LECTURES ON THE DIAGNOSIS AND SURGICAL TREATMENT OF ABDOMINAL TUMOURS.

Delivered at the Royal College of Surgeons of England.

BY

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LECTURE I—June 10th, 1878.

Mode of Examining Patients with Abdominal Tumours; External, Internal, and Combined Examination; Form of Note-Book for Recording Cases; Collections of Fluid in the Abdominal Cavity and in the Cyst; Ovarian, Renal, and Hydatid Cysts; Illustrative Specimens from Museum; Chemical Examination of Fluids removed by Tapping.

MR. PRESIDENT AND GENTLEMEN,—The honourable position of Professor of Surgery and Pathology, which, by the kindness of my colleagues on the Council, I hold this year, has been filled in past times by some of the greatest men in our profession. Abernethy, Cooper, Bell, Green, Lawrence, Brodie, Guthrie, and Fergusson are among those who have passed away. Of past professors still happily amongst us, and giving encouragement by their presence, some have published their lectures as actually delivered here; and I have only to mention Paget's *Surgical Pathology*, Hilton's *Rest and Pain*, Clark's *Surgical Diagnosis*, Hancock's *Surgery of the Foot*, and Hewett's *Injuries of the Head*, without doing more than allude to recent lectures which have appeared in the medical journals soon after delivery, to prove that the able men who have preceded me in this professorship have worked so well that, while they afford the stimulus of a bright example, they also make me painfully conscious of my inability to tread worthily in their footsteps. It would be presumptuous in me to attempt to rival them. All that I can do is to bring before you in the plainest manner the results of twenty years' exceptionally large observation and practice in a department of surgery which, until lately, has not received much attention here; and in endeavouring to tell what I have learned about the diagnosis and surgical treatment of abdominal tumours, how I have learned it, the lessons that I have been taught by mistakes and failures, the satisfaction which has attended increasing success, I may be of use in directing the thoughts and studies of some of the men who will practise surgery in years to come, and thus help to fulfil the great object for which this College exists, the lessening of suffering and the saving of life.

In the printed summary which has been circulated, it may be seen that I have arranged in an order which will allow me to present to you many valuable specimens from the museum, abundant material for the six hours allotted to me, and I will now ask you to imagine that we are about to examine a patient who is supposed to have an abdominal tumour. I need hardly say it is desirable to pursue in an examination of this kind a somewhat uniform plan or method; and, after a good many trials, I arrived at a mode of arranging the various questions and answers in a form, which, after a variety of changes, have at last arrived at this form of Note-Book, which I will send round, and which is published for general use by Messrs. Churchill. You will find in each book, arranged in pages, a series of questions which may be put in order to a patient when she presents herself in one's own consulting-room, or when called to see her at her lodgings; and spaces are left for the answers that may be given.

On the first page, one simply enters the date of the visit, the name and age of the patient, and the residence, which should be filled up in considerable detail and exactitude, because years afterwards, if it be imperfectly done, there is a good deal of trouble in finding out what has become of a patient. It is only those who have tried to do this who know how difficult it is to trace a case from its commencement to its close. Following the residence, comes a note where the patient was born and formerly resided, which also affords some assistance towards

understanding the history of the patient. When I was in America, at Professor Gross's Clinique in Philadelphia, he invited me to make some clinical observations upon a woman, and, to my surprise, she was a black woman. Dr. Atlee, who was present, whispered to me: "It is a very rare thing to see ovarian disease in a black woman." That at once put me on my guard, and really the tumour did turn out to be not ovarian, but a fibroid tumour of the uterus, which Dr. Atlee afterwards told me was extremely common amongst negroes. Dr. Knox told me it was rare to find ovarian disease amongst what he called cross-breeds; that the Celt and the Saxon are liable to them, but he had never seen one in what he called a cross-breed. That is a question I have never been able to examine into very closely, because it is so difficult to find exactly what may be a real true Celt or Saxon in these days, or what Dr. Knox would call a cross-breed. But these points are of some interest; and, after examining a great many patients, and getting a number of these books together, one can by annotation, examine how far statements of this sort are true or not.

