Anatomy notes-thorax.

Thorax: the part extending from the root of the neck to the abdomen.

Parts of the thorax:

- Thoracic cage (bones).
- Thoracic wall.
- Thoracic cavity.

**The thoracic cavity is covered by the thoracic wall which consists of the thoracic cage.**

Thoracic cage:

- **Posterior border:** 12 thoracic vertebrae (T1-T12)
- **Anterior border:** sternum.
- **Lateral border; 12 pairs of costal cartilages** → bars of hyaline cartilage that cap its anterior ends (flexible to allow breathing).

Sternum (brest bone):

- Anterior.
- It’s a flat bone.
- **Sternal angle:**
  - Can only be seen in lateral view.
  - Also called the angle of Louis.
  - Important clinically:

  → We can use it to count the ribs because it’s it the level of the 2\textsuperscript{nd} rib.
  → Trachea divided into right and left branches at this site.
  → Aortic arch below it.
  → Intervertebral disc between T4/T5 below the arch.

- Resuscitation done by compressing the body of the sternum because the heart is located behind it.

- Xiphoid process:
  - Hyaline cartilage which means that the X-Ray passes through it.
  - Ossified at the age of 40.
- The sternum is full with bone marrow → biopsy taken from sternum for patients with anemia or cancer.

*Vertebral column: A series of sequential vertebrae.*

- Coccyx also called a tailbone; Rudimentary: immature, undeveloped, basic form.
- Lower back pain: due to the vertebrae or space between them (intervertebral disc).
- The intervertebral disc acts as a shock absorber, but if the shock is too much, it’s disturbed and the disc slips out of position and bulges out of its position → IVDD (intervertebral disc disease).

Parts of vertebrae

- Typical vertebrae consist of a body, vertebral arch & vertebral foreman.
- **Body (anteriorly):**
  - For weight bearing.
  - The body of the cervical vertebrae (in the neck) is smaller than that of the lumbar vertebrae (in the abdomen) because the weight is increasing while moving down the body.

- **Vertebral arch (posteriorly):**
  - Protection of the contents of the vertebral foramen
  - Consists of (7 in total)
    → 2 pedicles.
    → 2 transverse processes.
    → 2 lamina (connects transverse process to spine).
    → Spine.

- Sequential vertebral foramen forms the vertebral canal, which makes a pathway for the spinal cord surrounded by meninges.

**Special features of thoracic vertebrae:**

- Different vertebrae have different features

**Thoracic vertebrae:**

- The only vertebrae which contains a facet for the articulation with the rib.
- Spines form a shield for protection of the thorax and spinal cord, which can’t be penetrated easily; as they are Long & Oblique.

- Person needs to flex (bend forward), in order to obtain a sample of the CerebroSpinal Fluid (CSF) when meningitis (inflammation of meninges) occurs.

**Thoracic vertebra – Lateral view:**

- Each vertebra has 2 superior and 2 inferior facets (one on either side)
- The superior facet articulates with the rib of the same number.

**Ribs – Classification:**

- **True ribs** (1-7): reach the sternum by their own costal cartilages.
- **False ribs** (8-10): reach the sternum indirectly by rib 7’s costal cartilage.
- **Floating ribs** (11, 12): don’t reach the sternum (not directly nor indirectly) but are located in the muscle of the anterior abdominal wall.
  
  Note: ribs 11 and 12 are shorter than the others.

**Parts of typical ribs (flat bone):**

- The head has 2 facets to articulate with 2 sequential vertebrae
  - The **inferior facet of the rib** articulates with the vertebra of the same number, where the superior one articulates with the one before
- The neck has 2 tubercles, one articular and the other non-articular
  - The **articular tubercle articulates with the transverse process of the same number.**
  - The neck is a constricted part.
- The **angle:** is the site where the rib changes its direction from lateral to anterior
  - Serratus anterior (muscle) originates from the angles of the upper 8 ribs
- Body (shaft):
  - **Costal groove:** the site where nerves, arteries and veins pass to supply the muscles (neurovascular bundle).

**Atypical ribs 1, 2, 11, 12:**

**1st rib:**

- Each typical rib should articulate with 2 sequential thoracic vertebrae, whereas ribs #1 articulate with 1 thoracic vertebra and are therefore atypical.
- Structures over the 1st rib (VAN).
• Subclavian vein (anterior)
• Subclavian artery (middle)
• Nerves [brachial plexus] (posterior)
These structures are protected by the subclavius muscle, which is attached to the clavicle.

12th rib:
- Typical ribs have anterior and posterior surfaces, superior and inferior borders, whereas ribs #12 has anterior and posterior borders, superior and inferior surfaces, and are therefore atypical.

