

How to examine the respiratory system

The common respiratory cases in clinical exam

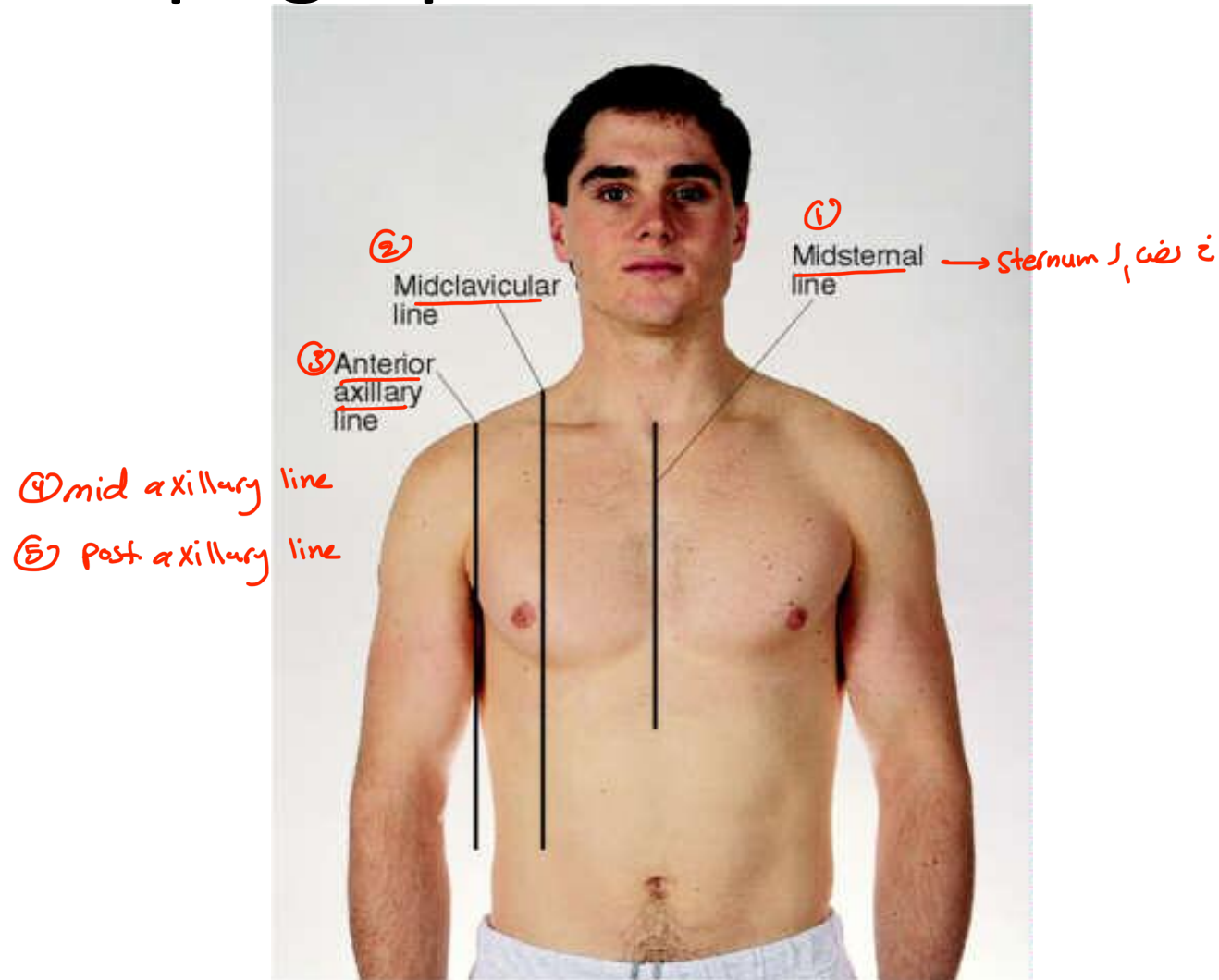
Bridge course for medical students

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Consultant Pulmonary/Allergy

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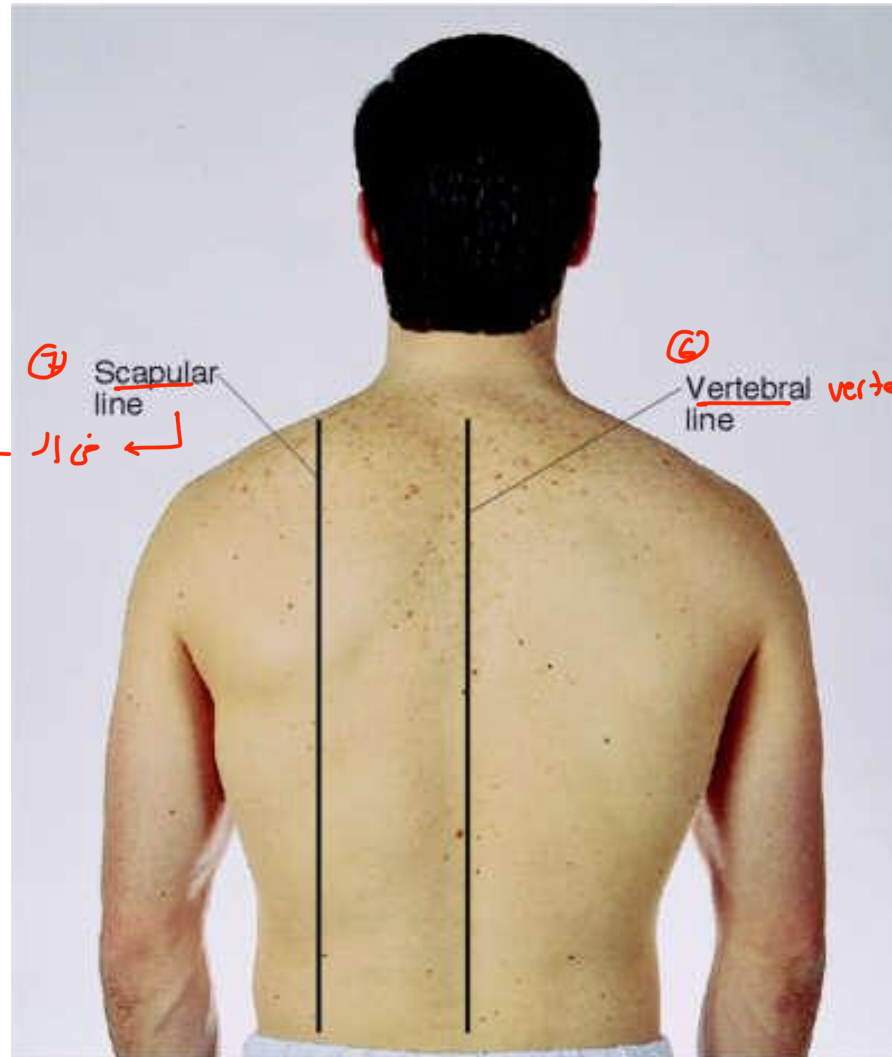
Topographical landmarks



Vertebral, Scapular Lines *From Back..*

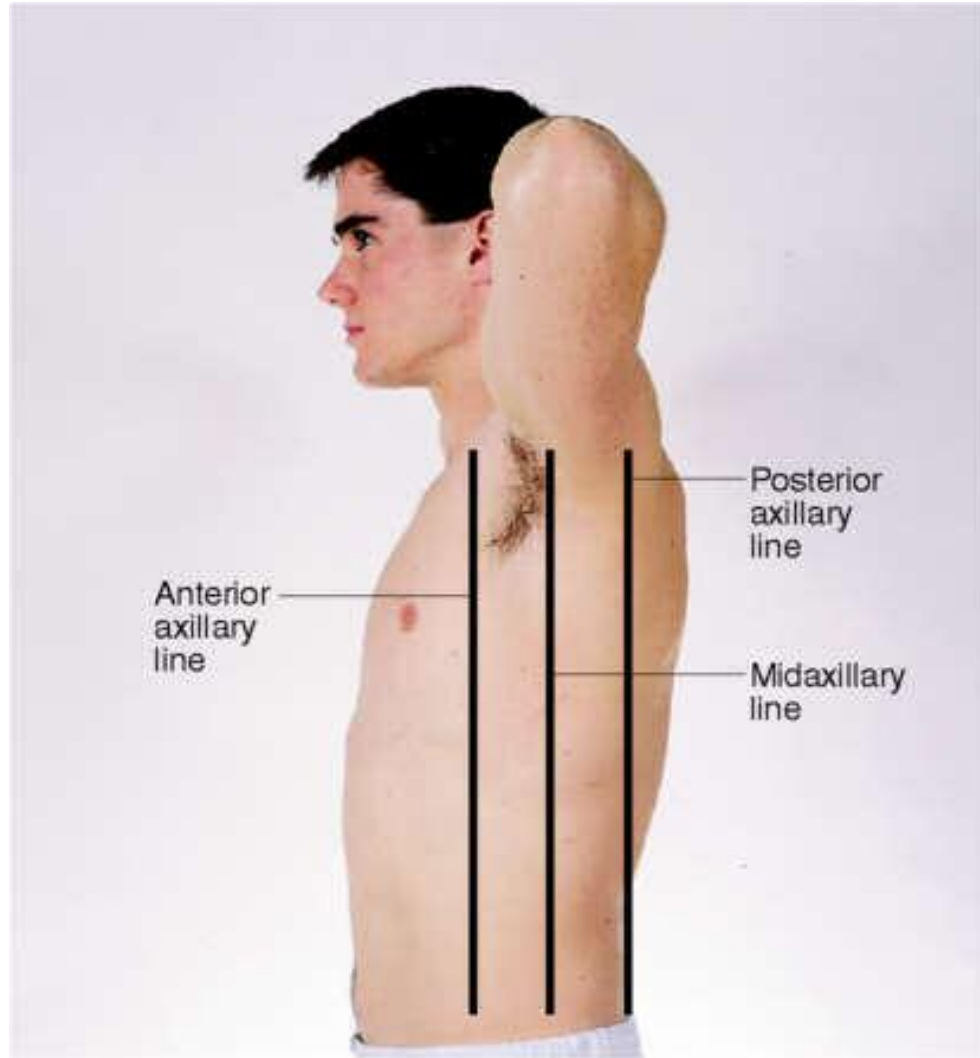
- Scapula:- 8 * 7 cm

... lower angle of scapula 1/5 ←

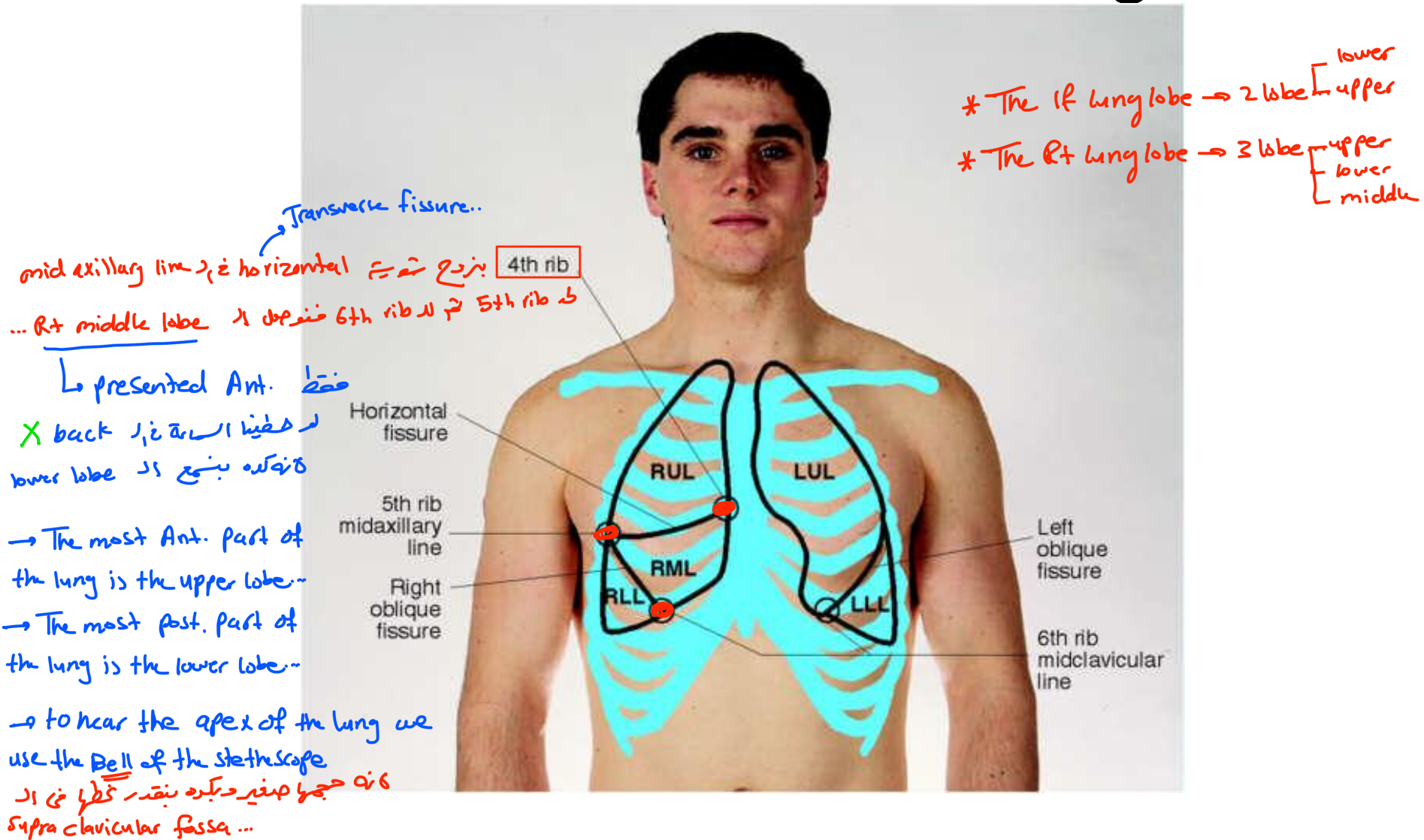


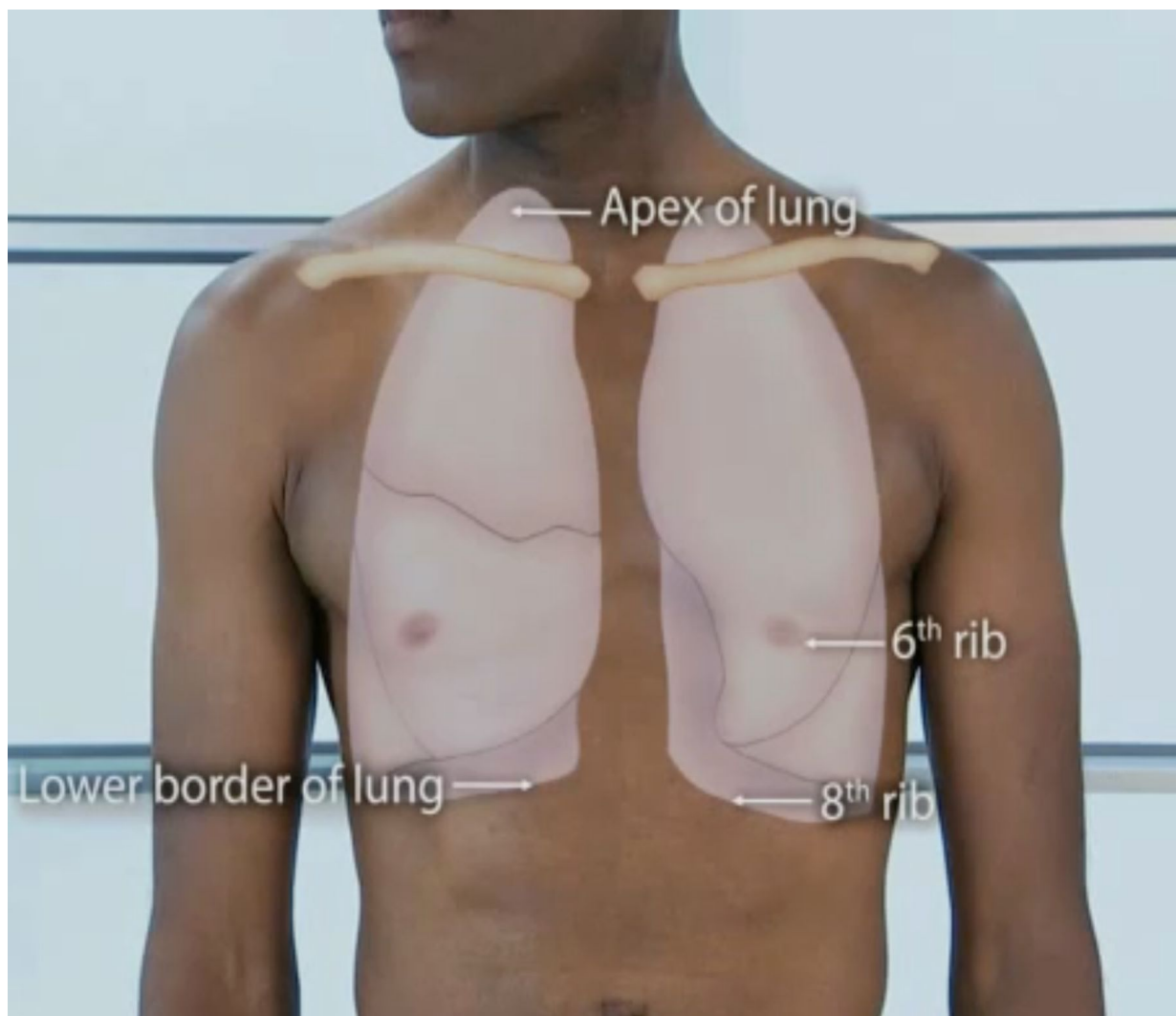
vertebrae 1, 2, 3

Anterior, Posterior, Midaxillary



Anterior Location of Lungs





Posterior Location of Lungs

* There is 3 fissures in the lung:-
2 oblique fissure + 1 transverse fissure...

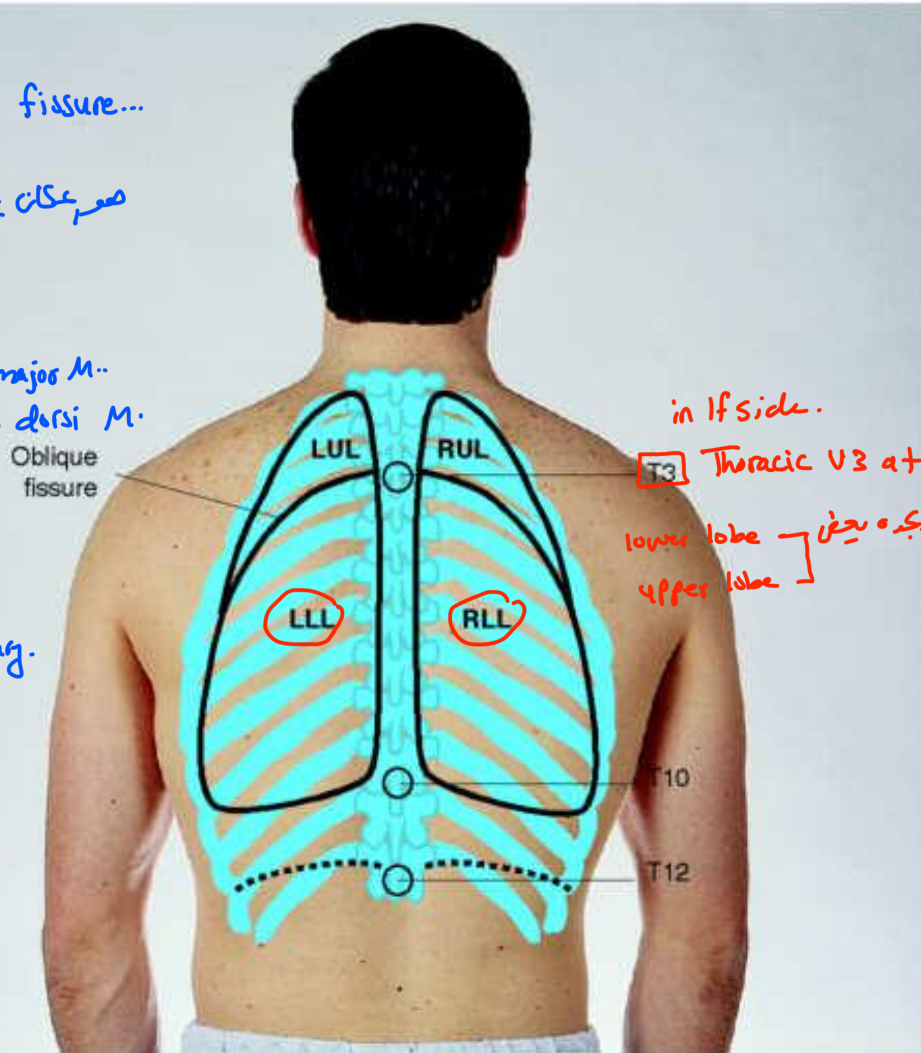
* The safe triangle:-
صغير مثلث في أسفل الصدر
chest tube..

- below it there is 5th rib..
- Anteriorly there is pectoralis major M..
- posteriorly there is latissimus dorsi M..

(من هنا نأخذ قسط من الصدر وندخله بالاسفنج)

* The pleural stenthesis :- [حجم السوائل]
from the lateral lines
Scapular post. axillary.
para vertebral line

← من هنا نأخذ قسط من الصدر وندخله بالاسفنج
من هنا نأخذ قسط من الصدر وندخله بالاسفنج
torious
para vertebral line
...vessels
upper border
lower rib...



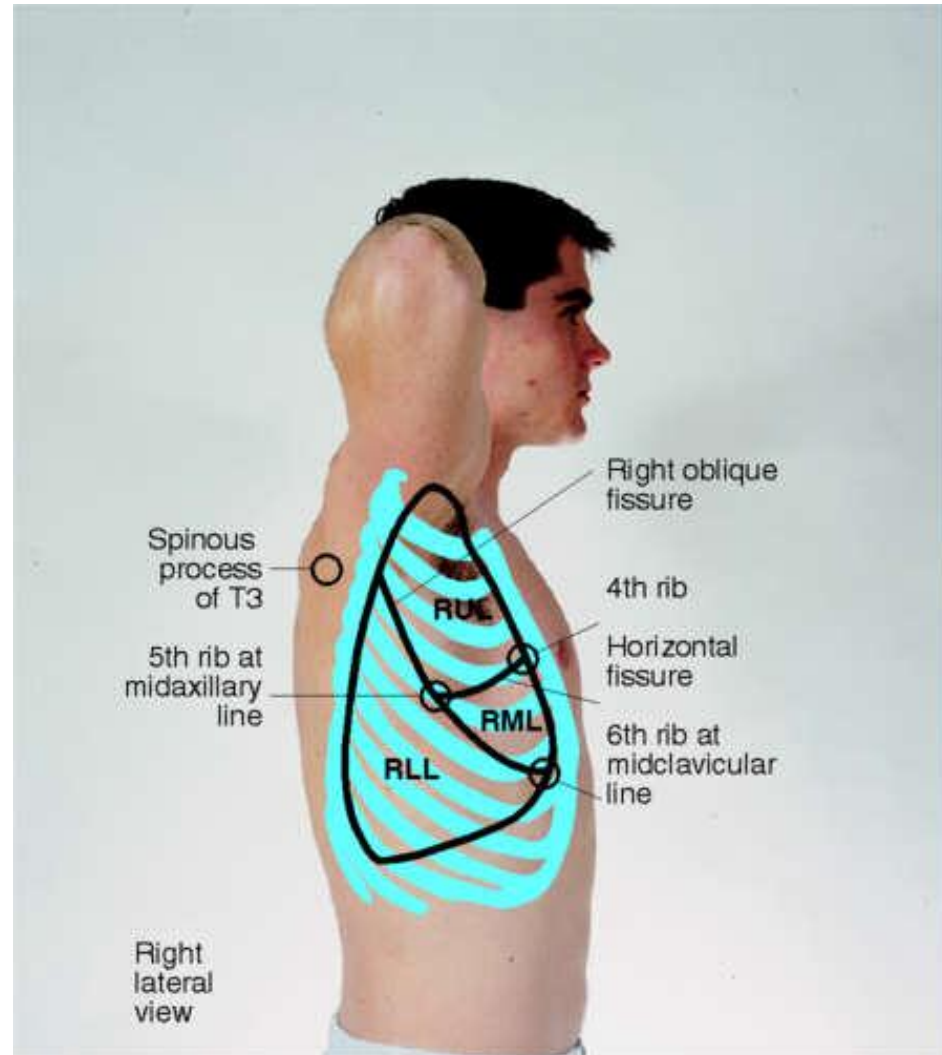
in 1st side.

