From an 1821 translation of Laennec's 1819 treatise on mediate auscultation.

ON THE

DIAGNOSIS

OF

DISEASES OF THE CHEST.

INTRODUCTION.

HOWEVER dangerous diseases of the chest may be, they are, nevertheless, more frequently curable than any other severe internal affection. For this reason medical men, in all ages, have been desirous of obtaining a correct diagnosis of them. Hitherto, however, their efforts have been attended by little success,—a circumstance which must necessarily result from their having confined their attention to the observation and study of the deranged functions only. From the continued operation of the same cause, we must even now confess, with Baglivi, that the diagnosis of the diseases of this cavity is more obscure than that of those of any other internal organ. Diseases of the brain, not in themselves numerous, are distinguished, for the most part, by constant and striking symptoms; the soft and yielding parietes of the abdomen allow us to examine,

through the medium of touch, the organs of that cavity; and thus to judge, in some measure, of the size, position, and degree of sensibility of these, and, also, of the extraneous bodies that may be formed in them. On the other hand, the diseases of the thoracic viscera are very numerous and diversified, and yet have almost all the same class of symptoms. Of these the most common and prominent are cough, dyspnœa, and, in some, expectoration. These, of course, vary in different diseases; but their variations are by no means of that determinate kind which can enable us to consider them as certain indications of known variations in the diseases. The consequence is, that the most skilful physician who trusts to the pulse and general symptoms, is often deceived in regard to the most common and best known complaints of this cavity. Nay, I will go so far as to assert, and without fear of contradiction from those who have been long accustomed to morbid dissections,—that, before the discovery of Avenbrugger, one half of the acute cases of peripneumony and pleurisy, and almost all the chronic pleurisies, were mistaken by practitioners; and that, in such instances as the superior tact of a physician enabled him to suspect the true nature of the disease, his conviction was rarely sufficiently strong to prompt and justify the application of very powerful remedies. The percussion of the chest, according to the method of Avenbrugger, is one of the most valuable discoveries ever made in medicine. By means of it, several diseases, which had hitherto been cognisable by general and equivocal signs only,

are brought within the immediate sphere of our perceptions, and their diagnosis, consequently, rendered both easy and certain.

We must still admit, however, that the method of percussion is far from being complete, or generally available. It frequently affords no indication in phthisis; and in no case does it enable us to distinguish this disease from chronic peripneumony. Even in peripneumony it fails us in a great measure when the inflammation is confined to the centre of the lung, or when both lungs are equally affected, and only in a slight degree. It does not enable us to distinguish the disease just mentioned from pleurisy, hydrothorax, or any other effusion into the cavity of the chest. It completely fails us, or rather certainly misleads us, in the disease called *Pneumo-Thorax*. It gives no indication of the diseases of the heart until this organ is greatly enlarged; and it is often before this takes place that the disease proves fatal. It affords no assistance in aneurisms of the aorta and large vessels, until the nature of the disease is appreciable by the sight, or by the touch. In many other respects, also, the indications afforded by percussion are rendered equivocal by peculiarities of formation, by the niceties required in its performance, and by the circumstances under which it is performed. It is more particularly in diseases of the heart that we regret the insufficiency of this method, and wish for something more precise. The general symptoms of disease in this organ greatly resemble those produced by many nervous complaints, and by the diseases of other organs. The

results afforded by the application of the hand to the part, with the view of judging from the tactual sensations communicated, have been found of some use, in doubtful cases; but, as a general method, this is by far too vague and uncertain to be of much benefit.

In these cases some physicians have attempted to gain further information by the application of the ear to the precordial region; and, doubtless, such a proceeding will encrease the certainty of the diagnosis. Even this, however, is very insufficient; and there are, besides, many reasons why it cannot be followed, as a general guide, in practice. Nevertheless, I had been in the habit of using this method for a long time, in obscure cases, and where it was practicable; and it was the employment of it which led me to the discovery of one much better.

In 1816, I was consulted by a young woman labouring under general symptoms of diseased heart, and in whose case percussion and the application of the hand were of little avail on account of the great degree of fatness. The other method just mentioned being rendered inadmissible by the age and sex of the patient, I happened to recollect a simple and well-known fact in acoustics, and fancied, at the same time, that it might be turned to some use on the present occasion. The fact I allude to is the augmented impression of sound when conveyed through certain solid bodies,—as when we hear the scratch of a pin at one end of a piece of wood, on applying our ear to the other. Immediately, on this suggestion, I rolled a quire of paper into a sort of

cylinder and applied one end of it to the region of the heart and the other to my ear, and was not a little surprised and pleased, to find that I could thereby perceive the action of the heart in a manner much more clear and distinct than I had ever been able to do by the immediate application of the ear. From this moment I imagined that the circumstance might furnish means for enabling us to ascertain the character, not only of the action of the heart, but of every species of sound produced by the motion of all the thoracic viscera. With this conviction, I forthwith commenced at the Hospital Necker a series of observations, which has been continued to the present time. The result has been, that I have been enabled to discover a set of new signs of diseases of the chest, for the most part certain, simple, and prominent, and calculated, perhaps, to render the diagnosis of the diseases of the lungs, heart and pleura, as decided and circumstantial, as the indications furnished to the surgeon by the introduction of the finger or sound, in the complaints wherein these are used.

