

Thoracic Wall

- Thoracic cage :
 - ▶ Oval-shape
 - ▶ Flattened (wider transverse diameter than AP diameter)
 - ▶ Composed of :
 - Most Ant → Sternum (aka : breast bone)
 - Anterolateral → Ribs
 - (1) 1-7th ▶ true (vertebrosternal ; directly attached to the sternum by their own cost cartilages)
 - (2) 8-10th ▶ False (vertebrochondral ; indirect attachment to the sternum by the 7th cost cartilage)
 - (3) 11-12th ▶ free/floating ribs (have no attachment w/ sternum)
 - Post → Thoracic Vertebrae

Sternum

Intercostal spaces 1-10th ▶ Closed
 Intercostal spaces 10th +11th ▶ Open
 directly into the abdomen

Manubrium	☆ Articulations : 1) Clavicle ▶ SCJ 2) 1 st rib 3) 2 nd rib along w/ the body 4) W/ the body ▶ Sternal angle ☆ Located at the level of T3-T4 (as whole <u>whereas its begins w/ T1-T2</u>) ☆ Superiorly ▶ Suprasternal notch
Body	Articulates w/ Costal cartilages of ribs (2-7 th)
Xiphoid Process	<u>No ribs attachment</u> ▶ instead a point of attachment of Abd muscles Located at the level of T9 approx T10

True angle ▶ The manubrium directed downward forward and the body directed downward backward .
 Ant : at the level of 2nd cost cartilage .
 Post : b/w T4-T5

Ribs

Typical	Features ▶ Long, twisted, rounded sup edge, grooved inf edge (<u>costal groove , internal inferior groove</u>) provides some protection for the <u>intercostal nerve and vessels.</u> <u>From Post → Ant</u> Head → Articulation w/ vertebral bodies Ribs 2-9 ▶ articulates w/ 2 vertebrae thus --> 2 articular facets Ribs 10-12 ▶ articulates only w/ the corresponding vertebra thus have only one articular facet Neck → Tubercle (articular smooth w/ transverse process of corresponding v and <u>rough nonarticular part</u> for costotransverse lig attachment) → Shaft & Costal angle (from post to anterolateral)
Atypical	1st ▶ broadest , shortest, most sharply curved of the seven ribs <u>It has a single facet on its head for articulation w/ the T1 vertebra only</u> Imp surface markings ▶ two transversely directed grooves crossing its superior surface for the subclavian vessels (SCV ant , SCA post); the grooves are separated by a scalene tubercle and ridge, to which the <u>ant scalene muscle is attached.</u> The 11th and 12th ribs (Floating ribs) are short and have no neck or tubercle

The space b/w 1st rib & clavicle makes the entrance from the thoracic region to the axilla.

Joint

Ant Joints

Cartilagenous	<ul style="list-style-type: none"> ✓ Sternum : ★ <u>Manubriosternal</u> ▶ symphysis ★ <u>Xiphisternal</u> ▶ Synchondrosis ✓ <u>Costochondral</u> ✓ <u>1st sternocostal</u> ▶ synchondrosis
Synovial (all plane▶ slight movements)	<ul style="list-style-type: none"> <u>2nd-7th sternocostal joints</u> <u>6th-10th interchondral joints</u>

Post Joints

(1) Joints of the Heads of Ribs (synovial plane)
2-9 -->

2 synovial joints (separate)
w/ the corresponding vertebra and the one above
Imp related lig ▶ Intra-articular ligament b/w head and IVD

Ribs (1,10-12) --> only one synovial joint as they are attached to the corresponding vertebra

(2) Costovertebral joints(synovial plane)
Only 1st 10 ribs
Rib tubercle w/ transverse process of the corresponding vertebra

Thoracic Apertures

Sup Thoracic Aperture

- b/w thoracic cavity and root of the neck
- Orientation ▶ forward downward
- Boundaries ▶
 - Posteriorly, by T1, the body of which protrudes anteriorly into the opening.
 - Laterally, by the 1st pair of ribs and their costal cartilages.
 - Anteriorly, by the superior border of the manubrium.

