Chest and Lung Examination

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OBJECTIVE

- Identify the organs that lie with in the thoracic cage.
- Describe components of inspection of chest and lung.
- Identify line of references and land marks used in describing location on the thorax.

Cont…d

- Assess respiratory expansion and tactile fremitus.
- Name and describe the characteristics of the five major percussion notes.
- Demonstrate inspection, palpation, percussion, and auscultation of chest.
- Record finding.

Chest Anatomy and Physiology

- The thoracic cage is a bony structure which is defined by the sternum, 12 pairs of ribs and 12 thoracic vertebrae.
- Its floor is the diaphragm, a musculotendinous septum that separates the thoracic cavity from the abdomen.

CONT…D

- The first seven ribs attach directly to the sternum through the costal cartilages.
- Ribs 8,9 and 10 attach to the costal cartilage above; and ribs 11 and 12 are “floating “.

CONT…D

Important landmarks;

Supra sternal Notch: Hollow U shaped depression just above the sternum in between the clavicles.

Sternum: has three parts- manubrium, body and xiphoid process. Walk your fingers down the manubrium 5cm until you feel a bony ridge, the manubriosternal angle.

CONT…D

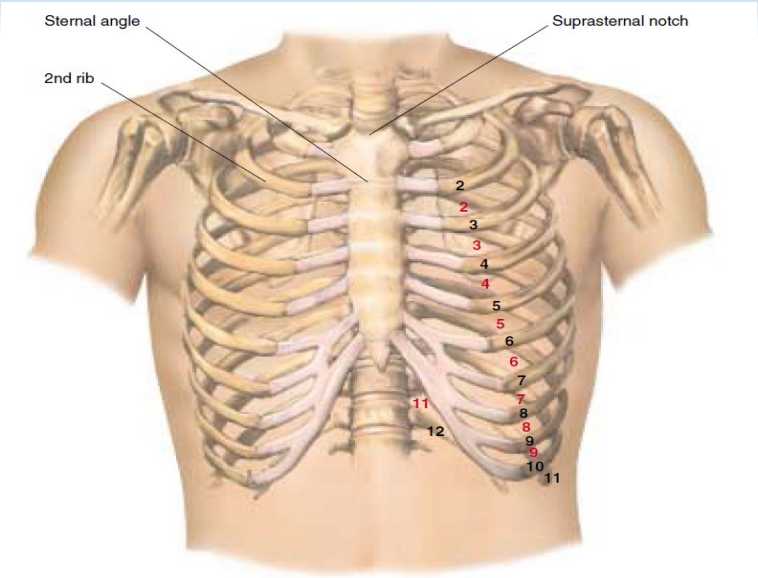
Manubriosternal angle:

- Often called the "angle of Louis".
- Which is continuous with the second rib and is a useful place to start counting ribs.
- Identify the angle of Louis, palpate lightly to the second rib and slide down to the second intercostals space.

CONT…D

- The rib above it numbers each intercostals space.
- The angle of Louis also marks the site of tracheal bifurcation into the right and left bronchi.

CONT…D


Sternal angle
Suprasternal notch
2nd rib
2
2
3
3
4
4
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7
8
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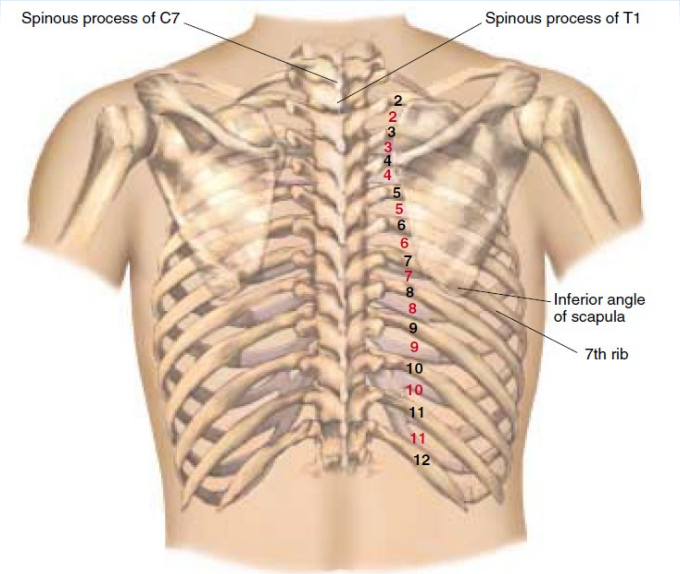
9
9
10
11
11
12

CONT…D

Costal angle: the right and left costal margins form an angle where they meet at the xiphoid process.

Vertebral prominence: Flex your head and feel for the most prominent bony protruding at the base of the neck. This is the spinous process C7. If two bumps seem equally prominent the upper one is C7 and the lower one is T1.

CONT…D


Spinous process of C7
Spinous process of T1
2
2
3
3
4
4
5
5
6
6
7
7
8
8
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9
10
10
11
11
12
Inferior angle of scapula
7th rib

CONT…D

Reference Lines:-

- Help to identify specific underlying structure for documentation.
- On the anterior chest, note the mid sternal line and the mid clavicular line.

