Percussion, auscultation

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The physical principles of the percussion

- Percussion sets the body surface (chest wall) and underlying tissues into motion.
- The motion of the surface and underlying tissues produce audible sounds and palpable vibration.
- Helps to determine whether the underlying tissues are:
  - Air-filled
  - Fluid-filled
  - Solid

Organs give rise to *sounds of different*:
- loudness (intensity)
- pitch (high or low)
- duration
The aims of the percussion

These differences in sound quality allow

- to establish organ size (boundaries) = topographic percussion
- to recognize abnormal formations (fluid, growth etc,) = comparative percussion
- to check movements of organs and abnormal formations

The sound quality of percussion depends on

- the mode of percussion
- air contents of the organ
- the elasticity of the superficial structures
I. On percussion, **air-filled organs** (abnormal formations, lesions etc.) give rise to

- **resonant** sound if tissues (structures) are present;
- this may become **hyperresonant** when the amount of tissue decreases;
- **tympanic** sound if only air is present

II. On percussion, **solid organs** (abnormal formations, lesions etc.) give rise to

- **flat** sound if they are not immediately beneath the surface;
- **dull** sound if they are close to the surface
The technique of percussion

- Hyperextend the middle finger of your left hand
- Press its distal interphalangeal joint firmly on the surface to be percussed. Avoid contact by any other part of the hand.
- The right middle finger should be partially flexed, relaxed, and poised to strike.
- With a quick, sharp, but relaxed wrist motion, strike the pleximeter with the right middle finger (plexor finger). Aim at your distal interphalangeal joint.
- Use the tip of your plexor finger, not the finger pad.
- Withdraw your striking finger quickly.
- Thump about twice in one location.
The technique of percussion

The pleximeter finger

The plexor finger
The longer the pleximeter finger pad touched the body surface, the larger the percussed area. The power of the percussion is proportional with the depth of the percussion.

Modification of the percussion technique according to the expected physical finding

- Small power, short pleximeter
  - Superficial solid organ, that gives absolute dullness

- Larger power, longer pleximeter
  - Deeply localized solid organ gives relative dullness

Laënnec: De l'auscultation médiate" (1819)

Stethoscope – Phonendoscope

Physical principle:

Sounds are generated in the body by:

- movement of air (bronchi)
- movement of fluid (bronchial secretion)
- movement of tissues (alveoli)
- movement of organs (friction rub)
- movement of blood (turbulence: murmurs)
- movement of cardiac valves (heart sounds)
- movement of bowels (bowel sounds)
Use of the stethoscope

• Listen to the **breath sounds** with the diaphragm of the stethoscope as the patient breathes somewhat more deeply than normal through an open mouth.

• Auscultation of the abdomen with the diaphragm
  – Before percussion and palpation, because these manoeuvres may alter the frequency of bowel sounds

• Auscultation of the **heart**:
  – The **bell** is more sensitive to **low pitched** sounds (S3, S4, mitral stenosis)
  – The **diaphragm** is better for picking up relatively **high-pitched** sounds (S1, S2, murmurs of aortic and mitral regurgitation, pericardial friction rub)
Normal breathing sounds

1. Vesicular breath sounds
   - arise from the alveoli. Vibrations of the alveolar wall during inspiration
   - soft, low-pitched
   - fade away during expiration - normal breathing sound

2. Bronchial breath sounds
   - arise in the bronchi
   - coarse, high-pitched, tubular sound
   - longer duration during expiration - usually pathological

3. Broncho-vesicular breath sounds
   - intermediate between 1. and 2.
   - normal between the scapulae

4. Tracheal breath sound
   - arises in the trachea
   - very coarse
   - normal over the trachea in the neck
Adventitious sounds of breathing 1.

- Discontinuous sounds (crackles, rales)
  - short intermittent
  - non-musical
  - typically inspiratory sound
  - they result from a series of tiny explosions when small airways deflated during expiration, pop open during inspiration.
  - it can be simulated by rolling a lock of hair between your fingers close to the ear
  - Fine crackles: produced in the alveoli (late inspiratory, repeat themselves from breath to breath) Coarse crackles (early inspiratory) : arise in the bronchioli
Adventitious sounds of breathing 2.

- **Continuous sounds are generated in the bronchi**
  - long in duration
  - musical character
  - occur when air flows rapidly through bronchi that are narrowed nearly to the point of closure
    - **Wheezing**: high-pitched, hissing (whistle)
    - **Rhonchi**: low-pitched, snoring (organ pipe)
    - **Stridor**: very coarse inspiratory sound, that represents flow through a narrowed upper airway (goitre, croup). Audible without the stethoscope.

- **Pleural rub**: coarse, loud, grating sound, indicates inflamed pleural surfaces rubbing against each other. Appears close under the stethoscope.
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