Lab 21: Dissection: Pleura, lungs, and bronchial tree

Goals

1. Review the thoracic body wall, including the sternum, ribs, costal cartilages, and intercostal spaces
2. Inspect the pleural sacs and define the pleural cavity, parietal pleura, and visceral pleura
3. Remove the lungs and study the external features of the lungs and structures in the lung root.

Anterior Thoracic Wall

Review these features of the thoracic wall:

- **Manubrium, body**, and **xiphoid process** of the **sternum**
- **Suprasternal (jugular) notch** and **sternal angle**
- **Ribs and costal cartilages**
- **Costal margin**
- **Intercostal spaces** filled with **intercostal muscles**
- **Costochondral junctions**, where ribs fuse with **costal cartilages**.
- **External intercostal muscles**. You will note that the muscles fibers run in an oblique direction inferomedially (like putting your hands in your front pockets). An **external intercostal membrane** (an aponeurosis) replaces the external intercostal muscle between the costochondral junction and the sternum (producing a see-through "window").

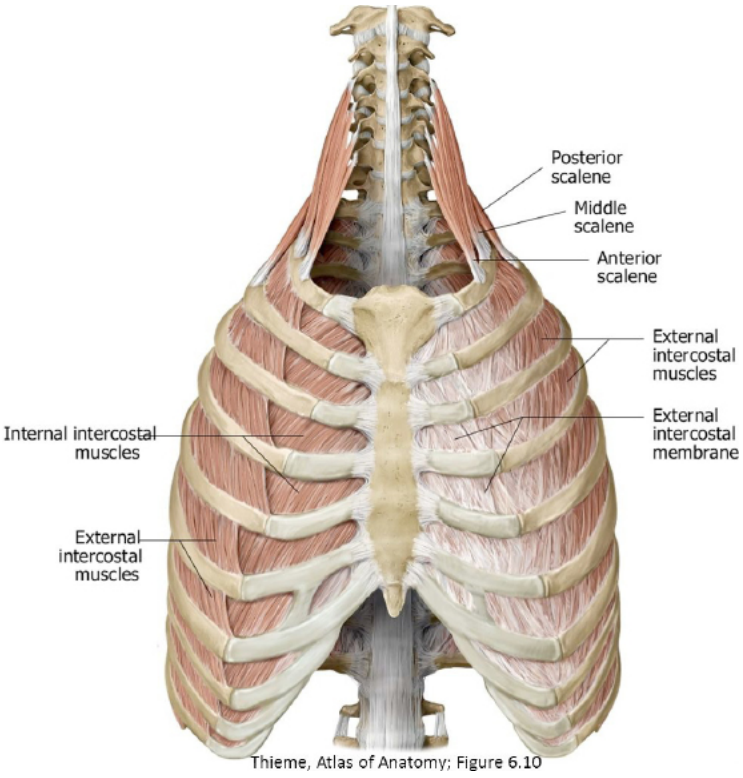


Figure 21.1.

- Adjacent to the sternum (and seen through the external intercostal membrane), identify the **internal intercostal muscles** = fibers run in an oblique direction inferolaterally (at a right angle to the external intercostal muscles).

Intercostal Space

Use the chest wall that was removed in a previous lab to identify muscles of the intercostal space:

- **External intercostal muscle**
- **Internal intercostal muscle**
- **Innermost intercostal muscle**

Discuss:

The **neurovascular plane** of the thoracic body wall is between the 2nd and 3rd muscle layers = between the internal and innermost intercostal muscles. In this plane run the segmentally arranged nerves and vessels of the body wall.

In the neurovascular plane, coursing along the inferior border of a rib (in the **costal groove** of the rib), neurovascular structures are arranged from top to bottom:

