

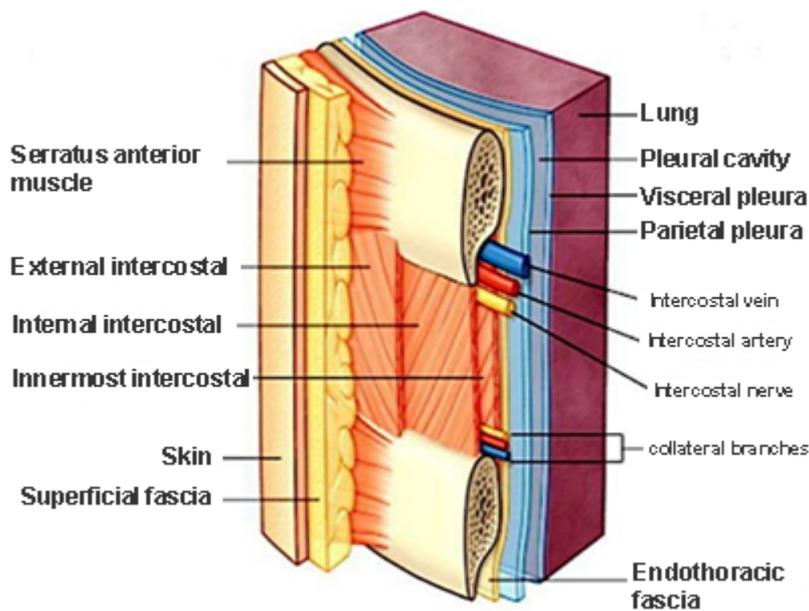
# Thorax

## STERNUM

- Manubrium = T3/T4 level
- Sternal angle = T4/5
- Body = T5-T9 vertebral levels

## Respiration

- Inspiration
  - Passive - Diaphragm, External intercostals - pulls ribs up
  - Forced - scalenes, SCM, serratus anterior
- Expiration
  - Passive - relax ext intercostals and diaphragm
  - Forced - deeper intercostals (deep and innermost), subcostals, abdominal muscles



## Thoracic wall

- Muscles
  1. **Intercostals** (all innervated by intercostal T1-T11 nerves)
    1. External
      - 11 external intercostals
      - Inferoanterior - from inferior part of rib to superior anterior part of rib below
      - Continuous with external obliques
      - Elevate ribs = increase thoracic volume
    2. Internal

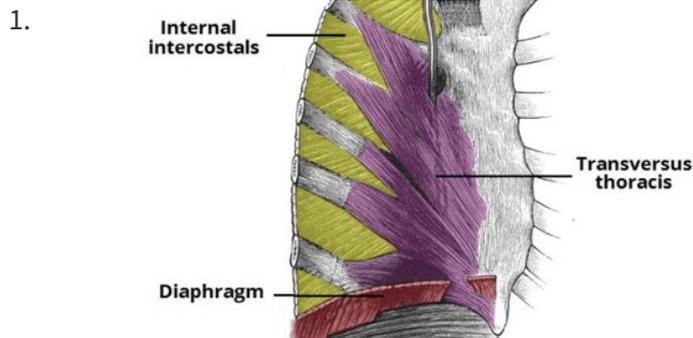
1. Depress ribs
3. Innermost
  1. Depress ribs