In prosecuting my enquiries I made trial of instruments of various composition and construction.—The general result has been that bodies of a moderate density, such as paper, wood, or indian cane, are best suited for the conveyance of the sound, and consequently for my purpose. This result is perhaps contrary to a law of physics;—it has, nevertheless, appeared to me one which is invariable.

I shall now describe the instrument which I use at present, and which has appeared to me preferable

to all others. It consists simply of a cylinder of wood, perforated in its centre longitudinally, by a bore three lines in diameter, and formed so as to come apart in the middle, for the benefit of being more easily carried. One extremity of the cylinder is hollowed out into the form of a funnel to the depth of an inch and half, which cavity can be obliterated at pleasure by a piece of wood so constructed as to fit it exactly, with the exception of the central bore which is continued through it, so as to render the instrument in all cases, a pervious tube. The complete instrument,—that is, with the funnel-shaped plug infixed,—is used in exploring the signs obtained through the medium of the voice and the action of the heart; the other modification, or with the stopper removed, is for examining the sounds communicated by respiration. (See Plate VIII.) This instrument I commonly designate simply the *Cylinder*, sometimes the *Stethoscope*.

In speaking of the different modes of exploration I shall notice the particular positions of the patient, and also of the physician, most favourable to correct observation. At present I shall only observe that, on all occasions, the cylinder should be held in the manner of a pen, and that the hand of the observer should be placed very close to the body of the patient to insure the correct application of the instrument.

The end of the instrument which is applied to the patient,—that, namely, which contains the stopper or plug,—ought to be slightly concave to insure its greater stability in application; and when there is much emaciation, it is sometimes necessary to insert between the ribs a piece of lint or cotton, or a leaf of paper, on which the instrument is to be placed, as, otherwise, the results might be affected by the imperfect application of the cylinder. The same precaution is necessary in the examination of the circulation in cases where the sternum, at its lower extremity, is drawn backwards, as frequently happens with shoemakers, and some other artisans.

Some of the indications afforded by the stethoscope, or *mediate auscultation*, are very easily acquired, so that it is sufficient to have heard them once to recognise them ever after: such are those which denote ulcers in the lungs, hypertrophia of the heart when existing in a great degree, fistulous communication between the bronchia and cavity of the pleura, &c. There are others, however, which require much study and practice for their effectual acquisition.

The employment of this new method must not make us forget that of Avenbrugger; on the contrary, the latter acquires quite a fresh degree of value through the simultaneous employment of the former, and becomes applicable in many cases, wherein its solitary employment is either useless or hurtful. It is by this combination of the two methods that we obtain certain indications of emphysema of the lungs, pneumo-thorax, and of the existence of liquid extravasations in the cavity of the pleura. The same remark may be extended to some other means, of more partial application, such, for example, as the *Hippocratic succussion*, the *mensuration* of the

thorax, and *immediate* auscultation; all of which methods, often useless in themselves, become of great value when combined with the results procured through the medium of the stethoscope.

In conclusion, I would beg to observe, that it is only in an hospital that we can acquire, completely and certainly, the practice and habit of this new art of observation; inasmuch as it is necessary to have occasionally verified, by means of examination after death, the diagnostics established by means of the cylinder, in order that we may acquire confidence in the instrument and in our own observation, and that we may be convinced, by ocular demonstration, of the correctness of the indications obtained. It will be sufficient, however, to study any one disease in two or three subjects, to enable us to recognise it with certainty; and the diseases of the lungs and heart are so common, that a very brief attendance on an hospital will put it in the power of any one to obtain all the knowledge necessary for his guidance in this important class of affections. There are three classes of application of this instrument, viz. as regards the Voice—the Respiration—and the Circulation; all of which I shall here briefly notice as observable in the healthy subject; referring for the varieties of these, as modified by disease, and for the diagnostic indications afforded by them, to the individual affections to be noticed hereafter.

I. The Voice. When a person in health speaks or sings, his voice excites in the whole parietes of the thorax a sort of vibration, which is easily perceived on applying the hand to the chest. This

phenomenon is no longer observable when, through disease, the lungs have ceased to be permeable to the air, or are removed from the contact of the parietes of the chest by an effused fluid. This sign is of inferior value, since a great many causes occasion varieties in the intensity of the vibration, or completely destroy it. For instance, it is little sensible in fat persons, in those whose integuments are considerably flaccid, and in those who have a sharp and weak voice. Anasarca of the chest completely destroys it, even when the lungs are quite sound. In any case it is only very perceptible at the anterior and superior part of the chest, on the sides, and in the middle of the back. From these and other causes we can derive little practical benefit from attending to this particular circumstance.

