A LECTURE

ON THE

INFLUENCE OF DISTENSION OF THE ABDOMEN
ON THE FUNCTIONS OF THE HEART
AND LUNGS.*Delivered at St. Mary's Hospital, Wednesday, July 16th, 1873.*By FRANCIS SIBSON, M.D., F.R.S.,
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GENTLEMEN, I need not say to you, with whom I have so often worked with pleasure in these wards, what very great delight it is to me to come for one hour amongst you. My subject, as you will have seen from the announcement, is the influence of distension of the abdomen on the functions of the heart and lungs.

Since the chest is divided from the abdomen by the diaphragm, which forms the floor of one cavity and the roof of the other, the ascent or descent of that movable partition while it enlarges one cavity encroaches upon the other. When the chest enlarges, it enlarges in two directions; one outwards over its whole circumference by the expansion of the walls of the chest, the other downwards by the descent of the diaphragm. When the abdomen is enlarged, it is enlarged also in two directions; one outwards and downwards with the extension of the walls of the abdomen, the other upwards by the elevation of the diaphragm. When the abdomen is extremely distended, the whole cavity becomes oval in form, or shaped like a balloon, as you may see in this diagram; the outer part of it presses outwards, and the upper part of it presses upwards. The cage of the chest is raised by this upward movement. The whole of this wide cone formed by the upper part of the large oval abdomen, acting upon the lower ribs, forces them asunder to the right and to the left, and lifts up the whole front of the cage of the chest. The more important effect, however, of this distension is to lift up the heart at the centre of the chest, and the right and left lung on each side of it. When these organs are raised, as the cage of the chest in front of those organs is raised also, the apparent elevation of the heart is much less than the real elevation.

Distension of the abdomen may be caused by the distension of the stomach, the colon, and the small intestines, either singly or in conjunction; by the presence in the cavity of the abdomen of gas and of fluid; by the enlargement of the liver; and by tumours and cysts.

Swelling of the stomach and bowels with gas is caused not by the secretion of the gas from the living structures, but by its formation from the food taken into the stomach. This diagram, taken from a poor woman who literally died of starvation owing to cancer in the œsophagus, presents a perfect clinical proof of what I have said. You will observe, that there is neither gas nor food in the whole digestive canal. The stomach is like an intestine. The great intestine is smaller than a small one. The food that is in the stomach, and the food that has passed from the stomach into the intestines, are the cause and source of the gas that they contain.

The heart, as you may see in these diagrams, rests upon the stomach. When the stomach is greatly swollen, the heart and the lungs, if healthy, suffer but slight inconvenience when rest is preserved; but moderate exertion, and especially quick walking, or the ascent of a hill, will often bring great distress in the region of the heart, and even actual anginal pain passing down the left arm. When, as is frequently the case, the stomach is swollen in patients affected with Bright's disease, or with affections of the aorta or of the heart, the patient has great distress of breathing even when raised in bed, but especially if he lie down or exert himself. In all these cases (diagrams) there was great distension of the stomach, and they show the serious and too often fatal contest that takes place between the enlarged organs of the chest striving to get downwards, and the distended and enlarged organs of the abdomen striving to get upwards. The functions of both the higher and lower sets of organs—the thoracic and the abdominal—are seriously interfered with; but those of the organs of the chest are more seriously and more often fatally deranged than those of the abdomen. The heart and lungs are both removed upwards from the more ample space of the middle region of the chest into the contracted area formed by the diminishing cone of the chest. The heart suffers from its inability to expand downwards, and yet as it cannot send its blood through the compressed lungs, the right cavities of the heart become gorged with blood, as you may see in these drawings. Although in all

of them the stomach and intestines are large and push the heart upwards, that organ is compelled to receive into it the blood that is sent from the whole system, which blood once received into the organ cannot be sent onwards through the lungs, the lungs having an additional obstacle to their expansion and to their reception of blood by being compressed upwards, owing to the elevation of the diaphragm.

