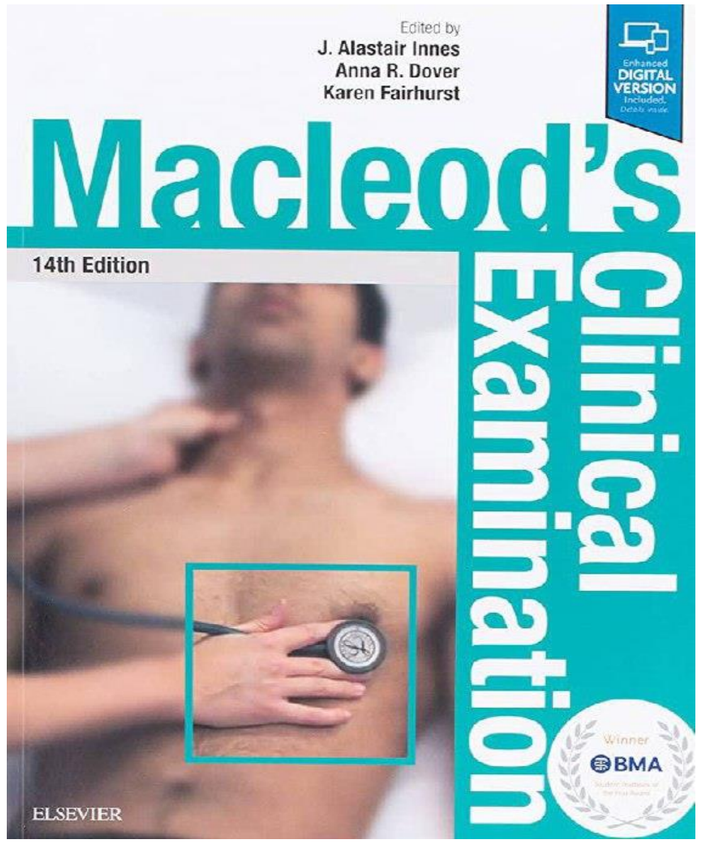


Outlines:

- **General Examination**

  Respiratory Signs / Hands & Arms / Face / Neck

- **Thorax Examination**

  Inspection / Palpation / Percussion / Auscultation

Done By: A.O.Alwikhyan , MD.

Introductory: Section 2 CH.5 Respiratory System Examination .

Note: This summary contains all Macleod's important notes.

For Full Material, please JOIN this WhatsApp Community:

Respiratory System Examination

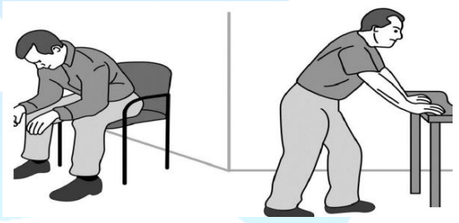
- The patient should be reclining on an examination couch or bed at **about 45 degrees**, with the **thorax exposed** and the head supported by a pillow.
- **LOOK FOR ANY RESPIRATORY SIGNS**

a. Respiratory Distress Signs

1. **Tachypnea**
   - At rest the rate is **normally 12–15 breaths per minute**; anxious patients may breathe at 15–20 breaths/minute but a **rate of over 20 breaths per minute is abnormal for an adult.**
2. Indrawing of the intercostal spaces **(Intercostal Retraction).**
3. **Using accessory muscles** (sternocleidomastoid ,trapezius and scalene muscles).
4. **Nasal flaring** , **Tripod Position** and **Pursed Lips.**

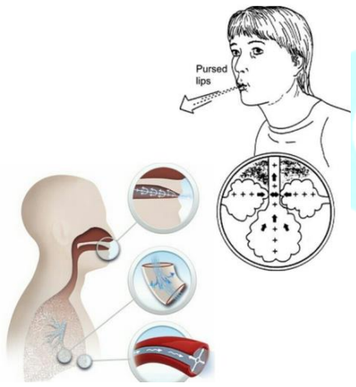
➢ Tripod position

- Sitting forward and bracing arms on table, allowing them to use **pectoralis major to pull the ribs outward during inspiration.**
- May be seen in patients with **Epiglottitis.**