On making use of the cylinder with the view of further investigating this phenomenon, I soon found, as indeed might have been expected, that it conveyed the peculiar vibration much less distinctly than the bare hand. I also ascertained that the degree of intensity of the vibration varied in different points of the thorax. The places where it is most distinct are the axilla, the back—between the spine and the edge of the scapula, and on the anterior and superior part of the chest near the angle formed by the union of the clavicle with the sternum. When we apply the cylinder to these points, the voice appears stronger and nearer to us; in the others, on the contrary, particularly in the inferior and posterior parts of the thorax, it seems weaker and more remote.

II. Respiration. On applying the cylinder, with its funnel-shaped cavity open, to the breast of a healthy person, we hear, during inspiration and expiration, a slight but extremely distinct murmur, answering to the entrance of the air into, and its expulsion from, the air cells of the lungs. This murmur may be compared to that produced by a pair of bellows whose valve makes no noise, or, still better, to that emitted by a person in a deep and placid sleep, who makes now and then a profound inspiration. We perceive this sound almost equally distinct in every part of the chest, but more particularly in those points where the lungs, in their dilatation, approach nearest to the thoracic parietes, as, for instance, the anterior-superior, the lateral, and the posterior-inferior regions. The hollow of the axilla, and the space between the clavicle and superior edge of the trapezius muscle, exhibit the phenomenon in its greatest intensity. It is equally perceptible on the larynx, on the exposed or cervical portion of the trachæa, and, in many persons, through the whole tract of this canal to the bottom of the sternum; but on the trachæa, and in some degree at the root of the bronchia, the respiratory murmur has a peculiar character, which evidently indicates the transmission of the air through a larger space than the air cells. In this position, also, it often seems as if the patient, in inspiring, inhales the air through the tube of the stethoscope, and expells it by the same, during expiration.

To judge correctly of the state of respiration by this method, we must not rely on the results of the

first moments of examination. The sort of buzzing sensation often caused by the first application of the instrument, the fear, restraint, and agitation of the patient, which mechanically lessen the force of respiration, the frequently inconvenient posture of the observer, and the great sensation occasionally produced by the action of the heart,—are all causes which may at first prevent us from correctly appreciating, or even from hearing at all, the sound of inspiration and expiration. We must, therefore, allow some seconds to pass before we attempt to form an opinion.

I need hardly observe that there must be no noise whatever in the vicinity of the patient. The intervention of clothing, even when of considerable thickness, does not sensibly diminish the sound of respiration; but we must be careful that there is no friction between this and the instrument, as this circumstance, especially if the clothes are of silk, or of a fine hard stuff, may mislead us by exciting a sensation analogous to that produced by respiration. Fatness, even when excessive, and anasarca of the chest, seem to have no notable effect in diminishing the peculiar sound. The sound is more distinct in proportion as the respiration is more frequent. A very deep inspiration made very slowly will sometimes be scarcely audible, while an imperfect inspiration, such, for instance, as hardly at all elevates the chest,—provided it be made quickly, may produce a very loud sound. On this account, when examining a patient, more especially if we have had but slight practice with the instrument, we should

desire the respiration to be performed rather quickly. This is, however, a very unnecessary precaution in most diseases of the chest, as the frequent presence of dyspnœa necessarily renders the respiration quick. The same is true of fever, and the agitation caused by nervous affections.

Many other causes, and especially the age of the individual, alter the intensity of the sound. In children, respiration is very sonorous, even noisy, and can be heard easily even through very thick clothing. In them the close and forcible application of the instrument, to prevent the friction of the garments, is unnecessary, as any noise that might arise from this cause is lost in the intensity of the other. The respiration of children differs, also, from that of adults in other respects besides its intensity. It is impossible to describe this peculiarity, but it will easily be understood by comparative trials. It appears as if, in children, we could distinctly hear the dilatation of all the air cells to their full extent; whilst, in adults, these seem as if, from their stiffness, they could only bear a partial dilatation. This difference of sound is much less marked in expiration than inspiration. The dilatation of the chest in inspiration is also greater in the child, and both these peculiarities are more remarkable as the child is young: they continue, in a greater or less degree, to the period of puberty or a little beyond it.