- Intercostal **V**ein
- Intercostal **A**rtery
- Intercostal **N**erve

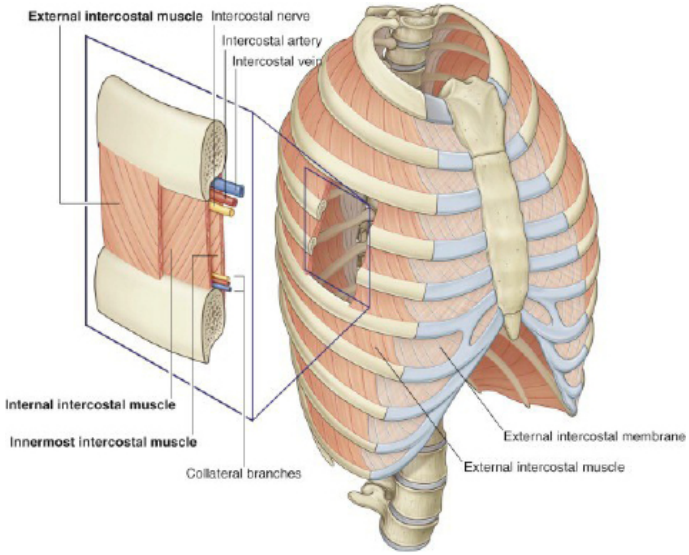


Figure 21.2. Gray's Anatomy for Students, 3rd ed.

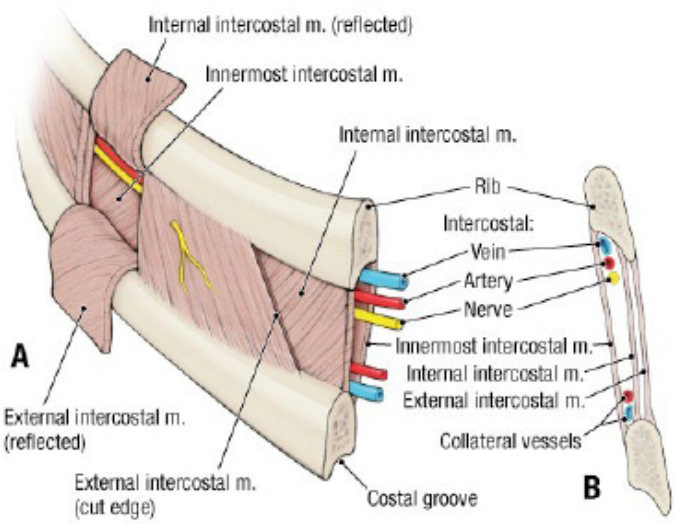


Figure 21.3.

Recall that there are two intercostal arteries (and veins) serving an intercostal space:

- **Posterior intercostal arteries**
- **Anterior intercostal arteries**

Where do the intercostal arteries originate?

Where do the intercostal veins drain?

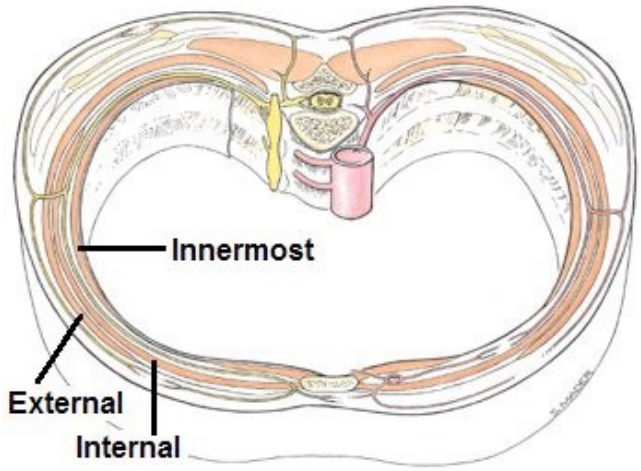


Figure 21.4.

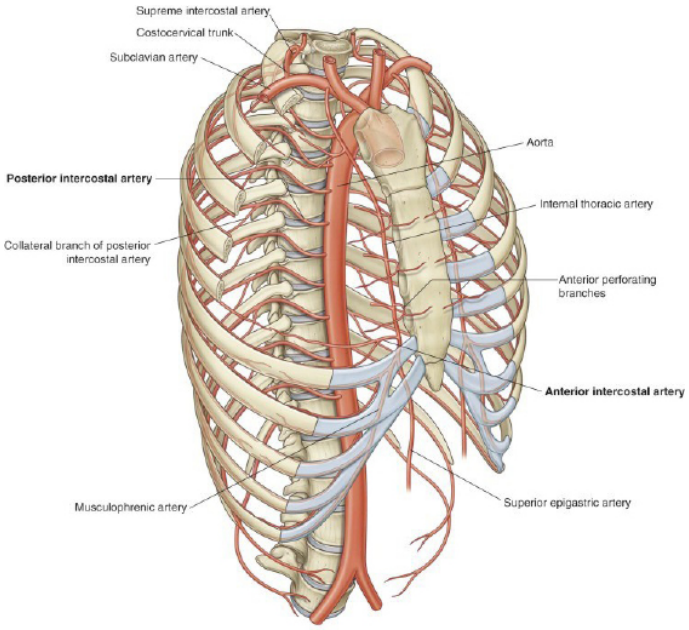


Figure 21.5. Gray's Anatomy for Students, 3rd ed.