Then one comes next to the question as to whether the patient is married, single, or a widow: if married, how long; if she have children, how many, and what their ages are, and whether she has suckled them. I have left out "lactation" in my note-book; but it is rather an important point, and will be inserted in any future edition. Then I have a question as to the number of abortions, and the name of the usual medical attendant. These are merely a few questions which serve to commence an acquaintance with the patient, and afford information of importance. On the next page, you will see a number of notes as to the general appearance of the patient. I am speaking rather of the patient herself than of her abdomen—the general aspect which she presents—what is her expression, whether cheerful or anxious, and what her apparent age as related to her real age. That is a matter of some consequence, because I think most of us would say a woman who looked considerably older than she stated herself to be, would be a less favourable subject for an operation than a woman whose apparent age was less than she stated, who looked younger than she really was. Then, with regard to the height or build of the patient—whether she is a strong well-built person, or a person below par in that respect. Then, as to complexion—whether she is fair or dark, pale or florid. This, we shall see, has some bearing on the diagnosis between ovarian and uterine tumours. Women with uterine tumours have a physiognomy which is more or less marked, one of the points being a good deal of coloration of face; whereas ovarian patients are more commonly pallid. Then we note something as to corpulence or emaciation, and muscular development. Then we regard the amount of hair developed on the surface of the body. Some persons have supposed that patients who have a large growth of hair are more subject to cysts like ovarian cysts, and so on, but I really have not been able to note that; for I have seen patients with a great deal of hair, and also with very little hair, both suffering from the same complaint. We next note the temperature of the skin and extremities; perspiration—whether it occurs during rest or under exertion, or whether there is any peculiar odour or acidity about it. Then we notice the presence of any glandular swellings, or eruptions, or ulcers, or old cicatrices—whether there are any varicose veins, particularly about the legs, or oedema of legs or feet; the condition of the areola round the nipple, particularly when there is any doubt as to pregnancy, and any special alterations in the hair or nails. These are all points which are seen at once, and, when one is in the habit of going over these headings regularly, the first view of a patient enables one to see directly what the case is likely to be.

Having done that, one turns to the next page, and proceeds from the general examination to an examination of the abdomen; and this may often be done quite as well in a surgeon's consulting-room as with the patient in bed. Of course, in some cases it is more convenient to examine the patient in bed, where the chest and abdomen can be thoroughly examined; but it is quite easy, in one's consulting-room, to remove the dress of a patient sufficiently, and to cover the limbs and lower part of the body with a shawl or towel, in such a way that the examination can be quite satisfactorily made without the least indecency.

Then, I would say, the first thing is to notice what one sees. We see at once whether there is visible enlargement of the abdomen or not, and if this enlargement is general or local; if one side of the abdomen is enlarged or if both sides are enlarged. One notices also the amount of subcutaneous fat, and, of course, if the patient is unusually thin and the abdomen retracted. The umbilicus is at once seen, whether it is concave or convex; and one also notices if there be any discharge there. Dilated veins at once come into view. One notes their size and the course they run, and sees any lineæ albicantes which may have remained after pregnancy or any other distension of the abdomen, and

one sees occasionally that these may be cedematous. These lineæ albicantes were formerly called varicose lymphatics, but there is no ground for that. Then, one frequently notices, in pregnant women, and most markedly in those pregnant for the first time, a brown mark running down the centre of the abdomen, which is a very common sign of pregnancy; and any hernial protrusion is also seen.

From seeing one proceeds to feeling; and we notice, by passing the hand over the surface, what its heat may be, and whether any unusual heat is confined to one side or is symmetrical; and one also feels if the abdominal wall is tense or flaccid; if there are any knots about it, or if it is cedematous. Then we also notice if there is any crepitation—if, on pressing the hand over any swelling, there is a feeling of friction beneath the hand; and also whether there are any movements of gas, or of mixtures of gas and fluid, which may gurgle. And then, with the two hands, one also may feel if there is that sensation of fluid, or wave of fluid, which is so well known as fluctuation; and one may be able also to appreciate whether the wave is fluid, or merely a sort of bag of jelly which moves about with the sensation which has been called "elastic impulse". Pulsation may also be felt, or a thrill; and one can estimate, with a little care, the seat of pulsation—whether it follows the course of the aorta, or whether it is felt elsewhere, and whether it may be simply the impulse transmitted from the heart's action downwards. Then we should also notice how these movements are affected by deep inspiration and full expiration, and also by sudden pressure.