The sound produced by respiration varies, also, very much in its intensity in different adults. In some men it is scarcely perceptible unless they make a very deep inspiration, and even then, although

sufficiently distinct, it is not one half so audible as in the majority of persons. These individuals have generally a rather slow respiration, and are little subject to dyspnœa, or breathlessness, from any cause. Others, however, have the respiration very sensible even during a common inspiration, without being, on this account, at all more subject to shortness of breath than the former. Some few individuals, again, preserve through life a state of respiration resembling that of children, and which I shall therefore denominate *puerile*, in whatever age it may be perceptible. Such persons are almost all women, or men of a nervous temperament, and they preserve, in some other respects, the character of childhood. Some of these cannot be said to have any actual disease of the lungs, but they soon get out of breath, even though lean, by exercise, and are very liable to catch cold. Others of this class are affected with a chronic catarrh, attended by dyspnœa, a condition constituting one of those cases to which the name of *Asthma* is usually given. With these exceptions, an adult cannot, by any effort, give to his respiration the sonorous character of childhood; but in some morbid states, the respiration spontaneously acquires it, without being, at the time, performed more forcibly than usual. This is particularly the case when one whole lung, or a considerable portion of both lungs, is rendered impermeable to air through disease, especially acute disease. In the sound portion of the lungs, in these cases, the respiration is perfectly similar to that of children. The same thing is observable throughout the

whole extent of the lungs in some cases of fever, and in certain nervous diseases.

At first we are tempted to believe that the superior intensity of the respiratory murmur in children may be owing to the tenuity of the muscles covering the chest, and to the superior suppleness of the tissue of the lungs. But the first cause must have scarcely any effect in this way, since we find that, even in the fattest children, and in those most thickly clothed, the respiration is much more distinct than in the leanest adult examined uncovered; whilst, of the adults who possess the *puerile* respiration, many are very robust and full of flesh. Neither does the quieter respiration of the adult depend on any induration or loss of pliability in the pulmonary tissue, since it sometimes accidentally returns to the character it had in infancy. I am rather disposed to believe that the difference of result depends on the fact of children requiring a greater proportion of air than adults; whether this necessity arises from the greater activity of their circulation, or from some difference in the chemical composition of the blood.

The respiration which is most audible to the ear, is not that which produces the greatest noise in the interior of the chest. I do not here allude to that species of respiration which is accompanied with a rattling or hissing, or any other unnatural sound, but to that kind of respiration which is simply loud, and which is so frequent in dyspnœa. This noise is merely the aggravation of the natural sound made by many persons in sleep, and is caused by the

mode in which the air impinges upon the parts in the fauces. We can imitate it at will. I am acquainted with an asthmatic patient, whose habitual respiration can be heard at the distance of twenty feet, and whose respiration, as heard in the interior of the chest, is, nevertheless, weaker than in the majority of men. The same remark applies to the noise *(snoring)* emitted by many healthy persons during sleep; and, also, to the imitative sounds of jugglers and ventriloquists,—all of which are produced in the throat and posterior nares, and are quite unconnected with the sound of respiration in the interior of the chest.

When we can distinctly perceive, and with a uniform intensity, the respiratory murmur in every part of the chest, we may be assured that there exists neither effusion into the cavity of the pleura, nor any species of engorgement in the substance of the lungs. On the other hand, when we find the respiration is not to be distinguished in any particular point, we may safely conclude the corresponding portion of the lungs within is become impermeable to the air from some cause or other. This sign is as easy to be perceived as the presence or absence of the sound, in the percussion of Avenbrugger, and affords precisely the same indications. With the exception of some peculiar cases, in which the simultaneous employment of the two different methods gives us signs which are completely pathognomonic,—we may state it as a general fact, that the absence of the sound on percussion coincides

uniformly with the absence of respiration, as ascertained by the stethoscope.

As appertaining to the action of respiration, although not observable in the perfectly healthy condition of this function, I shall here briefly allude to a phenomenon which will be more particularly described hereafter. It is the peculiar sound conveyed by the cylinder, when the air, during respiration, is transmitted through fluid matter of any kind in the lungs or bronchia. From its resemblance, both in its origin and character, to what is usually called *the rattles* in dying persons, and from want of a better word, I have adopted this term to denote it whenever it occurs. Its character and varieties will be described hereafter.

III. THE CIRCULATION. In the introductory chapter to the Diagnosis of the diseases of the heart, I shall detail, at considerable length, the results obtained by the cylinder, both in the healthy and disordered condition of that organ. At present I allude to them merely; and chiefly for the sake of uniformity.

The alternate contractions of the auricles and ventricles of the heart give rise to sounds very distinct, and of different kinds, so as to enable us to study the actions of that organ even more exactly than by the dissection of living bodies. The truth of this seemingly paradoxical assertion rests on the fact, of the ear judging much more correctly of the intervals of sound, than the eye of the intervals of motions corresponding to these.