Pleura and Pleural Cavities

In a previous lab, you examined the pleura and pleural cavity on the right side and removed the right lung. Today we will examine the pleura and pleural cavity on the left side and remove the left lung for further study.

On the left side, trace the extent of the **costal pleura**. Medially, it leaves the chest wall to become the mediastinal pleura, which covers the lateral walls of the mediastinum. The transition between costal and mediastinal pleurae occurs abruptly behind the sternum.

During respiration, the anterior border of the lung slides into this recess of the pleural cavity behind the sternum.

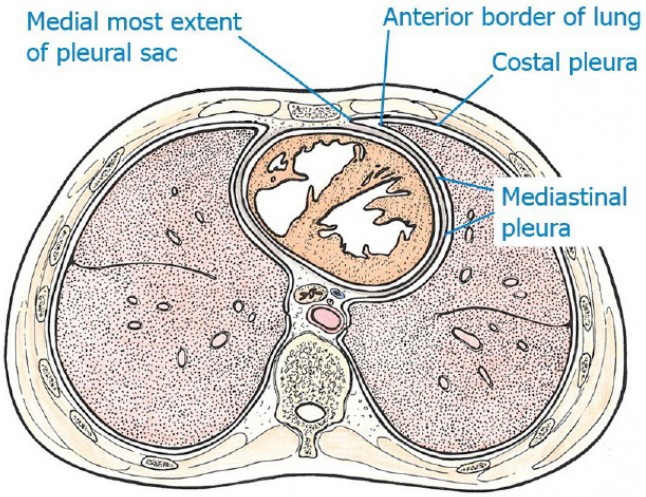


Figure 21.6. Transverse section showing the extent of the parietal pleura and pleural sacs.

With your hands, explore the **pleural cavities** all the way around the lungs, freeing up any fibrous adhesions that have obliterated parts of the pleural cavities.

These are common in cadavers and if not removed they can cause lung tissue to be sheared off when the lungs are removed. You don't want to do that.

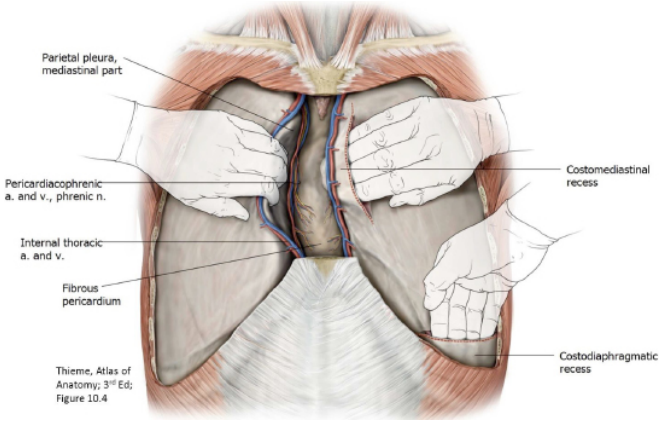


Figure 21.7.

BE CAREFUL!

The cut ribs have sharp edges.

Realize that your hands are in a potential space between parietal and visceral layers of pleura.

The one area where you won't be able to pass your gloved hand around the lung is medially where the lung faces the mediastinum.

This is where the **root of the lung** is located. The structures that comprise the root of the lung are the **pulmonary arteries**, **pulmonary veins**, and **main bronchi** that travel in/out of the lungs.