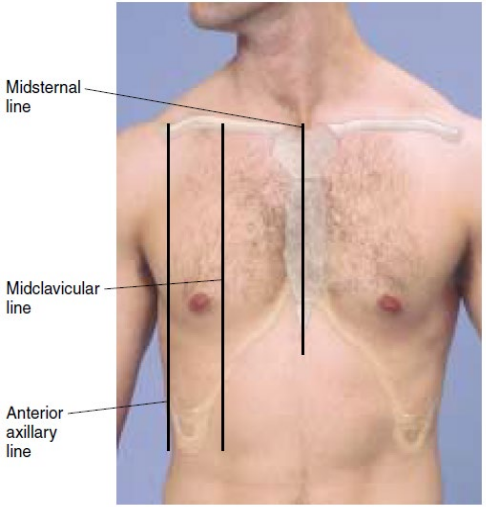
CONT…D

- The posterior chest wall has the vertebral line and the scapular line, which extends through the inferior angle of the scapula with arms on the side.
- Lift up the person's arm 90 degrees and divide the lateral chest by three lines;

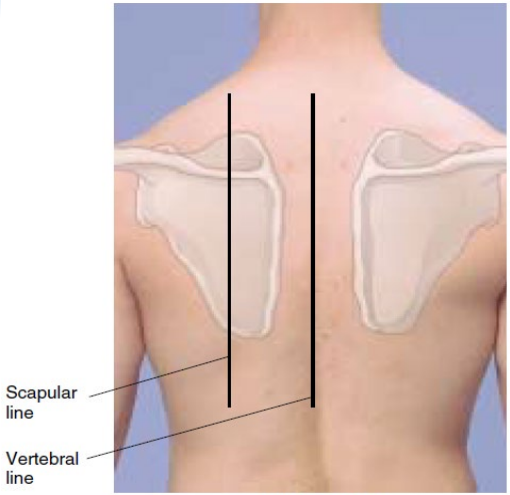
CONT…D

- The anterior axillary line extends down from the anterior axillary fold where the pectoralis major muscle inserts;
- The posterior axillary line continues down from the posterior axillary fold where the latissimus dorsi muscle inserts; and
- The midaxillary line runs from the apex of the axilla and lies between and parallel to the other two.

CONT…D

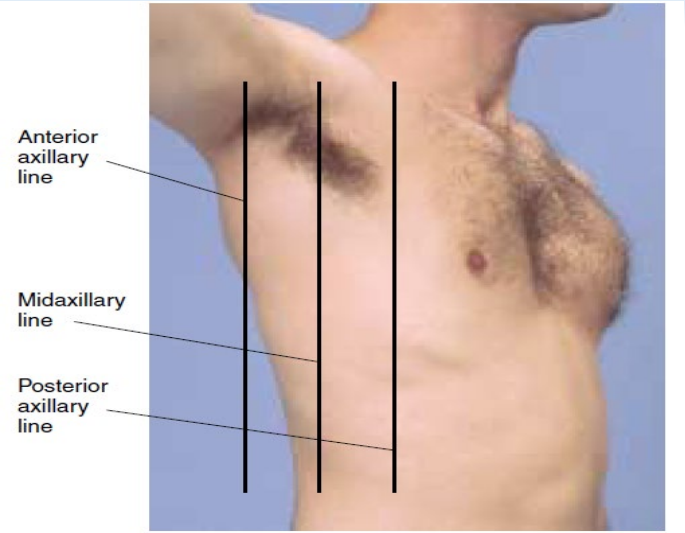


ANTERIOR VIEW



POSTERIOR VIEW

CONT…D



RIGHT ANTERIOR OBLIQUE VIEW

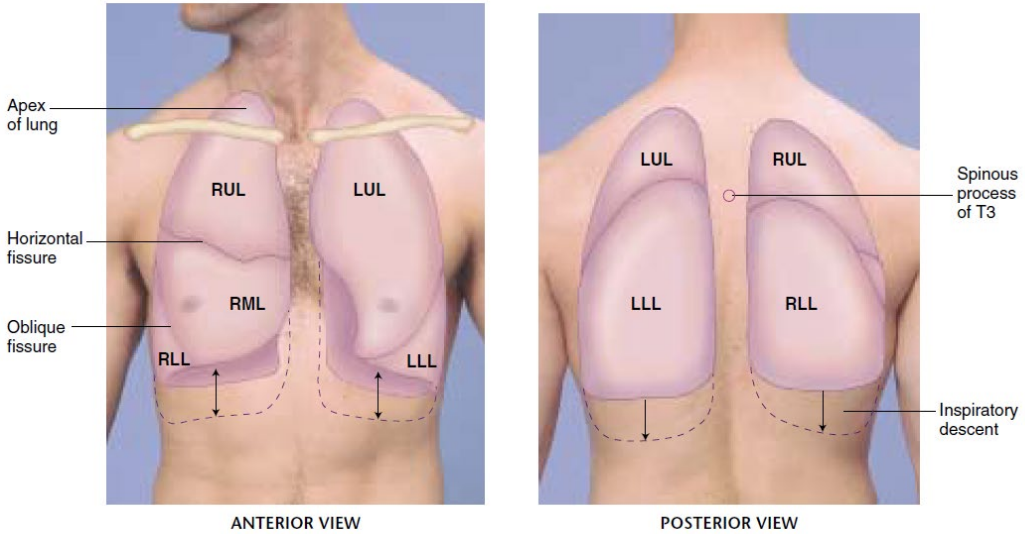
Lung

- The apex of each lung rises about 2-4 cm above the inner third of the clavicle.
- The lower border of the lung crosses the six rib at the mid clavicular line.
- Each lung is divided in half by oblique fissure.