2. **Subcostals**



2. In inferior portion of thoracic wall
3. Depress ribs

3. **Transversus thoracis**

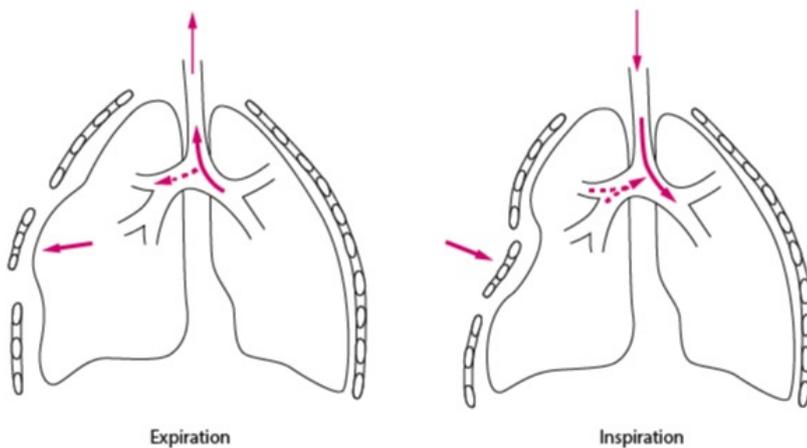


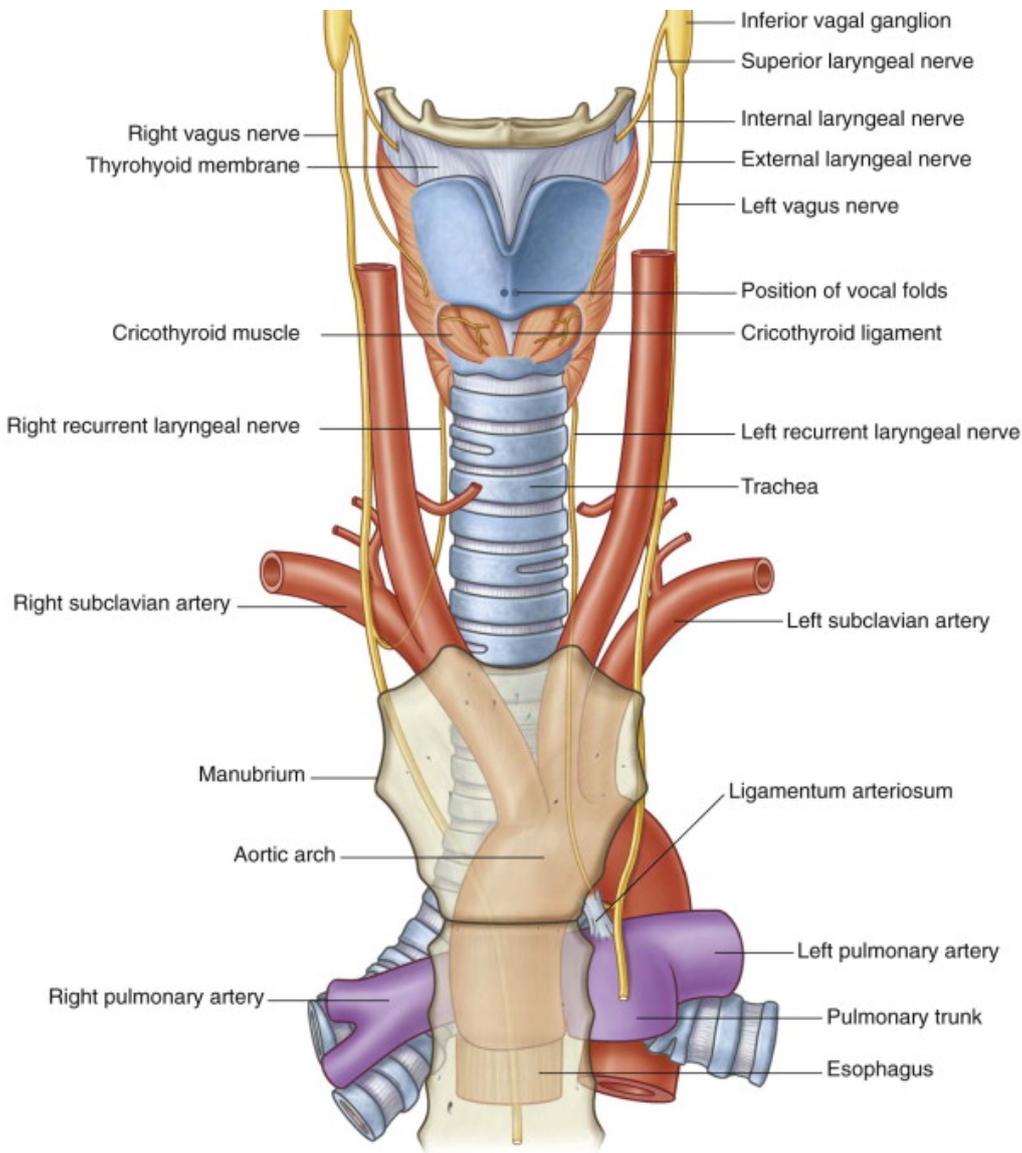
2. On internal aspect of thoracic wall
3. Depress ribs

**Flail chest**

≥3 adjacent ribs with ≥2 points of fracture/break = free floating section of chest wall

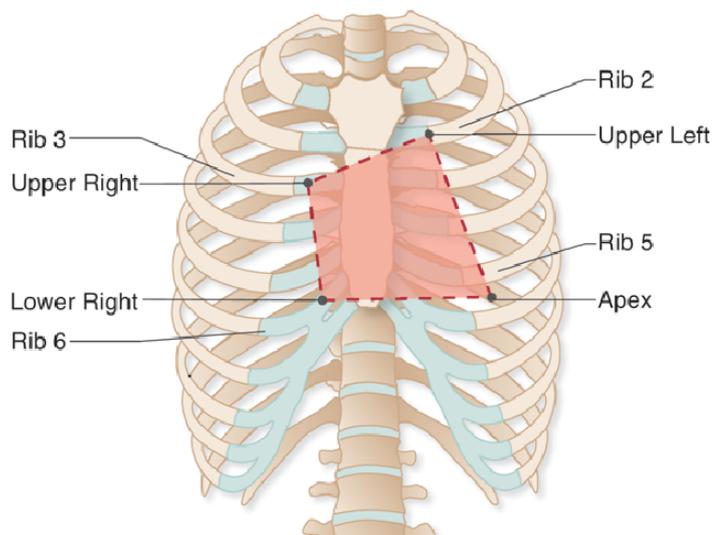
- Paradoxical respiration
- May have lung contusions develop
- Chest wall deformity
- Emphysema may be present/palpable

