, though very rarely, it is necessary to use chloroform before you can arrive at a positive conclusion.

318. Fæcal accumulations sometimes simulate malignant and other tumours; they feel soft and doughy,

and are often situated in the cæcum or sigmoid flexure of the colon. In all doubtful cases the bowels should be emptied, either by purgatives or by enemata, before a positive diagnosis is given. The accompanying

FIG. 85.

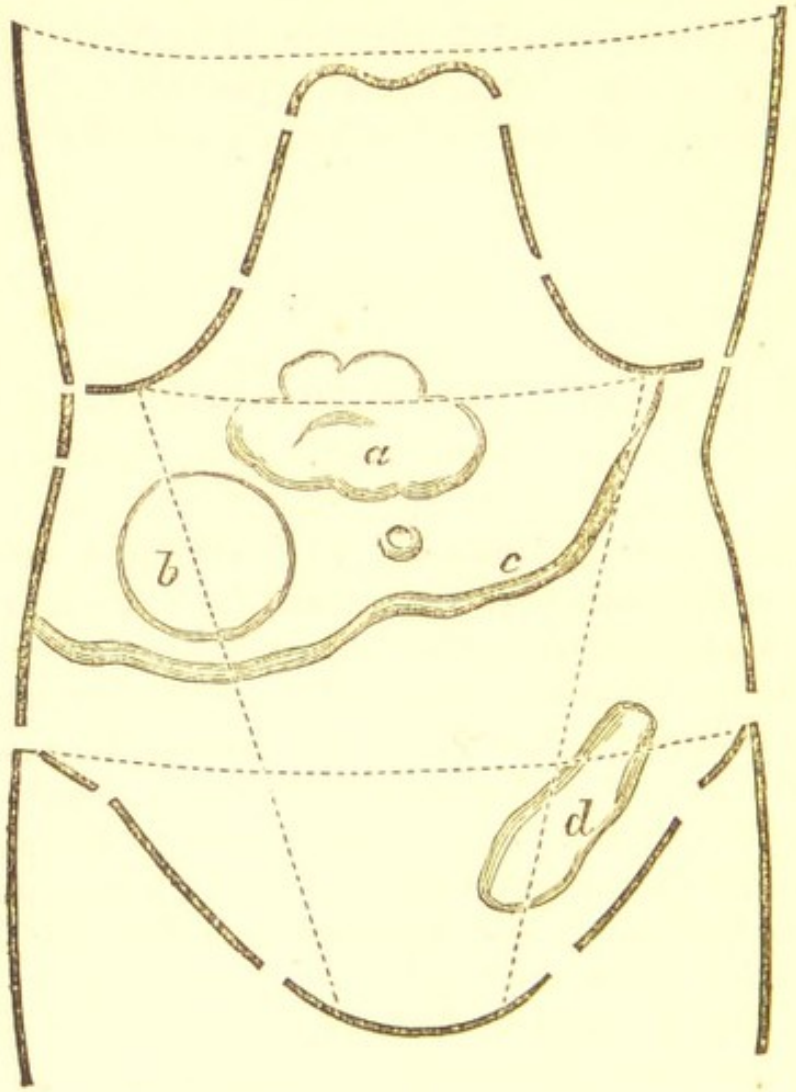


Diagram representing the situations of tumours in four different cases of fæculent accumulations in the large intestines. *a*. A nodulated enlargement, existing for many weeks, from fæces in the arch of the colon. *b*. A round tumour, continuing and slowly increasing for many months, from fæces in the ascending colon. *c*. Extensive hardness occupying the whole space included within the double line to the scrobiculus cordis; chiefly depending on large accumulation of fæces in the colon. *d*. Tumour from recent fæculent accumulation in the sigmoid flexure of the colon. (BRIGHT.)

diagram shows the usual situation of these tumours (see fig. 85).

319. The presence of an abdominal tumour is often obscured by ascites. When fluid exists in large quantity in the peritoneum, it may be impossible to determine the existence of a tumour until after tapping has been performed; but where there is only a moderate amount of liquid you can often reach the solid mass by suddenly and forcibly pressing the tips of the fingers on the abdomen so as to displace the intervening layer of fluid.

320. When you have satisfactorily determined the presence of an abdominal tumour, consider what organs occupy the region in which it is placed, and try to trace its connection with one of them. Thus, if it be situated in the right hypochondrium, mark out the liver, and ascertain if there is any connection between this organ and the morbid growth.

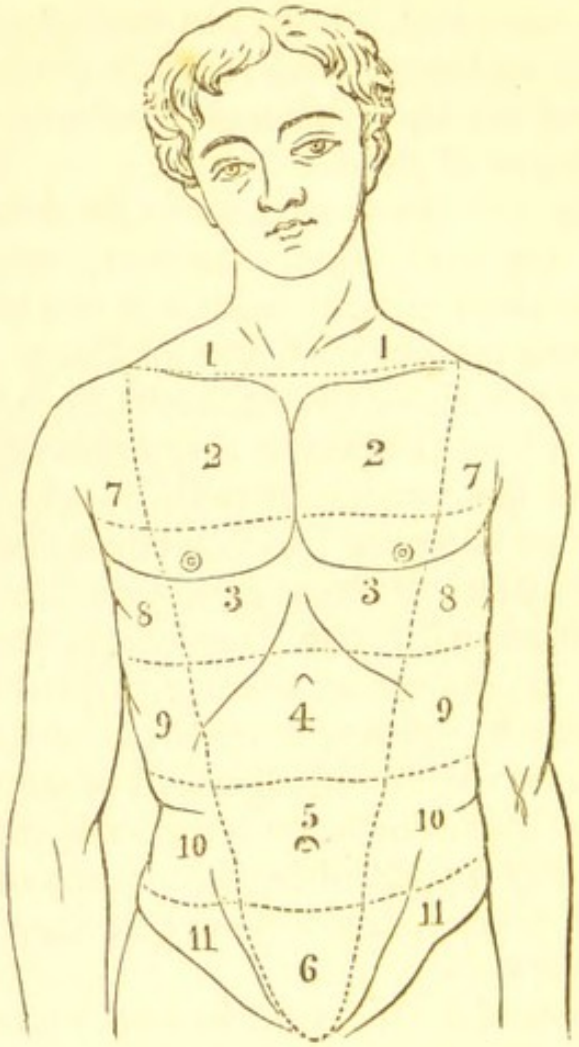
321. Observe whether the tumour is fixed or moves during respiration; if it moves, you know that it is either connected with the diaphragm or with some organ which is depressed during inspiration, such as the liver, stomach, spleen, omentum, or intestine. If it is fixed, it may be an enlargement of some structure, such as the kidney, aorta, or lymphatic glands, which are permanently retained in their position, or it may be connected with a movable organ that has become fixed by adhesions.

322. Pay especial attention to the state of any of the abdominal organs whose functions are disordered. Thus, if the patient has suffered from frequent vomiting of a large quantity of fermenting liquid, and the stomach was found to be enlarged, you would look upon a hard tumour as being connected with the pylorus, although it might be far removed from the normal position of that part.

The abdomen is divided into regions in the same manner as the chest; a glance at fig. 86 and fig. 87 will make you acquainted with them.

323. Right Hypochondrium.—Tumours of the liver, kidney, and gall-bladder are most generally found in this locality. You must remember that the liver may be displaced by emphysema, effusion into

Fig. 86.



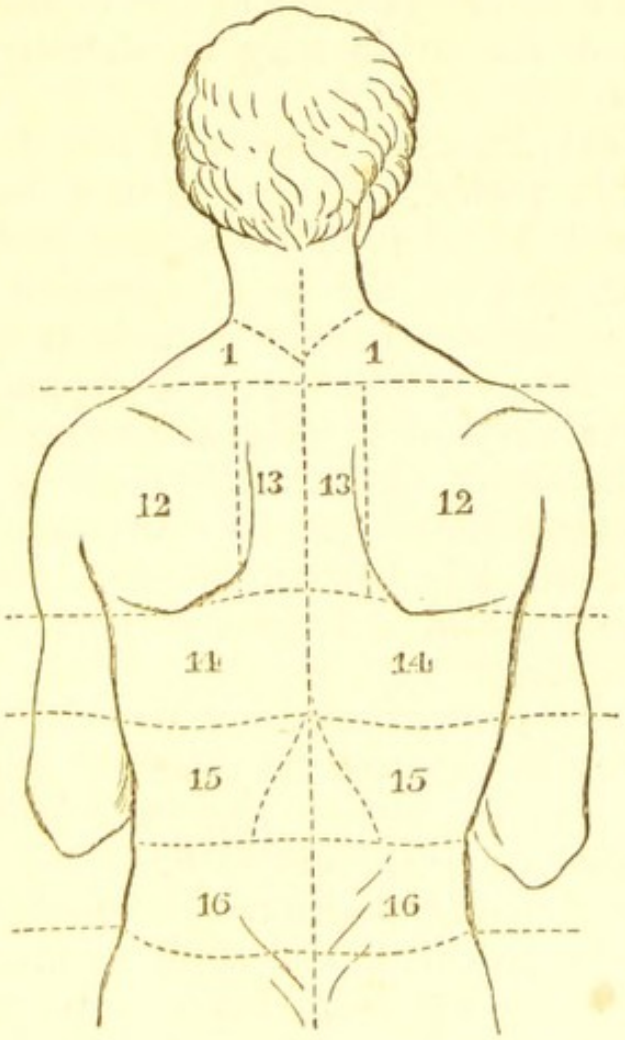
4. Epigastric.
5. Umbilical.
6. Hypogastric.
9. Hypochondriac (right and left).
10. Iliac (right and left).
11. Inguinal (right and left).

(Paxton.)

the right pleura, fluid in the pericardium (see fig. 13), or dilated heart, and thus may simulate hepatic enlargement. The diseases of the liver capable of producing a tumour are congestion, cirrhosis in its

early state, fatty and lardaceous degenerations, abscess, hydatid cyst and cancer, also dilatation and cancer of the gall-bladder. Hydatid tumour, cancer, and diseases of the gall-bladder are most likely to be confounded with tumours arising from other organs. The diseases of the kidney that may produce tumours

FIG. 87.



15. Inferior dorsal (right and left).

16. Lumbar (right and left).

(PAXTON.)

are dilatation, cystic disease, and cancer. When the tumour arises from the liver it is uncovered by the intestines, its continuity with the remainder of the organ can be generally traced, and there is often jaundice or ascites. When the kidney is affected

there is usually some part clear on percussion, on account of a portion of the colon lying in front of it; or there is, or has been, pus or blood in the urine, you have a history of stricture, diseased bladder or calculus, or it may be attended with disease of the testis or prostate gland. Medullary disease of the kidney, in children, is often very difficult of diagnosis, for, on account of the tumour lying behind the intestines, it may seem to consist of two or three separate swellings and the urine may be entirely free from blood or pus.

324. Epigastrium.—Tumours of the liver are also found in this region. Cancer of the stomach may be recognised by the hardness and irregularity of the swelling, and by the pain, vomiting, and other signs of that disease (279). Cancer of the pancreas occasionally forms a tumour in the epigastrium, but its symptoms vary so greatly, according to the other structures involved, that its diagnosis is generally a matter of great difficulty. In many cases, where no external tumour has been discovered, the urine has been saccharine, and a large amount of fat has been discharged by stool.

325. Left Hypochondrium. — Although fæcal accumulations are sometimes observed in this region, enlargements of the spleen, liver, and kidney are the tumours most frequently met with.

326. The size and position of the spleen may be determined by palpation and percussion. When you wish to ascertain by palpation if the spleen is enlarged, the patient must lie on his right side with the knees bent and drawn upwards, and you press your hand deeply below the left costal arch whilst he draws a full breath. You may assume the organ to be enlarged if it can be felt below the ribs. The investigation of the spleen by percussion is often very difficult. In the normal state it extends from the left kidney to a level with a line drawn perpendicularly downwards from the anterior border of the left axilla,

its upper and lower borders corresponding nearly with the ninth and eleventh ribs. But as its upper third is covered by the lower border of the left lung, only the lower two-thirds can be determined. The percussion should be undertaken whilst the patient is standing or lying on his right side; the stroke of the finger must be light, and it is advisable to seek first for the dulness at the border of the ninth rib, in the middle axillary line, and gradually follow it downwards.

327. The spleen is usually enlarged in typhoid, typhus, and relapsing fevers, in pyæmia, in many cases of cirrhosis of the liver, and in dilatation of the heart, especially where emboli have been swept into the circulation. The amount of enlargement in all these is usually moderate, and can be only ascertained by careful percussion. In malarial and lardaceous disease, and in leukæmia, it is often so much increased in size as to form a large tumour perceptible below the left costal arch, and filling perhaps a large portion of the abdomen. You may diagnose lardaceous spleen when there is also enlargement of the liver and albuminous urine in a person who has suffered from long-continued suppuration, or whose health has been broken up by constitutional syphilis or diseased bones. You refer it to malaria when there is a history of intermittent fever, and the liver is also enlarged.

328. Leukæmia, or Leucocythæmia, is a disease characterized by a great increase in the number of the white blood-cells. Normally, the proportion of the leucocytes to the red cells is one to three hundred; but in this disease you may have one white to ten red cells, or the numbers of each may be still more equal. The complaint is associated with anæmia, great weakness, a tendency to hæmorrhages from various organs, and usually dropsy. The pulse is feeble, and palpitation and dyspnœa on exertion are complained of. It is most probably a disease of the lymphatic system, and is commonly met with in persons suffering from

enlarged spleen, or enlarged thymus or lymphatic glands.

329. You distinguish an enlarged spleen from a tumour of the left kidney by finding that it is uncovered by the colon, and therefore quite dull on percussion, that it readily moves during respiration, and that its anterior margin is sharp, often notched, not round, as is the case with the kidney. In addition to these signs, the patient is usually anæmic and subject to hæmorrhages; whereas in enlarged kidney there is often blood or pus in the urine. The splenic tumour can be generally moved forwards with the fingers, and there is a space between its posterior border and the spine, in both of which circumstances it differs from enlarged kidney. The left lobe of the liver may be enlarged and in contact with a splenic tumour, but in such a case the right lobe will be found also increased in size, and the spleen can be made to alter its relation to the liver by deep inspiration, or by pressure with the hand.

330. Anæmia is one of the most common conditions that will come beneath your notice. In rare cases it is dependent on leukæmia or on Addison's disease, but ordinarily you meet with it where the patient has suffered from some severe hæmorrhage, or where, as in the later stages of cancer, tuberculous disease or other organic maladies, the waste of the blood has not been supplied by a sufficient amount of nutriment. It is of common occurrence in young females in whom the catamenial functions are imperfectly performed, and is then named *Chlorosis*.

331. There is a very fatal form of anæmia which is described under the name of *Idiopathic* or *pernicious anæmia*. It is unaccompanied by any disease of the spleen, or lymphatic glands, and the blood presents no increase in the number of its white cells. It occurs chiefly in persons of middle age and of the male sex, and the symptoms come on very insidiously. It is characterized by pallor of the lips and face, loss of strength

and energy, palpitation, attacks of dyspnœa, pains of the back and limbs, loss of appetite, and disturbance of the digestion. The anæmia gradually increases in spite of all treatment, and death is generally preceded by attacks of vomiting or diarrhœa, attended by an elevation of temperature. The duration of the disease is seldom more than twelve months. After death changes have been detected in some cases in the marrow of the bones, in others a general atrophy of the glands of the stomach has been discovered.

332. Umbilical Region.—Tumours in this region generally result from the extension of growth connected with the liver or stomach.

333. Enlarged mesenteric glands seldom or never produce an abdominal tumour. Sir W. Jenner states that "enlarged glands may sometimes be detected by grasping the two sides of the abdomen between the hands or between the fingers of one hand; then by bringing the fingers slowly together, you may at last feel the glands between your fingers." When enlarged lymphatic glands are big enough to form a distinct tumour, it is fixed and cannot be moved either by respiration or pressure of the hand.

334. Aneurisms of the aorta and its branches are most generally met with in this and the epigastric region. They are distinguished by the severe neuralgic pains, the pulsating tumour, and systolic murmur that accompany them. You must, however, be on your guard not to mistake for aneurism an increased pulsation of the aorta that is often met with in dyspeptics, especially in females, or the pulsation of a tumour situated over the vessel. You should endeavour to grasp the tumour on each side, and as an aneurism expands equally in all directions at each impulse of the heart, you will feel the dilatation as much at the sides as in the front, if it be an aneurism. Remember that a murmur may be produced by the pressure of the stethoscope; in case of

aneurism you will often be able to hear it behind near the spine as well as in front.

335. Lumbar Regions.—Tumours here are usually connected with fæcal accumulations, or with disease of the kidneys, liver, or spleen. Occasionally inflammation takes place in the cellular tissue surrounding the kidney, and abscess is the result; in other instances cancer attacks the spine or lumbar glands, and a tumour is formed in the loins.

336. You examine the size of the kidneys by pressing the fingers into the lumbar regions whilst the patient lies flat upon his face, or rests upon his hands and knees. Sir W. Jenner recommends that "you should place one hand at the back of the patient under the last rib, and outside the mass of the lumbar muscles in the spinal groove; the other you put in front of the patient, just over the hand behind, on the right side, under the inferior border of the liver. Having put your hands in these positions, so as to have the kidney well between them, depress the hand on the anterior wall of the abdomen, diverting the patient's attention, and removing the tension of the muscles. Then, having depressed that hand, using all means to expedite and assist its depression, and having brought it down as much as possible, tilt forward the hand that is behind; and in that way the kidney is brought well under the touch of the two sets of fingers—perfectly, in the great majority of cases."

337. Remember that tumours of the kidney almost always increase *anteriorly*, where there is least pressure; in case, therefore, you find an enlargement in the situation of these organs near the spine, it is in all probability not renal.

338. Iliac Regions.—Diseases of the cæcum, inflammation of the cellular tissue surrounding it (301), or diseases of the ovary, are the most common causes of tumours in this locality. Ovarian tumours, unless they are of a cancerous nature, are distinguished by

their mobility, their connection with the uterus, and the small amount of disturbance of the general health they appear to produce.

339. Hypogastric Region.— Diseases of the bladder and uterus usually give rise to the tumours in this region. Sometimes, in chronic peritonitis, pus is found in the situation enclosed in a sac formed by coils of intestine adherent to each other.

CHAPTER XI.

DISEASES OF THE BRAIN.

THE chief diseases to which the brain and its membranes are liable are—acute and chronic meningitis, hydrocephalus, congestion of the brain, encephalitis, abscess, hæmorrhage, softening, and tubercular, cancerous, and other tumours.

340. In CONGESTION OF THE BRAIN the vessels of the membranes are loaded with blood, and an unusual number of bloody points are visible when the substance of the organ is divided. When congestion has been continuous, or often repeated, the blood-vessels become enlarged, and more or less wasting of the substance of the brain takes place. *Active* congestion may arise from an increased action of the heart, as in hypertrophy, from a diminished circulation in the skin or other organs, as in ague, determining an unusual amount of blood to the brain, from excessive mental labour, or from wasting of the brain. *Passive* congestion depends on any circumstance that prevents the ready return of the venous blood from the brain, such as the pressure of a tumour, or disease of the heart or lungs.

341. In ANÆMIA OF THE BRAIN the grey substance is pale, and, on being cut, very few bloody points are visible. It may result from anything that lessens the quantity of blood in the body, such as severe bleedings, diarrhœa, &c., or from any morbid condition that encroaches on the cavity of the skull, such as a tumour. Portions of the brain may be deprived of their due supply of blood by their

vessels being obstructed with clots of blood, by œdema, or by compression of the capillaries by means of tumours, extravasations of blood, &c.

342. Meningitis, or inflammation of the membranes of the brain.—The blood-vessels of the pia mater are much enlarged and loaded with blood, the arachnoid is opaque; lymph, or in some cases pus, being situated beneath it. The pia mater is stripped with difficulty from the surface of the brain, which is soft and easily torn away. Microscopically, the smaller blood-vessels are covered with fat and granular matters, and often present dilatations in various parts. They are crowded with white blood globules, and their external coats and the tissues in their immediate neighbourhood are also infiltrated with cells.

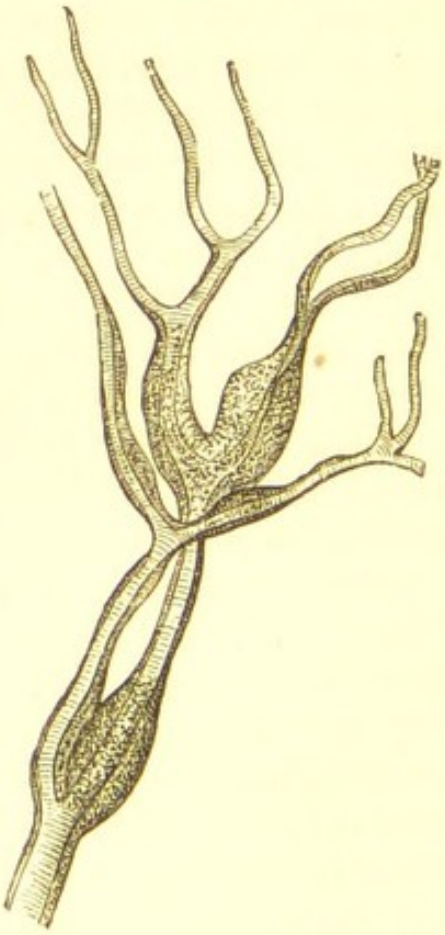
The first effect of meningitis is to excite general fever; the exudations resulting from it are apt to produce compression of the brain, and thus to give rise to convulsions or paralysis. It is almost always associated with inflammation of the surface of the brain itself, and when not tubercular is chiefly confined to the convexity of the organ. Inflammation of the dura mater scarcely ever occurs, excepting as a result of injuries or diseases of the bones of the skull; caries of the temporal bone being the most common cause.

343. Hydrocephalus, or water in the brain.—This disease consists in the effusion of fluid into the ventricles; it may occur as an acute or a chronic complaint.

344. Acute Hydrocephalus, also called Tubercular Meningitis.—The surface of the brain is flattened, the ventricles are filled with fluid, and the substance of the brain is soft and pulpy, especially in the neighbourhood of the ventricles; the membranes at the base of the organ, chiefly at the optic commissure and the fissure of Sylvius, are thickened, opaque, and studded with small grey miliary tubercles; the membranes on the upper surface are usually but little

affected. Microscopically, the tubercles appear to arise from a growth of nucleated cells around the external coat of the arteries (see fig. 88). The swellings thus produced compress the arteries, and in some cases the coats of the vessels are perforated by the inward growth of the tumours. The obstruction to the circulation gives rise to congestion and after-

FIG. 88.



Tubercular degeneration of a branch of the artery of the Sylvian fissure. The tubercle is seen to have been developed in the outer coat, and compresses the channel of the vessel. (RINDFLEISCH.)

wards to inflammation of the membrane. Tubercles are generally present also in the lungs or other organs.

345. In CHRONIC HYDROCEPHALUS the head becomes greatly enlarged, the bones of the skull widely separated, the fontanelles open; the ventricles of

the brain are distended with fluid, and the substance of the organ is softened and expanded by the pressure of the fluid.

346. ENCEPHALITIS, or inflammation of the substance of the brain, may affect the whole or only a portion of the organ. General encephalitis is associated with meningitis, and is confined to the surface just below the inflamed membrane. When localized it usually results from injuries to the skull or from irritation set up by a clot of blood effused from a ruptured vessel or by a tumour. It may end in abscess or softening of the brain. Only a single abscess may be present, or many different collections of pus may exist together; in the latter case they are almost always due to pyæmia.

347. IN RED OR INFLAMMATORY SOFTENING, the brain is soft or pulpy, of a red colour, often presenting numerous bloody points, and its specific gravity is increased. Microscopically, you see the nerve-tubes broken up and mixed with blood-cells, granular matter, and dark, granular, and fatty bodies, like mulberries named "exudation corpuscles." The minute arteries are covered with granular and fatty matters. When encephalitis has terminated in abscess, you find, in recent cases, an irregular cavity filled with yellow, grey, or reddish-coloured fluid, bounded by softened brain-structure; in older cases the pus is *encysted*, that is, enclosed in walls formed of connective tissue. You do not necessarily meet with true pus-cells in the contents of the abscess, but often only granules and exudation corpuscles in various stages of degeneration. Abscess of the brain generally results from injuries or diseases of the bones, the most common cause being caries of the internal ear.