T3 Thoracic V3 at this level :- oblique fissure
lower lobe
upper lobe
من هنا نأخذ قسط من الصدر وندخله بالاسفنج

T10

T12

Right Lateral Location of Lung

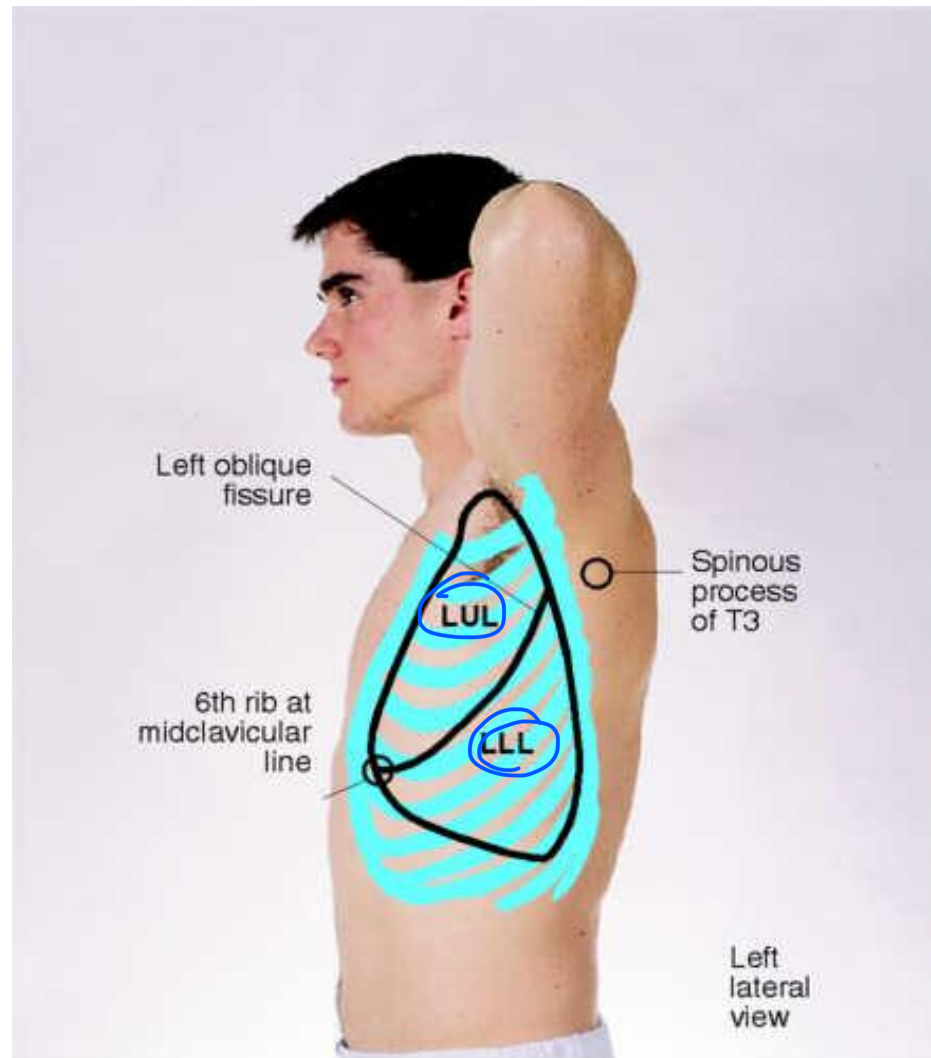


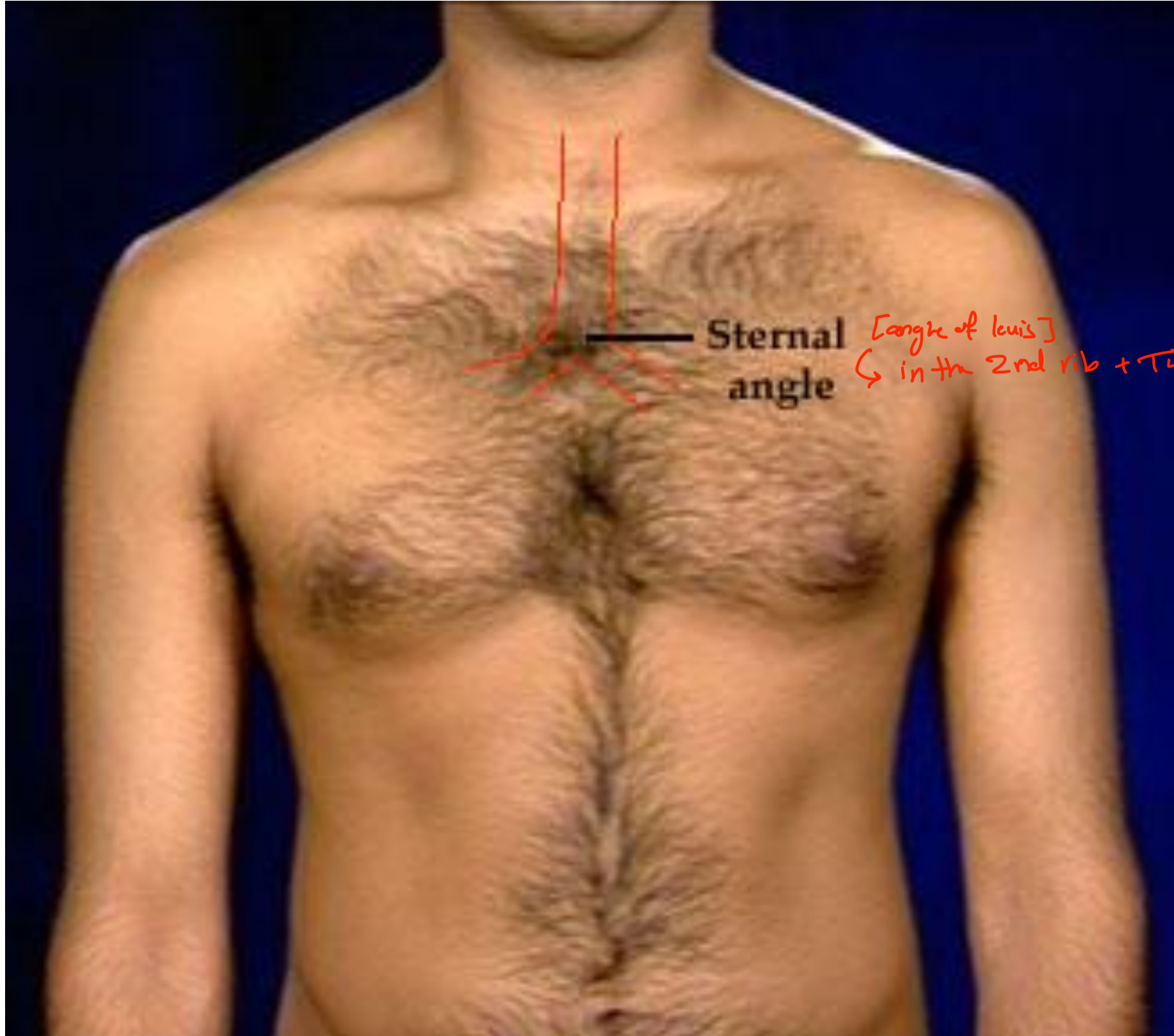
→ we should position the pt in 45 degree to exam the chest..

→ **Never** exam the pt from the lf side..

- **Examiner:** Where do you examine for a right middle lobe abnormality?
- **Candidate:** the right middle lobe is represented in the right mid chest anteriorly and laterally (between 4th and 6th ribs) but not posteriorly. When you examine the chest posteriorly, you examine for abnormalities in upper and lower lobes only.

Left Lateral Location of Lung





Sternal
angle

[angle of Lewis]
in the 2nd rib + T4 post.

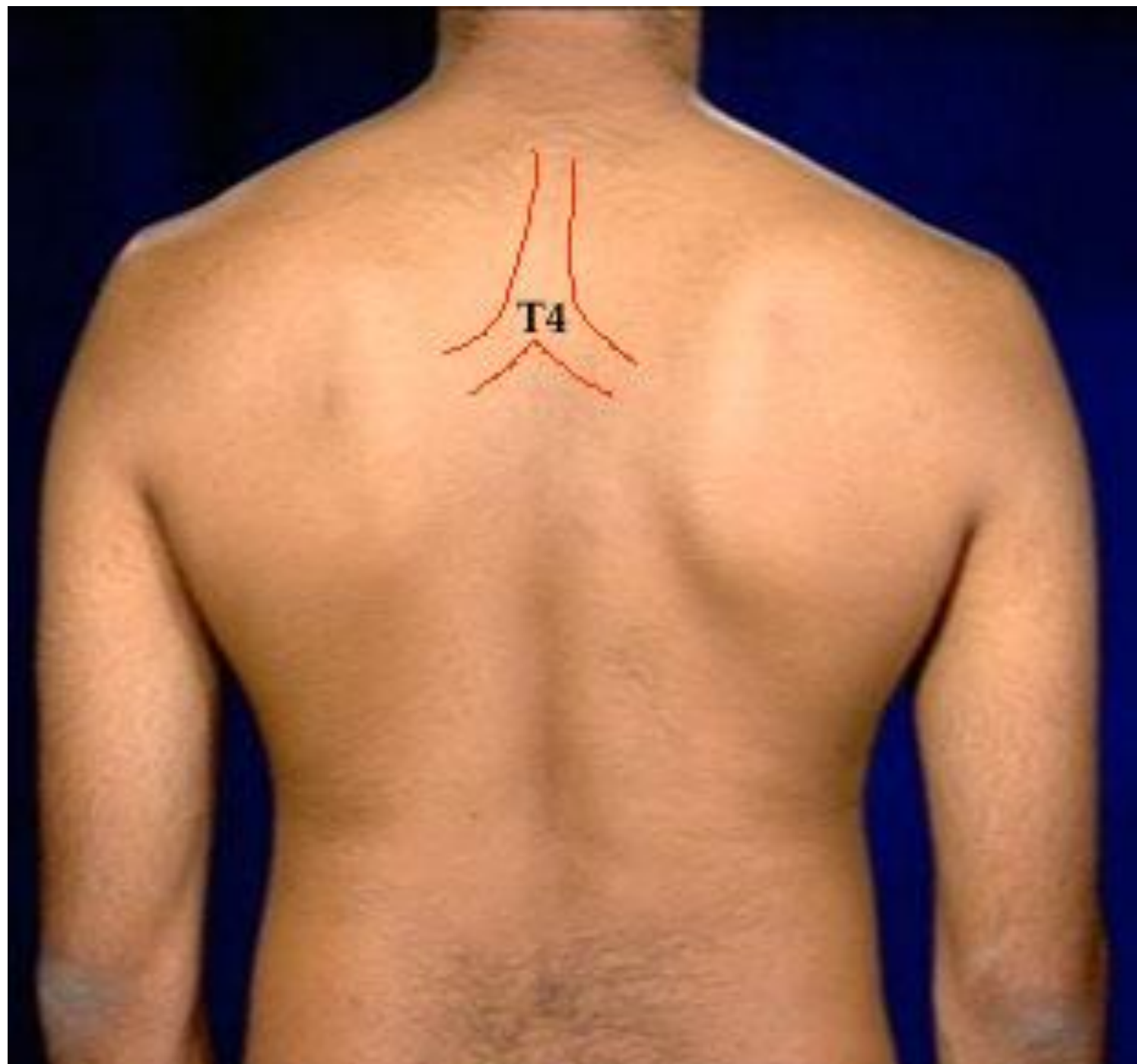
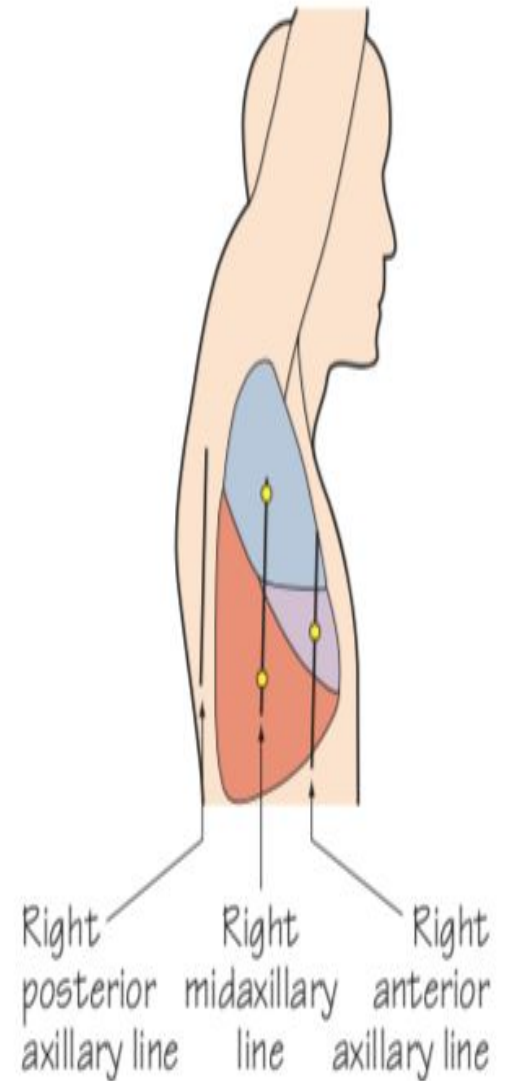
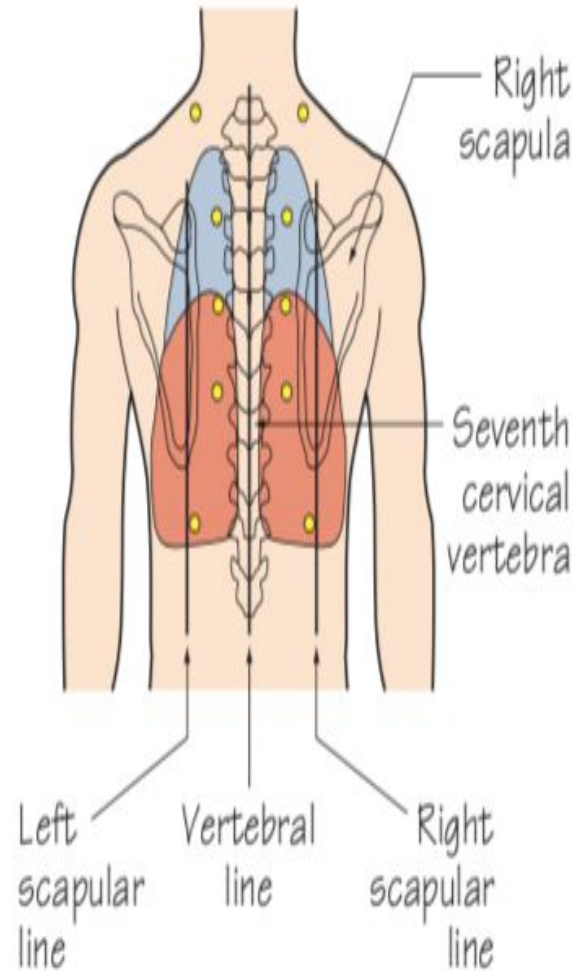
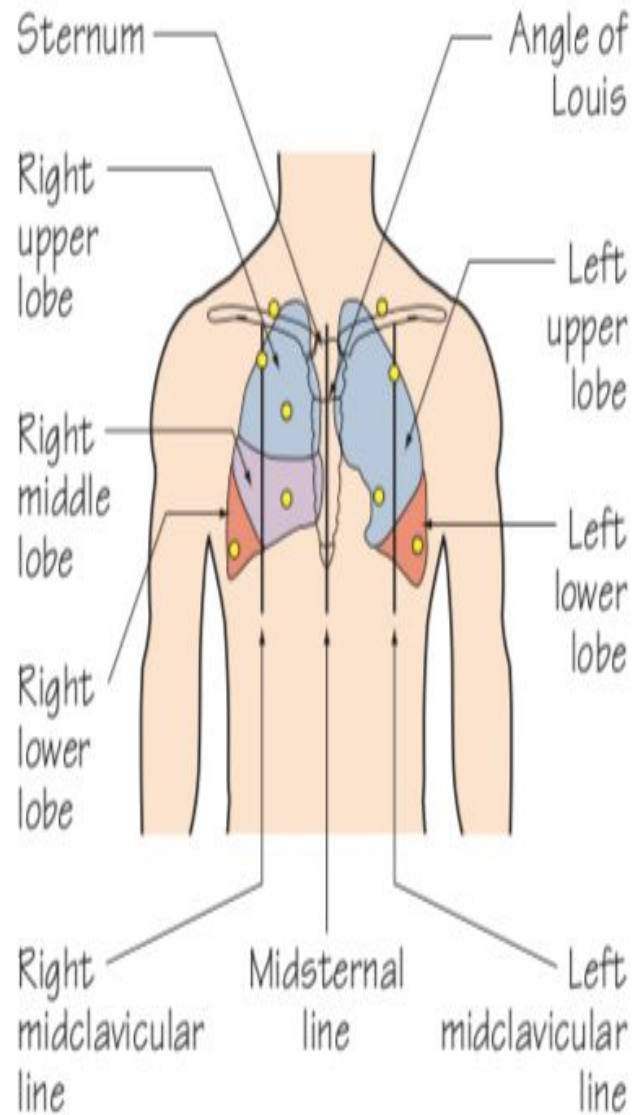


Diagram showing the surface markings of the lobes and suggested areas for percussion



* Examination of Ant. chest → local exam...

* if there is CPAP machine → mean the pt in respiratory failure...

* pt take O₂ mask → looks ill

Physical Exam Steps

NOTE:- The asthma or COPD purely don't make finger clubbing...

2nd cause - clubbing - COPD weight loss...

[Cancer - bronchiectasis - fibrosis]...

- General examination
- Mediastinal position
- Chest expansion
- Lung resonance
- Breath sounds
- Adventitious sounds
- Voice transmission

① Privacy - position - wash your hand - introduce your self - get permission...

② general look - facial expression - looks ill or well - consciousness - comfortable or not...
Body mass index [Body weight] - Color - Environment [O₂ - IV... etc]
- spectation [spectrum pot] → in the bronchiectasis - abscess - bronchoalveolar carcinoma...

③ hands

flapping tremor

→ oxygen failure [major] / take β-agonist / familial / Parkinson...
↳ advance resp. failure [hypoxia...
↳ hypoxic hypercapnic...

Salpitemal...

steroid / K⁺...
lead to ↓ K⁺

[asthenia - fine tremor]

clubbing

→ emphysema - abscess - bronchiectasis [superficial causes]
→ cancer [mesothelioma in the pleura]...
→ familial
→ Cardiac cause - GI cause

cause of unilateral of clubbing: - cardiac problem - articulation of aorta - AAA
or in LL just...

Peripheral cyanosis...

thin skin or ecchymosis → prolonged steroid.

Tary staining [smoker or not] very important in resp. exam...

unilateral muscle wasting → pancreatic tumor

pulver erythema → liver disease [cirrhosis] - COPD

④ Vital signs: - pulse - RR - BP - temp - O₂ saturation...

→ while we exam the pulse we exam the RR at the same time

⑤ Face exam: - eye - nose - mouth...

Essentials checklist mnemonic
– WINCER

W - Wash hands

I - Introduce

N - Notice (i.e. be observant)

C - Consent

E - Expose

R - Reposition

Respiratory Exam

Introduction

- Wash hands, Introduce self, ask Patients name & DOB & what they like to be called, Explain examination and get consent
- Expose and sit patient at 45°

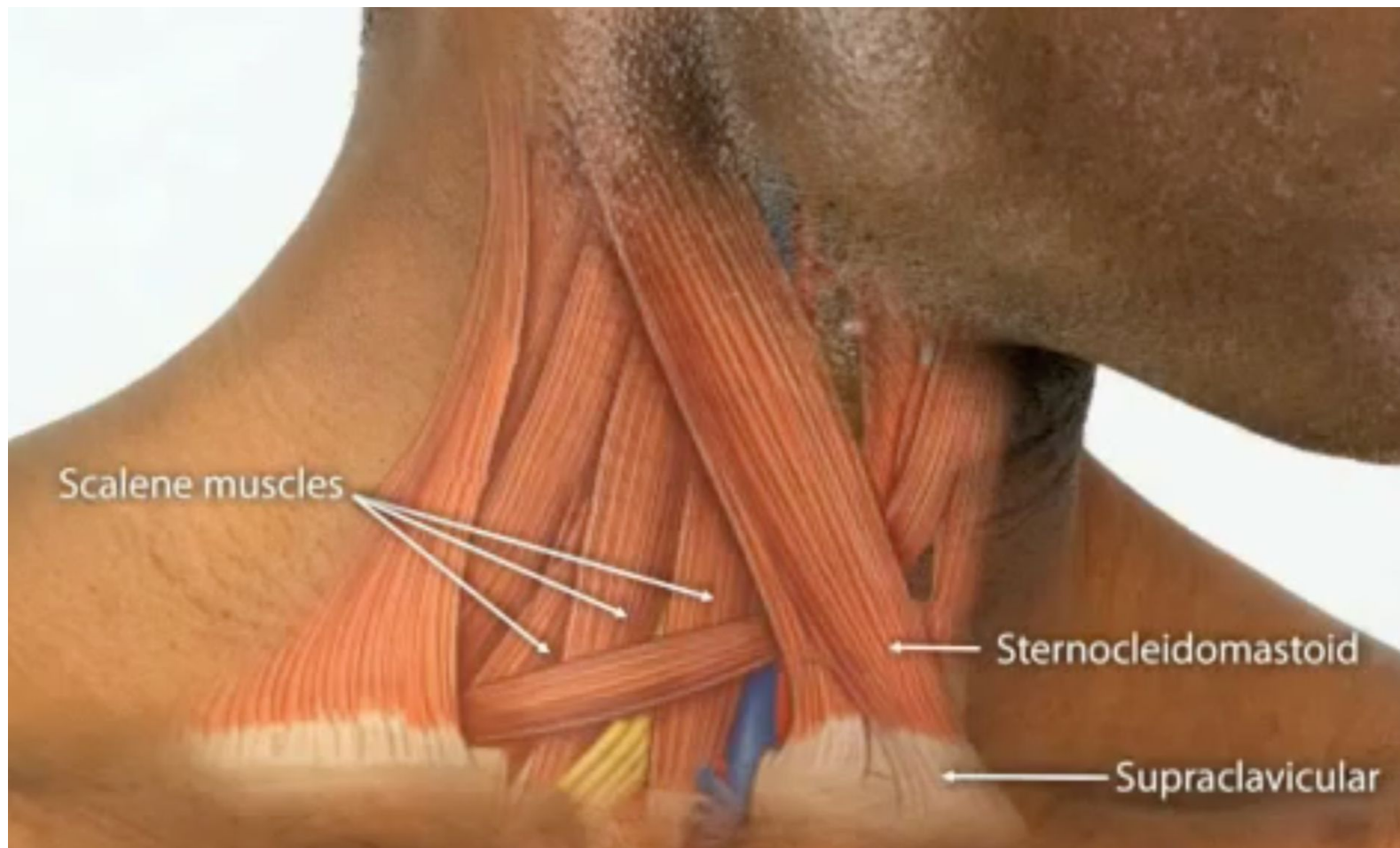
General Inspection

- **Patient wellbeing:** stable, alert, comfortable, breathless, cachexic (cancer, emphysema), Cushingoid (steroid use)
- **General breathing:** use of accessory muscles (COPD, pleural effusion, pneumothorax, severe asthma), puffing through pursed lips (prevents bronchial wall collapse by keeping lung pressure high in severe airway obstruction/emphysema)
- **Noises:** patients' speech normal? (obstruction, recurrent laryngeal nerve palsy), stridor (large airway obstruction e.g. mediastinal masses, bronchial carcinoma, retrosternal thyroid), wheeze, cough (dry/bovine/productive), prolonged expiratory phase (asthma, COPD), clicks (bronchiectasis), gurgling (airway secretions)
- **Around the bed:** oxygen, medication (metered dose inhalers, nebulisers), sputum pots (look at sputum), cigarettes

Systemic Signs of Pulmonary Disease

Clues to Increased Work of Breathing

- Nasal flaring.
- Intercostal/Supraclavicular retractions.
- Accessory muscle use.
- Pursed-lipped breathing.
- Disrupted speech.
- Thoraco-abdominal dissociation.