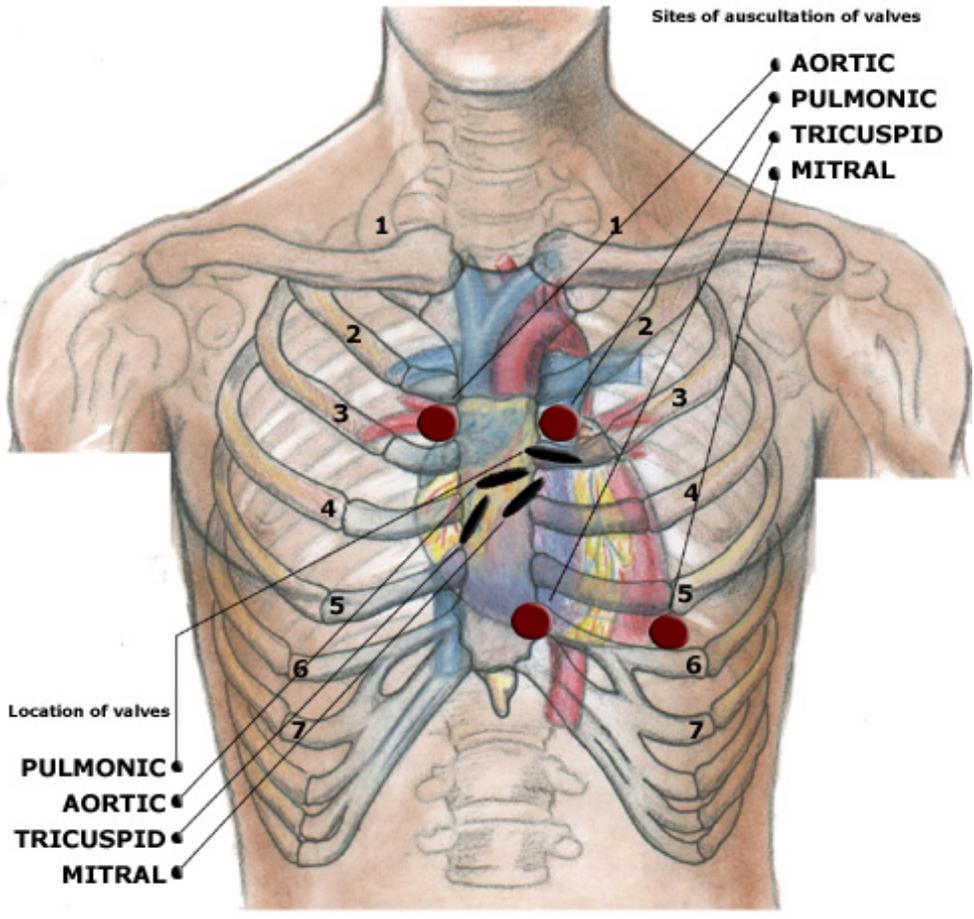
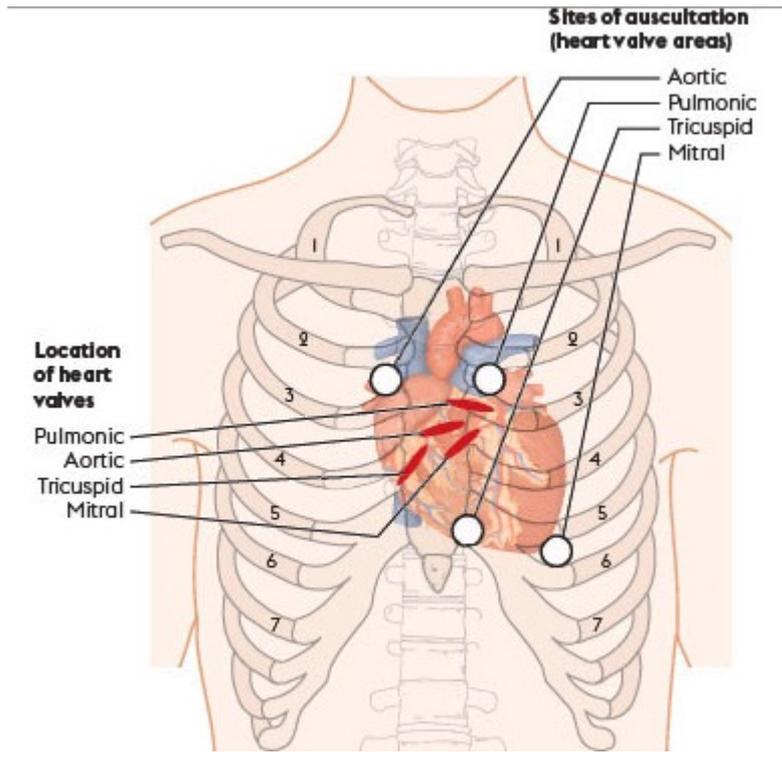




R recurrent laryngeal n. - originates around axillary a  
 L recurrent laryngeal n. - originates under arch of aorta

### Surface markings of the heart





**Pericardium**

Supplied by phrenic nerve (C3-5) for somatic innervation - fibrous and parietal pericardium