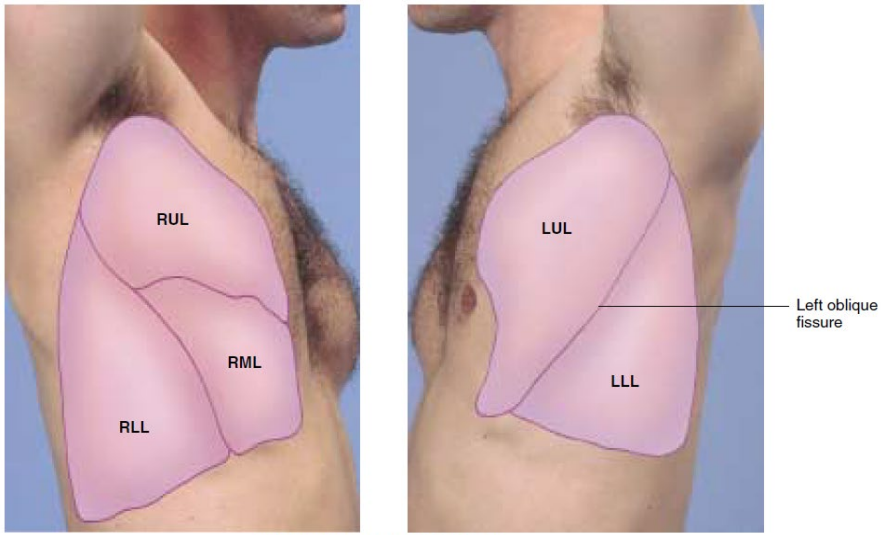
CONT…D

- The right lung is further divided by the horizontal (minor) fissure.
- There fore the right lung has three lobes and the left has two lobes.

CONT…D


Apex of lung
RUL
LUL
Horizontal fissure
RML
Oblique fissure
RLL
LLL
ANTERIOR VIEW
LUL
RUL
Spinous process of T3
LLL
RLL
Inspiratory descent
POSTERIOR VIEW

CONT…D



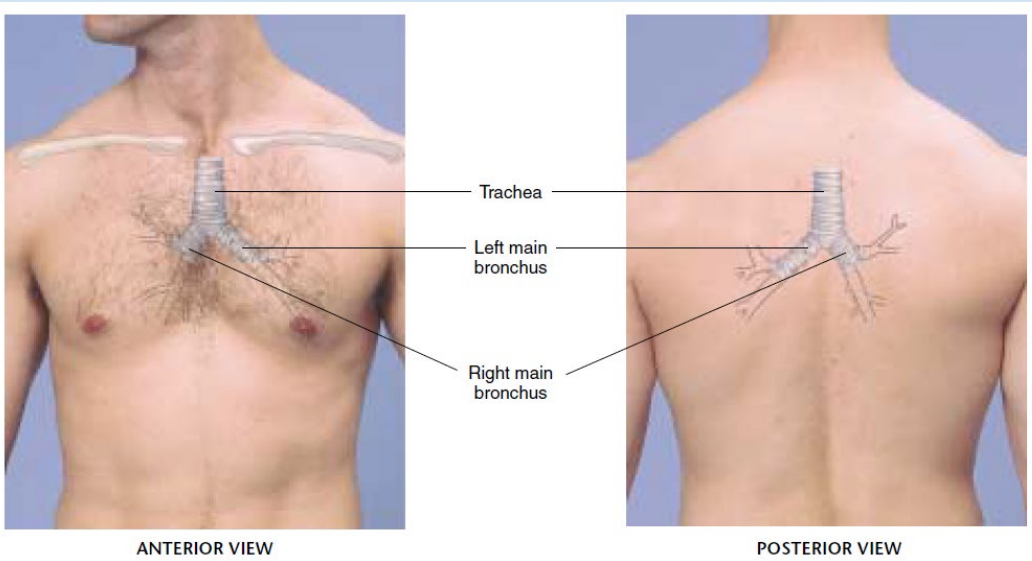
RIGHT AND LEFT LATERAL VIEWS

Trachea and major bronchi

The trachea bifurcates in to its main bronchi at the level of;

- The sternal angle anteriorly.
- The spinous process of the T4 posteriorly.

CONT…D


Trachea
Left main bronchus
Right main bronchus
ANTERIOR VIEW
POSTERIOR VIEW

Subjective Data

- Ask for cough, shortness of breath chest pain with breathing, past history of respiratory infections, cigarette smoking, self care behaviors (TB, skin test, chest x- ray).

Objective data

Equipment needed:- stethoscope

General guideline;

- Expose the chest fully.
- Proceed in ordinary fashion.
- Compare one side with other.