General Examination

- **Vital sign's** (BP , Temp , RR , PR , O2 sat).
- First, describe the general condition of the patient: his alertness, consciousness, cooperation, orientation to time, place and persons, intelligence and memory, then describe:
- **Built**: According to age, height and weight (normal 10% above or lower).

Appearance

- Blue bloater: obesity, generalized edema, cyanosis, puffy eyelids, and fish-mouth breathing → respiratory failure due to chronic bronchitis.
- Pink puffer: slim, cyanosis → respiratory failure due to α_1 antitrypsin deficiency.
- Cachectic: malignancy, malnutrition & chronic inflammatory diseases.

Pink Puffer

Thin, anxious

Type I respiratory failure
(= no CO_2 retention)

$\downarrow p\text{O}_2$

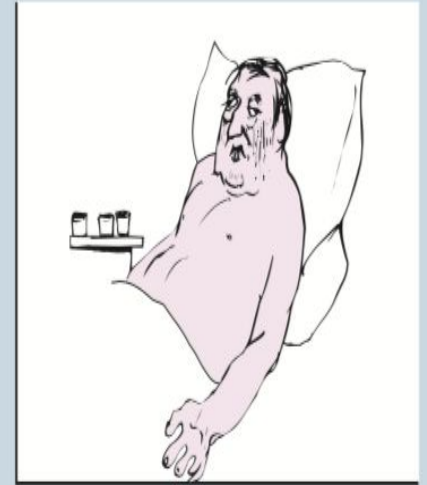


Blue Bloater

Large, quiet

Type II respiratory failure
(= CO_2 retention)

$\downarrow p\text{O}_2$



* Pupil sign:-

- **Enophthalmos:**
- Horner's syndrome. → in the pancost tumor... [Anhidrosis symptom]
- **Ptosis:**
- Unilateral:
- Horner's syndrome (Pancoast's tumor).

- **Conjunctiva:**

- **Anemia** (to be seen in lower lid because of the frequent affection of the conjunctiva of the upper lid by trachoma).
منخالی الحریفه يطام حذره

- **Jaundice**. in congestive HF - metastatic cancer...
منخالی الحریفه يتطلع لصف look to sclera

-The types of hypoxia:-

- 1- hypoxic hypoxia...
- 2- Anemic hypoxia...
- 3- stagnant hypoxia in HF...
- 4- histotoxic hypoxia...

- Nose:

- Redness in tip: alcoholism, mitral stenosis and cold weather, **lupus pernio**. *[nasal hypertrophy - redness] → in the Sarcoidosis]*
- Working ala nasi: pneumonia, toxemia, nervousness, bronchial asthma and respiratory failure.

* **Saddle nose**:- destruction of the nasal polyp in the granulomatosis - cholangitis...

* **tele canthars**:- widening of the nasal bridge due to nasal polyposis [young syndrome]

...infertility + crebretation + tele canthars + nasal polyposis ← [Kallmann syndrome]

... [Kartagener syndrome] cilia abnormality
 ↳ Bronchiectasis
 ↳ Chronic rhinosinusitis
 ↳ dextrocardia
 ↳ Fusion
 ↳ dextrocardia
 ↳ Fusion

↓
COPD- obesity- pericardial effusion

• Lips:

– Pallor: anemia.

– Cyanosis: ^{Central}congenital heart diseases, cor pulmonale, heart failure and arteriovenous fistula.
عن طرفيه رفع
اللسان ...

• Tongue:

• Pallor: severe anemia.

• Cyanosis: congenital heart diseases, cor pulmonale, heart failure and arteriovenous fistula. Cyanosis in tongue is always of the central type except in SVC obstruction where it is peripheral.



Central Cyanosis

Cyanosis:

- It is bluish discoloration of the lips and mucus membranes due to raised level of **reduced hemoglobin** in capillaries more than **5 gm%(>50 g/l)**
- (normally 1-2 gm%), so don't say cyanosis with pallor. Normally:
- O₂ saturation of arterial blood → 95-99%.
- O₂ saturation of venous blood → 70%.
- Cyanosis is apparent clinically when O₂ saturation is **below 80%**.

Types of cyanosis:

- Central cyanosis: blood leaving the heart already contains the required amount of reduced hemoglobin or abnormal hemoglobin (Sulph and methemoglobin), causes are:
 - » **Secondary polycythemia**:
 - Congenital cyanotic heart diseases.
 - Cyanotic cor pulmonale.
 - Cushing's syndrome.
 - Renal carcinoma (↑ erythropoietin).
 - » **Primary polycythemia**.
 - » **High altitudes**.
 - » **Acute pulmonary edema**.
 - » **Liver cirrhosis** (porto-pulmonary shunts).
 - » **Methemoglobin** due to nitrite toxicity.
 - » **Sulphemoglobin** due to sulphonamide toxicity.

- Peripheral cyanosis: blood leaving the heart contains the normal amount of reduced hemoglobin, but as it reaches the peripheral vessels rapid extraction of O₂ occurs raising the amount of reduced hemoglobin to more than 5gm% in the periphery, causes are:

- » 1-Right sided heart failure.

- » 2-Peripheral circulatory failure.

- (Due to low cardiac output and stagnation of blood)

- » 3-Peripheral vascular diseases:

- Raynaud's disease.

- Burger's disease.

- Acrocyanosis.

- 4-Cold weather

How to differentiate?

		Central cyanosis	Peripheral cyanosis
1-	Site:	Under surface of tongue	Extremities: hands, nose and nail bed
2-	Temperature:	Hot (peripheral vasodilatation)	Cold (peripheral vasoconstriction)
3-	Clubbing:	Present	Absent
4-	Femoral O₂:	Below 80%	Normal
5-	O₂ therapy:	Improves cyanosis due to lung disease only	No improvement of cyanosis

Neck Examination

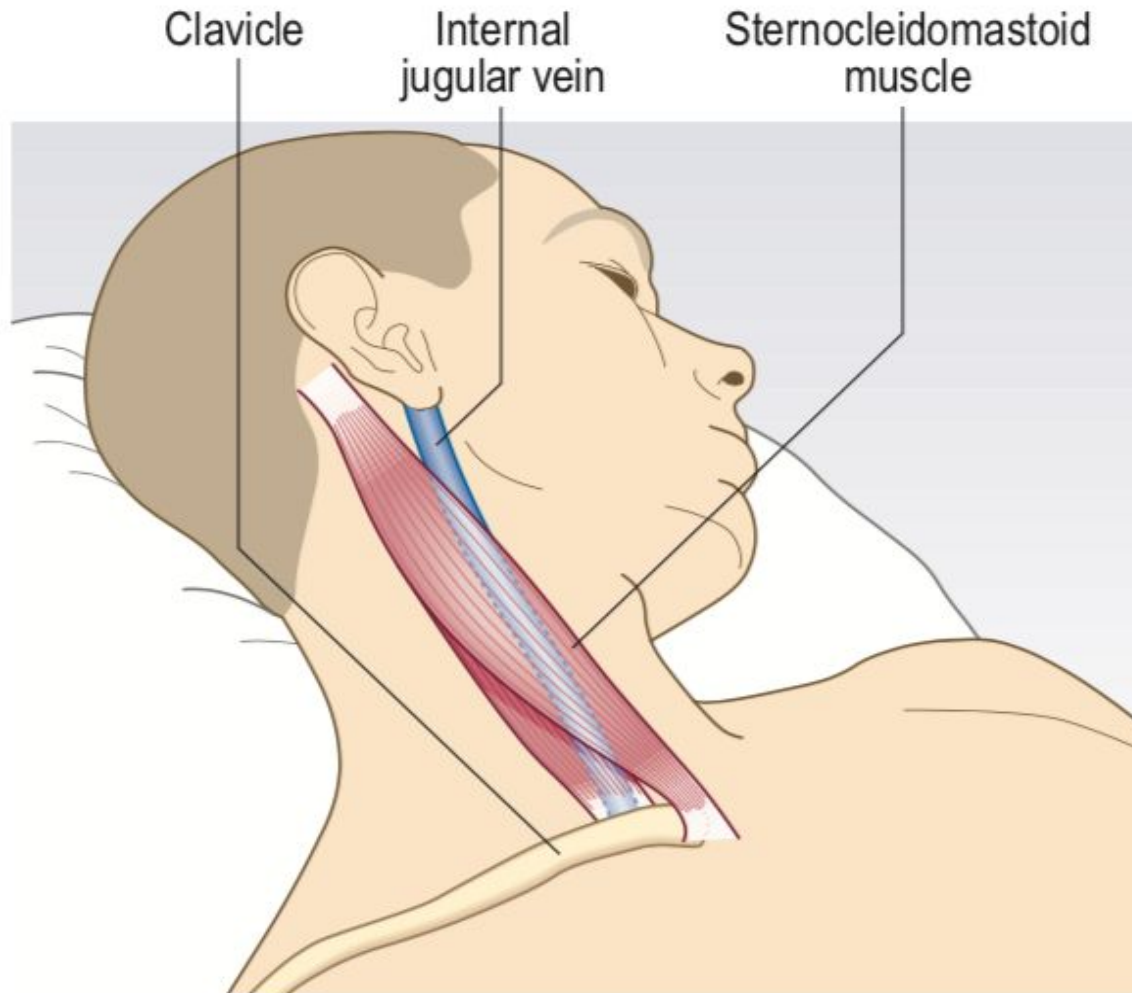
- JVP: *medial to the Sternocleidomastoid muscle*
 - Jugular venous pulse is defined as the oscillating top of vertical column of blood in the right **Internal Jugular Vein (IJV)** that reflects the pressure changes in the right atrium in cardiac cycle. Jugular venous pressure (JVP) is the vertical height of oscillating column of blood.
- Lymph nodes:
- Site, consistency, borders, tenderness, matted or discrete and the presence or absence of sinuses.

-Submental - submandibular - preauricular - postauricular - occipital → we exam them from Anterior..

→ we exam the Ant triangle + supraclavicular lymph node from the back.

*↳ Scalene LN :
 L IF :- virchow LN...
 R :- pancoast tumor...*

JVP



- Congested neck veins :
 - SVC thrombosis.
 - Aortic aneurysm causing mediastinal syndrome.
 - Mediastinal tumor.
- (These causes are usually associated with dilated veins on chest wall)

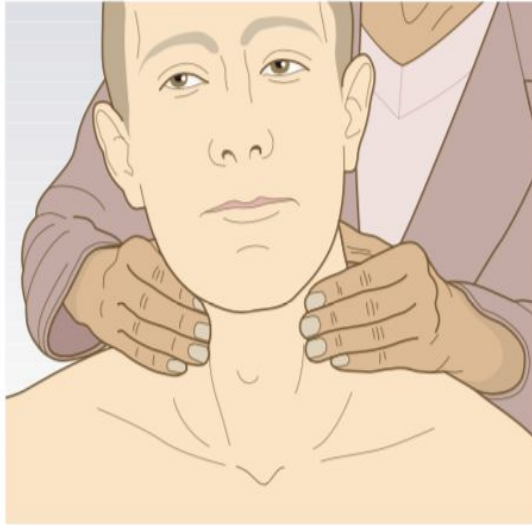


A



B

Fig. 7.11 Superior vena caval obstruction. (A) Distended neck veins. **(B)** Dilated superficial veins over chest.



A



B



C

Fig. 3.22 Palpation of the cervical glands. (A) Examine the glands of the anterior triangle from behind, using both hands. (B) Examine for the scalene nodes from behind with your index finger in the angle between the sternocleidomastoid muscle and the clavicle. (C) Examine glands in the posterior triangle from the front.

Hands:

- Flapping tremor , Alternatively ask the patient to squeeze your index and middle fingers and maintain this for 30–60 seconds. Patients with a flapping tremor cannot maintain their grip.
- Clubbing of fingers.
- Nicotine stains on fingers.
- Palmar erythema → liver cell failure and collagen diseases ,COPD.
- Muscle wasting.

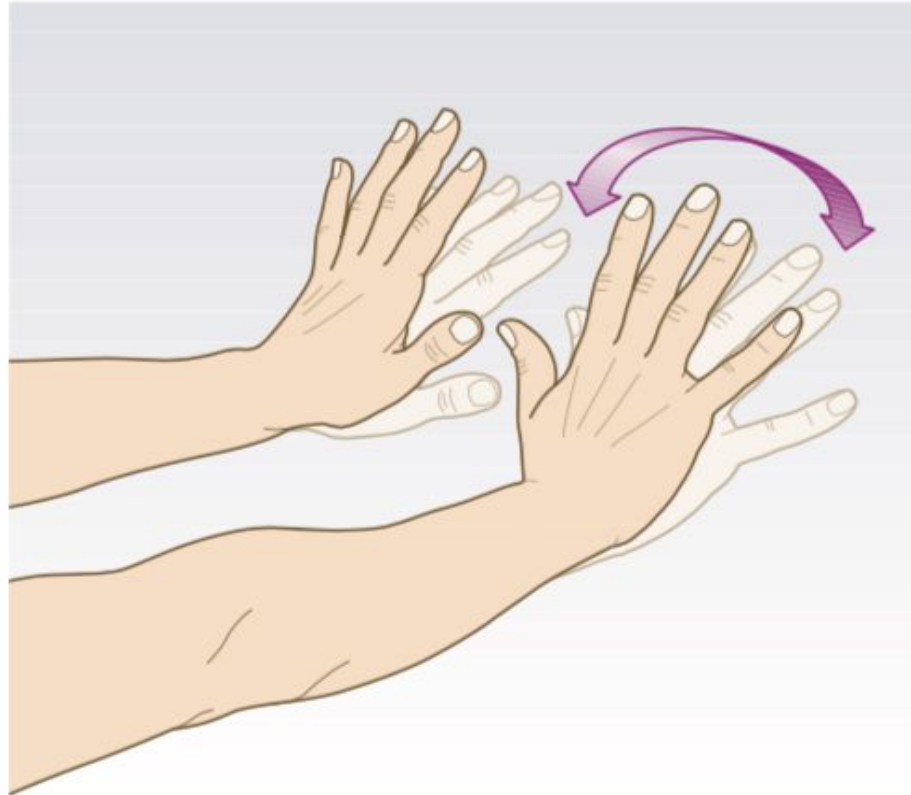


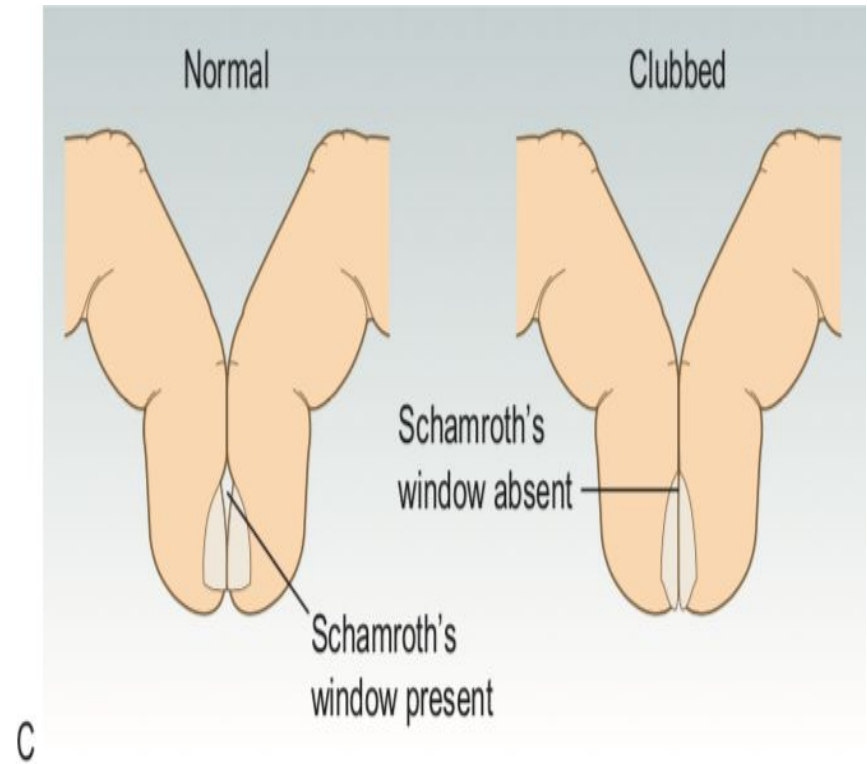
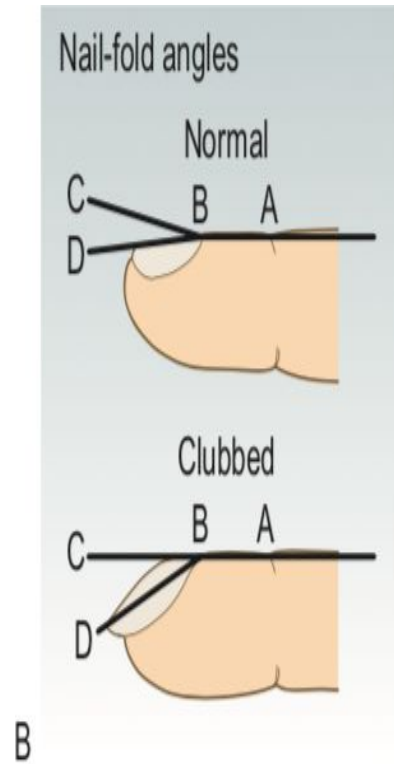
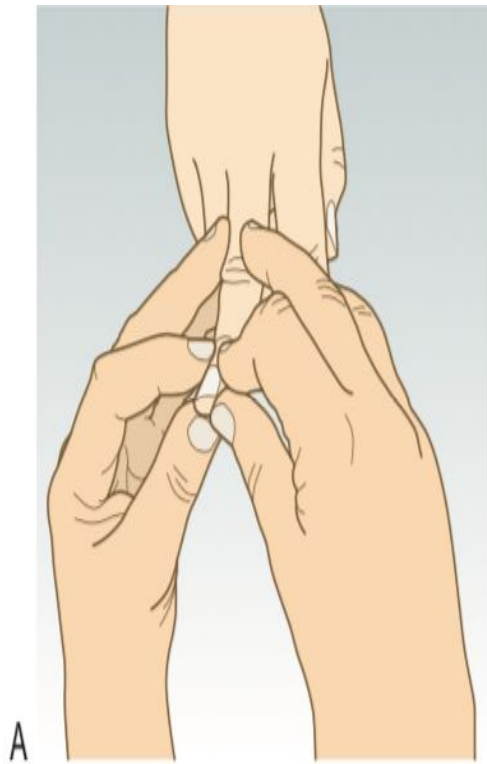
Fig. 7.10 Asterixis. Hand and arm position for observing the 'flapping tremor' of CO₂ retention.



Clubbing



- **Clubbing of fingers:**
- **Definition:** it is bulbous enlargement of the soft tissues of the terminal phalanges with over curving of the nail bed in longitudinal and transverse directions.
- **Degrees:**
- **1st degree** :Fluctuation (increased ballotability) and softening of the nail bed only. Palpating the nail bed by the index finger to detect softening and yielding of tissues under the nail.
- **2nd degree**: obliteration of the angle of nail bed detected clinically by:
 - Looking tangentially to the nail bed (normal <165° angle) .
- **3rd degree**: convexity of the angle of the nail bed (Parrot's peak).
- **4rd degree**: drum stick appearance.
- **5th degree**: pulmonary osteoarthropathy (widening and thickening of the ends of long bones). Sometimes the 5th degree is not included in the degrees of clubbing.



- Unilateral causes:
- Cervical rib.
- Pancoast's tumor.
- Aortic aneurysm.
- Infantile coarctation of the aorta.
- Clubbing in lower limbs only (differential clubbing):
- Eisenmenger PDA.
- Infantile coarctation of the aorta with PDA.
- Reversible clubbing: Mesothelioma (fibrous type) clubbing subsides after surgical removal of the tumor.



3.10 Causes of clubbing

Congenital or familial (5–10%)

Acquired

Thoracic (~70%)

Lung cancer

Chronic suppurative conditions

 Bronchiectasis

 Lung abscess

 Empyema

 Cystic fibrosis

Mesothelioma

Fibroma

Pulmonary fibrosis

Cardiovascular

Cyanotic congenital heart disease

Infective endocarditis

Arteriovenous shunts and aneurysms

Gastrointestinal

Cirrhosis

Inflammatory bowel disease

Coeliac disease

Others

Thyrotoxicosis (thyroid acropachy)

Significance: Clubbing Observed In:

- Intrathoracic malignancy: Primary or secondary (lung, pleural, mediastinal)
- Suppurative lung disease: (lung abscess, bronchiectasis, empyema)
- Diffuse interstitial fibrosis: Alveolar capillary block syndrome
- In association with other systemic disorders

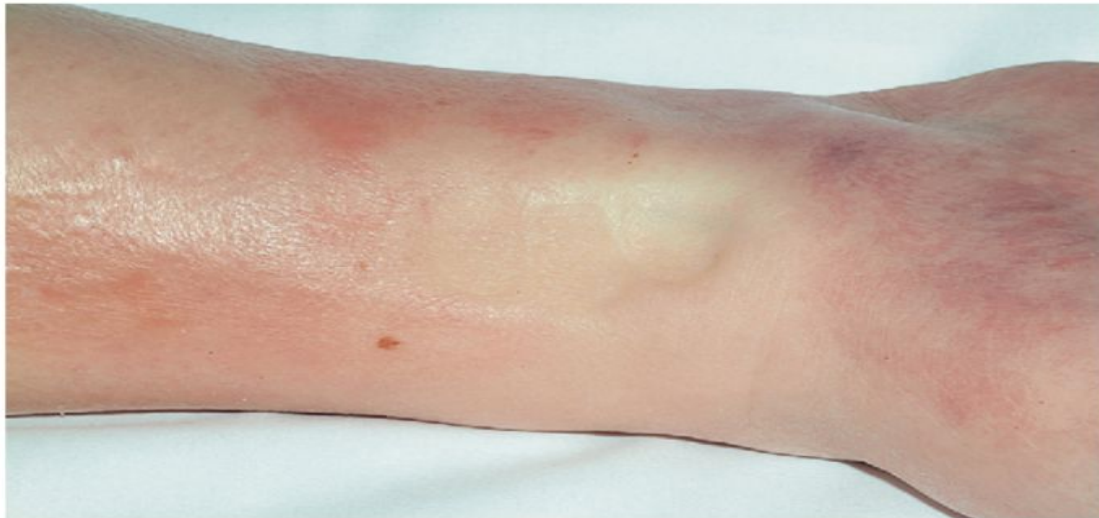
Lower limbs

- check for:
 - Edema:
 - Unilateral or bilateral.
 - Pitting or non-pitting

Exam the lower limb → DVT / bilateral leg swelling..
10sec) against tibia die)
+ look to facial expression..