In ordinary circumstances the stethoscope, applied between the cartilages of the fifth and sixth ribs, at the end of the sternum, or, indeed, in any point where the pulsation of the heart is perceptible,—conveys to the ear a distinct sound. This, in the healthy body, is double, and each beat of the arterial pulse corresponds to this double sound, in other words, to two sounds. One of these is clear and rapid, and somewhat resembles the sound produced by the valve of a pair of bellows: this corresponds to the systole of the auricles. The other is more dull and prolonged, coinciding with the beat of the pulse and with the shock or impulse communicated to the parietes by the motion of the heart:—it indicates the contraction of the ventricles. The sounds heard at the end of the sternum are produced by the action of the right side of the heart; those between the cartilages of the ribs by the left cavities. In the state of health the sound produced by the contractions of each side is the same.

I shall conclude this account of the several varieties of pleuritic inflammation, with several cases which illustrate many of the statements already made. In all of them will be found the complication of *air effused* into the cavity of the pleura, a complication which will be treated of more particularly, by and bye, under the name of Pneumo-Thorax.

Case 34. A man, aged 32, was seized for the first

time, in May 1817, with a catarrhal affection, attended by cough, dyspnœa, &c, which continued, with variable severity, until the beginning of November, when he came under my care. At this time there were considerable emaciation, hot skin, small and frequent pulse, short and quick respiration, much cough, and considerable expectoration of opaque, yellow and very viscid sputa. The stethoscope gave indication of tuberculous excavations in the lungs. The febrile and inflammatory symptoms continued; and, during the course of the following month, acute pain in different parts of the chest supervened: at the same time, the cough became more troublesome, and to the yellow opaque sputa there was now superadded a copious discharge of transparent and frothy mucus. Percussion of the thorax yielded a much clearer sound on the right than on the left side; while the respiratory murmur was distinct in the latter, and not at all perceptible in the former. The tinkling metallic sound, already alluded to (and which we shall hereafter find to be characteristic of the simultaneous existence of air and some liquid in the chest) was, also, very audible on the right side. The patient lay almost constantly on the right side, the intercostal spaces of which could now be perceived to be wider and more prominent than natural, and the subcutaneous veins more obvious. All these symptoms indicated the supervention of a pleurisy, with effusion of both air and a liquid of some sort into the right side of the chest. Towards the end of January the patient first perceived the fluctuation of a liquid in his chest when he turned himself: the

same thing was very distinctly heard by the by-standers when the trunk was shaken in a sitting posture. In February the sputa amounted to about six ounces in the twenty-four hours; they were yellow, opaque and puriform, intermixed with bubbles of air, and swimming, as it were, in a large proportion of a transparent and diffluent mucus, in which there were sometimes streaks of blood. One day in this month, he expectorated, after a fit of coughing, as much as he usually did in the whole twenty-four hours. At this time the operation of empyema was performed, between the sixth and seventh ribs, by means of a trocar only one line in diameter. Two pounds of matter flowed in twenty minutes. This matter was puriform, opaque, of a slightly-greenish yellow colour, and scarcely fetid. As it flowed it was intermixed with some air-bubbles; and, on settling, it separated into two portions,—the one, opaque and yellow, and composed of small yellowish flocculi,—the other, thinner and transparent. The patient felt relieved in proportion as the matter flowed, and this alleviation continued for two days, but he sunk on the 12th day after the operation.

On examining the body after death, we found that the succussion of the trunk produced the sound of fluctuation as before. On puncturing the thorax a gaseous fluid escaped. The right side of the thorax was larger than the left, and contained two pints of a sero-purulent fluid. The whole extent of the pleura, on this side, was lined by a thick layer of coagulable lymph, the consistence of which varied in different places, from that of soft cheese to one

nearly equal to that of cartilage: it was softer on the surface, and more dense where it touched the pleura. It was several lines thick on the lungs, and on the right side of the mediastinum and diaphragm; it was thinner, softer, and more easily detached, on the pleura of the ribs and remaining portion of the diaphragm, both of which were of an intense punctuated red colour. The pleura of the lungs had none of this punctuated appearance, and the layer in contact with it, which was of a cartilaginous firmness, could not be detached from it. The lung was compressed towards the spine and posterior part of the ribs (to which it closely adhered), so that it hardly occupied one third part of the cavity. The pulmonary tissue was flaccid, but still somewhat crepitous, and permeable to the air in its posterior part. There were several tubercles in this lung, from the size of a cherry-stone to that of a filbert, and almost all softened to the consistence of curd. Five of these, of a somewhat larger size, quite softened and nearly empty, communicated on the one side with the bronchia, and, on the other, with the cavity of the pleura, by openings of from one to three lines in diameter.

The left lung was of the natural size, and contained, also, a great many tubercles in different stages of maturity:—the greater number being small and diaphanous;—a few, quite softened but not communicating with the bronchia. The mucous membrane was very red through its whole extent, and there was a small ulcer in the posterior part of the larynx. There was a small quantity of serum in the pericardium, and, also, in the peritoneum.

