

with or after cough and at the end of inspiration. [More rarely squeaks may be heard.] (See Fig. 160).

(b) A slight diminution in the excursion of the diaphragm on the affected side, as shown by Litten's diaphragm shadow.

(c) Slight diminution in the intensity of the respiratory murmur, with or without interrupted inspiration ("cog-wheel breathing").

(a) In examining the apices of the lungs for evidence of early tuberculosis one should secure if possible perfect quiet in the room, and have the clothes entirely removed from the patient's chest. The ordinary hard-rubber chest-piece is better than the chest-piece of the Bowles instrument when we wish to search the apices for fine râles. After listening during quiet breathing over the apices above and below the clavicle in front, and above the spine of the scapula behind, the patient should be directed to breathe out and then, at the end of expiration, to cough. During the deep inspiration which is likely to precede or to follow such a cough one should listen as carefully as possible at the apex of the lung, above and below the clavicle, concentrating attention especially upon the last quarter of the inspiration, when râles are most apt to appear. Sometimes only one or two crackles may be heard with each inspiration, and not infrequently they will not be heard at all unless the patient is made to cough, but even *a single râle, if persistent,*¹ is important. In children who cannot cough at will, one can accomplish nearly the same result by making them count as long as possible with one breath and then listening to the immediately succeeding inspiration. When listening over the apex of the lung, one should never allow the patient to turn his head sharply in the other direction, since such an attitude stretches the skin and muscles on the side on which we are listening so as to produce annoying muscle sounds or skin rubs.

In cases in which one suspects that incipient tuberculosis is

¹ Râles heard only during the first few breaths and not found to persist on subsequent examinations, may be due to the expansion of atelectatic lobules.

present and yet in which no positive evidence can be found, it is a good plan to give iodide of potassium (gr. vii. three times a day) for a few days. The effect of this drug is often to make râles more distinct, and sometimes to increase expectoration so that tubercle bacilli can be demonstrated when before none were to be obtained.¹

(b) The diminution in the excursion of the diaphragm upon the affected side in cases of incipient phthisis has been much insisted upon by F. H. Williams and others who have interested themselves in the radioscopy of the chest. Litten's diaphragm shadow gives us a method of observing the same phenomenon without the need of a fluoroscope. Even very slight tuberculous changes in the lung are sufficient to diminish its elasticity and so to restrict its excursion and that of the diaphragm. Comparisons must always be made with the sound side in such cases, as individuals differ very much in the extent with which they are capable of depressing the diaphragm. It must be remembered that pleuritic adhesions, due to a previous inflammation of the pleura, may diminish or altogether abolish the excursion of the diaphragm shadow, independently of any active disease in the lung itself.

Those who are expert in the use of the fluoroscope believe that they can detect the presence of tuberculosis in the lung by radioscopy at a period at which no other method of physical examination shows anything abnormal. I shall return to the consideration of this point in the section on Radioscopy.²

Interrupted or cog-wheel respiration, in which the inspiration is made up of sharp, jerky puffs, signifies that the entrance of the air into the alveoli is impeded, and such impediment is most likely to be due to tuberculosis when present over a considerable period in a localized area of pulmonary tissue.

¹ Any irritating vapor—for example, creosote vapor—which produces violent cough and expectoration, may be used to expel bronchial secretions in doubtful cases. Tubercle bacilli may then be found in the sputum of patients who, without the irritating inhalation, have no cough and so no sputa.

² See Appendix C.

(2) *Moderately Advanced Cases*

So far I have been speaking of the detection of tuberculosis at a stage prior to the production of any considerable amount of solidification. The signs considered have been those of bronchitis localized at the apex of the lung, or of a slightly diminished pulmonary elasticity, whether due to pleuritic adhesions or to other causes. We have next to consider the signs in cases in which solidification is present, though relatively slight in amount. This condition is comparatively easy to recognize when it occurs at the

