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THE LOCALISATION  
OF THE  
LESIONS OF PHTHISIS

IN RELATION TO DIAGNOSIS AND  
PROGNOSIS



*FOWLER.*

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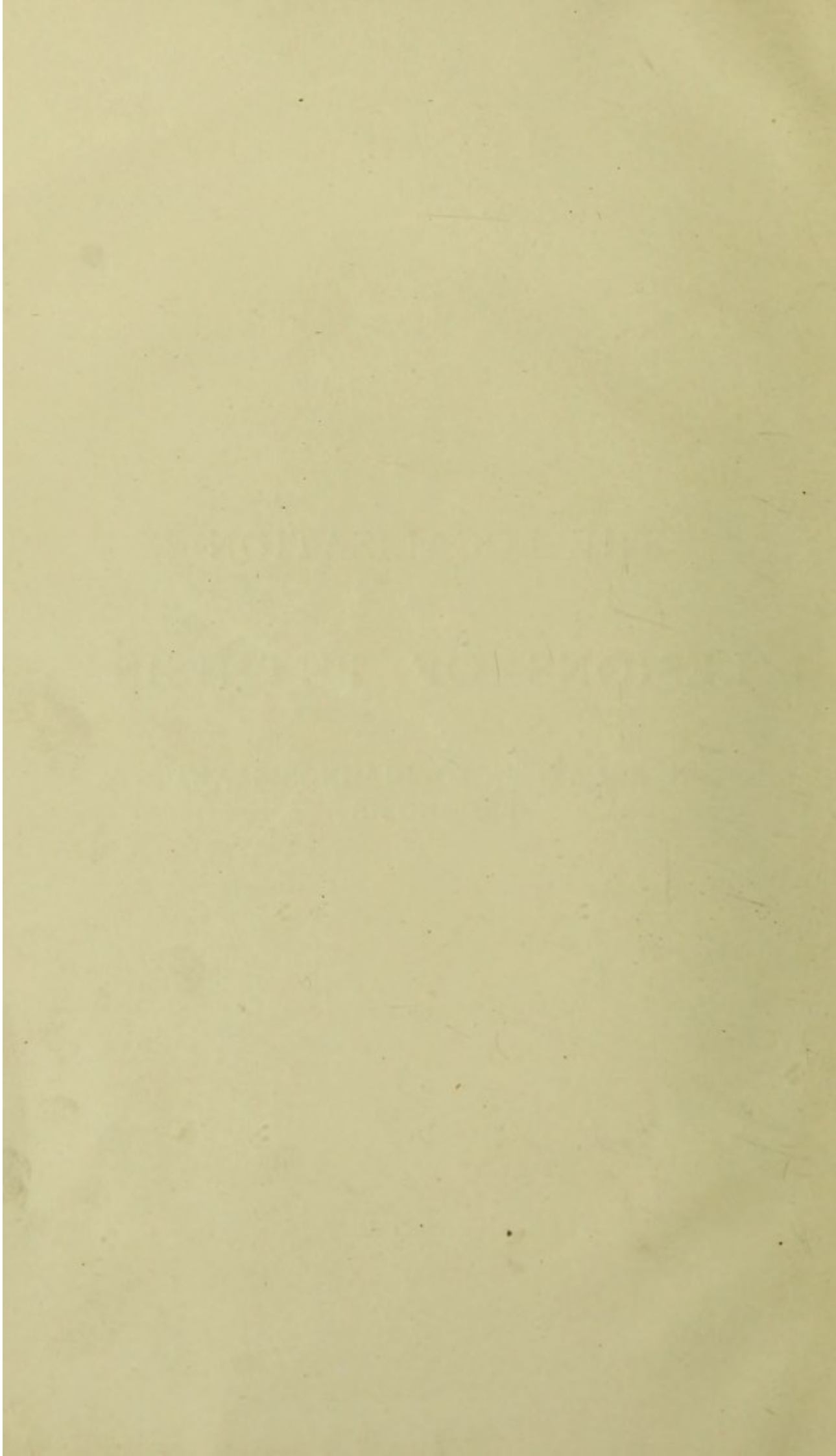
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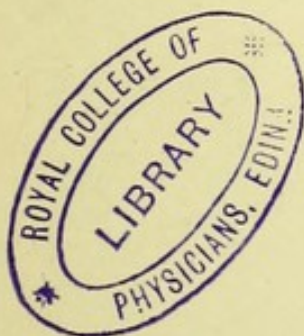


THE LOCALISATION  
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BY

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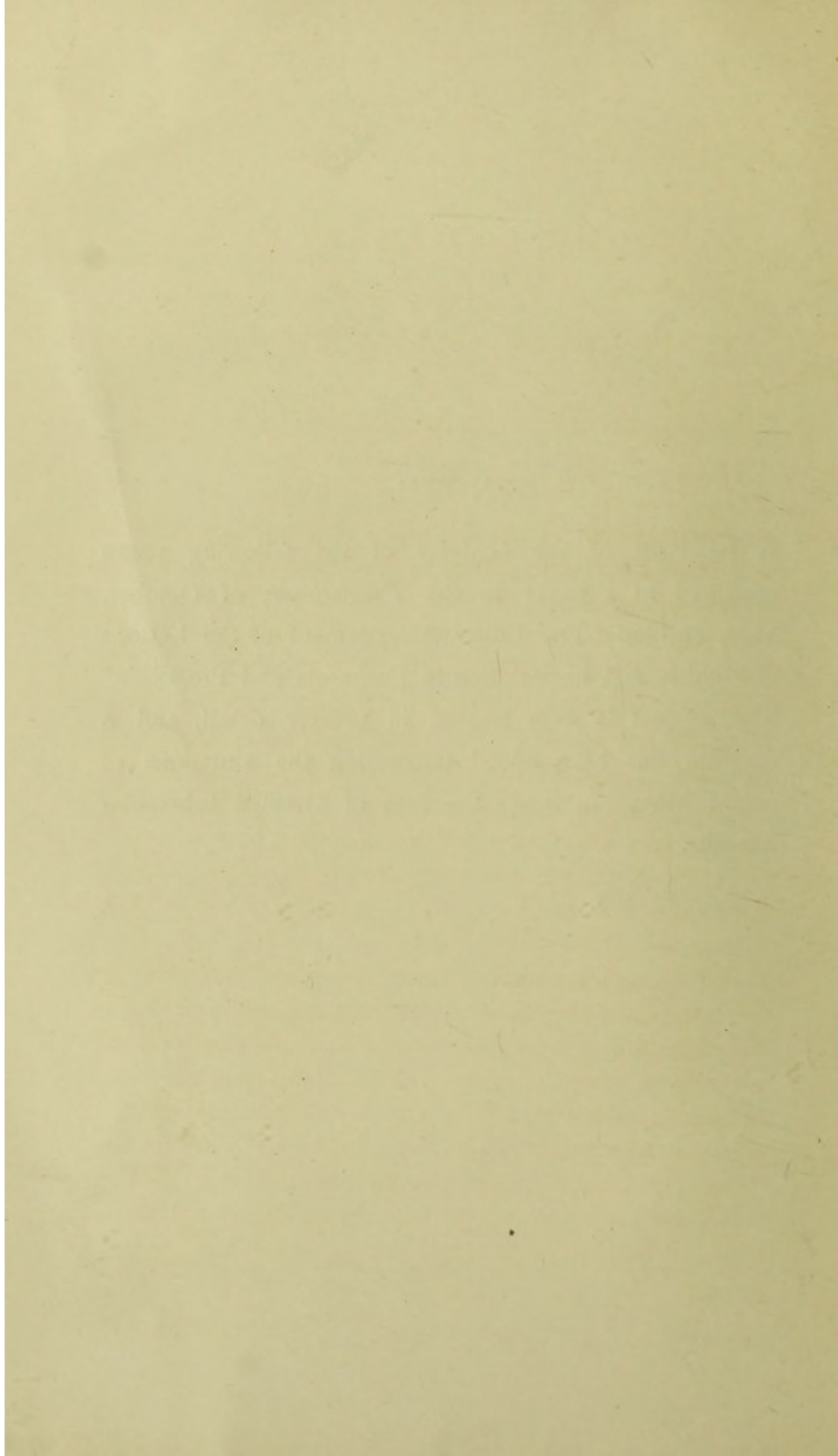