Next, as assisting inspection, we come to measurement; and there is, on the third page, a diagram, which we are in the habit of using, in which five different measurements are marked down: first, the girth at the umbilical level, then a measurement from the lower end of the sternum to the umbilicus, and from that to the pubes, and then from the right and left anterior superior spine of the ilium to the umbilicus. By these five different measurements, and also by marking out on the diagram the outline of any tumour that may be felt, we obtain a very accurate record of any swelling or tumour which is existing at the time of the first examination of the patient.

Then, from seeing, feeling, and measuring, we proceed to listen; and are able to mark out pretty distinctly what are the outlines of the liver or spleen, and what parts are dull, and which are resonant on percussion, and their exact seat and limits. We observe any unusual dullness over the liver, and whether it extends too far downwards, or whether the heart is pushed out of its place, or whether there is any definable tumour of any part of the abdominal cavity, by the dull sound which solid tumours give on percussion, as distinguished from the resonance of the intestines. The effect of altered position would also be noticed: turning the patient from side to side, raising the shoulders or hips, seeing what effect that has, and watching also the effect of respiration upon any dullness, and also seeing whether, on reperussion, there is anything like hydatid fremitus developed by the alternate impulse of the two hands. (A diagram showing the position of the viscera was referred to.)

Proceeding to observe the sounds heard on auscultation, one may note where any gurgling sound of the intestine and any friction sound is audible, where the sound of the aorta may be heard, whether there is any vascular murmur, or any foetal heart-sounds, and whether there is any sound accompanying succussion or fluctuation. All these things are frequently heard, and occasionally, where there is a mixture of air with fluid, one can hear the sound so well known by auscultators as "metallic tinkling"—air bubbling through fluid. What assistance the microphone may give us, I hardly know yet; but it is very probable that the foetal heart-sounds may be heard much more distinctly than they are by an ordinary stethoscope.

All this examination may or may not lead to the detection of a tumour; but we will suppose a tumour has been discovered; and then we have to determine whether there is only one tumour or more than one; supposing there to be more than one, if they are united or separate; whether they can be moved one upon another; and we mark on the diagram the exact position and outline of each of them, and note in what position of the patient they are best seen and felt. Then, one would also notice whether there is any connection with any of the abdominal organs—with the liver, the kidney, the uterus, or the spleen. This would at once become apparent by the position of the tumour; and one would notice also the surface of the tumour, whether smooth, or irregular and knotty; what its consistence was, hard or tense, soft or boggy, or whether any fluctuation which could be detected in it was uniform or limited, deep or superficial, and whether the superficial fluctuation was over the surface or only felt upon deep pressure of the tumour.

With regard to mobility, one would note to what extent the tumour may be moved upwards or downwards, or from side to side; whether the abdominal walls moved over it or not, or whether they were con-

nected with the tumour, and whether any movable portions of the tumour are more or less independent of its general mass; whether one tumour may be moved independently of others, and occasionally, when the abdominal wall is flaccid, one is able to make some kind of guess as to the probable weight of the tumour. It may be advisable also to ascertain what is the effect of meals, of vomiting, of purging, or of catheterism on any tumour that has been detected.

Having examined the abdomen in this way, one proceeds to the examination of the pelvis. In a man, of course, this is not so frequently necessary; but, in examining a woman, it is always necessary to ascertain whether an abdominal tumour is connected with any of the organs of the pelvis. One has to ascertain the position and size of the uterus, and the connections of any tumour with it; and all this can be done before any questions need be asked of the patient beyond a few preliminary inquiries. The examination by the vagina—feeling the uterus, feeling any tumour between the uterus and the rectum, or any tumour that interferes with the movement of the uterus, or presses it downwards, or draws it upwards, or presses it to one side—is an examination upon which I need not enlarge now; but there are one or two points on which I wish to say a few words. In the first place, examining by the vagina in a young unmarried woman with a perfect hymen is often quite needless. One can ascertain all that is necessary by rectal examination. With one finger in the rectum of a woman, one can feel very well the posterior surface of the uterus, and can make out pretty clearly whether there is anything below the brim of the pelvis without examining by the vagina at all. In married women, or in women where it is necessary to make a vaginal examination, the simple vaginal examination only does not, as a rule, afford very much information. You can tell whether the neck of the uterus is in its normal position, whether it is enlarged or whether it is small, whether it is hard or soft, or with any apparent growth from it; but one can get a great deal more information in cases of suspected tumour by combining the internal and external examination, putting one hand on the abdomen, and passing the finger of the other hand into the vagina, feeling the uterus; and then, moving about any abdominal tumour that there may be, one is able to tell pretty clearly whether the uterus is closely connected with any tumour, whether the tumour moves independently of the uterus, or, supposing it does move with the uterus more or less, whether that movement is transmitted or one closely associated with it; whether the uterus itself is enlarged and moves with the tumour, or whether any movement that affects the cervix of the uterus is simply communicated to it.