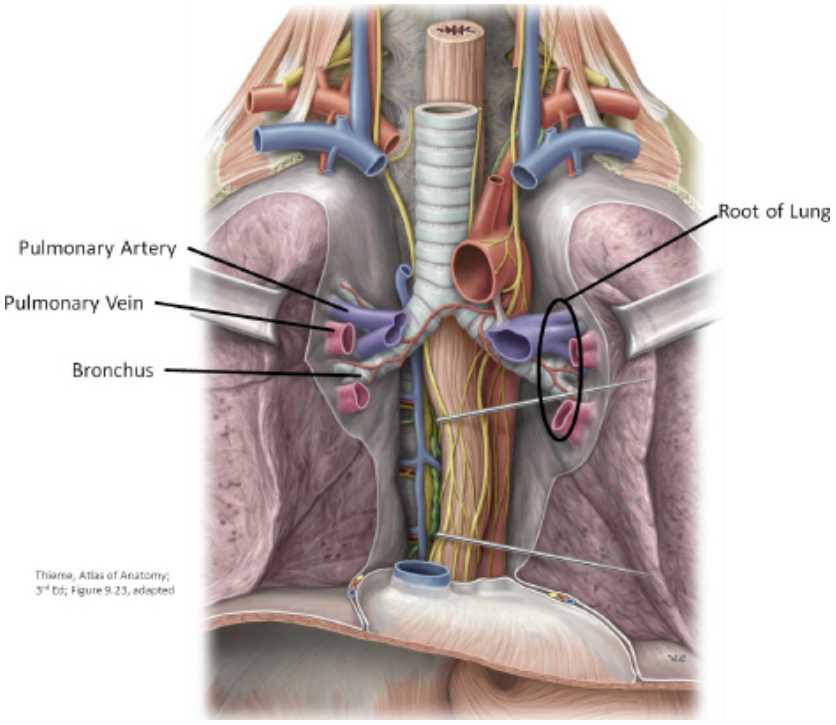


Figure 21.8.



Figure 21.9.

Chalk Talk

Discuss how the parietal and visceral pleura are continuous at the root of the lung (they form a "cuff" around it) and how the pulmonary ligament is a redundant fold of pleura below the root = use the sleeve of a lab jacket hanging from the wrist as a visual analogy!

The parietal pleura is associated with the body wall, while visceral pleura is associated with an organ (the lung). Which parts of the nervous system innervate each? How would pain be perceived from each? How does the development of these structures relate to their difference in innervation?

Remove the left lung.

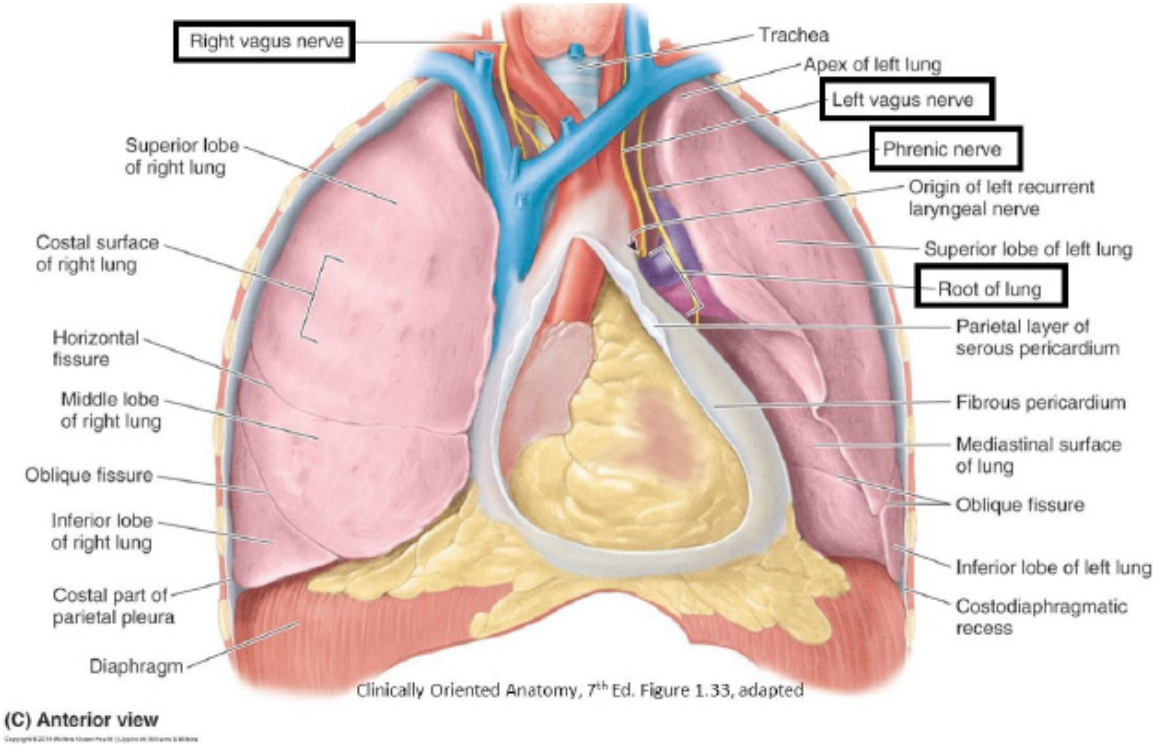


Figure 21.10.