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### NOTE.

A PORTION of the contents of the following pages appeared in a paper in the *Practitioner*, of October, 1887, entitled "The Lobar Arrangement of the Lesions of Phthisis and its Relation to Diagnosis and Prognosis." The subject is here treated in greater detail, and a diagram has been added illustrating the situations of recent lesions in lungs the seat of arrested tubercular deposits.

*April, 1888.*



THE LOCALISATION  
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AN examination of the literature of pulmonary phthisis will show how little attention has been paid by most writers to the exact site of the lesions in the lungs and their relation to the chest-wall. Whilst almost every one has his own explanation to offer for the apex-site of the primary lesion, and all recognise that in the early stages of phthisis the base is but rarely affected, scarcely any mention is made of the mode in which the disease progresses between these two points, or of the order in which the various parts of each lobe are affected.

The only reference to this part of the subject which I have been able to find in the writings of Laennec\* is as follows:—

“Tubercles are almost always developed primarily in the summits of the superior lobes, and especially in that of the right; and it is for this reason that, in these points, and particularly in the latter, vast tuberculous excavations are frequently met with. It is not very rare to find similar ones on the summit of one lung, the rest of these organs being quite healthy and presenting no tubercle; but in these cases, also, the patient has often betrayed no sign of

\* “Traite de l'Auscultation Médiante.” Trans. Ed. Th. Herbert, 1846, p. 265.

pulmonary phthisis, or has displayed none but such as were very equivocal, and has died of another disease. It is more common to find an excavation, and some crude tubercles already far advanced in the summit of the lungs, and the rest of these organs which are still crepitant and healthy in other respects, infarcted with a countless number of very small semi-transparent miliary tubercles, of which scarcely any yet present the central yellow point.

“It is evident that these miliary tubercles are the product of a secondary crop, and one much more recent than that which had given rise to the excavations. The results of dissection, compared with those drawn from observations on the living subject, have convinced me that these secondary crops take place at the period when the first formed tubercles begin to soften.

“We frequently find within the same lung evident proofs of two or three successive secondary eruptions, and we may then almost always observe that the primary eruption occupying the summit of the lung has already reached the stage of excavation; that the second, situated around the first, and rather lower down, is formed by tubercles now yellow, at least for the most part, but as yet smaller in size; that the third, formed of crude miliary tubercles, with some yellow points in the centre, occupies a still lower zone; and finally, that the base of the lung, and its inferior border, present a last eruption of entirely transparent miliary tubercles, some of which are likewise found in the intervals left here and there by the preceding eruptions. . . .

“Exceptions to this order of development are uncommon. Primary excavations are very rarely met with in the centre or at the base of the lung; it is less frequent for the left lung to be more affected than the right.”

Louis\* on the same subject writes as follows:—

\* “Researches on Phthisis.” Trans. by Walshe, Syd. Soc., 1844, p. 2.

“Tubercles were almost always more numerous, larger, and more advanced in development at the apex than at the base of the lungs; among the cases analysed in this work—one hundred and twenty-three in number—two only furnish exceptions to this rule.

“Associated with these tubercles appeared productions . . . known by the name of the grey semi-transparent granulation.

“Like tubercles I have found these bodies of larger size and in greater numbers at the apex than the base of the lungs, and, unless when pervading the entire mass of these organs, limited to their apices.

“When these organs (the lungs) were examined from below upwards there were commonly found in regular order grey semi-transparent granulations, granulations of opaline aspect and yellowish tint in their interior, and lastly, granulations of a yellowish white hue throughout their entire substance—in other words, completely tuberculous. The latter were generally the only specimens met with at the apices.”

The statements in the writings of Bayle, Andral, Portal, and others do not vary materially from the foregoing, and add nothing to our knowledge of the exact site of the lesions.

Walshe,\* in describing the anatomical characters of phthisis, states: “Yellow tubercle, whether preceded or not by the semi-transparent grey granulation, and whether accumulated in isolated or grouped masses, or infiltrating the pulmonary stroma, affects a special preference for the apex and upper lobe—either spreading thence downwards uniformly, or leaving islets of parenchyma of various sizes unoccupied in its transit toward the base. Exceptions to this topographical mode of progress (on which the diagnosis of the disease so often turns) are infinitely rare in chronic tuberculisations, the base of the lung proving the primary

\* “Diseases of the Lungs.” Fourth Ed., p. 415, par. 1228.

seat of the process, not oftener, it has been calculated, than once in sixty or eighty instances.

“The softening process, like that of original deposition, commences at the apex of the lung and spreads downwards.

To Dr. William Ewart\* belongs the credit of having been the first to draw attention to the “remarkable proneness to disease” of the dorso-axillary region, and of its “yet greater proneness to excavation.” In an examination of 304 lungs he found cavities in this area in 227 cases. He states: “I doubt whether clinical observations have hitherto led to so high an estimate of the frequency of this lesion. A knowledge of this pathological fact cannot fail to stimulate a more searching clinical exploration of a region so liable to disease, and to strengthen the conclusions which our diagnosis may derive from physical methods of examination.”

