

Medical Percussion

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To employ one mode of exploration to the exclusion of others would be proof of poor judgment.

Pierre A. Piorry, 1828

Leopold Auenbrugger (1722–1809) was the inventor of medical percussion.^{1–3} In 1761, Auenbrugger published his dissertation about percussion, in which he described dullness to percussion as a sign of pleural effusion or consolidation. Unfortunately, Auenbrugger's professors paid scant attention to his observations. But in 1808, Jean Corvisart (1755–1821), one of the fathers of internal medicine, found Auenbrugger's work on percussion. Corvisart translated the paper into French, and percussion became an established part of the physical examination.² Pierre A. Piorry (1794–1879) first described cardiac percussion in 1828.⁴ Piorry invented topographical percussion and was a proponent of finger-to-finger percussion, as opposed to Auenbrugger's one-handed percussion.

In recent years, the development of modern diagnostic technologies has brought a decline in physical examination skills, including the use of medical percussion. Percussion is only briefly addressed in medical school and clerkships.

Percussion is most useful in examination of the lungs and the abdomen. The heart can also be percussed. Otherwise, use of percussion is limited. It is imperative that findings obtained from percussion are evaluated within the context of the patient's history and other parts of the physical examination.

GENERAL TECHNIQUE

To obtain maximum information from percussion, a proper technique should be used.^{1,5–7} Generally, one hand is used as a base. Most frequently the dorsal aspect of the middle third phalanx is struck (**Figure 1**). This finger should be firmly placed on the skin, away from bony prominences. Preferably series of two blows are applied in each position with equal force. Blows must be delivered by bending the wrist only.

MEDICAL PERCUSSION SOUNDS

NORMAL PERCUSSION SOUNDS

Resonance: heard over lung tissue

Tympany: heard over most portions of the abdominal cavity

Dullness: heard over solid organs (eg, liver) and muscles

ABNORMAL PERCUSSION SOUNDS

Lung: *dullness*, which may be produced by pneumonia, tumor, infarction, or fluid collection; *hyperresonance* or even *tympany*, which may result from confluent air collection, as seen in pneumothorax or emphysema

Abdomen: *dullness*, which may be produced by intra-abdominal tumors or masses; *shifting dullness* may indicate presence of ascites

Heart: an expanded area of *dullness* may indicate cardiomegaly or pericardial effusion

Percussion Sounds

Three basic medical percussion sounds are described: resonant, tympanic, and dull. The resonant sound is heard over normal lung tissue. The tympanic sound is heard over most portions of the normal abdominal cavity. The dull sound is elicited over solid organs (eg, the liver) as well as muscles. The hyperresonant sound has a quality between the resonant and the tympanic sounds. The relatively dull sound has a quality between the dull and the resonant sounds.^{1,5–7}

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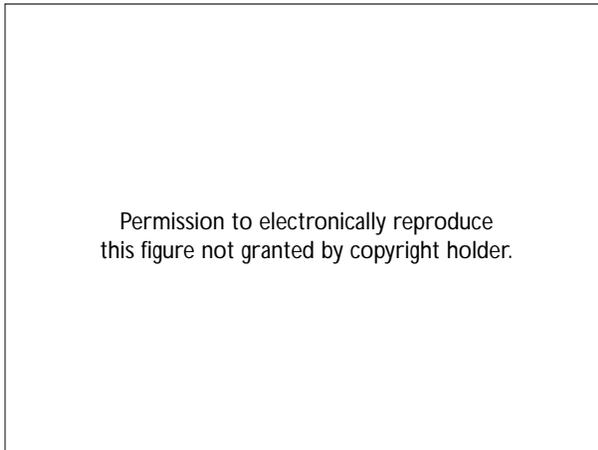


Figure 1. Proper position of hands during percussion. Adapted with permission from Adams SL, Gore M: Diagnostician's digit: a repercussion of percussion. *JAMA* 1997;277:1168.

Medical percussion may be comparative or detailed. Both approaches are used concomitantly. Comparative percussion is based on the comparison of sounds at both sides of the symmetrical organ. When the lack of symmetry is detected, detailed percussion is employed in order to localize pathology.

PERCUSSION OF THE LUNGS **Technique**

The first step in percussion of the lungs is the comparative percussion of both the anterior and posterior lung fields. Normal lung tissue will produce the resonant sound. Posterior lung fields are percussed with the base finger placed in the suprascapular, paravertebral, and infrascapular regions. This position should be used at the same level on both sides to check for asymmetry. Subsequently, anterior lung fields are percussed starting from supraclavicular regions to evaluate lung apices. The pectoral and the axillar regions are then percussed.