A



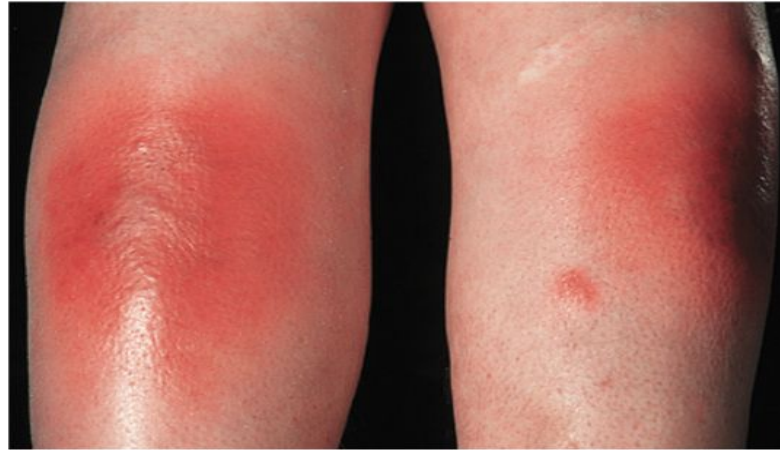
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Fig. 3.33 Demonstration of pitting oedema.

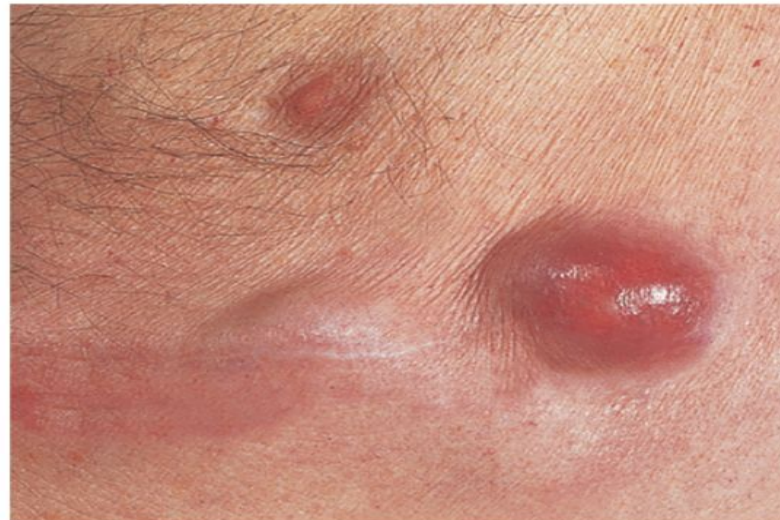


Fig. 3.30 Swollen right leg, suggesting deep vein thrombosis or inflammation, e.g. soft-tissue infection or ruptured Baker's cyst.

THE RESPIRATORY SYSTEM



A



B

Fig. 7.6 Skin lesions associated with respiratory conditions. **(A)** Erythema nodosum on the shins. **(B)** Metastatic skin nodes of lung cancer.

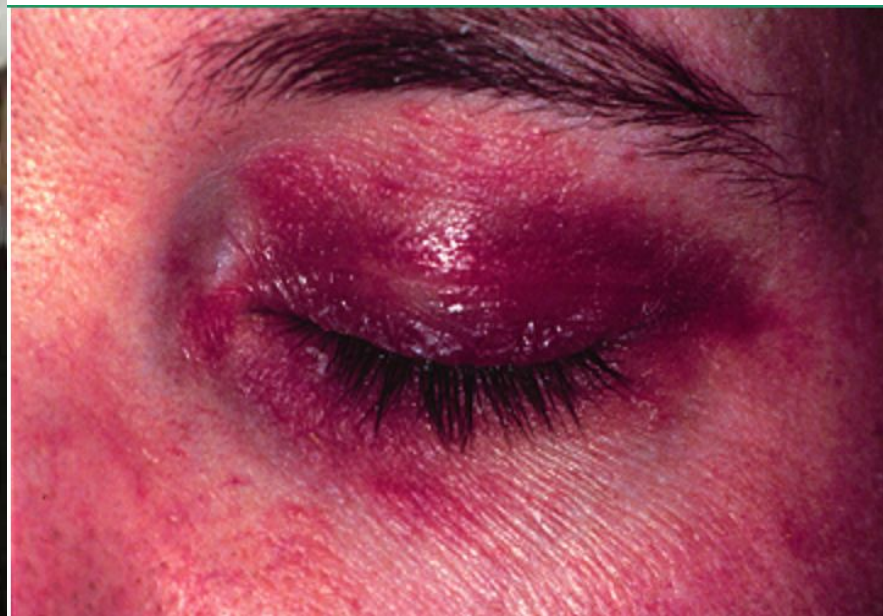
Extrapulmonary findings of systemic disease

- Gottron's papules.
- heliotrope rash.
- joint inflammation.
- "mechanics" hands.
- muscle weakness.

Gottron's sign in dermatomyositis



An erythematous, scaly eruption over the extensor surfaces of the metacarpophalangeal joints and digits in a patient with dermatomyositis. These lesions, called Gottron's sign, can mimic psoriasis.



Antisynthetase syndrome :

- **inflammatory muscle disease, interstitial lung disease, Raynaud phenomenon, arthritis, and cutaneous manifestations.**
- **cracking and fissuring on the radial side of the digits and the palms; there often is increased pigmentation along the palm creases that resembles the look of hands of a mechanic .**
- **Antibody positivity(anti-Jo1 antibodies).**



Sleep apnea syndrome

Examination hints

Overweight

Hypertension

Middle-aged man

Septal deviation

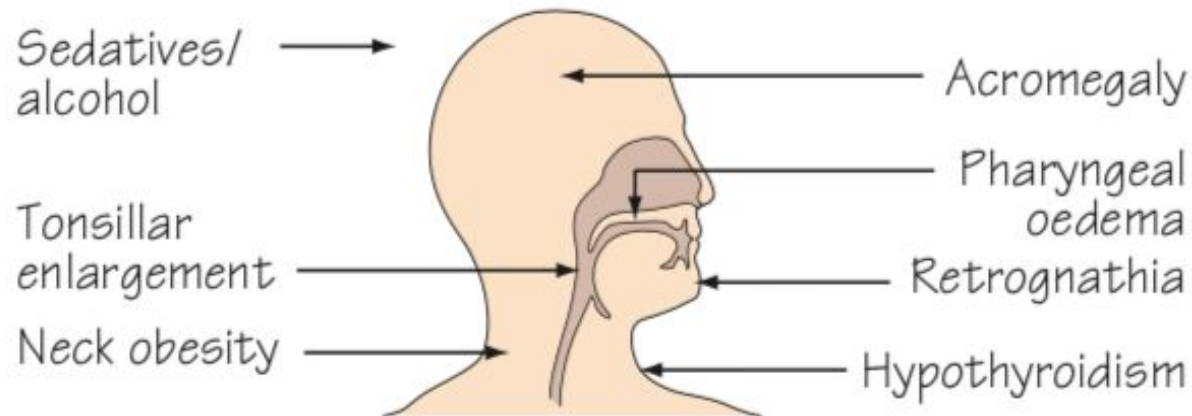
CPAP equipment

Large collar size

Micrognathia

Cyanosis

Signs of cor pulmonale



Diagnostic approach: Clinical picture

Systemic signs and DPLD

Fever	Infections (including immunodeficiency), eosinophilic pneumonia, drug reactions, vasculitis, connective tissue disorders, cryptogenic organising pneumonia, extrinsic alveolitis, sarcoidosis, AIDS, lymphoma and lymphangitic carcinoma
Rash	Sarcoidosis, connective tissue disorders, vasculitis
Scleritis	Sarcoidosis, connective tissue disorders, vasculitis
Keratoconjunctivitis sicca	Sjogren's syndrome
Uveitis	Sarcoidosis, Behcet's syndrome, ankylosing spondylitis
Raynaud's phenomenon	Systemic sclerosis, CFA
Systemic hypertension	Connective tissue disorders, Goodpasture's syndrome, vasculitis
Lachrymal and salivary gland enlargement	Sarcoidosis, Sjogren's syndrome
Lymphadenopathy	Sarcoidosis, lymphoma, lymphangitic carcinoma, HIV
Pericarditis	Connective tissue disorders, lymphangitis, lymphoma, vasculitis
Hepatosplenomegaly	Sarcoidosis, LCH, connective tissue disorders, amyloidosis
Arthritis	Connective tissue disorders, vasculitis, sarcoidosis, Goodpasture's syndrome
Haematuria	Vasculitis
Oral candidiasis	Immunodeficiency (especially HIV)



Brief Survey of Chest and Respiration



- Is the patient in distress?
- Observe the rate, rhythm, and depth of respiration.
- Audible sounds?
- Respirations should be easy, quiet, and regular.

* local exam:- expose above to umbilicus.

Inspection of anterior chest wall

- 1) Ask the patient to lie supine.
- 2) Ask the patient to lower his gown to waist level.
- 3) Stand at the feet of patient.
- 4) Inspect the shape of the chest (ratio of antero-posterior and transverse diameters).
- 5) Inspect the symmetry of the patient's chest on both sides with comparison.
- 6) Type of breathing.

* The chest deformity:-
1- pectus carinatum [pigeon chest] → Obstructive lung disease ← COPD
2- pectus excavatum [funnel chest] → occupational or rickets..

asthma

Respiratory Inspection

- AP diameter of chest as compared to the lateral diameter ($1/3$ to $1/2$) ?
Barrel chest
- Sternal abnormalities -
pectus excavatum or
pectus carinatum
- Dilated superficial veins
↳ SVC obstruction
- Rate, depth, rhythm of respirations
- Abnormal breathing patterns - Kussmaul ^{dy stress}
- Skin color, Scars, swelling ^{in the back of the chest [laterally]}
- Spinal curvatures -
kyphosis, scoliosis,
kyphoscoliosis

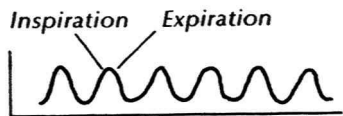
→ Type of breath:-

- * ♀ :- thoraco abdominal breath...
- * ♂ :- abdominothoracic breath...
- * Child :- abdominothoracic breath...

Visual Examination of the Chest

Breathing Patterns

- **Rate, Depth, Regularity**



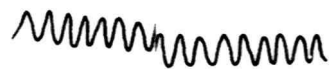
Normal

Adults: 12-20/min
Infants: 44/min



Ataxic breathing

Biot's breathing
Irregularly irregular



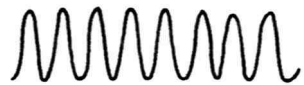
Tachypnea

Rapid, shallow breathing



Cheyne-Stokes breathing

Regular rate, irregular depth
MAY be normal



Hyperpnea

Rapid, deep breathing
Hyperventilation
Kussmaul breathing



Bradypnea



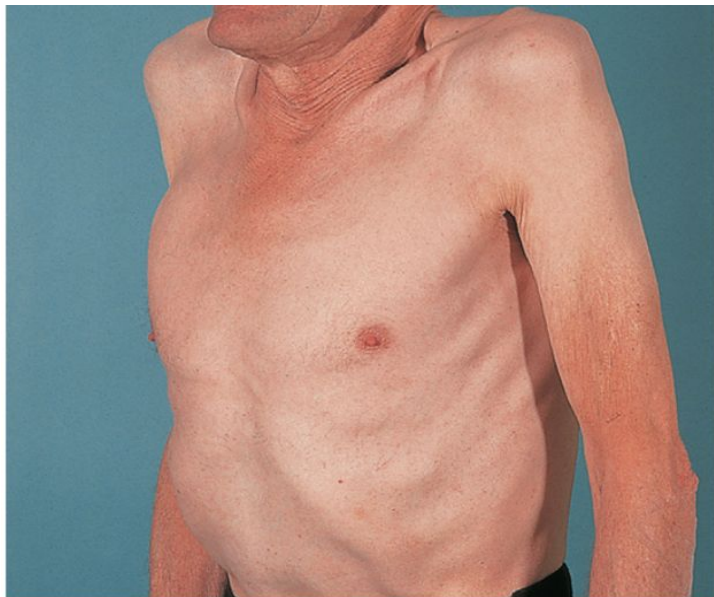
Sighs

Hyperventilation syndrome
1 sigh per 200 breaths

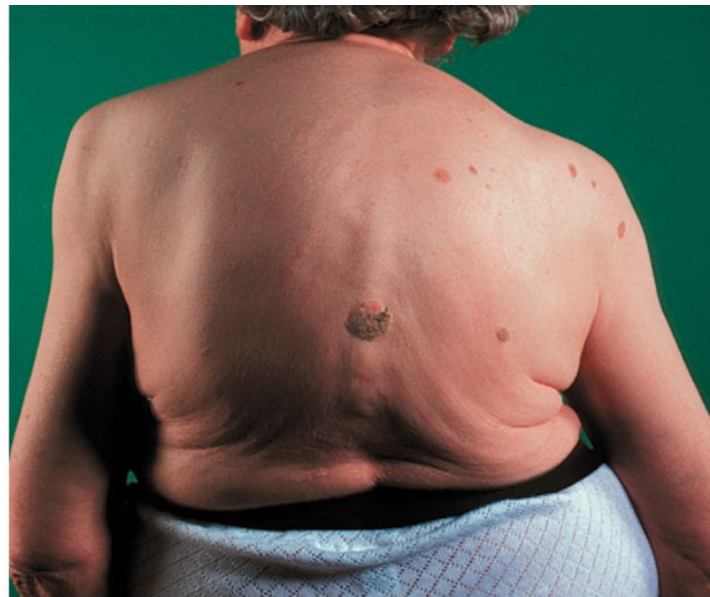
- Chest is inspected from the head or from the foot. If the patient is too ill to sit up, the back is examined by rolling the patient on each side in turn. include the following :
 -
 - *Shape*
 - *Symmetry*
 - *Movement of the chest*
 - *Respiration*
 - *Pulsations*
 - *Subcostal angel*
 - *The skin overlying the chest wall*

Resting Size and Shape of Thorax

- Barrel chest
- Kyphosis
- Scoliosis
- Pectus excavatum
- Gibbus



A



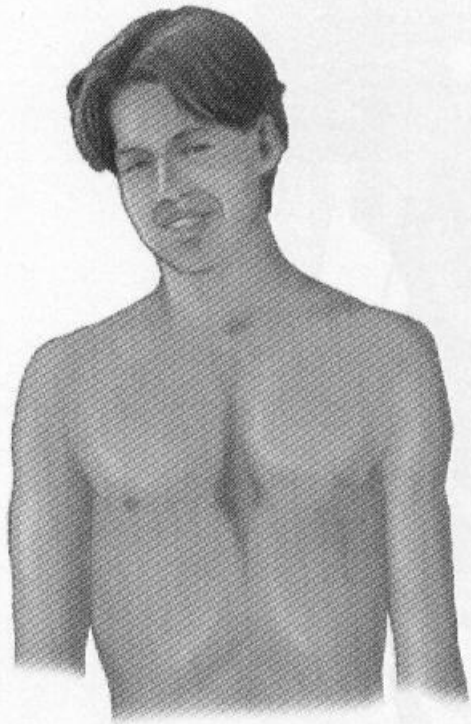
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C



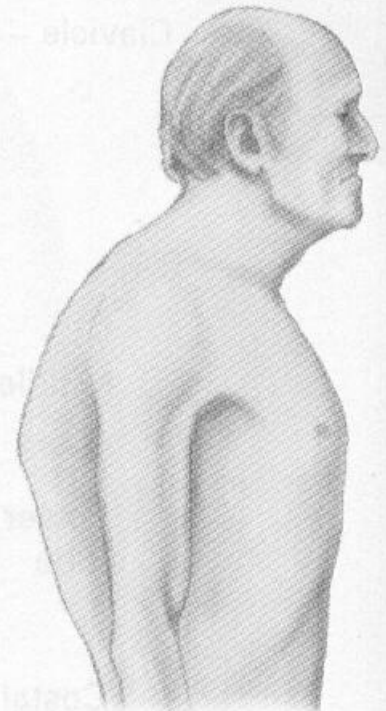
D



Funnel chest

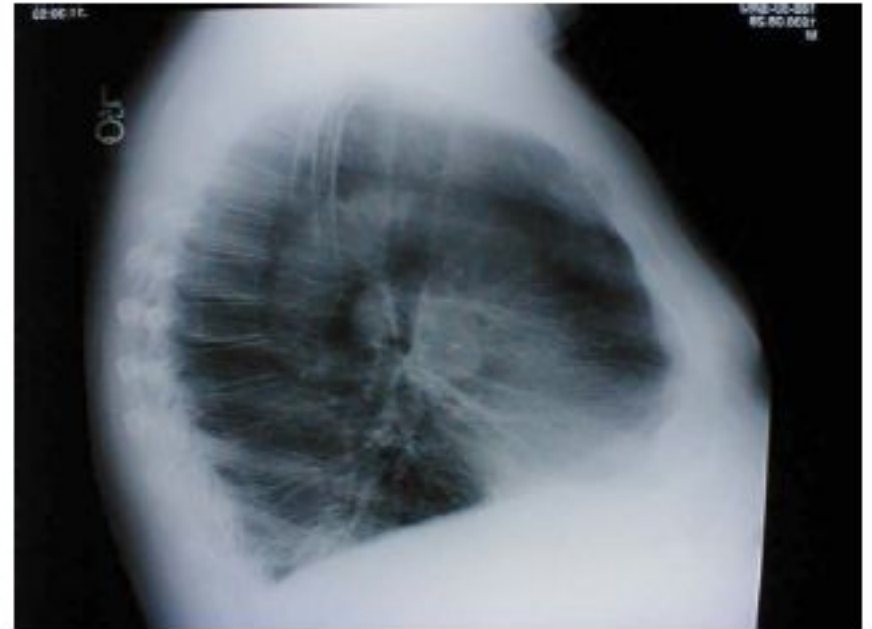
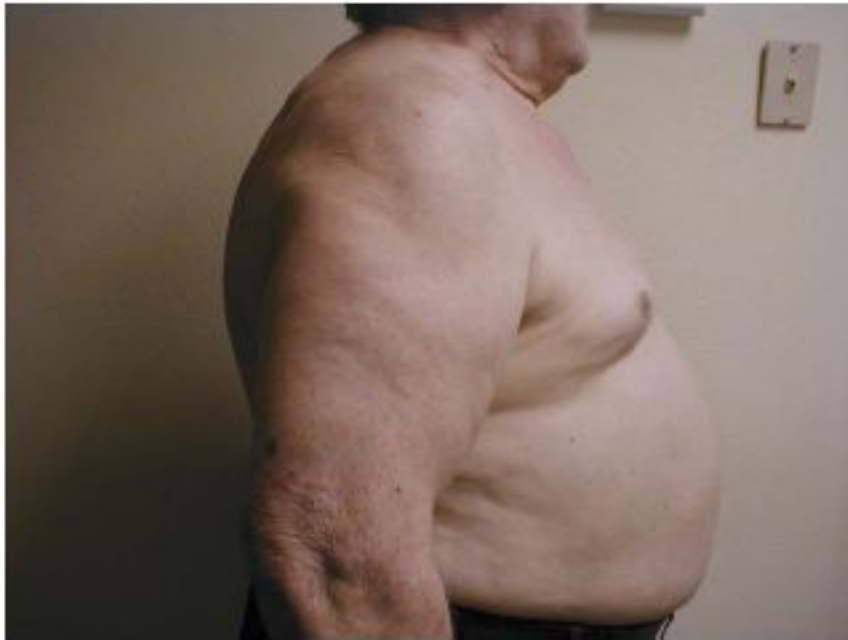


Pigeon chest



Barrel chest

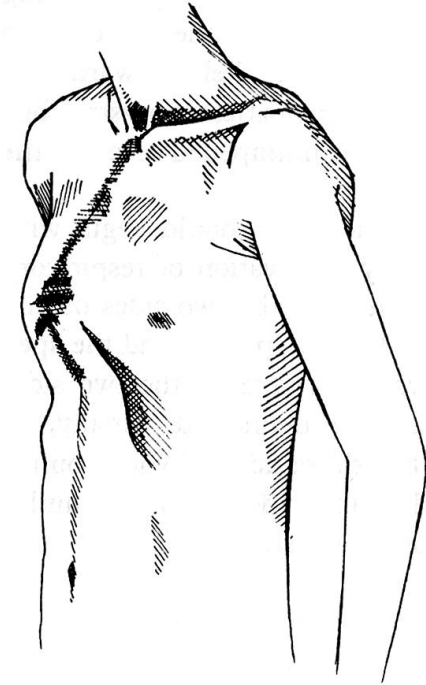
Pathologic Changes In Shape Of Chest



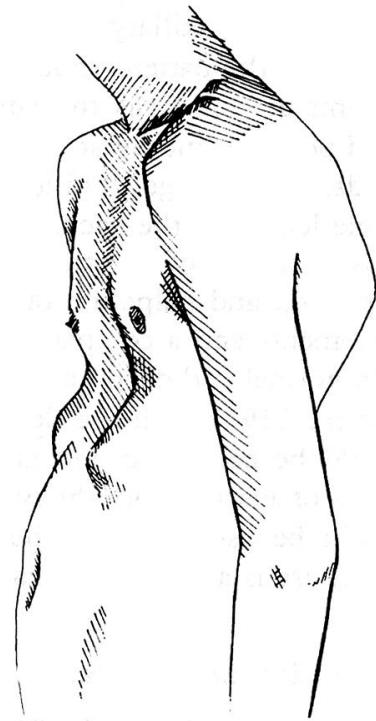
Barrel Chested (hyperinflation secondary to emphysema)

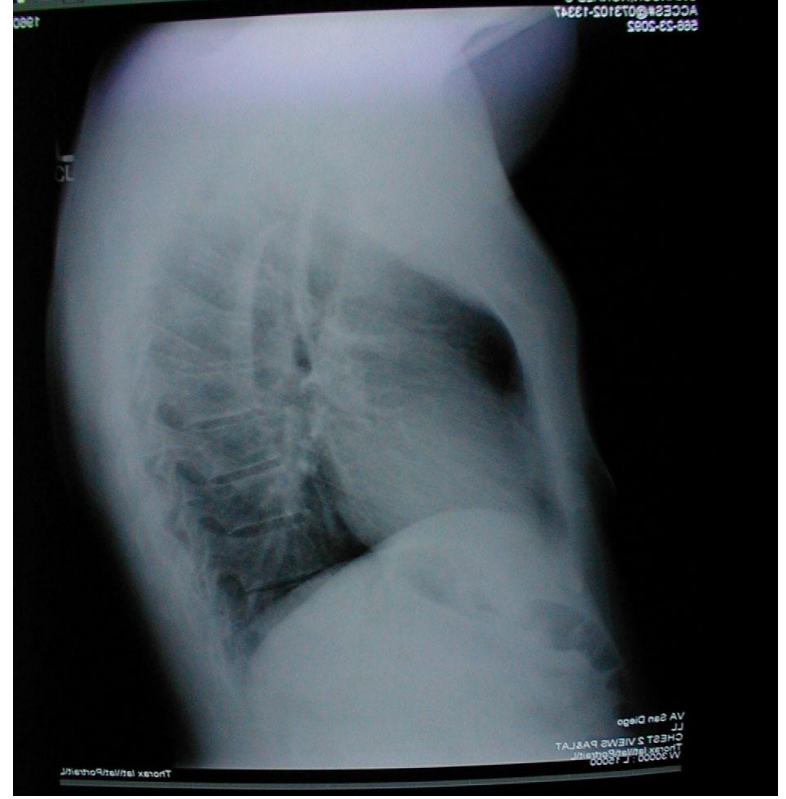
Chest wall

Pectus carinatum



Pectus excavatum







Gibbus

Palpation of anterior chest wall

- 1) Stand to the right of the patient.
- 2) Ask the patient to lie supine.
- 3) Palpate for chest wall ^① tenderness *surgical emphysema - mass [pneumomediastinum] or Clex رقبه*
- 4) palpate for ^② apex beat *in lf [normal] palpation to the chest [good exam]*
- 5) Palpate upper lung zone to confirm the movement by placing the palms in the infraclavicular fossa and the two thumbs in the midline at the level of suprasternal notch. Let the patient inspire deeply and let your thumbs follow chest movement.
- 6) Palpate middle lung zone by putting the palm in the middle part with tips of thumbs in the midline. Let the patient inspire deeply and let your thumbs follow chest movement.