▪ Contents :

Structures	<ul style="list-style-type: none"> ★ Trachea (ant) ★ Oesophagus (post) ★ Lung (its apex) Pleura (<u>suprapleural membrane</u>)*
Nerves	<ul style="list-style-type: none"> ★ Rt&Lt Vagi ★ Lt recurrent laryngeal ★ <u>Sympathetic trunk(most posteriorly located)</u>
Bvs	<ul style="list-style-type: none"> ★ Common Carotid ★ SCV , SCA

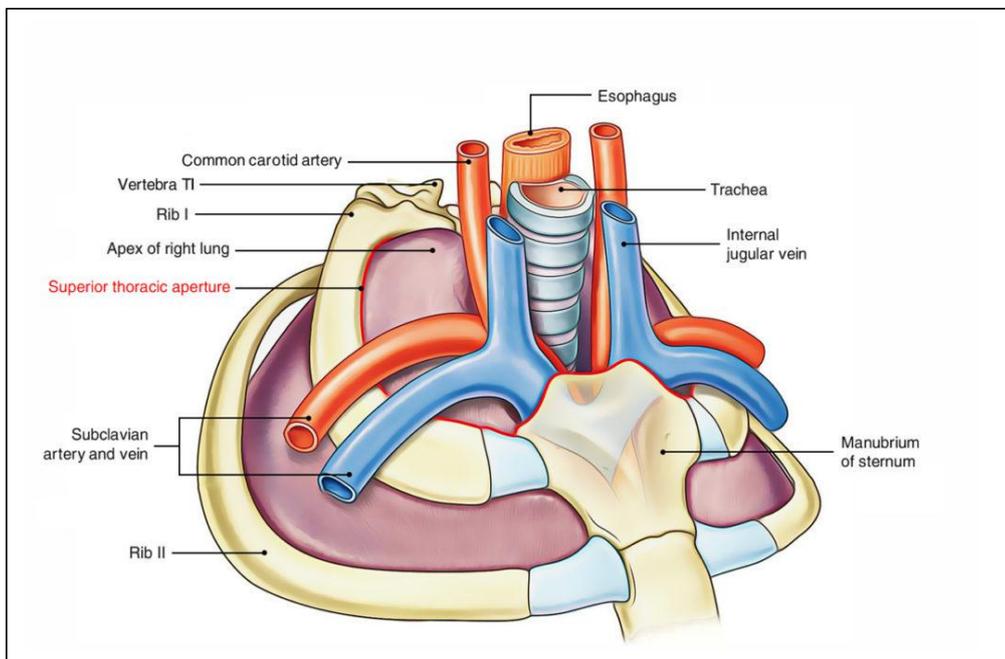
*Suprapleural mem : covers the sup surface of cervical pleura

Considered to be a continuation of the fascia of anterior scalene muscle mainly that attaches posteriorly to the transverse process of C7 and (from inside) to the parietal pleura & laterally to the medial margin of the 1st rib.

Inf Thoracic Aperture

- Boundaries ▶
 - Posteriorly, by T12, the body of which protrudes anteriorly into the opening.
 - Posterolaterally, by the 11th and 12th pairs of ribs.
 - Anterolaterally, by the joined costal cartilages of ribs 7-10, forming the costal margins.
 - Anteriorly, by the xiphisternal joint.

▪ Internally , at the level of inf aperture we're in the abd cavity bcz of the dome-like structure of the diaphragm which the real physical barrier b/w the thoracic and abdominal cavities .



Intercostal Muscles

External Intercostal

Internal Intercostal

Innermost Intercostal

Func: Inspiration
 Fibers orientation
 ▶ **Downward, forward, medially**

★ From the post part of intercostal space and deficient ant (no sternal attachment)
 ▶ ant (external) intercostal membrane (continuation of EI m.)

Func : Expiration
 Fibers orientation ▶ opposite to EI m

★ All over the intercostal space from the sternum ant , deficient posteriorly ▶ Post (internal) intercostal membrane (continuation of II m.)

- **Separate bellies , crossing more than one intercostal spaces (not continuous muscle)**
- Attached internally to the endothoracic fascia

Accessory Muscles

Exp	-Transversus Thoracis -Serratus post inf Inn ▶ last 4 intercostal nerves (ventral rami)
Insp	-Pectoralis major , minor -Serratus ant -Scalene mm -Levator costrum Inn ▶ post (dorsal rami) -Serratus post sup Inn ▶ 1-4 intercostal nerves (ventral)

↓

Neurovascular Bundle , runs in b/w the two muscles **being superficial to the innermost intercostal muscle thus deep to the internal** .

Arranged as : **V ▶ A ▶ N**

Diaphragm

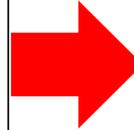
1) General Features → Physical barrier b/w thoracic and abdominal cavities .
 Functions include → -Inspiration -Abdominal pressure -Abdominothoracic pump

2) Parts →

- Peripheral muscular → Reach up to the 5th rib
- Central tendon → At level of xiphisternal joint

3) Origins :

- ✓ **Sternal**
posterior surface of xiphoid process
- ✓ **Costal**
the lower six ribs and their costal cartilages
- ✓ **Vertebral**
Right crus (tendon-like cord)
-bodies of **L1-L3**
- Left** crus
-bodies of **L1-L2**



