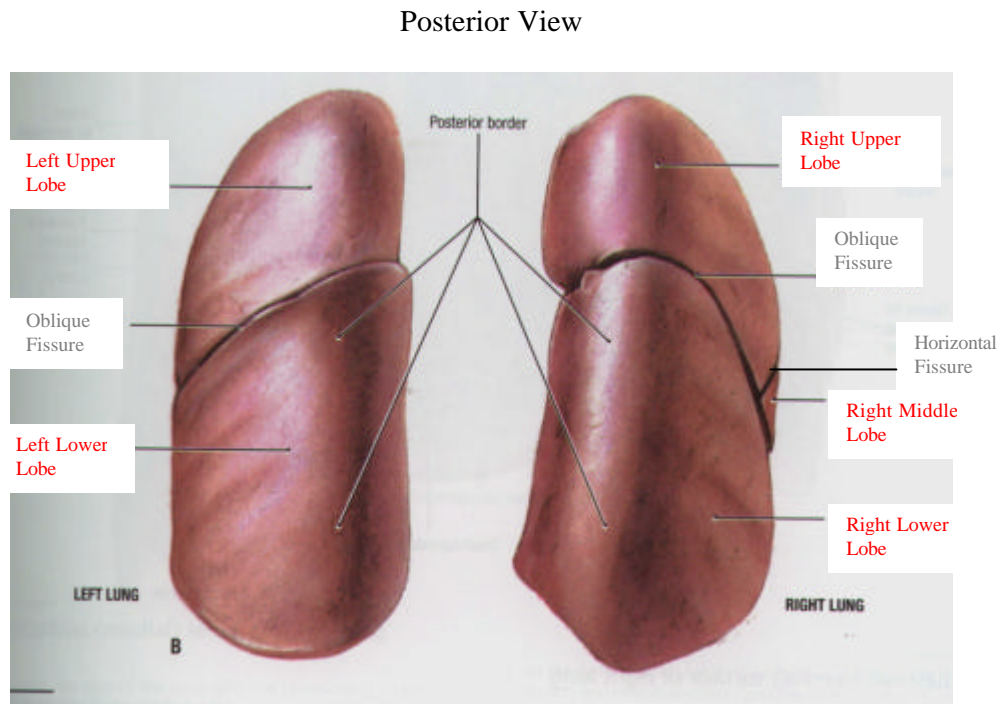
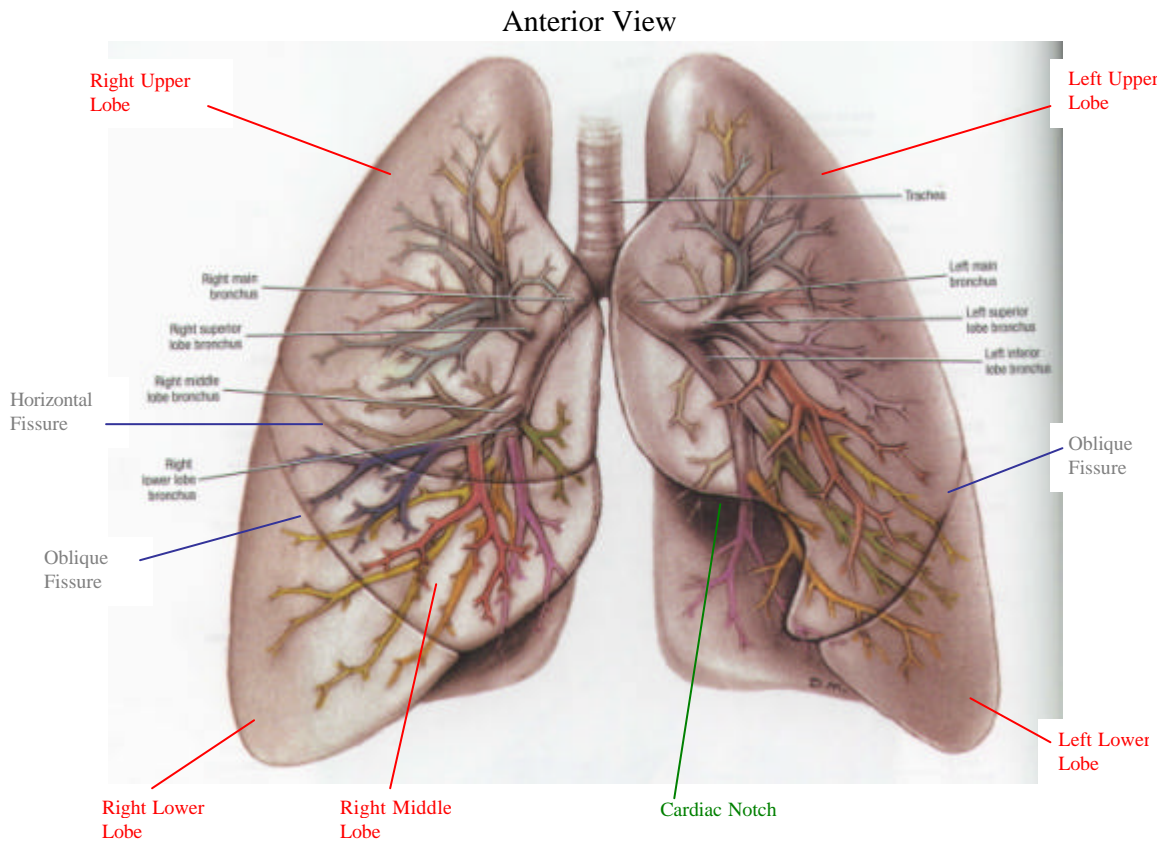