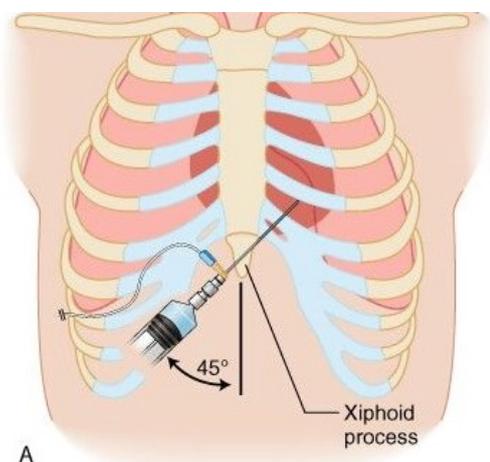
1. Fibrous pericardium - on most external. Continuous with diaphragm central tendon, attaches to great vessels and sternum

2. Serous pericardium (single layer epithelium each layer)
  1. Parietal
  2. Pericardial space
  3. Visceral

### Pericarditis pain

- Phrenic nerve responsible
- Usually sudden in nature
- Pleuritic and positional (better when sat up leaning forward vs lying down)
  - Worse on inspiration / coughing

### **Pericardiocentesis**



A

1. Needle at 30-45<sup>a</sup>
2. Insert between xiphisternum and L subcostal margin

### **Heart arteries**

70% of population are R coronary dominant

- R coronary → supplies AV and SA nodes
  - **R marginal** - R ventricle and apex
  - **Posterior inter-ventricular** - R and L ventricles and posterior 1/3 septum
- L coronary
  - **LAD** - anterior 2/3 septum (by perforating branches) and both ventricles
  - **L circumflex** - L ventricle and atrium

Pulmonary arteries bifurcate around T4/5

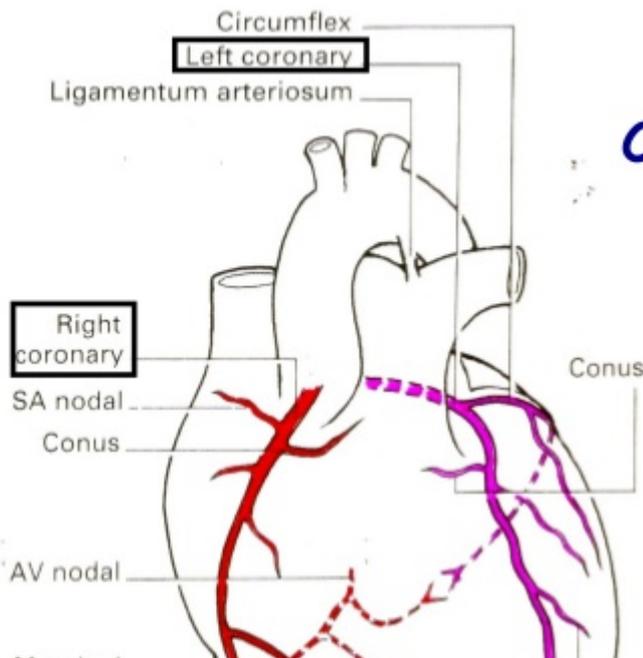
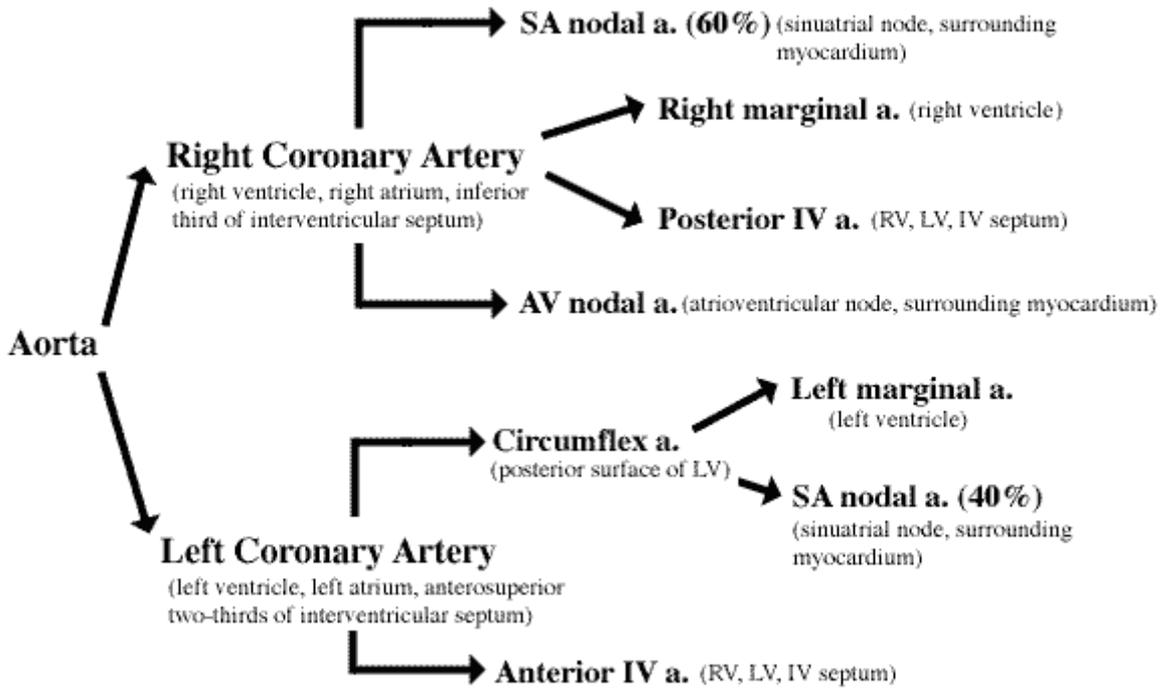
**Approximately 70% of the general population are right-dominant, 20% are co-dominant and 10% are left-dominant.**