The value of Dr. Ewart's observations is somewhat diminished so far as our present inquiry is concerned owing to his having adopted areas of the chest-wall, instead of the lobes of the lungs as the basis for his classification of cavities according to their situation.

The following extract is from the work of a writer of a still more recent date, the late Dr. Hilton Fagge†:—

“. . . I must insist on a point which has long been known both to physicians and pathologists, namely, that the upper parts of the lungs are almost invariably affected with phthisis, in whatever form, before the lower parts; and that in all but the most exceptional instances the disease spreads downwards from the apex to base often with almost perfect regularity.

“I must not omit to add that the general rate of the proclivity of the apex is liable to some other exceptions.

\* *Gulstonian Lectures*, 1882, on “Pulmonary Cavities: their Origin, Growth, and Repair.”

† “*Principles and Practice of Medicine*,” vol. i, p. 947.

In certain cases the tubercles appear a little lower down, leaving one or two cubic inches at the extreme summit of the upper lobe free from them. But sometimes the middle of the organ is first affected, or even the lower lobe, the upper angle of which is indeed very often the seat of a vomica, in ordinary instances of phthisis.

“But I believe it never happens that the tubercular process spreads upward from the base of a lung into and through the upper lobe. And it is certain that what has sometimes been called ‘basal phthisis’ is a distinct affection, which has been described above under the name of chronic pneumonia.”

It may, I think, fairly be said that until quite recent times our knowledge of the progress of pulmonary phthisis has been limited to the fact that: “The softening process, like that of original deposition, commences at the apex and spreads downwards.”\*

I have not anywhere met with the statement that *the disease, in its onward progress through the lungs, in the majority of cases, follows a distinct route, from which it is only turned aside by the introduction of some disturbing element.* Now this fact, if fact it be, is of great importance in that it tends to give increased definiteness and certainty to the information which we may gain from an examination of the chest. If we are prepared to find lesions anywhere and (the apex excepted) attach no particular importance to their being situated in one place rather than another, our knowledge of the conditions present and our ability to forecast the future progress of the case may be very different from what it would have been had we begun the examination with a clear idea, not only that the disease as a rule followed a definite line of march, but also of the actual route likely to be taken. We should then first have searched the apex in the various sites of election

\* Walshe, *op. cit.*, p. 415.



of primary lesions; finding evidence of disease there, we should have followed it along its usual course in the upper lobe and have estimated its extent by noting its furthest limits. Then, turning to the lower lobe, with a knowledge of the point most likely to be first attacked and of the lines along which the disease progresses in that part of the lung, we should have determined the presence and amount of infiltration; and our examination completed, the mental picture of the extent of lung involved might have been almost as clear as though the organs had been exposed to our view.

On the other hand, we might discover that the disease had not followed its ordinary course, and that, whilst the total area of lung involved was still very small, a part usually affected at a late period only, already showed signs of infiltration. This would start us on a search for some disturbing factor, such as a previous attack of pleurisy, which, by diminishing the resisting power of a portion of the lung, had allowed such an inversion of the natural sequence of events to take place; or, more important still, it might inform us that the disease was not of that subacute or chronic type in which the progressive development of lesions about to be described is usually found. Or again, it might be a question whether or no the disease was of a tuberculous nature; now the probability of such being the case is much increased if the lesions are found in situations most affected by tubercle.

I shall endeavour to show that this is no fanciful statement of the exact knowledge to be obtained from physical examination of the chest in phthisis, if my assertion of the existence of a definite "line of march" of the disease should prove correct. I am of course well aware that extensive lesions may be present of which there may be no evidence; but that fact tells for nothing, as we are only concerned with cases in which physical signs are to be found.

I have been led to these conclusions as the result of a considerable experience in the post-mortem room of the Middlesex Hospital; but as, like many other truths, they can only be appreciated when sought for in a certain way, it may be as well to state the mode of examining the lungs then adopted. Following the recommendations of Virchow,\* the sections should always be in the same lines, the first exposing the largest possible surface, and all others in the same lobe parallel with it; the organ after the examination presenting an appearance similar to the leaves of a book. To examine the left lung, place it on the table with the root downwards and the *base* toward you. If there be no interlobar adhesions, or only such as can be easily broken down, holding the blade parallel with the table, make a section through the upper lobe at the level of half the depth of the interlobar sulcus, commencing just below the apex and extending thence along the posterior border and the sulcus. The section must stop before the part is entirely severed. This "leaf" should then be turned over, and the whole of the upper lobe will be displayed.

The first section through the lower lobe is made along the prominence of the posterior border, through the base, and then towards the sulcus again, stopping before the part is completely separated.

If the interlobar adhesions cannot be separated without injury to the lung, a single long section should be made from apex to base along the posterior border, and carried through the lung toward its anterior margin.

To examine the right lung, place it on the table with the root downwards and the *apex* towards you.

Any easily separable interlobar adhesions having been dealt with as already directed, the point of the blade is inserted at the lower and anterior extremity of the upper lobe, and an incision is made at the level previously

\* "Handbook of Post-Mortem Examinations."

mentioned, upwards and outwards towards its apex and anterior margin. The middle lobe is separately incised from below upwards. The incision in the lower lobe, starting from the anterior margin of the base, is continued through this part and along the prominent posterior border, stopping short of the sulcus, so that the section may not be complete.

If the interlobar adhesions cannot be easily broken down, a single section is made as in the left lung, but from base to apex instead of *vice versa*.

I believe that any one who will make it a rule to examine the lungs after this method, will have no difficulty in appreciating the arrangement of lesions about to be described ; if, however, a number of irregular incisions be made and no definite plan adopted in the examination of each lobe separately, all traces of the progressive march of the disease may easily be lost.

As it is rare to find any one who, without having had reason to study the subject specially, is acquainted with the exact relations of the different lobes of the lungs to the chest-wall, and as such knowledge is obviously necessary in order to follow the spread of the lesions from one point to another, I shall offer no apology for introducing here a few brief anatomical details.