1 Make sure any adhesions within the pleural cavity have been removed.
2 Locate the **phrenic nerve** between the fibrous pericardium and the mediastinal parietal pleura first! **The phrenic nerves (made from C-3, C4, and C-5 spinal nerves) pass anterior to the roots of the lungs**.
3 Have one of your teammates retract the lung away from the mediastinum, so that the lung root (with its pleural covering) can be seen. Another team member will then use a knife or scalpel to carefully cut through the root of the lung, closer to the lung than the mediastinum.

CAREFUL!

Don't cut the phrenic nerves!

Cut through the **pulmonary ligament**, too (this is the inferior extension of the cuff of pleura around the root).

4 Don't push your scalpel all the way to the posterior wall—you'll cleave off the posterior lung!
5 After the lung has been freed, lift it out of the thoracic cavity. Place both lungs onto a tray for further study.

Inspect the extent of the parietal pleura and pleural cavities.

Identify and trace the four named parts of the parietal pleura:

- **Cervical (aka = cupula)**
- **Mediastinal**
- **Diaphragmatic**
- **Costal**

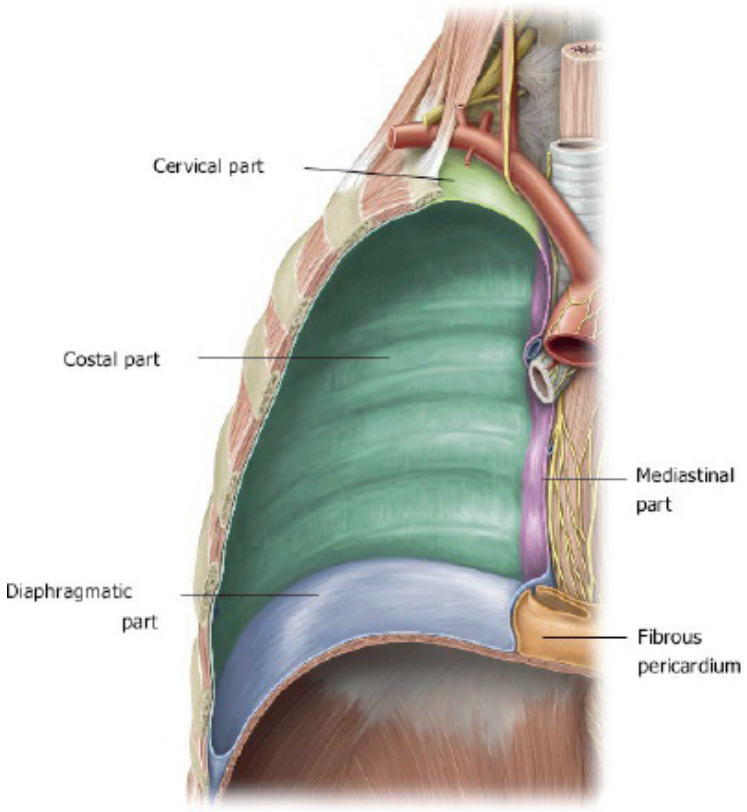


Figure 21.11.

OBSERVE the dome-shaped superior surface of the diaphragm with its shiny **diaphragmatic pleura** covering.

With your hands, probe the depths of the **costodiaphragmatic recesses**. They extend as low as the 12th ribs! During deep inspiration, the inferior border of the lung slides down into the costodiaphragmatic recess.

