Phthisis and the stethoscope : a concise practical guide to the physical diagnosis of consumption / by Richard Payne Cotton.

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from the Author.

PHTHISIS AND THE STETHOSCOPE.

Preparing by the same Author.

A GENERAL TREATISE on PHTHISIS,

BEING THE ESSAY FOR WHICH THE

FOTHERGILLIAN GOLD MEDAL HAS BEEN AWARDED.

PHTHISIS AND THE STETHOSCOPE.

A

CONCISE PRACTICAL GUIDE

TO THE

PHYSICAL DIAGNOSIS

OF

CONSUMPTION.

BY

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TO

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FOR CONSUMPTION AND DISEASES OF THE CHEST,

This Little Book

IS (WITH THEIR PERMISSION) DEDICATED,

AS A MARK

OF THE ESTEEM AND GRATITUDE

OF THEIR FRIEND AND FORMER PUPIL,

THE AUTHOR.

PREFACE.

I HAD often been perplexed—and, I might say, almost discouraged, in the endeavour to separate from the many excellent works we possess upon physical examination, the various points really available in the practical diagnosis of Phthisis; and, it occurred to me, that having, to some extent at least, overcome the difficulty, it might be serviceable to others, were I to describe them as concisely as possible, and apart from everything either speculative or argumentative. The attempt was made in six lectures, which were delivered at the Hospital for Consumption and Diseases of the Chest, and shortly afterwards published in the *Medical Gazette;* and it is to their flattering reception, both by the medical journals and private friends, that their reappearance in the present form is attributable.

With the exception of a few additions which subsequent experience has suggested, and, in some parts, a slight difference in arrangement, the better to suit the reader's convenience,—the following pages are the same as the original lectures, and, like them, possess very little novelty but what is derived from their practical character; they are not intended to supersede any of the more ample and discursive works upon physical diagnosis, but are merely designed for the use of those, whose professional duties require that such matters should be studied, rather in abstract than in detail.

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THE

PHYSICAL

DIAGNOSIS OF CONSUMPTION.

CHAPTER I.

INTRODUCTORY.

General characters of the healthy chest—Form—Movement—Vocal and Tussive Vibration and Resonance—Sonorousness—Respiration—Situation of the heart's sounds.

BEFORE attempting to explain the changes in the thorax induced by the presence of tubercles, it will be well to call the attention, as briefly as is consistent with its importance, to the condition of the chest of a person who is perfectly free from disease; and, without going into unnecessary refinement, or multiplying exceptions until they might begin to make us doubt the existence of

the rule, it is impossible to include everything which ought to be recollected upon this subject, more concisely, than in the following laws; upon each of which a few passing observations may be useful.

And, first,—as to the form of the chest:—

1. *a.* In a well-made, healthy chest, there is no *visible* difference in the form of the two sides.

   b. There is no relation between the dimensions of the upper and lower parts of the same side.

But it is a matter of importance to determine whether a deviation from actual symmetry is always indicative of disease; and, if not, what are the other circumstances under which it may arise.

In cases of lateral curvature of the spine, one side projects more than the other; and the same thing may be sometimes observed in persons engaged in those laborious occupations which require an undue amount of exercise of one side; as well as in others, whose pursuits, though, perhaps, of a less active kind, oblige them to pass the greater part of their time in an unnatural position;—an excess of muscular developement in

the one case, and the habitual use of one lung more than its fellow, in the other, producing imperceptibly more or less departure from strict symmetry; and, lastly, there may occasionally be natural and congenital differences in the two sides, which are perfectly consistent with health, and impossible to account for. It follows, therefore, that a less projection of one infra-clavicular region than the other, is not indicative of tubercles, unless it can be confirmed by other signs.

Some persons are inclined to distrust the eye in examining the form of the thorax, and have recourse to measurement; but I must confess myself unable to appreciate its practical utility, because, I consider that we are never justified in pronouncing one way or the other, simply from slight differences in form; and when other conditions are sufficiently advanced to authorize the assertion of any case being tubercular, the eye will commonly afford all the information which is needed. It is, however, only with respect to phthisis, that I would discard mensuration; in other diseases—such as pleuritis, and pneumonia, it may be of service, not merely in diagnosis, but also in estimating the progress of the case.

We have now to consider the movements of the chest.

2. *a.* The extent of healthy movement varies in different individuals.

b. During both ordinary and forced respiration, the motion of the two sides is equal.

As we cannot, therefore, fix a healthy standard of movement, the sole use of the respiratory motion as an aid to diagnosis, consists in watching the action of the two sides, and comparing one with the other. But it is possible that a difference between them may not be dependent upon disease, since the circumstances already mentioned as affecting the form of the chest, might equally influence its movements. Lateral curvature of the spine, however slight it may be, makes a marked difference in this respect; and the same may be said of certain occupations, amongst which, I might specially name that of blowing wind-instruments, many opportunities having been afforded me of observing, as its effect, a gradual but unequal dilatation of the chest, in consequence, probably, of one set of pectoral muscles having had greater freedom than its fel-

low, from one arm having been more used than the other. In tailors, also, the same thing may be occasionally observed, arising from their habit of leaning on one side, and using the right-hand set of muscles more than the left. Other instances might be adduced, but these will serve as illustrations. We may also, as in the conformation of the chest, occasionally meet with a slight difference in movement of a perfectly natural kind. It follows, therefore, that deficient action of either side cannot be of much use in diagnosis, unless it be as confirmatory evidence; and, consequently, it should never be considered apart from other physical signs.

The condition both of thoracic vibration (as felt by the hand) and resonance, (as communicated to the ear,) produced by the patient speaking or coughing, (vocal or tussive,) may be often employed in the detection of tubercular deposition: hence, it is essential to bear in mind their healthy characters.

3. *a*. They vary both in extent and degree, in different individuals.

b. They are generally greater throughout the right, than the left lung; but con-

stantly so, in the right infra- and supra-clavicular regions.

With regard to their developement, very much depends upon the intensity of the voice,—the distance of the bronchial tubes from the surface,—and the general form of the chest; and they are always more distinctly marked in thin, than in fat or muscular persons. It is manifest, therefore, that here, as in the former instances, we have no healthy standard to serve for comparison; and whether or not the thoracic vibration and resonance be morbid, must be determined solely by ascertaining the condition of both sides, and bearing in mind the natural differences which they present.

The healthy sonorousness of the chest, in its several parts, is of the utmost importance to be familiar with, since a departure from it is amongst the earliest signs of phthisis, besides being a means of deciding the value of several others.

4. *a.* The natural resonance varies in different persons.

b. One side strictly corresponds in resonance with the other, except at the point where the heart approaches the thoracic walls.

c. The sound is the more clear where the respiration is the most audible—viz. at the apices than at the bases of the lungs, and before than behind.

d. Percussion between the ribs will yield a clearer sound than upon them.

e. During calm breathing, the chest is at all times equally resonant.

In consequence of the varying thickness of the thoracic walls, arising from differences in muscular developement; or, perhaps, from peculiarities of structure which are inexplicable, we cannot fix upon a sound which will serve for comparison; the use of percussion is consequently dependent upon the second law (*b*), and consists in accurately comparing one side with the other, and at corresponding points.

But it becomes an important question, whether slight comparative dulness over the upper part of a lung, is to be taken as a proof of it being tubercular; and I am quite satisfied that this may be answered negatively. A greater thickness of muscle upon one side, as well as other peculiarities, probably anatomical, may produce a slight difference in the percussion-sound; and

in some cases purely nervous where the breathing is irregular and convulsive, allowing a much greater expansion of the lung at one moment than another, a decided difference is perceptible, especially if the percussion be somewhat forcible, according to the period of the respiratory act at which the stroke is given; I am convinced also, that in simple bronchitis, a temporary obstruction to the breathing, by an accumulation of mucus, now and then occasions slight alteration, both in the resonance and elasticity of parts of the thorax. Hence comes the practical conclusion, that when the difference is not highly marked, it can, at most, be regarded as suspicious, but, unless confirmed by other evidence, far from declarative of disease. It is otherwise, however, when the disparity between the two sides is great, as such could not happen, if the parts beneath were in their normal condition.

A knowledge of the laws of respiration is even more necessary than the preceding, because, in a deviation from healthy breathing, we have the earliest and perhaps the least equivocal announcement of incipient phthisis. Although a great deal might be said upon this portion of the

subject, all that is actually essential to remember may be included under the following rules:—

5. *a.* Respiration is modified by age: in children it is louder and more frequent than in adults.

b. In some persons the respiration is naturally weak; whilst in others, it is equally loud and distinct.

c. The respiration of one side strictly accords with that of the other.

d. The respiratory sound is somewhat louder at the apices than at the bases of the lungs, and at the anterior than posterior parts.

With respect to the relation of one respiratory murmur to the other, it is necessary to recollect, that,—

e. The comparative length of expiration is subject to great variety.

f. It never exceeds four-tenths of the whole respiration, but may be much less, and even inaudible.

There is but one thing which is invariable in healthy respiration, and that is its *quality*, by which is meant, that peculiar, soft, breezy

swelling, and uninterrupted character, which is sure to be observed in proportion to its audibleness. But as every other property, such as its loudness, duration, and rapidity of production, has no standard of its own, but may vary to every possible extent, we have again forced upon us the necessity of speaking only of one side comparatively with the other.

Wherever the larger bronchi approach the surface, or are separated from the parietes of the chest by a very small amount of pulmonary substance, the respiration will be bronchial. Much discussion has arisen as to the points where this occurs,—probably, from the circumstance that it varies in different individuals: in some, it is found for an inch or more on each side of the upper portion of the sternum, and in the axilla; the only parts in which it is invariably met with, are—the interscapular region over the roots of the bronchi, and, (to a somewhat less extent,) the middle of the upper part of the sternum. But however this may be in any given case, we are saved much difficulty, by recollecting that both sides should be strictly alike.

The duration of the two murmurs demands

especial attention, since, if that of expiration exceed the other, it certainly indicates something morbid. Yet, this is applicable only up to the middle period of life, for as we approach senility, the respiratory functions, like the rest, become impaired; the lung loses much of its elasticity, and the air escaping with less facility than formerly, the expiratory sound becomes longer than the other; but as at this time, phthisis is less common than in earlier years, the diagnosis of the disease is not much affected by it.

It is necessary to bear in mind the natural extent of the heart's sounds, because this may be sometimes usefully called into requisition.

6. *a.* Both their position and loudness vary considerably in different persons.

b. They are distinct only immediately over the heart, but may be detected, more or less, over the greater part of the left side, particularly in the vicinity of the large vessels.

c. Over the whole of the right side, they are inaudible.