Case 35. A man, aged 20, who had been unwell (he said) for six months, and who had suffered from diarrhœa for the three last, came into hospital in January, exhibiting all the usual symptoms of confirmed Phthisis, and, among others, that of a very distinct pectoriloquism at the superior part of the left side of the chest. In the beginning of March a sudden alteration took place in the symptoms: the respiration becoming more difficult, attended with pricking pains in the right side, the pulse getting quicker, the skin hotter, and the face flushed. On examining the chest at this time by percussion and the stethoscope, it was found that the right side, which on the day before had yielded only a dull sound, now resounded more than the other; while the respiration was very perceptible on the left side, and not at all on the right. These symptoms I regarded as indicating pleurisy, arising from the irruption of tuberculous matter into the cavity of the pleura, and attended both by liquid and gaseous effusion. I wished farther to ascertain the effusion by the succussion of the chest, but the patient was too weak to undergo the trial, and he died four days after the marked change in the symptoms.

The fluctuation of the fluid in the right cavity of the chest was very perceptible, on succussion, after death. This side appeared, also, larger than the left; when struck it emitted a clear sound; and when punctured an elastic fluid escaped from it with a hissing noise. There was found in the cavity of the pleura a considerable quantity of a sero-purulent liquid, of a greenish-yellow colour, and semi-transparent, notwithstanding the great portion of puriform fragments that floated in it. The pleura was lined throughout with an opaque albuminous exudation, of a yellowish-white colour, easily scraped off by the scalpel, and of the consistence of curdled milk. This layer was of considerable thickness on some parts of the ribs and diaphragm, and thinner on the lungs. The lung on this side was compressed into one third or one fourth its natural volume against the spine and mediastinum, to which last it closely adhered. It was flabby and very imperfectly crepitous through its whole extent, and contained hard tumours, which were evidently tubercles. On the closest examination no opening could be discovered on its surface. In the very summit of the superior lobe there were found three tuberculous excavations; two of which, of the size of a hazel-nut, were full of soft matter, and the third, six times as large, and capable of containing a pullet's-egg, nearly empty. This vast cavity was lined by two membranes, the interior (that in immediate and close contact with the pulmonary tissue) of a semi-cartilaginous density, and the exterior soft, almost entirely opaque, and easily torn. The former existed only in some points; the latter was complete. The remainder of the lung was filled by miliary tubercles. The left lung appeared quite sound, only containing a few miliary tubercles.

Case 36. A man, 35 years of age, while in hospital for a chronic affection of the knee, was suddenly attacked, in January, with pleuritic symptoms, viz. head-ache, pain in the chest aggravated by respira-

tion, frequent cough, and expectoration of white and very copious sputa. Getting better he left the hospital in the end of February, but returned again in the middle of March. At this time there were decided symptoms of pleurisy with effusion into the chest, and also of phthisis,—according to the indications of the stethoscope: the common symptoms were—hot dry skin, frequent pulse, quick short breathing, frequent cough, and expectoration (not very copious) of a frothy mucus intermixed with sputa of a yellow colour and opaque.

The same symptoms continued, with increase of emaciation and cough in June and July. In August, diarrhœa supervened, with increase of cough and fetid purulent expectoration, to the amount, for a short time, of a pound and half in the twenty-four hours. In October, there was again copious fetid expectoration, with dyspnœa and much cough, and inability to lie on the right side. At this time both sides yielded the same sound on percussion, but respiration could be perceived in the right side only. Fluctuation in the left side was also perceptible on succussion, by means of the cylinder, but not without it. The patient said that a momentary attempt to lie on the right side increased the frequency of the cough and greatly augmented the expectoration. He was not, however, sensible of any fluctuation in the chest. He died in the beginning of November.

On examination after death, the left side of the thorax was found larger than the right; the left intercostal spaces were wider and raised to a level with the ribs, while the right were sunk below that

level. On puncturing the thorax on the left side, an extremely fetid gas made its escape with a hissing sound. On laying it open it was found to contain about three pints of a blackish-grey liquid, extremely fetid, and having somewhat of the smell of garlick. The lungs on this side were compressed against the spine, and were not larger than the hand. Their surface was covered with a layer of a half-concrete white matter, intermixed with a very soft black substance. On it there were two openings of the size of the finger, which terminated, interiorly, in the substance of the lungs, in culs-de-sac not communicating with the bronchia. They were evidently the remains of tubercular excavations which had discharged their contents into the cavity of the pleura. The whole of the false membrane which invested the pleura was black and soft, on the surface, but below this is was firmer and whitish.

The right lung adhered to the pleura throughout by old attachments, and contained, internally, a great number of miliary tubercles. In its upper lobe there was an empty excavation, of the size of a filbert, and lined by a well-organised semi-cartilaginous membrane. In the middle of the same lobe there were found several white bands resembling antient cicatrices. (See Chap. I. sect. 2.) Two of these united in the form of the letter V, and contained between them a mass of tuberculous matter.*

APPENDIX,

CONTAINING SOME CASES NOT TRANSLATED IN THE BODY OF THE WORK, AND FULLER DETAILS OF SOME THAT HAVE BEEN TOO MUCH ABRIDGED.