348. IN THE WHITE, YELLOW, OR NON-INFLAMMATORY SOFTENING, the substance of the brain is soft, pulpy, and of a white or yellow colour. Sometimes capillary hæmorrhages are found on the exterior

of the affected part. Microscopically, you see the remains of softened nerve-fibres, granular matters, resulting from the destruction of the tissue, fatty blood-vessels, and fatty cells, produced by the degeneration of the nerve-cells and of the cells of the connective tissue. This condition is always the result of imperfect nutrition of the part affected. It is most frequently the consequence of the blocking up of an artery by an embolus, but it also arises from the pressure exercised by a tumour or hæmorrhagic clot upon the circulation of the adjoining parts of the cerebral substance. The *yellow* differs from the *white* softening merely in the difference of colour, arising from a greater amount of fat, or from the remains of extravasated blood.

349. HÆMORRHAGE of the brain is the most frequent cause of apoplexy and paralysis; it may take place above the dura mater, into the sac of the arachnoid, or into the substance of the brain. It generally occurs in the corpus striatum or optic thalamus, or in the white substance adjoining to these structures. It is usually distinguished as *capillary hæmorrhage*, or as *hæmorrhagic clots*. In capillary hæmorrhage the part is reddish or of a yellow colour, soft or pulpy, and dotted with minute spots of blood. These minute extravasations of blood are liable to occur in all acute cerebral inflammations, in the vicinity of an occlusion of a small artery by a clot, or as a result of disease (atheroma) of the lining membrane of the smaller vessels. Capillary hæmorrhage may go on to yellow softening, to suppuration, or to the organization of the blood-clots. Microscopically, in case of organization, the effused blood becomes covered with a thin membrane and the contained red blood-globules are gradually replaced by colourless cells. This outer membrane is converted into connective tissue, and the cells either degenerate and are absorbed, or they develop into connective tissue.

In the case of *hæmorrhagic clots*, the blood is found

amongst soft, or broken-up and discoloured brain-substance, or it may have burst into and filled the ventricles. When the patient survives, the fluid part of the blood is absorbed, the coagulum dries up, the surrounding cerebral substance, at first torn and softened, becomes of natural consistence, and either a cyst is formed or a cicatrix alone remains. Extensive cerebral hæmorrhage is usually caused by fatty or fibroid disease of the blood-vessels, by aneurisms of the arteries, or by softening of the tissue of the brain; it often accompanies degeneration of the kidneys and hypertrophy of the heart.

350. Tubercle frequently presents itself in the membranes of the brain, in the form of the grey miliary tubercle, producing meningitis. In children, a firm, yellow, cheesy tumour is often found in the cerebral substance, which is usually termed tubercular. Microscopically, there seem to be two different kinds of these so-called tubercular tumours. In one, which ordinarily constitutes the smaller nodules, you can distinguish numerous miliary tubercles joined together (see fig. 88). The other presents none of the characters of tubercle. It appears to originate in a growth of cells from the connective tissue of the brain (the neuroglia), which become cheesy towards the centre of the mass. The tumour is surrounded by a tissue composed of cells and freely supplied by blood-vessels, whilst its interior and older part presents only firm fibrous tissue.

351. Glioma is the name given to a form of tumour which originates in the connective tissue of the nervous substance. It affects the brain, nerves, and retina, is of slow growth, and is chiefly found in childhood. It is most commonly met with in the substance of the hemispheres, and is frequently the seat of hæmorrhage arising from the rupture of its vessels. Microscopically it consists of small round cells, intermixed with a sparing amount of fine fibres (see fig. 89).

352. Syphilis not unfrequently affects the brain,

the dura mater being the most common seat of gummatous tumours. The portion situated over the convexity of the hemispheres and on the sphenoid bone is most frequently attacked, and the substance of the brain is often softened or involved in the new growth. The disease may originate in the pia mater or the cerebral substance, but this is much more rare than in the dura mater. In some cases the arteries become thickened, their calibre is lessened, and a tendency to the formation of thrombi is the consequence.

FIG. 89.



Section of Gliomatous Tumour of the Brain.

353. MEDULLARY CANCER occasionally presents itself as a cerebral tumour; more rarely the firmer variety (scirrhus) is found. Such tumours may originate from the brain itself, or its membranes, from the bones, or from the orbit or other neighbouring cavities.

The symptoms that should lead you to suspect disease in the brain are—any alteration in the mental

functions or in the powers of motion or sensation, severe or long-continued pain in the head, affections of the sight or hearing unconnected with structural changes in the organs through which these senses are manifested. As you have to trust chiefly to symptoms, you will find more uncertainty in the diagnosis of this class of diseases than in those before described; greater care and more minute attention to the history of each case are necessarily required.

354. One of the means of physical diagnosis that you will find useful is the ophthalmoscope, but a considerable amount of practice is required to enable you to employ it properly. The form of instrument most generally used consists of a slightly concave mirror and a double convex lens. When about to use the ophthalmoscope the patient must be placed on a chair in a darkened room, whilst you seat yourself exactly opposite, and slightly above him. A gas or other bright lamp should be placed on a level with and on the same side, but a little behind the eye you wish to examine. Supposing you are desirous of looking into the left eye, take the handle of the mirror in your right hand and adjust its central perforation to your right eye. Then throw the light from the mirror upon the eye, and vary your distance until you observe the pupil brightly illuminated. Keep the mirror in this position, and place the convex lens a little distance from the pupil. Direct the patient now to look at the wall over the tip of your left ear, and by slightly varying the distance of the lens you will soon catch a view of a retinal blood-vessel. Trace this in the direction of its increasing thickness until you see a white circular patch from which the vessel seems to emerge; this is the optic disc. The optic disc is a nearly circular, well-defined, reddish-white patch, through which the retinal arteries and veins enter the eye. The arteries are smaller and of lighter colour than the veins; the main trunks of both pass

upwards and downwards before dividing into branches (see figs. 90 and 91).

In each case that comes before you, first observe whether there is any striking alteration in the mental condition of the patient. If so, begin at (355); if not, then investigate the state of his powers of motion (378): if you still feel in doubt as to the nature of the disease, ascertain if there be any change in the size of the head (392), or any alteration in sensation (394). In the progress of a single case all the functions of the nervous system may be implicated, but by inquiring into the history of the disease you will generally find which has been most prominently affected.

SECTION I.

There is an Alteration in the Mental Condition.

You may find the mental powers suspended, as in coma (355), or their activity much increased, as in delirium (371). In *deep* coma the patient can neither answer questions nor is he sensitive to light or other stimuli, the breathing is heavy, often snoring, swallowing is difficult or impossible. In delirium the mind is in a state of intense activity, the patient is constantly talking in a rapid, rambling manner, ever changing his position, and often so violent as to require restraint.*

A. You find suspension of the mental faculties.

355. Under this head you may have apoplexy, sunstroke, catalepsy, tubercular meningitis, convulsions, and epilepsy. In the first three of these the loss of consciousness is generally rapid; epilepsy attacks the

* I do not here enter into the subject of insanity, as the student is not likely to meet with such cases in the wards of a General Hospital.

patient only from time to time. In typhoid fever, meningitis, and many other complaints, loss of consciousness occurs towards the termination of the case, and the diagnosis must be determined by the history of the disease.

356. *a*. The patient is in a state of stupor, the pupils of the eye are dilated, the respiration is laborious and snoring, the swallowing difficult, the power of the limbs is lost; the pulse slow, sometimes irregular and intermitting. The urine is retained, or both fæces and urine are passed involuntarily.

The disease is *apoplexy*.

Apoplexy is often preceded by headache, giddiness, and vomiting, or by difficulty in speaking, numbness or palsy of the limbs or face, or by affections of the eyesight or bleeding at the nose. It is only in rare cases that the patient becomes at once comatose, usually a feeling of numbness, or a slight loss of power of one side of one limb, difficulty of speaking, headache, giddiness, or confusion of thought precedes the unconsciousness. The loss of consciousness during the attack varies greatly in degree. It may be very slight and temporary, or it may be profound and remain unaltered until death. The pupils are often unaffected; in some cases they are dilated, in others contracted.

357. Apoplexy may arise from congestion of the brain (*congestive*), the rupture of a blood-vessel in the brain or its membranes (*sanguineous*), or from serous effusion, which, in most cases, depends on disease of the kidneys. When it is the result of congestion, the patient has usually been affected before the fit with nausea, giddiness, dull pain of the head, sleepiness, and inactivity of the body and mind; in case of recovery the duration of the fit is short, the intellectual powers are soon regained, and no paralysis of the limbs or speech remains. In disease of the kidneys you have frequently convulsions, the attack is more gradual than in the other forms, there is

often no snoring, and the urine contains albumen. If the fit has been produced by hæmorrhage into the substance of the brain, there is generally hemiplegia, recognised during the coma by the twisting of the mouth and the loss of power of the limbs of one side; the attack is not necessarily preceded by premonitory symptoms, the mental power, in case of recovery, is slow in returning, and paralysis of one side of the body generally remains.

358. In hæmorrhage into the ventricles there is profound coma, with general paralysis and rigidity of the muscles. When the bleeding occurs into the arachnoid the symptoms are similar to those of ventricular hæmorrhage, but are often accompanied by severe convulsions. Rigidity or tonic contraction of the muscles is a sign of extensive hæmorrhage with laceration of the substance of the brain. When hæmorrhage has taken place into the pons Varolii, the pupils may be contracted instead of being dilated, and there may be at first neither stertor nor paralysis.

359. Coma may be produced by an injury to the brain, uræmia, or poisoning by spirits or opium, as well as by cerebral congestion and hæmorrhage. When you have the opportunity of obtaining a clear history of the case, you should ascertain if there has been any accident, or if the patient has been affected with kidney disease, or has been drinking to excess, or has previously suffered from an attack of paralysis, or from any of the premonitory symptoms of apoplexy. But where, as often happens, the person has been discovered in a state of insensibility, and no account of his previous condition can be obtained, you first examine carefully the face and scalp for any marks of injury, and the ears for blood. Next, observe if the mouth is twisted or if either side of the body is paralysed; if such be the case, a local lesion of the brain is indicated, and if there is no evidence of an accident, you may diagnose hæmorrhage of the brain or its membranes.

If local paralysis is absent, see if the tongue has been bitten, as the occurrence of convulsions limits the causes of the attack to hæmorrhage, epilepsy, and uræmia. In this case examine the urine for albumen. When the coma has been produced by drunkenness, the face is usually flushed instead of pale, the pulse quick, the breath smells of spirits, the patient can be often roused to answer questions, the loss of motor power is seldom complete, and there are no convulsions.* In opium poisoning the pupils are contracted, there is no stertor, and the coma gradually deepens. As, however, the pupils are often partially contracted, and the coma very deep in hæmorrhage into the pons Varolii, the diagnosis may be almost impossible, if there is no history of the attack. Remember in all doubtful cases to use the stomach-pump.

360. Inflammation of the retina is very common in kidney disease (165), and an examination with the ophthalmoscope may therefore prove useful in diagnosis. In the early stage the retinal veins are full, dilated and tortuous, and extravasations appear in different parts, the optic disc is hyperæmic, or bluish-grey, from serous infiltration. At a later stage the optic disc becomes swollen, and its outline is gradually merged into the retina, white spots or patches appear at a little distance from the disc, or they form a broad, glistening, white mound around it. These appearances are shown in fig. 90.

361. *b.* The patient has become unconscious after exposure to the heat of the sun, the face is pale, the

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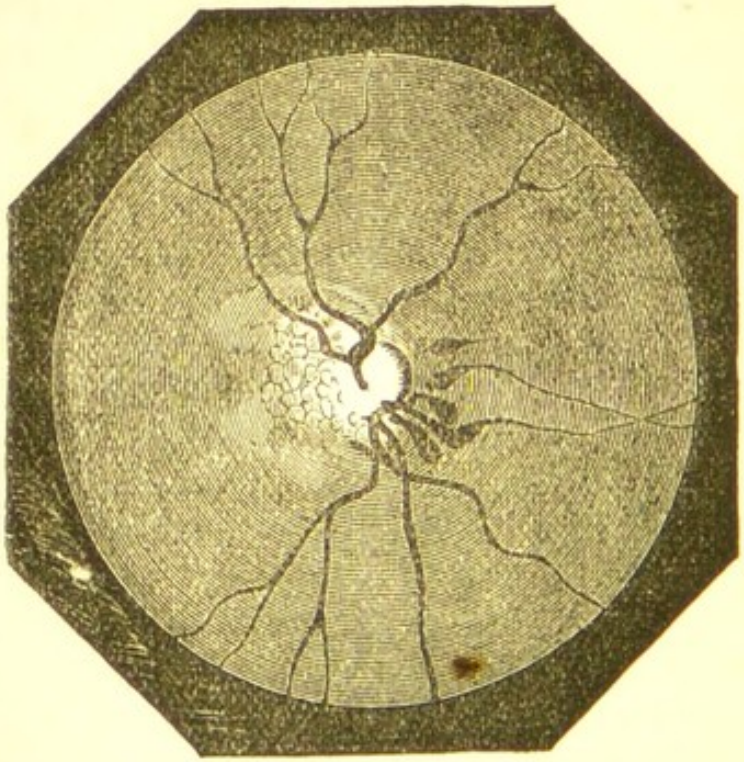
* "Dr. Anstie tells me that it would be possible to recognise the presence of a *poisonous* dose of alcohol in the system, if *one* drop of the urine itself, added to 15 minims of the chromic acid solution, turned the latter *immediately* to a bright *emerald* green. The chromic acid solution is made by dissolving one part of bichromate of potash in three hundred parts by weight of strong sulphuric acid." (Dr. HUGHLINGS JACKSON.)

pupils are contracted, the breathing is snoring, the pulse is frequent, feeble, and often intermitting.

The disease is *sunstroke.*

The complaint is rare in this country. It is usually preceded by sleeplessness, giddiness, heat and dryness of the skin, frequent desire to pass water, and in some cases by convulsions. In case of recovery it is not

FIG. 90.



"A case of retinitis in albuminuria. The optic disc was ill-defined; the vessels were large and tortuous; on the apparent inner side were several small ecchymoses, evidently proceeding from the retinal vessels. On the apparent outer side was a hazy circle, indicating sub-retinal effusion, and at several points were white spots." (POWER.)

followed by paralysis, but the attack very often leaves persistent headache, inability for mental exertion, giddiness, and in some cases it is succeeded by epileptic attacks or insanity.

362. *c.* The patient, usually a female, appears to be unconscious, the eyes are open, the body is rigid, and the limbs remain fixed in any position in which

they may have been when the patient was attacked, or in which they may be placed by others during the seizure. The pulse and respiration are natural, and are very feeble.

The disease is *catalepsy*.

This complaint is very rare, and is generally connected with disordered uterine functions. The attacks may continue for a few minutes only, or they may last for hours; they usually follow a severe mental shock, are never ushered in by convulsions, nor are they followed by paralysis. A modified form of this complaint is sometimes observed in persons of either sex affected with softening of the brain.

363. *d.* The patient (a child), after having suffered from the symptoms of tubercular meningitis gradually sinks into a state of unconsciousness; the eyes are dull and heavy, or squinting, the pupils dilated, the fontanelle is convex and prominent, the respiration often sighing, the pulse slow, sometimes irregular, but becomes more rapid when the child is raised up in bed.

The disease is *tubercular meningitis* (*acute hydrocephalus*).

In very young children the first symptoms that attract notice are vomiting and constipation of the bowels; the eyebrows are contracted, the head is hot and drawn backwards, the pulse is quick, the temperature raised, the child is fretful and suddenly screams as if in severe pain; he turns from the light and starts at any unusual sound. Older children complain from the first of severe pain in the head, and, not unfrequently, the disease in them is ushered in by convulsions. This is often described as the first stage. In the second the child becomes apathetic, lays in a quiet doze from which he can be roused for a few moments, and takes food when forced upon him, the face is pale, the eyes open, the temperature is lower than before, the breathing often irregular, the pulse slow, sometimes irregular, the

vomiting has ceased, but the constipation remains, and the abdomen is retracted. In the third stage the coma deepens, and either the patient sinks from exhaustion, or is cut off by convulsions. Tubercular meningitis is almost always preceded by loss of flesh, unwillingness for exertion, loss of spirits, cough, and other signs of failing health, for some weeks or even months before the attack comes on. It will be generally found that the malady affects those who belong to families some members of which have suffered from enlargement of the lymphatic glands (scrofula) or consumption.

364. Tubercular meningitis occasionally attacks adults who are suffering from phthisis. Severe shooting pains of the head, accompanied by fever, delirium, and vomiting, are usually the first symptoms that attract attention. It must be remembered that constipation in these cases is often absent on account of the coexisting tubercular disease of the intestines.

365. Acute hydrocephalus may be simulated by a state of exhaustion produced by diarrhœa or insufficient feeding. In this condition (*hydrocephaloid disease*) the child is insensible, but the fontanelle is depressed, the head is cool, the face pale, and the bowels are usually purged.

366. The ophthalmoscope may be useful in the diagnosis of both acute and chronic meningitis. In tubercular meningitis, it is said that the optic disc is œdematous, the retinal veins are dilated, extravasations take place, and, in some cases, small, circular, prominent tubercles may be distinguished in the choroid (fig. 91). In chronic meningitis, it is stated that you may meet with serous infiltration of the optic disc, hæmorrhages, and fatty exudations.

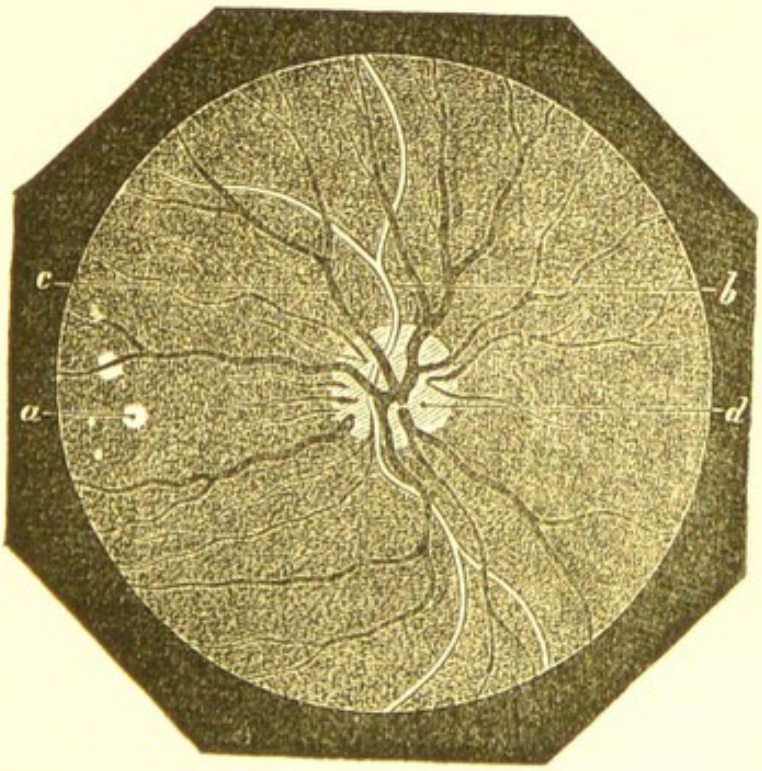
367. *e.* The patient is subject to attacks, in which he falls suddenly to the ground in a state of unconsciousness; the face is distorted, the pupils dilated, and insensible to light, the limbs are violently convulsed, the lips blue, froth issues from the mouth, and

the tongue is often bitten; the pulse is sometimes scarcely perceptible.

The disease is *epilepsy*.

The attacks seldom last more than a quarter of an hour, and are succeeded by a deep, heavy sleep. During the intervals the patient may be in good health, but the mind usually becomes gradually enfeebled, and he displays a want of physical and mental energy.

FIG. 91.



Representation of the appearances seen with the ophthalmoscope in a case of tubercle of the choroid. *a*. Tubercle in the choroid. *b*. Artery of the retina. *c*. Veins of the retina. *d*. Optic disc. (BOUCHUT.)

368. Epilepsy may arise from disease of the brain, or from syphilis, or it may be produced by irritation in some other organ; it is often hereditary, and a fright not unfrequently gives rise to the first seizure, The attacks are occasionally preceded for a few seconds by a sensation (termed the "aura") originating in some part of the body or limbs, and rising to the

head; in other cases by giddiness, headache, or a twitching movement of a limb. Usually the first symptoms are a shrill cry and a twisting of the neck to one side, accompanied by a distortion of the features. In some the unconsciousness lasts only for a few moments, the patient does not fall, and there are no convulsions (*epileptic vertigo*). Occasionally, the fits are followed by violent delirium, or by a loss of power in one side of the body (hemiplegia).

369. Epileptiform convulsions arising from a definite cause, such as the irritation of teeth in children, syphilis, kidney disease, pregnancy, &c., are usually termed *eclampsia*.[1]

370. Epilepsy may be simulated by hysteria, but in the latter, which only affects females, the unconsciousness is less complete, she is sensible to the dashing of cold water on the face, the convulsions are, at any rate to a great extent, under the control of the will, they do not occur during the night, the tongue is not bitten, and the patient is often noisy, or screams, or cries. Also, during the intervals of the attacks, she is liable to palpitation, pain of the left side, choking in the throat, or paroxysms of laughing or weeping.

B. The patient suffers from delirium.

371. Remember that some amount of delirium, especially at night, is common when there is much fever. Thus it often presents itself whenever any important organ is inflamed; in young persons a temporary state of delirium may arise even from dyspepsia; or it may be induced by narcotics, such as belladonna or Indian hemp. Always most carefully examine the condition of the heart and lungs, for it often happens that when inflammation of these organs coexists with delirium, the other symptoms are masked by it.

In the following complaints delirium is frequently a prominent symptom, lasting for some time, and continuing both day and night—typhoid and typhus

fever, acute meningitis and delirium tremens; all are acute disorders.

372. *a.* Along with delirium, often of a furious character, the patient complains of acute pain of the head, aggravated at intervals; there are intolerance of light and sound, contracted pupils, inability to sleep, great restlessness; the face is flushed, the conjunctivæ red, the head hot, the pulse quick and hard, the tongue coated, all food is vomited as soon as taken, and the bowels are confined.

The disease is *acute meningitis.*

In the early stage the patient is attacked by rigors, followed by headache and vomiting, a hot dry skin, and fever. If the complaint is about to terminate fatally the headache lessens, twitchings or convulsions come on, the patient becomes comatose, the pulse is small and thready, the tongue dry and brown. Acute meningitis may arise from injuries to the head, intemperance, syphilis, excessive care or anxiety. It is often produced by disease of the ear or nose, and therefore in every case examine these organs very carefully. Acute meningitis in children has been already described (363). In most cases it is impossible to distinguish simple from tubercular meningitis excepting by the history.

373. Typhoid fever is known from meningitis by the relaxation of the bowels, the smaller amount of headache, the absence of vomiting, the eruption on the skin, and in the slowness of the development of the complaint. In typhus fever you have muttering, not furious delirium, the strength is from the first prostrated, and the characteristic eruption presents itself. Acute mania differs from meningitis in the cleanness of the tongue, the absence of headache, thirst, and vomiting, and in the smaller rapidity of the pulse. The indications given by the thermometer are of very great value in the diagnosis of fevers.

374. *b.* In addition to delirium the patient is ex-

ceedingly restless and unable to sleep; he has hallucinations of the senses (he sees animals, such as beetles, mice, &c.), his hands tremble, the face is pale, the skin is covered with perspiration, the pulse feeble and quick, and the tongue is moist and creamy. His history shows that he has been in the habit of drinking to excess.

The disease is *delirium tremens.*

The chief difficulty in diagnosis is between this disease and meningitis, for the latter may also arise from drunkenness, although it is, in comparison with the former, very rare. You distinguish them by the severe headache, the hard, quick pulse, the heat of the head, and the raving of meningitis.

375. A form of delirium tremens occurs in those whose occupation exposes them to lead poisoning. In such persons you will find a blue line on the gums around the teeth, they have generally suffered from colic or palsy, and the delirium is chiefly at night.

C. The patient suffers from gradual diminution of his mental powers.

Under this head you may meet with chronic softening of the brain, chronic meningitis, and paralysis of the insane (386).