Such rules, however, are far less constant than any of the preceding; and in looking to the

sounds of the heart as a guide to phthisis, it is essential to recollect, that in young children and nervous persons, particularly hysterical females, they are often audible over the whole chest, varying in loudness according to the distance from the heart; and that the same thing may occur, to some extent, in aged persons, and those whose thoracic walls are much emaciated.

Having thus shown, as briefly as is consistent with the importance of the subject, what must be ever remembered in examining the chest of a person supposed to be phthisical; and having fairly stated both the certainty of some laws, and the exceptionable character of others, I may sum up the whole, by stating, that there is not one which should be trusted, by itself, in diagnosis, but that several of them ought to be employed, in order that one may be tested by another. But even if they be found to harmonize in their results, we have yet to bear in mind that physical signs by themselves, as a general rule, determine nothing more than physical *conditions*, or, in other words, declare the *physical*, and not the *pathological* condition of the lungs; hence it is, that we require the use of other rules, as well as

a knowledge of the patient's history and general symptoms, before it can be safely declared whether the changes we may have discovered depend upon tubercular deposition, or other diseases equally interfering with the pulmonary functions. And this seems a fit opportunity for remarking that those who are in the habit of placing their chief, or perhaps exclusive reliance upon physical examination, commit an error not less serious than others who altogether disregard it; each extreme should be equally avoided; in this, as in most cases, the "juste milieu" should be sought after, and physical signs ought to be looked upon as aids to, not as substitutes for other symptoms; since, that conclusion must be the most correct, which has been arrived at through the co-operation of every sense and faculty which can be brought to bear upon the subject.

CHAPTER II.

THE FIRST STAGE OF PHTHISIS.

Situation of Tubercle—Changes in the form and movement of the Chest—Increased vibration or fremitus—Alterations in the percussion-sound—Morbid changes in the Respiratory Murmurs.

THE preceding chapter having been devoted to certain points which we should look for in a healthy chest, we have now to consider what is the kind and extent of departure from them, which constitutes the physical evidence of Phthisis.

It is of the first importance to recollect the ordinary position of the tubercular deposit,—that the apices of the lungs are the parts principally, and, it might almost be said, exclusively involved. It is true, that in very rapid and acute cases, tubercles may be distributed equally throughout the lung; but in phthisis, as we usually meet with it, the bases are seldom impli-

cated, and even when they are, not until the disease is in an advanced stage. In five hundred cases, I have met with but four instances of the lower parts being alone affected, and only once with a tubercular cavity in the inferior lobe.

They appear at first equally disposed either to occupy but one side, or to occur in one to a much greater amount than in the other. In a hundred cases of the first stage, they were found on the right side only, twenty-seven times; on the left side only, fifty-one times; and on both sides, twenty-two times.

Situation of Tubercle in 100 *Cases of Early Phthisis.*

Right Apex.	Left Apex.	Both Apices.	
		Equally.	Unequally.
27	51	8	14

To form a fair statement, however, of the numerical preponderance of one side over the other, either a much larger number of cases must be taken, or care must be had, that each one of them is in precisely the same period of the particular stage. I think, we can only infer from

the above table, that, at the beginning of phthisis, the left side is more often attacked than the right, and, that the bases of the lungs are very rarely tubercular.

It is, consequently, towards the summit of the chest, that we are to look for the morbid changes announcing incipient tuberculosis of the lung.

The physical signs of consumption have their different stages as distinctly marked, and pass as regularly from one to the other, as the more general and visible symptoms of the disease; both travel onwards *pari passu*, and one may often be used to confirm or correct the other. They are divided into first, second, and third, stages; the first corresponding to the miliary and crude tubercle; the second to its period of softening; and the third to its elimination, with the formation of cavities.

On the first appearance of tubercles in the lungs, in the majority of cases, there is no visible deviation from the healthy form of the chest, and even mensuration with callipers will fail in detecting any dissimilarity in the two sides; the frequency with which some of the early symptoms of the disease—especially hæmoptysis, are seen

to precede any discoverable alteration in the symmetry of the chest, seems to place this matter beyond question. Yet, it is impossible either that there can be very much tubercle, or a smaller amount of it existing for any length of time, without effecting more or less alteration in the external form of the chest, not only about the clavicles, but in its whole contour.

The changes met with in the clavicular regions are of directly opposite kinds, consisting, either of bulging, or sinking inwards of the thoracic parietes.

Bulging is comparatively rare, as I have met with it but three times in about four hundred phthisical patients. I suspect, however, that it would be more commonly seen, had we the opportunity of examining a greater number of cases at their very beginning. The prominence is not lasting, and is soon succeeded by the opposite condition; yet it is far from being uninteresting, since its existence might lead to a mistake, in consequence of the other side, although perfectly normal, having the appearance of being flatter than it should be. If the part which is bulged be percussed, it will be found either preternaturally

resonant, or somewhat duller than the other. Hence, we may conclude that it depends either upon a local and temporary hypertrophy of the air-cells, in consequence of some of them compensating, by increased capacity, for the impaired functions of others in their vicinity; or, upon a transient congestive condition of the lung surrounding the tubercular substance.

Whether or not there may have been bulging at the commencement of the disease, as the first stage becomes established, there is more or less depression in the clavicular portions of the chest; but, as might be anticipated, great variety exists in this respect, many cases not presenting any marked difference in the two sides until softening has begun, and others displaying a visible falling inwards very early in the disease,—differences easily accounted for, in the variety both as to the amount and effect of the tubercular deposit. The depression is produced by a shrinking of the lung, either from atrophy of its cells, chronic inflammatory induration of its structure, or contraction of false membrane from secondary pleurisy.

But, it is not long, before a still greater altera-

tion becomes apparent in other parts of the chest; the dorsal vertebræ bend forwards, and the shoulders become rounded, so much so, that when looked down upon whilst the patient is sitting, they are seen to form a line somewhat approaching a semicircle. As a consequence of this, the front of the chest is contracted, the stature lessened, and an awkwardness given to the whole appearance. There is, of course, infinite variety in the degree of such changes; sometimes they are manifest to the friends of the patient, as well as to himself; but, equally often, it requires the eye of a physician to detect them.

I am satisfied that at the very commencement of phthisis, no information can be gained by watching the movements of the chest, as the thoracic walls, from long habit, are pretty equally expanded, although, perhaps, one lung may have rather less power of distension than the other; * and it scarcely ever happens that there is less mobility upon one side, until the case is sufficiently advanced to exhibit a corresponding de-

* Some may consider this impossible; but I am sure of its truth. There is more than one way in which it may be accounted for.

pression. But, as certain as any portion of the lung is permanently disabled in its function by tubercular deposit, sooner or later, will there be diminished movement of the thoracic walls over that region,—most conspicuous during forced respiration, but often sufficiently evident in the ordinary breathing. It is always more marked in females than in males, because the respiration of the former is more costal than in our own sex, in consequence, principally, of the restriction to the natural movements, arising from the evil practice of wearing stays.

As the case proceeds the loss of healthy movement becomes more and more conspicuous, until in some cases of old standing, although perhaps not advanced beyond the first stage, the whole action of the chest is changed:—when the patient takes a forced inspiration, instead of the progressive, swelling motion of the infra-clavicular regions, which we should be glad to discover, the entire chest is elevated, as it were in a mass, without being accompanied by the slightest increase of its antero-posterior diameter.

Between these extremes we meet with every shade of variety.

About this time, it will generally be found, on applying the hand to the clavicular regions, that there is increased vocal and tussive vibration or fremitus upon the diseased side; but as this is the case, naturally, over the right lung, its use in diagnosis is neccessarily limited, since it must be often difficult to say whether a large developement of it in this position is morbid or not. It is, therefore, nearly restricted to the examination of the left side, where, if the fremitus be greater than on the other, it may be certainly declared that that part is diseased.

In employing this sign, however, it is necessary to bear in mind what has been already stated upon the circumstances which may modify it; and, after all, its importance may be fairly questioned, since it can scarcely exist before the lung is considerably consolidated, when, of course, others far less equivocal, are sufficiently abundant.

At a very early period, careful percussion will generally detect a slight difference in the resonance of the diseased part, growing more and more evident as the case advances, until the sound produced becomes perfectly dull; at the

same time, the healthy elasticity of the thoracic walls is diminished, and a sense of resistance, passing into perfect hardness, given to the finger employed as the plexímeter. It is practice alone which can enable us to form a correct opinion of the shades of difference thus presented; but the senses of hearing and touch may be so familiarized to their varieties, as to render the most minute changes invaluable evidence of disease.

As the proper employment of percussion is of such special value in relation to phthisis, I may be justified in saying a few words respecting it.

The best method is to tap upon the centre of the middle finger of the left-hand pressed steadily upon the intercostal spaces, parallel to the ribs, with the extremities of the united fore and middle-fingers of the right-hand,—the movement being made solely by the wrist-joint, and the elbow kept perfectly motionless. Not only is a sharper and better sound produced in this way, but the appearance of striking the patient is avoided. I have seen many persons not only frightened, but actually injured, by the clumsy practice of lifting the entire arm. The plexímeter-finger may sometimes be placed upon, and parallel with, the

ribs, and often at right angles with them; and it is useful in doubtful cases to employ all these methods, as one may afford evidence which another does not; but, in all instances, one side must be compared with the other, at corresponding points, and by the same means.

Percussion of the clavicle is highly important, and is best performed directly,—that is to say, without the intervention of a pleximeter; it must be practised at points precisely similar on the two sides, as the natural resonance decreases with the increase of distance from the sternum. Although the supra-clavicular regions often pass unnoticed, they are very important, and should be examined by tapping with the fore-finger of the right-hand, the extreme joint of the middle-finger of the left-hand, pressed firmly downwards. The supra-spinous regions, also, are instructive parts, and may be examined in the ordinary way.

In children the interscapular region should not escape percussion, as it will often be found the only seat of dulness, owing to the frequency with which their bronchial glands are tubercular.

A very different result follows a gentle tap, and a more forcible one; the former yielding a sound

from the superficial, and the latter from the deeper portions of the lung; hence, it is frequently useful to practise both.

Where tubercles are few in number, or diffused, a difference, otherwise imperceptible, may be often detected by using the united four fingers of the left hand as the plexímeter, and tapping with the ends of the four fingers of the other hand.

In doubtful cases it is useful to percuss whilst the patient is holding the breath after a deep inspiration, during which, the affected lung being less distended than the other, may exhibit more or less comparative dulness.