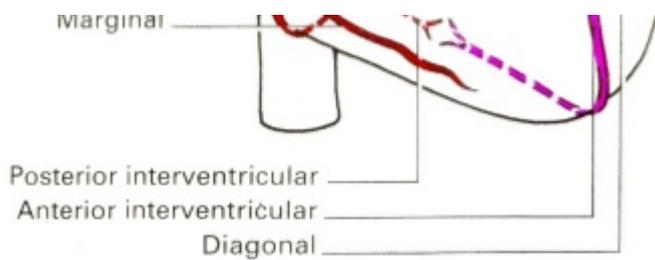


Posterior interventricular artery is a branch of **Right** coronary artery

Posterior interventricular artery is a branch of **Left** coronary artery



## Branches of Coronary arteries

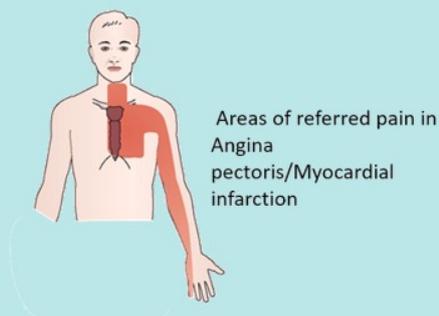


**Table: Blood Supply of the Heart**

Artery	Territory of Supply
Right coronary artery	Right atrium and ventricle, sinoatrial node, atrioventricular node
Right marginal branch	Inferior aspect of right ventricle
Posterior interventricular branch	Posterior aspect of right and left ventricles, posterior one-third of interventricular septum
Left coronary artery	Via main branches below
Anterior interventricular branch	Right and left ventricles, anterior two-thirds of interventricular septum
Left circumflex branch	Left atrium and left ventricle

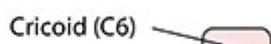
**Cardiac pain due to angina pectoris or myocardial infarction is usually referred to the left precordium and medial aspect of left arm and forearm**

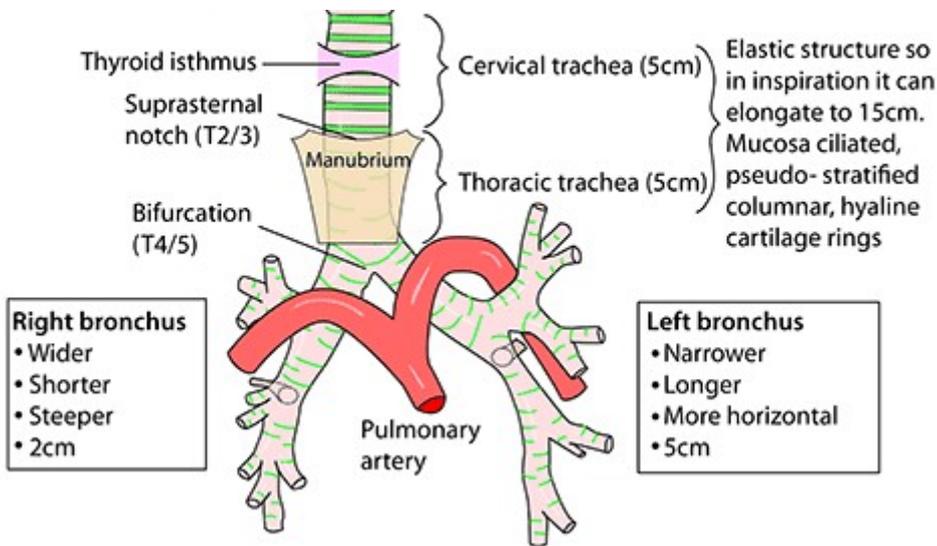
The heart is innervated by upper four thoracic spinal segments (T1-T4). The skin over the precordium is supplied by T2-T4 spinal segments and the skin over the medial aspect of forearm and arm by T1 and T2 spinal segments respectively. The cardiac pain is therefore referred to the precordium and medial aspects of arm and forearm because of the same spinal segmental innervation.