The apex of each lung rises about one-and-a-half inches above the clavicle. On the left side almost the whole of the front of the chest is occupied by the upper lobe, only the anterior extremity of the lower lobe being visible. On the right side the front of the chest above the fourth interspace is occupied by the upper lobe, below that by the middle lobe, only the point of the lower lobe coming in, as on the opposite side. Behind, the fact which is chiefly to be noted is that the lower lobes reach as high as the third dorsal spine, the right being however usually rather lower than the left. They thus occupy almost the whole of the

posterior surface of the chest, except that part which roughly corresponds to the supra-spinous fossæ. The septum

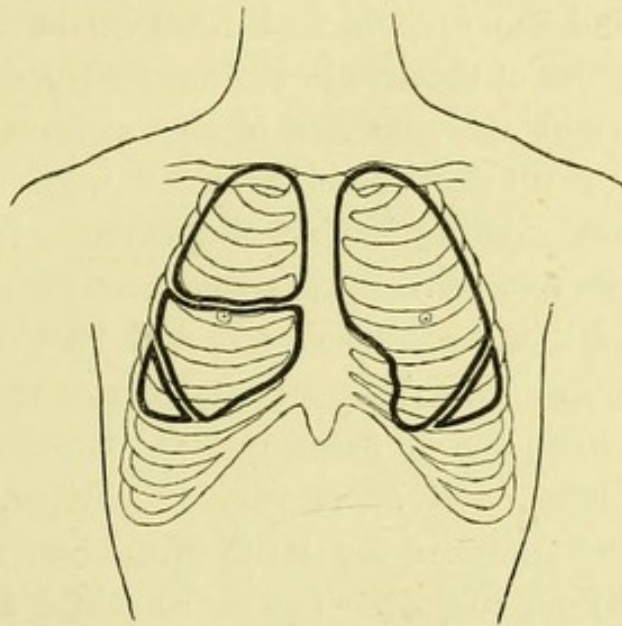


FIG. 1.—Showing the relation of the lobes of the lungs to the front wall of the chest.

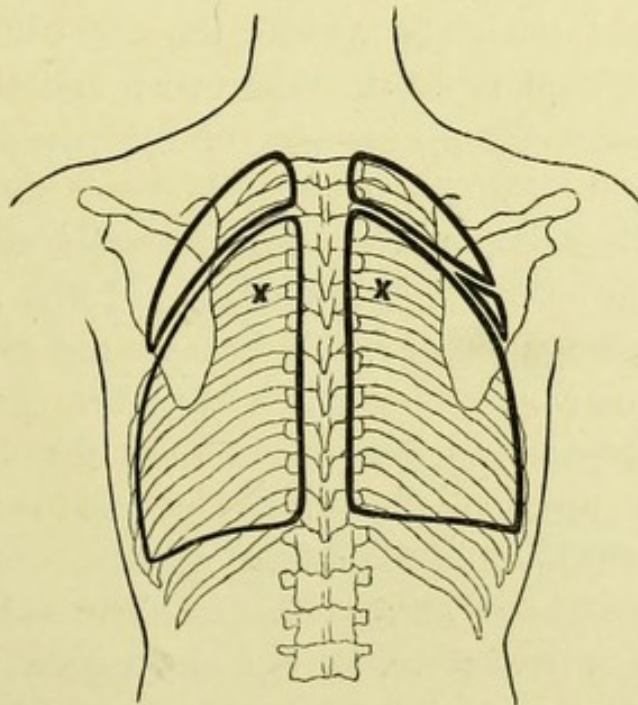


FIG. 2.—Showing the relations of the lobes to the wall of the chest posteriorly. The X marks the usual site of early infiltration of the lower lobes.

N.B.—The apex of the right lower lobe should have been slightly lower than the left.

between the left upper and lower lobes, starting from the third dorsal spine posteriorly, extends obliquely downwards and forwards, crossing the fourth and fifth interspaces, passing behind the scapula and sixth rib in the axilla to the upper border of that rib in the mammary line.

On the right side the line of the septum terminates at the eighth rib just outside the nipple line; and a second septum, starting behind the scapula, just external to the posterior fold of the axilla, runs transversely forwards along the fourth interspace to the middle line, thus forming the middle lobe. The above statements are approximately true in the majority of cases, but the exact relations of the various lobes and septa vary somewhat in different subjects. The limits of the bases of the lungs are not of importance to our subject. The errors which I have found most common with regard to the relation of the lobes to the chest-wall are, first, that a considerable portion of the front of the chest is in relation with the lower lobes; secondly, that the right middle lobe is situated much further back than is actually the case; and thirdly, that the lower lobes occupy far less of the posterior surface than they really do.

In the diagrams, for the sake of greater clearness the outlines of the lobes are completed, and in Fig. 1 the upper lobes are separated more widely beneath the sternum than is actually the case.

I now propose to describe in some detail the exact situations occupied by the primary and secondary lesions in the different lobes of the lungs.

*Sites of lesions in the upper lobes.*—The extreme apex of the lung is not often, in my experience, the site of the primary lesion; this usually occupies one of the two situations marked on the accompanying diagrams (Figs. 3 and 4). Of the two the former is by far the more common; it is situated from an inch to an inch and a half below the

summit of the lung and rather nearer to the posterior and external borders. Lesions in this situation tend to spread in the first instance backwards, possibly from inhalation of the virus whilst the patient is lying down. This line of extension explains the fact that an examination of the supra-spinous fossa will often give certain evidence of the presence of disease when the physical signs in front of the chest have left us in doubt, proving that the changes, as is generally the case, are more advanced there

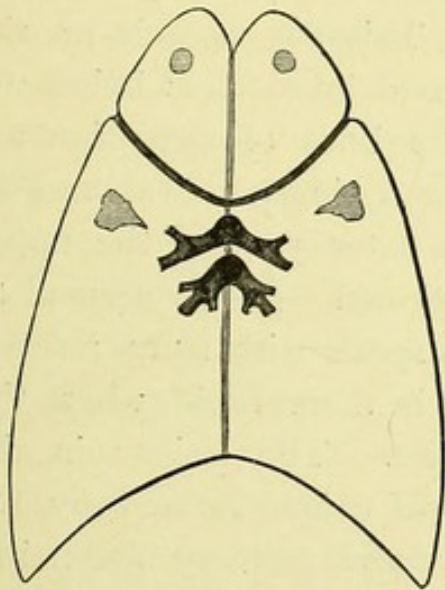


FIG. 3.—Diagram of a vertical median section of the lung, from back to front, showing one of the sites of the primary infiltration in phthisis; also the site of early infiltration of the lower lobe.