In this case (diagram) we have, perhaps, as complete an illustration of the contest as any that I can give you—the contest between the organs of the chest and the organs of the abdomen. You will observe that the aorta, which is affected with atheroma, is very greatly dilated and greatly lengthened; it has come down so low that the lower end of it is on a level with the lower end of the sternum. The consequence is, that the left ventricle and the right ventricle are pushed solidly downwards by the lengthened aorta, and the interior of the heart is itself compressed downwards by this very agency. Of course this displaces the stomach downwards. But here we have a fresh contest from below. The stomach is distended unduly with gas; so is the transverse colon; and so are the small intestines. The liver itself is gorged with blood, owing to the impossibility on its part of sending the blood forward to the right side of the heart; and, to crown all, in this case, we have effusion into the right side of the chest, displacing the heart to the side, and interfering with its work. Can we wonder that, under this accumulation of difficulties, this man died?

Here is another similar case. The man had aortic regurgitation. He was a labourer, aged 30, with a large athletic frame and an ample chest. He complained of shortness of breath, and of pain in the chest after a meal. This man would sometimes change rapidly from a state of comfort to one of extreme distress. Thus, on the 13th of July, when in these wards, he said that he never felt better in his life; and, on the 14th, all was changed, and a frequent cough, increased beating of the heart, and difficulty of breathing, rendered it impossible for him to sleep or to remain in the recumbent posture. This attack was associated with, and apparently caused by, great fulness of the stomach from eating.

Here is the case of another patient, a carpenter, with aortic disease. He suffered five years before admission from pain in his chest, especially after eating, and, on exertion, he felt as if "something were scratching him at the back of the breastbone." When in the hospital he still suffered pain in the lower part of the chest after eating, if he walked about, but not if he sat still. Here are other drawings, in which you will see an enlarged heart—enlarged owing to mitral and other diseases—and enlarged lungs caused by the enlarged heart. In one instance, the enlargement of the lungs was supplemented by extensive pulmonary apoplexy; and, in another, the heart was adherent and the right lung was contracted owing to bygone pleurisy; while in this case, the lungs were enlarged to a very great extent by emphysema. In all these cases the stomach, and to a less degree the intestines, lifted the heart and the lungs upwards, compressed the whole of the organs of the chest within a narrow compass, and interfered with their functions. In truth, we may see that the final close to the existence of all these patients was hastened by the distension of the stomach.

Each organ holds within itself a reserved force many times greater than the amount of force that is brought into play in the ordinary and quiet demands of life; but, in proportion as those demands are increased, more and more of the reserved powers are brought into use. The lungs—I have ascertained this in my own person—possess sixteen times as much breathing power to be used during violent exertion as they employ when the body is at rest. Thus, the patient affected with aortic disease, to whom I referred, felt no discomfort in the heart after food if he sat still, for then the heart had sufficient force to do its work; but when he walked after food he felt pain in the heart, for that organ had no reserve force to resort to, and so, by making violent and undue exertion, like a wrenched muscle, it excited pain within itself—in short, angina pectoris.

In considering the treatment of this distension of the stomach that thus confines the action of the heart and lungs, I need not detain you with the well known medicines often so serviceable on such occasions. Some of these, such as the warm and cordial tinctures, camphor, and, perhaps, chloric ether, are agreeable; some, if efficient, are repulsive, such as turpentine, assafoetida, and, perhaps, creasote; while others are neutral, such as that valuable remedy guaiacum. I have, before me, the case of a gardener who had mitral disease; he had, however, a complication of maladies—syphilis, subacute rheumatism, and ague. He complained of fluttering of the heart and great distension of the stomach. He was relieved by the use of turpentine and guaiacum.

Charcoal is of little or no use in these cases. Dried charcoal, owing to the immense distribution of its surface, absorbs a large amount of gas; but wet charcoal loses its subdivision. Suspend a piece of dry charcoal in the stomach, and of course it will absorb the gas. The very act of

swallowing causes it to become wet; when it drops down into the stomach, it becomes more wet still, and it is clearly out of the laws of possibility for that charcoal there to absorb one cubic inch of the immense mass of gas that is in the stomach.