CONT…D

- Examine the posterior thorax and lung first (always) while the patient is in the sitting position.
- Ask the patient to lie supine while examining the anterior chest.
- Relate all other findings in the thorax with findings.

Method of Examination

The posterior chest:

- Inspect the posterior chest.
- Note the shape and configuration of the chest wall.
- The spinous processes should appear in a straight line.

Cont…d

- The thorax and scapulae are symmetric.
- The anteroposterior diameter is less than the transverse diameter.
- Abnormal:– Antero posterior =Transverse diameter or “barrel chest” as in chronic emphysema. Skeletal deformities scoliosis, kyphosis, lordosis.

CONT…D

Palpate the posterior chest:

Symmetric Expansion;

- Confirm symmetric chest expansion by placing your warmed hands on the posterolateral chest wall with thumbs at the level of T9 to T10.

Cont…d

- Slide your hands medially to pinch up a small fold of skin between your thumbs.
- Ask the person to take a deep breath.
- As the person inhales deeply, your thumbs should move apart symmetrically.

CONT…D

- Note any lag expansion.
- Abnormal:-unequal chest expansion occurs with marked atelectasis, pneumonia, fractured ribs or pneumothorax.
- Pain accompanies deep breathing when the pleurae are inflamed (pleurisy).

CONT…D

CONT…D

Tactile Fremitus

- Assess tactile (or vocal) fremitus.
- Fremitus is a palpable vibration.
- Sounds generated from the larynx are transmitted through patent bronchi and through the lung parenchyma to the chest wall where you feel them as vibrations.

CONT…D

- More prominent in inter scapular & right side, disappears below the diaphragm.
- Use the palmar base of the fingers of one hand and touch the person's chest while he/she repeats the words "ninety-nine" or "Arba-Arat".
- These are resonant phrases that generate strong vibrations.

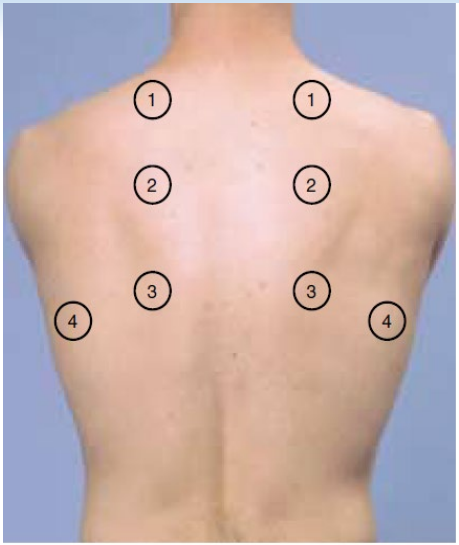
CONT…D

- Start over the lung apices (C7) and palpate from one side to another.
- Symmetry is important, the vibrations should feel the same in the corresponding area on each side.
- Avoid palpating over the scapulae because bone damps out sound transmission.

Cont…d

- Abnormal – Decreased fremitus occurs when anything obstructs transmission of vibrations as obstructed bronchus, pneumothorax, pleural effusion/ thickening, emphysema.
- Increased fremitus with consolidation of lung tissue as lobar pneumonia.

CONT…D



LOCATIONS FOR FEELING FREMITUS

CONT…D

- Using the fingers, gently palpate (rotary motion) the entire chest wall to note any areas of tenderness, skin temperature and moisture.
- Crepitus is a crackling sensation palpable over the skin surface. Ex. Subcutaneous emphysema-escape of air from the lung and enter subcutaneous tissue (stabbing, fracture in thorax area, surgery).

CONT…D

- Rhonchal fremitus-thick bronchial secretion.
- Pleural friction fremitus-pleurisy.

CONT…D

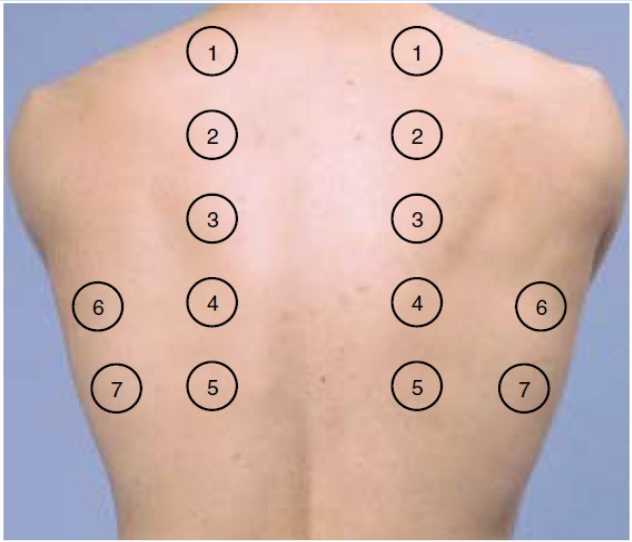
Percuss the posterior chest:

- Not help you to detect deep-seated lesions (5-7cm penetration effect).
- Start at the apices (C_7 or C_8) and percuss at the tops of the shoulders.
- Then percussing (2x in each location) in the interspaces, make a side-to-side comparison all the way down to T_7 or T_8.