376. *a.* The intellect has been gradually impaired, especially the memory of recent events, the temper is irritable, the face dull and expressionless, there is a tendency to laugh or cry on the least emotion; headache and giddiness are often present.

The disease is *chronic softening of the brain.*

This complaint frequently follows hæmorrhage into the brain or acute softening. It may also arise from disease or obstruction of the blood-vessels by emboli, from general debility, excessive mental effort, tubercular or other tumours, epileptic attacks, congestion of the brain, or syphilis.

377. In *chronic meningitis* you have nearly the same symptoms as in softening of the brain; but there are more headache, irritability of temper, depression of

mind, and occasional delirium. It is not preceded or accompanied by palsy, and there is usually a history of some injury to the head, rheumatism, or syphilis.

SECTION II.

The Prominent Symptoms are those of Alterations in the Power of Motion.

The muscular power may be diminished (paresis), or lost (paralysis) (378); or it may be increased and involuntary (388).

A. You have diminution or loss of muscular power.

378. You ascertain the loss of muscular power in different ways. Direct the patient to move the palsied part, and the muscles are seen to obey his rule imperfectly or not at all; thus, one side of the face being paralysed, you will ask him to laugh, and you will see the mouth drawn to the opposite side. In some cases you test whether the reflex action is intact, as, for instance, by tickling the sole of the foot and observing if the leg is drawn up involuntarily. In others you apply electricity to ascertain if the muscles are able to respond to that stimulus. Always remark whether, with the palsy, there are any cramps or contractions of the muscles, and if so, at what stage of the disease they have occurred.

379. Sensation is often impaired when the power of motion is defective. You ascertain this by inquiry, or, for greater exactness, you measure with a pair of compasses the smallest distance to which the points can be separated whilst the patient is sensible of the contact of both. The muscular sense may be impaired although the sensibility of the skin is perfect. In this case the movements of the part affected are awkward and irregular, and can only be performed when the will is strongly directed to the object or when the muscles are assisted by the eyesight.

In hemiplegia and paralysis of the insane the loss of motor power is a prominent symptom. It is also often present in cases of tumour of the brain (395).

380. *a*. The patient is paralysed on one side of the face, tongue, and body; the face is drawn to the opposite side from that palsied, speech is generally imperfect, and the tip of the tongue when protruded is pushed to the affected side.

The disease is *hemiplegia*.

This complaint generally comes on suddenly. It is often accompanied by apoplexy; in other cases there is sudden loss of speech and power of motion without the consciousness being affected. The patient may gradually recover, or the paralysis may persist, or the attack may be followed by softening of the brain. The arm is usually the latest part to regain its power.

381. Hemiplegia may follow chorea, epilepsy, hysteria, softening, abscess, tumour of the brain, or cerebral hæmorrhage. It also not unfrequently results from obstruction of some of the cerebral arteries by clots or vegetations that have been detached from diseased valves of the heart, and swept into the circulation (12). In chorea the loss of power is preceded by the muscular twitchings characteristic of that disease. The hemiplegia of epilepsy follows a fit, usually soon disappears, but is apt to return after each convulsive attack. In hysterical paralysis the face or speech is seldom affected, the whole side is not equally paralysed, and the patient exhibits other symptoms of hysteria. When it has arisen from an embolus the attack is sudden and complete at once, there is rarely any loss of consciousness, and you can detect disease of one of the valves of the heart or some other part of the circulating system from which an embolus might have been detached. When softening has produced the hemiplegia, there is usually no loss of consciousness, and the muscles of the affected parts are relaxed; the attack has been preceded by giddiness, headache,

impairment of the mental powers, or irritability of temper; the heart is generally feeble, and in young persons its valves are often found to be diseased. When hæmorrhage has taken place in the brain, there is a loss of consciousness at the commencement of the palsy which often occurs when the patient seems in good health, the muscles of the affected limbs are often contracted, and you will frequently discover either evidence of granular disease of the kidneys, or a hard thickened feeling of the artery at the wrist, or a white ring surrounding the cornea will show that the arteries of the brain are probably diseased. After the first shock is over, the condition of the mental faculties and the articulation often improve if the attack has been caused by hæmorrhage, but in cases of softening the mind remains enfeebled, and recovery in other respects is slow and imperfect.

382. You may have an imperfect form of hemiplegia from congestion of the brain. Sometimes hemiplegia is preceded by loss of power in the parts supplied by particular nerves, as the tongue or eyelid. Paralysis of the portio dura often occurs from cold, but in this case the patient is unable to close the eyelids from loss of power in the orbicularis, or to wrinkle the forehead, and the muscles do not respond normally to electricity as they do in the palsy of cerebral origin.

383. The extent of the paralysis varies according to the nerves affected. If the third nerve is implicated there is drooping of the upper eyelid, dilatation of the pupil, and an outward squint; if the fifth, the muscles of mastication act less forcibly on the affected than on the opposite side; difficulty in swallowing shows that the disease has implicated the vagus and glosso-pharyngeal nerves. When the affection has occurred above the pyramids, where the motor nerves decussate, the palsy takes place on the side of the face and body opposite to that which is injured. In some rare cases disease attacks the cord just below the

decussation, and then the palsy is on the same side as the seat of the disease, and the nerves of the face are not affected.

384. The term *aphasia* is applied to that condition in which a person is unable to express his thoughts by means of words. It usually presents itself in patients affected with hemiplegia of the right side of the body, and seems to arise from hæmorrhage or some other lesion of the third frontal convolution of the left side of the cerebrum. It must not be confounded with *aphonia* (72), in which there is a mere loss of voice from imperfect action of the vocal cords, or with a difficulty of speaking produced by paralysis of the tongue, a condition very generally met with in hemiplegia.

385. The muscles of the palsied limbs may be relaxed at the time of the attack, as in softening of the brain ; or contracted when the nervous matter is irritated by a clot ; or the muscles, at first relaxed, may subsequently become contracted, from inflammation or irritation set up during the cicatrization of the injured parts of the brain, or from sclerosis of the lateral columns of the spinal cord.

386. *b.* The patient, with symptoms of disordered intellect, gradually loses the powers of sensation and motion, his lips and tongue are tremulous, and he is unable to pronounce his words, or does so imperfectly.

The disease is *paralysis of the insane.*

In some cases the mental changes are not well marked in the early stage, and the difficulty of articulation and the gradual paralysis chiefly attract attention. Atrophy of the optic nerve is often present.

387. In atrophy of the optic nerve there is a pale, white, or bluish-white discoloration of the papilla, diminution in the calibre and number of the little nutritive blood-vessels upon the expanse of the disc, attenuation of the retinal vessels, more especially the arteries, and frequently a peculiar excavation of the optic nerve.

B. You find increased and involuntary muscular action.

388. When this affects only a part of a limb, it is named *spasm*; when excessive and involuntary muscular action is general and attended with unconsciousness, it is called *convulsion*. Spasms, again, may be "*tonic*,"—that is, continuous; or "*clonic*,"—that is, alternating with intervals of relaxation. Convulsions occur at all ages and in different diseases. Children are most liable to them, and at an early period of life they often usher in eruptive fevers, or they may be produced by teething, worms, or other causes of irritation. They also occur in various diseases of the brain.

In the following diseases the whole or large portions of the muscular system are affected with increased and involuntary action—tetanus, hydrophobia, and chorea.

389. *a*. The muscles of the body are stiff and rigid, the features retracted into a characteristic grin, painful spasms occur at frequent intervals, severe pain is experienced, shooting from the epigastrium to the back, the intellect is unimpaired.

The disease is *tetanus*.

Tetanus generally follows some injury, although it sometimes occurs idiopathically. The first symptom is stiffness about the back of the neck and jaw, whence it spreads over the whole body. The pulse is quick and small, the bowels confined, thirst and fever are generally present, the temperature is not at first very high but often becomes greatly elevated (110°) just before death. When the spine is arched backwards by the strong action of the muscles, so that the body rests on the head and the heels, the condition is termed *opisthotonos*; when it is bent in the opposite direction *emprosthotonos*; when the curvature takes place laterally it is named *pleurosthotonos*. An overdose of strychnia produces similar symptoms; but the spasms come on suddenly, they affect the whole body

at once, and are in paroxysms, not continuous as in tetanus.

390. *b.* There are violent spasms of the throat on attempting to swallow, a horror of liquids, great restlessness, want of sleep, often maniacal excitement. The pulse is feeble, the skin covered with sweat, and the saliva is secreted in increased quantity. The patient has some weeks or months previously been bitten by a dog or cat. .

The disease is *hydrophobia.*

This disease is rare, and is generally readily recognised by the patient's dread of drinking.

391. *c.* The muscles are affected with a disorderly jerking, painless, involuntary motion; the tongue is projected from the mouth with a jerk, and as suddenly withdrawn; the limbs cannot be kept at rest, the muscles of the face twitch, the speech is often hesitating.

The disease is *chorea.*

The hands and arms are generally first affected, and often to a very slight degree, but the unsteadiness increases and gradually extends to other parts. Occasionally only one side of the body is attacked, but generally both. In many cases there is a murmur at the mitral valve. The urine is often of high specific gravity, and contains an excessive amount of urea. This disease usually attacks persons from five to fifteen years of age, often follows or precedes acute rheumatism, is most common in females, and is very apt to recur. Dr. Hughlings Jackson believes that it is produced by embolism of the cerebral capillaries.

SECTION III.

You find the Head much Increased in Size.

There are only two diseases in this class—viz., chronic hydrocephalus, and hypertrophy of the brain.

392. *a.* The skull is much increased in size, especially at its upper part; the fontanelles are often unclosed, the eyes protrude and are directed downwards.

The disease is *chronic hydrocephalus.*

In the early stage the child may appear in perfect health, but, as the disease progresses, it becomes irascible, feeble in body and mind, and subject to convulsions. Nutrition is impaired, the patient is usually unable to walk, the senses are dull, and in some cases convulsions occur. The disease usually begins in children below six months of age.

393. *b.* Hypertrophy of the brain is a rare affection in which, excepting the increased size of the head, there are at first no prominent symptoms. The enlargement begins at the occiput, and the eyes remain deep; there is no prominence of the fontanelles.

SECTION IV.

You find that the Patient suffers from Severe Pain of the Head without Fever, the Intellect and Power of Motion being unaffected.

Headache may arise from dyspepsia, rheumatism, neuralgia, chronic disease of the brain.

394. Dyspeptic headache is recognised by the pain being aggravated after food, or accompanied by obstinate constipation, bilious vomiting, acidity, or other signs of disordered digestion. In rheumatism, the scalp is tender, and the patient has usually

suffered from the complaint elsewhere. If the pain is nocturnal, and there are tender swellings on the head, it is probably caused by syphilis, and you must inquire into the previous state of the patient's health. Neuralgia is chiefly felt in the course of some of the nerves of the face or head, and the pain is liable to periodical exacerbations; the most common seat of the pain is the temple, and you will then often find disease of the teeth or gums. Sometimes you will be able to trace the complaint to gout or ague. Various chronic diseases of the brain and its membranes are attended with pain, but they must be diagnosed by their other symptoms.

395. Tumours of the brain are often very difficult of diagnosis, the symptoms varying according to their nature, size, and position. As a general rule, they are attended with severe, constant pain, confined to one part of the head, and by paralysis of one or more of the cranial nerves gradually coming on and slowly progressing. The optic nerves are most frequently affected, but deafness, or loss of smell or taste, may present itself; the third nerve is also very generally implicated. In other cases attacks of vomiting, giddiness, or epileptic seizures form the most prominent symptoms. Similar symptoms may, however, be produced by abscess, softening, or other diseases of the brain. You should therefore inquire if the patient has suffered from any accident to the head, discharge from the ears or nose, or has any valvular disease of the heart.

396. If a young and apparently healthy person has suffered for some months from intense headache, attended with attacks of urgent vomiting, and if with the ophthalmoscope you ascertain the presence of *double optic neuritis*, it is probable that he has a tumour in some part of the brain. The diagnosis will be strengthened if there be also paralysis of the whole of one or more cranial nerves.

397. You cannot determine the nature of a cerebral

tumour by the symptoms it produces, but it is well to remember that tubercular tumours are chiefly confined to children, glioma is most liable to occur in children and young persons, whilst cancer is rarely met with except in those advanced in life.

398. Syphilis affects the brain and spinal cord, either by producing disease of the coats of the arteries or by the formation of tumours. As results of these morbid changes, you meet with paralysis, either of the whole side (hemiplegia), of the lower limbs (paraplegia), or of one or more of the cranial nerves; in other cases epileptiform convulsions occur. When a *young* person who has suffered from syphilis, and who has neither disease of the heart nor kidneys, is attacked with hemiplegia, you are justified in concluding that the disease is syphilitic. Dr. Hughlings Jackson remarks:—"With regard to palsies of the cranial nerves, our impression is that the suspicion is greatest when the fifth is involved; next when the portio dura nerve—especially if there be also complete deafness without discharge from the ear; next the third, then the sixth, and lastly the eighth and ninth. If several of the nerves are involved, one after another, or at the same time, the suspicion is greater still, and all the more if the palsies be limited to one side. Convulsions of any sort may be due to syphilitic disease of the brain, but syphilis is most frequently associated with fits which begin by spasm in one hand, one foot, or one side of the face, and which are not followed by hemiplegia for a varying time." As patients often deny they have suffered from syphilis, you should always examine in suspected cases for nodes on the head and shins, holes in the palate, the presence of a coppery rash upon the skin, and the results of iritis.

399. The changes in the eye, as observed by the ophthalmoscope in tumours of the brain, are either produced by optic neuritis or by atrophy of the optic nerve. In many cases the patient has no diminution

in the power of vision, so that the ophthalmoscope should be employed in all cases where "coarse" cerebral disease is suspected.

According to Von Graefe, the engorged papilla is chiefly distinguished by great but perhaps partial swelling and prominence of the disc, numerous and considerable hæmorrhages on and around the papilla, and great dilatation, darkness, and tortuosity of the veins; the arteries being, on the contrary, very small, attenuated, and often almost bloodless. The inflammatory infiltration of the retina is confined to the close vicinity of the nerve entrance.

The ophthalmoscopic signs which especially characterize atrophy of the optic nerve are—a pale white or bluish-white discoloration of the papilla, diminution in the calibre and number of the little nutrient blood-vessels upon the expanse of the disc, attenuation of the retinal vessels, more especially the arteries, and frequently a peculiar excavation of the optic nerve.

400. The following Table will be found useful in giving the student an idea of the seat of the lesions of the brain and spinal cord in cases of paralysis :—

Tabular View of the Seat of Lesion in Paralysis due to Injuries or Diseases of the Brain and Spinal Cord.

Symptoms.	Seat of Lesion.
Paralysis of muscles supplied by the facial nerve (Portio dura of 7th) without anæsthesia, and without deafness, commonly called Bell's Paralysis.	In ordinary cases is entirely independent of intra-cranial lesion.
Partial anæsthesia (part of 5th nerve), and *partial* paralysis of other cranial nerves, as some forms of strabismus (squint), and ptosis (dropt eyelid), and partial loss of smell, &c. &c.	May sometimes depend upon pressure or interference with the functions of the nerves outside the cranium.

Symptoms.	Seat of Lesion.
Complete paralysis of any cranial nerve, particularly of the whole 3rd, 5th, or 7th pair, and complete anæsthesia of one side of the face, or complete loss of any special sense.	Almost always central; generally on the *same* side of the brain (probably *all* the cranial nerves decussate, as some most certainly do).
Right arm and leg paralysed, and *right* half of face partially so (mouth *drawn* to opposite side). (In *left* Hemiplegia, all the symptoms and seat of lesion would be *reversed* as to side.)	*Left* optic thalamus, or corpus striatum, or cerebral lobe of *left* side or *left* half of pons Varolii *above* decussation of facial nerves.
Right arm and leg paralysed, but *left* side of face.	*Left* half of pons Varolii below the decussation of the facial.
Right arm and leg paralysed, and *both* sides of face.	Left half of pons Varolii at the *level* of decussation of facial nerves.
Right arm and leg powerless, and their *sensibility* and *heat* diminished. Temperature and sensibility of left arm and leg, &c., *increased*.	Medulla oblongata or pons Varolii on *left* side *above* decussation of anterior pyramids.
Loss of *motion* with *hyperæsthesia* and increased heat of right arm and leg, &c.; anæsthesia and loss of temperature in left arm, leg, &c.	Lesion in left side of medulla oblongata at *level* of decussation of anterior pyramids.
Right arm and leg paralysed (as to motion), more sensitive and hotter, but *left* arm and leg cooler, and less sensitive, or quite anæsthetic.	Injury to right half of spinal cord; above brachial plexus; below decussation of anterior pyramids.
Both legs paralysed, as to both motion and sensation. Paralysis of the sphincters of the bladder and rectum.	Both halves of spinal cord, *below* the brachial plexus.

CHAPTER XII.

DISEASES OF THE SPINAL CORD.

The spinal cord is liable to the same diseases as the brain, but there is considerable difference in the frequency with which these organs are affected by them. Thus hæmorrhage, which is so constantly met with in the brain, is comparatively rare in the cord, whilst sclerosis is much more common in the latter than the former.

401. Spinal Meningitis, or inflammation of the membranes of the spinal cord, presents morbid changes similar to those caused by inflammation of the cerebral membranes.

402. Myelitis, or inflammation of the spinal cord, usually ends in softening; the appearances are similar to those of cerebral softening. The morbid action ordinarily commences in the grey matter: where hæmorrhage is present, it is usually the result and not the cause of the softening.

403. Infantile Spinal Paralysis.—This seems to arise from inflammatory softening of the anterior cornua of the spinal cord. It may be localized or diffused, the cervical and lumbar enlargements are usually the chief seats of the disease. *Microscopically*, in the early stage the vessels of the affected part are dilated, nucleated cells are diffused throughout the tissue, and the ganglion cells are destroyed. In long-standing cases the ganglion cells have disappeared, and their place is occupied by connective tissue, and the motor nerves connected with the diseased structure are in a state of atrophy. In the muscles of the

paralysed limbs there is an increase of the connective tissue between the muscular fibres, whilst the latter are diminished in bulk or in a state of fatty degeneration.

404. Grey Degeneration of the Brain and Spinal Cord.—The white substance of these organs is liable to two forms of grey degeneration—the non-inflammatory and the inflammatory. In both cases the grey colour arises from the wasting of the white substance of Schwann, leaving intact the axis-cylinder of the nerve-fibres, which is of a greyish colour.

The *non-inflammatory grey degeneration* most frequently affects the spinal cord, usually commencing at the lower part and extending upwards. It generally begins at the surface, so that a section of the cord shows the posterior columns converted into a reddish-grey material, which extends inwards to a variable distance (fig. 94). Microscopically, there is a great increase in the amount of the connective tissue, forming a network of fine fibres, which compresses the nerve-fibres, and leads to their degeneration. The white substance of Schwann first breaks down, but the axis-cylinder can be often recognised even at a late period of the disease.

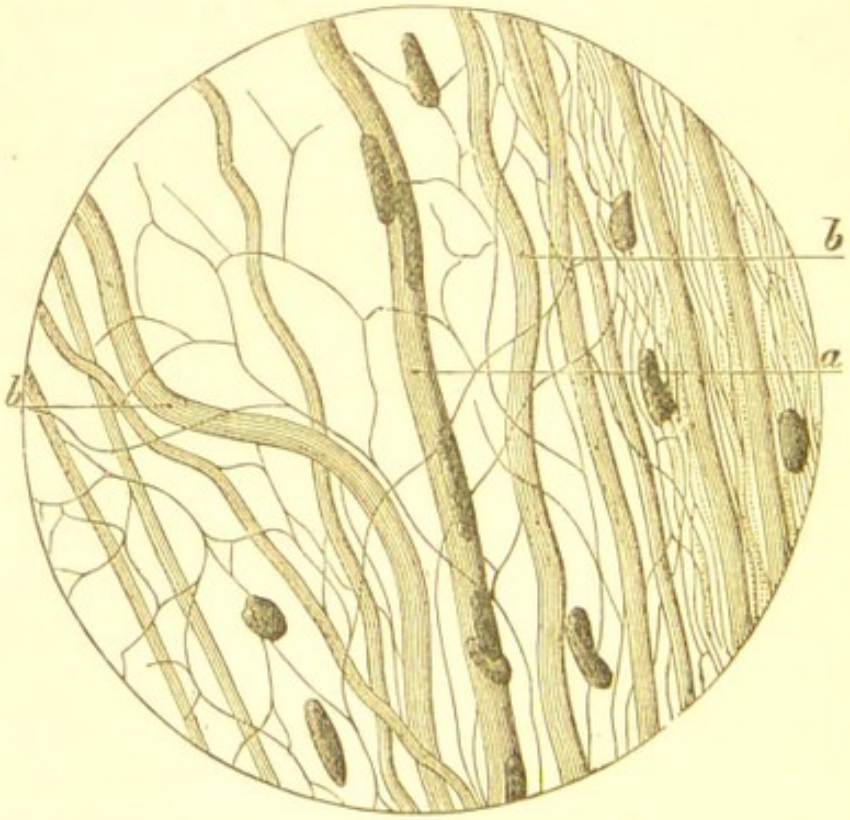
The *inflammatory grey degeneration* is usually more limited in extent than the preceding form. It gives rise to hardness and a certain amount of reduction in the thickness of the affected parts. *Microscopically*, the external coats of the blood-vessels are seen to be greatly thickened, the connective tissue is increased in amount, and the nerve fibres are compressed and degenerated as in the non-inflammatory form.

405. Multiple or Disseminated Sclerosis.—This usually affects both the brain and spinal cord. A number of hard, dense, isolated and well defined patches of a greyish material may be seen in various parts of the nervous centres, the white matter being the chief seat of the morbid change, and the nerves

coming from the patches often being involved in the disease. The microscopical characters are similar to those described in other cases of grey degeneration. (See fig. 92.)

406. In Locomotor Ataxia, atrophy and degeneration of the posterior columns and of the posterior roots of the spinal nerves, sometimes of the posterior cornua of the grey matter, have been found on

Fig. 92.



Section of a patch of multiple sclerosis as seen under the microscope. *a*. Capillary blood-vessel. *b*. Axis-cylinders of nerves. Between the nerves are seen the fibres of recently formed connective tissue. (Charcot.)

microscopic examination. The membranes are generally normal. The morbid change appears always to commence at the surface, and to spread towards the centre.

407. When degeneration has occurred in the lateral columns of the cord it is termed *lateral sclerosis*. It frequently follows cerebral hæmorrhage or softening

of the brain, but occasionally it takes place, like degeneration of other parts of the nervous centres, without apparent cause. When the pons Varolii or medulla oblongata is attacked, the disease is termed Bulbar Paralysis.

408. In Wasting Palsy, isolated parts of the anterior cornua of the spinal cord, and of the motor nerves arising therefrom, have been found in a state of degeneration, as in cases of infantile paralysis. The muscular structure of the affected limbs is completely wasted; it appears pale and soft, and microscopically the fibrils seem fatty or granular.

The symptoms that should direct your attention to the spinal cord are the pains of the back, round the abdomen, or shooting suddenly down the legs or arms in the direction of the nerves, partial or complete loss of motion or sensation in one or both of the extremities, or loss of power over the bladder or rectum.

First ascertain if the complaint has commenced suddenly or gradually. If acute, begin at (409); if gradually, pass on to (411).

SECTION I.

Acute Diseases of the Spinal Cord.

Although locomotor ataxia occasionally occurs as an acute disease, the cases under this head usually met with are cerebro-spinal fever (449), acute myelitis and infantile paralysis. In both of the latter the early appearance of paralysis constitutes the prominent symptom.

409. *a*, The patient is suddenly attacked with loss of sensation and diminished power of motion, followed in a few hours or days by complete paralysis of the lower limbs, retention or dribbling away of the urine, and loss of power over the rectum. The bowels are

confined, the pulse quick and small, and the temperature elevated; but there is not necessarily any pain of the back or limbs.

The disease is *acute myelitis.*

The extent of the paralysis of course depends on the part of the cord affected. Thus if the inflammation has been confined to the lumbar region, the lower limbs are alone powerless; whereas if it has implicated the cervical enlargement, the arms and intercostal muscles will be also paralysed. After a few days there is usually a tendency to the formation of bed sores and inflammation of the bladder, and the affected muscles rapidly waste. The usual cause of the complaint is an injury or disease of the spine, but in rare cases it follows exposure to wet and cold.