Diminished resonance is one of the earliest and most characteristic signs of phthisis, and I have met with but two cases in which it was calculated to mislead. These were patients labouring under sub-acute bronchitis, in each of whom, one infra-clavicular region was decidedly dull, simply, as I believe, from an accumulation of mucus. In these instances, however, this character changed even at each visit; and such examples are so rare as scarcely to detract from the value of percussion.

By far the most valuable evidence of phthisis is afforded by auscultation, which, to the prac-

tised ear, will rarely fail to reveal it at a very early period.

But since it is necessary, in order to appreciate the minute deviations from health arising from the disease when quite at its commencement, to employ it with care, and according to certain rules, I shall again digress for a moment, by saying a few words on this subject.

Although, in many cases, the ear may be applied directly to the chest (immediate auscultation), for a careful examination, the use of the stethoscope (mediate auscultation) is indispensable, as it enables us to isolate any one point from another. If too lightly applied, it fails to convey sounds to the ear; and, if too firmly, the respiratory movements of the patient are impeded, and changes which are simply due to our own unskilfulness, may be mistaken for those of disease. It should be steadily and evenly pressed, not to interfere with the costal motion, and not touched with the fingers;—a little experience, however, makes this matter very simple.

It is not sufficient to place the stethoscope upon one point only, as early tubercle may be very limited in position; every part in the infra-

clavicular region should be listened to, and compared with the opposite side. I have found it a good plan to examine first the acromial extremity on one side, and then on the other,—afterwards, the centres,—and lastly, the sternal end of each; for if these three parts be examined on the same side in succession, the peculiar character of any one is lost, before compared with its corresponding one on the opposite side. In the great majority of cases, the acromial angle will give the earliest indication of disease.

The changes in respiration caused by tubercle are various, and depend upon its extent and position, as well as on the physical state of the surrounding lung; but they may be all included under the following heads,—viz. weak, jerking, harsh, bronchial, expiration prolonged,—each of which must be spoken of separately.

Simple weakness, without any other alteration, is very often met with, and may be found over the whole apex, or only in spots; in the latter case, the intensity of breathing in the immediate neighbourhood is generally increased, to compensate for the deficiency; and, in the former, the other lung frequently presents the respiration

termed compensative or supplementary,—which is merely a highly-developed natural type, to make up for loss of energy on the other side. In some cases, the weakness passes almost into the absence of respiratory murmur; but I have never yet met with a case of its total suppression,—that is to say, in which a sound more or less loud could not be heard during forced breathing. Where feebleness of respiration depends upon tubercle, it is singular to observe how progressively the sound increases in descending, until, towards the middle of the lung, it becomes similar to the other side. Weakness may be a healthy peculiarity, but as such, it is found precisely alike in all parts of the chest; therefore, unless this character is determined comparatively, and is limited to the apex of the lung, no dependence can be placed upon it. When the breathing is naturally weak, slight changes are not easy of detection; but if by percussion and other general signs, suspicion be excited, it is useful to listen whilst the patient takes some deep inspirations, when a very manifest difference is often discovered. It is so difficult, however, to make many persons understand how to breathe forcibly,

that care must be taken that the same amount of effort be made whilst each side is examined; but, by practice, it is easy to tell from the movement of the stethoscope, whether the breathing is performed evenly.

Where, in suspicious cases, the respiration is equally feeble at both apices—the result of an equal amount of tubercle in both lungs (an unusual occurrence), a correct diagnosis may be formed by ascertaining its condition at the bases, and recollecting the rule previously mentioned, of there being, in health, a somewhat greater intensity in the former than in the latter.

In jerking respiration, the inspiration, but little changed in intensity, instead of being uniformly developed, occurs in irregular puffs; whilst the expiration is scarcely affected. This is a very distinctive and common sign, and early in its appearance, often remaining for weeks or months, and generally followed by the harsh variety,—or, if the disease does not advance, gradually subsiding, or passing into the weak type.

It is not difficult to understand the cause of the respiration being weak and jerking; an impediment exists to the free expansion of the lung,

which, in the former is partially and gradually overcome, but in the latter, only by intermitting efforts.

Harshness may be a quality added to either of the preceding, or occur as an independent variety; in the former case, no particular explanation is required; but, in the latter, a frequent and important condition obtains.

Harsh respiration is known by being louder than that of health, and conveying to the ear a distinct idea of air passing over a rough surface; it is either limited in position, or diffused over the whole infra-clavicular region (the latter generally happening with the progress of tuberculization,) and is at length superseded by the bronchial form. The harsh quality exists in every degree, from the simple loss of the smoothness peculiar to health, to its passage into indistinct and small crackling sounds, as it would seem, the commencement of rhonchi characteristic of phthisis, which will be explained hereafter. Its intensity is variable, sometimes amounting to a sound positively blowing, at other times scarcely above the healthy standard. When once established, it is but too apt to increase, whilst the

general symptoms betray a corresponding advance in disease; by proper treatment, however, it may often be arrested and lessened, although I have never known it entirely lose its characteristic quality.

Alteration in the relative length of the two respiratory murmurs is generally owing to an increase in the expiration; but sometimes, the inspiration is shortened, which gives to the other an appearance of prolongation. Whether the expiration be lengthened actually or relatively, it is equally a sign of disease; but a decrease is of no importance, because we have seen that its healthy duration may vary from the usual standard, until it is quite inaudible. Prolongation of the expiratory murmur may exist separately, or be associated with the weak and harsh varieties of respiration; it is rarely much increased in length without being changed in intensity or quality; sometimes it is louder than in health, at others, harsh, or bronchial. If one or more of such changes be limited to the ordinary seat of tubercle, they become valuable evidence of phthisis, and, with the concurrence of other general and physical signs, leave no doubt as to the disease.

The cause of prolonged expiration may be explained, either by the mechanical obstacle to the exit of air afforded by the tubercular matter, together with the diminished contractility of the pulmonary tissue; or, by a partial solidity of the lung conveying the sound from the larger bronchial tubes; in the first case, the quality of the murmur might remain unchanged, but in the other, it would certainly be either harsh or bronchial.

Bronchial respiration is easily recognised, by being entirely free from the softness peculiar to the healthy murmurs, and more or less harsh, loud, dry, and *tubular*. Whenever it is met with, in however slight a degree, where it does not occur naturally, it is a sign of disease: if it be heard in, or close to, those parts where it may do so, its value consists in the presence or otherwise of a corresponding condition on the opposite side, since the natural kind is never found on one side only, and the morbid rarely on both, or if so, not in the same degree.

M. Fournet, a great authority in auscultation, has taken pains in explaining the distinction between the healthy and morbid kinds, but from the varying character of both, I have failed to discover the practical utility of his conclusions.

Bronchial respiration, as it occurs in phthisis, commences either from an almost imperceptible transition of the harsh variety, or a gradual extension of the bronchial quality of expiration into both murmurs; even in the former case, the first change is often observed in the expiratory sound, and it may be a long period before the other becomes affected; but this is not an invariable rule, for occasionally, the inspiration alone is bronchial, and remains so throughout.

Whenever the respiration is bronchial over the ordinary seat of tubercle, it may be taken as presumptive evidence of phthisis, depending, as it must do, upon the conduction of sound from more or less deeply-seated bronchi, by solidity of the lung; but it is far from being a constant attendant upon the first stage, as a considerable amount of pulmonary condensation is necessary to its production, and softening may commence before this takes place; when fully established it is generally permanent, until superseded by symptoms of breaking up of the lung; although, by proper treatment, its progress may be often stayed, and its amount considerably lessened.

It happens, occasionally, that the murmur

caused by the air in its passage through the pharynx, from unusual loudness, or the high position of the clavicle, can be heard in the infra-clavicular regions, and from its resemblance to bronchial respiration, might lead to an error in diagnosis; but in such cases a similar condition invariably occurs on the opposite side, and both can be made to disappear, by directing the patient to breathe with the mouth widely open.

The following table has been formed to show the relative frequency of the preceding conditions in 100 cases in the first stage:—

Respiration.

Weak.	Jerking	Harsh.	Expiration prolonged.	Bronchial	Harsh with Expir. prolonged	Weak with Expir. prolonged.
33	12	7	16	10	5	17

It is important to recollect that these changes in the respiration are not, *per se*, a proof of phthisis, since they indicate merely disordered function of the lung, or some alteration in its physical condition.

For example:—The respiration is weak over the greater part of the chest, whenever an obstacle exists to the free entrance of air into the pulmonary cells; it is harsh, when the surface of the latter has lost its smoothness; hence, the first is met with in bronchitis and emphysema,—in many nervous affections,—whenever the calibre of the bronchi is changed either by spasm—as in asthma, or the pressure of tumors; whilst the latter accompanies bronchitis, and emphysema (from attendant bronchitis). Weakness of respiration also occasionally exhibits itself locally in those hysterical cases, where there is imaginary thoracic disease, from the patient either unknowingly, or by design, breathing with one lung more than the other. The expiration may be prolonged in any region by a mechanical impediment to the exit of air, and by diminished elasticity of the lung itself; hence it is common in bronchitis—from accumulated mucus, and in emphysema—from permanent dilatation of the air-cells. Jerking respiration may attend incipient pleurisy, and pleurodynia,—when it is limited to the seat of disease; and it is often heard in hysterical females over the entire chest. Bronchial respiration may occur over any part of

the lung, in dilatation of the bronchi, slight pleuritic effusion, and pulmonary consolidation.

Two circumstances are absolutely essential to their being considered as evidence of phthisis;—viz. (1) their limitation to the ordinary seat of tubercle; (2) their being confirmed both by other physical signs, and some one or more of the general symptoms of the disease; and, with these precautions, they will be found the very best guides to its diagnosis.

CHAPTER III.

THE FIRST STAGE OF PHTHISIS (CONTINUED.)

Dry crackling, Sibilant, Sonorous, Crepitant, and Sub-crepitant Rhonchi—Pleural friction murmurs—Pulmonary crumpling sound.

THE earliest indications of tubercular disease are chiefly connected with changes which have been already considered; but in the course of a short and variable time, additional sounds are developed. These differ both in themselves, and in their origin, and may be thus expressed:—

1. Sounds depending upon morbid secretion:—

Dry.	Dry crackling rhonchus.	
	Sibilant	,,
	Sonorous	,,
	Crepitant *	,,
Humid.	Sub-crepitant rhonchus	

* The mode of origin of crepitant rhonchus is not well understood, but there seems no reason for retaining it amongst the humid class, even admitting that it proceeds from a moist and not a dry state of the lung. As well

2. Sounds depending upon altered physical state of the lung :—

Friction murmurs.
Pulmonary crumpling sound.

