[*Reprinted from the Transactions of the American Therapeutic Society, Volume XLVI, 1946*]

WHY IS PHYSICAL EXAMINATION OF THE CHEST BEING NEGLECTED?

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Why do so many clinicians want to see an x-ray of the chest before they will risk a diagnosis? Is it because the x-ray is able to give all the information they desire, or more than can be obtained from a personal study of the patients? Is it because we are too busy to develop skill in the use of our methods of physical examination? Or does the fault lie in the uncertainty of the knowledge that we obtain by examining the chest by the eye, the ear, and touch?

Tuberculosis is the most interesting chest disease that we have to study by means of our senses because it exhibits every form of pathologic process that involves the lungs and pleura—pneumonitis, bronchitis, emphysema, cavity, pleural inflammation and effusion both simple and purulent, and pneumothorax. Then let us inquire why should such skill not be perfected rather than discarded.

Inspection.—Careful inspection will give the examiner valuable information of what is going on within the chest at the time and what has transpired previously. In combination with palpation the reflex spasms and atrophies which are found in the zones of soft tissues of the chest and neck may be detected and assigned to their proper cause. The life history of the disease stands out before one if he knows the reflex relationships between the lungs and pleura on the one hand, and the somatic structures on the other.

Palpation.—Textbooks teach that by palpation one can note such things as the texture of the skin, the presence or absence of enlarged glands, and the vibrations caused by the spoken voice. This is true. But these are the least important of all the things that may be detected by palpation.

The increased tension of the apical muscles when an active tuberculosis is present in the underlying lung; the degeneration of the same muscles and the skin and subcutaneous tissue above the second rib anteriorly and the spine of the scapula posteriorly when the lung is the seat of a chronic or healed tuberculosis, are of the greatest importance. Likewise, the boardiness of the intercostal muscles immediately over the lesion in acute pleurisy, and the degeneration of the skin, subcutaneous tissue, and intercostals over past or chronic lesions anywhere between the second rib anteriorly and the spine of the scapula posteriorly above and the margin of the ribs below, when an inflammatory condition of the pleura has been present in the past, are of great diagnostic acid.

Lagging and lessened motion of the chest wall on one side, or as a whole, or of some particular area, is of great diagnostic significance. Of great importance, too, is the detection of different degrees of density in the tissues according to the underlying pathology noted on palpation.

Percussion.—Physicians learn to recognize differences in quality, intensity, and pitch of the percussion note. They also learn to perceive different degrees of resistance over percussed areas. Many depend far more on the sensation conveyed to the finger than to the sound elicited, and many of our best diagnosticians pay little or no attention to sound but learn to percuss almost without producing sound.

There are errors in percussion as well as in auscultation. A popular text on physical examination published 50 years ago when men depended much on percussion of the chest, described the necessity of using heavy and light strokes according to the depth of the mass that one was attempting to detect, and by illustration showed that on the heaviest stroke the vibrations would not detect densities deeper than nine centimeters Why *nine* centimeters was not stated. Had he placed his hand on the anterior or posterior chest wall, either on or between the ribs, and then had some one deliver a light blow on the opposite side of the chest—so light as to be barely audible—he would have readily detected the vibration.

Heavy percussion is not necessary and confuses because the vibrations extend widely and contact so many structures other than the one percussed. I have also shown that differences usually detected by percussion can also be detected by palpating the surface of the chest.[1] The heart can be outlined as accurately by touch as by percussion.

Another common error in percussion to which I have called attention is the effect of differences in the tension of the muscles upon the percussion note and the resistance to the finger. If the apices of the lungs are percussed with the head turned to the right, it puts the left apical muscles on tension and gives increased resistance to the finger, and a higher pitched note on the left, and vice versa; so percussion should be carried on with the face forward and the neck muscles relaxed.

Auscultation.—Most physicians depend more on auscultation than on any other method of physical examination, but find difficulty in interpreting their findings. The reason is not difficult to discern if we approach the analysis of auscultatory sounds as they are described in textbooks and taught in our medical colleges. Our medical students are taught what is not true, and no one corrects it.[2] The first error is the basic one of an inaccurate description of the respiratory murmur. It is stated in textbooks that inspiration is to expiration as five to three, three to two, two to one, and so on according to the one consulted. Yet if one will listen to normal respiration carefully, he will find that there is very little difference in the two phases. Both are heard throughout their corresponding respiratory cycle; inspiration through the inspiratory phase, and expiration through the expiratory phase which is a little longer.

Let us next inquire into the cause of the respiratory sounds, because our idea of what produces the murmur will determine our interpretation of normal and pathologic sounds.

In 1834, Beau[3] suggested that respiratory sounds are caused by the air passing through the glottis, the sounds being modified by the trachea, bronchi, and the alveoli. In normal chests the alveoli were supposed to dominate the picture and so the "vesicular murmur." In pathologic infiltrations the bronchial elements entered to modify, causing "bronchovesicular" sounds; or to dominate, causing "bronchial" sounds. This was a guess which has determined our teaching for more than a century. Logical, perhaps, if the basic facts were true; but fallacious if untrue.