- 7) Palpate lower lung zone by putting the palm in the lower part with tips of thumbs in the midline. Let the patient inspire deeply and let your thumbs to follow chest movement.
- 8) Palpate for palpable rhonchi, pleural rub by putting the palm on various areas of chest wall.
- 9) Palpate for Tactile vocal fremitus → vocal resonance / رنين صوتي في Auscultation...
- a) Place the palm of hand over various area of chest wall in the direction of bronchial tree away from midline with comparison. ← chest رنين صوتي يترك 44
- b) Ask the patient to repeat the words "44" in arabic

④ Chest expansion:- infra mamary - mamary - supra mamary LN examination...
↳ normally :- 3-5 cm move..



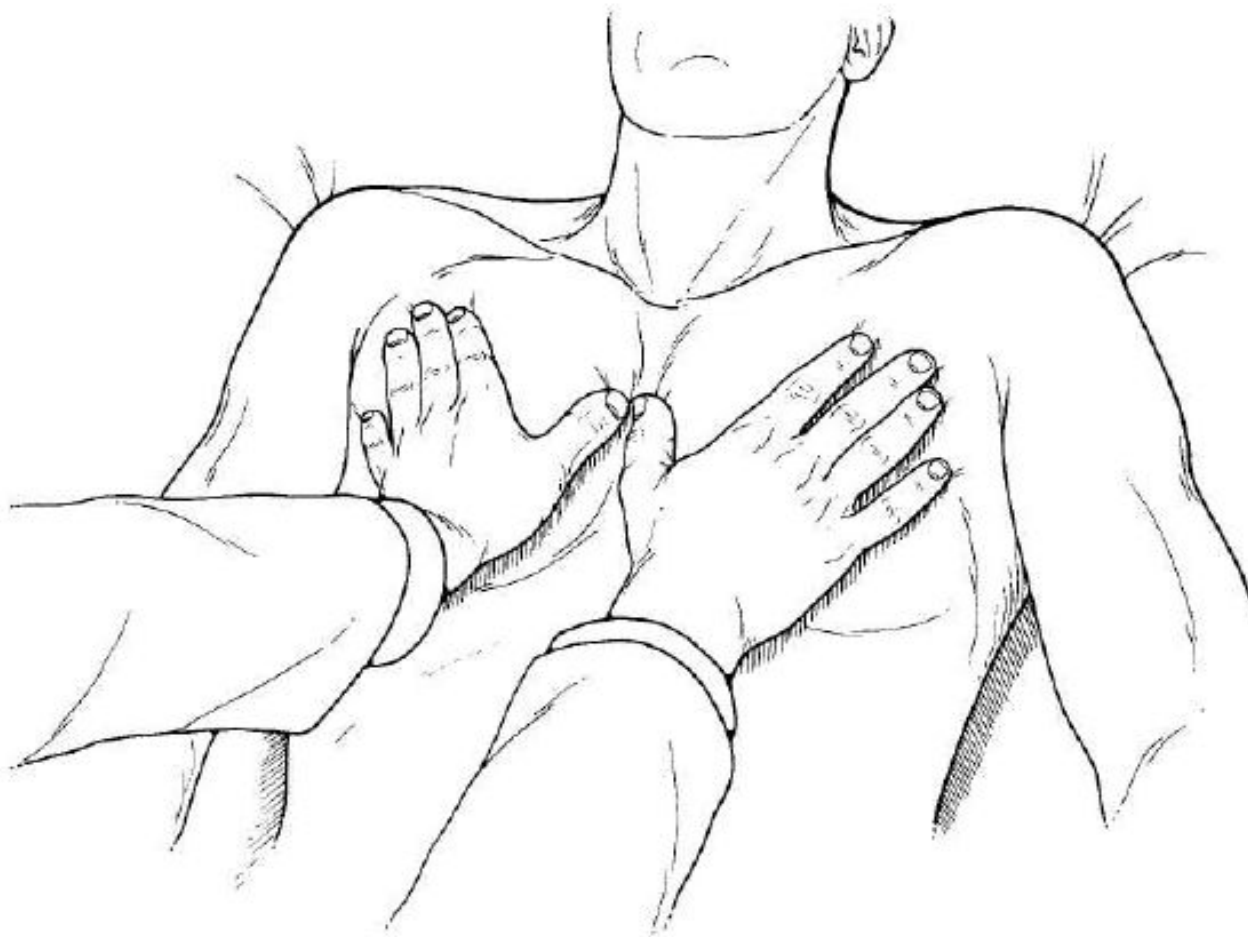


Figure 35.6

Palpation of the chest. Hands should be placed at the same level with thumbs over the sternum anteriorly or the spine posteriorly (not shown) to avoid artifactual asymmetry of chest motion. The patient should be seated upright or prone or supine.



(1)

(2)

(3)

(4)

Infraclavicular

Mammmary

Inframammary

Estimation of chest movement anteriorly



(1)

(2)

Suprascapular areas

Subscapular areas

Estimation of chest movement posteriorly



(1)

Infraclavicular area

(2)

Mammary area

(3)

Inframammary area

Steps in estimation of TVF anteriorly, note do each step on both sides in turn



(1)

Suprascapular

(2)

Upper interscapular

(3)

Lower interscapular

(4)

Subscapular

Steps in estimation of TVF posteriorly, note do each step on both sides in turn

Tracheal Examination

⑤

• Trachea: normally central position... or slightly deviated to the Rt..

- Shifted to site of lesion: Lung or pleural fibrosis or lung collapse.
- Shifted to opposite side: pleural effusion, pneumothorax, lung tumors or thyroid swelling.

Tracheal examination:

↳ Tracheal tug :- hyper inflation - COPD (الانزلة مع trachea)
↳ one finger or 3 finger technique..

Determine the **position of the mediastinum** by examining the **trachea** and **cardiac apex** beat .

- a) Stand to the right of the patient.
- b) Ask the patient to sit up with the head straight.
- c) Inspect for tracheal position "Trail's sign".
- d) **Tracheal shift**: Insert the index finger in horizontal position in the pouch between the medial end of sternomastoid and the lateral aspect of trachea with comparison.
- e) Check the **cricosternal distances**. This is the distance between the cricoid cartilage and the suprasternal notch. If it is less than **3 finger breadths**, this indicates hyperinflation of the lung.
- f) **Tracheal descent**: place the tip of the index finger on the thyroid cartilage during inspiration to observe its descent.



Fig. 7.15 Examining for tracheal shift.

Inspection for Position of trachea

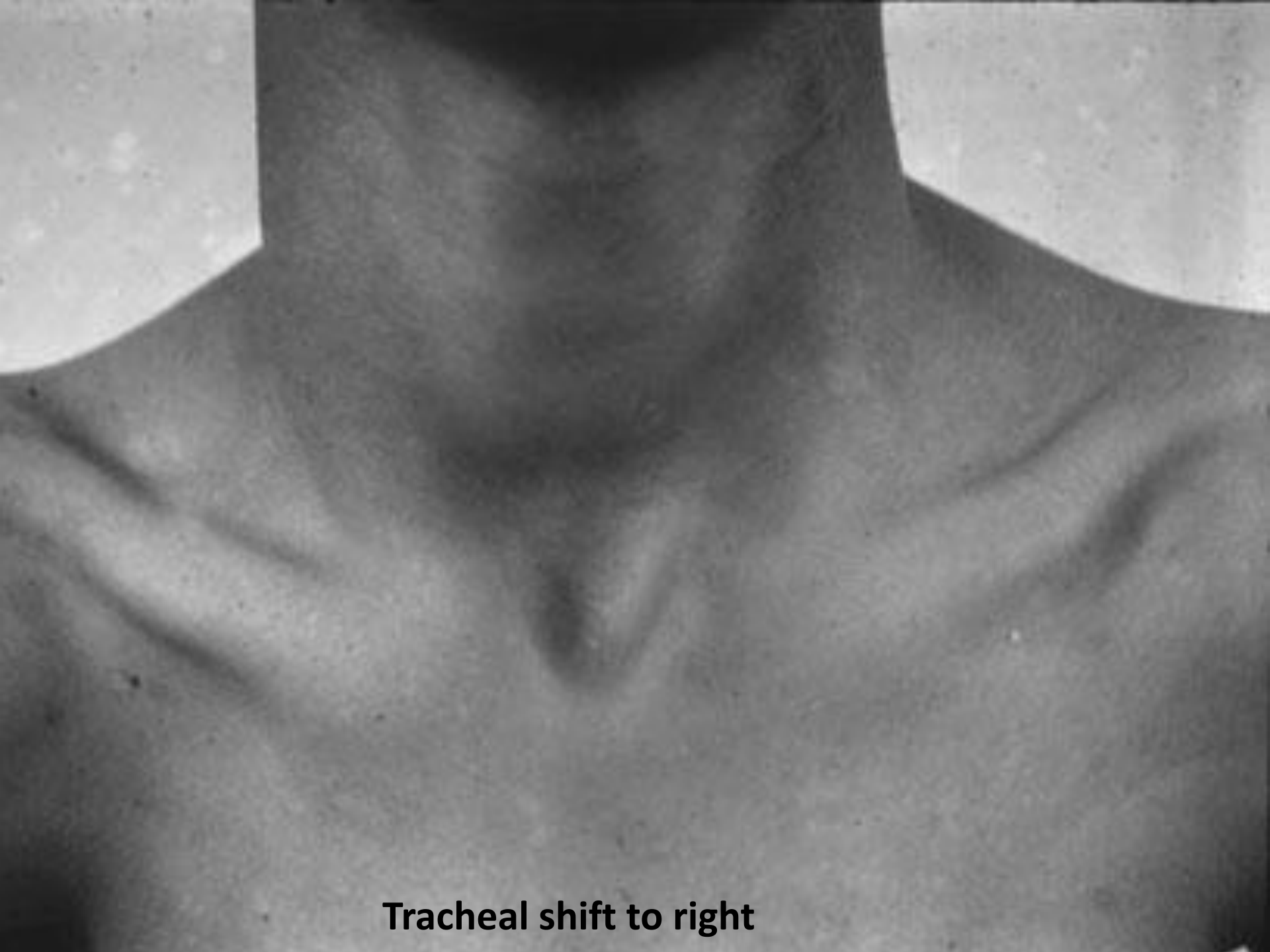
Trail's sign: It is the undue prominence of the clavicular head of sternomastoid on the side to which the trachea is deviated.



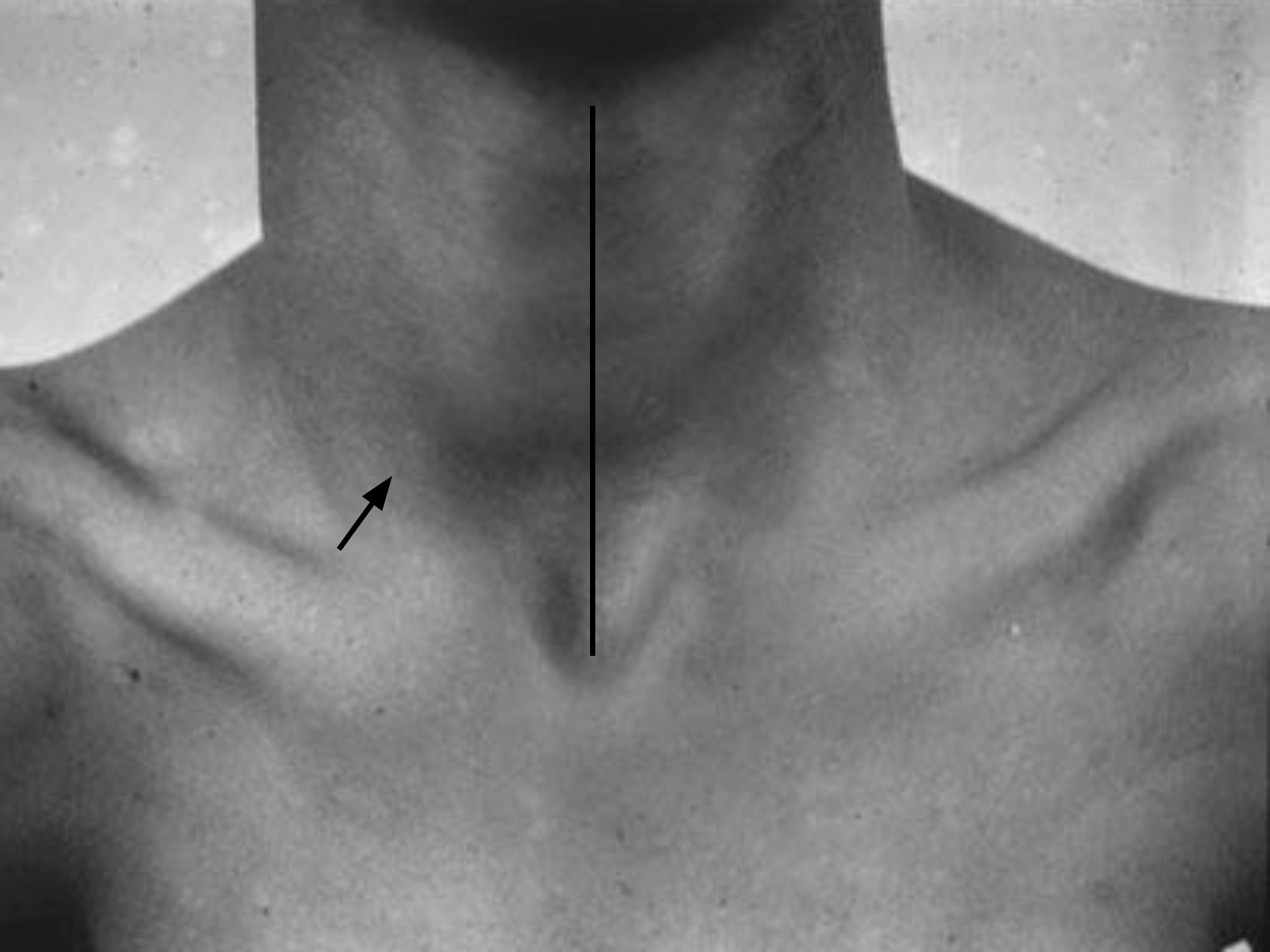
Position of Apex Beat

The apex beat is shifted to the side of mediastinal shift.





Tracheal shift to right



TVF²

Increased TVF

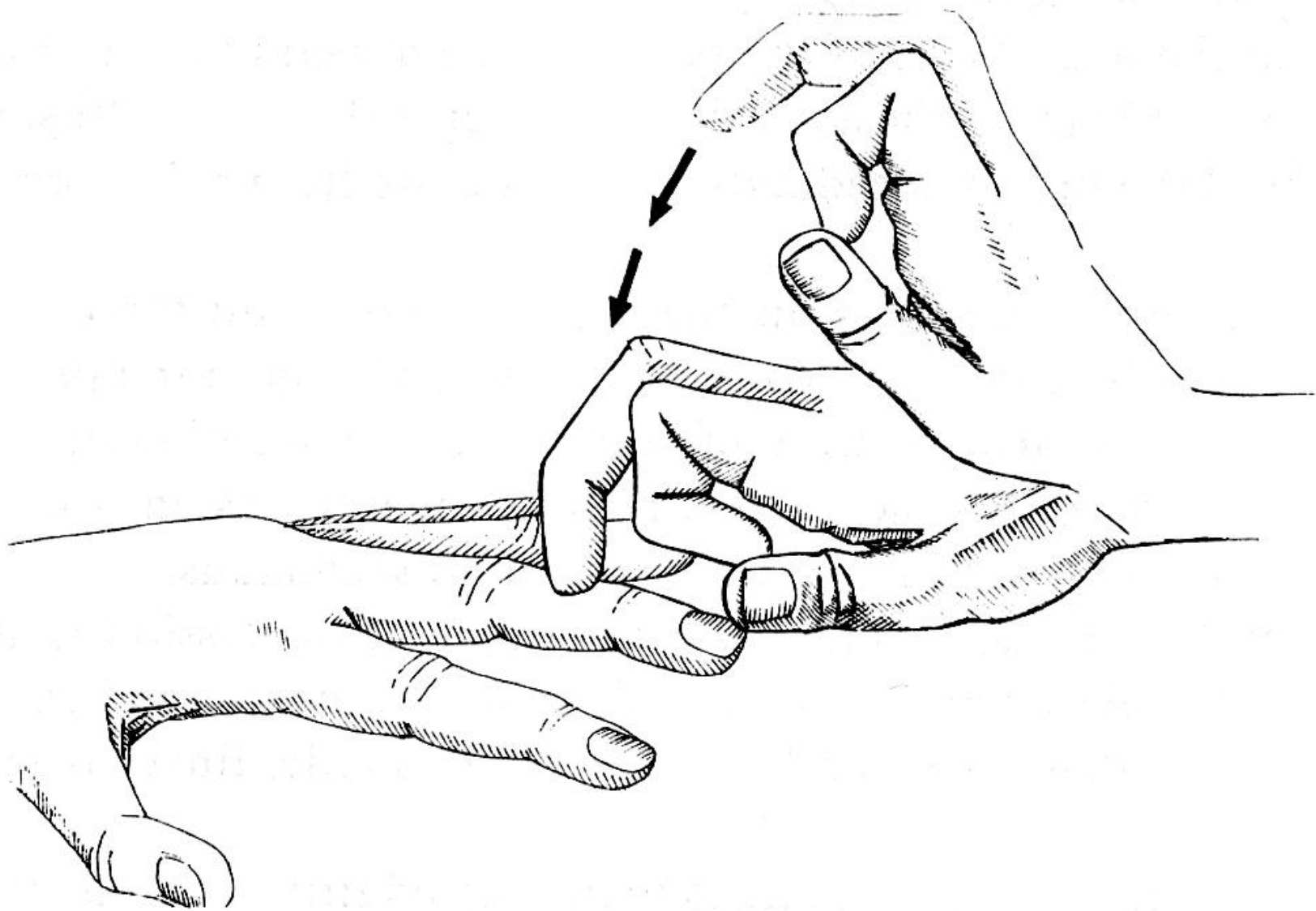
- Consolidation
- Cavitation
- Collapse with patent main bronchus

Decreased TVF

- Thick chest wall
- Pleural effusion
- Pleural fibrosis
- Pneumothorax
- Emphysema
- Collapse

Percussion technique

- Place left hand on chest wall, palm downwards with fingers separated
- 2nd phalanx over area of intercostal space
- Right middle finger strikes the 2nd phalanx producing hammer effect
- Entire movement comes from wrist



Percussion of the chest

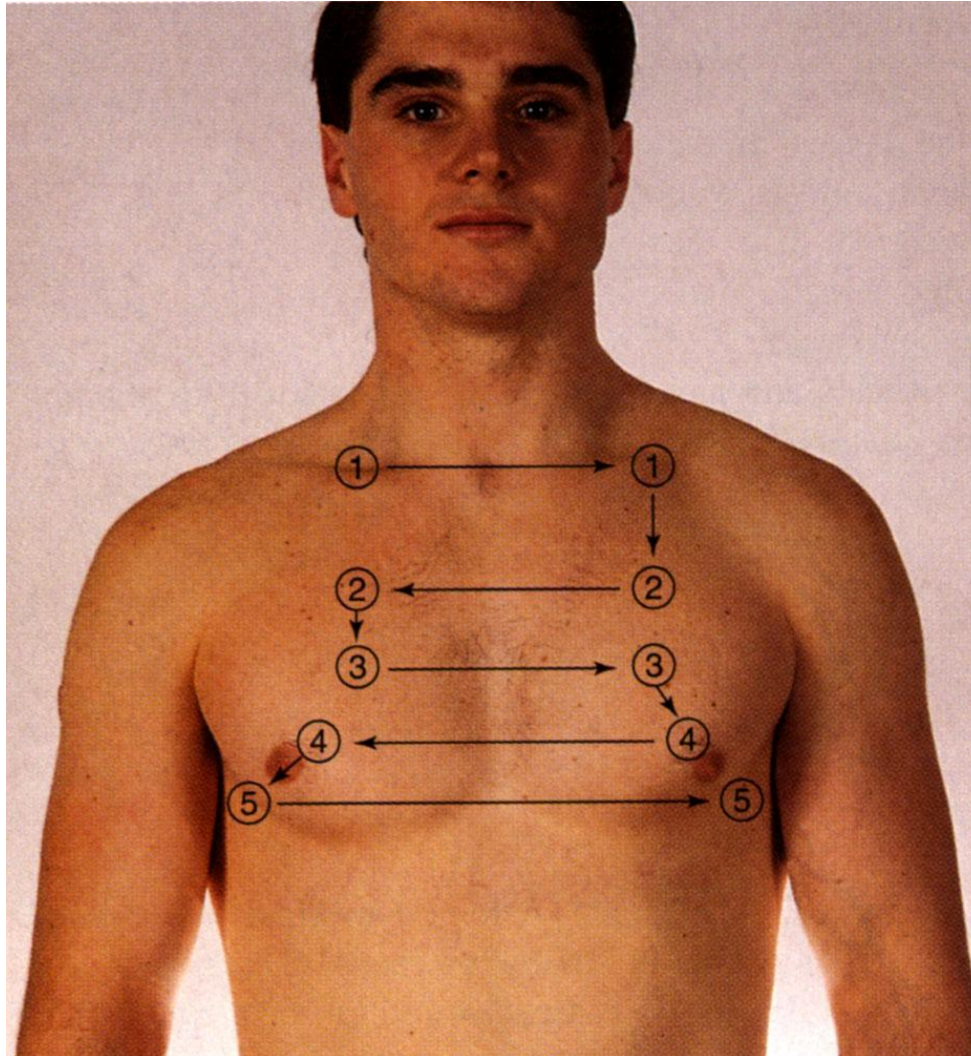
anterior chest wall

- 1- Stand to the right of the patient.
- 2- Ask the patient to lie supine.
- 3- Use light percussion.
- 4- Krönig's isthmus: Percuss both areas right and left from dullness to resonance (start from the neck) with comparison.
- 5- Percuss both clavicles directly (over medial third)
- 6- Percuss the infraclavicular regions.
- 7- Percuss both parasternal lines right and left, from the **second** space to the **sixth** space with comparison.
- 8- Spare bare area to be percussed late with special areas percussion.
- 9- Percuss both midclavicular lines right and left, from the second space to the sixth space with comparison.
- 10-Comment on dullness found.