**Trachea = C6 to T4/5**

**RELATIONS OF TRACHEA & BRONCHI**





- Hyoid bone - C3
- Cricoid bone - C6
- Bifurcation - T4/5
- Lung Hila - T5-T7

## Oesophagus

- C6 (cricoid cartilage area) to T10 (diaphragmatic hiatus)
- Joins stomach at T11

### Points of constriction (ABCD)

- Aortic arch
- Bronchus bifurcation
- Cricoid cartilage
- Diaphragmatic hiatus

Innervation is oesophageal plexus: combination of thoracic/cervical sympathetic trunks and vagal (para) innervation

- gross sensation = vagal
- pain = sympathetic innervation

## Lungs

Hila = T5-T7 posteriorly, ribs 3-4 anteriorly

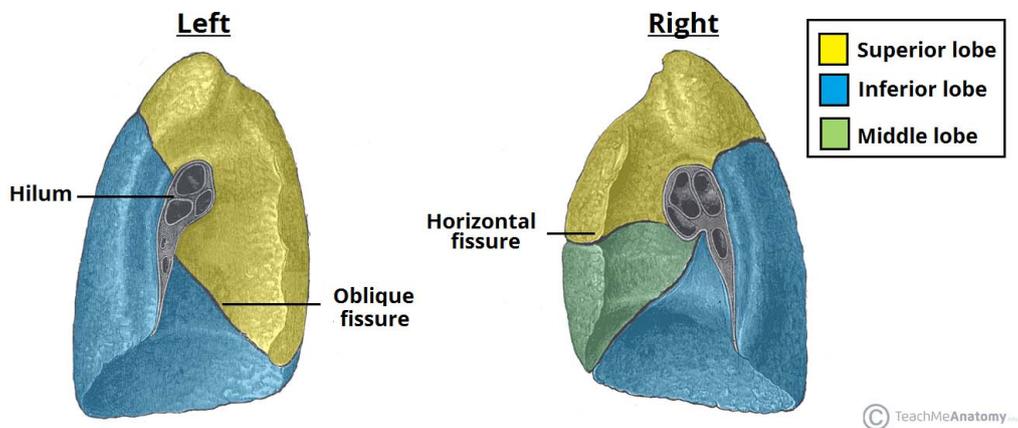
### Borders

- Apex - medial 1/3 clavicle, 2.5cm above clavicle
- Medial border - C7 to T10

- Interior border -
  - Posterior = T10,
  - Mid-axillary = 10th rib
  - Anterior = 6th rib

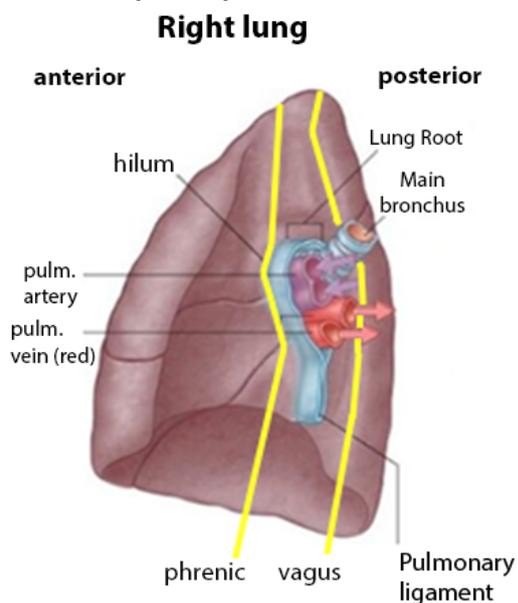
Oblique fissures same in both lungs

Horizontal fissure = T4



### Lung hilum/root

- CONTENTS:
  - 1x Pulmonary artery
  - 2x pulmonary veins
  - Bronchus
  - Bronchial vessels
  - Pulmonary plexus
  - Lymphatic vessels
- RELATIONS OF THE LUNG ROOT
  - Phrenic nerve = ANTERIOR
  - Vagus nerve = POSTERIOR
  - Pulmonary artery and veins = anterior to bronchus



