The respiratory system

Clinical examination
Respiratory symptoms
Past medical history/family history/smoking
Clinical examination:
  • Inspection
  • Palpation
  • Percussion
  • Auscultation
Auscultation of the lungs is the most important examining technique for assessing air flow through the tracheo-bronchial tree.

Together with percussion, it also helps the clinician to assess the condition of the surrounding lungs and pleural space.

The stethoscope usually has two heads: the bell and the diaphragm.

The bell is used to detect low-pitched sounds, and the diaphragm is better at detecting higher pitched sounds.
The bell must be applied loosely to the skin; if it is pressed too tightly, the skin acts as a diaphragm, and the lower pitched sounds are filtered out.

In contrast, the diaphragm is applied firmly to the skin.

It is never acceptable to listen through clothing.

The bell or the diaphragm of the stethoscope must always be in contact with the skin.
Auscultation involves:

- listening to the sounds generated by breathing
- listening for any adventitious (added) sounds, and
- if abnormalities are suspected, listening to the sounds of the patient’s spoken or whispered voice as they are transmitted through the chest wall, vocal resonance.
Technique of auscultation

- Auscultation should be performed in a quiet environment.
- Because most breath sounds are high-pitched, the diaphragm is used to evaluate lung sounds.
- Ask the patient to take deep breaths in and out through the mouth.
- Listen to both inspiration and expiration.
- Listen over the same areas percussed, comparing left to right. If an abnormality is found, examine more carefully and define borders.
- Listen for the breath sounds and any added sounds, and note at which point in the respiratory cycle they occur.
Normal Vesicular:

- Produced by airflow in the large airways and larynx and altered by passage through the small airways before reaching the stethoscope.
- Often described as “rustling”.
- Heard especially well in inspiration and early expiration.
- Heard over most of both lungs.
Reduced or absent vesicular sound:

- when air flow is decreased (as by obstructive lung disease or muscular weakness) or
- when the transmission of sound is poor (as in pleural effusion, pneumothorax, or emphysema).
Global:

- COPD or asthma (the “silent chest” is a sign of a life threatening asthma-attack).

Local:

- nasal polips
- diphteria
- laryngeal spasm
- pleural effusion
- tumour
- pneumothorax
- pneumonia
- lung collapse.
**Increased vesicular sound:**

- Hyperventilation (after exercise, compensatory hyperventilation)
- Narrowing of the tracheobronchial tree (bronchitis, asthma, COPD)
Bronchial breathing

- It is caused by an increased density of matter in the peripheral lung allowing sound from the larynx to the stethoscope unchanged.
- Has a “hollow, blowing” quality, heard equally in inspiration and expiration, often with a brief pause between.
- A similar sound can be heard by listening over the trachea in the neck and sometimes normally in the right intervertebro-scapular area.
Pathological conditions in which it can be heard (air-filled lung has been replaced by fluid-filled or solid lung tissue).

- Consolidation (lobar pneumonia, pulmonary infarction)
- Lung abscess at the chest wall and dense fibrosis.
- The upper border of a pleural effusion.
- Caverna if is large, superficial communicating with bronchus
- Compressive atelectasis
Adventitious (Added) Sounds

- Listen for any added, or adventitious, sounds that are superimposed on the usual breath sounds.
- Detection of adventitious sounds—crackles (sometimes called rales), wheezes, rhonchi, rub - is an important part of your examination, often leading to diagnosis of cardiac and pulmonary conditions.
CRACKLES, CREPITATIONS OR RALES

- They are intermittent, brief, discontinuous nonmusical sounds.
- They are caused by air entering collapsed airways and alveoli producing an opening snap.
- Heard in inspiration.
Fine crackles are soft, high pitched, and very brief (5–10 msec) occur later in inspiration. The sound can be reproduced by rolling the hair at your temples between the thumb and forefinger.

Coarse crackles are somewhat louder, lower in pitch, and not quite so brief (20–30 msec). They are made by larger airways opening and sound like the snap and pop of a certain breakfast cereal.
Crackles have **two leading explanations**

- They result from a series of tiny explosions when **small airways, deflated during expiration, pop open during inspiration.**
  - This mechanism probably explains the late inspiratory crackles of *interstitial lung disease and early congestive heart failure.*
- Crackles result from **air bubbles flowing through secretions or lightly closed airways during respiration.**
  - This mechanism probably explains at least some coarse crackles.
Crackles are often a normal finding at the lung bases.