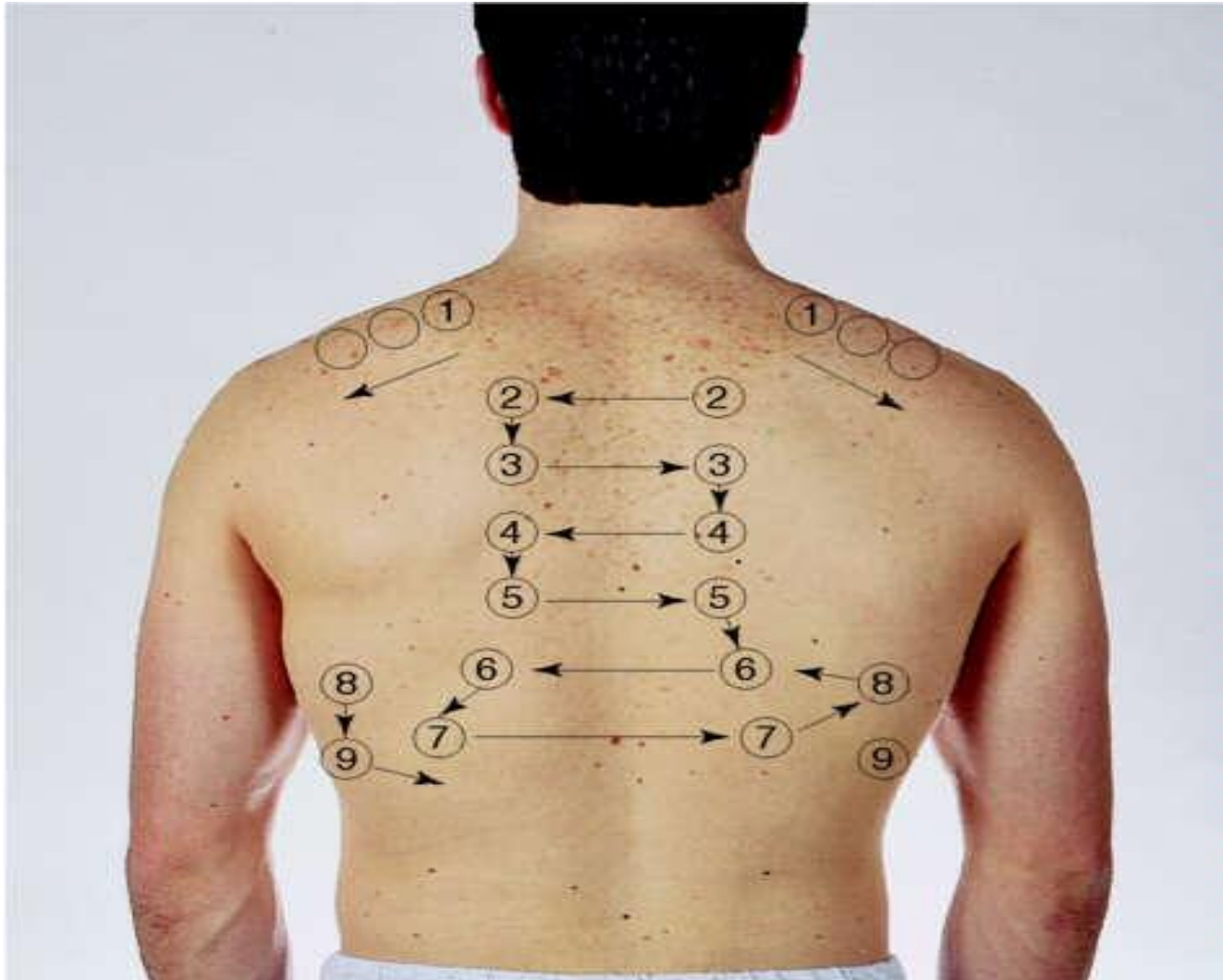
Percussion of the lateral chest wall

- 1-Stand to the right of the patient.
- 2-Ask the patient to lie supine and raise his hands above his head.
- 3-Use light percussion.
- 4-Percuss both anterior axillary lines right and left, from the fourth space to the eighth space with comparison.
- 5-Percuss both middle axillary lines right and left, from the fourth space to the eighth space with comparison.
- 6-Percuss both posterior axillary lines right and left, from the fourth space to the eighth space with comparison.
- 7-Comment on dullness found.

Sequence for Percussion



Sequence for Percussion



Tidal percussion

- 1- Stand to the right of the patient.
- 2- Ask the patient to sit.
- 3- After percussing the back using heavy percussion if any infrascapular dullness was found, fix the left hand over it and ask the patient to take a deep breath and hold it then percuss again.
- 4- Comment on whether it changed to be resonant or not and explain.

Diaphragmatic Excursion

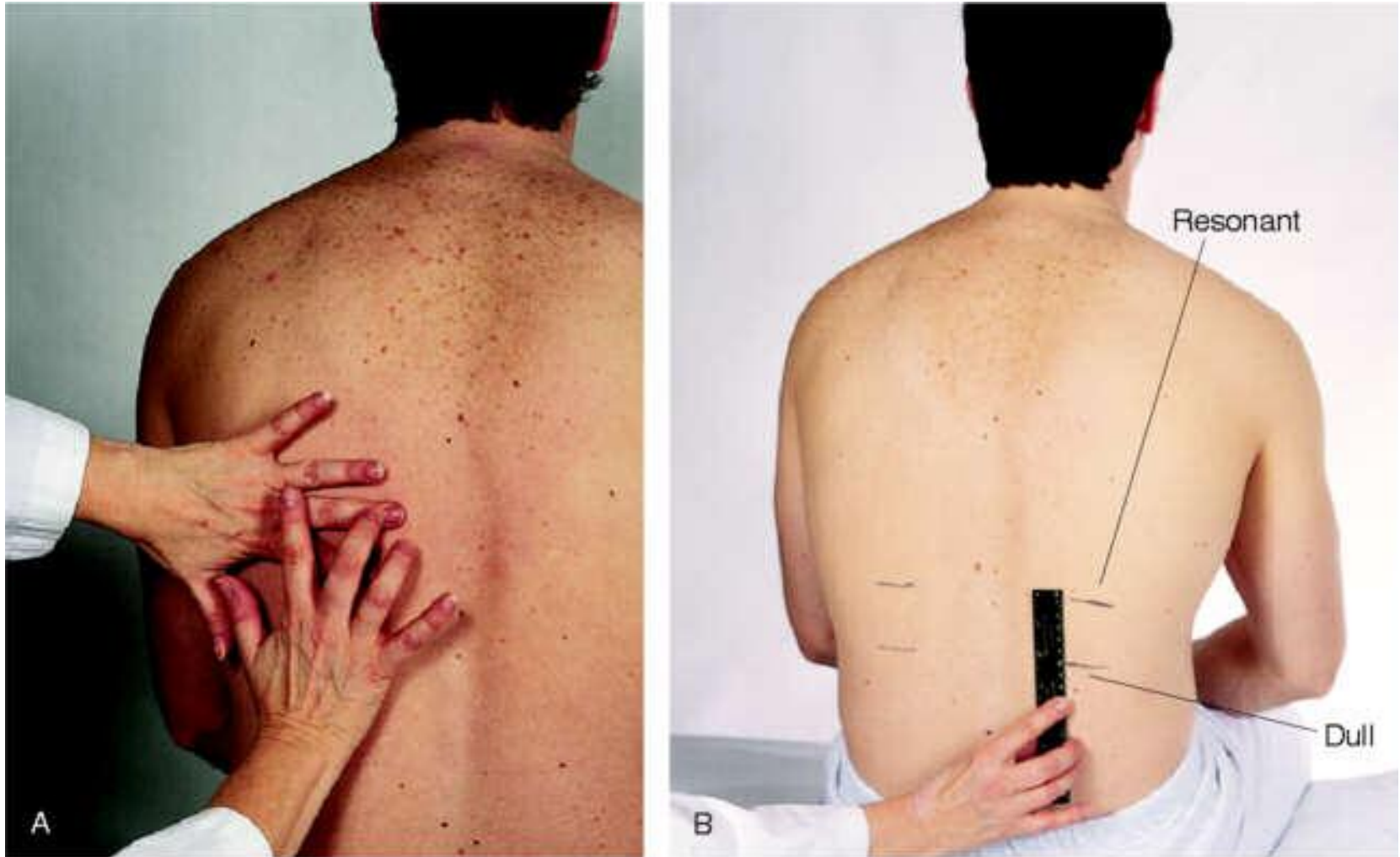


Figure 16-17. p. 464.

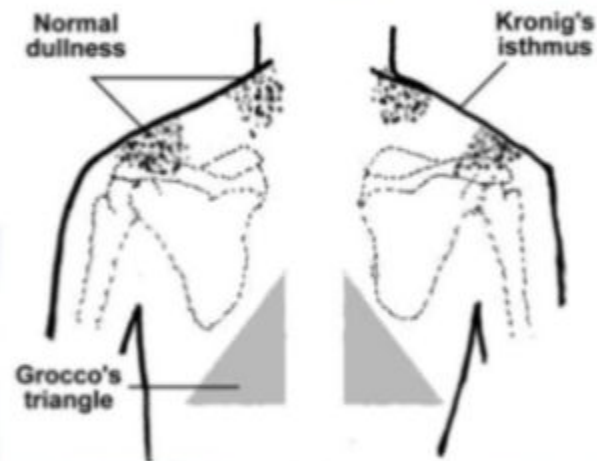
Tidal percussion

- **Examiner:** How would you differentiate an elevated hemidiaphragm from other causes of dullness at lung base?
- **Candidate:** By tidal percussion— percuss down the back until you reach the area of dullness. Keep your finger over that level and ask the patient to breathe in deeply and hold the breath. Now percuss again at that level. If the note becomes resonant then the cause is supra-diaphragmatic. In **diaphragmatic paralysis** or infra-diaphragmatic pathology, the note will remain dull.

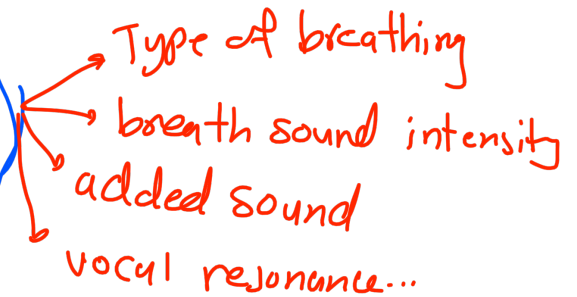
Kronig's isthmus

- 1- Stand to the right of the patient.
- 2- Ask the patient to sit and stand behind him.
- 3- Use light percussion.
- 4- Percuss both areas right and left from dullness to resonance with comparison.
- 5- Comment on dullness found.

Kronig's isthmus & Grocco's triangle



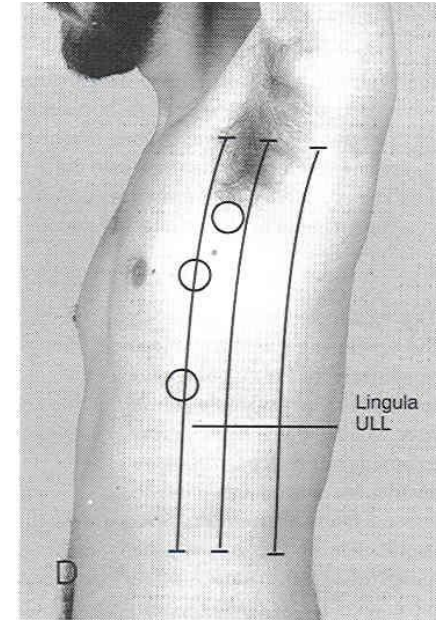
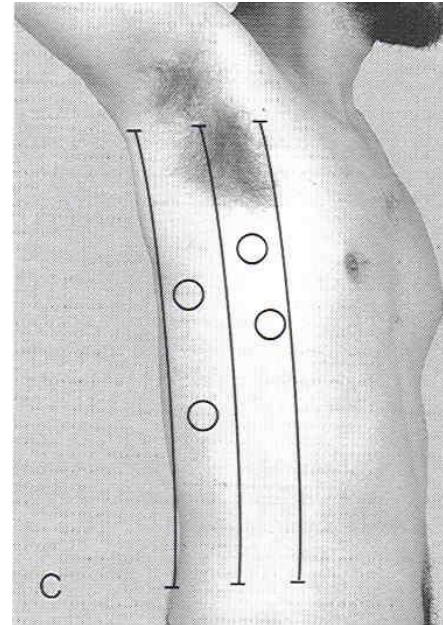
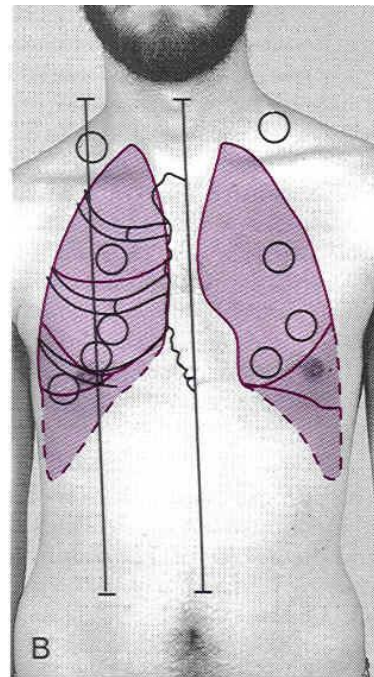
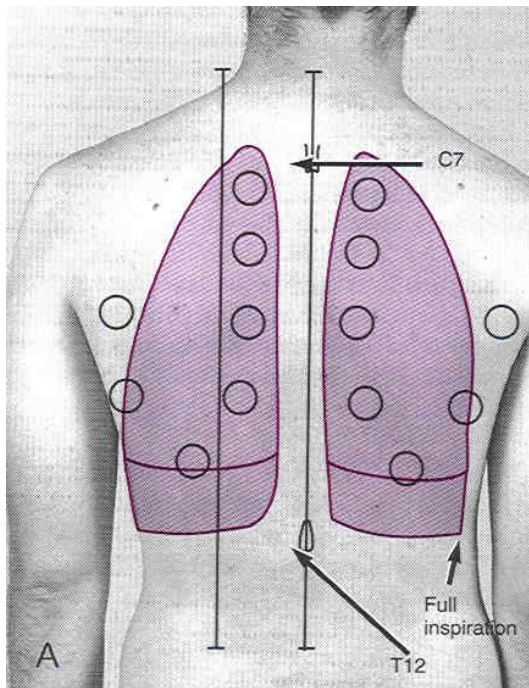
Auscultation



- Listen for:
 - Intensity *we say b/↑ breath sound intensity..*
 - Pitch
 - Duration
- Normal breath sounds
 - Vesicular
 - Bronchial
 - Bronchovesicular
- Adventitious sounds
 - Crackles *↳ added sound*
 - Wheezes *↳ insp. exp. [in asthma] biphasic*
 - Rhonchi *↳ biphasic*
- Voice Sounds
 - Bronchophony
 - Egophony
 - Whispered pectoriloquy

Auscultation of the Chest

Examination Points



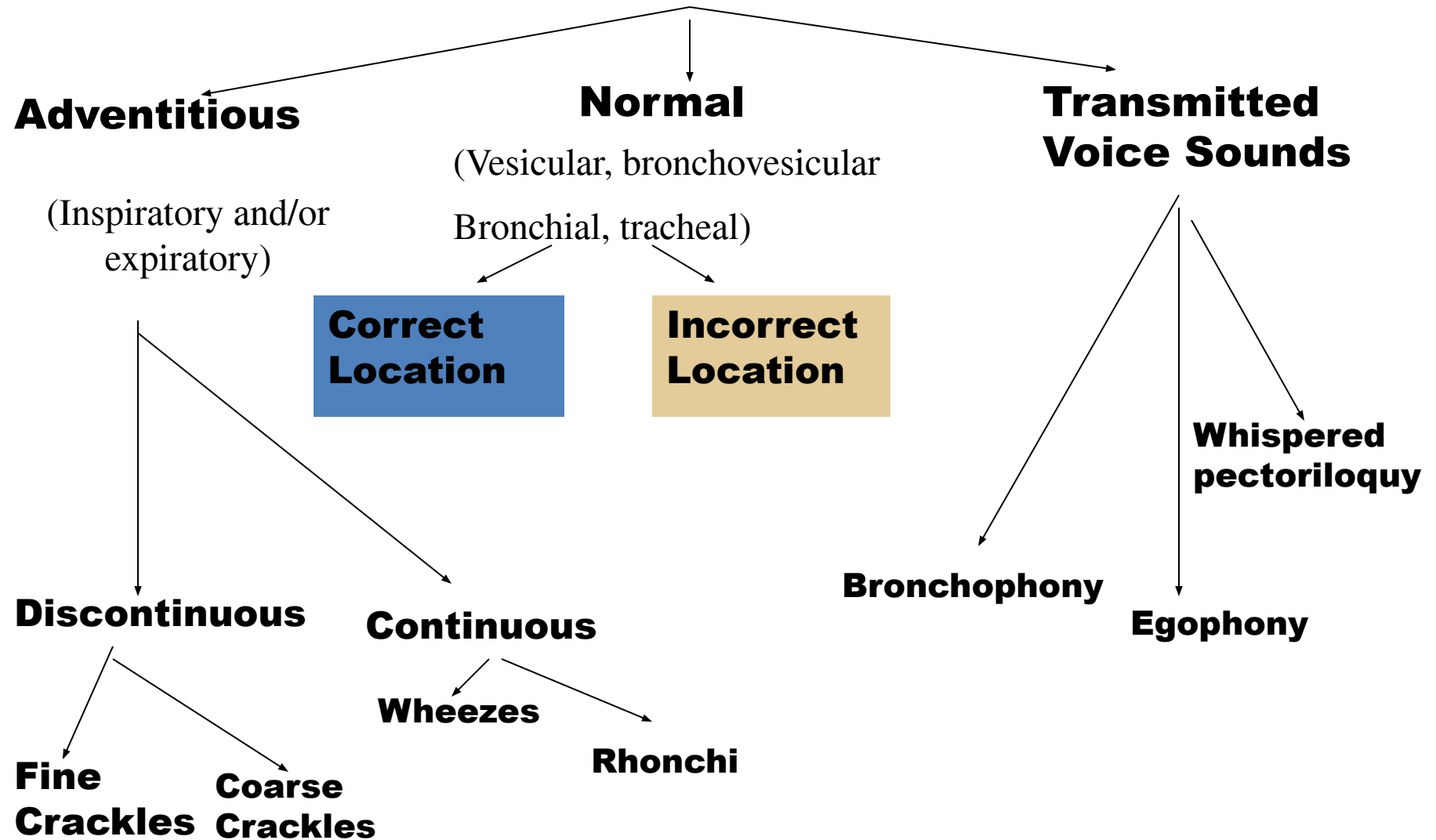
sites for both percussion and auscultation

Auscultation of the chest

anterior chest wall

- 1) Stand to the right of the patient
- 2) Ask the patient to lie supine.
- 3) Auscultate both midclavicular lines right & left, from the second space to the sixth space with comparison.
- 4) Ask the patient to say ' 44 ' and auscultate both midclavicular lines right & left, from the second space to the sixth space with comparison

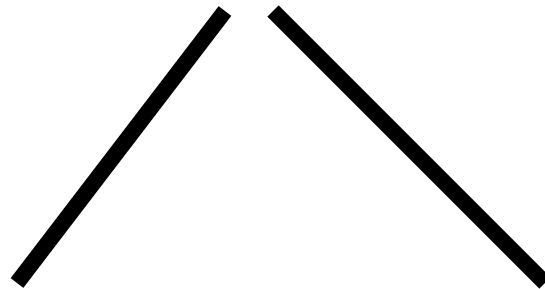
Breath Sounds



Breath Sounds: Normal: Tracheal

Tracheal

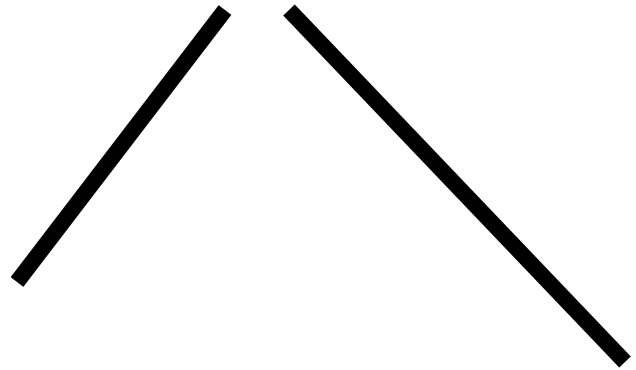
- Inspiratory and expiratory sounds are about equal
- Very loud
- Relatively high pitched
- Heard over trachea in the neck



Breath Sounds: Normal: Bronchial

Bronchial

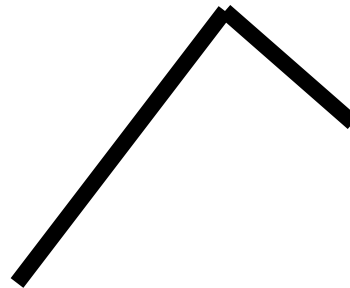
- Expiratory sounds are longer than inspiratory
- Loud
- Relatively high pitched
- Heard over manubrium, if heard at all



Breath Sounds: Normal: Vesicular (Alveolar)

Vesicular

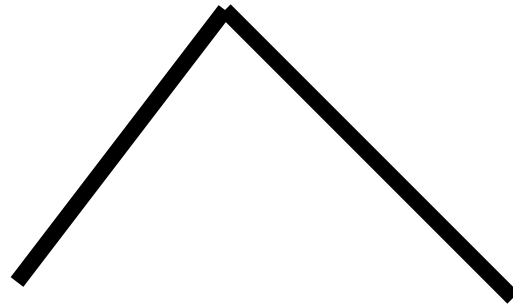
- BS attenuated by air-filled parenchyma
- Soft
- Relatively low pitched
- Heard over most of the lungs
- Inspiratory sounds are longer than expiratory
 - Note: true expiratory **phase** is 2-3x longer than inspiratory phase



Breath Sounds: Normal: Bronchovesicular

BronchoVesicular

- Inspiratory sounds and expiratory sounds about equal
- Intermediate
- Intermediate pitch
- Heard often in the 1st and 2nd interspaces anteriorly and between the scapula



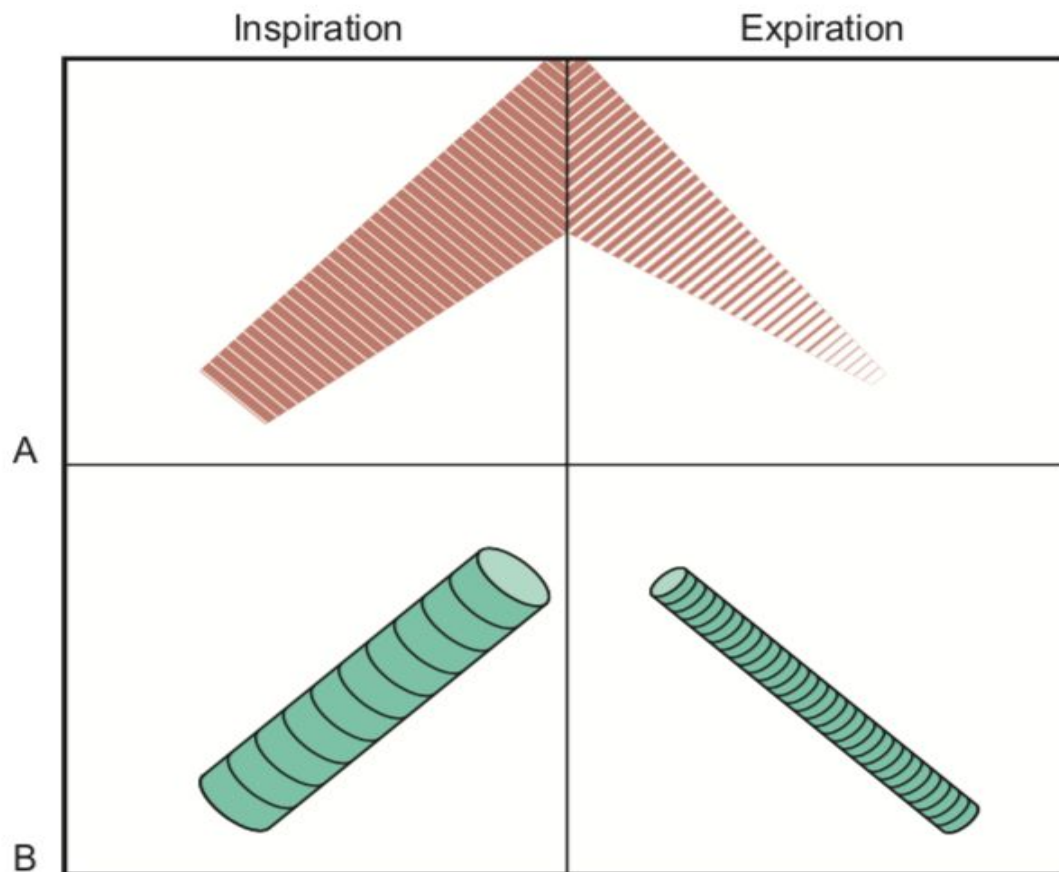


Fig. 7.19 Diagrammatic representation of breath sounds.

