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Palpation, in the Outlining of Organs and Determining Pathological Conditions Causing Different Degrees of Density in the Same Organ: Light Touch Palpation[1]

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SINCE physical examination of the chest was first practiced, inspection and palpation have been considered to be of comparatively little importance. Recently, however, through a study of the motor and trophic reflexes from the lung and through the method described in this paper, inspection and palpation have assumed positions of great importance. In fact, when carefully and intelligently carried out, they will give a surprisingly accurate picture of underlying intrathoracic pathology.

My early study of the muscle changes in tuberculosis caused me to palpate chests with greater care than that which was usually employed. As a result of this I found that one could not only determine the changes in the soft tissues covering the thorax by palpation, but that he could determine the state of the underlying viscera as well. I communicated this observation first to this society (1), and later described it more fully and more accurately in other papers (2, 3, 4, and 5).

[1] Read before the thirty-ninth meeting of the American Climatological and Clinical Association, Washington, D. C., May 2 to 4, 1922.

My first observation was that I could outline the borders of the heart by a very light touch. Later I found that this could be extended to other organs and even to differentiating different kinds of pathology in such viscera as the lungs and pleura. The outlining of the heart by palpation I proved in connection with the orthodiagraph under Schwartz of Vienna, and then extended the method to other intrathoracic and intraabdominal conditions.

In order to emphasize the lightness of palpation necessary to determine these differences in density, I designated the method as "Light Touch Palpation" (2). Much information can be derived from a "touch so light that it scarcely indents the skin"; but I use various degrees of pressure in my every day clinical work, depending upon the information desired. Many times a comprehensive idea of the pathology in a given thorax may be obtained by passing the tips of the fingers or the palmar surface of the fingers and hand over the surface of the chest. I usually stroke the chest from above downward in making this examination; but for more carefully differentiating pathology represented by

different degrees of density in the lungs and pleura, I have personally found that I can do it best by proceeding from areas of lesser density to those of greater density.

Some clinicians have failed to grasp the point that this is palpation and not percussion. Warnecke (6) in a recent discussion of Ebstein's "Tastperkussion" expresses a very common misunderstanding of this method as follows:

> It is now necessary to examine into Pottenger's Light Touch Palpation. I do not recognize that any new principal is discovered in Pottenger's method, since it can only be "Palpatory Percussion" in the sense in which Ebstein has described it. As already mentioned, one must expect to recognize different degrees of intensity to the touch under different conditions; so at times one will necessarily employ a much lighter touch than at other times, but I consider it entirely unnecessary to bring this forth under a new description. It is my opinion that every observer will agree that Pottenger's results can only be thought of as being obtained through "Palpatory Percussion," combined with sound percussion, and that they cannot be obtained through the simple laying on of hands upon the thorax.

Warnecke's assumption that the findings elicitated on feeling over the thorax are due to percussion, and that the information obtained is a result of the resistance to the finger combined with the tone emitted is not true. There is no sound emitted, neither is there any contact between the fingers and the thoracic wall more forceful than that which results from the usual laying on of hands. In fact, when palpating, I usually start either at the apex or base and often palpate a large portion of a lung without removing my fingers from the surface of the chest.

I am conversant with Ebstein's Palpatory Percussion (7), but Light Touch Palpation as described by me is totally different. There is no stroke at all. It consists of feeling and interpreting the varying degrees of resistance which are conveyed to the fingers.

If one will palpate a piece of board one-quarter of an inch thick and compare it with another piece two inches thick, the difference can readily be perceived. With practice one can learn to detect slighter and slighter differences in thickness. So is it in palpating the various organs of the body. At first, only such gross changes as those between a solid organ such as the liver or the heart, and an air-containing organ such as the lung, may be detected, but with practice, as one becomes proficient, he may outline any organ or any pathological condition which alters the density of an organ by utilizing the sense of touch, the same as he can by the more complicated method of percussion.

Those who are not accustomed to make such examinations by palpation, but who are trained in percussion, will probably not agree with me that palpation is less complicated than percussion; but this disagreement is due to the fact that the things we know usually seem simple while those we do not know often seem to be complex and difficult to understand.