One may go further than this in combining internal and external examination. By passing a thumb into the rectum and a forefinger into the vagina, one can feel very clearly what is contained in Douglas's pouch; and, on the other hand, putting a thumb of the right hand into the vagina and the forefinger into the rectum, one can feel very distinctly a considerable part of the uterus even to the fundus, and so get a notion of its size and form, and that of anything attached to its exterior either in front, behind, or at the fundus. Supposing this fold is depressed by fluid, or that the small intestines come down lower than usual, on pressing the thumb and the finger together, one gets very clear and distinct information of anything there may be between the uterus and the rectum, or the posterior wall of the vagina and the rectum.

Simon of Heidelberg laid great stress on the combined examination of the bladder and the uterus after dilatation of the urethra, believing that this was not only useful in completing examination of the bladder itself, but also for examining growths in the pouch between the bladder and the uterus. If you have anything formed between the front of the uterus and the top of the bladder, if you dilate the urethra well, you are able to make a very accurate examination, not only of the state of the bladder, but also of anything there may be between the bladder and the uterus. I cannot say I have myself ever found this very necessary, or have got much information from it.

In some cases, where there may be a doubt as to the state of the uterus, and where the cervix is small and one is doubtful what may be its condition, then, if the sponge-tent be introduced, left for a few hours, and the cervix well dilated, one is afterwards able to make more complete and accurate examination. Or, by a combined examination between the abdominal wall and the rectum, one is occasionally able to ascertain that there is a congenital absence of the uterus; for one's finger in the rectum meets the finger depressing the abdominal wall, and that may be sometimes checked also by examination of the bladder.

Hegar has lately added a good deal to our knowledge of this combined examination, by showing what one gains by pulling the neck of the uterus downwards after fixing it by a long hooked forceps. I have used Sims's hook, as less likely to do harm; and, by drawing the

cervix downwards, one is often very able to ascertain whether the uterus forms part of a tumour or growth, or whether it is separated from it. Combining this pulling down of the uterus with a hand on the abdominal wall and a finger in the rectum, one can get a very accurate idea of the contents of the pelvis; or, entrusting the uterus pulled down by a hook to a careful assistant, who will not pull too violently, with one finger of the surgeon's hand in the rectum and the other hand depressing the abdominal wall, one obtains a very complete idea of what there may be below the brim of the pelvis. Of course, I am supposing that there is not any extraordinary amount of fat on the abdominal wall, or any peculiar rigidity in the vagina. In this way, one is able to recognise any flexions of the uterus, and may be able to replace them without the use of the sound. The examinations may be carried out sometimes with the patient on her back, sometimes on her side; and sometimes one observation is checked by the other, examining first in one position and then in the other; and occasionally, though very rarely, it is necessary to try the knee-and-elbow position, raising the pelvis and lowering the chest. In this position, a heavy tumour falls upwards and forwards, and sometimes a tumour which is low down, and giving great trouble by its pressure on the bladder or the rectum, may, by the mere position of the patient on her elbows and knees, be pressed out of the pelvis, pushed into the abdomen, and in this way great relief is given.

Simon of Heidelberg laid great stress upon the fact that, when a patient is deeply narcotised by chloroform, the whole hand of the surgeon may be passed into the rectum. He showed this to me at Heidelberg one day. A patient was put deeply under the influence of chloroform, and, without much difficulty, I put my whole hand into the rectum and passed it upwards, so that, under Simon's direction, I could quite distinctly feel the left kidney. There was no doubt about it. I got my hand well up into the descending colon and felt the kidney very distinctly. In some two or three cases of very doubtful diagnosis of tumours in women, I have done this in England; but I really cannot say I have gained more information by it than I could gain by the finger in the vagina or rectum, combined with pressure upon the abdominal wall.