➢ Pursed lips

- This maneuver increases positive end expiratory pressure, **reducing small-airway collapse** and improving ventilation.
- May be seen in patients with **severe COPD**



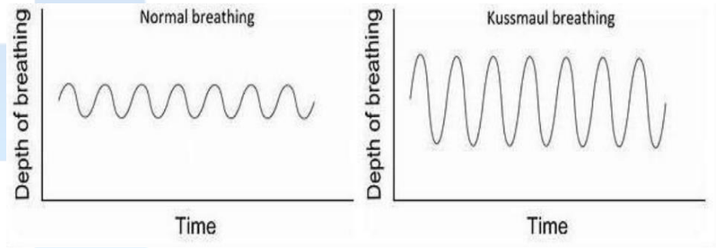
b. Respiratory Pattern

1-Cheyne–Stokes breathing:

- is cyclical **with increasing rate** and **depth of breathing**, followed by **diminishing respiratory effort and rate**, ending in a period of **apnoea** or **hypopnoea.**
- This relates to **altered sensitivity of the respiratory center to CO2** and delay in circulation time between the lung and chemoreceptors.
- in **healthy adults at high altitude** , **elderly people & patients of HF**.

2-Kussmaul breathing:

- is a **type of hyperventilation** that is the lung's emergency response to acidosis.
- Kussmaul breathing causes **a rapid ,deeper breathing rate**.
- It is most commonly associated with conditions that cause **metabolic acidosis** , particularly diabetes **In DKA .**



c. Chest deformity

- Normally;
  - ✓ The chest should be **Symmetrical.**
  - ✓ The anteroposterior **(AP) diameter** should be **less** than **the lateral diameter.**
- **Asymmetry** of the chest **(Kyphosis,scoliosis)**
- Congenital As **In Pectus Excavatum** (Pic D).
- Acquired as **In Pectus Carinatum** (Pic C) is an inward displacement of the lower ribs with a prominent sternum, caused by severe airflow obstruction in early childhood.

Hands & Arms

• **Examine hands for :**

- **Cyanosis ,Tar Staining** and **Nail Discoloration** as yellow brown nail discoloration as in yellow nail syndrome.
- **Small Muscle Wasting** which may **indicate T1 root damage** by apical lung tumor.
- **Finger Clubbing** and hypertrophic pulmonary osteoarthropathy (painful tender swelling on wrists and ankles).
- **Fine Tremor** and **Flapping Tremor.**

• Check the **Pulse** and **BP.**

Fig. 5.9 Yellow nail syndrome.

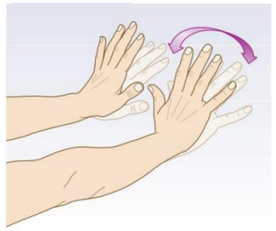


Fig. 5.10 Hand position for testing for the coarse tremor of CO_2 retention.

➢ **Hypertrophic Pulmonary Osteoarthropathy**

• **Painful tender swelling** of the wrists and ankles
• Rare complication of **lung cancer**
• Accompanies pronounced **finger clubbing**
• X-ray of the distal forearm and lower legs shows **subperisoteal new bone formation** over lying the cortex of the long bones.

➢ **Pulsus Paradoxus**

An **exaggerated fall** in a patient's **systolic blood pressure** during inspiration **by greater than 10 mmHg**. (normally it decreases but less than 10 mm Hg) . **Causes**:

1. **Pericardial diseases:** cardiac **tamponade**, constrictive **pericarditis**.
2. **Non-pericardial cardiac diseases**: right ventricular MI and restrictive cardiomyopathy.
3. Any cause of **cardiac compression** (iatrogenic during surgery, marked obesity, pectus excavatum).