Although any of these may be heard in the first stage, one only is unequivocal or positively indicative of tubercle, viz.—the dry crackling rhonchus; and as this attends no other disease, and is trustworthy under any circumstances, it may be termed a *direct* sign of phthisis; all the rest are equivocal, or may accompany other morbid conditions, and from requiring additional evidence to determine whether or not they are dependent upon tubercular deposition, may be properly termed *indirect* signs.

1. Direct sign of phthisis in its first stage.
   Dry crackling rhonchus.

2. Indirect signs of phthisis in its first stage.
   Sibilant rhonchus.
   Sonorous „

might sibilant and sonorous rhonchi be called *humid*, since the mucus producing them is certainly anything but *dry*. All sounds should be termed *dry*, or *humid*, with reference to the idea they convey to the ear, and not to their supposed origin.

Crepitant rhonchus
Sub-crepitant ,,
Friction murmur.
Pulmonary crumpling sound.

An acquaintance with the dry crackling rhonchus, therefore, is of the highest importance; but, fortunately, it is a sound very easily recognised; it consists of a succession of clear and dry *clicks*, varying in number (generally from one to five,) irregularly evolved, distinctly separated from each other, and chiefly, but not exclusively heard during inspiration.

This râle is never met with at the very commencement of the disease, but it is probable that there are few if any cases which do not present it, for a shorter or longer time, towards the latter part of the first stage. Its general origin may be thus stated;—after many weeks, or even months, of the earlier signs—such as diminished resonance, jerking, harsh, or weak respiration, one or two dry clicks are heard during inspiration; and, about the same time, the breathing becomes more impaired,—either less complete, or bronchial, with prolonged expiration. One single click is enough for diagnosis, and upon such evidence alone I have often founded it; but two,

three, or more are usually heard: at first they occur only with inspiration; as the case advances, however, they may attend both murmurs, but in proportion to their abundance with the expiratory one, is the increase of the disease.

The mechanism of dry crackling is unexplained, that is to say, we know not how it is produced; it would be useless to speculate upon the subject, but it has been so universally and exclusively found to co-exist with tubercles, as to leave no doubt of their relation as cause and effect.

It must ever be considered an unfavourable sign, apparently indicating the passage of tubercles from their state of latency, for when once established, it invariably remains, until superseded by other rhonchi belonging to a more advanced stage, and may be heard at every subsequent examination, if not in tranquil, at least in forced respiration. Its duration is variable; in some cases it is rapidly transformed, and in others remains many weeks; but I cannot remember having heard it in the same spot longer than three months.

The other sounds, as I have just now remarked,

require to be corroborated by additional evidence, and that their position should correspond with that of tubercle, before they can be looked upon as a proof of phthisis ; yet with these aids, some of them are scarcely less valuable in its diagnosis than the preceding one.

It is scarcely necessary to say that both sibilant and sonorous rhonchi are produced by mucus in the bronchial tubes, and that they differ from each other only in tone, the former being shrill, and the latter grave ; the existence of one or the other being determined by the quality and quantity of the secretion, and the calibre of the tubes.

They are declarative only of bronchitis in the larger tubes, and their relation to phthisis is consequently determined by the frequency or otherwise of such attacks in consumptive persons, and the peculiarities attending them.

When the lungs are tubercular, bronchitis is very apt to supervene, but it is rather the exception than otherwise, to find it seated in the larger bronchial tubes, for the smaller or capillary ones seem specially prone to inflammation in phthisical persons. Yet the former are sometimes attacked,

when it will almost always happen that the bronchitis is general, or pervades the whole chest, and the respiration being masked by sonorous or sibilant rhonchi, it is hardly possible to say, unless the case has been previously examined, whether or not it is associated with tubercles; for, even if there were slight dulness at either apex, it might possibly depend upon an accumulation of mucus. If, however, the attack be engrafted upon phthisis, as the inflammation declines, some of the rhonchi will be found lingering about the upper part of the lungs,—exactly the contrary to what happens in idiopathic bronchitis.

These two sounds, therefore, except under such circumstances, are of little use in the diagnosis of tubercles, and, as a general rule, tend rather to complicate the case than otherwise.

Crepitant rhonchus (fine crepitation)—the characteristic of pneumonia—is of rare occurrence with tubercular disease, simply because the local inflammation caused by tubercle is much more frequently of the smaller bronchi than the parenchyma of the lung, and when the latter is affected, it would seem to be more often in a congestive,

than inflammatory state. In four hundred out-patients examined at the Hospital for Consumption, I have not met with an unequivocal fine crepitation in the vicinity of tubercle—in other words, with tubercular pneumonia; but, without doubt, it occasionally exists,—I only speak practically of its rarity. It is at once recognised by being composed of a number of minute, clear, and crepitating sounds, precisely resembling each other, regularly and rapidly produced, and existing at first only with inspiration, but afterwards with both murmurs.

Whenever it is heard at the apex of either lung, it should always excite strong suspicion of phthisis; but since idiopathic pneumonia sometimes occupies the upper lobes, further evidence, and particularly the general history of the case, would be required to determine its real signification.

We have now arrived at the sub-crepitant rhonchus, which is the only one of a humid kind ever heard during the first stage; but being very common at this period, a familiarity with its characters is of the highest value. This râle conveys the idea of humidity; occurs chiefly in inspira-

tion; and consists of a succession of dissimilar bubbles, changeable in number, and alterable by coughing.

It arises from bronchial mucus, and is indicative of inflammation in the smaller bronchi (capillary bronchitis); and, although more common after softening has commenced, may occur during any stage of the disease, particularly amongst the poor, and those most exposed to changes of temperature.

The extent of the inflammation, and consequently, the position of the rhonchi, differ according to the severity of the attack. If it be but a slight one, and mainly dependent upon tubercular irritation, a few of these rhonchi in the immediate neighbourhood of the tubercle, indicating, in fact, a local bronchitis, will be all that will be met with; but if the inflammation be of a severe kind, they may be more or less diffused throughout the chest. In the former case, we could have no doubt whatever of its tubercular nature; but, in the latter, there would be a difficulty, because the bronchial inflammation might possibly be of a primary or idiopathic kind, were it not that the latter has certain peculiarities

which will nearly always serve to distinguish it. Idiopathic capillary bronchitis invariably attacks both sides pretty equally, and begins at the bases of the lungs; whilst phthisical capillary bronchitis, or that which is secondary to tubercle, occupies only the diseased side, and most usually begins at the apex. It is, therefore, necessary to have some rules upon this subject, and I have found the following of the greatest practical utility.—Sub-crepitant rhonchi either at the apex or base of one lung only, announce the presence of tubercles in that side; when at both apices, they are declarative of both lungs being tubercular;—when at both bases, they point rather to an idiopathic inflammation; and when throughout both lungs, they likewise indicate a primary bronchitis, although in this case, the conclusion is less certain than in the last, inasmuch as, if tubercles should exist to a tolerably equal amount in both lungs, a similar result might happen; but even here, we have a means of diagnosis, by observing the course of the bronchitis upon its decline; if it be phthisical, it will linger for some time about the apices, but if idiopathic, the last remnant of it will certainly be found at the bases.

In a lung really tubercular, when the base is affected, the apex is sure to be so at the same time, and it is curious to watch how gradually the inflammation extends from each point, until, by meeting towards the centre, the whole lung becomes filled with sub-crepitant râles.

It is scarcely possible to mistake any one of the rhonchi we have been describing, for another, as each of them has peculiarities of its own, which, when once learned, can never be forgotten. The dry crackling and the sub-crepitant are the only two at all approaching each other in character; yet if they be but once compared, the differences between them will be easily remembered;—the first being dry, sharp, clear, and clicking; the second, moist and bubbling. It is true that the sub-crepitant rhonchus is not always precisely alike, yet it never loses its specific character, varying only as to its size, loudness, and rapidity of production,—differences evidently dependent upon the amount and consistence of the bronchial secretion. In many cases where hæmoptysis has recently occurred, a rhonchus of the same kind as the sub-crepitant, but unusually liquid and frequent, is to be met with, not only

in the vicinity of the tubercle, but in other parts of the lung, and is plainly attributable to the presence of blood in the smaller bronchial tubes.

The two remaining sounds, unlike the rest, are produced externally to the bronchi, and depend upon changes in the physical condition of the pulmonary textures.

The pleural friction murmurs accompanying phthisis, are of the same kind as those attending simple pleurisy, and are easily distinguished, for, however much they may vary in tone and loudness, they always convey the idea of rubbing; —are irregular in occurrence, and accompany either one or both murmurs, but, more frequently, that of inspiration. Although not very common in the first stage, they are far more so than the crepitant rhonchus, showing, that secondary pleurisy is less rare than secondary pneumonia. In examining nearly three hundred cases, I met with pleural rubbing about ten times; it was invariably of a creaking character and very transient. It was remarkable that in nearly every instance in which it occurred, other symptoms were but indistinctly marked, which might lead to the inference that the tubercles were situated super-

ficially, and the pleura consequently irritated, whilst the lung itself was but little implicated—circumstances naturally favourable both to the existence and detection of local pleurisy; and such may be the pathological condition of many of the cases attended by pleuritic rubbing.

As idiopathic inflammation of the pleura very seldom commences in the upper part of the chest, an unequivocal friction murmur, limited to the apex of the lung, becomes a valuable sign, and justifies the suspicion of pleurisy resulting from tubercular irritation.

The pulmonary crumpling sound, so named by its discoverer, M. Fournet, is said to be of three kinds; the first resembling the noise of creaking leather; the second being a plaintive murmur, varying with the state of the patient, and the force of respiration; the third imitating the peculiar sound produced by blowing upon tissue paper.

It was stated, by this distinguished auscultator, to occur in one-eighth of all cases of phthisis, but its very existence has been denied by subsequent writers. Having had unusual opportunities of examining early cases, I have particu-

larly attended to this subject, and can, without hesitation, declare, that, whilst I am somewhat sceptical as to the first two varieties, I have no doubt of the third, although I believe its frequency is overrated. I have often heard a rhonchus at the upper part of tubercular lungs, of a dry plaintive character, much resembling the *new leather* friction sound, and have thought that to something of this kind, were to be referred the first two varieties ; but in all such instances there have always been sonorous or sibilant rhonchi in other parts of the chest, and the murmur has not only been absent at a subsequent examination, but even occasionally disappeared at the time by coughing ; hence, I have generally attributed it to their modification, either through compression of the bronchi, or some physical alteration in the condition of the surrounding lung.