All this knowledge one has gained for one's self without any questioning of the patient at all; simply by what one has been able to see, and feel, and hear. From that we must come to questioning. One is obliged to get from the patient some account of the state of her digestive organs and nervous system; the state of her respiratory organs and blood-circulation, all of which is noted in succeeding pages of the note-book. Following the examination of the pelvis, one comes to questions as to the state of the catamenia; when they commenced; when they ceased, if they have ceased, in an old woman; and any history of sudden suppression of catamenia from cold or any other cause; if there be any history of excess or deficiency, or any leucorrhœal discharges, or discharges of any other kind. A very few questions enable one to fill up this page. The state of the urinary organs requires a little more time, because the urine has to be examined afterwards, unless the patient has previously sent a specimen; and then one gets the ordinary information about the colour and odour of the urine; its specific gravity, and what it contains. Then one comes to the history of the disease for which she applies for relief, and one learns something about any hereditary influence and the fecundity of the females, and the general duration of life in the family; her mode of life, any moral causes, and any previous diseases or accidents: these all require some slight note.

With regard to the early symptoms of the present illness, one likes to know something about the first signs: what was the first departure from good health; whether there has been pain or tenderness, particularly in the groin or the pubic region; any sense of fulness in the vagina, or bearing down of the uterus; any pressure on the bladder; any pain, numbness, or weakness in the thighs or legs; whether there is any constipation; what the state of the breasts was; whether she suffers from much nausea; whether the symptoms were aggravated at the monthly periods; and then as to when the tumour was discovered. Whether she noticed it for herself, or whether, as is likely, it was discovered by some medical man; then the rate at which it enlarged, whether rapidly or slowly, or whether there was any regularity in its enlargement; and particularly whether the increase or diminution was associated in any way with the monthly periods. Women with uterine tumours will frequently tell you that they are distinctly larger before the periods and smaller afterwards; and this helps us a great deal in the diagnosis between uterine tumours and tumours that are not uterine. Then as to movements felt in it, particularly with regard to pregnancy; and then a note of any early treatment often becomes interesting.

Proceeding from the early history of the case to the progressive

symptoms, a note is made of any changes one is told of in the situation of the tumour, and you are very frequently told some odd stories about it. I do not think there is much confidence to be placed in what patients tell you about these things; but still, occasionally, some history of particular changes in situation becomes of importance afterwards.

Then with regard to the aggravation of the early symptoms: any increasing difficulty of breathing; any increasing distension of the abdomen or intestines; any history of febrile attacks; any inflammation of a cyst or peritonitis surrounding it; whether there have been successive attacks of peritonitis, and any proof of the presence of peritoneal fluid. Next, if there have been any discharge of any kind, either through the uterus, the vagina, the bladder, the bowel, or through the abdominal wall. All this would have considerable weight at times. And, then, whether there has been any history of a rupture spontaneously, or by a blow or fall. Frequently there will be this sort of history given—that the abdomen gradually became larger and larger, and, at last, the patient suddenly fell down, or got a blow; or that, without any reason at all, there was a sudden alteration in the shape of the abdomen; a sudden attack of acute pain, followed by a large discharge of fluid, either by the kidneys or by the bowel, and then the abdomen flattened down more or less. Then, supposing the patient had been tapped, one likes to get the date of the tapplings, and, as far as one can, some report of the nature of the fluid removed, and its quantity.

With all this information, we really ought to be able, and generally are able, to arrive at the heading which follows on the eleventh page of the book—a diagnosis of what the tumour may be; whether the patient has a tumour; what it is; and, generally speaking, I think this can be done at the first visit of the patient. It is very seldom one has to put off a patient and say the case is so doubtful that, until one has examined the urine, or made a more complete examination of something or another, it is impossible to say what it is. That, no doubt, is occasionally necessary; but, as a rule, with the sort of examination I have been trying to describe, we are pretty well able, by the time that we arrive at this eleventh page of the note-book, to make a diagnosis which is fairly and reasonably accurate.

Before deciding as to the treatment, one is able, I think, to form some kind of estimate as to what the probable duration of life will be if the patient is left alone, or if she is simply treated medically, or by palliative methods. We do know what the duration of life is in patients who have abdominal tumours of a sufficient size to interfere with locomotion and respiration—we know it is not long—and we are able to make a kind of approximate guess at what it is likely to be in any particular case.

One can also form a pretty good idea of what the general treatment should be as to diet and mode of life, and medical treatment, if any is necessary, and is able to say what surgical treatment may possibly be required hereafter.