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

Auscultation of the Chest

Breath Sound Characteristics

	<i>Duration of sounds</i>	<i>Intensity of Expiratory Sounds</i>	<i>Pitch of Expiratory Sounds</i>	<i>“Normal” Location</i>
<i>Vescicular</i>	Inspiration > Expiration	Softer	Relatively low	Both lung fields
<i>Broncho- vescicular</i>	Inspiration = Expiration	Intermediate	Intermediate	1 st & 2 nd interspaces anteriorly; between scapulae
<i>Bronchial</i>	Inspiration < Expiration	Loud	Relatively high	Over manubrium (?)
<i>Tracheal</i>	Inspiration = Expiration	Very Loud	Relatively high	At sternal notch

Stridor

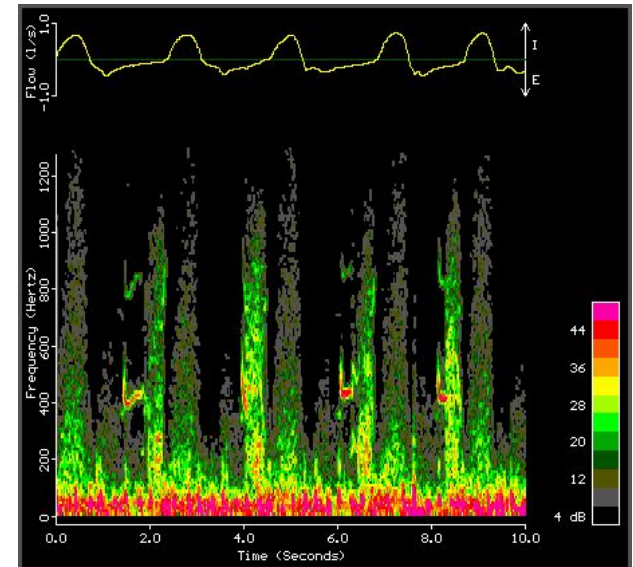
Inspiratory

- Continuous
- High pitched
 - Stidor

Wheezes

Expiratory

- Continuous
- High pitched, musical
- Narrow airways
 - Wheeze



Rhonchi

Expiratory

- Continuous rattle; fluid in large airways
- Low pitched
 - Rhonchi

Characteristics of wheezing

Site and disease	Tone		Timing		Location	
	Monotonic	Polyphonic	Inspiration	Expiration	Trachea or mouth	Chest
Stridor, as in upper airway infections; laryngospasm; post-surgical or post-intubation damage; extrathoracic tracheal stenosis; and endotracheal lesions	+		+		+	
Intrathoracic or lobar bronchial obstruction, such as by a foreign body; airway stenosis; intrathoracic tracheomalacia or bronchomalacia; and endobronchial	+			+	+	+
Diffuse obstruction of several large airways, as in asthma		+		+	+	+

Crackles

Short, popping; Sudden inflation of alveoli

Crackles are interrupted non-musical sounds and result from collapse of peripheral airways on expiration. On inspiration, air rapidly enters these distal airways, and the alveoli and small bronchi open abruptly, producing the crackling noise.

Crackles



7.25 Causes of crackles

Phase of inspiration	Cause
Early	Small airways disease, as in bronchiolitis
Middle	Pulmonary oedema
Late	Pulmonary fibrosis (fine) Pulmonary oedema (medium) Bronchial secretions in COPD, pneumonia, lung abscess, tubercular lung cavities (coarse)
Biphasic	Bronchiectasis (coarse)

Pleural Friction Rub

Grating, leathery; inflammed pleura

Whispered pectoriloquy

- Pectoriloquy means “chest speaking.”
- When a normal person whispers it is poorly heard with a stethoscope.
- With whispered pectoriloquy one can hear words that are whispered with the stethoscope. This is usually heard under the same circumstances as bronchial breath sounds and broncophony has similar significance.

Egophony

- The word egophony means "goat sound" from the Greek root "ego" (goat).
- This term describes a high-pitched bleating sound heard through an area of parenchymal consolidation

Egophony:

- When a normal individual says "E" it is heard under normal circumstances as an "E" with a stethoscope.
- With egophony this "E" becomes "A" when listening through a stethoscope.
- Usually heard under the same conditions as bronchial breath sounds and bronchophony and has similar meanings.

Egophony

- Egophony is thought to be the most sensitive physical finding for consolidation.
- Egophony may also occur over atelectatic or fibrotic regions of the lung, as well as above pleural effusions due to the upward compression of the lung by the underlying fluid.

PUTTING IT ALL TOGETHER

Examination sequence

- Note the patient's general appearance and demeanour.
- Look for central cyanosis of the lips and tongue.
- Examine the skin for rashes and nodules.
- Listen for hoarseness and stridor.
- Examine the hands for finger clubbing, peripheral cyanosis and tremor.
- Measure the blood pressure.
- Examine the neck for raised JVP and cervical lymphadenopathy.
- Record the respiratory rate.
- Observe the breathing pattern, and look for use of accessory muscles.
- Inspect the chest front and back for abnormalities of shape and scars.
- Feel the trachea and cardiac apex beat for evidence of mediastinal shift.
- Percuss the chest front and back for areas of dullness or hyperresonance.
- Listen to the chest front and back for altered breath sounds and added sounds.

FACE

- Eyes Anaemia
Horner's
Jaundice
- Mouth Cyanosis
Pursed lips
- Voice Hoarseness

NECK

- JVP
- Distended veins
- Palpate trachea
- Lymphadenopathy

POSTERIOR/ANTERIOR CHEST

- Inspect Scars/skin changes
- Palpate Deformity
Chest expansion
Tactile vocal fremitus
- Percuss
- Auscultate Breath sounds (vesicular/bronchial)
Added sounds (crackles/wheeze/rub)
Vocal resonance

LEGS/FEET

- Oedema
- Temperature/colour

TO COMPLETE

- Examine sputum
- Temperature chart
- Peak flow rate
- O₂ sats

RADIAL PULSE

- Rate/rhythm
- Bounding
- Pulsus paradoxus
- Count respiratory rate

HANDS

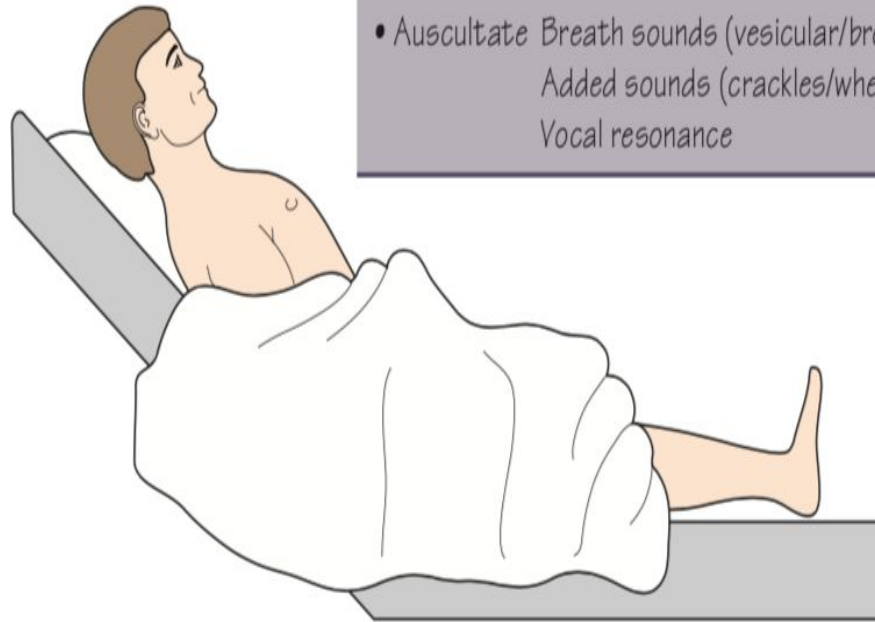
- Clubbing
- Muscle wasting
- Tar staining
- Peripheral cyanosis
- Palpate wrist for tenderness
- Check for flap/tremor

GENERAL INSPECTION

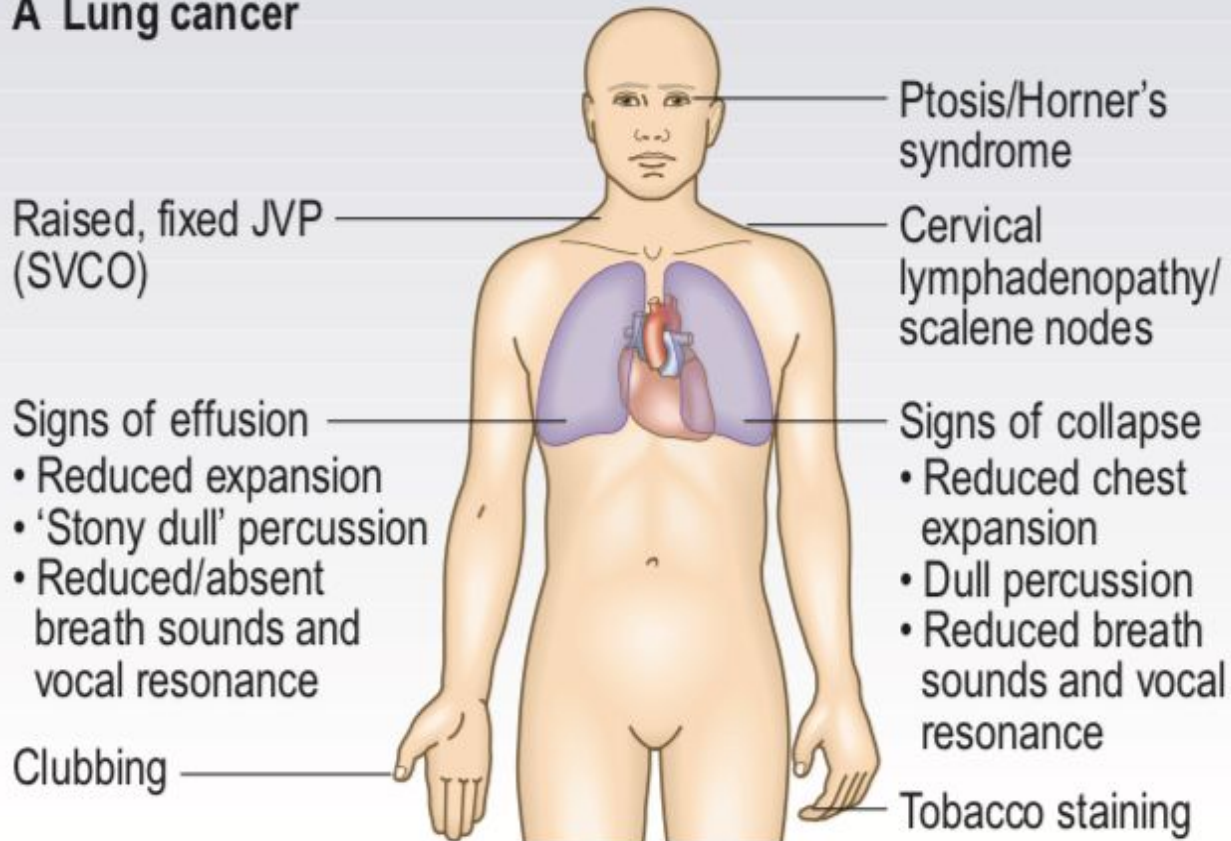
(take a physical step back and ask patient to take a deep breath and cough)

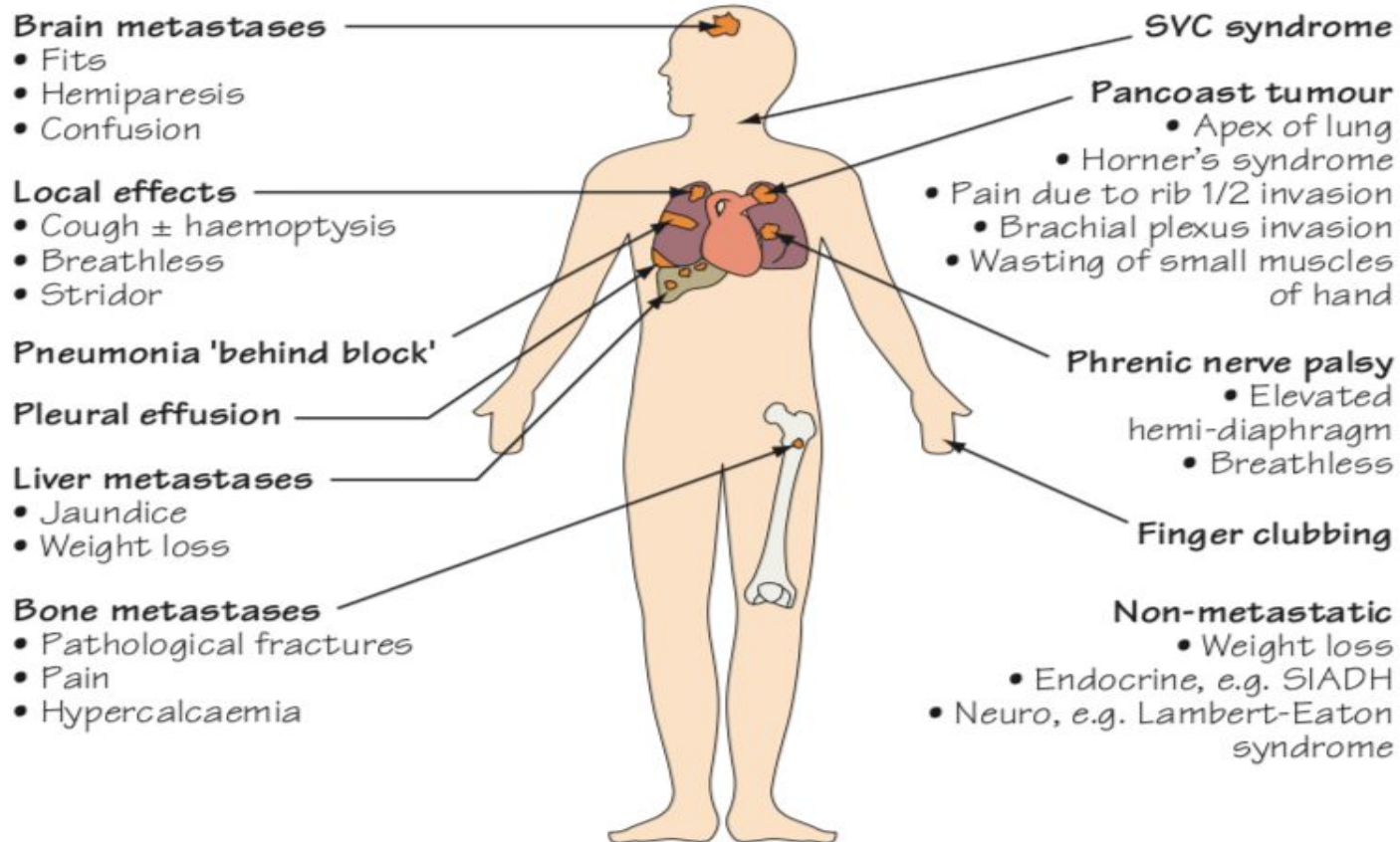
- | | | |
|--|------------------------|---------------------------------|
| • Well/unwell | • Cachexia | • Cyanosis |
| • Bedside clues (sputum pot, inhalers) | • Accessory muscle use | • Pallor |
| • Hydration/nutritional state | • General appearance | • Signs of respiratory distress |
| • Dyspnoea | • Mental state | • Signs of specific diseases* |

ESSENTIALS CHECKLIST (WINCER)



A Lung cancer





Cellular types of lung cancer

Small cell lung cancer

% cases

15–20

Non-small cell lung cancer

Squamous

25–30

Adenocarcinoma

40–60

Large cell

10–15

B Asthma

Agitation or drowsiness
(in 'severe asthma')

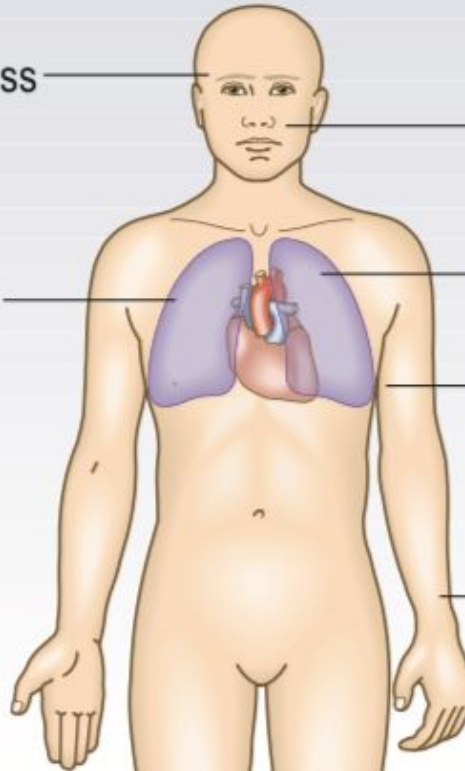
Central cyanosis,
(in 'severe asthma')

Intercostal indrawing
(children)

Wheeze (silent chest
in 'severe asthma')

Hyperinflated chest

Rapid pulse (slow in
'severe asthma')



C Pneumonia

Confusion
(in 'severe pneumonia')

Central cyanosis

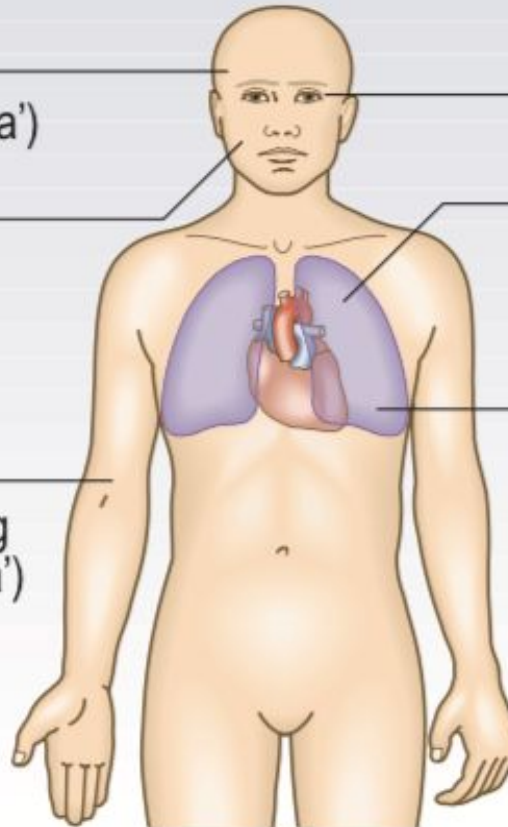
Hypotension
(diastolic ≤ 60 mmHg
in 'severe pneumonia')

Fever (rigors)

Respiratory rate >30
(in 'severe pneumonia')