Cont…d

- Avoid the damping effect of the scapulae and ribs.
- Resonance predominates in healthy lung tissue.
- A dull note signals abnormal density in the lungs as with pneumonia, pleural effusion, atelectasis, or tumor.

CONT…D



LOCATIONS FOR PERCUSSION

CONT…D

Proper Technique;

- Hyperextend the middle finger (pleximeter) of one hand and place the distal interphalangeal joint firmly against the patient's chest.
- With the end (not the pad) of the opposite middle finger (plexor), use a quick, sharp flick of the wrist (relaxed) to strike first finger.

CONT…D

Cont…d

- Categorize what you hear as normal, dull, or hyper resonant.
- Practice your technique until you can consistently produce a "normal" percussion note on your partner before you work with patients.

CONT…D

Percussion Notes;

- Clear note- lightest percussion.
- Louder note- more pressure with the pleximeter finger, not plexor force.
- Lower posterior chest-side standing (better percussion note).
- Notes differ in: intensity, pitch, and duration.

CONT…D

Percussion Notes and Their Characteristics

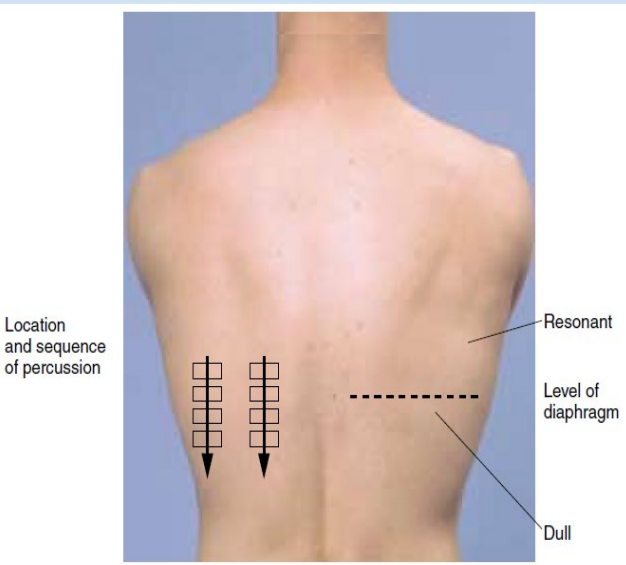
	Relative Intensity	Relative Pitch	Relative Duration	Example of Location	Pathologic Examples
Flatness	Soft	High	Short	Thigh	Large pleural effusion
Dullness	Medium	Medium	Medium	Liver	Lobar pneumonia
Resonance	Loud	Low	Long	Normal lung	Simple chronic bronchitis
Hyperresonance	Very loud	Lower	Longer	None normally	Emphysema, pneumothorax ,COPD
Tympany	Loud	High*	*	Gastric air bubble or puffed-out cheek	Large pneumothorax

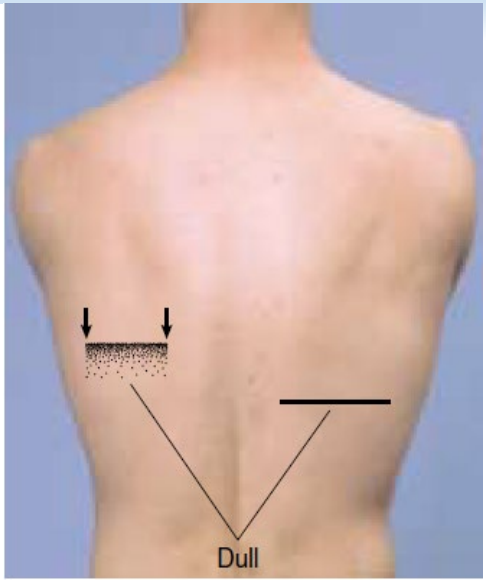
* Distinguished mainly by its musical timbre.

CONT…D

- Diaphragmatic excursion;
  - First-full expiration measurement, then full inspiration.
  - 5-6cm normal.
  - Abnormal:- higher level of dullness pleural effusion, atelectasis (lower lobe) or diaphragmatic paralysis.

CONT…D


Location
and sequence
of percussion
Resonant
Level of
diaphragm
Dull

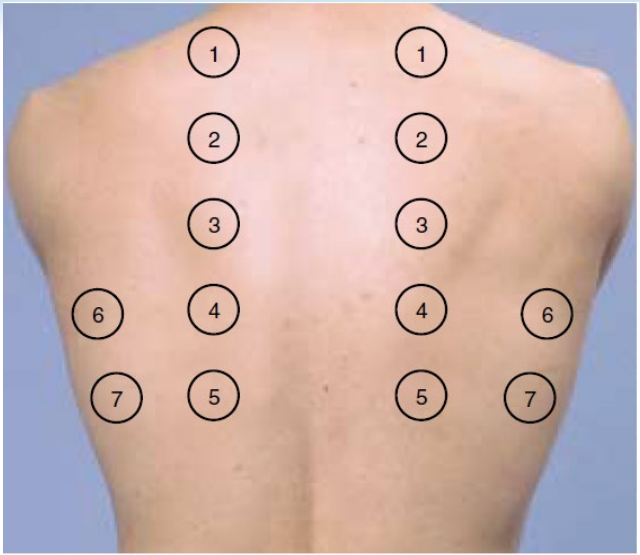

Dull

CONT…D

Auscultate the posterior chest:

- The passage of air through the tracheo-bronchial tree creates a characteristic set of noises audible through the chest wall.
- These noises also may be modified by obstruction with the respiratory passage ways or by changes in the lung parenchyma, the pleura or chest wall.