Now, I will suppose we have a patient who has a collection of fluid, either free in the abdominal cavity, or contained in some cyst.

These two diagrams represent the abdomen of a patient containing fluid. We will suppose the central dark shade to represent fluid, and that the rest of the surface is resonant on percussion. The part of the abdomen which contains the fluid is dull on percussion. In this other case, the dark shade shows dullness on percussion on both sides, the patient lying on her back; the centre is resonant on percussion, but the sides are dull. In the first case, the central part is dull on percussion, and the sides are quite clear. The inference would be at once

that, with intestines at the sides and the fluid in the centre, the woman lying on her back, the fluid must be enclosed in a cyst. On the other hand, here the intestines are floating, giving a clear sound on percussion, and the fluid gravitates to the most depending parts of the cavity, and you will see at once the fluid must be free; the intestines are floating about and the fluid is beneath. As a rule, I suppose, in nine cases out of ten, that would probably be the correct diagnosis. You would say here was a case of ascites, and here, where the intestines are pressed backwards and the fluid is in the centre, that will be encysted fluid; and, in a large number of cases, that will be certainly true. But there will be exceptions. There may be so much fluid in the peritoneal cavity that the intestines do not touch the front of the abdomen, or the intestines may be fastened backwards by adhesions; and fluid, which appears to be in front and is in front, is there, not because it is enclosed in a cyst, but because the intestines are held back. And, on the contrary, one may get a case where fluid is enclosed in the front by coils of intestine round it, and is circumscribed in that manner.

I have had a number of preparations brought down to show the way in which adhesions of different portions of the intestine to each other, and to the abdominal wall, may simulate cysts—may become false cysts. The fluid is encapsuled, not by a cyst, but by surrounding portions of intestine or omentum adhering to each other, or to some part of the abdominal wall. Those are our most puzzling cases in diagnosis at times. In the book on *Diseases of the Ovaries* which I published some years ago, there is rather a full account of all this, with which I need not trouble you now. I ought, however, to have mentioned that this fluid, when it is free, will move from side to side as the patient is moved. If she be turned on to her left side, the intestines go to the right; and when she is turned back again, the fluid sinks to the right side, and the intestines float up to the left. So when she is sitting up more or less, and her shoulders raised, the fluid sinks down towards the lower portion of the abdomen, leaving the upper free. If you put a pillow under the hips and lower the shoulders, it at once goes upwards towards the sternum. So, occasionally, one may be deceived by a cyst of moderate size sinking, if it be movable, from side to side as the patient is moved.

The alteration of the position of the patient makes considerably greater and more rapid changes in cases of ascites than in patients with ovarian cysts; the cyst moves about much more slowly than fluid. The superficial veins are more commonly enlarged in ascites than in ovarian dropsy, and, on measurement, the enlargement of the abdomen in ascites is more likely to be symmetrical than in the ovarian cyst; and then, on feeling the abdomen, you are more likely to get a flaccid abdominal wall in ascites, and a more tense wall in a cyst; and very often, in ascites, the greatest girth is at the umbilical level; whereas, in ovarian dropsy, it is sometimes considerably lower.

The way in which the fluctuation is felt is of some importance in ascites, the wave being a wave felt more immediately beneath the hand and not limited so distinctly by the cyst as in ovarian dropsy. Then, a very important question is the way in which the movements of respiration affect the dullness. Supposing one finds that, as the patient breathes deeply, resonance descends, it will often guide you correctly in a doubtful case by a careful examination as to how far the line of clearness on percussion varies or corresponds with the line of fluctuation. When you get distinct fluctuation beyond the limit of dullness—when you get evidently a wave of fluid moving about amongst the intestines—it is pretty certain that the fluid is free. However it may be limited, if one find that one has a distinct wave of fluctuation where one has a resonance indicating the presence of intestine, that must always certainly be free peritoneal fluid, and it is the same whether it is ascitic fluid or fluid escaped from a cyst. The fluid is free, with the intestines floating about. In the other case, you feel the wave of fluctuation limited exactly by the outline of the dullness. One can very seldom go wrong by carefully observing these two points.

I have said just now a doubt may arise where the quantity of fluid free in the peritoneal cavity is so very large that the front of the abdomen is pushed forward far beyond the reach of the intestines, the intestine cannot reach the surface of the abdominal wall, and so one has the fluid in front.