Face Check:

1. Conjunctiva for anemia.

2. **Ptosis** and **Pupil Asymmetry (Horner Syndrome).**
3. **Tongue for central cyanosis**:

♣ Remember that cyanosis becomes visible only when a sufficient quantity of deoxyhaemoglobin is circulating, making it hard to detect in anaemia but obvious in polycythaemic.

4. **Plethoric complexion (Skin color)** : a congested red-faced appearance associated with polycythaemia (e.g. COPD) and CO2 retention (e.g. type 2 respiratory failure).

Horner's syndrome

• Tumor at the root of the neck (Apex of the lung) **may disrupt the sympathetic nerves to the eye .**

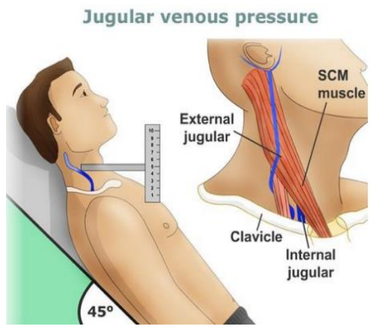
• Causes **unilateral ptosis** and **pupillary constriction**.

Superior Vena Cava Obstruction

• Usually **indicates tumor invasion of the upper mediastinum**.
• Causes **dusky red generalized swelling of the head, neck and face with subconjunctival edema.**

Fig. 5.11 Superior vena cava obstruction. Dusky, swollen face

Neck



• Support the patients head with a pillow

1- Examine **Jugular Venous Pressure** (JVP is a reflection of right atrial pressure): is raised in **pulmonary hypertension, tension pneumothorax or large PE.**

2- Examine **cervical LN** from behind with the patient sitting forward **(Scalene (s u p r a c l a v I c u l a r) LN** which is matted in TB).

Thorax Examination

1- Inspection

From the END of the bed:

Shape **symmetry**

Pattern of breathing

Chest **deformities** , barrel chest

From the SIDE of the patient:

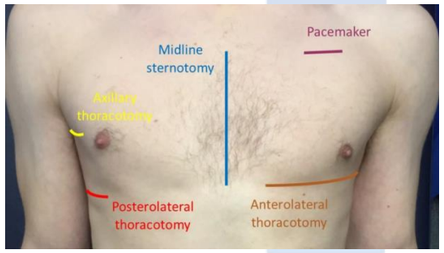
Visible **Scars** (Thoracotomy scar)

Drains

Superficial **masses** or swellings

Dilated **veins**

Axilla



2- Palpation

(try to move your hand over chest wall without gaps)

A. Superficial Palpation (Superficial Masses & Tenderness ,SC Emphysema)

- **Surgical emphysema**, indicating air trapped in the subcutaneous tissues , it feels like a palpable crackling under the skin .

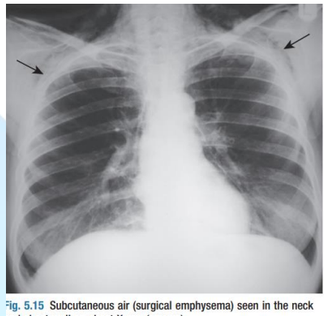
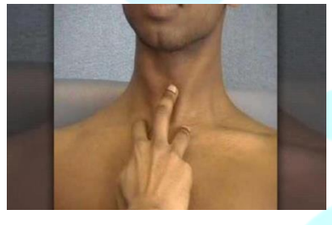


Fig. 5.15 Subcutaneous air (surgical emphysema) seen in the neck and chest wall on chest X-ray *(arrows)*.

B. Trachea

1- **Tracheal Deviation** : gently advancing a single finger resting in the sternal notch in the midline ,if the finger tip meets the center of the trachea then it is not deviated.



Common causes of tracheal deviation		
Away from the side of the lesion	**Towards to the side of the lesion**	**Upper mediastinal mass**
Tension pneumothorax	Upper lobe consolidation	Retrosternal Goiter
Massive pleural effusion	Upper lobe fibrosis	Lung cancer
	Pneumoectomy	Lymphoma

2- **Cricosternal distance** (the **vertical distance between the sternal notch and the cricoid cartilage**). Normally up to 5 cm (3-4 fingers)!