CONT…D



LOCATIONS FOR AUSCULTATION

CONT…D

Breath sounds

- Instruct the person the breathe through the mouth, a little bit deeper than usual.
- Use the flat diaphragm end- piece of the stethoscope.
- Listen to at least one full respiration and compare side to side.

CONT…D

- Listen posteriorly from apices at C_7 to the bases (around T_{10} (T_{12}–deep insp.).
- You should expect to hear three types of normal breath sounds. These are;
  - Bronchial (tracheal or tubular),
  - Broncho-vesicular, and
  - Vesicular

CONT…D

- Bronchial (tracheal) is high pitched loud amplitude normally located on the trachea and larynx. Harsh, hollow, tubular.
- Vesicular is low pitched and soft amplitude located over peripheral lung fields where air flows through smaller bronchioles and alveoli. Rustling, like sound of the wind in the trees.

CONT…D

- Broncho-vesicular is moderate pitch and amplitude normally located over major bronchi: Posterior between scapulae and anteriorly around upper sternum in the 1st and 2nd intercostal spaces. Mixed

CONT…D

Characteristics of Breath Sounds

	Duration of Sounds	Intensity of Expiratory Sound	Pitch of Expiratory Sound	Locations Where Heard Normally
Vesicular* 	Inspiratory sounds last longer than expiratory ones.	Soft	Relatively low	Over most of both lungs
Broncho-vesicular 	Inspiratory and expiratory sounds are about equal.	Intermediate	Intermediate	Often in the 1st and 2nd interspaces anteriorly and between the scapulae
Bronchial 	Expiratory sounds last longer than inspiratory ones.	Loud	Relatively high	Over the manubrium, if heard at all
Tracheal 	Inspiratory and expiratory sounds are about equal.	Very loud	Relatively high	Over the trachea in the neck

* The thickness of the bars indicates intensity; the steeper their incline, the higher the pitch.

Cont…d

- Abnormal:– Decreased or absent breath sounds occur with obstruction of bronchial tree by secretions, in emphysema due to loss of elasticity, pleurisy, pneumothorax, pleural thickening, and pleural effusion, .

CONT…D

Adventitious sounds

- Note the presence of any adventitious sounds.
- These are added sounds that are not normally heard in the lungs.

CONT…D

- They are caused by moving air colliding with secretions in the tracheo bronchial passage ways and include crackles or rales (fine Vs coarse) and wheeze (or rhonchi).
- Abnormal- during normal tidal flow, wheezing indicates asthma.

CONT…D

Adventitious Lung Sounds

DISCONTINUOUS SOUNDS (CRACKLES OR RALES) are intermittent, nonmusical, and brief—like dots in time

Fine crackles (⋅ ⋅ ⋅ ⋅ ⋅) are soft, high pitched, and very brief (5–10 msec).

Coarse crackles (▪ ▪ ▪ ▪ ▪) are somewhat louder, lower in pitch, and not quite so brief (20–30 msec).

CONTINUOUS SOUNDS are > 250 msec, notably longer than crackles—like dashes in time—but do not necessarily persist throughout the respiratory cycle. Unlike crackles, they are musical.

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

Rhonchi () are relatively low pitched (around 200 Hz or lower) and have a snoring quality.

Crackles may be due to abnormalities of the lungs (pneumonia, fibrosis, early congestive heart failure) or of the airways (bronchitis, bronchiectasis).

Wheezes suggest narrowed airways, as in asthma, COPD, or bronchitis.

Rhonchi suggest secretions in large airways.

CONT…D

Voice sounds

- The spoken voice can be auscultated over the chest wall like tactile fremitus.
- Ask the person to repeat a phrase while you listen over the chest wall.
- Normal voice transmission is soft, muffled, and indistinct.

Cont…d

- You can hear sound through the stethoscope but cannot distinguish exactly what is being said.
- Pathology that increases lung density enhances transmission of voice sounds.

CONT…D

- Voice sounds are supplemented maneuvers that are performed if you suspect lung pathology for possible;
  - Bronchophony
  - Egophony
  - Whispered pectoriloquy

CONT…D

Technique voice sound examination

Bronchophony;

- Ask the person to repeat 'ninety nine" while you listen with the stethoscope over the chest wall. Listen especially if you suspect pathology.

CONT…D

- Normal findings:- normal voice transmission is soft, muffled, and indistinct; you can hear sound through the stethoscope but can not distinguish exactly what is being said.

CONT…D

- Abnormal findings:-pathology that increases lung density will enhance transmission of voice sounds. You auscultate a clear "Ninety-Nine." The words are more distinct than normal and sound close to your ear.