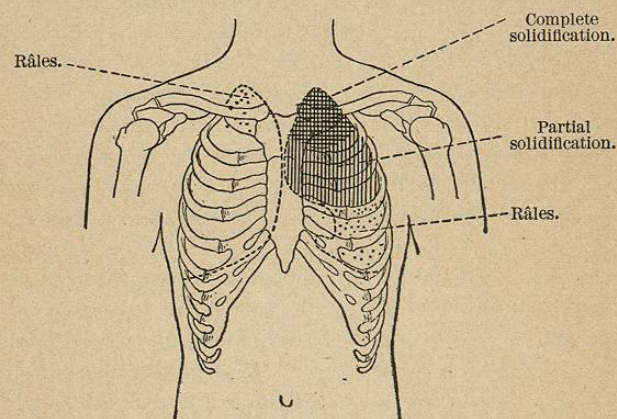


FIG. 161.—Diagram of Signs in Phthisis.

left apex, but more difficult in case only the right apex is diseased. Partial solidification of a small area of lung tissue at the left apex gives rise to

(a) Slight dulness on light percussion,¹ with increased resistance.

(b) Slight increase in the intensity of the spoken and whispered voice, and of the tactile fremitus (in many cases).

¹ Other causes of dulness, such as asymmetry of the chest, pleural thickening, and tumors, must be excluded. Emphysema of the lobules surrounding the tuberculous patch may completely mask the dulness.

(c) Some one of the numerous varieties of broncho-vesicular breathing (true bronchial breathing is a late sign).

(d) Abnormally loud transmission of the heart sounds, especially under the clavicle.

(e) Cardio-respiratory murmurs (*vide* p. 197) are occasionally due to the pressure of a tuberculous lobule upon the subclavian artery. In connection with other signs they are not altogether valueless in diagnosis.

In case there is also a certain amount of secretion in the bronchi of the affected area or ulceration around them, one often hears râles of a peculiar quality to which Skoda has given the name of "consonating râles." Râles produced in or very near a solidified area are apt to have a very sharp, crackling quality, their intensity being increased by the same acoustical conditions which increase the intensity of the voice sounds over the same area. When such râles are present at the apex of either lung, the diagnosis of tuberculosis is almost certain, but if, as not infrequently occurs, there are no râles to be heard over the suspected area, our diagnosis is clear *only* in case the signs occur at the left apex. Precisely the same signs, if present at the right apex, leave us in doubt regarding the diagnosis, for the reason that, as has been explained above, we find at the apex of the right lung in health signs almost exactly identical with those of a slight degree of solidification. Hence, if these signs, and only these, are discovered at the right apex, we cannot feel sure about the diagnosis until it is confirmed by the appearance of râles in the same area of the left side (whether under the influence of iodide of potassium or spontaneously), or by the finding of tubercle bacilli in the sputum.¹

A sign characteristic of early tuberculous changes in the lung and one which I have frequently observed in the lower and relatively sounder lobes of tuberculous lungs is a raising of the pitch of inspiration, without any other change in the quality of the breathing or any other physical signs. The importance of this sign in the diag-

¹ The natural disparity between the two apices is less marked in the supra-spinous fossa behind than over the clavicle in front, and hence pathological dulness at the apex is more often demonstrable behind than in front.

nosis of early tuberculosis of the lungs was insisted upon by the elder Flint in his work on "The Respiratory Organs" (1866), and has more recently been mentioned by Norman Bridge.

It must never be forgotten that tuberculosis may take root in

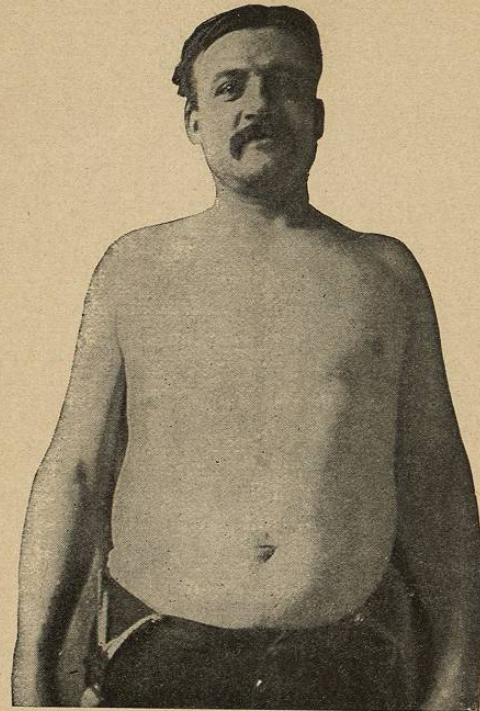


FIG. 162. —This Patient has Solidification at both Apices and Tubercle Bacilli in the Sputa. He feels perfectly well.