FIG. 93.

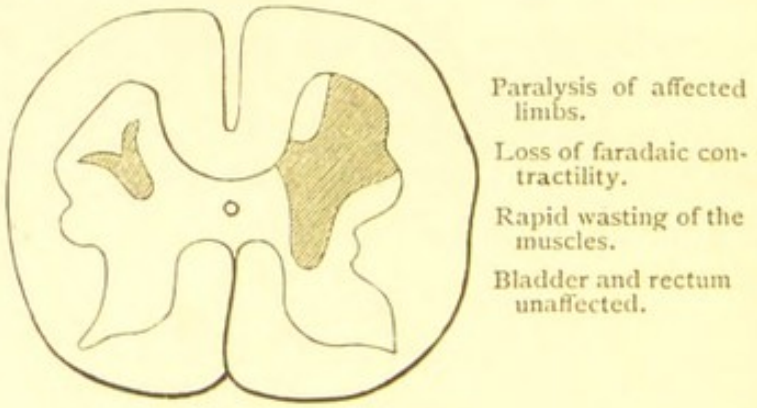


Diagram of section of spinal cord in infantile paralysis. (ROTH.)

410. *b.* After an illness of some hours or days, in which either fever, stupor, or convulsions have formed the prominent symptoms, the patient (a child) is discovered to have lost its power of moving one or more limbs, or some part of a limb. The bladder and rectum are unaffected.

The disease is *infantile paralysis.*

The early symptoms preceding the paralysis are rarely recognised, and the loss of power is usually discovered by accident. Partial or complete recovery

sometimes ensues, but any muscles that remain paralysed quickly waste and lose their power of faradaic contractility. Where a limb remains paralysed, growth is checked, and the bones as well as the muscles remain stunted. The disease is most common in children below two years of age, and often follows dentition, eruptive fevers, and exposure to cold and damp. (See fig. 93.)

SECTION II.

Chronic Diseases of the Spinal Cord.

First observe if there is any trembling of the affected muscles. If this is not the case begin at (411); if there is trembling, pass on to (417).

A. There is no trembling of the affected parts.

In all of the following diseases loss of motor power, without well-marked trembling, is the prominent symptom: — Chronic myelitis, locomotor ataxia, glosso-labio-laryngeal paralysis, and progressive muscular atrophy.

411. *a.* After slight numbness or altered sensation in the legs and feet, a loss of motion and sensation is experienced in both the lower limbs. The patient drags his legs when walking, or loses all power over them, and also over the bladder and rectum, but involuntary startings of the limbs are often present. When confined to bed, bed-sores are apt to form.

The disease is *chronic myelitis* (*paraplegia*).

The extent of the palsy depends on the amount of disease in the cord; only the lower limbs, or both the upper and lower, may be affected, according to the seat of the lesion. The urine is generally ammoniacal, and deposits a thick ropy mucus. Paraplegia may arise from hysteria, softening of the spinal cord or tumours, &c., compressing the cord. In hysteria the paralysis is seldom complete, it varies greatly in amount at different periods, and other

hysterical symptoms are present. In some cases the affection of the cord arises from disease of the vertebræ, or their cartilages; therefore examine if there is curvature of the spine, or if pain is produced by a smart shock upon any portion of it, or by the application of a sponge wrung out of hot water. Also inquire if the patient has suffered from any accident shortly before the first appearance of the symptoms.

412. *b.* The patient has an awkward, unsteady gait, the feet are thrown outward and forward, the heels first coming to the ground; when his eyes are closed he staggers and stumbles; when sitting he can move his legs strongly, sensation in the affected limbs is

FIG. 94.

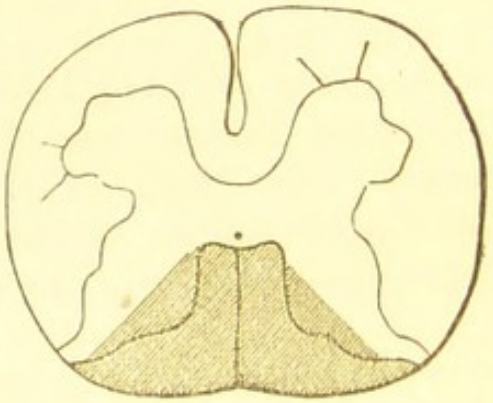


Diagram of section of spinal cord in locomotor ataxia. (ERB.)

very imperfect. He gradually loses his power of motion and sensation; the arms are usually affected at a later period than the legs.

The disease is *locomotor ataxia.*

The patient is usually first attacked with wandering, sharp piercing pains of the limbs, occurring in paroxysms; often with double vision and extreme or unequal contraction of the pupils. There is sometimes, but not always, imperfection in the power of the bladder or rectum. The disease is usually slow. There is occasionally atrophy of the optic nerve, but this seldom occurs in the early stages. When the limb is supported, a smart tap over the ligament of

the patella produces none of the ordinary jerking of the leg. The disease rarely occurs in females. (Fig. 94.)

413. You distinguish locomotor ataxia from paraplegia by the characteristic pains of the limbs and the affections of the sight that generally accompany or precede the former, by the function of the bladder not being so much affected in it, and by the muscular power of the limbs being intact when the body is in the sitting or recumbent position.

414. *c.* In glosso-labio-laryngeal (bulbar) paralysis the earliest symptom is usually difficulty in speaking, arising from stiffness of the tongue, but in other cases the voice first becomes weak and altered in its tone. The loss of power of motion and sensation increases, until the lips, tongue, soft palate, pharynx, and larynx are all affected, and the paralysed parts gradually waste. The intellect is not impaired, but towards the termination of the case there are frequently rapid and irregular action of the heart and attacks of dyspnœa.

415. *d.* Weakness of some muscle or group of muscles gradually takes place (usually the ball of the thumb or the deltoid is first affected), followed by their wasting and gradual disappearance; the sensibility of the parts is not impaired; vibrations of the enfeebled muscles are often observed.

The disease is *progressive muscular atrophy.*

The course of this disease is generally very chronic (9 months to 5 or 6 years), and life is generally destroyed by the muscles of respiration becoming implicated. There is no diminution in the faradaic contractility of the affected parts, and the loss of power does not precede but follows the atrophy of the muscular fibres.

416. You may have local paralysis from other causes. Thus the throat is sometimes paralysed after diphtheria, or the upper eyelid or even the whole side of the body may suffer in this way in children from

the irritation of teething. Workmen in lead are liable to palsy of the extensor muscles of the forearm, but the peculiar dropping of the wrist, the discovery of a blue line round the gums, the previous existence of colic, and the nature of the occupation, will in such cases direct your diagnosis aright.

B. The loss of power is accompanied by a trembling of the affected parts.

Under this head you meet with paralysis agitans, multiple sclerosis, and lateral sclerosis.

417. *a.* The parts affected are continually shaking independently of voluntary movements; at first the muscles can be steadied by an effort of the will, but afterwards their motions are beyond control.

The disease is *shaking palsy* (*paralysis agitans*).

The speech is slow but not difficult. The hands are generally first attacked, and the power of writing is lost; when the neck suffers the head is constantly shaking, and eventually droops. In many cases there is a tendency to stoop forwards, and the patients are obliged to run when they attempt to walk. It chiefly affects old persons, and not unfrequently follows violent mental emotion or distress of mind. The intellect is unimpaired, and the power over the bladder and rectum is unaffected.

418. *b.* The affected limbs are feeble and tremble whenever a muscular effort is made, but the tremor is absent when they are at rest and during sleep. After a time the trembling disappears, and the limbs become completely paralysed, often contracted. The speech is slow and hesitating, each word being uttered in syllables, the lips tremble, the eyeballs oscillate (nystagmus), giddiness is complained of, and the mental powers are impaired. There is a liability to attacks of apoplexy attended with elevation of temperature.

The disease is *multiple sclerosis.*

The lower extremities are usually first attacked, but the symptoms of course vary according to the

parts of the nervous centres which are the seats of the patches of sclerosis. In some the cord is almost entirely affected, in others loss of intellectual power forms the prominent symptom. The disease usually presents itself in persons below forty years of age, and is most general between twenty and thirty. (Fig. 95.)

419. You distinguish multiple sclerosis from paralysis agitans, with which it was formerly confounded, by the trembling in the former taking place only during muscular efforts, whilst in paralysis agitans it occurs even when the limbs are at rest. In multiple sclerosis there is loss of power before the

FIG. 95.

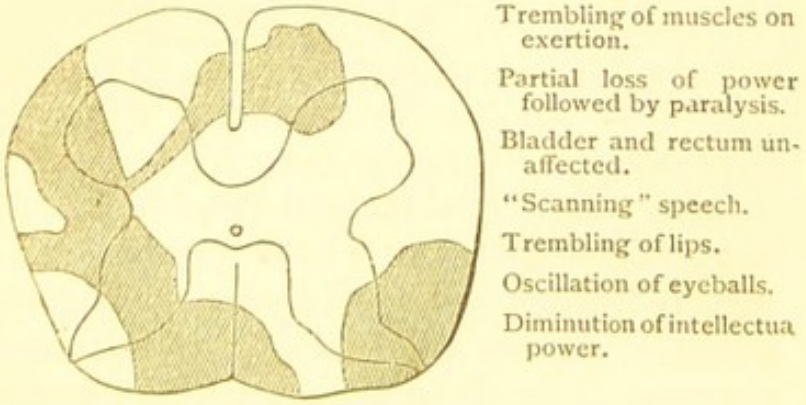


Diagram of section of spinal cord in multiple sclerosis. (ERB.)

tremor is apparent, in paralysis agitans the paresis follows after the trembling has lasted for some time. Multiple sclerosis usually attacks persons below forty; it is accompanied by nystagmus, a slow hesitating "scanning" pronunciation, by giddiness, impairment of the intellect, and by a liability to attacks of apoplexy. Paralysis agitans is a disease of old age: there is no nystagmus, the articulation is not altered, and the mental powers are unaffected.

420. *c.* Lateral sclerosis usually occurs as a consequence of disease of the brain or spinal cord, but it occasionally comes on without apparent cause. The

affected muscles gradually lose their power, and become rigid and contracted, every effort being accompanied by spasmodic twitchings or tremors. When, as is often the case, the disease implicates the anterior cornua, rapid wasting of the muscular structures ensues. (Fig. 96.)

FIG. 96.

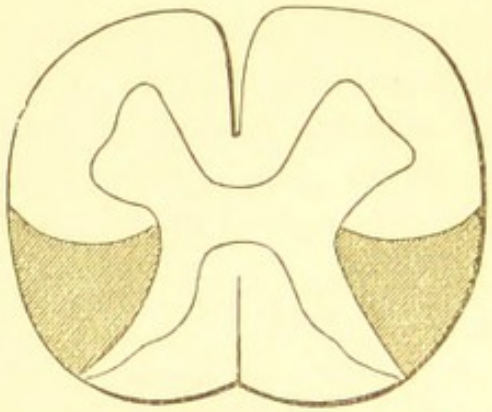


Diagram of section of spinal cord in lateral sclerosis. (ERB.)

421. *Mercurial tremor* is a form of trembling palsy that affects persons whose occupations oblige them to use mercury. *Writer's cramp* is a painful cramp affecting the hands and fingers of clerks whenever an attempt is made to use a pen. It probably arises from over-action of the muscles.

CHAPTER XIII.

FEVERS.

422. Almost every inflammation is attended with the symptoms of fever—viz., quick pulse, thirst, increased heat of skin, loss of appetite, scanty high-coloured urine, confined bowels, and general restlessness or great weakness. In case, therefore, you meet with these symptoms, you must first examine the condition of all the principal organs, so as to find if there is any local cause sufficient to account for them. Remember that in children slight affections, such as teething or indigestion, may give rise to sharp febrile symptoms. You should not conclude, however, because you find some organ affected, that it has necessarily produced the fever, for every fever is liable to give rise to local inflammations. To arrive at a correct diagnosis you must carefully inquire into the history of each case, and discover whether the symptoms of the local disorder, or those of the fever, were first developed.

423. Late researches seem to throw considerable light upon the nature of febrile diseases. It has been shown that certain vegetable organisms, named bacteria, which are so minute as to require the higher powers of the microscope for their detection, are often present in the blood and tissues of those affected with these disorders. When some of these bacteria are removed from the body they can be grown on various substances, such as jelly and animal broths, and by inoculating certain animals with minute portions of the organisms thus cultivated the original malady is

reproduced in them. In this way tubercle, erysipelas, pyæmia, &c., have been communicated from man to some of the lower animals, and the causation of these diseases by bacteria has been demonstrated. In others, although micro-organisms have been discovered in the system during life, all attempts to reproduce the diseases in other animals have failed, so that their dependence upon such a cause is still doubtful.

424. In the investigation of fevers you will require all the means of physical diagnosis you have already learnt to employ in the diseases of each organ. In addition, the thermometer is necessary to enable you to obtain correctly the temperature of the patient. A little care is required in its use. Introduce the bulb of the instrument below the fold of the skin covering the edge of the pectoralis major muscle, and keep it in close contact with the axilla for five minutes, having previously warmed it by holding it in the hand. Read off the degree of temperature to which the mercury has risen before removing the thermometer, unless it has a self-registering scale attached to it. The observations should be taken twice in the day; from seven to nine in the morning, and from five to seven in the evening, being the most suitable times. The normal temperature of the axilla is 98·6°, and any notable deviation from this (below 97° or above 99·5°) betokens ill-health. In addition to the temperature you should record at each visit the state of the pulse, and the number of respirations the patient makes in a minute.

425. No conclusion can be drawn from a single observation of temperature in any case, unless it is supported by other symptoms. Febrile diseases exhibit certain stages or periods, which can be recognised by the course of the temperature. The most clearly marked, in cases which recover, are the following:—
1. The *initial* or *pyrogenetic stage*, which generally begins with a shivering fit, in which the temperature

is high, although the patient complains of feeling cold. In typhoid fever this stage takes four days to reach the temperature of 104°. 2. The *fastigium* or *acme*, in which the highest average temperature of the disease is attained. 3. *The period of critical perturbation*, or *stage of decrement*, which is followed by the period of *defervescence* or cooling down. This may be sudden, when it is called a *crisis;* or slower (occupying perhaps some days), *lysis*.

426. You may take the following as general rules respecting temperatures:—1. That either very high or very low temperatures must be regarded as dangerous —if excessively so, they are usually fatal. 2. Very sudden changes are suspicious, and often dangerous. 3. A fresh rise, after the temperature has begun to fall, or has been stationary for some time, generally indicates a complication, or the approach of some new disease. 4. An unexpected fall usually accompanies hæmorrhage, perforation of the pleura or peritoneum, or exhausting diarrhœa. 5. A considerable rise in a disease, not usually considered febrile (epilepsy, chorea, tetanus, cancer, &c.), is generally a forerunner of death.

427. A patient may have a *normal axillary temperature*, and his pulse and respiration may be normal so far as *number* goes, and yet die within an hour or so. It is therefore important to note the characters of the pulse and respiration, and to take the general condition of the patient, as to muscular strength and the like, into consideration. It is now pretty generally admitted that there may be severe and dangerous peritonitis, pleurisy, bronchitis, enteritis, and the like without the *general* temperature (or that in the axilla) being raised above the normal. The temperature may even be sub-normal in the axilla in some of these cases.

428. It is sometimes desirable to ascertain, by chemical analysis, the rate at which the destruction of the tissues is going on. You do this by estimating

the amount of urea excreted by the kidneys in the twenty-four hours. The following is an easy method :— "A measuring tube, twelve or fourteen inches long, is provided, easily closed by the thumb, and graduated to tenths and hundredths of a cubic inch. This tube is filled rather more than one-third full of mercury, and a measured quantity (50 to 60 grs.) of urine poured into it. The tube is then quickly filled to the brim with solution of hypochlorite of soda, closed by the thumb, and inverted under a saturated solution of common salt (which being heavier than the solution in the tube, prevents its escape), contained in a small mortar. The tube is allowed to stand for three or four hours, or until the volume of the nitrogen ceases to increase, and the amount of urea is calculated (1·549 cubic inches of nitrogen gas representing 1 gr. of urea). In this process the carbonic acid is retained by the excess of hypochlorite of soda employed. To prepare this solution of hypochlorite of soda, 500 grs. of good chloride of lime (bleaching powder) are stirred with boiling water, filtered, and the residue washed once or twice with boiling water; 1000 grs. of crystallized carbonate of soda are dissolved in a little water, and added to the solution, which is then filtered and made up to 20 oz. with water." *

429. A more rapid and accurate process for the estimation of the amount of urea in urine has been lately introduced by Messrs. Russell and West, and has been further improved by Mr. Apjohn. The principle of the process is the same as that suggested by Davy, but for the hypochlorite of soda a mixed solution of hypobromite of sodium and caustic soda has been substituted. The materials for the construction of the apparatus recommended by Mr. Apjohn are :—

"1. A glass measuring-tube of about a foot in length drawn out at the end, which will be uppermost

* Bowman's "Medical Chemistry."

when the tube is used, like a Mohr's burette, and subdivided into thirty parts of equal capacity, the aggregate volume of which is 55 c. c.

2. A small wide-mouthed glass-bottle of about 66 c. c. capacity.

3. A short test tube of about 10 c. c. capacity, and of such height that when introduced into the glass-bottle it will stand within it in a slightly inclined position.

The following are the arrangements for combining the apparatus and working an experiment :—

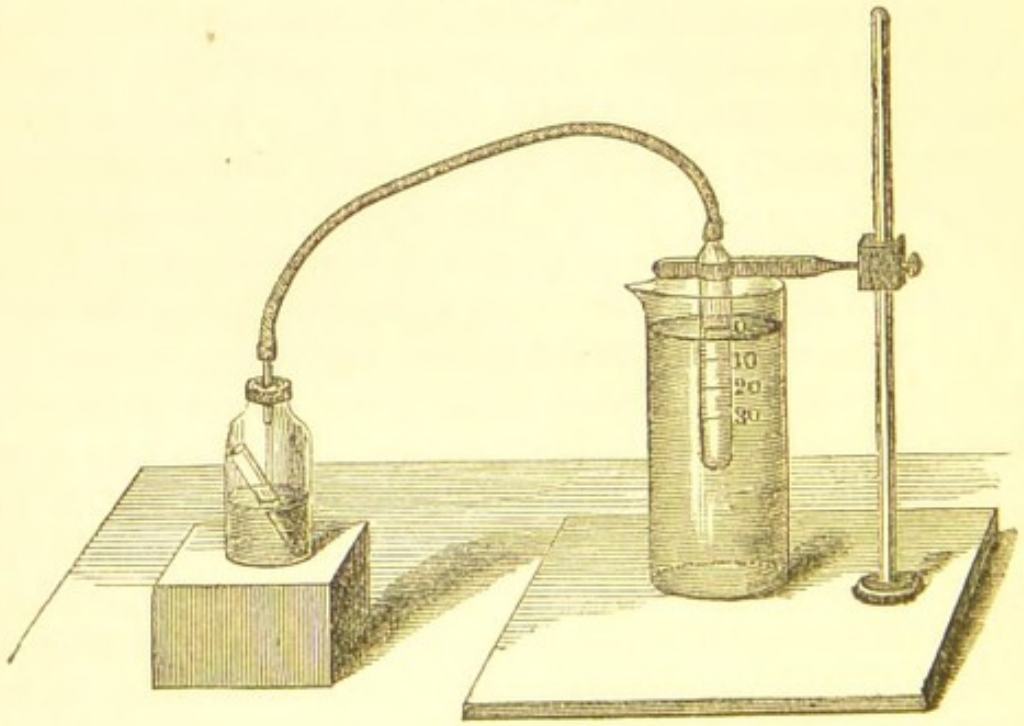
The graduated tube, held in a clamp attached to a retort stand, is depressed into a glass cylinder, nearly filled with water, until the zero mark, which is near the upper end, exactly coincides with the surface of the water. 15 c. c. of the hypobromite solution (100 grms. of NaHO, 250 c. c. of water, 25 c. c. of bromine) having been poured into the flask, the test tube containing the urine is introduced by means of forceps, care being taken that none of its contents shall spill into the hypobromite. The flask is now closed with a very accurately fitting india-rubber stopper, perforated with a hole, in which is inserted a short piece of glass tubing open at both ends, and is then connected with the measuring tube by means of a piece of elastic tubing. It is now inclined so as to allow the urine to mix with the hypobromite. Effervescence at once commences, and as it proceeds the measuring tube is gradually raised so as to relieve the disengaged nitrogen from the hydrostatic pressure. The flask is shaken a few times, and when the reaction is completely over, the apparatus is left for a few minutes until it has acquired the temperature of the room in which the experiment is performed. Another exact levelling of the measuring tube is made, and the number of the division corresponding to the volume of the developed nitrogen is read off."

"If we operate on 5 c. c. of urine, each measure of nitrogen evolved will correspond to 0·1 per cent. of

urea. The accompanying rough sketch represents the apparatus just before the flask is inclined, so as to bring the urine and the hypobromite solution into contact." (See fig. 97.)*

430. Having ascertained that the febrile symptoms under which the patient labours are not dependent on any local disorder, examine if there is any well-marked eruption on the face, body, or extremities. If such is the case, and the spots have appeared

FIG. 97.



within the first four days of illness, begin at (431). If the eruption has appeared at a much later date, or if, without any rash upon the skin, the symptoms of the fever have been continuous, pass on to (443). If there is no eruption, and the fever recurs at regular periods, subsiding in the intervals, pass on to (453).

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* *Chemical News*, January 22, 1875.

SECTION I.

The Fever is attended with a well-marked Eruption on the Skin, which has appeared within the first four days of the illness.

431. Under this head you meet with,—scarlatina, measles, erysipelas, small-pox, chicken-pox. These fevers are all infectious, and there is a period between the exposure to infection and the onset of the fever, termed "the stage of incubation." The first appearance of the illness is usually sudden and attended with shivering, which is followed by a train of symptoms peculiar to each disease. This stage is termed the "febrile stage," and is terminated by the appearance of the eruption ("eruptive stage"), which declines after a certain number of days. As a general rule, a person can only once in his life be attacked by each of these diseases. In the diagnosis of these complaints you must not only observe the eruption, but you should ascertain the nature of the symptoms preceding its appearance, also whether the patient had been exposed to infection, and from what eruptive fevers he had previously suffered.

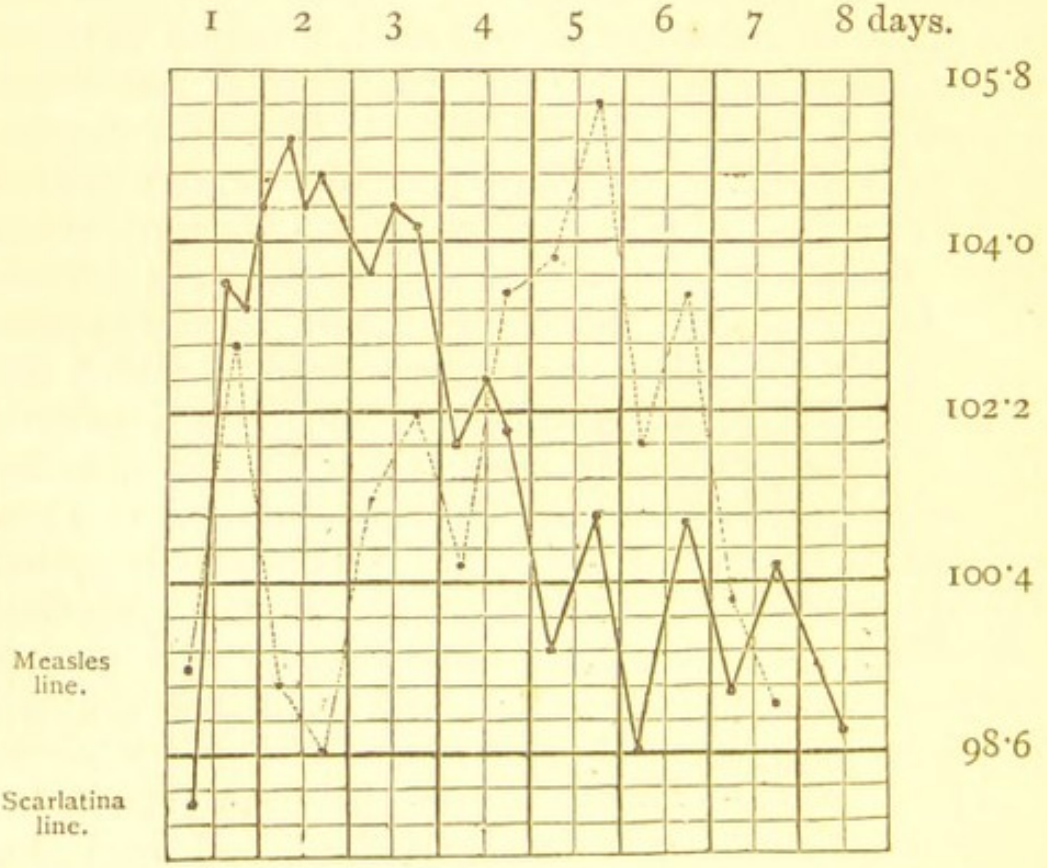
432. *a*. On the fourth day of the illness there has appeared, first on the forehead, face, and neck, but afterwards over the whole body, an eruption of raised red spots, which coalesce, and form slightly elevated blotches of a crescentic shape; the tongue is coated, the fever high. The eruption was preceded and is accompanied by headache, discharge from the nose, redness and swelling of the eyes, cough, and quickness of breathing.