Thoracic wall
- The muscles are located between 2 ribs are therefore called intercostal muscles.
- The intercostal muscles are arranged in a circular manner between the ribs and are supplied by the nerve of their own space.
- If the spinal nerve is affected from the area of the intercostal foramen, the intercostal space (skin, muscles and pleura) will be affected because they're supplied by the same nerve.
- The muscles are supplied segmentally.

Intercostal space:
Contents:
- Skin.
- Superficial fascia.
- Deep fascia.
- External intercostals muscle.
- Internal intercostals muscle.
- Innermost intercostals muscle.
- Endothoracic fascia; which is a glue to fix the pleura.
- Parietal pleura.

Orientation of the muscles:
- External intercostal: downward and forwards.
- **Internal and innermost intercostals:** *downward and backward.*

  - Fibers are running in 2 directions.
  - Function: strengthening the intercostal space during inspiration.
  - There’s soft area and bone, and this works on strengthening the soft area.
  - Supplied by the nerve of their own space.

Note that: when a cold draft affects an area; it will affect the skin & the nerves; thus the nerve will shrink and cause what we call **Pleurisy.**

**Parietal pleura**

- **Lung membrane.**
- *It’s a membrane so it can’t fix itself to the muscles directly.*
- *Remember that:* **Endothoracic fascia presents to “glue” the parietal pleura to the muscles.**

Note: the 12th nerve isn’t intercostal as it doesn’t pass between 2 ribs, as conditioned, and is therefore called the subcostal nerve.

**Thoracic cavity:**

- **Thoracic inlet** (superior) bounded:
  - **Anteriorly:** manubrium.
  - **Posteriorly:** 1st thoracic vertebra.
  - **From both Sides:** 1st ribs.

- **Thoracic outlet** (inferior), bounded by the diaphragm.

Remember that: **Pericardium – membrane covering the heart.**

**Pleura:**

- Pleura is a serous membrane.
- Types of pleura:
  - Pericardial (heart).
  - Peritoneal (abdomen).
  - Parietal (lungs).
In the diagram above, we can notice that:

- **Right lung**: full exhale, smallest size
  - **Left lung**: full inhale (filling whole size), largest size

- Right and left plural membranes are separate from each other.

**Parietal Pleura:**

- Lines the thoracic wall/far away from the lung.
- The parietal pleura is divided according to regions into:
  - **Cervical pleura**: at the root of the neck
  - **Costal pleura**: the longest, and the most common to be affected by diseases (especially cold draft).
  - **Diaphragmatic pleura**: over the dome of the diaphragm.
  - **Mediastinal pleura**: medial.
- The intercostal nerves supply the pleura (from the peripheral nervous system).
- The parietal pleura is highly sensitive to pain, touch, temperature and stretch.

**Visceral Pleura:**

- Lines the lung/near the lung
- The visceral pleura is supplied by the autonomic nervous system.
- It’s insensitive to pain → sensitive to stretch only.

**Pleural cavity:** *The space between the visceral and parietal pleura.*

- No air.
- No pressure.
- Potential space (if filled by fluid it means there’s a diseases e.g. blood or air).
- Allows lungs to move freely.

**Trachea:**

- Esophagus presents behind the trachea.
- Upon eating a large bulk of food, difficulty in breathing arises because the wall of the esophagus would push on the trachealis muscle; thus making the trachea smaller.
- Lined by respiratory epithelium (ciliated pseudostratified columnar epithelium).
**Bronchus:**

- Carina – the angle between the bronchi.
  - The most sensitive part of the respiratory system.
  - A cough is caused by a foreign body passing over it, where the foreign body is either expelled out, or taken into the right lung.

**Lungs:**

- Located inside the plural sac.
- Suspended by its root.
- The base lies on the diaphragm, therefore the movement of the diaphragm affects the lungs.
- The stomach lies inferior to the left lung.
  - Gas-collecting part of stomach (fundus) compresses on the left dome of the diaphragm which in turn compresses on the left lung.
- Costal surface: located below the ribs and their intercostal spaces
- Usually involved in diseases (*cold drafts*): costal surface because it’s the largest.

1- **Left lung:**

In the embryo, the apex (formed mainly by the left ventricle) is anterior and the base is posterior:

During development it rotates 90° to the left.

- 2/3 of the heart is therefore shifted to the left and 1/3 is shifted to the right.
- As a consequence the left lung develops in a smaller space than the right.
- It is related to the left high pressure arterial side of the heart.
  - As the heart rate increases, the blood pressure increases.
  - Not fast enough oxygenation of the blood.
  - Venous pressure is lower than the arterial pressure.

2- **Right lung:**

- *Below the right dome of the diaphragm is the liver (largest gland) and therefore it’s shorter.*
**Root of the lung:**

- **Main bronchus to bring air for Re-Oxygenation.**
- Pulmonary **artery**: carries **deoxygenated** blood from the right ventricle to the lungs.
- Pulmonary **vein**: carries **oxygenated** blood from the lungs to the left atrium.