If the sounds are caused by the air rushing through the glottis and on into the finer air chambers, what causes the sound of expiration? Here the air is passing the other way. What causes the weakness of the murmur in abdominal as compared with costal breathing? The air rushes in—in the same volume and with similar speed. It enters the bronchi and the alveoli the same as in the

costal breather. Why is it so weak in emphysema and rigid thorax? It still enters through the glottis.

Ornstein[4] has given considerable study to the cause of the sounds and sharp edge of the bifurcating bronchus.
has come to the conclusion that the sounds may be explained on the basis of physics and suggests that "the mechanism is similar to the production of a sound in a labial pipe," and that "the sounds are produced throughout the length of the bronchial tree wherever the in-rushing column of air strikes the

Sahli[5] observed a patient with congenital fissure of the sternum and reported that increased intra-abdominal tension caused the lung to protrude and that the filling of the alveoli produced a typical vesicular murmur. The same has been found in inflating and deflating lungs removed from a cadaver.

I have observed and taught for years that muscle sounds may simulate the respiratory sounds. If one listens over a contracting and relaxing biceps, he may hear sounds similar to the respiratory sounds which vary in pitch and intensity according to the tension in the muscles.

Having found that sounds similar to the respiratory sounds can be heard over muscles in various phases of contraction, and that a modified murmur often may be heard over the side of the chest in which a lung is partially collapsed and separated from the chest wall; and that the sounds are usually weaker when the air pressure in the pleura is markedly positive, and in high-grade emphysema where the intercostals are markedly distended; and in rigid thorax where the muscles are functioning very little; I cannot help but believe that we must change our opinions of the cause of respiratory sounds, and assign to them a marked muscular element.

The air current, the bronchi, and the alveoli are intimately involved. That the larynx is of minor importance is shown by the fact that the sounds are heard during bronchoscopy when the air enters through the tube. The musculature of the bronchi which lengthens and dilates on inspiration and contracts and shortens on expiration undoubtedly causes sound vibrations. The muscles of respiration, particularly the intercostals, are undoubtedly important factors. The contraction of the crus and central tendon of the diaphragm influences the murmur and enters into the production of sound regularly. Size and form of the chest cavity, its elasticity, and the superficial muscles as well as those intimately concerned with respiration, are all factors. Thus the respiratory sounds are produced by vibrations set up by the entire respiratory mechanism.

With the inaccuracy in description of the normal murmur, and the probably wrong explanation of the method of its production, is it any wonder that there should be confusion on the part of clinicians who have been taught the error but failed to work out a satisfactory explanation for themselves? That physicians examine better than their teaching would warrant, goes without saying; for each one learns certain sounds and certain modifications of the usual sounds which he learns to interpret in a certain manner.

One more sweeping statement must be made before we start to construct a rational basis for auscultation, that is: No type of murmur or modification of that type always means the same pathology. We would like to think that whenever a pneumonia is present we will find a given sound, and that whenever we find that sound we will find a pneumonia. We would like the same for the various pathologic changes found in tuberculosis, lung abscess, bronchitis, bronchiectasis, and so on; but it is not true.

Now what can be substituted for past teachings so that these statements will not be wholly destructive?

Nothing will be changed unless change is necessary, and not always then. Careful auscultation will show that the inspiratory and expiratory murmurs are of about equal length, that the expiratory sound, while often weaker than the inspiratory, lasts throughout the inspiratory cycle. It will also show that the basic murmur qualitatively and quantitatively differs in different individuals and in different portions of the chest in the same individual. Pulmonary sounds, both normal and pathologic, fail to conform to standardization.

If the normal breath sounds are produced by the several factors which I have suggested, then an infiltrated area would add a hindrance or obstruction to the degree that the elasticity of the pulmonary tissue is decreased. This would hinder both the ingress and egress of air which would be expected to be met by greater muscular effort, or a lesser muscular efficiency. The effect on the respiratory note would show as an impeding of inspiration and slowing (prolongation) of expiration, probably raising the pitch somewhat and prolonging the phases because the air would not have the normal contractility of the alveolar tissues and bronchi to receive or expel it. Possibly an increased effort on the part of the respiratory muscles might be required too.

If all lungs were of the same volume and had the same degree of elasticity; all bony thoraces were equally elastic or rigid; all musculature of equal volume and tension; all larynges were of equal capacity; all pleurae and mediastina were free; and the respiratory demands were the same on each individual, then the normal respiratory murmurs could be described as fixed and definite, and a definite departure might mean a definite pathology. But since these things are not true, each clinician must learn that variability is the rule in supposedly normal breath sounds and must also be so in the presence of pathology.

What the clinician must do then is to find the basic murmur for each chest, and starting with that he will have to note variations In fact, this is what he has been doing regardless of the error that has prevailed in our textbooks.

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