Cont…d

Egophony (Greek: the voce of a goat)

- Auscultate the chest while the person phonates a long "ee-ee-ee-ee" sound.
- Normally, you should hear "eeeeee" through your stethoscope.

CONT…D

- Abnormal – over areas of consolidation (lobar pneumonia) or compression, the spoken “eeee” sound changes to a bleating long “aaaaa” sound. If this is present record “E→A change”

CONT…D

Whispered pectoriloquy

- Ask the person to whisper a phrase like "one-two- three" as you auscultate.
- The normal response is faint, Muffled and almost inaudible.

Cont…d

- Abnormal with consolidation, the whispered voice is transmitted very clearly and distinctly although still somewhat faint.
- It sounds as if the person is whispering right into your stethoscope, “one-two-three”.

CONT…D

The Anterior chest:

Inspect the anterior chest.

- Note the shape and configuration of the chest wall.
- The ribs are sloping downward with symmetric interspaces.

CONT…D

- The costal angle is within 90 degrees.
- Abnormal:-
  - Barrel chest horizontal ribs and costal angle>90 degrees.
  - Abdominal muscle hypertrophy-chronic emphysema.

CONT…D

Note skin color and condition;

- The lips and nail beds are free of cyanosis or unusual pallor.
- Assess the quality of respirations.
- Normal relaxed breathing is automatic and effortless, regular and even, and produces no noise.

CONT…D

- The chest expands symmetrically with each inspiration.
- There should be no retraction or bulging of the interspaces on inspiration.
- Respiratory rate is within normal limits for the person's age with regular pattern of breathing.

CONT…D

Abnormal:-

- Noisy breathing occurs with severe asthma or chronic bronchitis.
- Unequal chest expansion occurs with obstructed or collapsed lung as with pneumonia.

CONT…D

- Retraction- severe asthma, COPD, upper airway obstruction, emphysema.
- Bulging- asthma, emphysema.
- Accessory muscle- acute airway obstruction and massive atelectasis.
- Rectus abdominis and intercostal muscle-COPD.

CONT…D

Palpate the Anterior Chest:

- Palpate symmetric chest expansion.
- Place your hand on the antero-lateral wall with the thumbs along the costal margins and pointing toward the xiphoid process.

CONT…D

- Ask the person to take a deep breath.
- Watch your thumbs move apart symmetrically and note smooth chest expansion with your fingers.
- Abnormal:– a lag in expansion occurs with atelectasis, pneumonia.

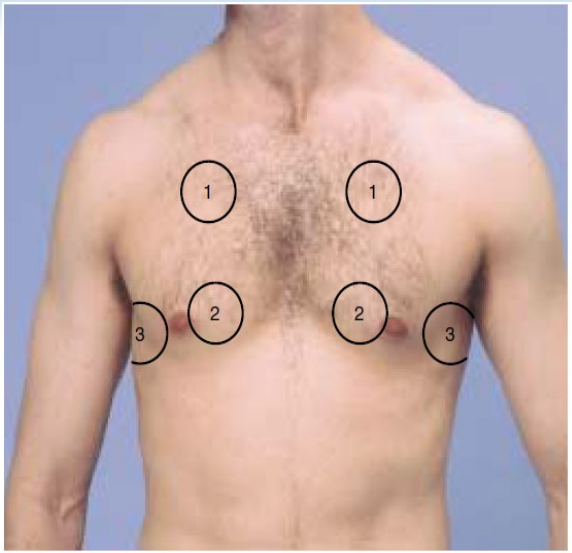
CONT…D

CONT…D

Assess tactile (vocal) fremitus;

- Begin palpating over the lung apices in the supra- clavicular areas.
- Compare vibrations from one side to the other as the person repeats “ninety-nine” or “44”.

CONT…D



LOCATIONS FOR FEELING FREMITUS

CONT…D

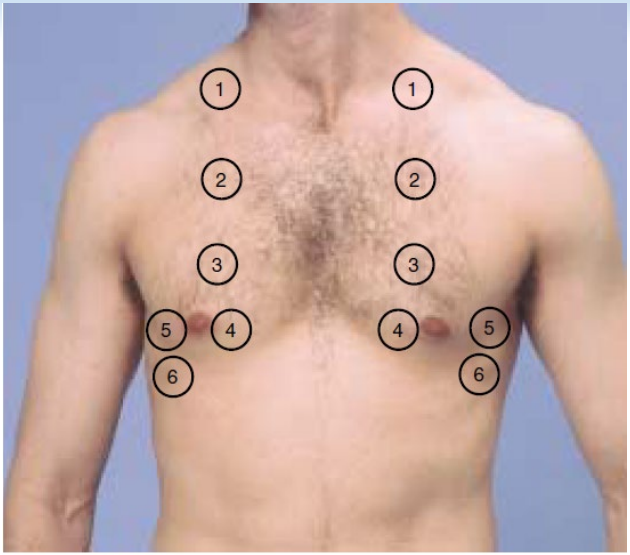
- Palpate the anterior chest wall to note any tenderness and superficial lumps or masses.
- Note skin mobility and turgor, and note skin temperature and moisture.