Chest Auscultation

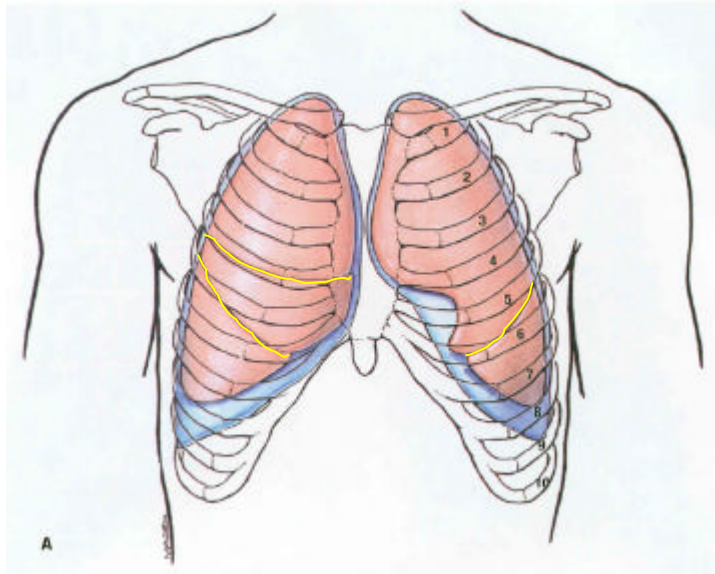
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A. Revision of Anatomy