The disease is *measles*.

The period of incubation is ten to fourteen days. Chilliness or rigors, and sometimes convulsions, precede the eruption, and occasionally bleeding at the

nose is observed. The cough and other chest symptoms are not generally relieved on the appearance of the rash. In most cases the throat is also inflamed, and diarrhœa is apt to come on with the eruption and is often very obstinate. The temperature rises rapidly at first, and then falls again before the eruptive elevation of temperature (see fig. 98). The highest

FIG. 98.



The above figure shows the course of the temperatures in an attack of measles, and in one of mild scarlatina. (WUNDERLICH.)

temperature in ordinary cases is 103°; if it rises above this, the case will be probably severe; if much lower, it will be a mild attack; the maximum of temperature is generally on the fifth day, after which it rapidly falls; the rash disappears on the fifth or sixth day after its coming out, and is succeeded by bran-like desquamation of the skin.

433. Measles may exist without catarrhal symptoms.

Laryngitis, diphtheritic inflammation of the larynx, capillary bronchitis, and pneumonia are the chief causes of danger during the attack; but phthisis, diphtheria, diseases of the bones and glands, and chronic ophthalmia, are sometimes induced by the complaint. The papillæ of the skin appear to be first and principally affected, and it is from this circumstance that the eruption first shows itself in the form of raised red spots. There are two varieties of measles, the slight, and the severe or malignant; in the latter, the eruption is of a dark purple colour, the pulse is quick and feeble, the tongue brown, the patient is delirious or comatose, and is apt to sink from exhaustion.

434. *b*. On the second day of the fever there has appeared on the upper part of the chest and neck a diffused scarlet rash, which extends over the whole body in twenty-four or thirty-six hours. The throat is inflamed, the tonsils enlarged and often ulcerated, the glands below the angle of the jaw tender and enlarged, the pulse very rapid, the skin hot and dry, the tongue at first coated, with red tip and edges and red elevated papillæ, afterwards it is clean and raw-looking. The eruption is generally preceded in children by vomiting.

The disease is *scarlatina*.

The period of incubation is from four to six days. The febrile stage is usually ushered in by shivering, vomiting, or diarrhœa; occasionally delirium and convulsions appear. The eruption usually declines on the fourth or fifth day, and is followed by peeling of the skin, especially of that covering the hands and feet. The temperature rarely rises above 105°, but it may nearly reach that height on the first day of the eruption. It at first rises rapidly and continuously until the eruption appears; its fall is very gradual, and occupies five or six days (see fig. 98). It is generally at its maximum on the third day of the fever, from the third to the ninth it ranges between 103·8° and 102·9°, and subsides between the tenth

and twelfth day, unless the throat be severely affected, when it may be indefinitely prolonged. The pulse falls along with the temperature. The danger in the early period of scarlatina is generally in proportion to the severity of the throat affection, but life may be destroyed by *malignant* scarlatina at the very outset of the disease.

In fatal cases the microscope shows the rete mucosum of the skin to be much thickened, and to contain a large number of newly formed nucleated cells. The epithelium of the sweat-glands is often so much increased as to block up their ducts. In other cases both the rete mucosum and the sweat-glands are stained with blood, arising from hæmorrhage having occurred into these structures. A similar state of inflammation is present both in the stomach and intestines. The gastric tubes are distended with cells and granular matters (see fig. 74), and in many cases membranous "casts" of the tubes are found in the contents of the stomach. The tubes of Lieberkühn are also choked with epithelium, and the mesenteric glands are generally enlarged.

After the cessation of the fever, and usually from the tenth to the twentieth day, the patient is liable to acute nephritis, indicated by bloody or albuminous urine and dropsy of the body and limbs (159) and sometimes associated with convulsions or hydrothorax. In other cases scarlatina gives rise to acute rheumatism, to discharge from the ear and consequent deafness, or to diphtheria. As soon as the rash has disappeared the urine should be tested daily for albumen (149).

435. Scarlatina may be confounded with roseola, measles, or small-pox. The eruption of roseola consists of irregular, rose-coloured blotches confined to the chest, the throat is less affected, and the accompanying fever is slight. It is known from measles by the absence of the affection of the eyes, nose, and bronchial tubes, and by the different appearance of

the rash. Small-pox is sometimes ushered in with an eruption like scarlatina; but the previous pain of the back and the subsequent papular form of the eruption serve to distinguish it.

436. There are three varieties of this disease—*simple*, *anginose*, and *malignant*. In *simple* scarlatina the throat is inflamed but not ulcerated, and the fever is moderate. In the *anginose* variety the throat is ulcerated, the temperature high, the pulse rapid, and the prostration of strength great. In the *malignant* form the eruption is faint or scarcely visible, the pulse is feeble, rapid, and irregular, the tongue brown, the throat is apt to slough, and the glands of the neck are enlarged and suppurate; there is consequently great danger to life.

437. The following Table will be found useful in the diagnosis of the above fevers:*—

Measles.	*Scarlatina.*
Rash appears on the fourth day.	Rash on the second day.
Begins near roots of hairs in spots slightly elevated.	Begins on neck and face.
Colour brownish-red.	Colour rose-red, or crimson.
Crescentic arrangement with normal skin between redness.	Punctiform, almost uniform.
Slight branny desquamation; accompanying symptoms, coryza and cough, heat of skin moderate.	Copious desquamation; accompanying symptoms, sore-throat, strawberry tongue, great heat of skin, rapid pulse.

438. There is an eruptive fever ("Rubeola" or "Rötheln") which was formerly supposed to be a hybrid between measles and scarlatina, but which is now generally allowed to be distinct from both. It is preceded by catarrh, the eruption appears on the third or fourth day as minute red spots that form

* Hillyer's "Handbook of Skin Diseases."

elevated, irregularly-shaped patches like measles. The eruption usually remains longer than either measles or scarlatina. It is sometimes followed by dropsy.

439. *c.* The patient is attacked with redness, heat, and swelling of some part of the body, attended with the formation of vesicles; the inflammation commences at one part and gradually spreads. There are great pain and stiffness of the parts affected, and the neighbouring lymphatic glands are swollen. The accompanying fever is usually high.

The disease is *erysipelas.*

The usual site for erysipelas, in medical practice, is the head and face. It is preceded for a few hours or days by a certain amount of fever, and generally commences with a slight swelling over the bridge of the nose, or near one of the ears, from which it spreads until the whole face and scalp are affected, the eyelids become œdematous and the features swollen and disfigured. The temperature in the axilla is high, but varies greatly in the course of the disorder. In many cases suppuration of the subcutaneous cellular tissue occurs, and abscesses form as the inflammation subsides. Occasionally the membranes of the brain are attacked, and the symptoms of meningitis present themselves.

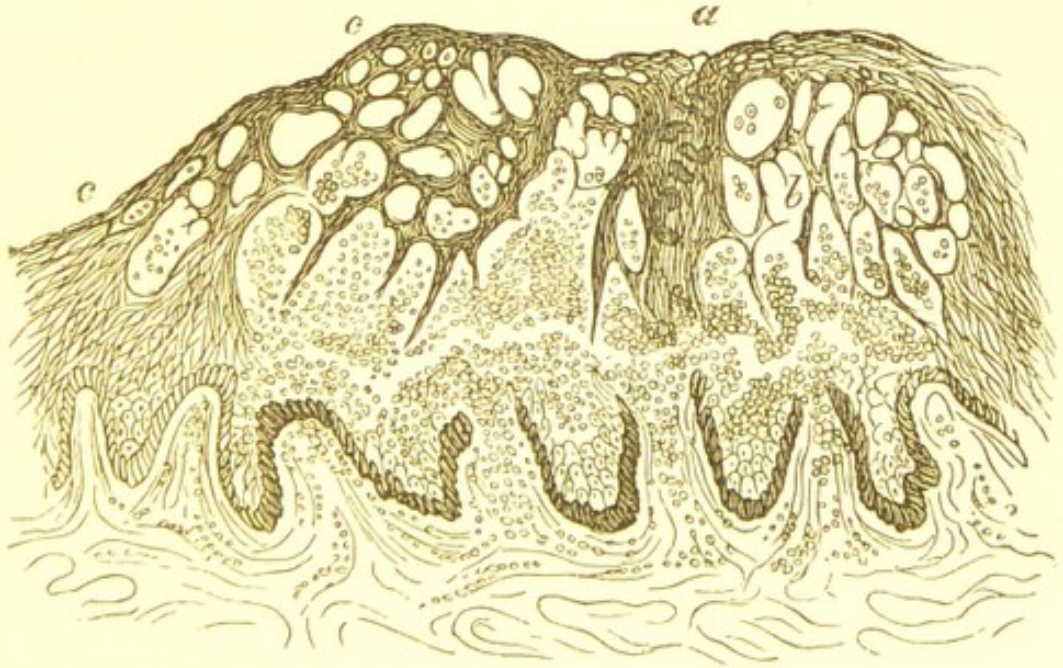
440. *d.* On the third or fourth day of illness, an eruption of a papular form has appeared on the face, neck, and wrists; on the second or third day of the appearance of the spots they have become vesicular, and afterwards pustular. The eruption is preceded by severe pain of the back, rigors, vomiting, constipation, headache, restlessness, fever, and sometimes delirium.

The disease is *small-pox.*

The period of incubation is from ten to sixteen days. The fever is usually relieved and the pulse and temperature decrease as soon as the eruption comes out. The spots become pustular about the fifth or

sixth day after their appearance ; on the eighth day matter appears to ooze from their edges, and a decided increase of fever sets in (*secondary fever*). It is especially marked by a fresh rise of temperature about the eleventh and twelfth days of the fever (the suppurative stage), when the danger to life is the greatest (see fig. 100). Scabs are formed and fall off on the fourteenth or fifteenth day, leaving pits in their places. The temperature falls when the spots appear,

FIG. 99.

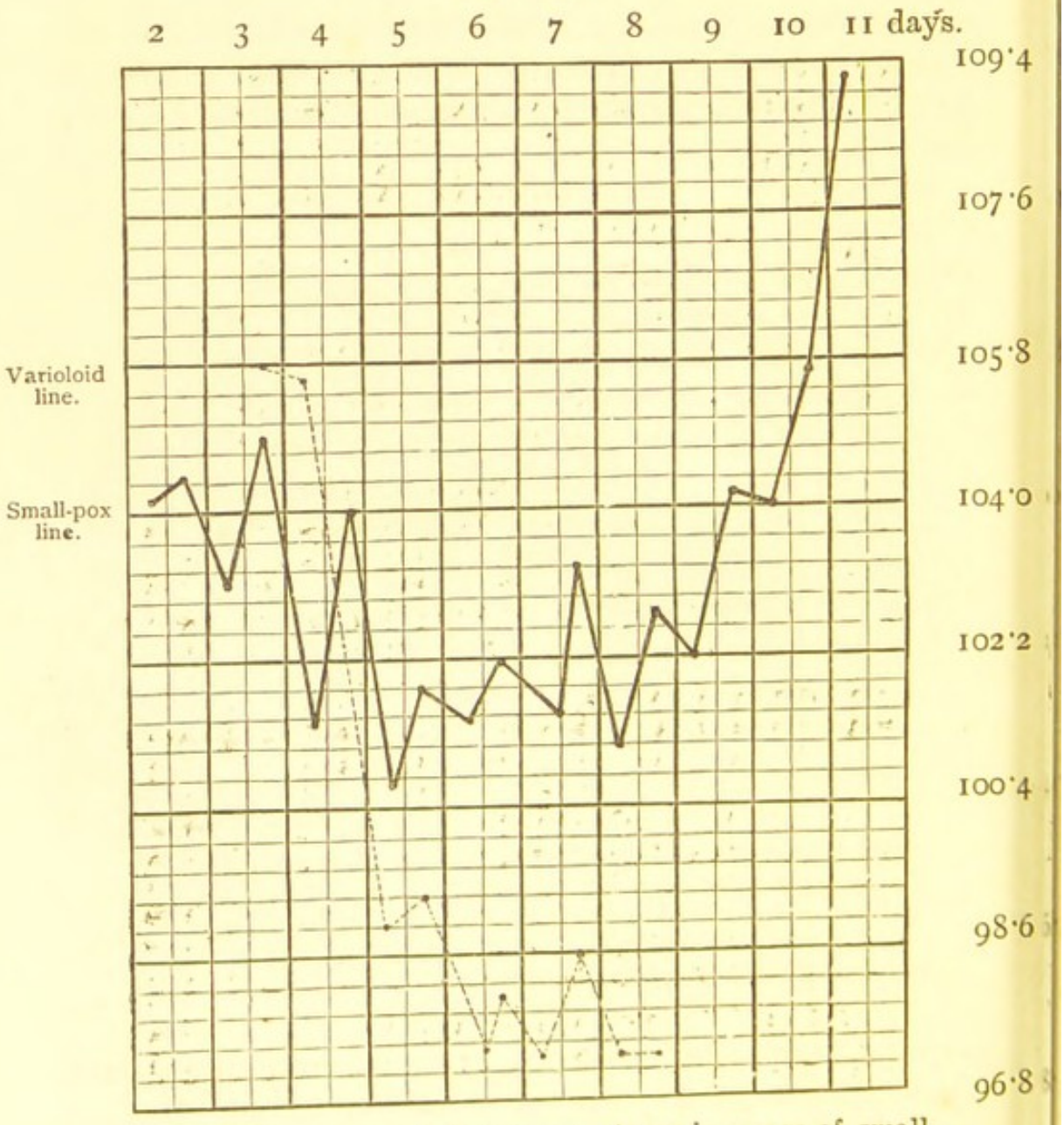


Shows a section through the middle of a pock passing from the granular to the pustular stage. *a*. Umbilicus with duct of sweat-gland. *b*. Cavities in the substance of the rete mucosum filled with lymph. *c*. Small cavities containing pus cells. (RINDFLEISCH.)

perhaps from 106° to 100°, but it augments again when the secondary fever sets in. Small-pox is termed *discrete* when the spots are few and separate; *confluent* when they run together; the danger being in proportion to the amount of the eruption. When the disease is *modified* by vaccination (*varioloid*), although the primary fever may be very severe, the spots form scabs and die away about the eighth day

without any secondary fever. Albumen is often present in the urine. Small-pox may be complicated, especially during the secondary fever, with pneumonia or bronchitis; or it may be followed by

FIG. 100.



Shows the course of the temperatures in a case of small-pox which terminated fatally in the suppurating stage, and in a case of modified small-pox (*varioloid*). (WUNDERLICH.)

erysipelas, abscesses in various parts of the body, ulceration of the cornea or pyæmia.

The microscope shows that in the earliest stage

there is inflammation of the papillæ of the skin. An exudation takes place from the papillæ into the rete mucosum, which separates the layers of the latter from each other (see fig. 99). When suppuration occurs, if the rete mucosum is alone destroyed no scar is left. But when the papillæ become so infiltrated by newly formed cells that their blood-vessels are compressed, sloughing takes place, the dead portions are thrown off, and, when the part heals, a scar is the consequence.

441. Small-pox is chiefly distinguished from other eruptive fevers in the primary stage by the severe pain of the back and the vomiting that accompany it. In the early period of the eruption, the fact that the spots feel to the finger as if small shots were embedded in the skin is very valuable in distinguishing this complaint from measles and scarlatina. In the worst form of small-pox the eruption is sometimes preceded by a livid redness of the skin, more or less diffused; delirium and typhoid symptoms, or hæmorrhage from the mucous membranes, may speedily follow.

442. *e.* On the second day of a mild fever there has appeared an eruption, which is at first papular, but in a few hours becomes vesicular. The spots have no inflammatory ring around them in the first stage.

The disease is *chicken-pox* (*varicella*).

This disease is peculiar to childhood and early adult age; its period of incubation varies from ten to sixteen days. The eruption consists of a series of crops that succeed each other for four or six days, at intervals of twenty-four hours. Each spot forms a scab, about the fourth day of the fever, which falls off and seldom leaves any pit. It is distinguished from small-pox by the mildness of the premonitory symptoms, the distinctly vesicular character of the spots, the absence of hardness to the finger, and by the shorter course of the complaint.

SECTION II.

No Eruption has appeared in the Early Stage of the Fever, and, if present, it is usually small in amount; the Febrile Symptoms have been continuous from their commencement.

Under this head you may have—typhus, typhoid, relapsing fever, cerebro-spinal fever, influenza, mumps, and rheumatic fever. (454.)

443. *a.* The patient lies on his back in a state of half-consciousness, or low muttering delirium; the eyes are injected, the cheeks are uniformly flushed and of a dusky colour, the lips are covered with sordes, the tongue dry and brown. There are thirst and absence of appetite, but the bowels are not usually purged. The pulse is rapid and feeble, skin hot, respiration increased in frequency. An eruption generally appears on the body and limbs from the fifth to the seventh day, the spots of which are dark-coloured and persistent; they are at first slightly elevated, but after a few days become flat, and do not disappear, although they are made paler by pressure.

The disease is *typhus*.

The period of incubation is from five to eleven days. The attack of typhus is generally sudden, and begins with chilliness, lassitude, noise of the ears, giddiness, pains of the head and limbs, quick pulse, and hot skin. In other cases it is preceded for a few days by feebleness, headache, and want of appetite. The loss of muscular power is early and marked. The tongue is at first large and pale, afterwards covered with a yellow brown fur. Delirium usually presents itself from the fourth to the eighth day; the urine is frequently albuminous; a peculiar odour can be often detected in cases of typhus. As the disease advances, the stupor increases, the pupils are contracted, the

muscles twitch, the hands tremble or catch at the bedclothes, the pulse is so rapid and feeble as scarcely to be felt, and the dulness in the region of the spleen is much increased in extent. The urine and fæces are often passed involuntarily, or the bladder becomes distended from loss of its power of contraction, and bedsores form on the hips and nates. In severe cases the impulse and the first sound of the heart are very feeble, or may be undistinguishable, the second sound being clear and distinct. Typhus is not unfrequently complicated with pneumonia, sometimes with convulsions. The rash is often absent in children and in young persons.

There is usually a sudden rise of temperature at the onset, and there is less difference between the morning and evening temperature than in typhoid fever, although it is highest in the evening. In mild cases the temperature attained on the third or fourth day remains without increase until the end of the first week, and after the seventh or eighth day there is a decided remission. In severe cases the temperature increases after the fourth day, and there is no remission on the seventh day. The fever increases in the beginning of the second week; in mild cases the increase lasts only a few days, but in severe ones it continues until the end of the second week. The critical stage is at the latter end of the second week, or in severe cases at the beginning of the third week. The turning-point is most generally about the fourteenth day, and the decline of the fever is, in cases of recovery, often very sudden, forming what is termed a crisis (see fig. 101). If the temperature does not exceed 103·5° before the fourth day, the case will probably be a mild one.

444. You may confound typhus with typhoid fever, pneumonia, and meningitis (372). You can only distinguish typhus when complicated by pneumonia from pneumonia attended with typhoid symptoms, by ascertaining which disease was first developed, and

whether or not the characteristic eruption is present. In many cases delirium is a prominent symptom: it seldom sets in until the end of the first week, it is low and muttering, and accompanied by great restlessness. This symptom is apt to make the diagnosis between typhus and meningitis difficult, but the former differs from the latter in the appearance of the tongue, the presence of an eruption, and the feebleness of the pulse; meningitis is accompanied by vomiting, and the headache is more severe and constant than in typhus. It must be remembered that meningitis may occur as a complication of typhus.

445. *b*. The patient suffers from great feebleness, his mind is dull or wandering, the cheeks have a bright circumscribed flush, the tongue is coated, red, fissured, or dry. There are headache, thirst, loss of appetite, and purging of the bowels, the stools being of a yellow colour. The pulse is quick and feeble, the skin hot, and there is swelling of the abdomen, with tenderness and gurgling on pressure over the right iliac region, and increased dulness in the region of the spleen. An eruption appears about, or after, the seventh day, of a few rose-coloured lenticular spots, which disappear for a moment on pressure, The eruption is chiefly confined to the chest and abdomen, and each spot disappears in a few days, to be succeeded by others near it.

The disease is *enteric* or *typhoid fever*.

The stage of incubation is generally beyond fourteen days. The disease is usually confined to persons below forty-five years of age, whilst typhus attacks individuals at any period of life. The approach of typhoid fever is insidious, and the first symptoms are those of dyspepsia, sleeplessness, languor, dull pain of the head, often succeeded by slight delirium at nights, loss of appetite, thirst, and diarrhœa. In rare cases the attack comes on suddenly.

The temperature rises very gradually during the first week, that in the evening is often 2° higher than

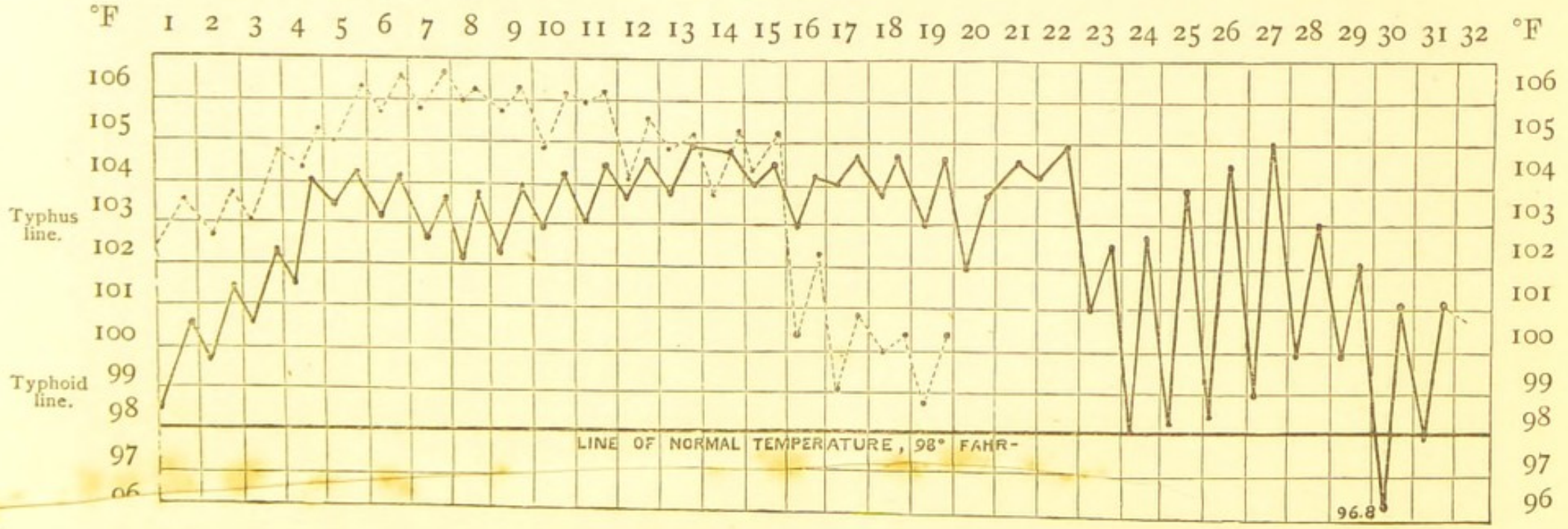
that in the morning, whilst the next morning it is 1° less than the preceding evening. At the end of the first week there is no increase of evening temperature, but that of the morning is still less than in the evening. In the second week there is only a slight morning remission. In the beginning of the third week there is often an increase of temperature, and, if improvement takes place, the difference between the morning and evening is very striking (see fig. 101). In case of recovery the fall in temperature is gradual, not sudden as in typhus. Mild cases are generally ended in twenty-one days, but severe ones may last four or five, or even eight or ten weeks. A *permanent* temperature of 104°, or elevation, of the morning over the evening temperature, is an unfavourable sign.