CONT…D

Percuss the Anterior Chest:

- Begin percussing the apices in the supraclavicular areas.
- Then percussing the interspaces and comparing one side to the other move down the anterior chest.
- Interspaces are easier to palpate on the anterior chest than on the back.

CONT…D



LOCATIONS FOR PERCUSSION

CONT…D

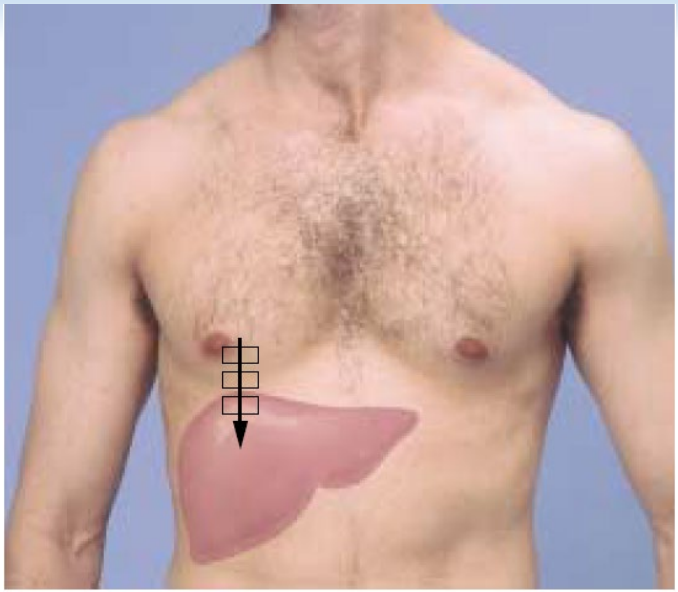
- Do not percuss directly over female breast tissue, it produces a dull note.
- Shift the breast tissue over slightly using the edge of your stationary hand.
- Note the borders of cardiac dullness normally found on the anterior chest and never confuse with lung pathology.

CONT…D

CONT…D

- In the right hemi thorax, the upper border of liver dullness is located in the 5th intercostals space in the right mid- clavicular line.
- On the left, tympany is evident over the gastric space.

CONT…D



CONT…D

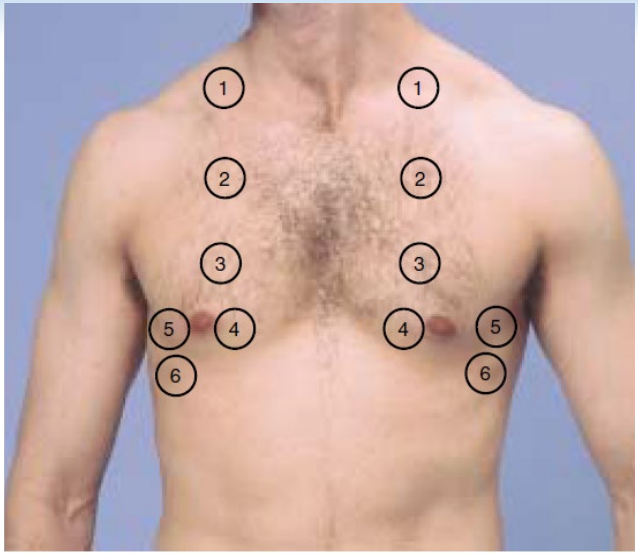
Auscultate the Anterior Chest:

- Auscultate the lung fields over the anterior chest from the apices in the supra-clavicular areas down to the 6th rib.
- Progress from side to side as your move downward and listen to one full respiration in each location.

CONT…D

- Like percussion displace the breast and listen directly over the chest wall.
- Evaluate normal breath sound; note any abnormal breath sounds and adventitious sounds.
- If necessary, assess the voice sounds on the anterior chest.

CONT…D



LOCATIONS FOR [illegible] AUSCULTATION

Assessment of Common Respiratory Conditions

- Normal Lung- On inspection: A.P< transverse diameter, relaxed posture, Rate 10-18 breaths /minute, regular, no cyanosis or pallor.
- Palpation: symmetric chest expansion; tactile fremitus present and equal bilaterally, diminishing toward periphery. No lumps, masses, or tenderness.

Cont…d

- Percussion-Resonant.
- Auscultation – Vesicular over periphery fields, bronchovesicular over parasternally (anterior) and between scapulae (posterior). No any adventitious sounds.

Abnormality

- Lobar pneumonia;
  - Inspection-increased RR, guarding and lag expansion on the affect side.
  - Tactile fremitus increased if bronchus patent, and decreased if bronchus obstructed.
  - Palpation-chest expansion decreased on affected side.

CONT…D

- Percussion- dull over lobar pneumonia.
- Auscultation- breath sound louder with patent bronchus. Voice sounds have increase clarity, bronchophony, egophony, and whispered pectoriloquy present.
- Adventitious sound-crackle, fine to medium.

Nursing Diagnosis

- Anxiety related to threat of death as manifested by increased pulse and blood pressure.
- Impaired gas exchange related to altered oxygen supply as manifested by clubbing of fingers.
- Ineffective breathing pattern related to inflammation process as manifested by cyanosis

CONT…D

Thank you for your attention!!!