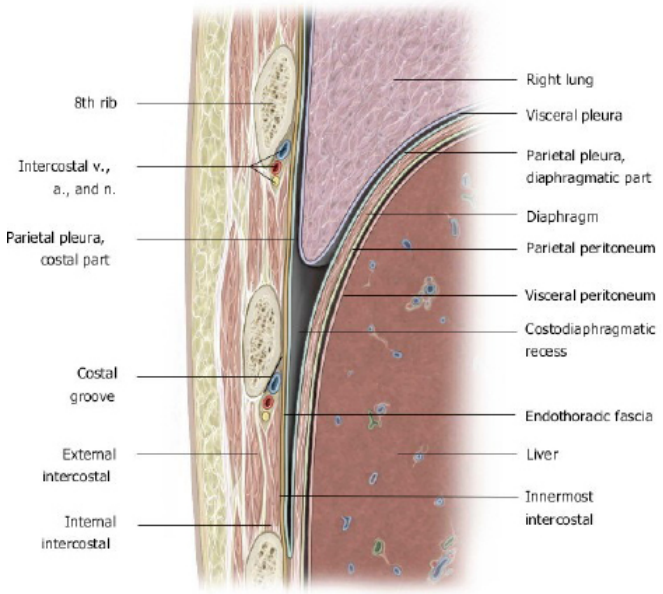


Figure 21.12.

CLINICAL CORRELATION

Gravity can cause fluid, pus, or blood to collect in the **costodiaphragmatic recesses**. On X-rays, this produces "blunting" of the **costophrenic angles**."

During quiet respiration, there is about a two-rib gap between the inferior border of the lung and the inferior most extent of the costodiaphragmatic recess. Why would this be important information to the clinician?

Trace the cervical pleura upwards—note that it extends into the root of the neck.

The apex of the lung fits snugly into this region. What is the name of the depression on the surface of the body wall, superior to the clavicle? The cervical pleura and apex of the lung are deep to this landmark.

Do you recall the clinical significance of this relationship?

Internal Thoracic Wall

You should have stripped away the costal and mediastinal pleura on the right side in a previous lab.

Review and identify:

- **Innermost muscle layer** of thoracic body wall (innermost intercostal muscles and subcostal muscles)
- **Intercostal nerve**
- **Posterior intercostal artery and vein**
- **Vertebral bodies**
- **Heads of ribs**

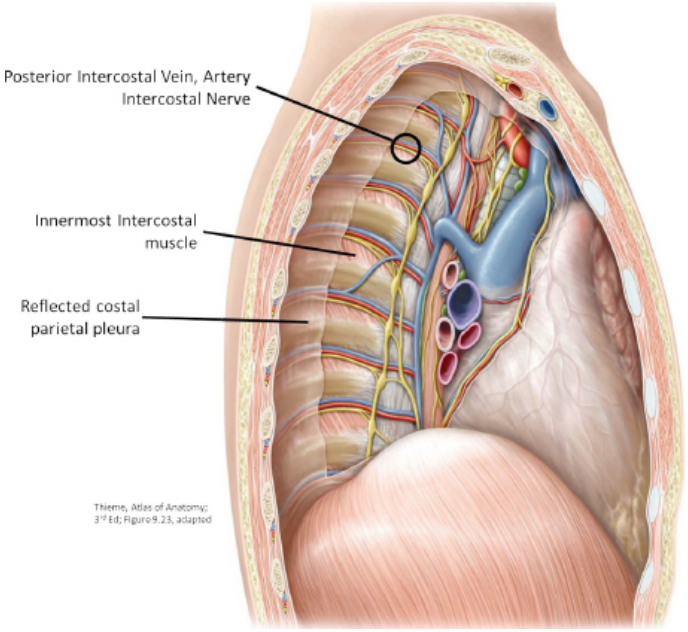


Figure 21.13.

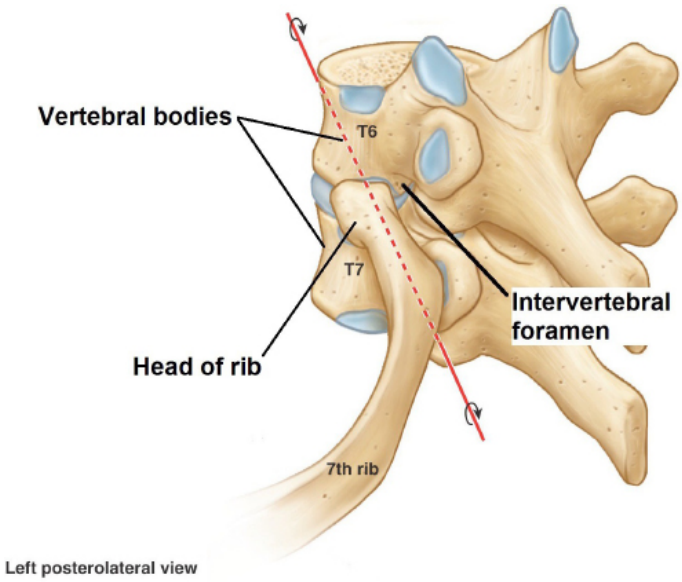


Figure 21.14. Clinically Oriented Anatomy, Figure 1.5.