But of the variety resembling the sound of crumpling tissue paper, I have met with several instances. According to my experience, it occurs only at the apices of the lungs, distinctly conveying the idea of their expansion under difficulty ; is most audible posteriorly in the supra-spinous regions ; is limited to inspiration, and

sometimes heard only during forced breathing; appears to accompany only the early stage, usually before other symptoms are much developed; remains but a short period (hence, perhaps, the infrequency of its detection); and is invariably succeeded either by harsh respiration, or dry crackling rhonchus. In consequence of the doubt attending it, I once called the attention of two physicians, much practised in auscultation, to three well-marked examples, when they admitted that the sound was neither a friction murmur nor rhonchus, and that no title could convey a better idea of its character than that adopted by M. Fournet. From its rarity and short duration, it ranks not amongst the most important signs of phthisis; but when distinctly ascertained, it may be regarded as pretty conclusive evidence of the disease, requiring, however, to be corroborated by other symptoms.

The period during which tubercle seems to act only mechanically, by impeding the proper function of the lung, is that in which the physical changes relate chiefly to the form and mobility of the chest and the respiratory sounds; hence it is, that none of the signs spoken of in the present

chapter, with the exception, perhaps, of pulmonary crumpling, are likely to be met with at the first appearance of the disease, for it is only after the lung has become irritated and locally inflamed that we meet with rhonchi.

Thus are we enabled to judge pretty clearly even as to the period of this stage of phthisis. For example, if the deviation from what is normal, does not exceed the condition referred to in the preceding chapter, we may conclude that the tubercular affection of the lung is not greatly advanced, but should there be any of the dry crackling rhonchi, or other bronchial râles, and especially if they should be permanent, the inference would be that the first stage was advancing, and that softening might be looked for at no very distant period.

CHAPTER IV.

THE FIRST STAGE OF PHTHISIS (CONCLUDED.)

Bronchophony and Bronchial cough — Morbid extension of the Heart's Sounds—Sub-clavian murmur—Recapitulation.

In this chapter I propose considering other signs belonging to the first stage, which may sometimes be usefully employed as confirmatory evidence, but which, from the capriciousness of their character, and their occurring at a time when there is no lack of others less liable to error, are of inferior importance to most of the preceding.

In placing bronchophony in this category, I am differing from the established faith in such matters, since the condition of vocal resonance, is, of all the physical signs of phthisis, perhaps, the one most commonly trusted and employed; but this is probably less attributable to its own merits, than to the comparative facility with which it may be used.

In the first place, it is frequently difficult to ascertain clearly, whether a certain amount of vocal resonance is really morbid; and, in the next, it may happen that it bears not the least appearance of being abnormal, although other signs have announced, long ago, that the lungs are tubercular: the truth being, that bronchophony requires a considerable degree of consolidation, as well as a peculiar and deep tone of voice for its perfect developement. Still, although of secondary importance to many others, it may occasionally serve us in diagnosis, when this must depend rather upon the coincidence of a number of physical signs, than the unequivocal character of any one in particular.

In employing it, the patient should be directed to count up to any given number, in a distinct and rather loud voice, twice over, in order that each side may be examined under similar circumstances.

It is necessary to recollect, that bronchophony is found naturally in some parts of the chest, assuming many varieties both in position and degree. In all persons, it is heard,—often very loudly, on the sternum, and in the interscapular

region over the larger bronchi, and,—with less intensity, in the supra-clavicular spaces; in most persons, it occurs, as a distant and indistinct sound, in all parts of the chest, being louder in the upper than the lower regions, and before than behind; very frequently, it is more audible throughout the right than the left lung, but always so, in the supra- and infra-clavicular regions. The character of the voice, and the thickness of the thoracic walls, have considerable influence in its modification: in many females, and frequently in young children, it is scarcely audible (unless over the bronchi,) from weakness of voice; and the same often happens in males, from extreme muscular developement; and from various combinations of such circumstances, the greatest variety is met with,—the only constant rule being, that when it exists, it is most audible beneath the right clavicle.

Morbid bronchophony varies in intensity, and is sometimes so loud as to be positively painful to the ear, but in other respects it is not distinguishable from the natural type, and oftentimes can be called morbid only from its position. It declares one of two pathological conditions;—

either, that a portion of the lung is consolidated, and the sound of the voice thereby better conducted to the surface, or, that a bronchial tube is considerably dilated. Although the latter is a comparatively rare affection, it is possible to lead to erroneous diagnosis, since percussion in both cases would furnish the same result—viz. more or less dulness; * but the history of the case, and the state of the patient, would, in most instances, declare the real nature of the disease.

In estimating the value of bronchophony as a sign of phthisis, we have, of course, only to look for it at the upper part of the chest; and the following rules will be found of service. If it be equally loud on both sides, the left is probably morbid; should there be any excess on the left, it is undoubtedly so; but a greater amount upon the right side must not be considered an indication of tubercles, since, as just now remarked, such is the case in nearly every healthy chest, although, if the excess be *very great*, it may be looked upon with suspicion.

In the great majority of instances, broncho-

* In some instances of dilated bronchi, a clear sound attends percussion; but this is the exception.

phony is accompanied with bronchial respiration; but this is not necessarily the case; for often it is distinctly marked when there is merely a slight dulness and resistance on percussion, and the respiration is weak or jerking. When once established, it will generally continue, but under proper treatment, may sometimes be lessened; too frequently, however, it increases, and passes by insensible degrees into pectoriloquy, which, as a sign of the third stage, will be considered in another place.

If a patient exhibiting bronchophony, instead of speaking, be directed to cough, a sound, (bronchial cough,) varying in intensity, and often most painfully loud, will be communicated to the ear. Similar remarks will apply to this as to the bronchial voice, or bronchophony, and, for the same reasons, its importance may be estimated at the same amount.

The only remaining physical signs of the first stage, are those connected with the heart and circulation; and, although there is much uncertainty in their application, they may occasionally be brought into use, when others are but imperfectly developed.

The sounds of the heart applied to the diagnosis of phthisis, rest upon the general fact, that in the left infra-clavicular region of a healthy chest, they are rarely sufficiently loud to interfere with the auscultation of respiration, and would generally escape observation, unless particularly attended to; whilst in the corresponding part of the right side, they are not heard at all; but if there be any consolidation at the apex of either lung, they may be readily conveyed to these parts. Whenever, therefore, they are detected on the upper part of the right side, suspicion should be excited, even if the other side be in the same condition; and, *à fortiori*, when they are at the same time inaudible in the latter, we may regard it as a pretty sure indication of tubercle; if, however, matters be reversed, and they are audible only at the left apex, it is of little moment, for, if unattended by other signs, it would probably be natural; whence it follows, that this sign is chiefly available in examining the right lung, being exactly contrary, in this respect, to vocal fremitus.

It is necessary to recollect that aneurismal and other tumors, and many diseases of the heart,

cause an extension of the sounds; but these have their distinctive marks; the preceding observations apply only to cases in which the organs of circulation are known to be unaffected.

We cannot regard an undue extension of the heart's sounds, as sufficiently important, to declare the non-existence of tubercles by its absence; or even by its presence under apparently morbid circumstances, if unattended by other signs, to justify our pronouncing a patient phthisical; but, taken with other evidence, it may be often turned to useful account.

A murmur of the subclavian artery, generally of the soft and blowing kind, but sometimes rough or rasping, is enumerated amongst the signs of the first stage of phthisis, but is not entitled to much confidence. It is natural to suppose that any thickening of the pleura, or consolidation of the lung about its apex, might be so related to the subclavian artery, as to cause its compression to a slight amount, and give rise to a murmur; but I am disposed to think such an occurrence rarely takes place, and that when a murmur really exists, it is generally due to other causes.

Arterial and venous murmurs, independent of structural change in the heart or blood-vessels, are owing to anæmia, or, to that peculiar nervous and dyspeptic condition chiefly occurring in males, in which the larger arteries, and especially the abdominal aorta, are so influenced, as often to give rise to the suspicion of an aneurism. In all such cases, a murmur may be heard on one side, without being discovered in the corresponding artery of the other side (although it is more commonly found in both;) and when it is recollected how very numerous are such patients, it is manifest, that a murmur in either subclavian artery can have but little value in the diagnosis of phthisis. But when it is evident that a patient has been hitherto healthy and robust, and there is a subclavian murmur on one side, without any abnormal sound in any other part of the circulatory system, it would, to other signs of phthisis, form additional evidence; but such cases, I believe, will be rarely met with. Where, from the state of the system, there is a tendency to arterial and venous murmurs, one may be often made unintentionally, by pressing too firmly with the stethoscope,—a circumstance detracting much from their diagnostic value.

I have found a few cases of early phthisis, in which, whilst no murmur was audible during ordinary respiration, one became manifest by deep inspiration, and remained so until the lung was again contracted; this may have been produced by the indurated part coming in contact with the artery as the lung expanded; but having since met with the same phenomenon in persons quite free from tubercle, and believing, that great distension of a sound lung in an anæmic, or even a perfectly healthy person, might cause a murmur, by producing slight pressure upon the artery, or changing its position, I am not disposed, as at first, to place much confidence in it.

Having now completed the consideration of the physical signs of the first stage, I may remark that every possible variety will be encountered in their association and sequence; one patient may afford sufficient proof of the disease, chiefly on percussion; another, by the character of respiration, or the presence of rhonchi; a third, by thoracic vibration and vocal resonance; and a fourth may have the whole of these combined. The amount and situation of the tubercles, the state of

the patient, and the period of the stage, will, perhaps, account for such diversities.

But I would again urge the necessity of not looking at any one sign, except the dry crackling rhonchus, (and not even this, in every case, lest perchance we may be deceived in it,) as positive evidence of phthisis, unless it be found to harmonize with others, as well as with, at least, one or two of the general symptoms of the disease.

It may be useful to recapitulate briefly, all that we have hitherto discussed; and, perhaps, this cannot be done in a better way than by an imaginary description of the examination of a patient in the first stage of phthisis.