A fatal issue may occur, whilst the patient seems to be recovering, from perforation of the intestine or hæmorrhage from the bowels, the latter accident being most common in the third and fourth weeks. Recovery is generally slow, and the mind often remains feeble for some weeks. Typhoid fever is often complicated with pneumonia, and it may be followed by phthisis. In fatal cases disease is always present in the lower part of the ileum. The mucous membrane is inflamed, and the solitary glands and Peyer's patches are either enlarged, prominent, and surrounded by inflammation, or they are in a state of ulceration; the mesenteric glands are also softened and enlarged. The perforation of the intestine, which cuts off so many cases of typhoid fever, is the result of these ulcerations.

Microscopically, in the earliest stage the whole of the mucous membrane of the affected part is in a state of catarrhal inflammation, the lymphatic follicles are enlarged by an increase in the number of their cells, whilst the blood-vessels around them are greatly congested. The surrounding connective tissue is next infiltrated with cells, and unites with the enlarged

FIG. 101.

Typical ranges of temperature in cases of typhus and typhoid fever. The dotted line indicates the typhus range; the continuous dark line that of typhoid; the two dots under each day indicate the morning and evening temperatures. (WUNDERLICH and TRAUBE.)



(*From* AITKEN'S "*Practice of Medicine.*")

follicles to form a soft medullary mass. The follicles may return to their normal state, either by the degeneration and subsequent absorption of their cells, or they may burst and discharge their contents. In other cases, sloughing of the affected structures occurs, the dead parts are thrown off, and the ulcers before described are left. The cells are said by some to differ from the ordinary lymph-corpuscles, in containing a much larger mass of protoplasmic material.

446. You will most easily confound enteric fever with meningitis, tubercular peritonitis, acute phthisis, and typhus. You distinguish it from meningitis by the absence, or less urgency, of the vomiting, the less severe pain of the head, the feebleness of the pulse, the dryness of the tongue, and the diarrhœa present in enteric fever. Although in both typhoid fever and tubercular peritonitis you may have hectic flush, pinched features, pain of the abdomen, and diarrhœa, yet in peritonitis the tongue is usually clean, and there is no eruption. Acute phthisis is distinguished from typhoid fever by the cough and difficulty of breathing, which appear earlier, and are more intense in the former, by the lower temperature, and the presence of the stethoscopic signs of tubercle, when these exist; also by the absence of the typhoid eruption and enlargement of the spleen. Typhus differs from typhoid fever in attacking persons above forty-five years of age, the attack is more sudden, the prostration more marked, the duration shorter, delirium or stupor appears sooner, the face is dusky and generally flushed, the bowels are usually constipated, and the rash is darker, more general, and not, after the first day or two, obliterated by pressure, nor does it appear in successive crops. Typhoid fever in children is often described as *infantile remittent fever*.

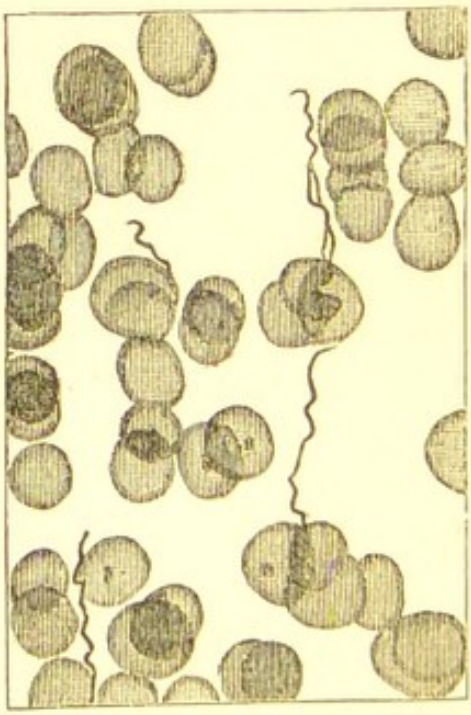
447. *c.* The patient has been suddenly attacked with rigors, headache, and pain of the back or limbs; the tongue is white, there are thirst, often vomiting,

and confined bowels; the pulse is very rapid, the skin hot and dry (104° to 106°), with occasional sweatings; there is no eruption, but jaundice is often present. The symptoms disappear, after a violent sweating, from the fifth to the eighth day, but reappear, as at first, about the fourteenth day of the illness. The relapse usually terminates in from three to eight days, but may be succeeded by others.

The disease is *relapsing fever*.

FIG. 102.

Spirillum Obermeieri.



The spirillum is seen amongst the blood cells. (KOCH.)

448. Its period of incubation varies from two to sixteen days. A form of Bacterium named Spirillum (see fig. 102) has been detected in the blood by means of the microscope. The Spirilla seem to disappear shortly before the crisis. This disease seldom appears except as an epidemic, and is chiefly seen amongst the poor and ill-fed part of the population. It may be impossible to diagnose it from other fevers previous to the crisis. Convalescence is generally very slow,

and it is apt to be complicated with severe ophthalmic or rheumatic affections. When jaundice is present the stools are of their natural colour, and may even be abnormally dark. The temperature sometimes falls 10°, or even more, during the crisis.

449. *d.* After a short interval, in which the patient has suffered from severe headache, giddiness, and vomiting, he is attacked with excessive pain of the neck and back, increased by pressure and motion. The head is drawn backwards, the jaws are often closed, swallowing is difficult, the back is arched and painful, tetanic spasms affect the muscles. The patient becomes delirious, the pupils are contracted, the pulse and respiration are rapid.

The disease is *cerebro-spinal fever.*

The invasion of this complaint is almost always sudden and it usually occurs as an epidemic. The mortality is great, and it chiefly attacks the young and middle-aged, seldom persons advanced in life. An eruption of herpes or of purpura sometimes presents itself. The temperature seldom rises above 103°. In fatal cases there is an exudation of lymph on the membranes of the brain and spinal cord, the substance of these parts being usually abnormally soft and vascular.

450. Besides the above forms of fever you meet with what is termed *simple continued fever.* In this there are headache, a frequent full pulse, white and coated tongue, thirst, loss of appetite, hot dry skin, pains of the back and limbs, and inability for mental or bodily exertion; but it is unaccompanied by any eruption, and usually terminates by a severe sweating. Before determining a case to be one of simple continued fever, be careful to examine the condition of every important organ, lest the fever be the result of some hidden inflammation.

451. *e.* The patient is suddenly attacked with chilliness or rigors, great prostration of strength and aching of the limbs, along with intense headache,

discharge from the eyes and nose, sneezing, sore throat, dyspnœa, cough, expectoration, elevation of the temperature and other signs of fever.

The disease is *influenza*.

Often severe frontal pain is first complained of; the catarrhal symptoms are at their height on the second or third day, and decline from the fifth to the seventh day. Cough and expectoration frequently remain for some time after the fever. Influenza is sometimes complicated with capillary bronchitis or pneumonia; it generally prevails as an epidemic. Fatal cases are chiefly confined to children and aged persons, or to those already affected with some serious disease of the heart or lungs. The average duration of the complaint is from three to five days in mild cases, and from seven to ten in those more severely affected.

452. After a few hours of slight fever the patient feels pain in the front of one or both ears, quickly followed by the formation of a firm elastic swelling in that situation, the movements of the jaw are difficult and painful, the pulse is quick and the temperature increased.

The disease is *mumps* (*Parotitis*).

The complaint is infectious, the period of invasion varying from fourteen to twenty-one days. The fever is rarely high, the swelling of the gland usually increases from the third to the sixth day, remains stationary for one or two days and then quickly subsides, so that the whole duration rarely exceeds fourteen days. In some the submaxillary glands are also inflamed, occasionally the testis in the male or the mammæ or labium in the female become swollen and painful. The disease is unattended with danger, but it often leaves the patient in a feeble state of health. It is most common between the ages of five and fifteen, but may occur at almost any period of life.

Swelling of the parotid or submaxillary glands

sometimes occurs during the course of febrile diseases, especially in typhus. Suppuration rapidly takes place, and its occurrence should be regarded as a most unfavourable sign.

SECTION III.

The Patient is subject to Periodical Attacks of Fever.

Under this head you only meet with ague in this country.

453. *a.* The patient is periodically attacked with shiverings, attended with quick pulse, uneasiness, oppression of breathing, or sense of fatigue; these are succeeded, after a period varying from half-an-hour to two hours, by great heat of skin, restlessness, thirst, rapid full pulse, and scanty secretion of urine; afterwards a profuse perspiration breaks out with relief of all the symptoms.

The disease is *ague.*

The mean duration of the first stage is from three to eight hours. Ague occurs under different forms. If the attack occurs daily it is termed *quotidian;* if every forty-eight hours, *tertian;* if every seventy-two hours, *quartan.* It is called *double tertian* when the patient is attacked daily, but the attacks of alternate days alone correspond in severity and time. Ague is sometimes complicated with, and still more frequently followed by, enlargement of the liver and spleen. The rise in temperature is found to precede or commence with the cold stage; when the sweating has fairly set in the heat begins rapidly to fall. The temperature may rise to 106°, or in some cases even to 108°.

CHAPTER XIV.

RHEUMATISM AND GOUT.

These diseases are characterized by inflammation of the muscular, fibrous, or serous structures of the body; the inflammation seldom goes on to suppuration, and is apt frequently to change its seat. They may give rise to affections of many, if not of all the internal organs. They may attack the patient suddenly, or their course may be slow and lingering.

454. In Acute Rheumatism (Rheumatic Fever) the joints are swollen, hot, red, painful, and excessively tender. The larger articulations are chiefly affected, different joints are either attacked together or in succession, and the pain is so greatly increased by the slightest movement that the patient lies in a helpless condition. The skin is covered with a profuse acid perspiration, having a sour smell, the urine is scanty, high-coloured, and loaded with lithates, the bowels confined, the pulse quick and bounding (90 to 110), the temperature high, but varying from day to day, there is constant thirst, and the tongue is white. The blood contains an abnormal amount of fibrine; in the urine there is an increase of urea and lithic acid, whilst the chlorides are deficient in quantity, or are altogether absent. As pericarditis or endocarditis occurs in a large proportion of the cases, and as these diseases are often unattended by pain, or other symptoms tending to direct attention to the heart, you should examine the chest daily with the stethoscope. In other cases the patient is

attacked with pleurisy, pneumonia, or delirium. The affection of the joints is generally preceded for twenty-four or forty-eight hours by chilliness, languor, heat of skin, and other symptoms of fever; in some cases the heart is affected at this period. Acute rheumatism is believed by many pathologists to arise from the presence of lactic acid in the blood. It is often hereditary, is apt to recur frequently, usually follows exposure to wet and cold, and is occasionally a sequence of scarlatina.

455. Sub-acute Rheumatism.—The pain and swelling of the joints are less, the fever is not so intense, and liability to affection of the heart is not so great as in the acute form. A variety of it is often met with in persons suffering from gonorrhœa, and is termed *gonorrhœal rheumatism.*

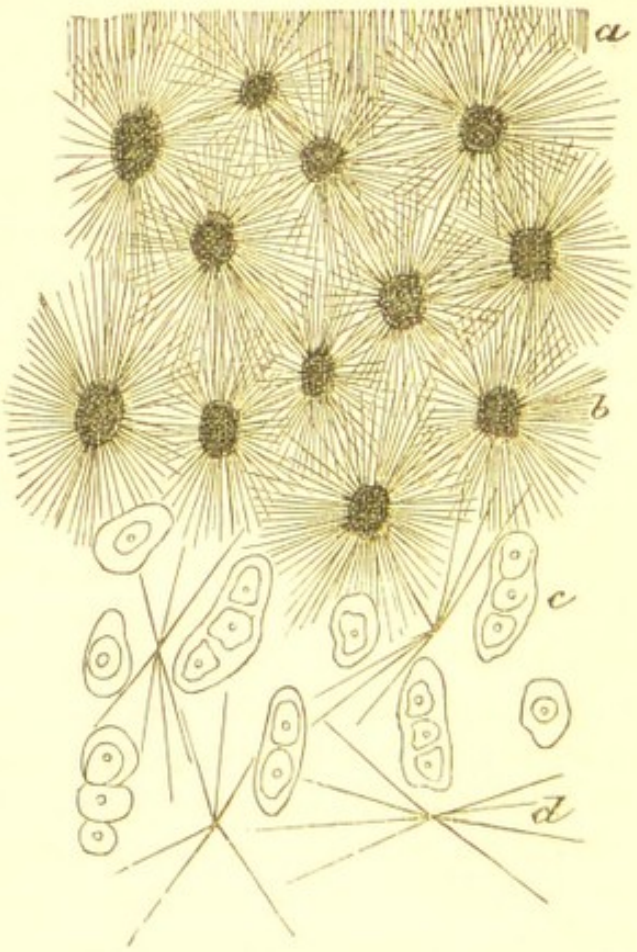
456. Chronic Rheumatism may remain as the result of rheumatic fever, or it may attack those who have been previously healthy. There is no fever, but the parts affected are painful and tender, and the suffering is increased by motion. When it occurs in the joints adhesions are apt to take place, so that the motions of the limb become restrained, and you can often feel a grating on moving the joint, when the hand is placed over it. Chronic rheumatism is most generally met with in persons advanced in life.

457. Rheumatism is often named according to the structure principally affected. Thus lumbago, or rheumatism of the muscles of the loins, is termed *muscular rheumatism;* when the periosteum is inflamed it is termed *periosteal rheumatism.* In the diagnosis of local rheumatism you must first exclude all other causes likely to produce the pain of which the patient complains; for instance, pain of the loins may arise from a disease of the spine or kidneys, from aneurism of the aorta, affections of the testes in the male, or of the uterus or ovaries in the female. If, then, you meet with a case of long-standing pain in this region, you should first ascertain that none of the above com-

plaints are present before determining that rheumatism is the cause of the suffering.

458. GOUT.—In a joint that has been only slightly affected with gout a white-coloured deposit will be found on the cartilages and on the surface of the ligaments. The deposit is composed of urate of soda, and

FIG. 103.



Vertical section through an articular cartilage infiltrated superficially with urates. *a*. The surface. *b*. Cartilage cavities with tufts of crystals. *c*. Cartilage cells not yet infiltrated. *d*. Isolated needle-shaped crystals. (CORNIL and RANVIER.)

is probably permanent. It is situated in the substance of the cartilage, but is most dense towards the surface. In more severe cases a large portion of the articular surface may be found thus altered, the synovial fluid thickened, and the ligaments rendered

rigid from infiltration with urate of soda. The blood in gouty persons also contains the same substance, and in some instances oxalic acid has been detected. Microscopically, the urate of soda appears in the form of fine crystalline needles or prisms closely interlaced (see fig. 103). Chalk stones, which consist also of urate of soda or lime, are apt to form in the helix of the ear, the joints of the fingers, and other exposed parts of the body.

A first attack of gout generally takes place in the ball of the great toe. It may occur suddenly or be preceded by symptoms of dyspepsia. During the night the part becomes painful, red, swollen, and very tender, the veins proceeding from it being distended with blood. After a day or two the swelling increases, the pain lessens, the skin becomes œdematous, and as the attack subsides the cuticle generally desquamates. The fit usually recurs within twelve months, and as time goes on a number of the articulations become affected at once.

Gout is hereditary; it never attacks children, and men are more liable to it than females, who seldom suffer from it until after the cessation of the catamenia. It is apt to be induced by free indulgence in wines and malt liquors, by excess of animal food, and by severe mental exertion. Workers in lead are especially liable to be affected by it.

459. Acute gout may be distinguished from rheumatic fever by the former usually affecting men of middle or advanced age, the latter young persons of either sex. Gout usually attacks the smaller joints, and persists for some time; as the pain lessens the skin becomes œdematous and the veins distended. Acute rheumatism affects the larger joints, rapidly changing from one to the other; the skin over them is not shining, and there is no œdema. In acute gout the temperature is not high, the pain is worst at nights, the skin does not perspire freely, and there is usually a history of a previous attack which had

commenced in the joint of the great toe; in acute rheumatism the fever is severe, and there is a liability to pericarditis and endocarditis.

460. Dr. Garrod has proposed the following method of ascertaining the presence in the blood of gouty patients of uric acid:—"Take from one to two fluid drachms of the serum of the blood (or of the fluid obtained from a blister) and put it into a flattened glass dish or capsule; those I prefer are about three inches in diameter, and one-third of an inch in depth, which can be readily procured at any glass-house; to this add ordinary strong acetic acid in the proportion of six minims to each fluid drachm of serum, which usually causes the evolution of a few bubbles of gas. When the fluids are well mixed introduce a very fine thread, consisting of from one to three ultimate fibres about an inch in length, from a piece of unwashed huckaback, or other linen fabric, which should be depressed by means of a small rod, as a probe or point of a pencil; the glass should then be put aside in a moderately warm place until the serum is quite set, and almost dry; the mantelpiece in a room of the ordinary temperature, or a bookcase, answers very well, the time varying from twenty-four to forty-eight hours, depending on the warmth and dryness of the atmosphere. Should uric acid be present in the serum above a certain small amount, it will crystallize, and during its crystallization will be attracted to the thread, and assume forms not unlike that presented by sugar-candy on a string. To observe this, the glass containing the dried serum should be placed under a linear magnifying power of about fifty or sixty, procured with an inch object-glass and low eye-piece, or a single lens of one-sixth of an inch focus answers perfectly."

461. Rheumatoid arthritis (Rheumatic Gout.)—This complaint may occur in an acute or chronic form, the latter being the more common. In chronic cases, Dr. Garrod states "that the fibro-synovial

structures of the joint are much altered, the capsules distended with synovial fluid, and exhibit signs of chronic inflammation: the synovia afterwards becomes absorbed, leaving the capsular membrane much thickened. The internal structures—as the round ligament in the hip joint, the tendon of the biceps in the shoulder—become destroyed and sometimes entirely removed. When the disease has been long in a joint the articular cartilages are absorbed, and in certain very old cases even the inter-articular cartilages: this is seen in the knee joint, the wrist, and the lower jaw. From the amount of distension caused by the fluid in the early stages, the different ligaments become elongated and are slow to recover their natural state, and the joints are thus rendered mobile and more subject to dislocation. When the articular cartilages have been completely removed, their place is supplied by an ivory-like enamel, remarkable for its polish and hardness; in some joints this covers the entire end of the bone, in others in streaks or patches in the direction of the movement of the joint. The denuded surfaces become partly worn away, and a smooth enamel is formed by the natural action of the bones on each other; and around the articular surfaces thus acted upon, bony vegetations arise."

462. In *acute rheumatic arthritis* one or more joints is attacked with severe pain, increased on pressure or motion, but the inflammation persists in the joint first affected, although others may be afterwards implicated. There is no sweating, and the temperature is lower than in rheumatic fever. The hip is the most common seat of the disease; the duration of the illness is often tedious, and stiffness or anchylosis not unfrequently results.

463. *Chronic rheumatoid arthritis* chiefly affects persons of delicate constitution, and is most common amongst females at the commencement or termination of menstruation. It seems to be occasionally excited by acute rheumatism, but more generally comes on

without any apparent reason. The disease commences with swelling, pain, and stiffness of one or more joints; those of the fingers being generally first attacked. After a time the swelling gradually subsides, but imperfect motion remains, the muscles become wasted and the joint distorted. Only one or many of the joints may be thus affected, and in the latter case the powers of motion are often so completely destroyed that the patient becomes a helpless cripple.

CHAPTER XV.

DISEASES OF THE SKIN.

464. You will probably find more difficulty in the diagnosis of diseases of the skin than of any other structure of the body. This arises chiefly from the number of different classifications that have been proposed, and the variety of names that have been bestowed upon the same complaint. In the present chapter the system of Willan and Bateman has been mainly followed, as it is that which is chiefly used in this country, and is also most easily remembered. You must bear in mind that an eruption may alter its appearance during its progress, and therefore you must be careful in any difficult case to inquire as to its condition in its early stages. If it is general, examine it in different parts of the body, for its character may be altered by the friction of the clothing or other circumstances. In many instances the diagnosis requires you to ascertain if the eruption is contagious, or has been produced by a local irritant. It is a good plan to make yourself familiar with the various forms of skin diseases, by means of coloured plates or wax-models, before you begin your observations on the living subject, so that you may more readily seize on their distinctive characters when they come before you.

465. When inflammation attacks the skin, a greater variety of morbid appearances is produced than when it affects the mucous membranes or other parts of the body. These appearances serve as a means of classification, and it is therefore necessary that they should

be carefully studied. The following definitions are taken from Willan and Bateman :—

466. "*Papula* (*Pimple*) : a very small and acuminated elevation of the cuticle with an inflamed base, very seldom containing a fluid, or suppurating, and commonly terminating in scurf. *Vesicula* (*Vesicle*) : a small orbicular elevation of the cuticle, containing lymph, which is sometimes clear and colourless, but often opaque, and whitish or pearl-coloured. It is succeeded either by scurf or by a laminated scab. *Pustula* (*Pustule*) : an elevation of the cuticle, with an inflamed base, containing pus. *Tuberculum* (*Tubercle*) : a small, hard, superficial tumour, circumscribed and permanent, or suppurating partially. *Bulla* (*Bleb*) : a large portion of the cuticle detached from the skin by the interposition of a transparent watery fluid." In all the above, small portions of the skin are raised above the surface, and you will observe that the papula differs from the tubercle, and the vesicle from the bleb only in size. "*Exanthemata* (*Rashes*) : superficial red patches, variously figured, and diffused irregularly over the body, leaving interstices of a natural colour, and terminating in cuticular exfoliations. *Squama* (*Scale*) : a lamina of morbid cuticle, hard, thickened, whitish, and opaque. *Macula* (*Spot*) : a permanent discoloration of some portion of the skin, often with a change of its texture."

467. Besides the above alterations in the appearance of the skin, each separate structure of which it is composed is liable to disease. The papillæ are greatly increased in size in warts and corns, the appearance of which it is unnecessary to describe. *Warts* are enlargements of the papillæ, each one of which contains a loop of blood-vessels and also nerves. *Corns* are of the same nature as warts, excepting that the epidermis covering them is greatly thickened by pressure.

468. The secretion is not unfrequently retained in the sebaceous follicles, the surface often becomes

covered with dirt, which forms a black spot on the skin. The secretion can be readily squeezed out, and looks like a little grub. If the little tumour thus formed is uninflamed it is termed a *comedo;* if inflamed it is named *acne*. When the secretion is not confined to the excretory ducts, but distends the sebaceous glands themselves, a little tumour is produced called *Molluscum*. A minute animalcule, varying usually from $\frac{1}{130}$th to $\frac{1}{80}$th of an inch in length, is often met with in the sebaceous follicles (*Acarus folliculorum*). It lies lengthways in the follicle, with the head downwards, but it does not seem to give rise to irritation, as it is often met with in the skin of persons who are not liable to acne.

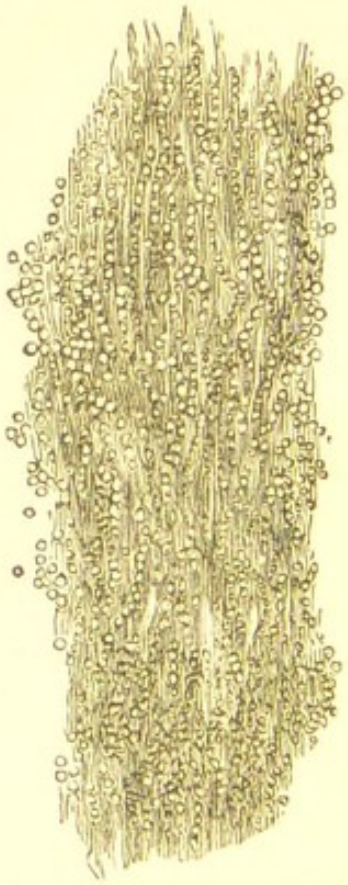
469. Authors describe three forms of vegetable parasites which present themselves in diseases of the skin; two of these are confined to the hair, the third is found on the surface of the skin. The best method of displaying these minute bodies is to extract a few hairs from the diseased part, or in the case of *Pityriasis versicolor*, to scrape off a little of the epidermis. Place the object thus obtained on a clean slide, add a drop or two of liquor potassæ, cover it with a piece of thin glass, and examine it with a microscope having a quarter of an inch object-glass.