Lungs

External Anatomy of the Lungs

- **Apex** and **base**
- **Lobes**
  - Left lung = **upper** and **lower**
  - Right lung = **upper**, **middle**, and **lower**
- Surfaces = **costal**, **mediastinal**, and **diaphragmatic**
- **Anterior** and **inferior borders**
- In left lung: **Cardiac notch** and **lingula**
- **Oblique** and **horizontal fissures**
- **Hilum** and **root of lung** (what is the difference?)
- Visceral pleura
- Pulmonary ligament

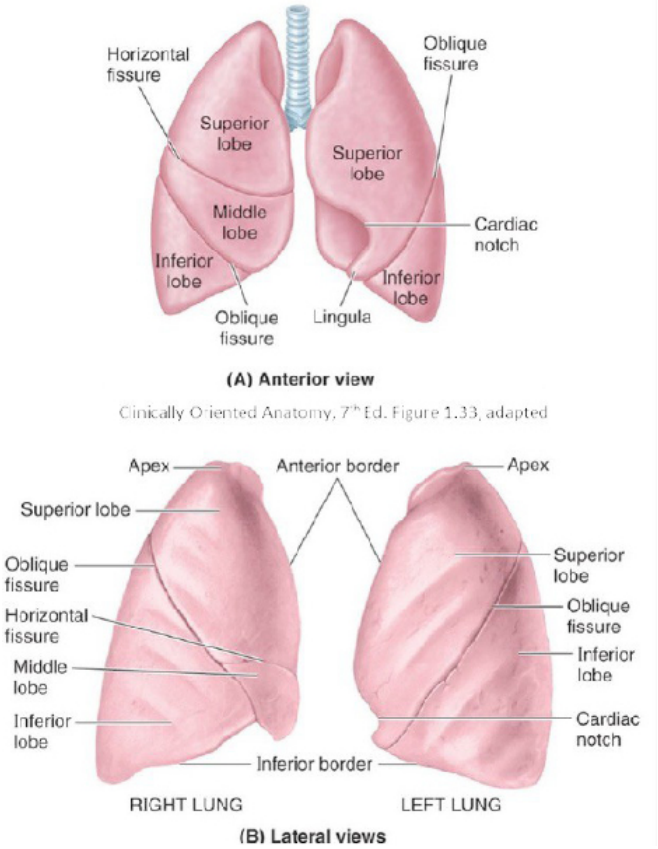


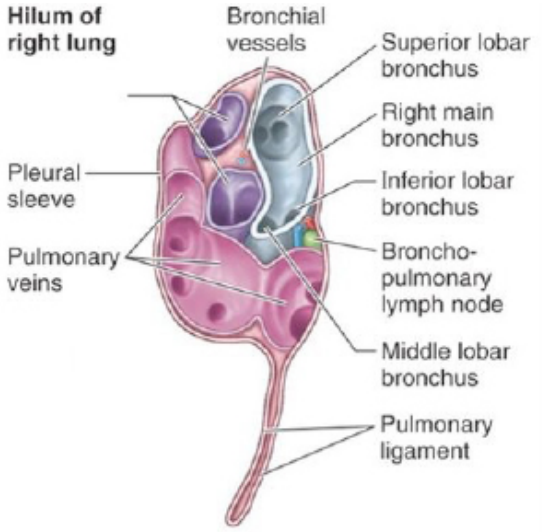
Figure 21.15.

Root of the Lung

Examine the hilum of both lungs to identify structures comprising the root of the lung.