Palpation as herein described is carried out in such a manner as to give one the maximum amount of information from the use of the sense of touch. He simply *feels*. The surprise when one fully learns this art is that he feels so much and so deeply. It is so contrary to our usual grasp of the idea of feeling, which confines it

to those superficial objects which come in direct contact with the nerves which give us our touch sense, that we are apt *a priori* to consider the determination of different degrees of density in the deeper structures as impossible. One of the chief ways, however, in which progress is made, is by doing something which has hitherto been considered as impossible.

Outlining deep organs and differentiating pathological conditions which cause differences in density in the same organ when the palpating finger does not come into contact with the organ involved seems impossible, but it is not; it is a regular procedure carried out every day by my assistants and myself in our clinical work. Hearts are outlined; shifting of the mediastinum is recognized; borders of the lungs are determined, infiltration, cavities and compensatory emphysema are diagnosed; hilum thickening, and the enlarged bronchial trunks are determined; and conditions in the pleura such as fluid and air and pathological thickening are recognized as accurately by feeling through the chest wall as can be done by percussion.

The chief advantage that palpation possesses over percussion is that it can be more accurately limited to the area examined. A percussion stroke over the thorax produces evidence of two kinds, (*a*) through the sense of touch, and (*b*) through the sense of hearing. The resistance and the tone emitted are both resultants of many factors, such as the amount and condition of the soft tissue; the size, shape and elasticity of the bony thorax; and the size, shape and actual condition which results from past and present pathological changes in the pleura, heart, mediastinal structures and lungs. Further these are altered by such things as pathological conditions in the abdomen; gas in the intestinal tract; the position, whether lying or sitting; the objects on which the patient lies or sits; and objects which are nearby. If each organ and each physical condition found in an organ had its particular tone and its particular resistance which was always characteristic of it, and these were never unduly modified by other conditions, then percussion would be only a matter of practice; but it is an individual matter differing with every patient. Few men are expert, and comparatively few are above the average in percussing and interpreting the data obtained. Unfortunately because of having studied percussion most examiners are willing to offer an opinion based on this procedure, and they usually interpret these findings as though the pathology which they are seeking is responsible for all data obtained.

Percussion data, whether obtained by resistance or by sound, are records of normal conditions plus the past and the present pathological history of each individual in the part examined, and must be so interpreted.

No matter how light the stroke, the sound emitted will be largely made up of elements which arise from structures outside of the organ or area percussed. The resistance is influenced in the same manner but is more definitely confined to the area under examination when the stroke is light. Teachers of percussion, recognizing the confusion which arises in interpreting percussion sounds, and the extraneous factors which modify resistance when the

stroke is heavy, have been gradually urging very light percussion. Turban (8) was an early teacher of the value of the sense of resistance. I would suggest that accuracy often can be further increased by omitting the stroke entirely and simply feeling.

No one must think, however, that this method is without its difficulties and its errors. Nor do I suggest it to displace percussion, but rather to combine with percussion and thus increase the evidence in the case.

In instances of rigid thorax, in emphysematous chests, in thickened pleura with disease in the underlying lung, one's skill in examining will be taxed in palpating the same as in percussing.

One of the sources of failure on the part of men who try to test out this method, is that they expect to master it at once and without much difficulty. All examining procedures used in diagnosing chest conditions are difficult to learn and are mastered only after much practice. Nor must anyone think that he can learn this with less difficulty than he learned percussion; and, until it is taught by teachers of physical diagnosis, it must be learned without a teacher by men who are more or less familiar with other methods. Thus this unique test is at great disadvantage. Its value, however, is beyond question and I commend it to the patient consideration of those who wish to help add another valuable diagnostic measure to our too limited methods of finding out what pathology lies within the thorax. It can be used in examining all organs of the body, but it is in the chest that we are most in need of more accurate methods.

METHOD

For those who are desirous of learning this method I would suggest three visceral borders as being easiest to make out: (*a*) the left border of the liver; (*b*) the upper border of the liver in the right axilla, and (*c*) the left border of the heart in the fourth interspace. In determining these borders one proceeds in palpating in each instance from a tissue of slight density to one of greater density, or the reverse. It is much easier to detect the border of a solid organ than to detect different degrees of density in the same tissue.