470. When the crust of *favus* is thus treated, a number of vegetable cells termed "spores," intermixed with a large amount of granular matter, are brought into view. The spores are oval or round, about $\frac{1}{3000}$th of an inch in diameter, are slightly constricted about the centre, and are mixed with numerous branching tubes, some of which are empty, some filled with granular matter, and which generally vary from $\frac{1}{4000}$th to $\frac{1}{15000}$th part of an inch in diameter. This parasite is named *Achorion Schönleinii*, and is seen in the substance of the hair itself.

471. The parasite in *Tinea tonsurans*, *Tinea circinata*, and, according to some authors, in *Sycosis*, presents

the appearance of round or oval spores, about $\frac{1}{7000}$th of an inch in diameter, mostly isolated, but some also united in the form of chains. It is termed the *Trichophyton*, and differs from the *Achorion* chiefly in the smaller number of its tubes and the larger quantity of its spores (see fig. 104).

FIG. 104.



Hairs from a case of Tinea tonsurans loaded with spores.
(M'CALL ANDERSON.)

472. The *Microsporon furfur* is found on the patches of skin affected with *Pityriasis versicolor*. It presents a number of spores of considerable size collected into clusters, like bunches of grapes, intermixed with numerous branching tubes (see fig. 105).

473. *Pediculi* (lice) are common causes of irritation of the skin. Three varieties are mentioned which differ in appearance—viz., *Pediculus capitis*, *Pediculus pubis*, and *Pediculus corporis*. The latter of these is a frequent cause of prurigo in old persons. The insects

and their ova should be carefully searched for in the folds of the clothes worn next the skin (see fig. 106). Pediculus capitis is often associated with eruptions on the head in children.

474. The *Acarus scabiei* is the cause of scabies or itch. In this disorder furrows (*cuniculi*) can be often detected, which are formed by the insects. "Before endeavouring to detect the cuniculi it is often useful

FIG. 105.



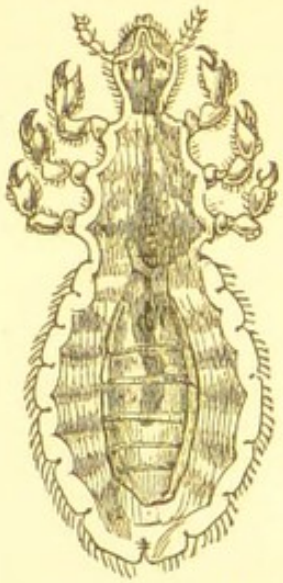
Spores and tubes of the Microsporon furfur, from a case of Pityriasis versicolor. (M'CALL ANDERSON.)

to make the patient wash the part, especially if the skin is dirty. A minute whitish elevation can then be seen at the extremity of each, which is, in effect, the insect itself covered by a thin layer of epidermis. It can be very readily removed by gently raising with a penknife the epidermic covering, and then inserting the point in the direction of the acarus,"* which can then be examined by the microscope. In other cases

* Anderson "On Skin Diseases."

you may obtain evidence of the presence of acari by a plan recommended by Dr. Hilton Fagge. A piece of the scab must be boiled in a solution of caustic soda

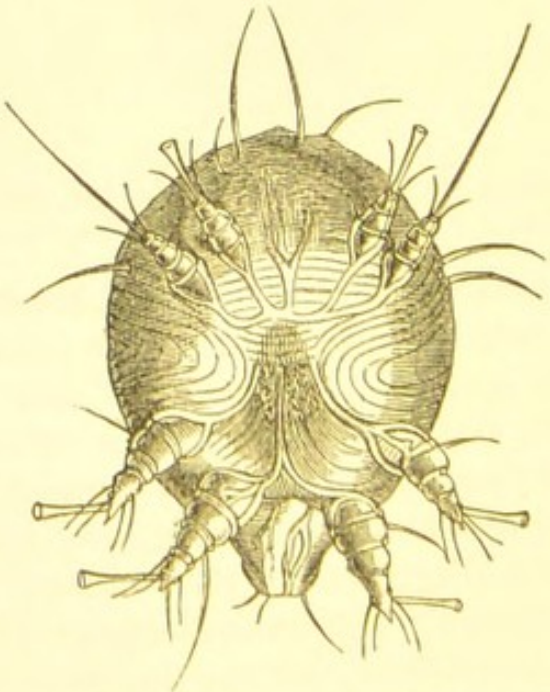
FIG. 106.



Pediculus Corporis (female). (M'CALL ANDERSON.)

(ʒss to ʒj of water) until it is dissolved. Pour the fluid into a conical glass, suck up the deposit with a dipping tube, and place it on a clean slide for micro-

FIG. 107.



Male Acarus. (M'CALL ANDERSON.)

scopic examination. The full grown acarus has eight legs, a round body, and a projecting head (see fig. 107). The female is larger than the male, and varies from $\frac{1}{7}$th to $\frac{1}{4}$th of a line in length. The eggs, which are usually found in the furrows, are about $\frac{1}{25}$th of a line broad, and $\frac{1}{11}$th of a line long.

475. If the scalp or other part thickly covered with hair be the seat of the disease, pass on to (509). If the skin presents simply a change of colour, unaccompanied by pain, itching, heat, or swelling, pass on to (506). If the eruption is accompanied by signs of inflammation, or by pain, or itching, begin at (476), Increased production of epidermis and thickening of the skin are here assumed to arise from inflammation.

SECTION I.

The Eruption is accompanied by Inflammation, Pain, or Itching.

First observe if there be any hard, solid projections of the skin (tubercles), or ascertain if these were present at the commencement of the complaint, and if so, pass on to (504). If such is not the case, remark if the eruption is dry or moist. If it has existed for some time you may have to determine this point by the previous history of the case, and by observing if the part presents scabs or scales on its surface. Remember that scabs result from the drying up of serous, purulent, or bloody secretions, whilst scales are produced by an increased formation of epidermis. If the complaint is of a dry character, begin at (476); if it is, or has been, attended with a fluid secretion, pass on to (491).

A. The eruption is of a dry character.

Under this head you may have the Papular, Scaly, or Exanthematous forms of disease; each of these is again subdivided into three orders. Observe if the

skin is raised into pimples, and if so begin at (476). If this is not the case, see if there is an increased formation of epidermis (480); otherwise pass on to (486). Remember that papular diseases are often followed by a scurfy condition; you distinguish them from the squamous affections by the total absence in the latter of any pimples.

a. The eruption is papular.

You may have three diseases under this head—lichen, prurigo, and scabies (496).

476. *a. a.* The eruption consists of a number of minute pimples, generally of a red colour, sometimes separate, at other times grouped together, and attended by itching of a tingling character.

The disease is *lichen.*

The complaint sometimes commences with slight fever, and lasts only for a week or ten days, but usually it runs a more chronic course. It ordinarily affects the parts where the skin is thickest, as the back of the forearms and hands, and the outside of the thigh and leg. When lichen occurs in children it is named *Strophulus*, and is often dependent on teething or derangement of the digestion.

The chief varieties of lichen are—

L. Circumscriptus.—Clusters of pimples of an irregularly circular form.

L. Agrius.—The irritation of the skin being severe.

477. Lichen is distinguished from scabies by the latter presenting vesicles as well as papules, by the eruption being situated where the skin is thin, as between the fingers, and by the discovery of the acari or their eggs. From eczema by the edges of the patches of lichen showing papules, not vesicles, by the skin being thicker, rough and harsh, and not having the yellow crusts of the former.

478. *b. b.* The eruption presents scattered, and rather flattened papulæ, scarcely differing in colour from the surrounding skin, but usually covered with a small black scab. The skin is generally thickened,

flabby, and dirty-looking. The itching is intense, and is increased by warmth.

The disease is *prurigo*.

At the commencement of the complaint few papules may be present, and itching is the prominent symptom. The black scabs on the pimples are produced by scratching. The parts chiefly liable to prurigo are the outer parts of the limbs, the neck, chest, back, anus, and genital organs.

The chief varieties of the disease are—

P. mitis.—In which the itching is tolerably slight.

P. formicans.—The itching severe, and accompanied by stinging and pricking.

P. senilis.—When it occurs in old persons.

Prurigo is also named according to the locality affected; thus *P. podicis*, when the neighbourhood of the anus is attacked; *P. pudendi* and *P. scroti*, when the female or male genital organs are the seats of the disease.

479. In a large number of instances, especially in old persons, the prurigo is produced by the irritation set up by lice. This is especially the case when the eruption is confined to the neck, back, and shoulders. In all doubtful cases examine the clothes for the insect or its eggs (fig. 106).

b. The eruption is of a scaly character.

Under this head you have also three forms of disease—viz., psoriasis, ichthyosis, and pityriasis. Ascertain, by gently pinching up a fold of the affected part, if the cutis is thickened; if so, the case is one either of psoriasis or ichthyosis; if the complaint is entirely superficial, it is pityriasis.

480. *a. a.* The eruption consists of elevated patches of dry white epidermis. When the scales are removed, the cutis below them is found to be slightly raised, somewhat thickened, and of a red colour. Chaps often occur when the complaint affects the hands, feet, or other parts liable to constant motion. The itching is slight.

The disease is *psoriasis.*

The term *lepra* used to be applied to those cases in which the eruption assumed a circular form, but it is now seldom employed. Psoriasis commences in the shape of small elevations of the skin capped by a thick layer of epidermic scales; these gradually extend, mostly in a circular shape. The disease usually attacks persons in good health, and is often hereditary.

The chief varieties are named from the shape of the patches, or according to the part affected; thus—

P. guttata.—The spots like drops of mortar.

P. diffusa.—When a large portion of skin is involved.

P. capitis.—When the scalp is attacked.

P. palmaris.—When it affects the palm of the hand.

481. Psoriasis is most generally found just below the elbows and knees; when the palm of the hand or the sole of the foot is alone affected, the disease is almost always of a syphilitic character. When the scalp is the seat of the disorder, you may confound it with eczema; but in the latter the hairs are glued together by the dried secretion, which is not the case in psoriasis.

482. *b. b.* The *whole* skin of the part affected is covered with a dry, hard, thick, almost horny epidermis, which is irregularly elevated, being either raised into prominences, or showing the natural divisions of the skin. If the cuticle is removed, there is no redness of the skin beneath. The complaint is not attended by pain or itching.

The disease is *ichthyosis.*

The name is derived from the resemblance of the skin to the skin of a fish. The disease seems to consist in an increased thickness and altered condition of the epidermis, and is sometimes accompanied by hypertrophy of the papillæ of the cutis. It is often hereditary, and in some cases, congenital. When general, it usually avoids the palms of the hands, the

soles of the feet, and the axillæ; when local, it chiefly affects the legs and forearms near the elbows.

483. It is distinguished from psoriasis by its not occurring in patches with healthy skin intervening between them, by the absence of decided exfoliation of the epidermis, and by the redness of the cutis.

484. *c. c.* The part affected is covered by an increased formation of fine scales of epidermis, which are being constantly rubbed off in the shape of powder. The cutis is not thickened. It is generally attended with a considerable amount of itching.

The disease is *pityriasis.*

Some authors look upon this disease as only a variety of erythema. It has received its name from the bran-like character of the scales.

The varieties are named from the part of the body affected; thus we have *P. capitis*, when the head is the seat of the disorder. *Pityriasis versicolor* is a disease depending upon the presence of a vegetable growth, the Microsporon furfur (fig. 105). It presents itself as an eruption of irregularly formed patches of a yellow-brown colour, from which scales that under the microscope display the vegetable growth can be easily removed by friction. It is chiefly met with on the trunk of the body, and is seldom attended with much itching.

485. Pityriasis on the scalp may form patches which in children may be mistaken for "ringworm" (511); but the circular shape, the elevation of the edges, and the microscopic characters of the hairs in the latter complaint will suffice to distinguish it.

c. The disease is of an exanthematous character.

The rashes attended with a considerable amount of fever have been already described (431). You meet with three forms of rash in which fever is absent, or of only moderate amount—Roseola, erythema, and urticaria. First remark if there are prominent smooth patches, redder or whiter than the surrounding skin (wheals), and attended with severe itching and

tingling; if so, pass on to (490). If this is not the case, begin at (486).

486. *a. a.* The skin is covered with irregularly shaped patches of a more or less rose-red colour, slightly, if at all, elevated. The throat is sometimes similarly affected; there is often slight fever, and the rash is attended with itching or tingling.

The disease is *roseola.*

The eruption may affect the whole body, as in measles and scarlatina, or it may be limited to some particular part. It often appears in the course of other diseases, but does not influence their course or issue.

The varieties are classed as idiopathic or symptomatic:—

Idiopathic.	*Symptomatic.*
R. Infantilis: affecting children.	*R. Variolosa.*
R. Æstiva: affecting adults, chiefly in summer.	*R. Vaccina.*
R. Autumnalis: affecting adults in autumn.	*R. Rheumatica.*
R. Annulata: the eruption in shape of rings.	*R. Arthritica.*
	R. Choleraica.

487. Roseola is most likely to be confounded with measles and scarlatina. It is distinguished from the former by the small amount of fever and the absence of catarrhal symptoms, by the uniformity of the redness, and the deeper colour of the patches; from scarlatina, by the smaller amount of inflammation of the throat, and the slight degree of fever with which it is accompanied.

488. *b. b.* Patches of the skin present a red colour that disappears under pressure. The parts are sometimes slightly elevated, and the complaint is often attended with heat or itching.

The disease is *erythema.*

Erythema differs from roseola in its being limited to a portion of the skin, and in the absence of any fever.

The complaint has been described under different forms—

E. læve. — Eruption on the legs of dropsical persons.

E. fugax.—Patches suddenly appearing and disappearing.

E. intertrigo.—Eruption produced by the friction of adjacent parts of the body.

E. nodosum.—Elevated patches, chiefly over the shin-bones and arms, never on the body.

489. Erythema is distinguished from erysipelas by its having no tendency to spread, by the slight amount of swelling, heat, and pain, the absence of fever and of vesication.

490. *c. c.* The patient is affected with round or oval, elongated, prominent patches of the skin, that present the appearance of being produced by nettles. They appear and disappear suddenly, can be often excited by scratching, are not followed by desquamation, and are accompanied by intense heat and itching.

The disease is *urticaria.*

It often arises from indigestion, and in some persons certain articles of diet quickly give rise to it.

B. The eruption is of a moist character.

The vesicular and pustular forms of inflammation of the skin are included under this head. To distinguish between these, remember that the contents of the latter are *from the first* purulent, for the fluid of vesicles, though at first clear, often becomes turbid as the disease progresses. If the eruption is vesicular, begin at (491); if pustular, pass on to (499).

a. The eruption commences with vesicles.

Under this head we have five orders—eczema, herpes, sudamina, scabies, and pemphigus. Rupia, which often contains a clear fluid at first, and is therefore classed by many amongst vesicular diseases, is by others referred to the pustular group. Chicken-pox also presents a vesicular eruption, but is described amongst Fevers (442). If the vesicles exceed a four-

penny piece in size they are named bullæ; if the eruption is formed of such, pass on to (498).

491. *a. a.* The eruption consists of irregularly shaped patches of minute vesicles, usually not larger than a pin's head, which, on breaking, discharge a fluid that stiffens linen and dries up into thin yellow crusts. It is attended with pain, smarting, or itching.

The disease is *eczema.*

No vesicles may be apparent; the disease is then recognised by the skin feeling thick when pinched up with the fingers, by the *starchy* nature of the discharge, the formation of thin yellow crusts, and the attendant itching. It is one of the most common eruptions, is often hereditary, and is sometimes associated with rheumatism, gastric affections, or bronchitis.

The chief varieties are—

E. simplex.—When the itching and inflammation are moderate.

E. rubrum.—A more inflammatory form of the disease; often on legs affected with varicose veins.

E. impetiginodes.—A combination of eczema and impetigo.

It is likewise named according to the part affected—*Eczema capitis,* &c.

492. Chronic eczema occasionally simulates psoriasis, but in such cases you observe that the scales are formed by the drying up of secretion, not, as in the latter, by an increased formation of dry epidermis. When it affects the scalp, it may be mistaken for pityriasis, but in the latter the surface has been dry from the commencement, and the hairs are not glued together.

493. *b. b.* The eruption is formed of a number of large vesicles, grouped together on an inflamed base; they go through successive stages of maturation and scabbing, and are not reproduced. It is attended with

heat and smarting, and sometimes with severe pains of a neuralgic character.

The disease is *herpes.*

Herpes usually commences as a red patch, on which vesicles shortly form. In some cases the eruption is preceded, in others it is followed, by severe neuralgic pains, and it is usually seated over the course of a nerve, such as the frontal or one of the dorsal nerves.

The varieties are divided into a phlyctenoid and a circinate group. In the former the eruption presents no regularity of shape; in the latter, it is more or less circular. *Herpes circinatus* is a parasitic disease, and will be described in the affections of the hair. In *Herpes zoster*, or "shingles," the patches of spots are arranged in the form of a band around half of the body, or down one limb. *Herpes preputialis* has been often mistaken for syphilis.

494. Herpes differs from eczema in the localized nature of the patch, in the absence of the oozing of a starchy secretion, and in the vesicles not being reproduced.

495. *c. c.* The eruption is formed of scattered vesicles like little drops of water, which in three or four days shrivel and dry up. There is no irritation or itching.

The disease is *miliaria.*

When the vesicles are unattended by redness they are termed by many *sudamina:* when slightly inflamed, *miliaria.* The eruption occurs in febrile or other diseases in which perspirations are present, but it seems to have no effect on the progress of the complaint with which it is associated.

496. *d. d.* The eruption consists of vesicles intermixed with papules, and sometimes with pustules; it is situated where the skin is most thin, and is attended with excessive itching, increased when the body is warm. The *Acarus scabiei* or its ova can be discovered.

The disease is *scabies* (*the itch*).

As scabies is extremely contagious, whenever you suspect it to be present, ascertain if other members of the same family have been attacked. The parts chiefly affected are the spaces between the fingers, the inner surfaces of the wrist, forearms, thighs, the lower parts of the abdomen, the penis in the male, and the nipples in the female. In children the buttocks and inner sides of the feet are most often attacked. The face and head are scarcely ever affected.

497. The diseases most likely to be confounded with scabies are lichen, prurigo, and eczema. The peculiarity of situation, the evidence of contagion, and the discovery of the Acari or their ova, are the most certain means of diagnosis. Lichen is distinguished by the essentially papular nature of its rash, by its occurring chiefly on the outside of the back, arms, and thighs, and by the dry rough state of the skin accompanying it. In prurigo the neck and shoulders are more often attacked, and the discovery of pediculi may perhaps be made. Eczema can be often traced to some local irritant, as sugar, lime, &c., and the rash is more simply vesicular than in scabies.

498. *e. e.* A number of small blisters (bullæ) appear upon a reddened surface. The fluid they contain is transparent or of a yellowish colour, and after being evacuated, a thin crust or superficial ulceration remains. The blisters are often, but not always, attended with pain, heat, or itching.

The disease is *pemphigus.*

The chronic form of pemphigus was formerly termed *pompholyx*, but this name is now rarely employed. The blisters seldom attack the scalp, palms of the hands, or soles of the feet. The disease is usually divided into *acute* and *chronic.*

b. The eruption commences with pustules.

Under this head you have impetigo, ecthyma, acne, and rupia. Observe if the pustules are pointed and

situated on a hard elevated base; if so, pass on to (502). If they are blebs, or covered by a thick conical scab, pass on to (503).

499. *a. a.* There is an eruption of small pustules, only slightly elevated, often in patches; the pus dries into a greenish-yellow, irregularly-shaped scab or crust. No scar is left after healing. There is generally a sense of heat or itching.

The disease is *impetigo.*

By many persons impetigo is considered as a pustular form of eczema. A variety occurs in which the characters of both are present, and which is known by the name of *Eczema impetiginodes.*

500. *b. b.* The eruption consists of large, round, isolated pustules, situated on a hard, inflamed base. The pus dries up into thick brown scabs, which afterwards fall off and leave slight scars. There is often heat, tingling, or itching.

The disease is *ecthyma.*

Ecthyma is chiefly met with on the extremities, back, and shoulders. In scabies, ecthymatous pustules are often formed on the hands and feet, but they are associated with vesicles, and acari can be generally discovered.

501. Ecthyma is distinguished from impetigo by the small size of the pustules in the latter, and by their not having a hard base.

502. *c. c.* The eruption consists of little, isolated, hard, conical projections of the skin, some suppurating at their summits, or covered with a scab; others red, hard, and tender. The eruption is confined to the face, neck, and shoulders.

The disease is *acne.*

Acne is seldom seen before puberty. It might be confounded with ecthyma, impetigo, and eczema. Ecthyma is known by its broad, flat, not pointed pustules, and is not interspersed with black points, as in acne. In impetigo the pustules are not hard and prominent. Eczema is distinguished by its vesicular

appearance, its itching or burning sensation, and by its not being confined to the face and shoulders.

The varieties of acne are—

A. simplex.—Small black specks surrounded by slight inflammation.

A. indurata.—Hard, red elevations, with suppurating tops.

A. rosacea.—Red patches, often associated with enlarged veins.

503. *d. d.* Flattened blisters are formed, which contain at first a clear, afterwards a bloody or purulent fluid. Subsequently each is covered with a hard, dark-coloured scab, often conical, which conceals a more or less deep, unhealthy ulceration.

The disease is *rupia.*

Rupia is almost always the result of syphilis. The lower limbs, loins, and shoulders are most often attacked. It is distinguished from pemphigus by the flattening of the bullæ, the thickened crust, and the subsequent deep ulcerations, instead of the distended blisters, the scaly covering, and superficial ulcers of pemphigus.

The chief varieties are—

R. simplex.—Where the crusts are thin.

R. prominens.—Blisters large, crusts thick and prominent, ulcerations deep.

C. The eruption is of a tubercular character.

Under this head you have acne (502), molluscum, and lupus. Warts and corns have been already noticed. Keloid, elephantiasis, and frambœsia are generally classed under this head.

504. *a. a.* A number of hard circular tumours, varying from the size of a split pea to that of a hazel-nut, are present on the skin. They generally have a black point or slight depression on their summits, and are sometimes attached by a pedicle to the skin.

The disease is *molluscum.*

The varieties of molluscum are the following—

"(*a*) Circular tumours about the size of peas,

having a well-marked depression in the centre of each; occurring most commonly on the faces (or other exposed parts) of several children in a family, or on a baby's face and its nurse's breast at the same time. This is *Molluscum contagiosum*. If one of the little tumours be cut into and squeezed, a lobulated gland-like substance is seen. There is a tendency to spontaneous cure.

"(*b*) A number of circular tumours of various sizes (from that of a walnut downwards) scattered all over the body and extremities, dotted on their surface with black spots, and giving a semi-fluctuating feeling to the fingers. This is *Molluscum fibrosum* (or *simplex* or *congenitale*). There is no tendency to spontaneous cure.

"(*c*) In connection with the last, or occurring separately, you meet with tumours of various sizes consisting of pendulous portions of skin and cellular tissue hanging by longer or shorter slender stalks."*

505. *b. b.* The eruption consists of red patches, on which are situated small, round, softish tubercles, which may be covered with a brownish scab, or may have given rise to ulcerations or white puckered scars.

The disease is *lupus*.

The disease is most generally met with on the face, and the ulcerations frequently produce great deformity by destroying portions of the nose, &c.

The varieties of lupus are—

L. erythematosus.—Irregularly shaped, red patches, with a smooth and glistening surface, ending in scars, but not in ulceration.

L. non-exedens.—Ends in scars, but not in ulceration.

L. exedens.—Gives rise to destructive ulceration and scars.

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* Mr. Waren Tay.

SECTION II.