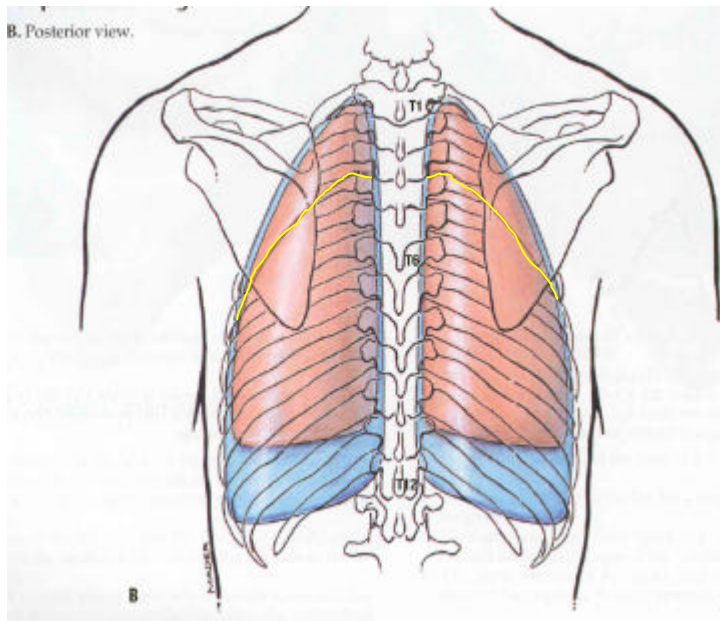


1. Apices of lungs extend above clavicles.
2. Horizontal fissure follows right 4th rib
3. Oblique fissures on both sides extend to 6th rib anteriorly
4. Left lung has large deficit anteriorly extending from 4th to 6th rib and from sternum to costochondral joint – cardiac notch
5. Both lungs extend to 8th rib laterally
6. Parietal pleura extends down to 19th rib laterally



Posterior Aspect

7. Much of left and right upper portions of lungs are covered by scapulae.
8. Oblique fissures extend from spinous processes of T2.
9. Lungs extend down to T11 medially and 9th rib laterally
10. Parietal pleura extend to T12 medially and 10th rib laterally



B. Before You Begin

Auscultation is perhaps the most important and effective clinical technique you will ever learn for evaluating a patient's respiratory function. Before you begin, there are certain things that you should keep in mind:

- a) It is important that you try to create a quiet environment as much as possible. This may be difficult in a busy emergency room or in a room with other patients and their visitors. Eliminate noise by closing the door and turning off any radios or televisions in the room.
- b) The patient should be in the proper position for auscultation, i.e. sitting up in bed or on the examining table, ensuring that his or her chest is not leaning against anything. If this is not possible, ask for assistance or perform only a partial assessment of the patient's breathing.
- c) Your stethoscope should be touching the patient's bare skin whenever possible or you may hear rubbing of the patient's clothes against the stethoscope and misinterpret them as abnormal sounds. You may wish to wet the patient's chest hair with a little warm water to decrease the sounds caused by friction of hair against the stethoscope.
- d) Always ensure patient comfort. Be considerate and warm the diaphragm of your stethoscope with your hand before auscultation.

As you are auscultating your patient, please keep in mind these 2 questions:

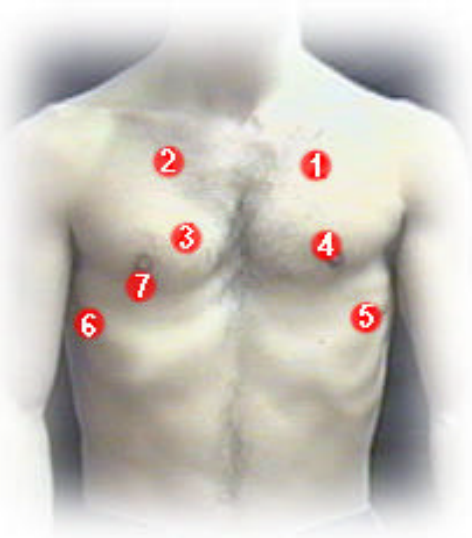
- 1) Are the breath sounds increased, normal, or decreased?
- 2) Are there any abnormal or adventitious breath sounds?

C. Auscultation

To assess the posterior chest, ask the patient to keep both arms crossed in front of his/her chest, if possible.

Auscultate using the diaphragm of your stethoscope. Ask the patient not to speak and to breathe deeply through the mouth. Be careful that the patient does not hyperventilate. You should listen to at least one full breath in each location. It is important that you always compare what you hear with the opposite side. e.g. If you are listening to the left apex, you should follow through by comparing what you heard with what you hear at the right apex.

There are between 12 and 14 locations for auscultation on the anterior and posterior chest respectively. Generally, you should listen to at least 6 locations on both the anterior and posterior chest. Begin by auscultating the apices of the lungs, moving from side to side and comparing as you approach the bases. Making the order of the numbers in the images below a ritual part of your pulmonary exam is a way of ensuring that you compare both sides every time and you'll begin to know what each area should sound like under normal circumstances. If you hear a suspicious breath sound, listen to a few other nearby locations and try to delineate its extent and character.



