

# The History, Methods, Rules and Clinical Applications of Percussion

By "Two students"

Percussion is one of the four clinical means of examination to which a doctor has to resort at the bedside, the others being inspection, palpation and auscultation. Whilst it is relatively unimportant in the examination of the abdomen, it is more important when examining the heart, although even here one cannot be too sure of the deductions arrived at. Whilst in examining the respiratory system, percussion is one of the most important, if not the most important, method of examination.

The importance and practicability of percussion as a method of clinical diagnosis was first discovered by Leopold Auenbrugger (1722-1809), a Viennese physician and son of an inn-keeper. In trying to determine the amount of wine which his father's barrels contained, Auenbrugger used to percuss the tops of the barrels, noting that the sound varied from dullness to tympanic as the barrels from full became empty. He applied these principles in examining patients' chests, and in 1761 he published a 97-page book with the title "*Inventum Novum Ex Percussione Thoracis Humani*". In its preface he wrote "I here present the reader with a new sign which I have discovered for detecting diseases of the chest. This consists in the percussion of the human thorax whereby according to the character of the particular sound elicited, an opinion is formed of the internal state..... In making public my discoveries, I have not been unconscious of the dangers I must encounter, since it has always been the fate of those who have illustrated or improved the arts and sciences by their discoveries, to be beset by envy, malice, hatred,

destruction and calumny." Brilliant though he was in his discovery of percussion Auenbrugger was wrong in his prediction of the discovery as it did not impress the medical world, and was treated with indifference, and nearly forgotten.

In the early 19th Century, Corvisart, a French physician, discovered this book and at once saw the potentialities of such a method as a means of diagnosis. He translated the book, amplified it nearly to 400 pages by his own observations, but very gallantly gave all the praise to Auenbrugger. Poirry, another French physician, also took up the method, and was another great influence in introducing percussion to the medical world.

Once percussion took root and became the physician's stand-by, certain constant peculiarities of resonance, hyper-resonance and dullness over or around the diseased area were noted by physicians and were afterwards known by their name. For instance, it was Skoda who found out that over a liquid level the lung is hyper-resonant and afterwards this hyper resonance became known as Skodaic resonance. Kronig's Isthmus is another example of this.

Percussion as we know it today is not very different from the original method. Direct percussion was first practised and this consisted of the chest wall being struck directly with the fingertip of one hand or with a percussion hammer. This method is unsatisfactory for many reasons and has generally been discarded. It is applied only when percussing the clavicle, when the examiner taps lightly over the most prominent part of the clavicle, making

sure that the points examined correspond exactly with each other.

Nowadays, indirect percussion is used. The fingers of one hand are placed flat on the place to be percussed and one of them is struck smartly with the tip of the finger of the other hand. The chief advantage of this is that not only can the percussion sound be appreciated by the ear, but also the percussion vibration can be felt by the fingers on the chest wall. This tactile perception can, with practice and experience, become so highly sensitive, to the extent that percussion can be practised even if the doctor is stone deaf. So much so, that in light percussion, tactile appreciation is at least as important as aural. It should always be the aim to keep percussion as light as possible. Heavy percussion causes large areas of lung to resonate and so small patches of impaired resonance is overlooked.

When percussing it is essential that the "anvil" finger be placed fully extended and flat against the part to be percussed. It should also be adapted to any irregularities of surface, so that no air space is interposed between it and the skin. The "hammer" finger must strike it perpendicular just proximal to the base of the nail. As soon as the blow has been given, the "hammer" should "bounce" off the "anvil", lest it should impair the vibration it has excited. Percussion should be a wrist, not an arm or a finger movement, and the wrist joint must move loosely. The middle finger of each hand is mostly used as both hammer and anvil, and in percussing the lungs, one must, as far as possible, percuss in the intercostal spaces, in order to obtain maximum resonance. This is not always possible in obese or muscular patients as the spaces may be difficult to find.

There are three major rules to be remembered when percussing:—

- (i) In percussing the boundaries of any organ, one must percuss from a resonant to a less resonant place.
- (ii) The longer axis of the pleximeter finger should always be parallel to the edge of the organ percussed.
- (iii) The pleximeter finger should always be kept in firm contact with the chest wall.

The character of the sound elicited varies with the strength of the blow and with the capacity of the part to resound the blow. The principle sounds heard are:—

- (i) *Tympanitic* — when the air in the cavity is of sufficient size to be sent into vibration, and is not modified by excessive tension of the wall of the wall of the organ. This is commonly heard over the stomach.
- (ii) A *Resonant* note is heard when the air-containing organ is divided into small loculi. This is heard over healthy lung tissue.
- (iii) *Dullness* on percussion is always heard over solid organs such as the liver, spleen, etc.