Following comparative percussion, the inferior lung borders are estimated. These borders are typically located at the level of the 10th rib at the scapular line, at the level of sixth rib at the midclavicular line, and at the level of the seventh rib (right) or the ninth rib (left) at the axillar line.⁵⁻⁷

To estimate lung expansion, the examiner should percuss the inferior lung border during normal respiration and then ask the patient to take a deep breath and hold. The border in a normal subject will descend approximately one intercostal space—ie, 3 to 4 cm. If the sound is abnormal (ie, not resonant) over the lung fields, a detailed percussion of the area of the abnor-

mal sound should be performed. This enables localization and further delineation of the abnormality.^{1,5-7}

Abnormalities on Lung Percussion

A dull sound is produced by a consolidation (eg, pneumonia, tumor, infarction) or a fluid collection (eg, effusion, empyema) within the lung tissue. Hyperresonance or even tympany results from a confluent air collection in the lung or chest, as seen in pneumothorax or emphysema.

A dull sound due to pleural effusion is usually located at its highest point at the axillar line. On chest radiograph, the dull sound represents the highest point of the Ellis-Damoiseau line.⁷ At the paravertebral line, just at the border of the lung, an area with lesser dullness at the side of the effusion may be heard (**Figure 2**). This has been named the Garland's triangle.⁷ On the contralateral side, an area of dullness over the normal lung (Grocco's triangle)¹ may be detected.

Fibrosis or consolidation of lung apices may result in narrowing of the resonant space in the supraclavicular region (called Krönig's isthmus).¹

PERCUSSION OF THE HEART **Technique**

Percussion may provide an estimate of a patient's heart size.^{1,8} Initially, the area of decreased resonance or relative dullness is heard just at the right sternal border; this comprises the right border of the heart. At the left sternal border, dullness becomes absolute; this area is where the heart is closest to the chest wall. The absolute heart dullness extends approximately 3 to 4 cm to the left from the left sternal border. Percussion in the left parasternal line estimates the superior heart border. The relative dullness starts at the third intercostal space, and the absolute dullness occurs at the fourth intercostal space. The left heart border is percussed at the fifth intercostal space starting from the axillar line. The relative dullness begins at the left midclavicular line and becomes absolute 2 to 3 cm medially. The inferior heart border is not amenable to precise percussion.

Limitations of estimating heart size with cardiac percussion are due to constitutional factors (eg, obesity, large muscles or breast tissue) and lung disease. Coincidentally, the same is true for the echocardiography.

Abnormalities on Cardiac Percussion

An increase in the size of the absolute and/or relative heart border signifies cardiomegaly. A large pericardial effusion produces the most spectacular increase in heart dullness. A small notch (Sibson's notch)¹ at the outline

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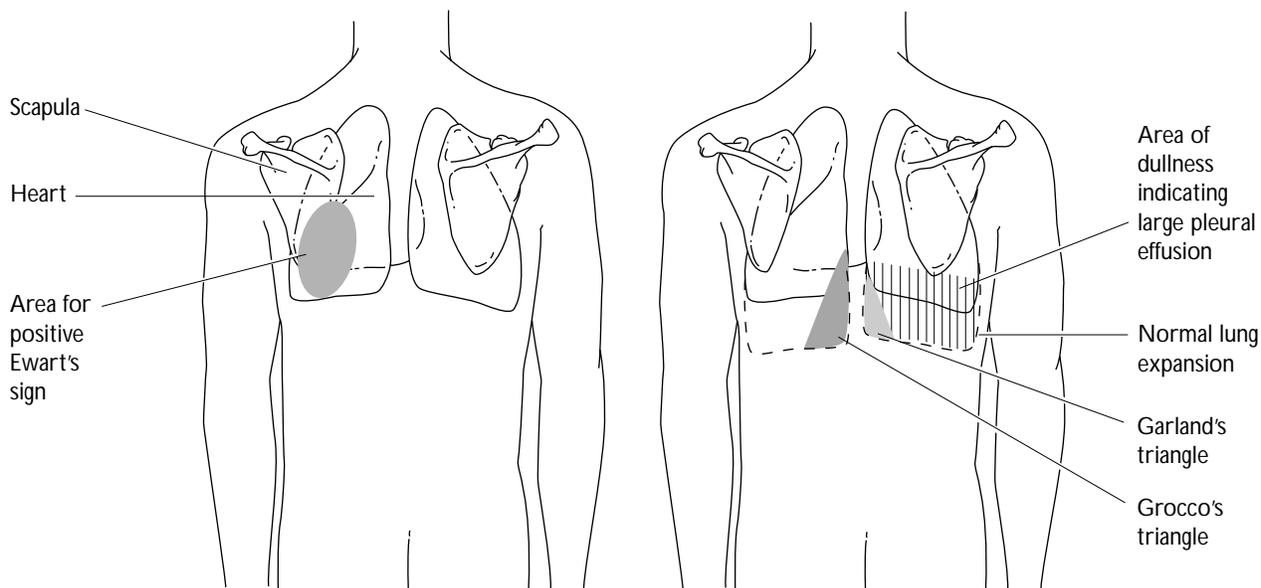