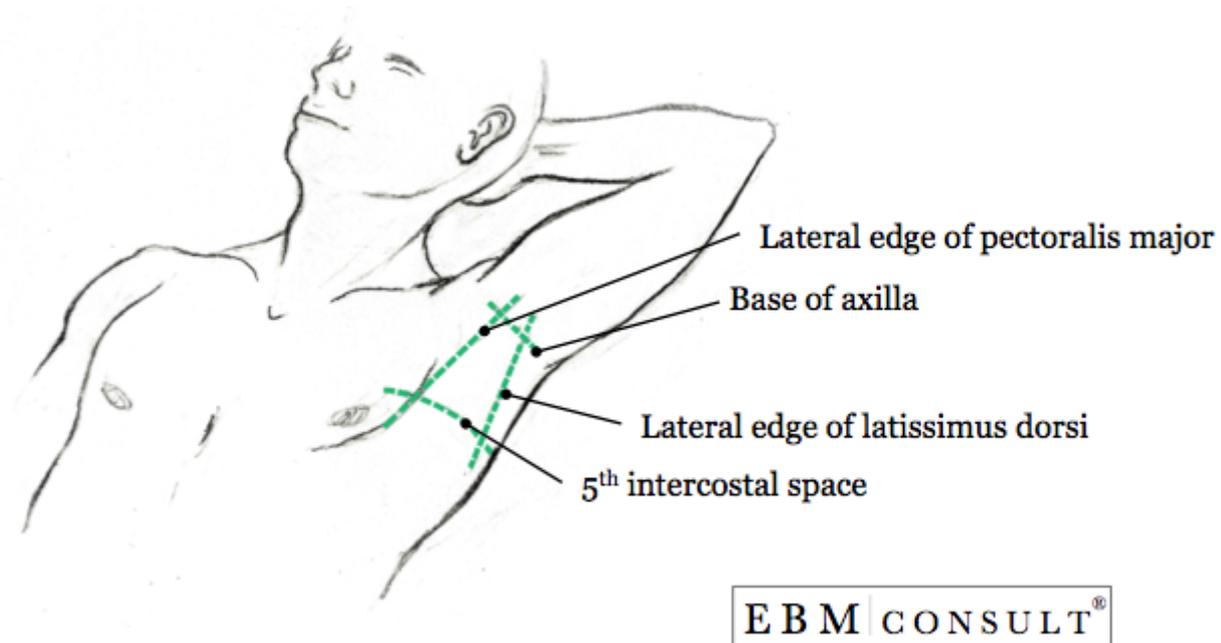
### Lung innervation

- Sympathetic = sympathetic trunk
  - *Relaxation bronchial smooth muscle, pulmonary vasoconstriction*
- Parasympathetic = vagus
  - *Bronchial gland secretion, bronchial constriction, pulmonary vasodilation*

### Pleura innervation

- **Parietal** - pain, temp, pressure = phrenic and intercostal nerves
  - *Responsible for pleurisy pain*
  - Costal pleura (chest wall) - intercostal nerves
  - Mediastinal and diaphragmatic pleura - phrenic nerves
- **Visceral** - only stretch - pulmonary plexus (vagus n)

### **Chest drain = 5th IC space, mid axillary line**



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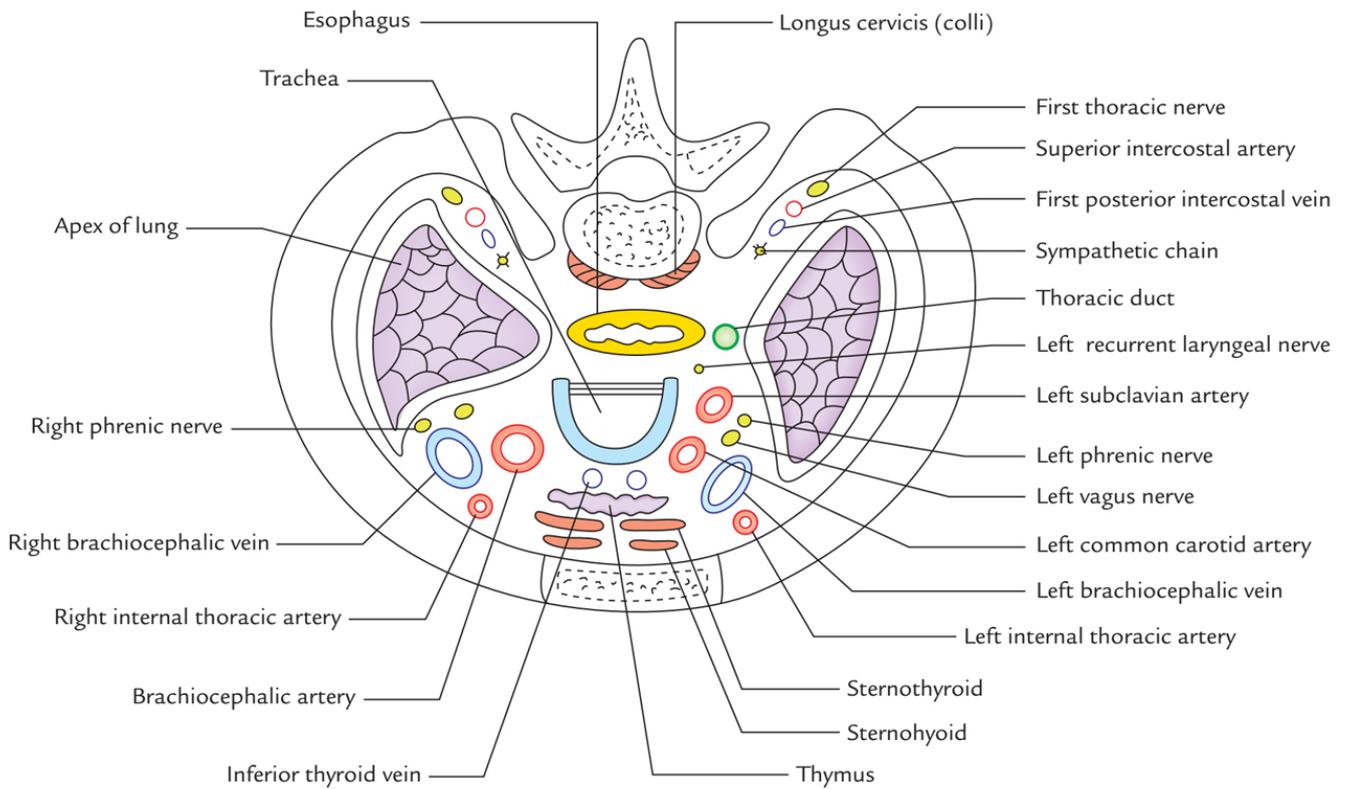
### **Diaphragm**