the most finely formed chests and in persons apparently in blooming health. The "phthisical chest" and the sallow, emaciated figure of the classical descriptions apply only to very advanced cases. Fig. 162 represents a patient with moderately advanced signs of phthisis and abundant tubercle bacilli in the sputa. He feels perfectly

well and is at work. On the other hand, a patient with very slight signs may be utterly prostrated by the toxæmia of the disease.

(3) *Advanced Phthisis.*

Characteristic of the more advanced stages of tuberculosis in the lungs is the existence of large areas of solidified and retracted lung, and, to a lesser extent, the signs of cavity formation. The patients are pale, emaciated, and feverish. The signs of solidification have already been enumerated in speaking of pneumonia. They are:

1. Marked dulness, or even flatness,¹ with increased sense of resistance.

2. Great increase of voice sounds or of tactile fremitus.

3. Tubular breathing, sometimes loud, sometimes feeble.

4. As a rule, coarse râles, due to breaking down of the caseous tissue, are also to be heard over the solidified areas. Sometimes these râles are produced within the pleuritic adhesions, which are almost invariably present in such cases. If they disappear just after profuse expectoration, one may infer that they are produced within the lung.

Increase in the intensity of the spoken voice, of the whispered voice, or of the tactile fremitus may be marked and yet no tubular breathing be audible. Each of these signs may exist and be of importance as signs of solidification without the others. As a rule, it is true, they are associated and form a very characteristic group, but there are many exceptions to this rule.

The tendency of the spinal column to transmit to the sound lung sounds produced in an area of solidification immediately adjacent to it on the other side, has been already alluded to in the section on pneumonia, and what was then said holds good of tuberculous solidification. Owing to this it is easy to be misled into diagnosing solidification at both apices when only one is affected.

Since solidification is usually accompanied by retraction in the affected lung in very advanced cases, the chest falls in to a greater

¹ Unless senile emphysema masks it. Fibroid phthisis (*vide infra*) may show no dulness. Remember that gastric tympany may be transmitted to the left lung and mask dulness there.

or less extent over the affected area, and the respiratory excursion is much diminished, as shown by ordinary inspection and by the diminution or disappearance of the excursion of the diaphragm shadow. The intensity of the tubular breathing depends on the proximity of the solidified portions to the chest wall and to the large bronchi, as well as on the presence or absence of pleuritic thickening.

It is rare to find a whole lung solidified. The process, beginning at the apex or just below, extends down as far as the fourth

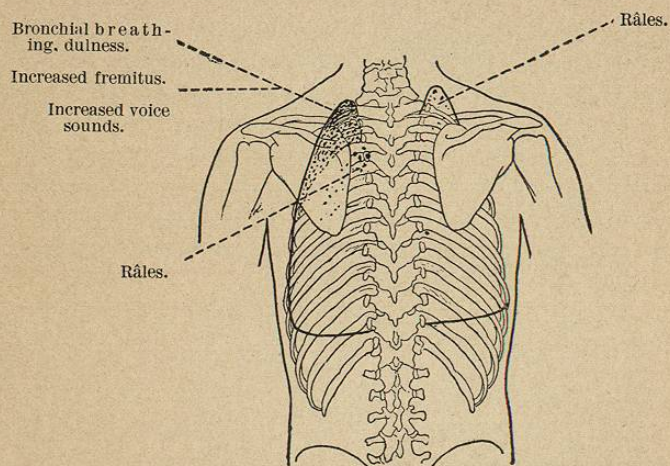


FIG. 163.—To Illustrate Progress of Signs in Pulmonary Tuberculosis.

rib in front, *i.e.*, through the upper lobe, in a relatively short time, but below that point its progress is comparatively slow and the lower lobes may be but little affected up to the time of death. On the relatively sound side the exaggerated (compensatory) resonance may mask the dulness of a beginning solidification there, which sooner or later is almost sure to occur. It is exceedingly rare for the disease to extend far in one lung without involving the other.