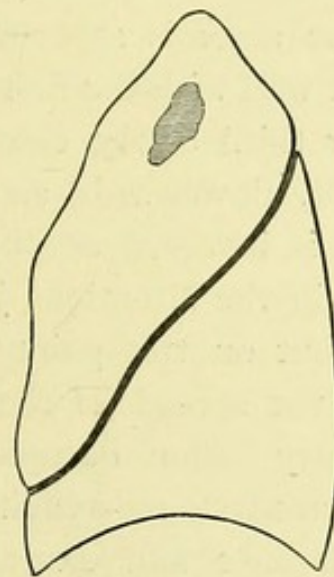


FIG. 4.—Diagram of the left lung, viewed from its outer border, showing a less usual site of primary disease of the apex.

than towards the front of the chest. *The investigation, therefore, of this part of the lung is so important that it should never be omitted.*

From this primary focus, which in front corresponds either to the supra-clavicular fossa or to a spot immediately below the centre of the clavicle, the lesions often first spread downwards along the anterior aspect of the upper lobe, about three-fourths of an inch within its margin, frequently occurring in scattered nodules, separated perhaps by an inch or more of healthy tissue. If therefore the disease

appears to be limited to the upper lobe, a careful examination should be made along a line running about one and a half inches from the inner ends of the first, second, and third interspaces. It is not unusual to find in these scattered nodules the only evidence of disease on the anterior aspect of the lung, when, posteriorly, excavation has advanced to such a degree that little more than the two layers of the pleura, united by adhesions, remain. This is an additional reason for making a careful examination of the supra-spinous fossa.

The second and less usual site of the primary affection of the apex is seen in Fig. 4. This corresponds on the chest wall with the first and second interspaces below the outer third of the clavicle. The lines of extension are usually downwards, so that after a time an oval area of lung is involved occupying the outer part of the upper lobe in the situations just mentioned. It has seemed to me, but on this point I would speak with some reserve, that the spread of the disease is more rapid when the primary lesion occupies this site. The lesions in the advanced stages—cavities—are of course formed by the coalescence and extension of these primary foci; but this part of the subject has been so fully treated by Dr. Ewart in the lectures already referred to that it is unnecessary to say much as to their exact limits. The scattered nodules of consolidation on the anterior surface of the lung often unite and break down, forming a long sinuous cavity which may extend almost to the lower anterior margin of the upper lobe; posteriorly, where as I have already stated the signs of excavation are usually most distinct, the further progress of the disease is generally arrested at the pleural reflexion in the interlobar septum. This was found by Dr. Ewart to be destroyed, and the cavities in the upper and lower lobes united, in only five out of one hundred and fifty-two consecutive cases of phthisis examined post-mortem.

*Site of lesions of the middle lobe.*—The middle lobe of the right lung, which is believed by Aeby, from the arrangement of the bronchi, to be the analogue of the upper lobe of the left, is rarely the site of a primary tuberculous lesion. It is, so far as I have observed, almost invariably affected after the upper lobe of the same side and usually at a rather late period of the disease, whilst not uncommonly it escapes altogether. The lesion most commonly found there is a coarsely granular tuberculo-pneumonic nodule often of large size, in process of caseation at its margin, with an area of softening in the centre.

*Extension of the lower lobe.*—The lower lobe of the lung primarily diseased is usually affected *at a very early period of the disease, often long before any extensive infiltration or destruction of the upper lobe has taken place, and as a rule before the apex of the opposite lung.*

The site of the secondary infiltration of the lower lobe is indicated in Figs. 2 and 3. It is situated about an inch to an inch and a half below the upper and posterior extremity of the apex of the lower lobe, and about the same distance from its posterior border, although I have in some cases found it nearer to and even at the apex of this lobe. This situation nearly corresponds on the chest-wall to a spot opposite the fifth dorsal spine (*vide* Fig. 2), midway between the border of the scapula and the spinous processes.

The infiltration of the lower lobe at this site in the early stage of phthisis is one of the most constant features in the pathological anatomy of the disease, and its recognition is a point of the greatest clinical importance, as the existence of a lesion in the lower lobe at this spot coincident with physical signs at the apex, even though the latter be in themselves of doubtful import, is in my experience almost positive proof of the presence of pulmonary tuberculosis.



At what an early period this infiltration of the lower lobe takes place may be gathered from the fact that from a careful observation extending over several years, I feel able to state that, *in the great majority of cases, when the physical signs of disease at the apex are sufficiently definite to allow of the diagnosis of phthisis being made, the lower lobe is already affected.*

It would therefore appear that the upper and posterior part of the lower lobes is a spot in the lungs only second in point of vulnerability to the apex itself. I cannot, however, agree with the statement of Dr. Hilton Fagge, which I have already quoted that "sometimes the middle of the organ, or even the lower lobe" (not at any rate this part of it) "is first affected," as I have never yet met with a case, either during life or on the post-mortem table, in which this area was affected whilst the apex on the same side was free from disease (but *vide* p. 25 as to "crossed lesions").

The absence of any sign of infiltration there is not, however, proof of the non-tuberculous nature of an apex lesion, as it is quite possible in some cases to arrive at a positive diagnosis of the presence of pulmonary tuberculosis before the lower lobe is affected; and the disease may be arrested whilst still confined to the apex.

On one point I feel able to speak positively, viz., that no report of the condition of the lungs in a case of apical disease is complete without a distinct statement as to the condition of the "posterior apex" (for so, for brevity's sake, it may be called) of the lower lobe. I believe that if careful attention be given to this point we shall hear of fewer cases of "catarrh of the apex," which are often assumed to have been non-tubercular from the subsequent disappearance of the physical signs; such cases must often be examples of arrest of the disease in the first stage and help to explain the very frequent discovery of that condition post-mortem.

In the description of the results of climatic or medicinal treatment in the early stage of phthisis it is commonly stated that the disease was limited to the apex of one or both lungs.

I have before me a recent account of the climatic treatment of twenty cases of phthisis ; in thirteen of these the disease is said to have been limited to one apex, whilst in four both apices were affected, and in no case is there any mention of the condition of the lower lobes except when the whole of a lung is stated to have been affected.

Cases in which the lesions are confined to both apices, no other portion of either lung being affected, must, I think, be rare. I have met with few instances of such a condition during life, but I was lately present at the autopsy of a patient who died from tubercular meningitis, with recent pulmonary tuberculosis, and the apices of both lungs were the seat of old disease, whilst the lower lobes had at that time entirely escaped infiltration. It was interesting to note the signs of arrest of the disease at each apex, showing clearly that in both lungs the process had been stayed before the lower lobe on either side had become affected. In the left lung the changes were of much older date than in the right, and the patient had clearly been the subject of two separate attacks of tuberculosis.\* It is common enough to find arrest of pulmonary tuberculosis when one apex and its corresponding lower lobe have been affected, but it very rarely happens that arrest occurs at both apices without infiltration of either lower lobe. The early stage of the disease at which the lower lobe is implicated is well illustrated in lungs presenting old apex lesions which have undergone arrest. The area of disease may not be larger than a

\* I have since seen a very similar case in which death occurred from acute pulmonary tuberculosis.

cherry or an olive, but if the process was tuberculous a nodule will almost invariably be found in the lower lobe. This arrangement of lesions thus becomes an important rough post-mortem test of the presence of tubercle, and is strong evidence in favour of the existence of a "line of march" of the disease.