Figure 2. Areas of dullness on cardiac and pulmonary percussion. Adapted with permission from Parrino TA: The art and science of percussion. *Hospital Pract (Off Ed)* 1987;22(9A):28. Original illustration by Susan C. Tilberry.

of large pericardial effusion located at the left second intercostal space may be noticed. Pericardial effusion may also be detectable as an area of dullness near the lower angle of the left scapula; this is termed Ewart's sign¹ (Figure 2).

PERCUSSION OF THE ABDOMEN

Technique

On general percussion, the tympanic sound is heard at most regions of the abdomen. Different qualities of the tympanic sound at various areas of the abdomen are caused by uneven location of abdominal gas. The liver is percussed at the right midclavicular line. The dull sound typical of a normal liver starts at the upper edge of the sixth rib and ends at the lower edge of the 10th rib just at the costal margin.⁹ The spleen can be percussed at the area parallel to the left 10th rib at the left anterior axillar and axillar lines.⁵⁻⁷ Spleen percussion produces relative dullness, because only a small surface of the normal spleen is superficial enough to be detected. It is somewhat easier to percuss the spleen in a patient placed in the right decubitus position.

Abnormalities on Abdominal Percussion

Dullness can be produced by intra-abdominal tumors or masses. Dullness can also be produced by a distended urinary bladder or pregnancy. If the dullness shifts with the position of the patient (shifting dullness), this usually indicates the presence of ascites.^{10,11}

Another method to evaluate for ascites is a combination of one-handed percussion and auscultation: The patient is placed in the prone position for several minutes and then asked to elevate his or her body using all four extremities. The diaphragm of the stethoscope should be placed on the most dependent part of the abdomen. Then, the lateral abdominal region is directly percussed with the third finger. Increasing resonance with movement of the stethoscope toward the percussing finger indicates presence of ascites and is called the "puddle" sign.¹² Using this method, fluid amounts as small as 125 ml can be detected.

In hepatomegaly or splenomegaly, an increased area of dullness is heard over these organs. A metallic sound suggests an increased amount of abdominal gas. Costovertebral angle tenderness to one-handed percussion (Goldflam's sign)⁷ is a sign of nephrolithiasis or pyelonephritis. At this area, percussion is done with the fist.

A similar sign—Chelmonski's sign⁷—can be elicited over the gallbladder: One hand of the examiner is placed on the right costal margin, and the fist of the other hand is used to hit the base hand while the patient is trying to hold a deep breath. Presence of tenderness indicates cholecystitis.

SUMMARY

Despite rapid expansion of imaging studies, physical examination remains the foundation for proper

patient evaluation. Physicians have practiced medical percussion for more than 200 years. As part of the physical examination, it is both an art and a science.^{1,3,4} When applied with appropriate technique and knowledge, medical percussion is an important component of physical examination.^{1,6,7} The role of percussion remains significant in the evaluation of pleural effusions and pneumothorax.⁵ For example, hyperresonance at the time of emergency evaluation of a chest trauma victim may indicate need for the immediate needle decompression without obtaining any radiographs. The role of percussion is limited in the evaluation of the heart.⁹ Percussion can also provide information about the size of the solid abdominal organs and the presence of ascites.¹¹

In the era of technical medicine, it is imperative that physicians master and maintain skills in physical examination. Instruction in performance of medical percussion seems to be urgently needed, as percussion becomes obscure to numbers of medical students. HP

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