Palpation must often be done through the ribs, a thing which might at first seem impossible but which is not. One of the striking facts connected with palpation is that organs and various pathologic conditions in the same organ can be delimited through bone as well as through soft tissue. The lung can be examined and infiltration and cavities made out by palpating through the scapula. The caution should be given, however, when carefully examining for changes in density of tissues or for the border of an organ such as the liver or the heart, to restrict palpation either to the intercostal spaces, or to the ribs, not to palpate from one to the other. If one passes from the intercostal spaces to the ribs or the reverse, it is difficult to accurately measure the differences in resistance which are due to differences in these superficial tissues, hence difficult to accurately judge of the density of the underlying tissue.

In order to determine the left border of the liver, the examiner should palpate over the lower ribs just below

the heart, beginning well out toward the axilla and palpating slowly toward the median line. The normal left border of the liver lies under the left costal arch below and slightly to the left of the apex of the heart, and will be recognized as an increased resistance to the finger.

The upper border of the liver may be found by starting the palpation in the intercostal spaces high up in the right axilla and gradually approaching the position of the upper liver margin. I usually use two fingers, either the first and second, or the second and third, and palpate two intercostal spaces at one time. Acute pleurisy, either dry or with effusion, and thickened pleura are the most common conditions which interfere with this procedure. The margin of the liver is recognized by an increased resistance to the fingers.

The left border of the heart in the fourth interspace is comparatively easy to find in normal chests, because one finds a fairly large volume of air containing lung tissue to compare with the dense muscle of the heart. It is very confusing in many chests, however, particularly those which have been the seat of influenza, pneumonia or repeated attacks of bronchitis, which have left the patients with dense hilum and thickened bronchial walls, also those structures that lie immediately to the left of the heart border, and give an impression of increased density which can be readily mistaken for the heart. The same confusion exists in determining the right border. I, personally, often have been confused by these conditions. They can be differentiated by care, but often prove to be very confusing to a beginner. An emphysematous left lung or a dense pulmonary infiltration is also confusing.

I would suggest that one learning this palpatory method should first outline the organs by percussion or follow an X-ray plate. This would make the beginner feel surer of his results.

After one has learned to outline and delimit such denser organs as the heart and liver, he will then begin to see the many possibilities which palpation offers. It is in determining the various pathologic states which attend pulmonary tuberculosis that I have found its greatest use.

Having learned to appreciate the resistance which is offered by normal lung tissue, one is then ready to note abnormalities. Healthy lung has a normal feeling as it is palpated through the thoracic wall the same as it has a more or less definite feeling and emits a more or less definite note on percussion and the same as it gives a more or less definite sound to the ear or stethoscope. While these data vary in different chests, yet we learn through experience that such and such data are within the range of normal variation.

The results obtained by palpating normal lungs will also vary; but one characteristic will always be the same—increased pressure over the deeper tissues will always fail to produce markedly increased resistance. My meaning can be ascertained by palpating over the heart or liver, or over the muscular portions of the leg and comparing with the lung. Increased pressure over the former meets markedly increased resistance; while over the latter, it elicits comparatively little change.

One must always bear in mind in palpation the same as in percussion, that the rigidity of the bony cage; the thickness and condition (normal, spasm or degneration) of the muscles; the thickness or other condition of other soft parts; the thickness of the bony structure through which he is palpating; the nearness to the insertion of the muscles; the nearness to the junction of the ribs with the sternum and vertebrae; and the relative amount of solid and air containing tissues, will alter the findings.

EVIDENCE OF DISEASE AS SHOWN BY "LIGHT TOUCH PALPATION"

With these things in mind one is ready to examine the lungs by palpation. The examination must be systematically made. It is well to first palpate portions of the lung which are resonant. This often may be inferred from inspection, by noting those areas which move most freely, the motion appearing to be normal or above normal in amount; or it may be determined by percussion and auscultation. Such areas are to furnish a comparative palpatory resistance by which other areas are to be judged. To one who can appreciate the difference between a solid and an air containing organ, the difference between an infiltrated and normal lung, should be quite easy to differentiate.