I have on the contrary met with a few cases, post-mortem, in which, whilst considerable lesions not presenting a trace of tubercle were present at the apex—*e.g.*, collapse followed by bronchiectasis, or changes resulting from old pleurisy, the lower lobes were quite free from disease.

This lesion once established tends to spread backwards towards the posterior border of the lung, and at the same

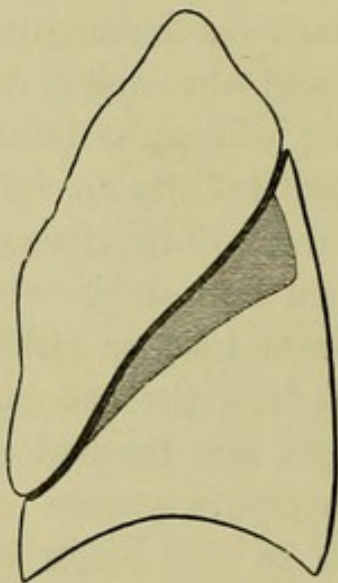


FIG. 5.—Showing the line of extension of a lesion of the lower lobe along the interlobar septum.

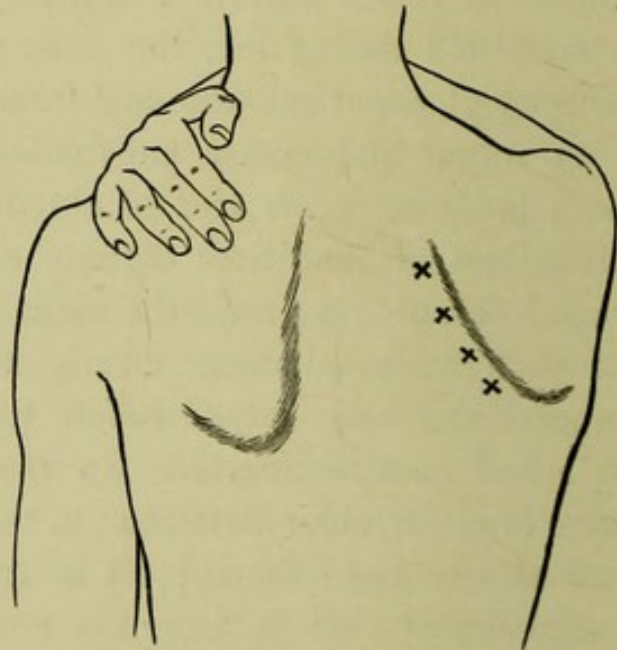


FIG. 6.—Showing the position of the arm when the vertebral border of the scapula indicates (roughly) the usual line of extension of lesions along the interlobar septum.

time laterally along the line of the interlobar septum (Fig. 5), forming a doubly wedge-shaped area of infiltration gradually narrowing as it extends outwards. It follows from this that even in the early stages of the disease, in order to ascertain the extent of lung affected, we must examine the lower lobe, not only opposite the fifth dorsal

spine, but also along the line of the interlobar septum. This line is roughly marked by the vertebral border of the scapula, when with the hand upon the spine of the opposite scapula the elbow is raised above the level of the shoulder (Fig. 6).

The mode of extension towards the base of the lung is not usually by an advancing line of consolidation, but by scattered nodules of infiltration often arranged in a racemose manner (Fig. 7). Even at the termination of a chronic case some healthy, or at least uninfiltreated, tissue will generally be found at the base, even of the lung primarily affected. This freedom of the bases from phthisical lesions is another very marked feature in the

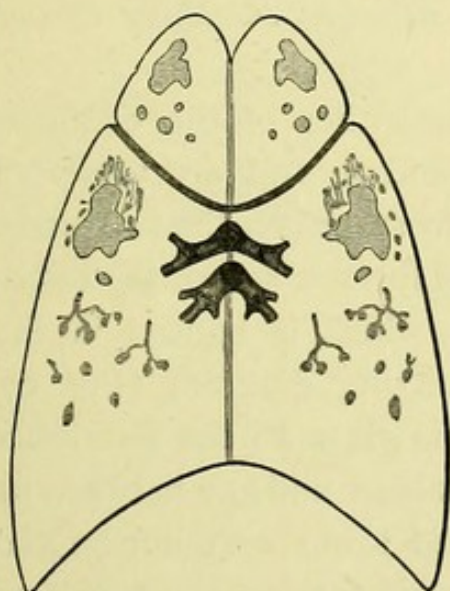


FIG. 7.—Showing the usual mode of extension of the disease towards the base of the lung.

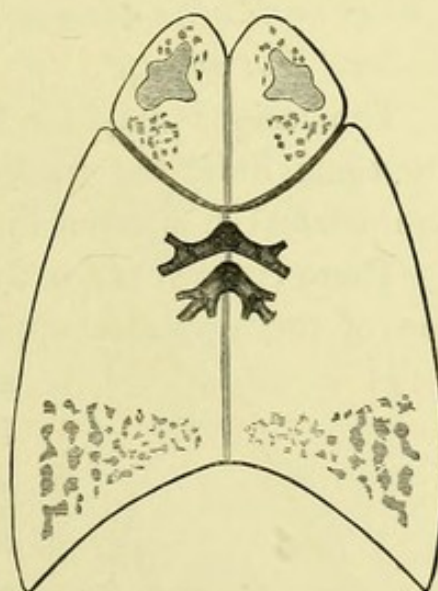


FIG. 8.—Typical arrangement of lesions in a case of apical phthisis with non-tuberculous disease of the lower lobe.

pathological anatomy of the disease. In estimating the probability of any basic lesion being tuberculous in origin, it is important to observe whether the physical signs of disease in the lower lobe are continuous from its apex posteriorly, downwards to its base; if so the lesion is probably tuberculous. If the base be affected, but the apex of the lower lobe be free from disease (*vide* Fig. 8),

the basic lesion is either non-tuberculous—*e.g.*, due to œdema and collapse, followed by bronchiectasis, catarrhal pneumonia, or pleurisy, &c.—or if tuberculous, the resisting power of the base has been diminished by some previous affection—for example, an attack of pleurisy followed by partial collapse; but the presumption is strongly in favour of a non-tuberculous lesion.

In describing the exceptions to the usual arrangement of the lesions, I have tabulated the varieties of chronic disease which may be met with at the bases of the lungs.

*Mode of Extension to the opposite upper lobe.*—Tuberculous infiltration in the upper lobe of the lung not primarily affected often occurs at an early period, *but not usually until after the disease has attacked the lower lobe of the lung first affected.*

The lesions may be found in either of the common situations indicated in Figs. 3 and 4, and are therefore symmetrical in site, but in different stages on the two sides.