Arcuate ligaments

- (1) **Medial**
-L2 (body) to L1 (transverse process)
- (2) **Lateral**
-L1 (transverse process) to 12th rib
- (3) **Median**
-connects crura anterior to aorta

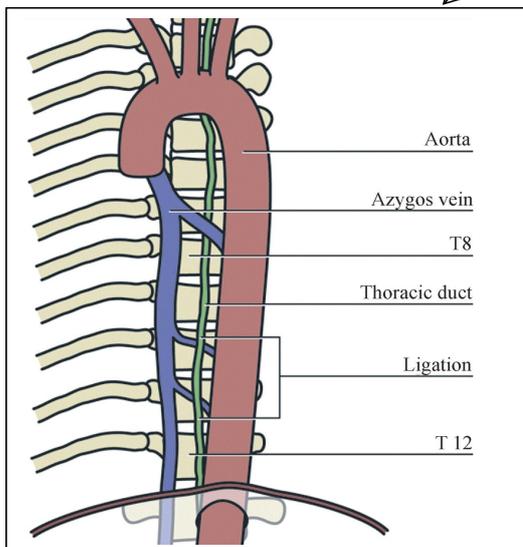
	Aortic Opening	Oesophageal opening	Caval opening
Level	T12 (most post, most inf) B/w the 2 crura	T10 (in b/w the 2 openings)	T8 (most ant, most sup)
Contents	Aorta, thoracic duct, & azygos vein ↗ Recap ▪ Thoracic duct and azygos vein are located posteriorly and to the right in relation w/ aorta ▪ Thoracic duct is located medial to the azygos v	Esophagus. Vagi. BVs & lymphatic vessels	IVC. branches of right phrenic nerve

Other structures;

Structure	Pass through?
Splanchnic nerves	crura
Sympathetic trunk	Medial arcuate lig
Subcostal n	Lateral arcuate lig
Sup epigastric vessels	B/w sternal and costal origins of the diaphragm

Inn&Blood supply

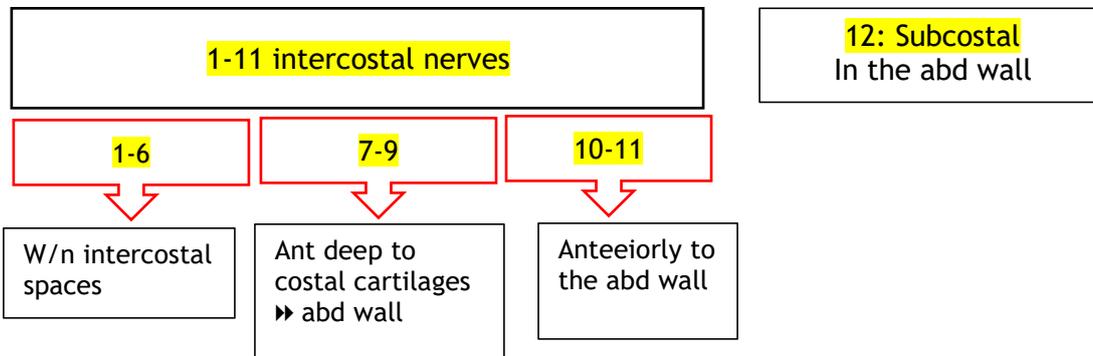
Innervation	Sensory: Central → phrenic nerves Peripheral → intercostal nerves (T7-T12) Motor : Phrenic nerves
Blood Supply	Sup phrenic a : from thoracic aorta Musculophrenic a , pericardiophrenic a : from internal thoracic arteries Inf phrenic a : abd aorta



★ Arterial Supply & Venous Drainage of Thoracic wall

Arterial	<p>(1) Post intercostal aa</p> <ul style="list-style-type: none"> ★ 1-2 ▶ sup intercostal a ★ 3-12 ▶ descending thoracic aorta <p>(2) Ant intercostal aa</p> <ul style="list-style-type: none"> ★ 1-6 ▶ Internal Thoracic a ★ 7-12 ▶ Musculophrenic
Venous	<p>(1) Post intercostal veins ▶ drain into :</p> <ul style="list-style-type: none"> ★ Rt side → azygos ★ Lt side → Hemiazygos <p>(2) ant intercostal veins ▶ Follow the corresponding aa. (internal intercostal and musculophrenic vv.)</p>

★ Nerves of the thoracic wall : Anterior rami of thoracic spinal nerves



★ Branches of the Intercostal Nerves

- Rami communicants • Collateral branch
- Lateral cutaneous branch (has 2 parts/divisions)
 - 1st - part of the brachial plexus
 - **Intercostobrachial nerve (2nd) ▶ Referral pain in coronary artery disease**
- Anterior cutaneous branch • Muscular branches • Pleural sensory branches
- Peritoneal sensory branches