I wish, however, rather to bring before you the other and non-medical means that may be employed for the relief of the distension of the stomach with gas. This gas, as I have said, is secreted, not by the structure of the stomach, but by the food. If you cut off the supply of food, sooner or later, when that already in the stomach has passed away, relief will be obtained. But we cannot cut off the supply of food; therefore we must select such kinds of food as give the greatest amount of nourishment, and tend to set free the least amount of gas; for, although every kind of food will produce gas when the powers of digestion are weak, yet some kinds will do it much more freely than others. My rule is simply this: Take no bread, but eat biscuits instead. Take no solid vegetables, but use lemon-juice freely. Squeeze some of it over all your food. Shun soups, cucumbers, and fruit. Prefer meat, fish, fowl or game, tender, but perfectly fresh, lightly cooked and juicy—not hard and dry; or take it thoroughly soft and fragrant, as sent up by the hand of the artist. Take no rich sauces, or indeed, any other sauce, than wholesome fresh lemon-juice or mushroom ketchup; no twice cooked, or salted, or seasoned, or dried meat. Let everything be fresh and savoury. Under this simple rule of substituting biscuit for bread and fresh lemon-juice for vegetables, relief will often be obtained from distressing symptoms indicating danger. Let the food be agreeable to the eye, fragrant to the nostril, and savoury to the palate; and, invited by those senses, the influences of the nervous system will bring those juices into the mouth and stomach that are required for the digestion of the food—juices that are attracted if the food is attractive, repelled if the food is repulsive.

The rules, however, that I have given are but a portion of the proper treatment. Each case stands upon its own grounds, and must be treated according to its own demands. In treating each case, the laws of nature must be strictly enforced. Departure from those laws has brought on the illness; and in a renewed obedience to those laws, we shall usually find the best road to restoration of health. The right treatment of disease is neither expectant nor heroic, but is a treatment founded on knowledge, a watchful interest in the patient, moderation, and good sense.

One patient had been quite well until the previous April, when, one night, after a late supper, he woke up fighting for breath and life. He raised a thin and frothy phlegm, which was stained the next day with blood. He had suffered from no such attack for a month; but he could not lie down; he was short of breath, and felt, as he said, inflated—blown out—sometimes almost ready to burst. His heart was very large, its action being powerful. There was a doubling of the first sound over the ventricles, and feeble first sound, and loud second sound over the aorta. Effusion was present in the right side of the chest. There was a mere trace of albumen in the urine, but I found in it one large waxy cast. The kidneys were the true seat of the disease. Under the influence of the restricted diet I have described, and the general treatment, he lost the distension of the stomach; he could lie down on one pillow; he had no return of the sense of suffocation; and the fluid in the right side of the chest disappeared. The condition of the heart and that of the kidneys were not materially altered.

Here is another case of a patient (represented in this little diagram) who complained of "trouble" over the region of the heart. His abdomen was swollen; the stomach displaced the lower boundary of the heart upwards, so that it was situated in the fourth space. Subsequently, under a restricted diet, the upper boundary of the stomach and the lower boundary of the heart fell almost to the extent of an inch. The heart having gained an increase of space, lost its "trouble"; and, though he was ill in other respects, the distension of the stomach disappeared.

Another diagram that I have here shows a more marked difference in the position of the heart during the second, as compared with the first, observation made eleven days previously. This patient complained that he had pulsation through the body, and that the heart stopped for two or three beats. This state was worse after dinner, and was accompanied by fulness in the head. The irregular action of the heart disappeared with the descent of that organ that followed upon the diminution of the size of the stomach.

The last case to which I shall refer gave me at first some anxiety from its obscurity. This patient was a fine-looking man, with a large but not overgrown frame. He was of good colour and complexion. He complained of great shortness of breath, and he had a dropsical swelling of the right lower limb. The only unhealthy condition that I could discover in his internal organs was a distension of the stomach from gas. I will allow that I felt as if there must be some other cause,

but I could find none. He took a dry diet; and although, a week later, the stomach was less distended, yet his right leg was still swollen, and his breathing short. He persevered, and gradually lost the shortness of breath and the swelling in the right leg, and he regained his usual good health.