There is, however, a third site for the secondary infection of the opposite upper lobe, which is figured in the accompanying diagram (Fig. 9).



FIG. 9.—Showing an occasional site of lesion in the lung not primarily affected.

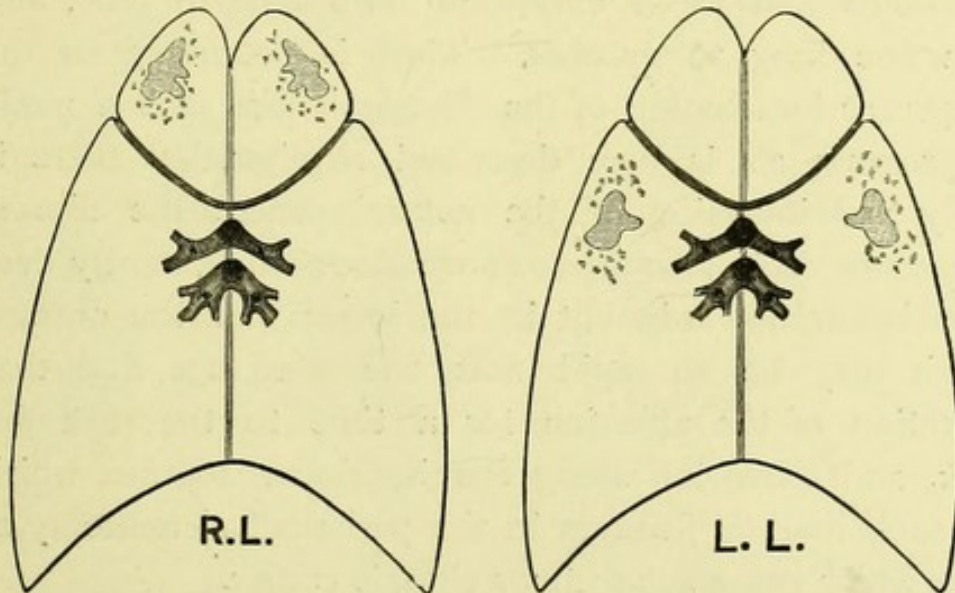
Its site is close to the interlobar septum, about midway between its upper and lower extremities, and corresponds on the chest-wall to the upper part of the axilla. Small areas of consolidation form here and coalesce, but rarely break down into a cavity of any considerable size. Once established, this lesion tends to spread laterally, inwards and upwards, and is often found to occupy a considerable area of the lung

when the apex is quite free from disease.

Infiltration of this area, when present, generally follows that of the lower lobe of the lung first affected.

It follows from this fact that in addition to the apex the upper part of the axilla must be carefully examined, before (say) the left lung can be pronounced to be free from disease, in a case of phthisis apparently limited to the right.

*Extension to the lower lobe.*—The distribution of the lesions in the lower lobe of the lung secondarily diseased is usually similar to its fellow on the opposite side, and presents no peculiarities. The first infiltration is situated below the posterior apex, and this extends along the interlobar septum and ultimately downwards toward the



FIGS 10 AND 11.—Illustrating a "crossed lesion," *i.e.*, from right apex to left lower lobe.

base, but it is rare for the lower margin to be reached before death takes place.

*Crossed lesion of the lower lobe.*—I have met with a considerable number of examples post-mortem, and have been able to recognise a few clinically, of what I call a crossed lesion of the lower lobe (Figs. 10 and 11). The usual mode of extension to the lower lobe is, as I have just stated, from (say) the left apex to the left lower lobe, but occasionally the lower lobe of the lung primarily affected

escapes infiltration and the disease crosses over to the right lower lobe. In such a case the site of secondary infiltration is the usual one near the posterior apex. In all cases, therefore, of apex disease it is necessary to examine both lower lobes before deciding that the disease is limited to that spot.

*Exceptional arrangement of lesions.*—As I have already stated, the line of march here laid down, although covering the great majority of cases, is subject to certain exceptions. Speaking generally this arrangement of lesions is seen in its most typical form when the progress of the disease is slow, and is less distinctive of cases marked by acute symptoms and rapid extension from lobe to lobe, and from one lung to another. Time is necessary for the temporary localisation of the disease which such a mode of progress as is here described requires, but there is rarely any inversion of the natural order; the disease spreads in each lobe from above downwards, hardly ever from below upwards, but in the lower lobe the onward march may be so rapid that one does not find that limitation of the affection for a time to the posterior apex, and extension along the interlobar septum, which are such marked features in the pathological anatomy of cases which run a subacute or chronic course.

*Upper lobe.*—I have lately met with an example of a lesion which had gone on to the stage of cavity, and which appeared to be placed almost midway between the two sites of primary lesions indicated in Figs. 3 and 4. In this case the posterior part of the upper lobe and the apex of the lower lobe were apparently not affected, as there was a complete absence of physical signs in the supra-spinous fossa, and also opposite the fifth dorsal spine. It is possible that further observations may show that the disease tends to run a different course when the primary lesion occupies this site.

When the usual sites of infiltration in the upper and lower lobes are already occupied by arrested lesions, and a second tubercular infection of the lung occurs at some later and perhaps distant date, the more recent lesion in the upper lobe usually occupies a position close to the interlobar septum, whilst that in the lower lobe is situated along the posterior border, and extends almost to the base (Fig. 12).

This observation is of importance in so far as it helps in some cases to explain the occurrence of basic disease,

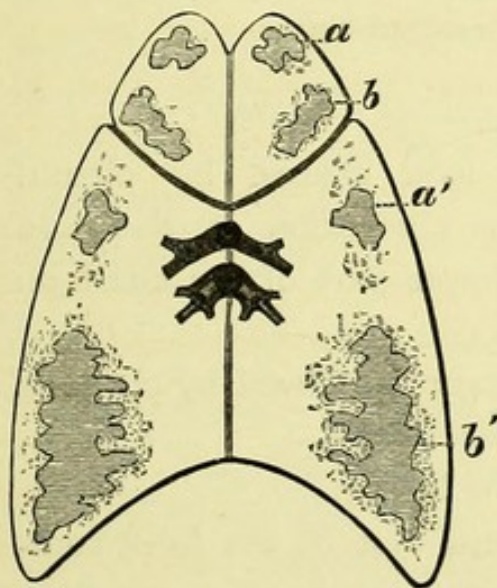


FIG. 12.—Illustrating the situation of lesions in secondary infection of a lung the seat of arrested phthisis; *a, a'*, arrested lesions; *b, b'*, recent lesions.