Where evidence of pleural adhesions or other basal thickening is absent, I prefer to start at the base in the axillary region and examine each intercostal area systematically going from the axilla toward the median line, noting each change in resistance. In chests, either of tuberculous or non-tuberculous individuals which have been the seat of bronchial infections, one will usually note an increased resistance around the hilum extending out into the lung tissue and over the area lying to the left of the upper two-thirds of the heart and to the right of the sternum, and posteriorly several centimeters on each side of the vertebral column extending from the midscapular region toward and often continuing to the base. This will correspond to the dense shadows which are shown in the X-ray plate and are due to the thickenings which occur in the hilum tissues and bronchial walls.

In cases showing tuberculous infiltration, in palpating from healthy to diseased tissue (and this can usually be done by starting the examination in the lower intercostal spaces and examining each higher space in succession) one will notice an increased resistance when the lower border of the area of infiltration is reached. The resistance will vary with the difference in the pathological processes present. The extent and relative amount of active infiltration and scar tissue will cause differences which will be perceived by the palpating finger. Light infiltration shows very delicate changes in the resistance perceived, while dense infiltrations may at times feel much like such solid organs as the heart and liver or a large muscle mass. The fixing of the upper segments of the chest by spasm of the scaleni in early pulmonary inflammation, is usually readily detected as an increased resistance.

Cavities usually form in the midst of a densely infiltrated area, and may be suspected because of this fact. On palpating over an area of infiltration which is marked by an increased

resistance, cavity is suspected by a sudden decrease in resistance. A decreased resistance surrounded by an area of increased resistance is probably one of the most dependable signs of cavity. Cavities are most easily palpated in the first and second interspaces anteriorly, although they may be detected in other areas even through the scapula if extra care is used. Error will sometimes occur in the second intercostal space in case it is wide; for under these circumstances the finger will sink deeply, because the resistance is less than normal.

Compensatory emphysema usually occurs in pulmonary tuberculosis as a result of prolonged coughing and when lung tissue has been destroyed and conditions are such that the intrathoracic space can be better filled by enlargement of pulmonary air cells than by such other compensatory measures as elevation of the diaphragm and contraction of the thoracic wall. It produces a relatively greater volume of air containing tissue, hence theoretically presents to the palpating fingers a feeling of resistance less than even that of the normal lung. Actually this is not true, for the enlargement of the air cells is usually accompanied by an increased tension and expansion of that portion of lung tissue involved which presses upon the inclosing thoracic cage causing increased tension of the intercostal tissues, and holding the thorax in a state of inspiration. This increased tension gives a feeling of increased resistance to palpation; but that it is not due to increased density may be readily determined by the fact that on heavier palpation—increased pressure—the resistance does not increase. A dense tissue when palpated lightly offers a sense of resistance which is increased by increased palpatory pressure; but an increased resistance over the lung which is due to increased tension fails to offer greater resistance on heavier pressure.

Pneumothorax either as a result of spontaneous rupture or artificial measures, if large, gives an increased tension with a decreased resistance on heavier pressure the same as compensatory emphysema. My meaning may be gained by palpating a balloon in different degrees of distention.

Pleural effusion, emphysema, and thickened pleura may be detected by palpation. They show an increased resistance to the palpating finger. The former two may cause wide and bulging intercostal spaces, while the latter is usually accompanied by a narrowing of the same.

Enlarged mediastinal glands and thickening about the hilum may be detected by palpation. In order to detect these I usually begin high up posteriorly and palpate with two fingers, one on either side of the spinal column. As one approaches the denser tissue the increased resistance may be noted.

The data obtained upon palpation as herein described are entirely aside from the changes which are noted in the muscles and subcutaneous tissues as a result of reflexes from the lung and pleura. Changes in soft tissues such as spasm of muscles, and degeneration of muscles and subcutaneous tissue, must always be taken into consideration, however, when palpating the deep tissues, because anything that changes the density and elasticity of the muscles and subcutaneous tissue influences to that extent all findings

noted on palpating the deeper structures. I have purposely discussed this phase of palpation alone, in order to avoid the confusion that often comes to the mind of the reader when I discuss the outlining of organs and different pathological conditions in organs by touch at the same time that I discuss the changes which are perceived in the muscles and subcutaneous tissue as a result of reflex stimulation when the lung is inflamed. These two methods of examination are entirely different both as to the procedure in their execution and in the data obtained.

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