Distension of the colon is illustrated in these diagrams. You will observe that, in these instances, the transverse colon is no longer transverse. In these they all form a loop from above downwards, the tip of the loop being midway between the navel and the pubes. You will also see that the ascending colon increases greatly in length, starting from its head in the crest of the ilium. You may remark, on looking at these two diagrams, that inasmuch as the top of the ascending colon immediately abuts upon the lower surface of the liver, the elongation of the ascending colon directly elevates the liver. So, also, with regard to this double flexure of the transverse colon. In one instance, you see the loop is single, and in another the loop is double. You will see that the descending colon is not in any of these cases, except perhaps in one very greatly distended; yet there is in all of them great distension. In this diagram, representing a back view, the descending colon is distended quite as much as the ascending and transverse are in any of the others. In another instance, you see that the liver on the right side, and the stomach and spleen on the left, are both lifted up, as it were, upon the top of the lengthened colon. You may remark in these cases that the liver rises very high; in one instance, quite into the lower end of the fourth space; and in another, as high as the third space. And you may observe how much higher the upper boundary of the right wing of the diaphragm, which is lifted up by the liver, is than the upper boundary of the left wing of the diaphragm, which is lifted up by the stomach. The result is that, in these cases we have the heart pushed over to the left side, owing to the elevation of the liver, which tends to displace the heart to the left; and while the right lung is compressed from below upwards, the left lung is encroached upon by the heart, which is pushed aside by the liver.

You will at once see, from the study of these diagrams, how seriously distension of the colon must affect the organs of the chest, not only the lungs, but also the heart, by displacing that organ to the left; whereas, in the case of the stomach, its displacement tended rather to the right.

The next set of cases that I shall bring before you are those in which the stomach, the colon, and the small intestines are all distended. In this diagram, distension of the stomach is not extreme, but there is extreme distension of the ascending, the transverse, and, I believe, the descending colon, and extreme distension of the whole of the small intestines owing to peritonitis. You will observe that this diagram shows, better than any other, the oval shape that the distended abdomen assumes. Contrast it with this one, which shows the shape of health, like a reversed sugar-loaf rounded at the top, while the other is a true type of complete abdominal distension, being a perfect oval. In this other case, where the abdomen is perfectly flaccid, you have neither the reversed sugar-cane shape of health, nor the oval of distension, but a double concavity. The centre of the abdomen is narrower than either the top or the lower part. We see here, in another diagram, the effect of immense distension upon the walls of the chest. See how these cartilages are pushed aside to the left, and those to the right, so that there is an addition of nearly one-third to the width from side to side. Again, you may perceive that the cage of the chest is lifted up by this great oval mass below pressing upon it from below, and this will account for the remarkable fact that, although we have the heart and lungs so elevated by the diaphragm thus pushed up, yet the lower boundary of the heart is very little above the lower boundary of the sternum; the lower boundary of the lungs is very little above the position in which we often find it in a perfectly healthy body. If you look at the aorta you will see how completely that artery has been driven over to the right side. If you compare the breadth of the heart from side to side, with the length of the heart and the great vessels from below upwards, you will see that the whole organ is, in point of fact, compressed upwards. In health, as you may see in several of these instances, the apex of the heart is lower than the lower boundary of the heart behind the lower end of the sternum. In this instance, the apex of the heart has been lifted upwards and is a third of an inch higher than the lower boundary of the heart at the end of the sternum.