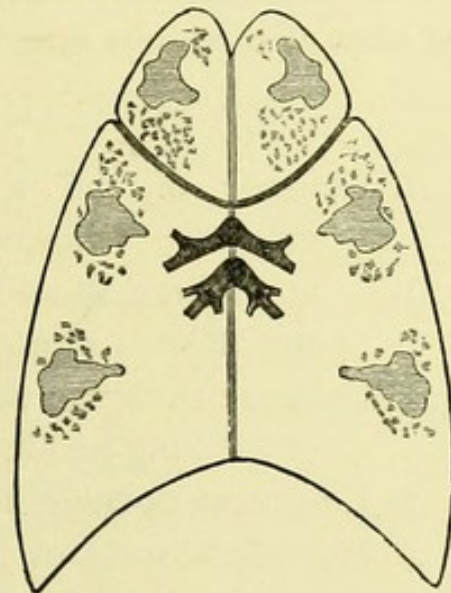


FIG. 13.—Illustrating an unusual arrangement of lesions in the lower lobe.

and will be referred to again in the description of lesions of the lower lobes occupying exceptional situations.

*Lower lobe.*—The accompanying diagram (Fig. 13) illustrates an unusual lesion, of which several examples have come under my notice.

A second cavity, almost equal in size to that at the posterior apex, is seen in the lower lobe about midway between that spot and the base, and close to the posterior border, the intervening area being almost free from disease



and the base quite unaffected. I have not, however, met with any case in which this cavity was present whilst the usual area of disease in the lower lobe remained uninfiltated.

*Basic lesions.*—Reference has already been made to the comparative freedom of the bases of the lungs from tuberculous disease; whenever, therefore, a lesion is found in this situation a most careful survey should be made, both of the history of the case and of the physical signs present, before coming to the conclusion that the basic disease is tuberculous.

The most common varieties of chronic disease affecting the basis of the lungs may be classified thus:—

(a) *Non-Tuberculous Basic Disease.*

1. Collapse of the lower lobe caused by pleural effusion; followed by absorption of the fluid and falling in of the lower part of the chest on the affected side.
2. Collapse from the same cause, followed by cirrhosis of the lung and bronchiectasis.
3. Empyema opening into the lung.
4. Hepatic abscess, or hydatid cyst of the liver, communicating with the lung.
5. Collapse of the lower lobe from pressure on the main bronchi by growths or enlarged and infiltrated mediastinal glands, followed by bronchiectasis.
6. Diffuse gangrene of the lower lobe resulting from a communication through the bronchi with the œsophagus, either directly or through the medium of a softened bronchial gland.
7. Chronic pneumonia and bronchiectasis following on the impaction of a foreign body in one of the bronchi of the lower lobe.
8. Unresolved and chronic pneumonia of the lower lobe.

9. Bronchiectasis secondary to catarrhal pneumonia and collapse. This lesion is rarely found except in children.

(b) *Non-Tuberculous Basic Disease complicated by subsequent Tuberculosis.*

Cases presenting basic lesions are occasionally met with in which the disease, originally non-tubercular, has had the tuberculous process engrafted on to it at some later period ; the lower lobe being infected, either directly or, which is perhaps more common, subsequently to the apex of the same lung. This complication is very likely to occur where bronchiectasis forms a part of the original lesion, but may also be found in cases of chronic pneumonia and in other forms of non-tuberculous basic disease enumerated above.

(c) *Basic Phthisis.*

1. Phthisis with physical signs most marked at the base, but the oldest lesions at the apex.
2. Phthisis with arrested lesions at the apex and at the posterior apex of the lower lobe, more recent lesions in the upper lobe and also at the base (*vide* Fig. 12).
3. Primary basic phthisis.

Cases illustrating several of the conditions here tabulated are described by my colleague, Dr. Percy Kidd, in a paper on "Basic Tuberculous Phthisis,"\* from which I have taken some of the headings here used.

The mere enumeration of the many varieties of disease affecting the bases of the lungs is sufficient to show what caution is necessary before arriving at a diagnosis of primary basic tuberculosis.

\* *Lancet*, October 2nd, 1886.

Dr. Kidd narrates two such cases, being the only instances met with in 412 consecutive cases of phthisis examined post-mortem; he is of opinion that a larger number of examinations would probably reduce the proportion of basic to apical phthisis to 1 in 500. I have not found a single such case in the post-mortem room of the Middlesex Hospital during the last six years, and, as Dr. Kidd very rightly insists, none but pathological evidence can be accepted on this point, for it is only by a prolonged experience in the making of autopsies that one can become adequately impressed with the fallacies attendant upon physical diagnosis.

When the lower lobe is shown on post-mortem examination to have been the site of primary tubercular infection it will, I believe, usually be found that its resisting power and functional activity have been diminished by previous disease either of the lung or pleura, and I notice that in both of Dr. Kidd's cases, already referred to, firm pleuritic adhesions were found at the base.

Increasing experience convinces me of the truth of the theory implied in the term I have here often used, viz., "the line of march of the disease," and also of the fact that in nearly all cases presenting lesions in unusual situations, it is possible by careful inquiry and examination to determine the cause of the departure from the normal course.

I believe that in such cases as show this arrangement most typically the disease spreads chiefly by inhalation of the virus from one point to another through the medium of the bronchi. Where, however, the blood or lymph vessels form the chief channels of dissemination, as for example in acute pulmonary tuberculosis, and probably also in the more acute forms of phthisis, it is difficult to recognise, either during life or on the post-mortem table,

that the lines of extension of the disease are such as I have indicated. This does not, however, diminish the value of such observations as are contained in these pages, provided they are sound, for *the mere fact that no definite line of march can be made out is often in itself of the greatest importance in the prognosis of the case*, as it may indicate that the disease will run a rapid course. One of the chief dangers which beset the subject of chronic or arrested phthisis is the liability at any time to an outbreak of acute pulmonary tuberculosis. In such a case one constantly sees, post-mortem, that whilst the older lesions have followed the course I have described, the remaining and previously healthy portions of the lungs have been rapidly infiltrated with miliary granulations arranged in no definite order. A recognition of the fact on which I have been insisting, viz., that there is a normal mode of extension of the lesions of phthisis through the lungs, has appeared to me, since I have thoroughly appreciated it, of the greatest assistance in the diagnosis of a tuberculous lesion, and also a valuable aid in forming a reliable prognosis, although, so far as the latter point is concerned, it is obvious that many other factors have to be taken into consideration. That in the interpretation of physical signs their exact site is a matter of importance has always been held with respect to lesions at the apices ; my object has been to extend this doctrine to all signs of disease, no matter in what part of the lungs they may be found.

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