They can also occur after prolonged recumbency in dependent portions of the lungs. If so, they will clear after asking the patient to cough.

Crackles may be due to abnormalities of the lungs (pneumonia, fibrosis, early congestive heart failure) or of the airways (bronchitis, bronchiectasis).
Late inspiratory crackles may begin in the first half of inspiration but must continue into late inspiration.

- They are usually fine and fairly profuse, and persist from breath to breath.
- These crackles appear first at the bases of the lungs, spread upward as the condition worsens, and shift to dependent regions with changes in posture.
- **Causes** include:
  - interstitial lung disease (such as fibrosis)
  - early congestive heart failure.
Early inspiratory crackles appear soon after the start of inspiration and do not continue into late inspiration.

- They are often but not always coarse and are relatively few in number.
- Expiratory crackles are sometimes associated.
- Causes include chronic bronchitis and asthma.

Midinspiratory and expiratory crackles are heard in bronchiectasis but are not specific for this diagnosis.

- Usually they are heard constantly in the same lung area.
- Wheezes and rhonchi may be associated.
They are **continuous** sounds > 250 msec, notably longer than crackles, but do not necessarily persist throughout the respiratory cycle.

They are **musical whistling** sounds caused by narrowed airways, often audible at the mouth as well as through the chest wall.

Heard easier in **expiration**.

**Wheeze**s are relatively **high pitched** (around 400 Hz or higher) and have a hissing or shrill quality.

They suggest **narrowed airways**

This narrowing may be caused by swelling, secretions, spasm, tumor, or foreign body.

Most frequently are heard in asthma, COPD, or bronchitis, cardiac asthma and are generalized throughout the chest.
Different calibre airways = different pitch note

Asthma and COPD can cause a chorus of notes termed “polyphonic wheeze”.

A partial obstruction of a bronchus, as by a tumor or foreign body causes “monophonic” persistent localized wheeze.

It may be inspiratory, expiratory, or both.

A wheeze that is entirely or predominantly inspiratory is called stridor. It is often louder in the neck than over the chest wall. It indicates a partial obstruction of the larynx or trachea, and demands immediate attention.
Rhonchi are relatively low pitched (around 200 Hz or lower) and have a snoring quality. They are produced by transient mucus plugging and poor movement of airway secretions. They suggest secretions in large airways. Clearing of crackles, wheezes, or rhonchi after cough suggests that secretions caused them, as in bronchitis or atelectasis.

PLEURAL RUB:
Creaking sound likened to the bending of new leather or the creak of a footstep in fresh snow. Caused by inflamed pleural surfaces rubbing against each other.
Is usually confined to a relatively small area of the chest wall, and typically is heard in both phases of respiration, usually at the end of inspiration and at the beginning of expiration.

When inflamed pleural surfaces are separated by fluid, the rub often disappears.
Transmitted Voice Sounds.

- If abnormalities are suspected, listening to the sounds of the patient’s spoken or whispered voice as they are transmitted through the chest wall, vocal resonance.

- With a stethoscope, listen in symmetric areas over the chest wall as you:
  - Ask the patient to say “ninety-nine.”
    - Normally the sounds transmitted through the chest wall are muffled and indistinct.

- Increased transmission of voice sounds suggests that air-filled lung has become airless.
Louder, clearer voice sounds are called **bronchophony**.

Ask the patient to say “ee.” You will normally hear a muffled long E sound. When “ee” is heard as “ay,” an E-to-A change (**egophony**) is present, as in **lobar consolidation** from pneumonia. The quality sounds nasal.

Ask the patient to whisper “ninety-nine” or “one-two-three.” The whispered voice is normally heard faintly and indistinctly, if at all.

Louder, clearer whispered sounds are called **whispered pectoriloquy**, and they appear in the presence of consolidation of the lung.
One of the most important principles concerning the examination of the chest is to correlate the findings of percussion, palpation, and auscultation.