We find in these cases—that the heart and the lungs are put to an immense disadvantage—that the lungs are compressed and the reserved air driven out of them—that the heart is compressed and the blood driven out of it—that the ventricles are diminished in size and are incapable of receiving so much blood as they did before—that there is an obstacle to their action, and that they are incapable of sending out the blood that they have already received with the ease that they did before. Again, if you look at the walls of the chest and the diaphragm, you see what an obstacle is put to the very limbs,

by which, as it were, the lungs expand and the heart is moved. The cartilages and ribs are pushed aside and lifted upwards. The cage of the chest has reached the limit of its powers by the elevation given to it, and permanently given to it by the distension of the abdomen. Again, look at the diaphragm, lifted up by this immense distension. How can it act downwards? If the diaphragm is affected with peritonitis, the inflammation paralyses the inflamed muscle. The whole contest is then narrowed to the smallest bounds; and the whole work of respiration must be done by the few ribs remaining unassailed at the top of the chest. In cases of peritonitis, respiration is what is very well called high. The whole of the breathing is performed by the laboured lifting up of the upper cartilages, the upper ribs and the clavicles. All the muscles that act—the sterno-cleido, the scaleni, the levators of the ribs and the scapule, are hard at work, and, in spite of that, you see visibly in the face that the patient is undergoing chronic asphyxia, and must soon die unless his breathing is relieved.

Here is another case:—a repetition of the other, but a little less extreme. It shows in what I would call a rather beautiful and orderly manner, a series of tiers, one above another, the top one made by the distended stomach, the second by the circular curve of the transverse colon, and the third by the small intestines. Here is also another case, showing tier above tier in the same way, the intestines below, the transverse colon in the middle, the stomach above, and above that the heart. Here is also another, shewing the intestines below, the transverse colon at the middle and the stomach at the top, all pushing up the heart and lungs and interfering with their work. I could show to you other cases; but these are sufficient.

The tendency of this great distension of the stomach and intestines is to push the heart directly upwards, to flatten the heart from below, and to displace it somewhat to the right side. You see in this diagram that the aorta, instead of being shielded by the sternum, lies almost entirely to the right of that bone. The pulmonary artery, on the contrary, instead of lying entirely behind the spaces, is almost entirely behind the sternum. A similar condition obtains in this other case. You see that the apex has been raised. It is nearly half an inch higher than the lower boundary of the centre of the heart, although, naturally, it ought to be half an inch lower than that lower boundary. The position of the apex is the test of the extent to which the heart has been compressed upwards.

There are two means by which the treatment of great distension of the stomach may be met, independently of drugs; and I would say to you that when distension is extreme, drugs are worse than useless. They add, by their offensiveness, to the misery of the patient. These two modes are the insertion of the œsophageal tube into the stomach through the mouth, and the insertion into the stomach of the fine point for injecting morphia under the skin. I have the particulars of a case that occurred in this hospital—that of a man who had the most serious threatening of death in consequence of great distension of the stomach. The circumference of his chest was thirty-nine inches. We introduced the œsophageal tube, and a large quantity of gas escaped. The circumference of the chest was reduced from thirty-nine inches to thirty-seven, and for a time the man experienced perfect relief. Before this was done, he had great distress; after it, he was at ease. The relief lasted for some days. He had kidney-disease and various other serious affections; and after a time he died.

Another case, that I saw with the late Dr. Williams of Swansea, was more fortunate. The patient had acute rheumatism of a low type. The stomach was extremely distended, and respiration was interfered with in consequence. Dr. Williams introduced the tube; a large quantity of gas escaped; the powers of respiration were restored, and gradually the patient recovered completely, lived for many years afterwards, and is, I believe, now alive. With regard to the other method—the insertion into the stomach of the fine point for injecting morphia under the skin—I have never had the opportunity of employing it; but I have been always ready to use it if required; and I believe, though I cannot put my hand on a case, that it has already been practised with advantage and success.

I now come to the question of the distension with gas owing to rupture of the intestine, one of the most formidable incidents that can occur. There are two classes of cases. In one class the distension takes place slowly, widening out the abdomen in an oval form; while in the other class the distension takes place rapidly; and inasmuch as the muscular walls of the abdomen are the sentinels of the cavity, they do not yield, and the abdomen does not assume the oval form that it does in cases of inflammation of the intestines and stomach, with distension of those parts. The result is that the whole of the distending force is expended upwards, and the liver and stomach are elevated to an extreme degree. You may see that the top of the liver and the top of the stomach are seated just below the third cartilage, and the lower

boundary of the right lung immediately behind the fourth cartilage. All the organs are pushed up into the highest part of the chest; and, as the chest is a cone narrowing from below upwards, they are pushed up into the narrowest part of the house that they inhabit. You will also see that, on the whole, the right side is more affected than the left; and thus the liver, being a large and massive organ, is pushed upwards to a greater extent than the stomach. Thus in these two diagrams the right lung is much more highly raised than the left, and the apex of the heart is much less raised in proportion than the centre of the heart at its lower boundary.