D. Breath Sounds

Breath sounds can be divided and subdivided into the following categories:

<i>Normal</i>	<i>Abnormal</i>	<i>Adventitious</i>
<i>tracheal</i>	absent/decreased	crackles (rales)
<i>vesicular</i>	bronchial	wheeze
<i>bronchial</i>		rhonchi
<i>bronchovesicular</i>		stridor
		pleural rub
		mediastinal crunch (Hamman's sign)

1. Normal Breath Sounds

These are traditionally organized into categories based on their intensity, pitch, location, and inspiratory to expiratory ratio. Breath sounds are created by turbulent air flow. In inspiration, air moves into progressively smaller airways with the alveoli as its final location. As air hits the walls of these airways, turbulence is created and produces sound. In expiration, air is moving in the opposite direction towards progressively larger airways. Less turbulence is created, thus normal expiratory breath sounds are quieter than inspiratory breath sounds.

i. Tracheal Breath Sound (*track 11*)

Tracheal breath sounds are very loud and relatively high-pitched. The inspiratory and expiratory sounds are more or less equal in length. They can be heard over the trachea, which is not routinely auscultated.

ii. Vesicular Breath Sound (*track 12*)

The vesicular breath sound is the major normal breath sound and is heard over most of the lungs. They sound soft and low-pitched. The inspiratory sounds are longer than the expiratory sounds. Vesicular breath sounds may be harsher and slightly longer if there is rapid deep ventilation (eg post-exercise) or in children who have thinner chest walls. As well, vesicular breath sounds may be softer if the patient is frail, elderly, obese, or very muscular.

iii. Bronchial Breath Sound (*track 15*)

Bronchial breath sounds are very loud, high-pitched and sound close to the stethoscope. There is a gap between the inspiratory and expiratory phases of respiration, and the expiratory sounds are longer than the inspiratory sounds. If these sounds are heard anywhere other than over the manubrium, it is usually an indication that an area of consolidation exists (ie space that usually contains air now contains fluid or solid lung tissue).

iv. Bronchovesicular Breath Sound

These are breath sounds of intermediate intensity and pitch. The inspiratory and expiratory sounds are equal in length. They are best heard in the 1st and 2nd ICS (anterior chest) and between the scapulae (posterior chest) - ie over the mainstem bronchi. As with bronchial sounds, when these are heard anywhere other than over the mainstem bronchi, they usually indicate an area of consolidation.

2. Abnormal Breath Sounds

i. Absent or Decreased Breath Sounds

There are a number of common causes for abnormal breath sounds, including:

- ARDS: decreased breath sounds in late stages
- Asthma: decreased breath sounds
- Atelectasis: If the bronchial obstruction persists, breath sounds are absent unless the atelectasis occurs in the RUL in which case adjacent tracheal sounds may be audible.
- Emphysema: decreased breath sounds
- Pleural Effusion: decreased or absent breath sounds. If the effusion is large, bronchial sounds may be heard.
- Pneumothorax: decreased or absent breath sounds

ii. Bronchial Breath Sounds in Abnormal Locations

Bronchial breath sounds occur over consolidated areas.

3. Adventitious Breath Sounds

i. Crackles (Rales) (*tracks 13, 19 & 14*)

Crackles are discontinuous, non-musical, brief sounds heard more commonly on inspiration. They can be classified as fine (high pitched, soft, very brief) or coarse (low pitched, louder, less brief). When listening to crackles, pay special attention to their loudness, pitch, duration, number, timing in the respiratory cycle, location, pattern from breath to breath, change after a cough or shift in position. Crackles may sometimes be normally heard at the anterior lung bases after a maximal expiration or after prolonged recumbency.

The mechanical basis of crackles: Small airways open during inspiration and collapse during expiration causing the crackling sounds. Another explanation for crackles is that air bubbles through secretions or incompletely closed airways during expiration.