We will suppose that a person presents himself with some one or more of the general symptoms of consumption, but too obscure and equivocal to determine the real nature of his malady. Upon examining his chest, it is possible that one side may be found slightly bulged beneath the clavicle, but, more probable, either that there is no visible difference in the two sides, or that one is somewhat more depressed than the other,—in other words, that one clavicle appears to stand

out more than its fellow. Either of these excites suspicion, but is not sufficiently important to justify any conclusion, and we proceed further. We watch the ordinary movements of the chest, and direct the patient to take a full inspiration, when, perhaps, the upper regions of the two sides are not equally expanded, and if the diminution correspond with either of the preceding signs, there is reason to suspect phthisis; but as it may happen that no very evident difference is discoverable, or that such is too trivial or uncertain to be depended upon, we proceed onwards in the examination. Upon the suspected part we place the hand lightly, whilst the patient speaks, when there may be an increase of vocal fremitus;—or, we ascertain whether the heart's sounds are unduly conducted to that point, recollecting, that the former is chiefly applicable to the left side, and the latter to the right;—or, we listen for a murmur in the subclavian artery, taking care, however, not to place too much reliance upon its discovery.

One or more of these will probably strengthen the idea of the case being a tubercular one; but we yet need further proof of it.

We then percuss, and find more or less dulness and resistance above, upon, or beneath the clavicle, or in the supra-spinous region; but should ordinary percussion be somewhat doubtful in its results, we order the patient to take a deep breath, and percuss whilst he is holding it, when a difference is, perhaps, more readily detected.

The stethoscope now comes to our assistance to determine the value of the previous evidence; the respiration is found weak or jerking; or, the expiration is prolonged beyond its healthy limits; or, perhaps, the case is sufficiently advanced to render it harsh, or even bronchial.

We have, now, no doubt whatever, of the patient being phthisical, yet, should we discover the pulmonary crumpling sound, it will be additional confirmation of it, although its absence would be unimportant. A friction murmur, or, it is just possible, even the fine crepitation of pneumonia may be heard at the apex, making the case still more decided; or, we may discover that there is both bronchophony and bronchial cough; but, what is better than all, there may be a few dry crackling rhonchi, placing the matter absolutely beyond question; if, however,

there be any of the other rhonchi, already described, about the suspected part,—and especially the sub-crepitant,—showing a limited capillary bronchitis, they would be scarcely less declarative of the disease being phthisis.

But it might happen that the case is not quite so simple in its character, in consequence of our patient suffering at the time from general bronchitis, which prevents or nullifies the employment of many of our signs. If, in such instances, the attack be seated in the larger tubes, we must not be too hasty in arriving at a conclusion, but wait for its decline, and see whether it lingers about the apices of the lungs; if, however, the inflammation be only capillary, or limited to the smaller bronchi, we may still announce its tubercular nature, should we find sub-crepitant rhonchi upon one side only,—or, in the event of their being throughout both lungs,—should they be observed, as the attack is upon the decline, to be located chiefly about the apices.

CHAPTER V.

THE SECOND STAGE OF PHTHISIS.

Increase of signs previously described—Humid crackling—Sub-crepitant—Large Mucous, and Metallic Mucous Rhonchi—Recapitulation.

An acquaintance with the physical signs denoting the commencement of tubercular softening, is of great importance in relation to prognosis, because, under proper treatment and favourable circumstances, it may often happen, that the first stage will extend over months or years, producing, perhaps, but little effect upon the health and enjoyment of the patient; but so soon as softening begins, the disease commonly progresses in an enormously increased ratio, and medical treatment becomes of diminished usefulness.

Although, about this time, the general symptoms will declare a considerable advance in the malady, there is nothing about them to point out with any degree of certainty, even to the most

practised observer, the real state of the lungs,—a circumstance showing at once the high value of physical examination.

Of the great majority of signs attending the second stage, little more will be requisite than a brief enumeration, since they consist merely of a greater and more unequivocal developement of those already explained as belonging to an earlier period,—the result of an increased amount of tubercular deposit, which, for the most part, immediately precedes and accompanies the softening process.

It is, consequently, unnecessary to go into the detail of any but those which are directly dependent upon the changed condition of the tubercular matter; and these are, fortunately, equally simple as important.

A patient in the second stage will generally have the infra-clavicular region of one side visibly flattened, and less capable of expansion during ordinary and forced breathing, than the other. If the hand be applied to that part, both vocal and tussive fremitus will be found increased; and, on percussion, it will exhibit more distinctly than formerly, both dulness and resistance. The re-

spiration will probably possess some of the morbid characters already described,—most frequently it is harsh or bronchial. The sounds of the heart are now often heard unnaturally on the diseased side; bronchophony and bronchial cough are much more developed; and the pulmonary crumpling, if it had previously existed, ceases to be heard. Such a catalogue of symptoms is given merely as an illustration of what may be expected, to a greater or less degree, in the majority of cases. Great variety will be observed in their association, and none of them can be regarded as any proof of the tubercles having softened. I sometimes meet with patients unquestionably in the second stage, exhibiting them so slightly, that were it not for other indications, they might hardly be suspected of being tubercular, or, at most, only in the commencement of the disease; whilst, on the other hand, it is as common to encounter others, in whom these deviations from health are sufficiently evident to lead to the suspicion of a much more advanced period. There is at this time a greater probability than formerly of the occurrence of the disease on both sides; this, however, will rarely take place to an equal

extent, but if one side have been previously unaffected, it will often now begin to exhibit symptoms of becoming tubercular.

We must not expect to find any distinct line of separation between any of the stages of phthisis; the first glides insensibly into the second, and the second into the last; the difference between them is only one of degree, in all respects except the altered state of the tubercles; all signs not directly depending upon the latter, may consequently be met with, at any period of its duration.

Fortunately, there is nothing in the whole practice of auscultation more easy than to detect the very beginning of the softening process; the dry crackling rhonchus, already spoken of as characteristic of the first stage, has simply to become humid, and the evidence is complete; or, a number of bubbling and moist sub-crepitant, or large mucous râles, have but to occupy the diseased part, and the transformation becomes more than probable.

A knowledge of the humid crackling rhonchus is, therefore, of the greatest importance, but is easily acquired, as it resembles the dry one, in all respects except its moistness, having the same

characteristic click. The two are found to pass gradually into each other, and every intervening state, from the perfect dryness of the one, to the well-marked humidity of the other, is constantly heard; so that it is sometimes difficult to determine to which a particular sound should be referred. In such cases, however, the *click* would place its tubercular origin beyond doubt, and any deviation from positive dryness would justify the conclusion that transformation had begun.

The humid crackling rhonchi, on their first appearance, seldom exceed their predecessors in frequency, but with the advance of the case, they become much more numerous, and, at the same time, more frequent with expiration,—more distinctly liquid and bubbling,—until, at length, they acquire a somewhat metallic quality, and pass into others distinctive of the last stage. Nothing is more variable than the period of their duration, but it may be said to be decidedly shorter than that of the dry variety. The mode of their production is not thoroughly understood, but for all practical purposes this is not important; it is sufficient to know that a humid crackling rhonchus, under all circumstances, tells of softening tubercle.

There is no physical sign, in the whole course of phthisis, upon which we may place greater reliance than this rhonchus; and when the ear is familiarized to it, nothing else is necessary in order to decide upon the stage of the disease; although, as a matter of precaution, it is well to seek additional evidence.

I might illustrate its value in many ways, but one will suffice. I was once greatly puzzled by seeing a patient with several of the general symptoms of advanced phthisis, but in whose chest I failed to detect the least evidence of tubercular disease, simply, because it was, at first, only looked for in the usual place of its occurrence, viz.—the apices of the lungs. Upon examining their bases, the percussion sound upon one side was found to be totally dull at the very lowest point, but this character became gradually lost in ascending, until, at the apex, it was much the same as that of the other side; the respiration was entirely absent where the sound was the dullest, unless on deep inspiration, when it was strongly bronchial, but at the summit of the chest it was scarcely, if at all, changed from that of health. There could be no doubt, from such

signs, that the lowest lobe of the lung was consolidated; but it became a question, whether this depended upon chronic pneumonia, or tubercular deposition out of its usual locality. The decision was evidently of no little importance to the patient, since, the treatment which might cure the one, would certainly only increase the other. The difficulty was at once solved by auscultation; two or three humid clicks were to be heard with each inspiration, and tubercular softening was the diagnosis. Subsequent events have proved its correctness, for, in the course of but a very few weeks, there were all the physical signs of an extensive vomica in the place of the former dulness, and, at the present moment, the patient is dying of phthisis.

After softening has begun, as well as during the whole of the second stage, the lung in the neighbourhood of the tubercular secretion is more than ever liable to be the seat of inflammation, which, however, is generally concentrated upon the capillary bronchi.

Sub-crepitant rhonchus—the indication of such an occurrence, is consequently often to be met with about this time, and occurs either in the

apex only, or is scattered throughout the whole of the diseased lung; in either case, there can be little doubt of the presence of phthisis, the only difficulty lies in determining the stage. Unless we can discover, at least, the occasional intermixture of the humid click, I admit there is some uncertainty about it, yet, the character of the rhonchi will be generally sufficient to decide the question, as I have invariably found them, when resulting from the breaking up of tubercle, more bubbling and abundant, and of larger size, than when depending either upon an idiopathic inflammation, or one arising from tubercular irritation. But it may sometimes happen, from their changeableness, that there is much uncertainty in any conclusion; and here we must be satisfied with naming the disease, without speculating as to its stage; or we may be guided by the extent of other physical signs, and the patient's general history.

In many cases, this sub-crepitant rhonchus is either associated with, or supplanted by, a variety of mucous râle, of a large size and peculiar character, conveying the idea of adhesiveness, united with liquidity and clearness. When

this occurs separately, I think it does not justify the positive decision that tubercles are breaking up, as it might possibly depend either upon an attack of bronchitis, or (if hæmoptysis had happened), the presence of blood in some of the larger bronchial tubes; but in the absence of the latter, whenever it is strictly limited to the ordinary seat of tubercle, and all other symptoms indicate an advanced period of phthisis, it may be taken as presumptive evidence that softening has commenced.

During the second stage, it is equally unusual as at earlier periods, for the parenchyma of the lung itself to be attacked with inflammation; hence, the fine crepitation of pneumonia is seldom heard.

It is otherwise, however, with the pleura, and secondary pleurisy being occasionally present, friction sounds are sometimes met with.

The larger bronchi are somewhat more predisposed than formerly to inflammatory seizures, and sonorous and sibilant rhonchi are consequently not uncommon attendants; but they merely announce the presence of bronchitis, and are usually heard over the whole chest.

Humid crackling, — the large and bubbling sub-crepitant,—and the mucous rhonchi just now described, may, therefore, be looked upon as the physical signs proper to the second stage; but they differ materially in their value. The first, alone, is positive and unequivocal, as it cannot happen under any other circumstance; both of the others are of less importance, since they require, like other indirect signs, considerations similar to those so often spoken of—viz. their position, and the co-existence of other signs, to determine their signification. Either of them may occur alone, or be so intermixed with each other, as to make their distinction impossible. With regard to their comparative frequency, the humid crackling by itself is the most common; next to this, is its combination with the sub-crepitant; but the latter is often found in conjunction with the mucous; and they are so variously associated, that we may examine an immense number of cases in which the softening process is going on, before meeting with two at all alike.