Another point of doubt and difficulty may arise from air having entered an ovarian cyst; for, as an ovarian cyst contains a certain amount of fluid, it may also contain gas, and either the fluid is decomposed after tapping, or there may have been some possible communication set up between the intestine and the interior of the cyst. Sir Thomas Watson records a case in which a patient had a cyst filled alternately with fluid and with air; when the fluid collected to a certain quantity, it seemed to open some valve-like communication with the intestine, emptied itself, and became filled with air. As the fluid gradually reformed, the air was displaced, and the same series of

changes went through again. I have known a case in which air distinctly entered an ovarian cyst through the Fallopian tube—at least, we could find no other means of entrance; and, after death, it was found there was a large and distinct communication between the interior of a large ovarian cyst and the uterus through an enlarged Fallopian tube; there would have been, at any rate, no difficulty in air entering in that way.

Supposing doubt does arise as to whether fluid is free or not, one has always the resource of tapping; and a chemical and microscopical examination of the fluid that is removed will settle any doubt as to whether it is free peritoneal or ovarian fluid, or fluid of some other cyst. Years ago, before Scherer's test to distinguish albumen in its true form from the forms of albumen that chemists do not seem very accurately to determine, it was sometimes extremely doubtful to arrive easily at this determination. But Scherer showed that the albumen which, when coagulated by heat, is redissolved by acetic acid, is a very different albumen from true albumen. Paralbumen and metalbumen are forms that, when coagulated by heat, can be dissolved by acetic acid boiled. One takes a test-tube and boils the fluid, and the albumen is coagulated. You add some strong acetic acid, and give it a good boil, and shake it up, and if the albumen be true, the coagulum does not redissolve in the acetic acid. But supposing it to be paralbumen, then it either dissolves, or forms a whitish transparent fluid, or breaks up into a kind of jelly-like transparent mass, which is quite easily distinguishable from undissolved albumen coagulated by heat. This was supposed to be, for a long time, a pretty certain means of distinguishing between ascitic fluid and ovarian fluid. If the coagulated albumen were dissolved in acetic acid, it was said to be ovarian; and if it did not redissolve, it was said to be ascitic; and that was frequently right. Sometimes part would redissolve and part would not; and then the supposition was that it was a mixed fluid, some ovarian and some peritoneal, that an ovarian cyst had burst and some of the fluid was in the peritoneal cavity, a certain amount of fluid had been poured out, and there was a mixed fluid, which contained some true albumen and some paralbumen.

After a little further examination, one saw that there were exceptions to this rule. For instance, Dr. Schetelig of Hamburg once examined the fluid from a large renal cyst that I had emptied, and he found paralbumen and cholesterine, and no trace of urea, because the proper structure of the kidneys seemed to have been completely destroyed. He found in another patient that the fibrine found at the first tapping of the patient disappeared after another tapping, and he concluded that, at the first tapping, the fluid was removed from the peritoneal cavity, and, at the second tapping, from an ovarian cyst. It is quite possible, in tapping the abdomen, to remove a certain amount of peritoneal fluid and leave an ovarian cyst behind; and that, at another tapping, the ovarian cyst might be tapped and emptied, and the fluid escape.

After the chemical examination of the fluids removed, one has to resort to the microscope, and this we will consider at the commencement of the next lecture.

NOTE ON THE MICROPHONE AND TELEPHONE IN AUSCULTATION.

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IN common with many others, I have been deeply interested in the recent remarkable inventions of the telephone, phonograph, and microphone, not only because these instruments promise to be useful, but also because I feel convinced that every advance in the obscure region of molecular physics is destined to have an important influence on our interpretation of many physiological phenomena. The results already obtained have given us a new conception of the delicacy of the organ of hearing and of the action of the membrana tympani, and it is interesting for the physiologist to note that the secret of success with the telephone and phonograph is to imitate as nearly as possible the conditions in which the living organ of hearing works.

The ingenious invention of Mr. Hughes, the microphone, has already been employed by Sir Henry Thompson for the detection of minute calculi in the bladder, and not a few are attempting to apply it to ordinary auscultation. During the past fortnight, I have been trying a number of experiments, the results of which may be of interest, and possibly they may suggest improved methods to others.

The arrangement of Mr. Hughes which I have used consists of two little pillars of gas-carbon, having between them a spindle-shaped piece of the same material free to move in sockets in the pillars. The wires