Locate:

- **Pulmonary artery** (branched in the right lung)
- **Pulmonary veins** (superior and inferior)
- **Main bronchi (R&L)** (branches before entering right lung)
- **Interlobar & superior lobar bronchi** (in the right lung)
- **Bronchopulmonary (hilar) lymph nodes**



Clinically Oriented Anatomy, 7th Ed. Figure 1.34, adapted

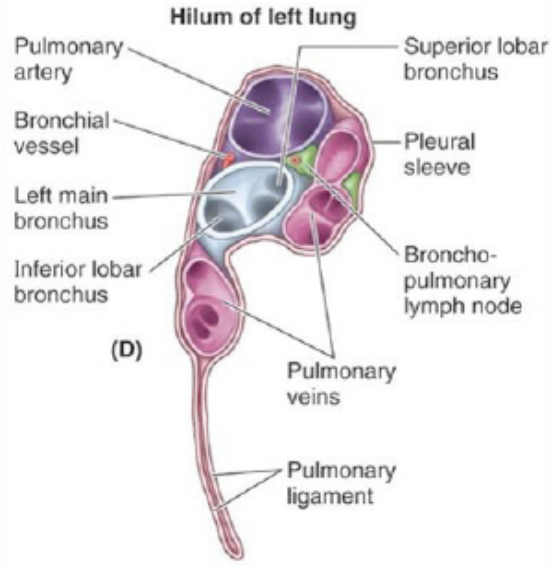


Figure 21.16.

Compare and contrast right and left lungs—are the arrangements of structures in the lung roots different?

In one lung, trace the main bronchus into the lung to demonstrate its branching into second order lobar bronchi.

Use scissors and forceps to remove lung tissue in order to follow the intra-pulmonary course of the **bronchial tree**.

- In the right lung there are three lobar bronchi: **upper**, **middle**, and **lower**.
- In the left lung there are **upper** and **lower lobar bronchi**.

Third order bronchi are called **segmental bronchi**. These aerate specific regions of the lung known as **bronchopulmonary segments**.

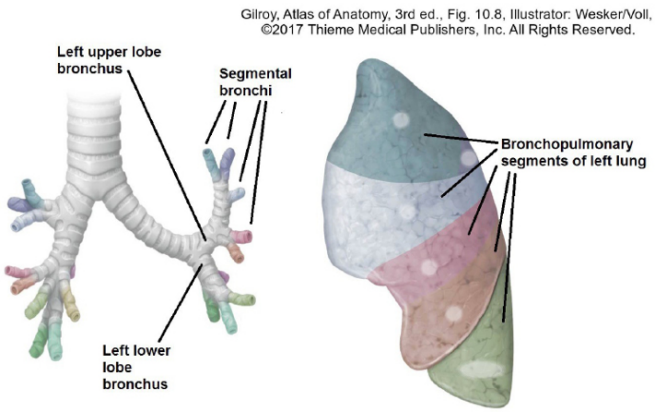


Figure 21.17. Lobar and segmental bronchi of left lung.

WHEN YOU HAVE FINISHED THIS SESSION,

return the lungs and chest wall to your cadaver. Clean off trays and tabletops and make sure all tissue scraps go into the orange tissue containers.

CHECKLIST, LAB #21

REVIEW AND MAKE SURE YOU HAVE IDENTIFIED EACH OF THE STRUCTURES BELOW.

CHEST WALL (REVIEW)

- [ ] Sternum: body, manubrium, and xiphoid
- [ ] Ribs, costal cartilages, and costal margin
- [ ] External and internal intercostal muscles

- [ ] Innermost intercostal muscles
- [ ] One example of an intercostal nerve, artery, and vein in an intercostal space
- [ ] Internal thoracic artery and veins
- [ ] One example of an anterior intercostal artery
- [ ] Phrenic nerves

PLEURA/PLEURAL CAVITIES

- [ ] Parietal pleura:
  - [ ] Costal
  - [ ] Cervical (cupula)
  - [ ] Mediastinal
  - [ ] Diaphragmatic
- [ ] Visceral pleura
- [ ] Pleural cavity
- [ ] Costodiaphragmatic recess

LUNGS

- [ ] Visceral pleura
- [ ] Pulmonary ligament
- [ ] Base and apex
- [ ] Lobes
- [ ] Surfaces (costal, diaphragmatic, and mediastinal)
- [ ] Borders (anterior & inferior)
- [ ] Fissures (oblique, horizontal)
- [ ] Cardiac notch and lingula (left lung)

- [ ] Hilum of lung
- [ ] Root structures of lungs:
  - [ ] Pulmonary artery
  - [ ] Superior and inferior pulmonary veins
  - [ ] Main bronchus
- [ ] Bronchopulmonary (hilar) lymph nodes
- [ ] Main bronchi (R & L)
- [ ] Lobar bronchi:
  - [ ] Upper (superior) and lower (inferior) (R & L)
  - [ ] Middle (R)