As the second stage is about to pass into the third, we often hear a variety of mucous rhonchus

of a very liquid and bubbling character, and with a clear *metallic* note; and, although difficult to describe, so peculiar, as to render its recognition, after having once been heard, a very easy matter. I have reason to believe that the humid crackling rhonchus changes into it, and that the others sometimes do the same; but whether this is the case or not, it is certain that whenever it is heard, the second stage is much advanced, and the last, not very remote. When once established, I have invariably found it permanent, until, by gradually increasing, it has become lost in rhonchi characterizing the third stage, or, (if the secretion has diminished,) cavernous respiration has occurred where it had existed.

The part where softening first shows itself, will generally be found to be that in which there were the earliest signs of crude tubercle; and, if the lung be now examined, those points where there was formerly no appreciable deviation from the healthy conditions, will exhibit more or less evidence of incipient tuberculosis. It appears that there is, at this time, a tendency to the rapid deposition of tubercle,—the effect of some further reduction in the resisting powers of the patient,

under which, those tubercles which are the oldest undergo transformation.

Hence, it often happens, that we can observe upon the same patient the blending of the two stages, and, at the same time, the distinctive marks of each. There is, perhaps, a mucous rhonchus of the clear metallic variety at the very apex; surrounding and beneath it, a humid crackling, sub-crepitant, or ordinary mucous one; and still lower down, a few dry clicks. The percussion sound will probably show a corresponding gradation,—the dulness which was greatest at the summit decreasing gradually in descending, until it becomes lost in the clear sound over the yet unaffected basis. The respiration is perhaps equally changed, being bronchial where the sound was the dullest; harsh, weak, or jerking, lower down; until in the inferior parts it is found healthy,—or, if altered, either weaker than on the opposite side, or slightly exaggerated, according to the state of the other lung.

We cannot, of course, expect to find every case thus clearly marked; some will exhibit one change more than another, and we shall meet with almost endless variety in the grouping of

the several signs; yet, there will scarcely be any practical difficulty in deciding upon the existence or otherwise of the second stage, since one or two are amply sufficient to determine it. And thus we may rejoice, that, whilst the passage of the hard into the softened tubercle is of such great importance in connection with prognosis, nothing is more easy than to detect it by auscultation.

CHAPTER VI.

THE THIRD STAGE OF PHTHISIS.

Increase of signs previously described—Cavernulous rhonchus—Percussion-sound of cavities; amphoric resonance; cracked-pot sound—Cavernous respiration—Amphoric respiration—Cavernous rhonchus—Metallic tinkling—Pectoriloquy—Cavernous cough—Amphoric voice and cough——Acute phthisis——Laryngeal phthisis.

THE third stage of phthisis, or that in which cavities exist in the lungs, is, in general, very easily recognized by physical examination.

Although, as a general rule, at this period of the disease, the symptoms are so conspicuous as scarcely to leave a doubt as to the pathological condition, it is not very uncommon to find patients with large vomicæ, whose appearance is so deceptive, that without the stethoscope, the existence even of phthisis might not be suspected. Such cases, after a long combat with the disease, generally terminate suddenly and unexpectedly: hence, a familiarity with the physical signs of

pulmonary excavations becomes of equal importance with those of the earlier stages.

There is no positive line of separation between the second and third stages; one passes imperceptibly into the other, and cases often occur in which it is difficult to decide between the two; but so soon as there is proof of the smallest excavation, the latter is said to have commenced.

It is unnecessary to describe minutely all the signs of this period, because, the majority consist merely of an increase of those already explained. In most instances, there is an evident falling inwards of the supra- and infra-clavicular regions, giving an appearance of prominence to the clavicle; the antero-posterior diameter of the diseased parts is much decreased, even to the naked eye, and, on deep inspiration, the movement of that portion of the chest, and often of the whole side, is considerably diminished, and sometimes imperceptible: on percussion, the sound is usually dull and flat, and the resistance of the thoracic walls strongly marked: the vocal and tussive fremitus are likewise increased.

Inspection, mensuration, and percussion (except over very large cavities, which will be men-

tioned presently), cannot, however, do more than announce an advanced period of the disease, and it remains for auscultation to decide the actual stage.

For the sake of convenience it may be well to describe the stethoscopic signs of small and large cavities separately; it being understood, however, that the difference between them consists only in degree, and that every intervening state will be constantly discovered.

Where the cavities are small.—It was mentioned in the preceding chapter, that the humid crackling, and sometimes also the mucous, and sub-crepitant rhonchi pass into one nearly allied to the mucous, but essentially metallic in its quality; when this is fully established, the commencement of very minute cavities may be safely diagnosed. If a patient in this condition be examined from time to time, the rhonchus will be found more and more characteristic, until, by increasing in size and humidity, it at length becomes decidedly cavernulous.

The true cavernulous rhonchus is a clear, bubbling, and metallic sound, taking place both with inspiration and expiration, but especially the

former; varying in loudness and frequency according to the amount of secretion; and giving to the ear the impression of being produced in a small and hollow space; it is easily recognised, and declares unequivocally the establishment of the final stage. The respiration, at this time, is usually more or less bronchial; sometimes merely harsh; but often distinguished with difficulty, from being masked by rhonchi.

I have often observed that the sounds of the heart, especially the second, become, about this period, more than ever distinct on the diseased side, which although not amongst the positive signs of excavations, may be sometimes recollected with advantage. Bronchophony is now more positive than formerly, and oftentimes so loud, as to be painful to the auscultator,—this as well as the preceding, being the result of increased conducting power of the lung, with emaciation of the thoracic walls.

Where the cavities are large.—As the vomicæ increase in size, there arise a new set of signs, not yet mentioned, and with which it is highly necessary, but happily equally easy, to be familiar; they consist of still further modifications in the percussion-sound, the respiration, the

rhonchi, and vocal resonance,—all of which must be explained separately.

Percussion-sound.—Every variety of sound, from absolute dulness, to that degree of morbid resonance which is termed amphoric, may attend percussion over a cavity, according to its size, position, and the state of the surrounding parts; the force employed also makes a considerable difference, since, if gentle, it will proceed from the superficial, and, if hard, from the deeper parts. Positive dulness of sound, with perfect inelasticity of the thoracic wall, is by far the most common; but cases now and then occur, where the sound is so little altered from that of health, owing, probably, to the morbid clearness of the cavity balancing the dulness of the neighbouring induration,—that it is not very easy, without other evidence, even to ascertain which side is diseased. Amphoric resonance is heard only over large cavities seated close to the surface, or separated from it by indurated lung, and, in the latter case, requires rather strong percussion for its production; it is very characteristic, and exactly imitated by fillipping the cheek when the mouth is inflated. When the percussion-sound is more

or less amphoric, it frequently happens that by directing the patient to keep the mouth open whilst the chest is struck somewhat smartly, a new character is developed, so peculiar, as to decide at once the history of the case;—I allude to the *cracked-pot sound*, first described by Laennec under the name of "bruit de pot fêlé." It is impossible, by description, to do justice to its peculiarity; but this is well expressed by its own designation, as it exactly resembles the noise produced by striking an empty and cracked pipkin. It seems necessary to its developement that the cavity should be large, tolerably dry, and communicating freely with the bronchi; and that the mouth should be widely open; in no case have I heard it clearly marked in the absence of the last condition, although I should be sorry to assert that under some rare and peculiar circumstances it might not be dispensed with. Such a combination, however, does not invariably produce the cracked-pot sound, for reasons, perhaps, difficult of explanation; and, if I were to hazard an opinion as to its frequency, I should say, that it may be met with in about one-third of such cases. It might, probably, be noticed oftener

than it is, were greater attention paid to the mode of percussing, as it requires a sharp tap upon the pleximeter finger, pressed firmly between and parallel to, the ribs, and, in fact, some little practical skill, to elicit it nicely. On the whole, percussion is a capricious guide to vomicæ; —more frequently affording no evidence of their presence; sometimes calculated to mislead even as to the nature of the disease; yet occasionally announcing them in the most unequivocal manner.

Respiration.—By the respiration alone, cavities of tolerable size may generally be detected, in consequence of the air in passing through them giving rise to the sound which is properly termed cavernous, easily distinguished by its hollow and metallic character, and at once telling of its production in an empty space.

Cavernous respiration often has its origin in a gradual increase of the bronchial type,—the one passing into the other,—but it may succeed any other morbid variety, or begin in spots, where, during the second stage, scarcely any respiration could be heard. Intense bronchial respiration is very closely allied to cavernous, and from a

confusion of the two by inexperienced auscultators, I have seen patients unnecessarily alarmed, and most undeserved discredit thrown upon the stethoscope. They may be distinguished by the bronchial giving rise to the idea of its originating in a dry tube, whilst the cavernous seems to be produced in a hollow space, and is distinctly *metallic;* but, it must be confessed, that cases now and then occur, in which the most experienced have some difficulty in deciding between them;—and in such we must remain satisfied in naming the disease, without determining too hastily its actual stage.

Where the cavity is of very great extent, and tolerably free from secretion, the respiration undergoes another change, and is said to be amphoric,—a quality easily recognised by its resemblance to the sound caused by blowing into an empty bottle.

Amphoric respiration is generally, but not invariably, attended by amphoric resonance on percussion, and, like the latter, requires for its developement, that the cavity should be large, and situated near the surface. There is, in reality, no line of separation between cavernous

and amphoric breathing; the one merges into the other.

It is a question of some interest, whether we can form a tolerably correct estimate of the size of a cavity, from the quality of the respiration. To a certain degree, I believe it to be possible, by its loudness, tone, and extent; but where there is much surrounding consolidation, we may easily be misled by the sound of what is, in reality, but a small vomica, becoming more diffused. After a little experience, however, it becomes in a great measure the suggester of its place of origin; but to prescribe rules for such distinctions, would be utterly vain. How *small* a cavity may cause cavernous respiration, is a point upon which it is not easy to decide; much must of course depend upon its position, — but I have several times seen one diagnosed, which, after death, was found scarcely larger than a hazel-nut; although I believe that vomicæ of this size will more generally pass unobserved.