I next come to distension of the abdomen from the effusion of fluid into the cavity. I am not rich in specimens of this kind of abdominal distension, but here is a very good example, admirably drawn by our old friend the artist, Mr. Fairland. You may see here that the whole of the interstices of the abdomen—especially the backward interstices—are filled up with fluid. You may mark the intestines and the stomach floating forwards, and the liver sinking backwards. You may see how the liver, instead of, when the stomach and intestines are distended, being pushed up so as almost to thrust itself and intrude upon the heart, drops away from the diaphragm, and leaves the fluid to make the elevation. You may mark how the whole abdomen assumes an oval form. The result is that the heart is pushed up, that the right lung is pushed up, and that the left lung is pushed up, all at about an equal pace, and you have, as the effect of all this, compression of those organs, and difficulty on their part to do their work. If those organs are at rest, and if there be neither heart disease nor lung disease, nor Bright's disease, then the patient may be able to lie down, and to go through his days and nights in bed, without shortness of breath. As a rule, however, patients who have a large amount of fluid in the abdomen are compelled to sit up. And this gives you a brief explanation of the inability to breathe in a recumbent posture in many of these cases. When the patient lies down, the fluid bears at once upon the diaphragm and presses it upwards. The right lung, the left lung, and the heart are compressed, and all the difficulties of respiration are most seriously increased; but when the patient sits up, then the fluid drops downwards to the lower part of the abdomen; the pressure is removed from the diaphragm and from the heart and lungs, and respiration can go freely on.

In cases, however, where you have disease of the heart, disease of the lungs, or disease of the kidneys, unfortunately the very cases in which fluid is often thrown out into the abdomen, and the very cases in which there is distension of the stomach and intestines, the mischief done is very great, and the relief to be afforded by any slight treatment is trivial.

I have one case in which the effect of the removal of a very little fluid lets in a flood of light upon the terrible influence of distension. It is the case of a man who was in the Albert Ward. He was a labourer, aged 23. He came in with aortic and mitral regurgitation, great enlargement of the heart, and distension of the abdomen. He complained of pain about the heart and great difficulty of breathing. The urine was scanty, amounting to only twenty ounces in the twenty-four hours; and the quantity was not increased by the treatment adopted. The abdomen was greatly distended, its circumference measuring forty-one inches; and this distension was chiefly due to swelling of the stomach and intestines with gas. The quantity of fluid was not great, but it was determined to remove as much as possible. An incision was made in the skin four inches below the navel; and, to avoid the intestines, which were perilously near the surface of the abdomen, the point of the trocar was not pushed backwards, but obliquely downwards. At first, only a teaspoonful of serum flowed; but we had been prepared for this; and inserted a female catheter through the cannula, and so pressed gently backward the wall of intestine that was dropping upon the end of the cannula so as to stop it up. Seventy-five ounces flowed pretty quickly away through the female catheter. The measurement of the abdomen fell from forty-one to thirty-eight and a half inches. The man passed twenty-four ounces of urine that night. The next day, he could breathe with perfect ease, and he felt in comfort. The quantity passed in the twenty-four hours increased from twenty ounces to seventy-four on the second day, eighty-six on the third, and ninety on the fourth. The treatment in all other respects was absolutely unaltered. The improvement continued for a time; but at the end of three weeks the urine lessened, and the fluid in the abdomen increased. One hundred and fifty ounces were withdrawn; but, although this produced relief and some increase of urine, the patient became gradually worse, and died about five weeks afterwards. In this case, the distension of the abdomen acted, as it were, as a ligature, and prevented the secretion of urine. As soon as this ligature was removed by the withdrawal of a moderate amount of fluid, the quantity of urine increased.