The Skin presents simply a Change in Colour, without Fever or signs of Inflammation.

Under this head are ephelis (sunburn) and lentigo (freckles), which do not require description; also pityriasis versicolor (484), purpura, and Addison's disease.

506. *a. a.* The eruption consists of a number of spots or patches of a dull red or purple colour, which do not disappear under the pressure of the finger.

The disease is *purpura.*

The disease is usually attended with great debility and sometimes proves fatal by hæmorrhage from the lungs or into the substance of the brain. It is believed to arise from an abnormal condition of the blood, which becomes extravasated from the vessels of the skin. When the spots are very small they are termed *stigmata;* those the size of flea-bites are known as *petechiæ;* rather larger as *vibices;* and when of considerable area, the patches are named *ecchymoses.*

The chief varieties of purpura are—

P. simplex.—Spots small in size, attended by general weakness.

P. hæmorrhagica.—Spots larger. Gums and mucous membranes liable to bleedings.

P. urticans—Round elevations, like wheals, followed by dark livid spots.

The peculiar colour of the eruption, and its persistence under pressure, are sufficient to distinguish purpura from all other skin diseases.

507. Hæmorrhagic spots are also apt to occur on the skin in scurvy. They usually appear first on the lower extremities, but may afterwards present themselves on any part of the surface of the body, being generally attended by extravasations into the subcutaneous connective tissue, and often by hæmorrhages from the

mucous membranes. The gums are always swollen, spongy, and bleed readily, the teeth are often loose and the breath fœtid. The patient is anæmic, emaciated, and feeble, complains of dyspnœa on exertion, palpitation, and œdema of the legs, the appetite is bad, the bowels constipated, and the temperature below the normal point. In the later stages attacks of diarrhœa and of dangerous faintings are apt to occur.

The disease is the consequence of an insufficient supply of vegetable food; it is therefore most common amongst seafaring persons, but also occasionally presents itself in landsmen. It has been supposed by some to arise from a deficiency of potash in the blood, but the researches of Dr. Ralfe have led him to believe that it consists in an alteration in the quality of the blood produced by a diminution in its alkalinity. You may confound it with purpura, but it may be distinguished from it by the swollen, spongy condition of the gums, and by the history of a deficiency in the amount of vegetable food.

508. *b. b.* There are patches of skin of a brownish or olive-green colour on different parts of the body. The patient suffers from extreme debility, palpitation, breathlessness on the slightest exertion, loss of appetite, nausea, and occasional vomiting. The lips are pale, and the pulse very feeble.

The disease is *Addison's disease* (*Melasma Addisoni*).

In this complaint, first described by Dr. Addison, the supra-renal capsules are diseased. The duskiness of the skin is most marked in those parts which are normally darker than the rest, such as the axillæ, umbilicus, and scrotum, but the face, neck, and upper extremities are also commonly "bronzed;" the lips and inner side of the cheeks often present dark stains. The bronzing seldom occurs when the capsules are affected with cancer. The morbid changes in the supra-renal capsules, which are associated with bronzing, are described by Dr. Wilks as—"first, the deposition of a translucent, softish, homogeneous sub-

stance; subsequently, the degeneration of this into a yellowish-white opaque matter; and afterwards a softening into a so-called abscess, or drying up into a chalky mass."

SECTION III.

The Scalp, or other parts thickly covered with Hair, is the Seat of the Eruption.

The hairy parts of the body are liable to the various eruptions that have been before described; thus the scalp is often attacked by psoriasis, pityriasis, eczema, and impetigo. But they are also subject to parasitic affections, which must be carefully studied, on account of their frequency and importance. In every doubtful case the hairs must be examined by the microscope.

509. *a. a.* The part affected presents a number of bright yellow, dry, circular crusts, depressed in the centre, or an irregular mass of dry, sulphur-coloured crust. The hairs are dull and dry-looking, are readily pulled out, and under the microscope exhibit the *Achorion Schönleinii.* There is some itching, and a peculiar mouldy smell, like that of mice.

The disease is *Tinea favosa* (*favus*).

The disease commences as little yellow specks surrounding the roots of the hair; when it has continued for a length of time, patches of baldness are often produced by the destruction of the hair follicles.

There are three varieties of *Tinea favosa*—

Favus pilaris.—When the hair is affected.

F. epidermidis.—When other parts of the skin are attacked.

F. unguium.—When the disease is in the nails.

510. Favus may be confounded with impetigo, but in the latter there are seldom patches of baldness, the colour of the hair is not altered, and the microscope fails to detect the vegetable parasite. Psoriasis may

simulate favus, but in it there is no change in the hairs and no mouldy smell, and patches of scaly eruption are usually also present on the elbows and knees.

511. *b. b.* There are circular patches on the scalp, upon which the dull dry hair has been broken off, so as to project only a few lines above the surface, which is covered with fine, white, powdery scales. The hair and scurf, when examined with the microscope, show the *tricophyton* (fig. 104). There is usually itching at the commencement of the eruption.

The disease is *Tinea tonsurans* (*ringworm*).

512. Permanently bald patches may be the result of ringworm, but they are rare. When affecting the scalp it is almost confined to childhood. It may be confounded with *eczema impetiginodes*, but in the latter the patches are not circular, and the hairs are healthy, the itching is excessive, and an eruption of a similar kind may be found on other parts of the body.

The varieties of the complaint are—

Tinea tonsurans.—Affecting the scalp.

Tinea circinata (*Herpes circinatus*).—Ringworm of the trunk or extremities.

Tinea sycosis.—Affecting the beard, usually attended with pustules and tubercles.

513. *c. c.* There are round or oval patches of baldness where the hair is quite removed, or replaced by fine downy hairs. The skin is white, and there is but little itching.

The disease is *Alopecia areata* (*Porrigo decalvans*).

At first the skin is rather wrinkled and slightly reddened. The complaint is usually limited to the scalp, but may attack the eyebrows, beard, or genitals. It is believed by many to be the result of a vegetable parasite, but this is denied by others.

CHAPTER XVI.

ANIMAL PARASITES.

A LARGE number of different animals are known occasionally to infest the human body, the majority selecting the alimentary canal for their habitation. These helminthic or worm-shaped parasites are arranged in three orders—the Cestoda, Trematoda, and the Nematoda.

SECTION I.

I. CESTODA, OR TAPE-WORMS.

514. The entozoa belonging to this order present themselves in the bodies of man and other animals in two different forms, one of these being the larval or immature condition of the other.

In the sexually mature state they are found in the small intestines. They are of an elongated, ribbon-like form, are composed of separate joints or segments, and, as every mature joint contains both male and female reproductive organs, each worm may be regarded rather as a chain or colony of individuals than as a single animal. They are destitute of mouth or alimentary canal, and probably exist by the absorption of the fluids in which they are immersed. The head is provided with suckers, accompanied in some species by hooklets, by which they are enabled to fix themselves to the mucous membrane of the intestines. The growth of new segments takes place at the upper end of the worm below the head; and the lower, and therefore older, joints, as soon as the

ova they contain become mature, separate, and are discharged along with the fæces.

When a ripe ovum of the ordinary tape-worm escapes from the intestinal canal, and gains an entrance, along with the food or drink, into the stomach of an animal fitted for its habitation, the embryo is set free by the digestion of its enveloping capsule. The "*proscolex*," as the embryo in this stage is termed, perforates the walls of the intestine by means of the spikelets with which it is furnished, and reaches some organ suitable for its abode. Here it is excluded from the air, becomes enclosed in a cyst, and a colony of individuals is produced. The "*scolex*," as each of these is termed, is furnished with a head provided with hooklets, and a neck which is attached to a vesicular body, containing fluid. In this condition it has no reproductive organs, and cannot be further developed, unless it is taken into the intestinal canal of a warm-blooded animal. The cysts of one species (*Tænia echinococcus*) constitute the hydatids so often met with in the human liver (fig. 67). Those of another species give rise to the disease, in the flesh of the pig and other domestic animals, named "measles."

The symptoms resulting from the presence of tape-worm in the intestines vary greatly. Some persons are unaware of the existence of the parasite until their notice is attracted to the fact of joints being passed with the fæces. Others complain of a feeling of faintness and a craving for food, flatulence, griping pains of the abdomen, irregular action of the bowels, irritation of the mouth or nose, and other signs of disordered digestion. More rarely, giddiness, headache, or even convulsions, have been observed, especially in young persons.

There are eight varieties of this order found in the human body, but only two are of frequent occurrence in this country. These are the *Tænia solium* and the *Tænia mediocanellata*

515. *a. Tænia solium.*—This may attain the length of ten to twenty feet, and, although formerly supposed only to occur alone, two or three worms may exist together. The head is very small, and furnished with four suckers and a double row of hooklets, the neck is long and narrow (figs. 108, 109, and 110). The larval form is named the *Cysticercus tæniæ cellulosæ*, and constitutes the "measles" of the pig. The worm is consequently apt to be developed in such persons as consume raw or underdone pork. It is perhaps the most common form of tape-worm met with in this country.

516. *b. Tænia mediocanellata.*—This is usually longer than the tænia solium, and its segments are larger and more numerous. The head has four suckers, but is devoid of hooklets. The larval form (*Cysticercus tæniæ mediocanellatæ*) infests the flesh of the ox, and the worm is consequently found in those who have partaken of raw or imperfectly cooked beef. It is common on the Continent, and was supposed, until the researches of Dr. Cobbold, to be rare in this country. It is now, however, believed to be as common in England as the former variety.

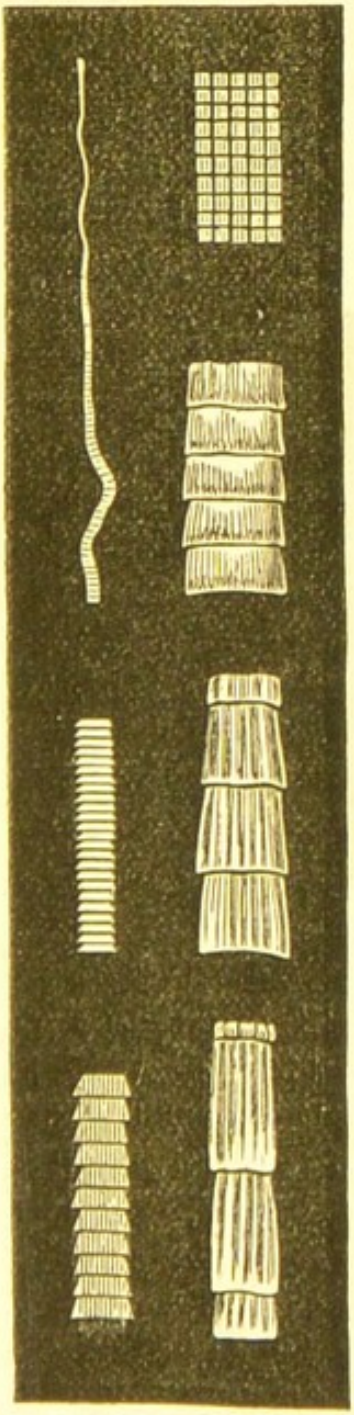
517. *c. Tænia elliptica.*—This only attains the length of six or eight inches. The head is very small, and furnished with hooklets. It exists in the intestines of the cat and dog, but has been rarely observed in the human subject. The larval condition has not yet been recognised.

518. *d. Tænia flavo punctata* scarcely reaches a foot in length. The joints in the anterior half of the chain are marked by a yellow spot. It has been only once found in the human subject. The larval condition is unknown.

519. *e. Tænia nana* is a very small worm, scarcely attaining an inch in length. The head is provided with hooklets and four suckers. It has been met with in the duodenum of the natives of Egypt. The larval condition is unknown.

520. *f. Tænia echinococcus.*—The mature worm consists of three or four joints, and is seldom longer than a quarter of an inch. The head is provided with hooklets. It occurs in the intestines of the dog, but

FIG. 108.



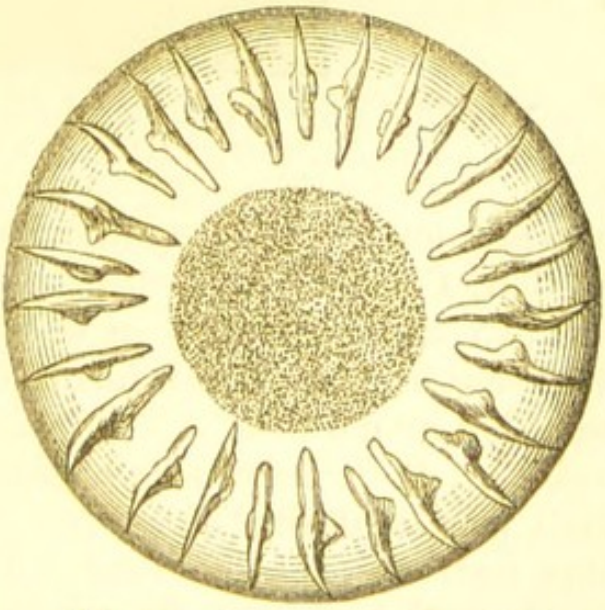
Tænia solium, showing the head and some of the segments at different distances—natural size. (DAVAINE.)

FIG. 109.



Head of the *Tænia solium* magnified, showing the four suckers and the hooklets. (DAVAINE.)

FIG. 110.

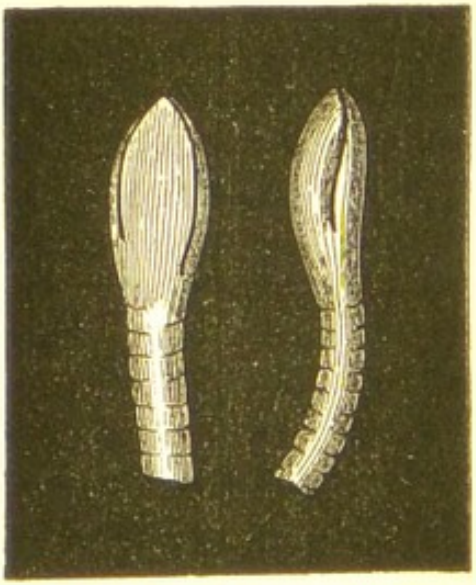


Microscopic appearance of the hooklets of the *Tænia solium*. (LEUCKART.)

has not been met with in man. In the larval condition it constitutes the hydatid so frequently found in the human subject, more especially in the liver (fig. 67).

521. *g. Bothriocephalus latus.*—This is the largest form of tape-worm known to infest the human subject. It is said to vary from six to twenty-six feet in length. The head is club-shaped, and unprovided with hooklets, but has a deeply-grooved longitudinal sucker on each side (fig. 111). The joints are broader than

FIG. 111.



Magnified view of the head of the *Bothriocephalus latus.* (DAVAINE.)

they are long. It is common in Switzerland, Russia, Sweden, Poland, and some other European countries. The ova are developed in water, and the parasite is supposed in the larval form to inhabit the body of some fish or mollusc.

522. *h. Bothriocephalus cordatus* is of comparatively small size, and has only been recently discovered in some natives of Greenland. It is about a foot in length, and has been found in the intestines of the dog. The head is heart-shaped, short, and broad, and the segments are distinct in the neck.

SECTION II.

Trematoda, or Fluke-like Parasites.

523. The entozoa belonging to this order are small, flat-shaped, usually pointed at each end, and not divided into segments. They are provided with two sucking discs, one situated at the mouth, and the other on the abdomen. They possess a mouth and a bifurcating alimentary canal, but no anus. The alimentary canal is hollowed out in the substance of the body, and is not surrounded by a peri-visceral cavity. The male and female reproductive organs exist in the same individual. The larvæ are often tailed, have no hooklets, are never cystic, and probably go through various changes in form before their admission into the digestive organs of the animal in which they attain their perfect development. Nine species have been discovered in man.

524. *a. Fasciola hepatica*, or *Distoma hepaticum*.—This has been rarely met with in the human subject, and only in the gall-bladder and ducts.

It is very common in the sheep, where it inhabits the gall-bladder and ducts, and gives rise to the destructive disease termed the "rot." The worm varies from eight to fourteen lines in length and from two to six lines in breadth.

525. *b. Distoma crassum*.—Varies from one inch to three inches in length by five-eighths of an inch in breadth. It was discovered in the duodenum of a Lascar by Mr. Busk.

526. *c. Distoma lanceolatum*.—Is about one-third of an inch in length, by one line and a half in breadth. It is of a lanceolate form, and has only twice been met with in man.

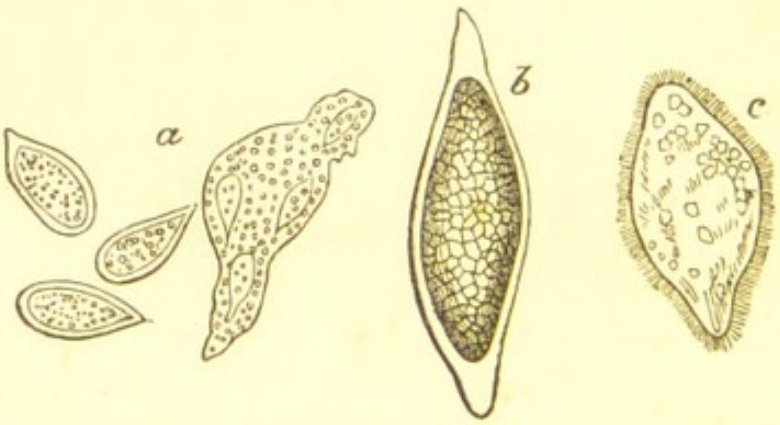
527. *d. Distoma ophthalmobium*.—Was found in the eye of a child affected with cataract. Of the four

specimens discovered not one exceeded half a line in length.

528. *e. Distoma heterophyes.*—Was found in the intestine of a boy in Cairo. It did not exceed three-quarters of a line in length by a quarter of a line in breadth.

529. *f. Bilharzia hæmatobia.*—The male and female are separate, the latter, which is much the larger, being about four-fifths of an inch in length. It infests the human subject in Egypt and the Cape of Good Hope, and has been found in the veins of the mesentery, in the intestines, bladder, ureters, and kidneys.

FIG. 112.



Eggs and embryos of *Bilharzia hæmatobia*. *a*. Three ova and a portion of mucous membrane with ova attached. *b*. Ovum further developed. *c*. Free embryo. (Dr. JOHN HARLEY.)

By the irritation it produces, inflammation and hæmorrhage are set up in the organs it inhabits. When the intestines are the seat of the parasite, symptoms of dysentery are observed; when situated in the kidneys it produces a form of hæmaturia which is very prevalent amongst the inhabitants of certain parts of the Cape of Good Hope (178). The presence of the worm can only be detected by the discovery of the ova in the fæces or urine, by means of the microscope (fig. 112).

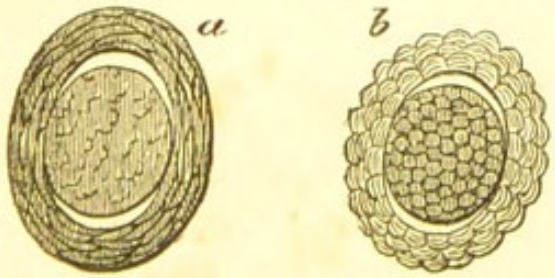
SECTION III.

Nematoda, or Round Worms.

This order comprises a number of different families. The worms are slender, elongated, and not jointed. They possess a mouth, alimentary canal, and anus. They are unisexual, and most of them are parasitic during only a portion of their existence. The most important of this order are the following:—

530. *a. Ascaris lumbricoides*, or *common roundworm.*—The body is of a reddish colour, tapers towards each extremity, varies in length from six to sixteen inches, and greatly resembles the ordinary earth-worm in its general appearance. It has three distinct and uniform papillæ that surround the mouth, each of

Fig. 113.



Ova of *Ascaris lumbricoides* from the stools.
a. Recently deposited. *b*. Longer delayed in the stools.
(Ransom.)

which is beset internally with microscopic teeth. It chiefly inhabits the small intestines, but may present itself in the stomach, œsophagus, or gall-ducts. It may be solitary or a large number may be present together. It commonly infests children or young persons.

In many cases no symptoms are produced by the presence of the worm in the intestines, but in others signs of intestinal irritation are observed. Thus, there may be occasional griping pains of the abdomen, irregular action of the bowels, variable appetite, itching of the nose or anus, restlessness at night, grinding of the teeth. The ova of the worm pass away with

the fæces, and can be generally discovered by microscopic examination (fig. 113).

531. *b. Ascaris mystax.*—Is chiefly found in the cat, but has been proved to be occasionally present in the human subject. It varies from an inch and a half to two or three inches in length. Its head is spear-shaped.

532. *c. Trichocephalus dispar.*—Varies from an inch and a half to two inches in length. Its anterior extremity is like a hair, and occupies two-thirds of its entire length; the posterior extremity is comparatively thick. The males are shorter than the females. It occurs chiefly in the cæcum and colon, but no symptoms have been recognised as resulting from it.

533. *d. Oxyuris vermicularis* or *thread-worm.*—This is a small worm, like a piece of thread in shape. The female is about four-tenths of an inch in length, whilst the male is seldom more than one-sixth of an inch. The head is furnished with three lips, and is enlarged with wing-like attachments. It is most commonly met with in children and young persons, and infests the rectum. These worms are often present in great numbers, and are apt to creep out of the anus, especially at night.

FIG. 114.



Magnified cyst of the *Trichina spiralis*. (VIRCHOW.)

534. *e. Trichina spiralis.*—This minute worm, which is only about one-eighteenth of an inch in length when mature, may exist in the human body in a free or encysted condition. In the encysted state it is situated between the sarcolemma of the primitive muscular fibres, and its capsule becomes more or less calcified (fig. 114). Thus enclosed it is sexually immature, gives rise to no symptoms, and is only discovered accidentally after death. It is often met with in the flesh of the pig, and if a piece of raw

or imperfectly cooked pork thus affected be eaten, the encysted trichinæ are set free by the digestive process. In the intestines they increase in size, become sexually mature, and rapidly produce a numerous progeny. The young worms perforate the tissues, and enter the muscular fibres, setting up a severe form of fever which often terminates fatally. The symptoms occasionally are ushered in by violent diarrhœa and vomiting. More generally the patients complain at first of great depression of strength and pains of the limbs and muscles. These symptoms are quickly followed by hardness and rigidity of the muscles, great heat of skin, rapid pulse, thirst, and œdema of the face and limbs. When recovery occurs the trichinæ become encysted amongst the muscular fibres, and are incapable of further mischief.

535. *f. Filaria medinensis*, or *Dracunculus*, or *Guinea Worm*.—Although only about one-tenth of an inch in thickness, the parasite may attain the length of six feet. It may occur alone, or several may exist together. Only the female appears to occur in the human body, and the worm is confined to certain tropical regions of Africa and Asia. The young filariæ are believed to enter the body by perforating the skin of persons bathing in the muddy water of tanks, and are supposed to constitute some of the numerous species of "tank-worms." After penetrating the tissues the parasite appears to remain quiescent for a period of about twelve months, during which time it has grown to a large size and become distended with young. It now makes its way to the surface, and a small blister forms over the part where it is about to make its exit. When this bursts the head of the worm appears, the young filariæ are discharged, and the parent is gradually ejected or is removed by art.

536. *g. Filaria lentis*.—Only attains the length of three-tenths to six-tenths of an inch. It has been found in the eye of the human subject.

537. *Filaria sanguinis hominis.*—The embryos of a minute nematoid worm, provisionally so named by their discoverer, Dr. T. Lewis, have been found in great numbers in the blood, and in the urine and other fluids of persons in India affected with chyluria, elephantiasis, or some other closely allied pathological condition. These average $\frac{1}{75}$th of an inch in length, with a transverse diameter of about $\frac{1}{3500}$th of an inch, and do not materially differ from the young of other nematodes, except in being enclosed in delicate transparent sheaths, within which they can be seen to contract themselves.

538. *h. Sclerostoma duodenale.*—Is about four to six lines in length. The head is round and provided with hooklets. It infests the small intestines, and is chiefly found in Egypt and in some parts of Italy. It occurs in large numbers, and is apt to produce a form of anæmia (Egyptian chlorosis), by the frequent small hæmorrhages it excites.

539. *i. Strongylus gigas.*—Is rare in the human subject, but is not uncommon in some of the lower animals.

540. *k. Strongylus bronchialis.*—Is six to nine lines in length, and has been found in the bronchial glands.

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