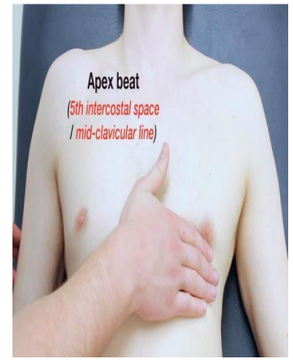
- **Reduction** in cricosternal distance is a **sign of hyperinflation** and reflects upward displacement of the sternum.

3- **Tracheal tug :** systolic downward movement of the trachea is felt in patients with **aortic aneurysm.**

C. Heart

1. Apex beat:

Impalpable in hyperinflation in obstructive lung disease when the lingula comes between the heart and the chest wall (due to hyperinflation).



2. **Right Ventricular heave**

D. Tactile Vocal Fremitus

- Is the **palpable vibration** (of nonvascular origin) that **reaches the body surface during low frequency vocalization** & is **felt by examiner's palms.**
- **Sound waves travels faster and is conducted better in solid media rather than air/fluid.**
- Palpate the chest wall with palm of hand while patient repeats one, one, one.
- The cause of change in vocal fremitus is same as these for vocal resonance in auscultation .

Tactile vocal fremitus	
Increased	**Decreased**
-Consolidation -Dense pulmonary fibrosis - Lobar collapse with patent major bronchi - Lung mass	**- Pleural effusion/ Heamothorax - Obesity - Pneumothorax - Collapsed lung with obstructed major bronchi**

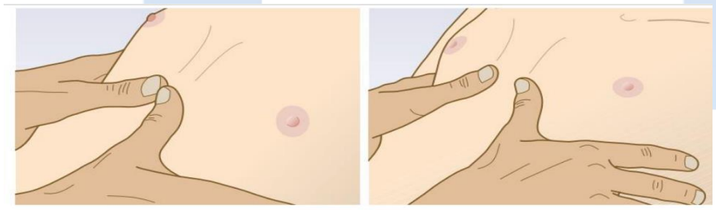
E. Chest expansion

- **Normally**:

Both sides of the thorax should **expand equally** during normal breathing and ribs move out and up with inspiration.

Exam Sequence :

- To assess chest expansion , **Cup your hands, with fingers spread**, round the patient's upper anterior chest wall, pressing **the fingertips firmly in the mid-axillary line**.
- Pull your hands medially towards each other to tighten any loose skin, and use your **thumbs (off the skin) as pointers** to judge how much each hand moves outwards when the patient is instructed to take a full breath in.



A B

Fig. 5.14 Assessing chest expansion from the front. A Expiration. B Inspiration.

Abnormalites In Chest Expansion:

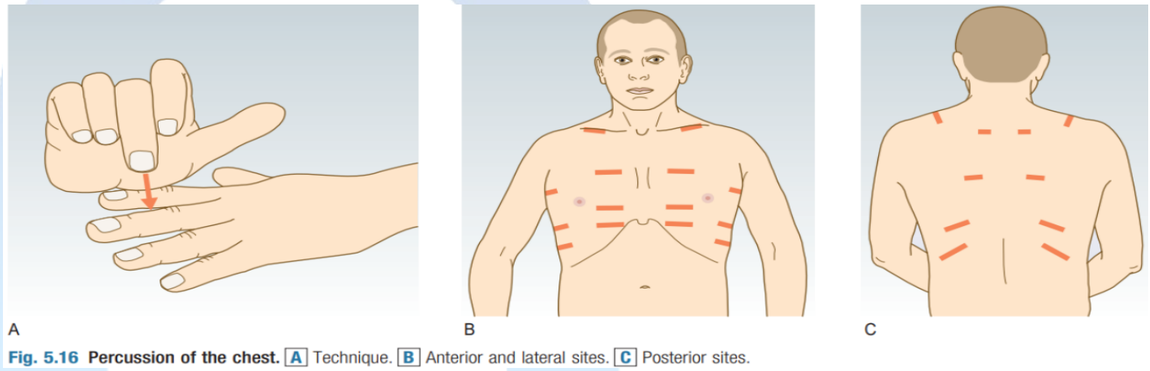
- **Reduced Expansion** on **one side** indicates abnormality **on that side :** Pleural effusion, Lobar collapse,Pneumothorax & unilateral fibrosis.