About the time that the tuberculous process invades the previously sound lung it is apt to show itself at the apex of the lower lobe

of the lung first affected. Consonating râles appear posteriorly along the line which the vertebral border of the scapula makes when the arm is raised over the shoulder. These points are illustrated in Fig. 163.

Cavity Formation.

Cavities of greater or lesser extent are formed in almost every case of advanced phthisis, but very seldom do they attain such size as to be recognizable during life. Indeed, the diagnosis of cavity in phthisis plays a much larger part in the text-books than it does in the practice of medicine, since to be recognizable by physical examination a cavity must not only be of considerable size but its walls must be rigid and not subject to collapse,¹ it must communicate directly with the bronchus and be situated near the surface of the lung, and it must not be filled up with secretions. It can readily be appreciated that it is but seldom that all these conditions are present at once; even then the diagnosis of cavity is a difficult one, and I have often known skilled observers to be mistaken on this point.

The signs upon which most reliance is usually placed are:

- (a) Amphoric or cavernous breathing.
- (b) "Cracked-pot resonance" on percussion.
- (c) Coarse, gurgling râles.

(a) *Cavernous or Amphoric Respiration.*—When present, this type of breathing is almost pathognomonic of a cavity. It is also to be heard in pneumothorax, but the latter disease can usually be distinguished by the associated physical signs. Cavernous breathing differs from bronchial or tubular breathing in that its pitch is lower and its quality *hollow*. The pitch of expiration is even lower than that of inspiration. Since a pulmonary cavity is almost always surrounded by a layer of solidified lung tissue, we usually hear around the area occupied by the cavity a ring of bronchial breathing with which we can compare the quality of the cavernous sounds.

¹ Yet not so rigid as to be uninfluenced by the entrance and exit of air.

(b) Percussion sometimes enables us to demonstrate a circumscribed area of tympanitic resonance surrounded by marked dulness. More often the "cracked-pot" resonance can be elicited by percussing over the suspected area while the chest-piece of the stethoscope is held close to the patient's open mouth.

Cracked-pot resonance is often absent over cavities; rarely occurs in any other condition (*e.g.*, in percussing the chest of a healthy, *crying* baby, and occasionally over solidified lung).

(c) The voice sounds sometimes have a peculiar hollow quality (amphoric voice and whisper).

(d) Cough or the movements of respiration may bring out over the suspected area splashing or gurgling sounds, or occasionally a metallic tinkle. Flint has also observed a circumscribed bulging of an interspace during cough. Bruce noted a high-pitched sucking sound during the inspiration following a hard cough ("rubber-ball sound").

Very important in the diagnosis of cavity is the *intermittence* of all above-mentioned signs, which are present only when the cavity is comparatively empty, and disappear when it becomes wholly or mostly filled with secretions. For this reason, the signs are very apt to be absent in the early morning before the patient has expelled the accumulated secretions by coughing.

Wintrich noticed that the note obtained when percussing over a pulmonary cavity may change its pitch if the patient opens his mouth. Gerhardt observed that the note obtained over a pulmonary cavity changes if the patient shifts from an upright to a recumbent position. Neither of these points, however, is of much importance in diagnosis. The same is true of metamorphosing breathing (see above, p. 156).

Tuberculous cavities differ from those produced by pulmonary abscess or gangrene in that the latter are usually situated in the lower two-thirds of the lung. Bronchiectasis, an exceedingly rare condition, cannot be distinguished by physical signs alone from a tuberculous cavity.

Fibroid Phthisis.

This term applies to slow tuberculous processes with relatively little ulceration and much fibrous thickening.