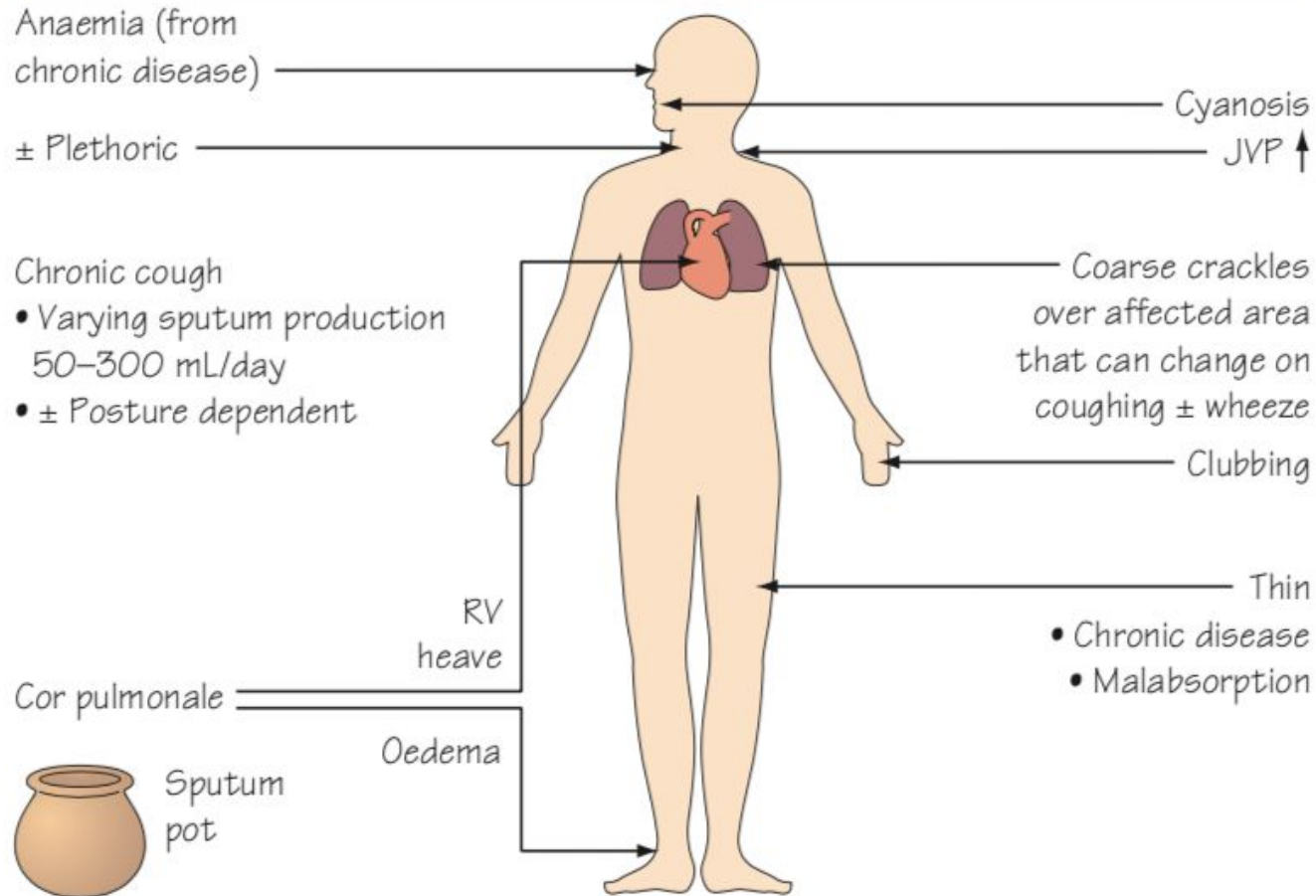
Signs of consolidation

- Reduced chest expansion
- Dull percussion
- Bronchial breath sounds $\pm$ pleural rub
- Increased vocal resonance



Bronchiectasis

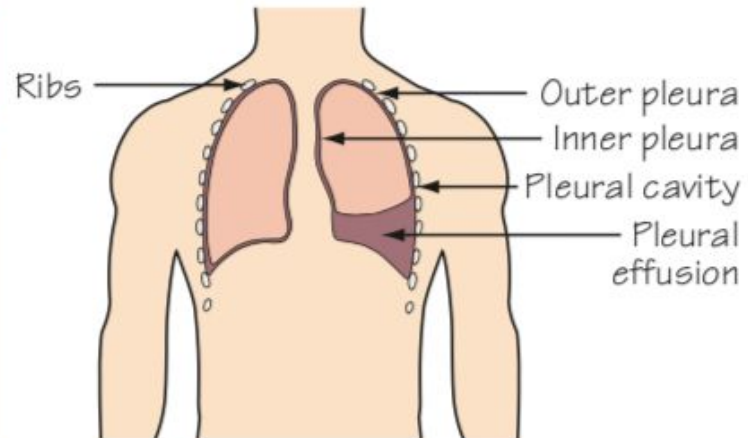
Examination hints



Pleural effusion

History hints

SOB
Chest pain
Occasionally cough
Symptoms related to
underlying cause



Examination hints

Examine the peripheries carefully for a possible cause, e.g. rheumatoid arthritis (RA)

Expansion	↓ if large
Percussion	Stony dull
Breath sounds	↓
Added sounds	None
Vocal resonance	↓
Other	? Mediastinal shift (away from side)

The differential diagnosis of dullness at the lung base includes:

- • **Pleural effusion:**
Signs: Site of needle aspiration, stony dullness to percussion, decreased breath sounds and decreased vocal resonance.
- • **Collapse:**
Signs: Dullness to percussion, tracheal deviation to the same side and decreased breath sounds.
- • **Lobectomy/pneumonectomy:**
Signs: Thoracotomy scar, asymmetrical chest(depressed on the affected side), dullness to percussion, tracheal deviation to the same side and decreased breath sounds (signs are similar to a collapse in addition to the presence of a scar).
- • **Elevated hemidiaphragm:**
Signs: Dullness, decreased breath sounds, decreased vocal resonance and fremitus.
- • **Consolidation:**
Signs: Dullness to percussion, decreased breath sounds, bronchial breathing, increase vocal resonance, egophony and whispering pectoriloquy.
- • **Pleural thickening** Signs: Similar to pleural effusion.

**D Idiopathic pulmonary
fibrosis (fibrosing
alveolitis)**

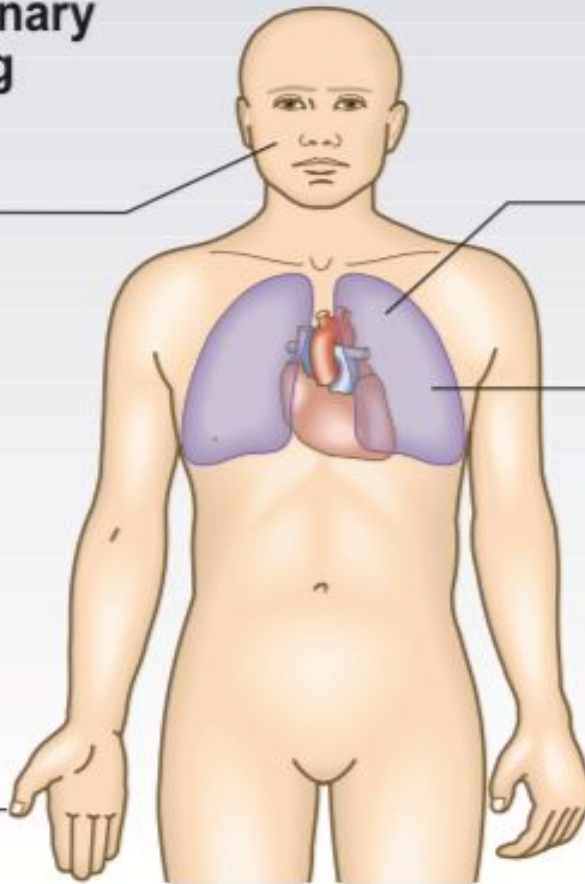
Central cyanosis

Reduced chest
expansion

Fine late inspiratory
crackles

Clubbing

Ankle swelling in
late stages



Chronic presentation (several years) – Most cases

Cyanosis

Reduced chest expansion

Short of breath

Tired

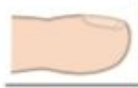
Cough

'Showers of inspiratory crackles'

Clubbing in 50%

– often very marked

= drumstick clubbing

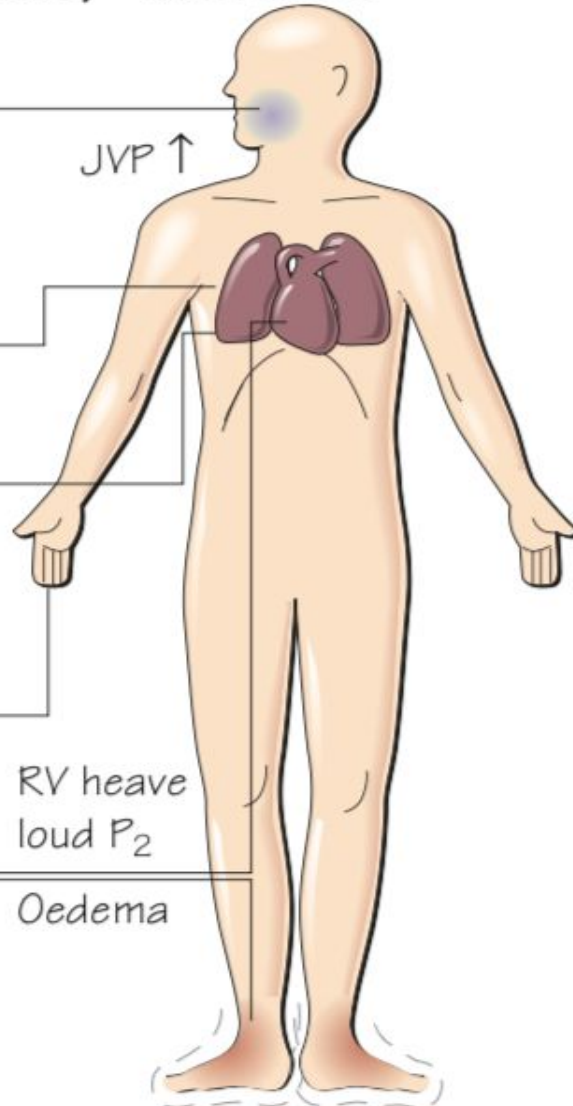


Cor pulmonale common

JVP ↑

RV heave
loud P_2

Oedema





Bibasilar Fine end inspiratory crackles

Bibasilar Fine end inspiratory crackles may indicate idiopathic pulmonary fibrosis (IPF)

Fine crackles on inspiration are characteristic of IPF

- Similar to the sound heard when gently separating a strip of Velcro 
- Predominantly located in the lower, posterior (basal) areas of the lung
- Best detected during slow, deep breaths
- Can be present throughout the inspiratory time



E Chronic obstructive pulmonary disease

Plethoric
(secondary polycythaemia)

Using accessory
muscles

Wheeze

Tobacco staining

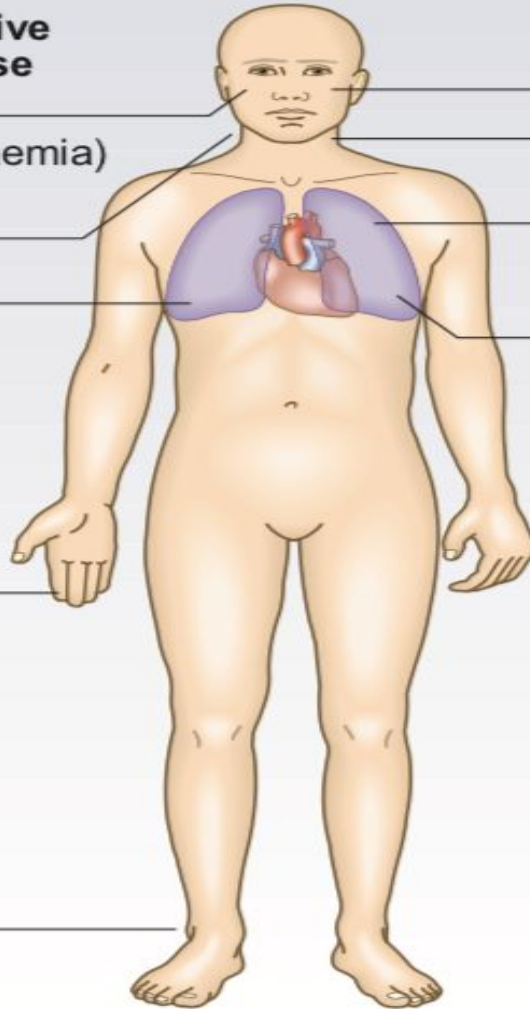
Ankle swelling
(cor pulmonale)

Central cyanosis

Raised JVP
(cor pulmonale)

Hyperinflated
'barrel-shaped' chest

Reduced air entry



Examination hints

Look for inhalers, spacer, nebuliser, oxygen, sputum pot

Hyperexpanded chest

Paradoxical movement of lower ribs

Reduced cricosternal distance

Cyanosis, cachexia

CO₂ flap, bounding pulse, tar-stained fingers

Use of accessory muscles, pursed lips

Evidence of cor pulmonale (raised JVP, ankle oedema)

Wheeze, reduced air entry

NB. Some patients may have no abnormal physical signs

Assessment of severity of airflow obstruction according to FEV₁ as a % of the predicted value [1]

Severity

Mild airflow obstruction

Moderate airflow obstruction

Severe airflow obstruction

FEV₁

50–80% predicted

30–49% predicted

<30% predicted

Agitated ($\downarrow pO_2$)

Sleepy ($\uparrow pCO_2$)

Plethoric (high Hb)

Lip pursing

(prolonged expiration)

Cyanosis

Wheeze $\downarrow$ Air entry

Blood pressure

- $\uparrow$ Systolic (smoking $\rightarrow$ atherosclerosis)
- $\downarrow$ Diastolic (CO_2 retention $\rightarrow$ vasodilation)

Hyperinflated chest

- Barrel chest
- Decreased (<3 finger breadth) distance from suprasternal notch to trachea

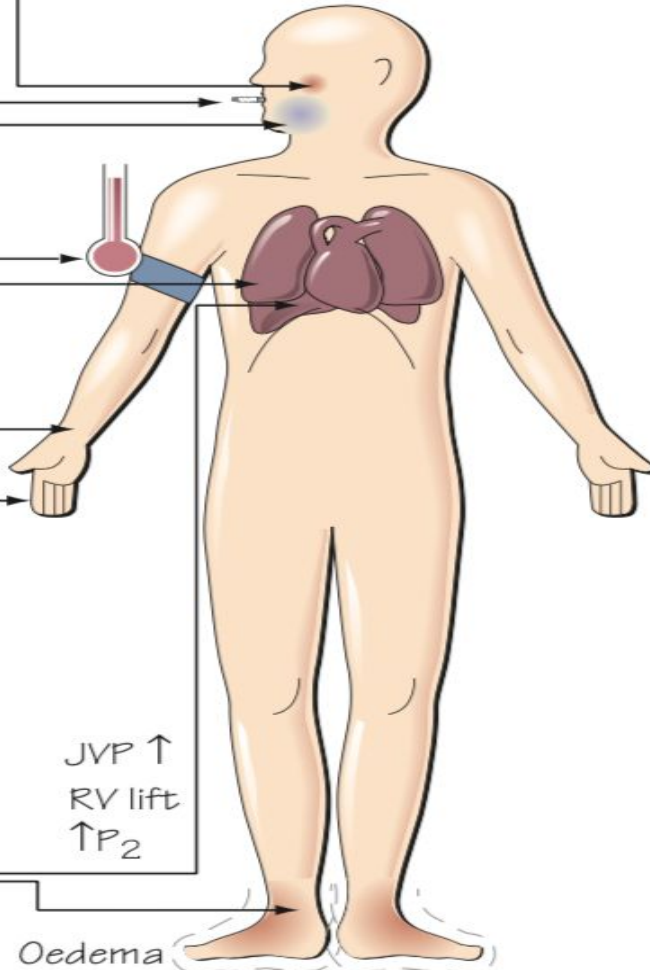
Bounding pulse

Warm hands $\pm$ metabolic flap



Sharp 'twitch' every 5–10 seconds

Signs of right heart failure = cor pulmonale



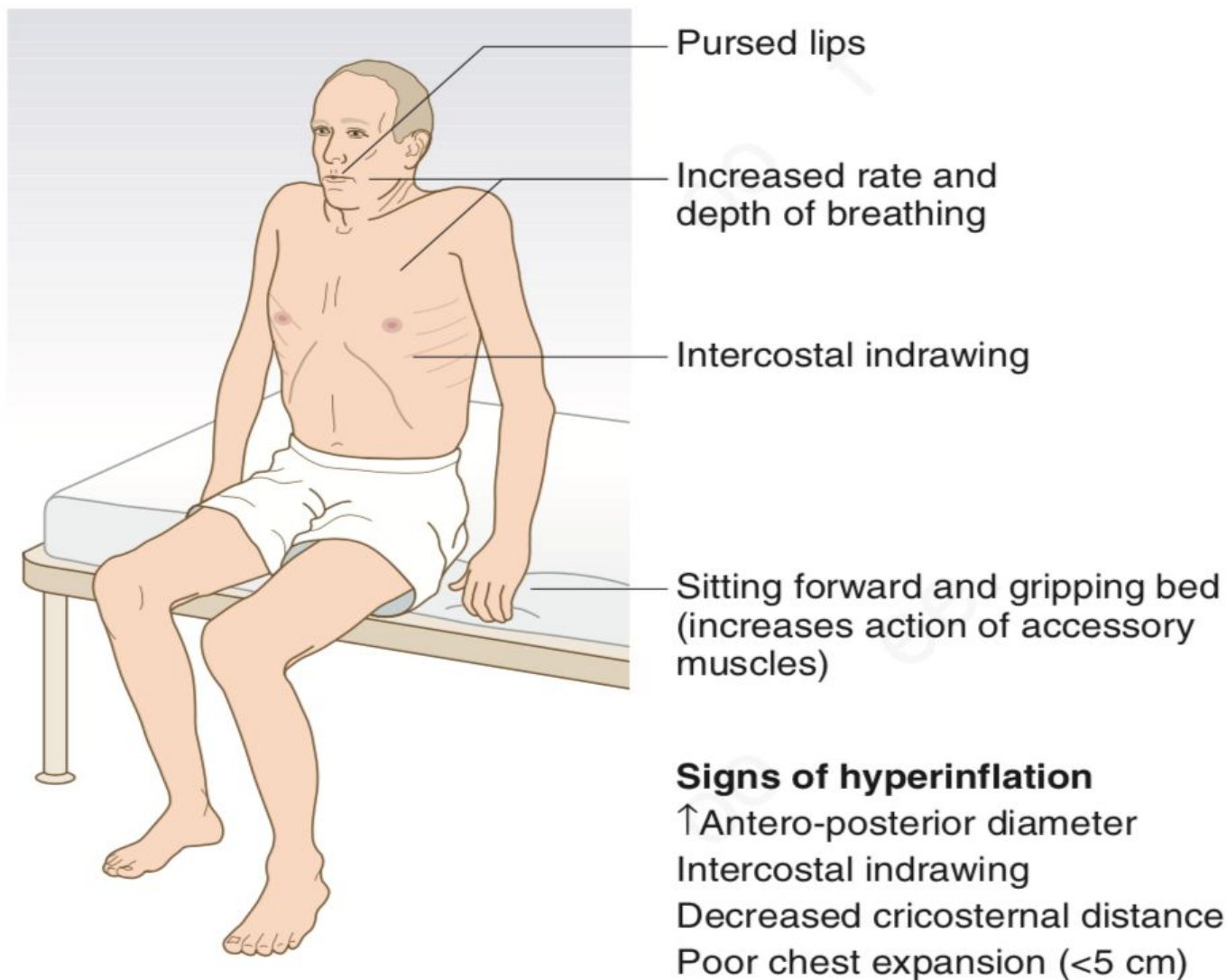
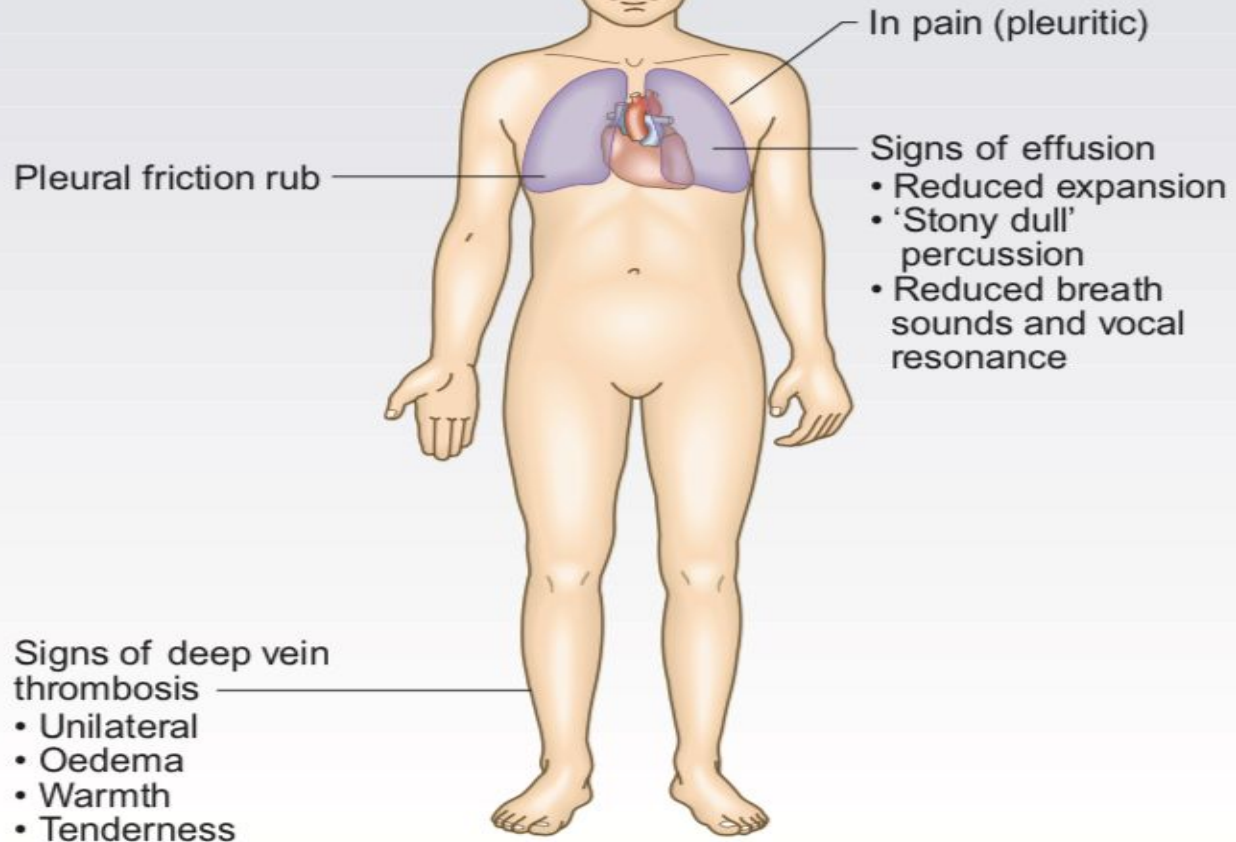


Fig. 12.1 Clinical features of COPD.

F Pulmonary thromboembolism



Putting It All Together

Physical Signs in Selected Chest Disorders

	Trachea	Percussion Note	Breath Sounds	Tactile Fremitus	Adventitial Sounds
Normal	Midline	Resonant	Bronchial, Bronchovesicular, Vescicular	Normal	None
Obstructive lung disease	Midline	Resonant Hyperresonant	Normal Distant	Normal Decreased	Wheezes
Lobar Consolidation	To involved side	Dull over involved site	Bronchial over involved site	Increased	Late inspiratory crackles
Pleural effusion	From involved side	Dull to flat over fluid	Decreased to absent	Decreased	None (Pleural rub?)
Pneumothorax	To involved side	Hyperresonant, Tympanitic over pleural air	Decreased to absent	Decreased	None (Pleural rub?)

Interpretation of findings

Pleural effusion

- reduced tactile vocal fremitus
- reduced chest expansion
- stony dull
- reduced breath sound
- no added sounds
- reduced vocal resonance

Consolidation

- increased tactile vocal fremitus
- reduced expansion
- dull percussion
- bronchial breathing
- coarse creps
- increased vocal resonance
- whispering pectoriloquy

Interpretation of findings

Pneumothorax

- deviated trachea
- reduced tactile vocal fremitus
- hyper-resonance
- reduced breath sound
- reduced vocal resonance

Collapse

- deviated trachea
- reduced tactile vocal fremitus
- dull percussion
- reduced breath sound
- +/- creps

	Pneumothorax	Pneumonia	Pleural effusion	Collapse
Trachea displacement	Away	None	Away if large	Towards collapse
Expansion	All reduced ipsilaterally			
Percussion resonance	Increased	Decreased	"Stony dull"	Decreased
Breath sounds	Reduced/absent	Bronchial breathing + Coarse crepitations	Reduced/absent	Reduced/absent



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Was it as easy as it looked?



No, sir. No, it wasn't.

Questions ?



Thank You