Cavities, even of considerable size, may sometimes escape detection, if only one examination be depended upon, owing to the absence of cavernous respiration, either from the closure of

bronchi communicating with them, or from the vomicæ themselves being entirely filled with their own secretion, and, in some instances, perhaps, in consequence of the feeble respiratory powers of the patient not allowing the air to pass freely into them; accordingly, whenever other physical signs, and the general symptoms and duration of the disease, indicate an advanced period of phthisis, it is prudent not to declare the absence of cavities, merely from not detecting cavernous respiration, until after a second, or even a third examination. During the last few hours of the patient's life, I have, several times, entirely failed in discovering the situation of vomicæ, although on many previous occasions, I had had most undoubted evidence of their existence; in such cases, the last of the above explanations, is probably the correct one.

The only condition at all likely to be mistaken for vomicæ, from the evidence of cavernous respiration, is extreme dilatation of the bronchial tubes; but this is a very rare disease; more common in the centre than at the apex of the lung; and, in its attendant symptoms, so different from the last stage of phthisis, as scarcely to justify an error in determining between them.

Cavernous respiration is of itself essentially dry, yet, whenever there is much secretion in the vomica, the moist rhonchi, with which it is associated, often give it a humid character; in many cases, it is completely masked by them, but whenever the rhonchus can be clearly separated from the sound of respiration, the dryness of the latter is very evident.

Rhonchi. — Cavernous rhonchus has many varieties, according to the amount and consistence of the secretion, and the size of the cavity; sometimes it resembles the bursting of large bubbles,—at others, the agitation of some thick and viscid substance in contact with air,—and very often it is clear and *ringing*, appearing as though there were something actually *metallic* within the vomica; but in all instances it conveys the idea of metallic hollowness, and can scarcely fail, even to the most inexperienced, to tell at once of the seat of its production. It varies in loudness, to every possible degree; not unfrequently it may be distinguished at some distance from the patient's chest; and is sometimes heard by the patients themselves, who are thus enabled to point out the exact situation of the cavity.

Persons with vomicæ occasionally speak of a sensation in the upper part of the chest, which they compare to the ticking of a clock, and, if the cavity be listened to at such a time, an indistinct impulse is often communicated to the ear of the auscultator; this is merely the agitation of fluid secretion by the heart's action, but it frequently gives rise to much anxiety on the part of the sufferer.

Sonorous rhonchus is now and then heard within, or in the neighbourhood of large cavities, either separately or mixed with the cavernous, but, unless in the latter case, it is a sign unworthy of dependence, since it might result merely from inflammation lingering in the larger bronchial tubes, at the upper part of the lung, from tubercular irritation.

Pleural friction murmurs, generally of the creaking variety, are occasionally heard in the neighbourhood of vomicæ, but are of course valueless, as regards their diagnosis, because they may happen at any period; but as the patient is, at this time, more than ever liable to secondary pleurisy in distant parts of the lung, friction sounds of various kinds are frequently met with where pain is complained of.

When amphoric resonance, or, the cracked-pot percussion-sound, or, amphoric respiration, announces a very large cavity, the cavernous rhonchus will seldom be heard, except perhaps at the very bottom; but a new sound may be developed by any effort of the patient, such as coughing, speaking, or breathing loudly, and sometimes without it—which is termed metallic tinkling.

It would be useless to enter into the many speculations as to the cause of this phenomenon; it will suffice to state, that the sound exactly resembles the falling of a sharp metallic substance into a glass or metal jar,—sometimes reverberating and giving rise to what has been called metallic echo; and, that it declares the existence of a hollow space filled with air, and containing a fluid. It must, however, be a very rare attendant upon tubercular cavities, as I have not met with it more than once or twice. Many auscultators consider it far from uncommon, but I much suspect that it is often confounded with the clear and metallic variety of cavernous rhonchus just now spoken of. The two certainly have some characters in common; but it is only necessary to hear, once, metallic tinkling in its genuine

form, as it occurs in hydro-pneumothorax, to distinguish the differences between them.

Vocal resonance.—Cavernous voice, or pectoriloquy, is a still further modification of vocal resonance, and bears the same relation to bronchophony as cavernous respiration does to bronchial, and cavernous rhonchus, to the crackling varieties.

Pectoriloquy is distinguished from bronchophony, by the words being articulate, and seeming to arise from the stethoscope itself; and so much is this the case, that, very often, it appears as if the patient were actually speaking into the ear of the auscultator. It is necessary to its production, that the cavity should be of moderate size, tolerably empty, and near to the surface. Unlike bronchophony, the tone of the voice has but little influence upon its developement, for, when the patient whispers, it is even more characteristic, although, of course, less loud, than when he speaks in the ordinary voice,—and we have what has been termed whispering pectoriloquy.

Of all the signs of pulmonary excavations, I believe pectoriloquy is the least to be depended upon; because, in the first place, it is not very

often met with in a perfect form, and, owing to some strange combination of circumstances which cannot be explained, may even be entirely absent, although other evidence has sufficiently shown the existence of a cavity; and, in the next, many healthy persons, with thin chests and peculiar intonation of voice, have, what may really be termed, a natural pectoriloquy. I have especially observed this amongst French persons, and attributed it to the peculiar tone of their language; it was, in fact, at the hospitals of Paris that I first began to distrust pectoriloquy, from having oftentimes fancied I had discovered it, where its presence must have been impossible. When well developed, however, it is very characteristic, and may occasionally be brought into use, where the diagnosis is rendered difficult by the absence of other signs.

In cases which exhibit pectoriloquy in a tolerably distinct form, the resonance produced by coughing is similarly modified, and we hear what is called the cavernous cough. This is a ringing and metallic sound, apparently produced close to the ear, and often with sufficient intensity to cause a very painful sensation to the auscultator; it is

of the same value as the cavernous voice, and, when fully developed, is, perhaps, even more characteristic.

When the cavity is of very large size, and under circumstances favourable to the production both of the amphoric sound on percussion and amphoric respiration, the resonance of the voice and cough is attended with still further modification. When the patient speaks, the voice, instead of being close to the ear and articulate, as in pectoriloquy, has more the character of bronchophony, but is hollow and metallic, and from resembling the sound produced by speaking into an empty vessel, is termed amphoric. Precisely the same quality of sound attends coughing, and the amphoric cough and voice will generally be found together. On the whole, they are of more value than the cavernous, being not only more peculiar, but impossible of imitation in any healthy condition—and, under favourable circumstances, more constant in occurrence. There are but two pathological states which can produce these amphoric sounds,—viz. large vomicæ, and pneumothorax ; but with the aid of other signs, and the history of the case, one can rarely be

mistaken for the other; the former is nearly always at the upper part of the lung, and of comparatively limited extent; the latter exhibits itself over the greater part, if not the whole, of one side; whilst any sudden invasion and severity of the attack would immediately suggest the idea of pneumothorax.

We have, at length, completed the physical signs of the three stages of phthisis, such as are presented in its ordinary or chronic form, and, as we may expect to find them, more or less evident, in nearly all the cases we shall meet with in practice.

It is unnecessary to enter into the detail of the physical changes which attend the acute variety of the disease, because it is an extremely rare affection, and differs from the other, mainly in its greater severity and shorter course, and we should naturally anticipate a corresponding alteration in the stethoscopic and other signs.

We must hesitate, however, before declaring too positively what is the physical condition in

these distressing cases, since they are, happily, too uncommon to admit of being described from much practical observation. I have myself met with, at most, two or three examples of the disease in what really claims to be called its acute form. We often hear of cases of what is termed "rapid, or galloping consumption,"—but most of these are merely instances of the sudden and unexpected termination of a disease which, in all probability, had long existed in a quiescent form, and undiscovered. Diminished resonance, feeble and harsh, or bronchial respiration; dry,—rapidly passing into humid-crackling, sub-crepitant, and mucous rhonchi; and these not limited to the apices, but more or less diffused throughout the lungs, and associated with sibilant and sonorous râles, consequent upon severe secondary bronchitis,—are the signs we may expect;—but here they would probably terminate, as the patient could scarcely live long enough for vomicæ to form, or, if it were otherwise, we should, most likely, fail in detecting them, owing to their physical signs being obscured by the rhonchi arising from the complicated forms of secondary inflammation.

Such cases might easily be mistaken for pneumonia or acute bronchitis, but, if by any means they are to be distinguished, it must be by accurately comparing their physical signs with a number of general circumstances, which, although important, it would be foreign to my present object to enter upon.

The variety of the disease, known as laryngeal phthisis, requires but little to be said upon it, since, it differs in nothing from ordinary phthisis, except in the addition of certain symptoms referrible to the larynx and trachea. It has, consequently, the same association and sequence of pulmonary signs, as we have been discussing throughout; although, it often happens, that many of them, and especially those relating to the respiration, are masked or rendered valueless, either by the greater loudness of the morbid sounds arising in the trachea or larynx, extending themselves some distance below the clavicle to the exclusion of every other,—or by the small amount of air which finds a passage through

them, causing the lungs, which might otherwise be fairly expansible, to present but a feeble and deficient respiratory murmur. Hence it is, that in these cases, we are often entirely dependent upon percussion and inspection, in order to arrive at the physical condition of the chest.

The respiratory sound in the healthy larynx and trachea differs from that of the lungs, in being loud, shrill, and blowing, and having the two murmurs of equal length, but divided from each other; it is, in fact, only an exaggerated form of the bronchial type. Morbid tracheal respiration principally consists of the addition of harshness and loudness to the above qualities, and the occasional association of rhonchi, variable in kind, but either of the sonorous character peculiar to the larger tubes, or, of a gurgling nature allied to those generated in cavities. Any further distinction of such sounds, I believe, to be altogether valueless, because, whenever these structures become the seat of tubercular disease, its general symptoms are but too evident; and, I doubt the possibility of any physical signs informing us of the precise pathological condition of the mucous surface,—for example, whether, and to what de-

gree, it is either thickened, softened, or ulcerated; whilst I question the utility of such knowledge, even if we could possess it.

Physical examination of the larynx and trachea, might, I think, be altogether dispensed with in diagnosis; although it is highly important to have a general acquaintance with its results, in order that sounds originating in the upper part of the respiratory passages, may neither be falsely ascribed to the lungs, nor mislead us, by modifying the proper characters of the pulmonary respiration.

In concluding this sketch of the physical signs of phthisis, I would merely remark, that we need not be alarmed at the apparent complexity of the subject, since it is as easily mastered as any other of equal importance; and requires only a little practical experience properly directed, to render it both easy and useful. I have carefully excluded everything which might tend only to complicate it, whilst I have admitted nothing which my own observations cannot authenticate.

THE END.

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