I find that my time has expired; and you know my old maxim about

not transgressing the allotted period. The other subjects that I had intended to bring before you were, ascites associated with cirrhosis of the liver, when its effect on the functions of the heart and lungs is comparatively trivial; ascites associated with disease of the heart, when its effect is more serious; ascites associated with Bright's disease, when its effect is more serious still, and more difficult for the physician to combat; and the influence of enlargement of the liver upon the functions of the heart and the lungs. Pure enlargement of the liver produces very little mischief to the heart and lungs, and for this reason: if there be no distension of the intestines, the liver, owing to its bulk, drops downwards upon the intestines and compresses them; it, therefore, does not push upwards and compress the heart and lungs. But, if there be enlarged intestines and a distended stomach, and fluid in the abdomen, pressing the liver upwards, then, if the liver be also large, you get, besides that accumulated series of causes of distension of the abdomen, this additional one. In these diagrams you have a fivefold series—the first made by the liver, the second by the stomach, the third by the transverse colon, the fourth by the small intestines, and the fifth by the fluid. But, if the right upper lobe of the liver be enlarged by an abscess, or a hydatid cyst, or a large cancerous mass, then the liver, ascending into the right side of the chest, forces the heart over into the left side, and compresses the right lung directly and the left lung laterally through the medium of the heart.

Gentlemen, I need not tell you that I have touched upon a subject, to illustrate which would require a series of practical lectures, but I shall be well rewarded if I have awakened in any of your ingenious minds the desire to study, in the mortuary and in the wards, the various causes of distension of the abdomen, and the various and often serious and even fatal results that this distension may induce on the functions of the heart and lungs. The clinical study of disease is inexhaustible. It requires knowledge, patience, skill, an increasing interest in the welfare of the patient, an increasing interest in the study of his disease, as you watch it. Clinical study is ever living, ever fresh. It brings that true power that depends on true knowledge and wisdom, to him who has diligently pursued it, and who still pursues it to the end of his career.

SMALL-POX AND VACCINATION.—Dr. E. H. James, reporting on the prevalence of, and the active measures taken by the Board of Health to arrest the small-pox in New York, states that during the winter of 1871-2 there were more than 300,000 vaccinations and revaccinations by the Health Department alone, to say nothing of the number in private practice and at the dispensaries. "It requires no argument at this late day to prove the efficacy of vaccination in the prevention of small-pox, otherwise repeated instances could be given of the only person in a crowded tenement house who refused vaccination becoming the victim of the disease, while all of the others escaped."

LADY MEDICAL STUDENTS.—The *Times* has the following:—Miss Jex Blake and others, although defeated by the recent decision in the Court of Session, are not yet discouraged. Edinburgh being no longer open in order to qualify for the medical profession, they have resolved to see what the Senatus Academicus of the University of St. Andrew's can do for them. In appeals addressed to that body, they request sanction for the admission of women as students of medicine in the University, and submit the following grounds among others on which they rest the application. In reason 8, they say, "The most general objection to the admission of women to an University lies in the supposed difficulty of educating them jointly with male students of medicine." This argument, they remark, may be applicable to every University in the kingdom, with the exception of St. Andrew's, where there are no male students of medicine. In reason 10, they say, "If a supplementary charter should be needed, this could be obtained without delay." They further intimate they are "willing to be responsible for all contingent expenses". Reason 12 is, "We are in a position to state that at least fifteen ladies would at once avail themselves of the permission, if given, to matriculate at the University of St. Andrew's." Reason 13, "We may further state that we, with the assistance of the committee formed in our favour, are prepared at once to hire or build suitable premises for a medical school, and are also in a position to arrange for a complete course of lectures on all the required subjects of medical education which are not taught at St. Andrew's, if the University authorities will sanction such an arrangement, and will subsequently admit us to examination and graduation." It is rumoured that the application is favourably viewed by the majority of the members of the Senatus.