CASE. (No. xxxvi. of the Author, not translated in the body of the work). PHTHISIS PULMONALIS.—*Tuberculous cavity partly converted into fistula, producing the metallick tinkling.* A woman, 50 years of age, who had been affected with cough and expectoration for several years, and which had got much worse within a few months past, came to the Hospital on the 13th April, having, for the first time, been obliged to desist from her ordinary occupation. She looked much older than she was, and was very thin. The pulse was quick, skin slightly hot, and the expectoration, which was in moderate quantity, consisted of thick yellow sputa intermixed with much transparent ropy mucus.

The stethoscope, applied to the anterior and upper part of the right side, and to the right axilla, detected distinct pectoriloquism; and, in the same places, when the patient coughed or spoke, and still more during respiration, there was heard a tinkling, like that of a small bell which has just stopped ringing, or of a gnat buzzing within a porcelain vase. A mucous rattle, or strong guggling, existed in the same points; and all these phenomena were distinctly

perceptible over the whole space from the top of the shoulder to the fourth rib,—being, only, more distinct anteriorly and under the axilla than behind. The murmur of respiration was sufficiently distinct over the greater part of the chest, except at the roots of the right lung and the top of the left. The Hippocratic succussion afforded no result. From these various signs I made the following diagnosis: *Vast tuberculous cavity occupying the whole of the superior lobe of the right lung, and containing a small quantity of fluid; tubercles, especially at the top of the left and root of the right lung.* Four days after her entry this woman was discharged for irregularity. She came into the hospital again in the end of May, affected with precisely the same symptoms. She died suddenly on the 6th of June.

Dissection twenty-four hours after death. On penetrating with the scalpel between the fourth and fifth ribs of the right side a small quantity of air escaped.* The lungs on this side were flattened from within outwards towards the ribs, and adhered throughout to the pleura of the ribs, mediastinum and diaphragm. Above the sixth rib the adhesion was very close. The upper half of this lung was occupied by a vast tuberculous cavity, which contained about two spoonfuls of a purulent fluid. The parietes of this excavation (except on the lower side) consisted of condensed pulmonary tissue, surrounded by a thin layer of a fibrous texture like the lateral ligaments of the joints, which was intimately connected with the pleura of the ribs and lungs. The cavity was large enough to contain the hand of the largest man, and branched out into many anfractuosities. This cavity was crossed at one point by a band of flaccid pulmonary tissue, pretty healthy, and covered by the lining membrane of the excavation. Here and there, blood-vessels of the size of a crow-quill ramified on the interior of this, some adherent and others partially detached,

* This must have come from the excavation which will be immediately noticed, as the cavity of the pleura was obliterated.

some quite obliterated, others only partially. A semi-cartilaginous membrane, extremely uneven and of very variable thickness, lined the cavity throughout; and this was the only boundary, on the inferior part, between it and a branch of the pulmonary artery large enough to admit the little finger. The anterior part of this excavation terminated in a longish cul-de-sac, which was lined by a membrane entirely cartilaginous, and much thicker than that of the other parts of it. In cutting this part of the lung from above downwards, we could trace this cartilaginous lining under the form of a lamina of cartilage, for more than an inch into the substance of the lung, beyond the walls of the excavation. This was no doubt the remaining cicatrization of a cavity which had communicated with that which existed at present. Some bronchial tubes that stretched towards this lamina terminated in culs-de-sac before reaching it, still, however, retaining a considerable caliber, and having their mucous membrane very red and thickened. Several other branches of the bronchia opened into the existing cavity, with their terminations quite smooth and polished.

The anterior portion of the superior and middle lobes, which had not been implicated in this destruction, was still crepitous, and contained, in different parts, small groupes of tubercles in different stages, as did also the lower lobe.

On puncturing the left side of the chest there was an escape of gas, which must have come from the cavity of the pleura. There was no effusion in this side of the chest, and the greater part of the lung was unattached, except at its very upper point. This was strongly attached to the costal pleura by a very thick, whitish, fibrous membrane. This covered a sort of cartilaginous cicatrice in the lung, of two or three lines in thickness, which surmounted an irregular cavity of the size of a pigeon's egg. The walls of this were formed by condensed pulmonary substance and

inclosed a small calcareous concretion. The remaining parts of this lung were pretty sound, only containing some tubercles.