As the full treatment of the subject on percussion. The dullness shifts abdomen would take pages and pages, it is quite out of the scope of a short essay, and therefore it will here be treated in brief.

*Percussion of the Abdomen* is, except in very few circumstances, a somewhat unrewarding procedure. Care should be taken that percussion be light and so the stroke should not be too heavy. The note elicited should be tympanitic throughout except over the regions of the splenic and liver dullness, and over a distended bladder. Enlargement of these organs can be confirmed by percussion. Absence of liver dullness denotes air or gas in the

peritoneum, which is a sign of perforation of a viscus, usually a perforated duodenal or gastric ulcer.

Free fluid in ascites gives a dull note on percussion. The dullness shifts with the position of the liquid as the patient changes his position from side to side. This is called *shifting dullness* and can be elicited when the patient is rolled from one side to another, always giving time for the intestine to float on to the surface before percussing, the dullness always being elicited on the lower flank, the upper flank being resonant.

A *fluid thrill* may also be palpable in ascites. This is elicited by placing one hand flat on one side of the abdomen, and the other side is flicked rapidly by the other hand. A distinct impact is felt to pass from one hand to the other. To counteract the presence of fat which simulates the fluid thrill through the abdominal wall, an assistant should place the ulnar side of his hand firmly on the middle line of the abdomen whilst percussion is being made.

*Percussion of the Heart* provides little information which can only be ascertained by X-rays, as percussion alone might give fallacious results.

The heart produces a dull note on percussion, and therefore, cardiac enlargement can theoretically be noted, as also pericardial effusions and aortic aneurisms. Also, absence of cardiac dullness over the usual area of total cardiac dullness generally denotes hypertrophic emphysema.

In percussing the heart, one must first percuss the sternum over the angle of Louis, to detect any aortic aneurism, which in that case can be mapped out as a dull area over the heart. Then the aorta and pulmonary trunk should be examined for hypertrophy. This is done by percussing lightly over the second and third interspaces just to the right and left of the sternum res-

pectively. The percussion stroke should be light and the pleximeter finger should be struck on the distal phalanx and not on the middle phalanx, as is usual. Dullness here denotes hypertrophy. Enlargement of the right ventricle to the right can be noted by percussing midway on the line joining the apex beat and the liver dullness. This spot is normally resonant and is dull when the right ventricle is hypertrophied. The left cardiac border can rarely be found accurately, but can approximately be found by percussing rapidly and lightly across the left breast, starting from near the shoulder towards the heart with the pleximeter finger parallel to the edge of the heart. In order not to prejudice the aural note, one must look away whilst percussing.

As stated before, everything discovered by percussion is relative and has to be ascertained by X-rays.

*Percussion of the Lungs* is an important part in the examination of the chest, and many important conclusions can be drawn from it.

The normal degree of resonance varies from individual to individual and in different parts of the chest. It is most resonant below the clavicle and beneath the scapula where muscles are thin, and resonance is least over the scapulae.

Beginning in front, the examiner should tap lightly over each clavicle, observing the sound and comparing the sound on one clavicle to that on the other. Thereafter, the areas on either side should be compared, many points being systematically percussed over each area.

After the front has been examined the axillary and infra-axillary areas should be percussed with the patient holding his hands joined above his head, and lastly the various areas posteriorly should be systematically work-

ed out.

The normal degree of resonance by lung tissue is resonant but in certain conditions the note varies with the lung or pleura underneath. *Resonance is increased* when the pleural cavity contains air, as in pneumothorax. Large cavities also elicit a hyper resonant or tympanitic note under certain conditions, but many cavities do not do so.

Resonance is also increased in most cases of emphysema, but the character and pitch of the note obtained may be so altered, due to the rigidity of the chest wall, that sometimes the sound is suggestive of dullness.

Skodaic resonance is heard above the level of pleural effusion or in the upper portion of the lung whose lower lobe is affected by consolidation.

*Resonance is diminished* when the pleura is thickened, when the lung is, for some reason or other, more solid than usual, or when the pleural cavity contains fluid. In fibrosis and infiltration by Tuberculous bacilli in the lung, the part affected is not aerated as well as usual, and therefore there is a slight impairment of resonance.

Over a lung abscess, neoplasm, fibrosis or collapse, the note is distinctly dull, whilst an absolutely dull note is elicited over completely consolidated lobes in pneumonia. On any pleural effusion of any size, the tactile appreciation of "stony dullness" is very characteristic, whilst in heart failure, dullness or impaired resonance can be found at the bases indicated in oedema or bilateral effusion of both bases.