- **Bilateral Reduction** in chest wall movement is common in **severe COPD and diffuse pulmonary fibrosis**.

- **Paradoxical inward movement** (**paradoxical rib cage movement or 'Hoover's sign'**) may indicate **diaphragmatic paralysis** or ,more commonly, **severe COPD**, caused by contraction of the **abnormally low flat diaphragm.**

3- Percussion

- Tapping on a surface to **determine the underlying structure**, it allows to listen for the pitch and loudness of the percussed note.
- Percussion sequence, **comparing areas on the right with corresponding areas on the left before moving to the next level**.
- **Posteriorly** : the scapular and spinal muscles obstruct percussion, so **position the patient sitting forwards with their arms folded in front to move the scapulae laterally.**
- Percuss **a few centimetres lateral to the spinal muscles**, taking care to compare positions the same distance from the midline on right & left.



A B C

Fig. 5.16 Percussion of the chest. A Technique. B Anterior and lateral sites. C Posterior sites.

➢ Direct **Percussion On Clavicle**.

➢ Move your wrist **NOT** your elbow.

➢ Don't forget to percuss over the Trapezius muscle in anterior and posterior chest exam because **it represents lung apex.**

Resonant	Hyperresonant	Dull	Stony dull
• Normal lung	• Pneumothorax	• Pulmonary consolidation • Pulmonary collapse • Severe pulmonary fibrosis	• Pleural effusion • Haemothorax

4- Auscultation

Breathing Sounds

- Most of the sound heard when auscultating the chest wall **originates in the large central airways** but is **muffled and deadened** by passage through **overlying air-filled alveolar tissue**; this, together with a small contribution from medium-sized airways, results in **'normal' breath sounds at the chest wall, sometimes termed 'vesicular'.**
- The **harsh 'bronchial' sound** generated by **the major airways can** be appreciated by listening with the diaphragm of the stethoscope applied to the larynx (try this on yourself).
- When healthy, air-filled lung becomes **consolidated by pneumonia or thickened and stiffened by fibrosis**, **sound conduction is improved**, and the **centrally generated 'bronchial' breath sounds** appear **clearly and loudly on the overlying chest wall.**
- Breath sounds normally reveal the **presence of consolidation or fibrosis (bronchial breath sounds)** or **pleural air or fluid (absent breath sounds).**

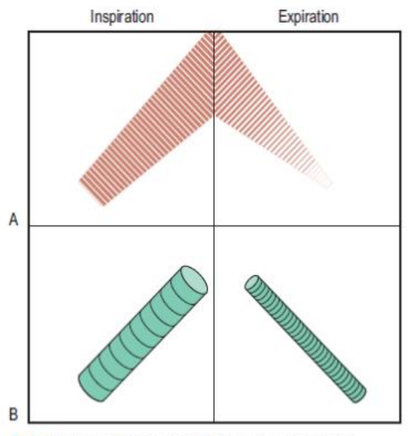


Fig. 7.19 Diagrammatic representation of breath sounds.
(A) Vesicular. **(B)** Bronchial. Note the gap between inspiration and expiration and change in pitch and the blowing, tubular quality of bronchial breath sounds.

	Vesicular breathing	Bronchial breathing
Duration of sound	Inspiratory longer than expiratory	Expiratory longer than inspiratory
Intensity of expiratory	Soft	Loud
Pitch of expiratory	Low	High

Added sounds

There are 3 common added sounds: 1- Wheezes 2- Crackles 3- Rubs

1- Wheezes

- **Musical whistling sound** accompanying air flow and usually **originates in narrowed SMALL AIRWAYS.**
- Most commonly **Expiratory** due to dynamic airway narrowing.