Conditions:

- ARDS
- asthma
- bronchiectasis
- chronic bronchitis
- consolidation
- early CHF
- interstitial lung disease
- pulmonary oedema

ii. Wheeze (*track 18*)

Wheezes are continuous, high pitched, hissing sounds heard normally on expiration but also sometimes on inspiration. They are produced when air flows through airways narrowed by secretions, foreign bodies, or obstructive lesions.

Note when the wheezes occur and if there is a change after a deep breath or cough. Also note if the wheezes are monophonic (suggesting obstruction of one airway) or polyphonic (suggesting generalized obstruction of airways).

Conditions:

- asthma
- CHF
- chronic bronchitis
- COPD
- pulmonary oedema

iii. Rhonchi (*track 17*)

Rhonchi are low pitched, continuous, musical sounds that are similar to wheezes. They usually imply obstruction of a larger airway by secretions.

iv. Stridor (*track 16*)

Stridor is an inspiratory musical wheeze heard loudest over the trachea during inspiration. Stridor suggests an obstructed trachea or larynx and therefore constitutes a medical emergency that requires immediate attention.

v. Pleural Rub (*track 20*)

Pleural rubs are creaking or brushing sounds produced when the pleural surfaces are inflamed or roughened and rub against each other. They may be discontinuous or continuous sounds. They can usually be localized a particular place on the chest wall and are heard during both the inspiratory and expiratory phases.

Conditions:

pleural effusion

pneumothorax

vi. Mediastinal Crunch (Hamman's sign)

Mediastinal crunches are crackles that are synchronized with the heart beat and not respiration. They are heard best with the patient in the left lateral decubitus position. As with stridor, mediastinal crunches should be treated as medical emergencies.

Conditions:

pneumomediastinum

Summary

E. Summary

The following table has been adapted from A Guide to Physical Exam and History Taking by Barbara Bates.

Type	Characteristic	Intensity	Pitch	Description	Location
Normal	tracheal	loud	high	harsh; not routinely auscultated	over the trachea
	vesicular	soft	low		most of the lungs
	bronchial	very loud	high	sound close to stethoscope; gap between insp & exp sounds	over the manubrium (normal) or consolidated areas
	bronchovesicular	medium	medium		normally in 1st & 2nd ICS anteriorly and between scapulae posteriorly; other locations indicate consolidation
Abnormal	absent/decreased			heard in ARDS, asthma, atelectasis, emphysema, pleural effusion, pneumothorax	
	bronchial			indicates areas of consolidation	
Adventitious	crackles (rales)	soft (fine crackles) or loud (coarse crackles)	high (fine crackles) or low (coarse crackles)	discontinuous, non-musical, brief; more commonly heard on inspiration; assoc. w/ ARDS, asthma, bronchiectasis, bronchitis, consolidation, early CHF, interstitial lung disease	may sometimes be normally heard at ant. lung bases after max. expiration or after prolonged recumbency
	wheeze	high	expiratory	continuous sounds normally heard on expiration; note if monophonic (obstruction of 1 airway) or polyphonic (general obstruction); assoc. w/ asthma, CHF, chronic bronchitis, COPD, pulm. oedema	can be anywhere over the lungs; produced when there is obstruction
	rhonchi	low	expiratory	continuous musical sounds similar to wheezes; imply obstruction of larger airways by secretions	
	stridor		inspiratory	musical wheeze that suggests obstructed trachea or larynx; medical emergency	heard loudest over trachea in inspiration
	pleural rub		insp. & exp	creaking or brushing sounds; continuous or discontinuous; assoc. w/ pleural effusion or pneumothorax	usually can be localized to particular place on chest wall
	mediastinal crunch		not synchronized w/ respiration	crackles synchronized w/ heart beat; medical emerg.; assoc. w/ pneumomediastinum	best heard w/ patient in left lateral decubitus position

(Adapted from <<http://sprojects.mmip.mcgill.ca/MVS/MVSTETH.htm>>)