Surface marking = T12 (posterior) to costal margin (anterior)

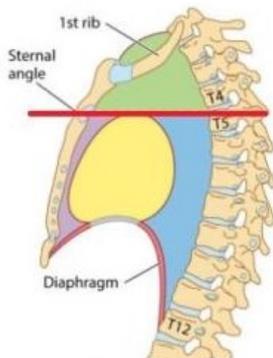
- Attachments
  - Lateral = Ribs 7-12
  - Posterior = Vertebrae and arcuate ligament



**Thoracic inlet:**



Thoracic plane - located at manubriosternal angle (T4/5).

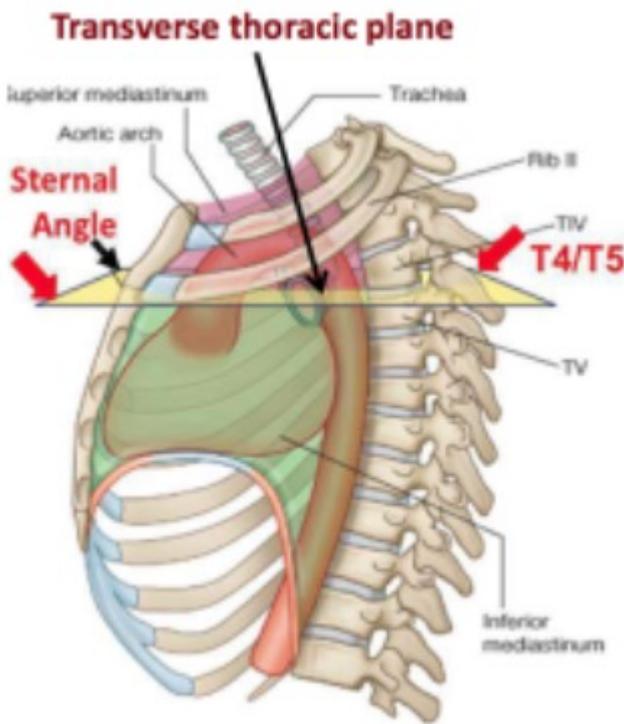


Cuts across:

- Pulmonary artery branches
- Where azygos vein meets SVC
- Beginning and end of aortic arch
- Tracheal bifurcation
- 2nd rib joins sternum at costal margin

Related

- Aortic and pulmonary trunks originate at lower edge of 3rd costal cartilage



(When body lying in supine)

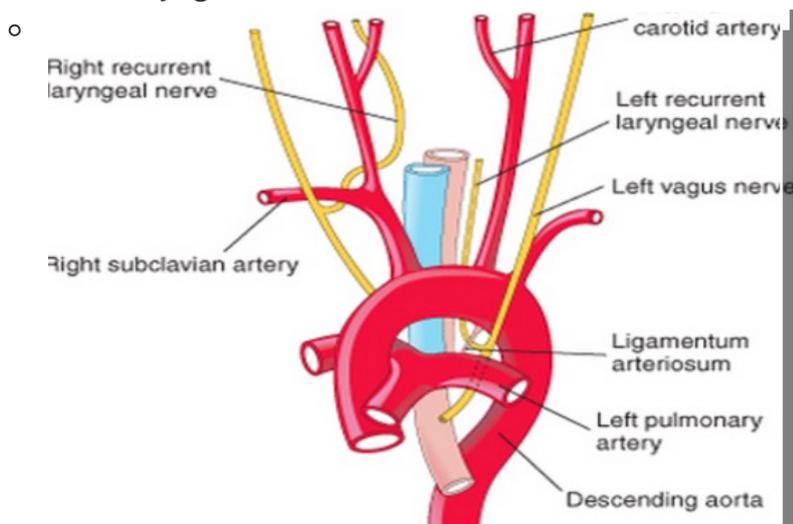
1. Separation between superior and inferior mediastinum.
2. Beginning **and** end of the aortic arch
3. Bifurcation of the trachea into 2 main bronchi.
4. Azygos vein arches over the roof of the Rt. Lung and opens into SVC.
5. Thoracic duct crosses from right to left.
6. The **upper limit** of the base of the heart (upper border of the atria of the heart).

Thoracotomy

- If pericardial tamponade
- Access in left side 5th intercostal space midclavicular line - clamp open

**Vagus nerve**

- In neck
  - Pharyngeal
  - Superior laryngeal
- Recurrent laryngeal:



- Right - recurrent laryngeal loops under R subclavian artery
- Left - recurrent laryngeal loops under aortic arch, to left of ligamentum arteriosum
- Carrys on down to give:
  - Cardiac plexus
  - Pulmonary plexus
  - Oesophageal plexus
- →
  - R becomes posterior vagal trunk
  - L becomes anterior vagal trunk
    - → both enter abdomen via oesophageal hiatus