✓ **Polyphonic wheeze :** multiple wheezing sounds are heard together ; this sign is common in **asthma**, **bronchitis** and **exacerbation of COPD**.

✓ **Monophonic :** solitary wheeze that is present **consistently with each breath** and **does not clear with coughing** suggests a **fixed bronchial obstruction** and can be an important sign of **underlying cancer.**

2-Crackles

- Crackles accompanying **deep breathing** are thought to represent the **sudden opening of small airways** but sometimes may indicate **secretions in the airways** or **underlying lung fibrosis.**
- Graded as 'fine', meaning soft, multiple crackles, to 'coarse', indicating loud, scanty crackles that tend to change with each breath.

✓ **Fine crackles : pulmonary oedema** and some **viral pneumonias**.

✓ **Coarse crackles** : are generally heard in patients with significant **purulent airway secretions** such as those with **bronchopneumonia or bronchiectasis.**

3- Pleural rub

- is a **rasping, grating sound** occurring with **each breath** and sounding superficial, just under the stethoscope, like **two sheets of sandpaper rubbing together.**
- It indicates **Pleural Inflammation**, usually due to infection, and is often accompanied by **pleuritic chest pain.**

➢ Vocal resonance, Whispering Pectoriloquy, Aegophony

- Breath sounds normally reveal the presence of consolidation or fibrosis (bronchial breath sounds) or pleural air or fluid (absent breath sounds).

These signs can be confirmed by :

1- Vocal resonance

• asking the patient to generate laryngeal sounds deliberately ('Please say "one, one, one" each time I move my stethoscope on the skin') and listening on the chest wall .

• The spoken sound is **muffled and deadened over healthy lung**, but the spoken sound is **heard loudly and clearly** through the stethoscope over **consolidation or fibrotic lung scarring**.

• is **absent or greatly diminished** over **pneumothorax and pleural effusion** , consistent with absent breath sounds.

**** See Table In Tactile Vocal Fremitus**

2- 'Whispering pectoriloquy':

- may be used to confirm the same changes in sound conduction.

Whispered speech is muffled to silence by normal lung but may be **heard over consolidated or scarred lung**.

3- Aegophony :

- Ask the patient to **say (E) if heard as (A)** then this is Aegophony which **indicate consolidation.**

EXAM SEQUENCE:

• Listen with the patient **relaxed** and **breathing deeply** through his open mouth.

- **Avoid** asking him to breath deeply for prolonged periods, as this causes giddiness and even tetany.

• Auscultate each side alternately, **Comparing Findings** over a large number of equivalent positions to ensure that you do not miss localized abnormalities.

• **Listen using the diaphragm of the stethoscope:**

- **anteriorly** from above the clavicle down to the **6th rib.**
- **laterally** from the axilla to the **8th rib.**
- **posteriorly** down to the level of the **11th rib.**
- Assess the quality and amplitude of the breath sounds.

• Identify **any gap** between inspiration and expiration, and listen for **added sounds.**

• **Avoid auscultation within 3 cm of the midline** anteriorly or posteriorly, as these areas may transmit sounds directly from the trachea or main bronchi.

You should comment on:

-Determine whether you hear **Bronchial or vesicular breathing.**
-If there is **good bilateral air entry** or **reduced air entry**.
-If the air entry is **symmetrical** or not.
-If there is **prolonged expiration**.
-If you hear **Added sounds.**

N.B:

- When there is lobar collapse caused by a proximal bronchial obstruction, the signs are different from those in simple consolidation. The usual findings are **diminished expansion**, sometimes with chest **asymmetry** due to loss of volume, **dullness** to percussion over the collapsed lobe, and **reduced breath sounds** and **vocal resonance.**
- When the lung tissue is physically separated from the chest wall by intervening **air (pneumothorax)** or **fluid (pleural effusion),** sound conduction is greatly impaired and the breath sounds are usually absent. These two causes of **absent sounds** are readily distinguished by **percussion**, which will be **resonant with pneumothorax and completely dull over pleural fluid.**