LECTURES

ON

THE VARIETIES IN THE MUSCLES OF MAN.

Delivered at the Royal College of Surgeons of England.

By G. M. HUMPHRY, M.D., F.R.S.,

Lecturer on Anatomy and Physiology in the College; Professor of Anatomy in the University of Cambridge; etc.

VARIETIES IN THE MUSCLES OF THE LOWER LIMB.

LECTURE III.—*Concluded.*

THE MUSCLES ON THE FRONT OF THE LEG AND FOOT.

THE extensor muscles on the dorsal aspect of the leg, corresponding in their disposition with those on the dorsal aspect of the forearm, are divided into three parts. Of these two, the tibial or tibialis anticus, and the fibular, or peronei, are marginal and are inserted into the tarsus, while the third or intermediate—the extensor longus digitorum—extends to the toes. The marginal parts, like those on the dorsal or extensor aspects in other regions, overlap the sides of the limb, and, passing upon the flexor aspect of the tarsus, acquire a flexor action of the foot upon the leg. In the extent to which they do this there is not much variety. The irregularities are rather shown in the more or less imperfect manner in which each is separated from the intermediate, or extensor digitorum, part of the series. That is to say, subdivision into tarsal, or marginal, and digital, or median, muscles, not unfrequently fails of its normal completeness, in consequence of the tarsal muscles not being fully segmented from the digital muscles.

Thus, the tibialis anticus is commonly inserted into the first metatarsal bone, as well as into the internal cuneiform bone; and the two portions thus induced are often separate for some extent. Further, the want of limitation of this muscle to the tarsus is sometimes, in addition, indicated by the extension of a slip from it, where it comes into close contact, or conjunction, with the extensor brevis, and the slip, passing to the first phalanx of the hallux, is an imitation of the extensor primi internodii pollicis. This slip sometimes blends with the extensor hallucis, instead of joining the extensor brevis, and reaches the terminal phalanx of the hallux.

The same muscle, tibialis anticus, sometimes exhibits further evidence of imperfect concentration by sending slips, on the one side, to the plantar fascia, which may seem to increase its action as a flexor;* and, on the other side, into the anterior annular ligament or the dorsal fascia, which increase its action as an extensor. Or a distinct muscle may be segmented from it, arising from the tibia and passing to the annular ligament or the dorsal fascia. It has acquired the names of "tensor fasciæ dorsalis" and "tibio-fascialis anticus"; and it resembles the disposition of part of the tibialis anticus in the hippopotamus.† An additional outward extension of the tibialis anticus was presented by a slip which Macalister found passing to the side of the astragalus and the os calcis.

With regard to the peroneal, or outer marginal sector, I have not seen the notice of any case in which the peroneus longus failed to take its remarkable and very general‡ mammalian course to the base of the first metatarsal bone; but it has been found to detach slips to the other metatarsals on its way to the first. Thus, in a case of talipes varus, Macalister traced it into the third and fifth metatarsals, as well as into the first; and Wood traced a part of it into the cuboid. These additional attachments to the other metatarsals are not uncommon as regular conditions in other mammals. In a dog I found them attached to the bases of all the metatarsals, and in the pig to two. The muscle is rarely connected by fleshy slips with the other peronei. Meckel§ found a separate or intermediate muscle segmented from between the long and the short peronei and joining the long muscle beneath the

* Wood (*Proceedings of the Royal Society*, 1865, p. 389) remarks that a sesamoid bone is often found in the tendon of the tibialis anticus, playing over a bursa on the internal cuneiform bone; and in one instance a strong slip of tendon passed from it to join and strengthen the inner division of the plantar fascia, being ultimately attached to the bone of the great toe.

† The most remarkable example of flexor action in the tibialis anticus is furnished by the two-toed sloth, in which the tendon of the muscle is continued into that of the flexor digitorum (*Journal of Anatomy*, iv, 66).

‡ See my *Observations in Myology*, p. 182.

§ In *Pteropus* I could not trace it beyond the second metatarsal bone (*Journal of Anatomy*, iii, 317).

§ *Archiv*, v, 117.