In a considerable number of cases the physical signs do not differ materially from those of the ordinary ulcerating forms of the disease, but occasionally when a slow chronic process at the apex of the lung results in the falling-away of the parenchyma of the lung so that we have left a cluster of bronchi matted together by fibrous tissue, the percussion note may be noticeably tympanitic; similar tympany may be due to emphysema of the lobules surrounding the diseased portion. In such cases râles are usually entirely absent; otherwise, the signs do not differ from those of ordinary phthisis, except that falling-in of the chest walls over the retracted lung may be more marked. Occasionally the heart may be drawn toward the affected lobes, *e.g.*, upward and to the right in right-sided phthisis at the apex. In two cases of fibroid disease at the left base, Flint found the heart beating near the lower angle of the left scapula.

Phthisis with Predominant Pleural Thickening.

Tuberculosis in the lung is in certain cases overshadowed by the manifestations of the same disease in the pleura, so that the signs are chiefly those of *thickened pleura*. To this subject I shall return in the section of Diseases on the Pleura (see below, p. 331).

Emphysematous Form of Phthisis.

Tubercle bacilli are not very infrequently found in the sputa of cases in which the history and physical signs point to chronic bronchitis with emphysema. I have seen two such cases within a year. Dulness is wholly masked by emphysema, tubular breathing is absent, and piping and babbling râles are scattered throughout both lungs. The emphysema may be of the senile or small-lunged type, as in one of my recent cases (with autopsy), or it may be associated with huge downy lungs and the "barrel chest." Such cases

cannot be identified as phthisis during life unless we make it an invariable rule to examine for tubercle bacilli the sputa of every case in which sputa can be obtained, *no matter what are the physical signs.*

Phthisis with Anomalous Distribution of the Lesions.

Very rarely a tuberculous process may begin at the base of the lung. When the process seems to begin in this way, a healed focus is often to be found at one apex surrounded by a shell of healthy lung.

The summit of the axilla should always be carefully examined, as tuberculous foci may be so situated as to produce signs only at that point.

Another point often overlooked in physical examination is the *lingula pulmonalis* or tongue-like projection from the anterior margin of the left lung overlapping the heart. Tuberculosis is sometimes found further advanced at this point than anywhere else.

As a rule cases in which signs like those of phthisis are found at the base of the lung turn out to be either empyema, or abscess, or unresolved pneumonia (cirrhosis of the lung).

Acute Pulmonary Tuberculosis.

No one of the three forms in which acute phthisis occurs, viz.,

(a) Acute tuberculous pneumonia,

(b) Acute tuberculous bronchitis and peribronchitis,

(c) Acute miliary tuberculosis, involving the lungs, can be recognized by physical examination of the chest. The first form is almost invariably mistaken for ordinary croupous pneumonia, until the examination of the sputa establishes the correct diagnosis. In the other two forms of the disease, the physical signs are simply those of general bronchitis.

CHAPTER XV.

EMPHYSEMA, ASTHMA, PULMONARY SYPHILIS, ETC.

I. EMPHYSEMA.

FOR clinical purposes, the great majority of cases of emphysema may be divided into two groups.

(1) *Large-lunged* emphysema, usually associated with chronic bronchitis and asthma.

(2) *Small-lunged*, or senile, emphysema.

Although the second of these forms is exceedingly common, it is so much less likely than the first form to give rise to distressing symptoms that it is chiefly the large-lunged emphysema which is seen by the physician. In both conditions we have a dilatation and finally a breaking down of the alveolar walls until the air spaces are become relatively large and inelastic. In both forms, the elasticity of the lung is diminished; but in the large-lunged form we have an increase in the volume of the whole organ in addition to the changes just mentioned.

Large-Lunged Emphysema.

The diagnosis can usually be made by inspection alone. In typical cases the antero-posterior diameter of the chest is greatly increased, the in-spaces are widened, and the costal angle is blunted, while the angle of Ludwig¹ becomes prominent. The shoulders are high and stooping and the neck is short (see Fig. 164). The patient is often considerably cyanosed, and his breathing rapid and difficult. Inspiration is short and harsh; expiration prolonged and difficult. The ribs move but little, and, owing to the ossification of their car-

¹ Formed by the junction of the manubrium with the second piece of the sternum.