CASE. (No. xxxvii. of the Author, not translated in the body of the work). PHTHISIS PULMONALIS.—*Tuberculous excavation producing the metallick tinkling.* A woman, aged 40, came into the Hospital 29th January, having been affected with cough for five months, and which had increased since her confinement, three months ago. At this time the respiration was short and quick, and difficult; the chest resounded pretty well in the back and left side before,—but better on the right side; there was distinct pectoriloquism near the junction of the sternum and left clavicle, and the same phenomenon, but less distinct, on the same side where the arm joined the chest; the sound of the ventricles was dull, and the heart gave hardly any impulse. Two days after, by means of the cylinder, we distinguished a sound resembling fluctuation, in the left side, when the patient coughed, and the *metallick tinkling* when she spoke. Succussion of the trunk did not produce the sound of fluctuation. From these results the following diagnostic was given: *very large tuberculous excavation in the middle of the left lung, containing a small quantity of very liquid tuberculous matter.* The patient died five days after this.

Dissection twenty-fours after death. In the right lung, through its whole extent, there were innumerable tubercles of a yellowish white colour, and varying in size from that of a hemp-seed to a cherry-stone, and even a large filbert. These last were evidently formed by the reunion of several smaller ones, and, for the most part, were more or less softened. Besides these there were, in other parts, several cavities, the largest of which would have contained a hazel-nut, completely filled by pus, thicker than that of an abscess, and lined by a double membrane, the inner layer of which was white, soft, and little adherent to the other; the outer was of a cartilaginous character and semi-transparent, and incomplete in certain points. The left lung adhered closely to the pleura of the ribs and pericardium. On its anterior and lateral part it contained, near its surface, three cavities, one above the other, and communicating by two large openings. The upper, of the size of a pigeon's egg, occupied the top of the lung, and corresponded to the junction of the clavicle and sternum; the second might have contained a pullet's egg, and the lowest, which reached within an inch of the base of the lung, was of the size of a walnut. These excavations were lined by two membranes, like those in the right lung, contained a liquid pus, and communicated with several bronchial tubes. This lung contained also some smaller cavities and tubercles, and exhibited marks of inflammation in several places.

CASE 1. Page 19. (No. i. of the Author). PHTHISIS PULMONALIS. *Ulcers of the lungs cured by transformation into semi-cartilaginous fistulæ.* A woman, aged 68, had been for several years affected with much cough and expectoration; accompanied by habitual shortness of breath, greatly aggravated by the least exercise. In other respects she was pretty well, and was able to discharge the laborious duties of a servant. She was sufficiently stout and had good appetite; but her lips and cheeks were of a violet red colour. On the last day of December she was seized with fever, very severe dyspnœa, and cough attended by very viscid frothy sputa, of a pale green colour and semi-opaque. She was bled, and thereby obtained some relief. Four days after this attack she was removed to the hospital, and presented the following symptoms on being examined by the stethoscope:—Respiration was barely perceptible (and was accompanied by a well-marked *rattle* in the inferior and left part of the chest) to the height of about the fourth rib. Percussion elicited a dull sound over the same extent, especially on the back. The pulsation of

the heart gave no shock, but was perceptible over the whole anterior and lateral part of the chest, and slightly on the left side of the back. The contraction of the auricles and ventricles produced a considerable sound, and nearly equally so. The external jugulars were swollen. The dyspnœa and expectoration were as stated above. On these data the following diagnostic was given: *Peripneumony of the inferior part of the left lung: slight dilatation of the ventricles.*

Fresh bleedings gave temporary relief; but on the eighth day the fever increased and was attended by stupor and delirium. At this time respiration was much more perceptible on the upper part of the left side than any where else; and naturally led us to suspect the existence of pectoriloquism there: but the patient was too weak to have this tried, and died the following day.

Dissection twenty-four hours after death. The lungs adhered to the costal pleura, nearly through their whole extent, by means of well organised cellular substance, evidently of antient date. The right lung was crepitous and very sound, exclusive of the upper lobe, which contained an excavation of the size of a large filbert. This was lined by a thin smooth, equable membrane, pearl-grey, and of a semi-cartilaginous nature. Several bronchial tubes opened into this, extremely dilated, so as, at first sight, to look like appendices of the cavity. The mucous membrane of some of these tubes was very pale, and that of others red, but not swollen. The top of the left lung contained a similar cavity, only larger and more irregularly shaped. It was lined by a similar membrane, which was continuous with the mucous coat of a great number of bronchial tubes (large as a crow-quill) which opened into it. It contained merely a small portion of nearly colourless serosity. The substance of the lungs around these cavities was sound and crepitous; except in the places where some of the projecting angles came nearly in contact, in which

cases the intervening substance appeared like a compound of fibro-cartilage and black pulmonary matter. There were no tubercles whatever in the lungs; but the whole of the inferior lobes, and the lower portion of the superior, had a consistence equal to that of liver, which, when cut, exhibited a granulated surface, and poured out a purulent fluid intermixed with blood.

The heart was somewhat larger than natural, and was filled with coagula. The right ventricle, in particular, was evidently enlarged, and both of these were thin, especially the right.