Mediastinum

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Objectives

At the end of the lecture, students should be able to:
✓ Define the “Mediastinum”.
✓ Differentiate between the divisions of the mediastinum.
✓ List the boundaries and contents of each division.
✓ Describe the relations between the important structures in each division.
Mediastinum

Definition:

- It is a thick movable partition between the two (right and left) pleural sacs & lungs.
- It contains all the structures which lie in the intermediate compartment of the thoracic cavity.

Like: trachea, heart, vagus n (all structures except the 2 lungs).

Boundaries:

Superior:
- Thoracic outlet:
  - manubrium [Anteriorly]
  - 1st rib [Laterally]
  - 1st thoracic vertebra T1 [Posteriorly]

Anterior:
Sternum.

Posterior:
The 12 thoracic vertebrae.

Laterally:
Lung and Pleurae.

Inferior:
Diaphragm.
The mediastinum is subdivided by a Horizontal plane (extending from the Sternal angle* to the lower border of T4) into:

- **Superior mediastinum (S):** above the plane
- **Inferior mediastinum:** below the plane.

* Note:
The sternum is divided into 3 parts
1. Manubrium
2. Body
3. Xiphoid Process
The sternal angle is at the junction of the manubrium and the body.
The sternal angle is also called angle of Lewis.
Superior Mediastinum

Boundaries:
Superior: Thoracic outlet.
Inferior: Horizontal plane.
Anterior: Manubrium of sternum
Posterior: Upper (4) thoracic vertebrae.
Lateral: Lungs & pleurae

LEVEL OF T4
It is at the Level of:
• Sternal angle
• Second costal cartilage

Why is the level of T4 important? (important)
1-Bifurcation of trachea (the division of the trachea into the right and left main bronchi)
2-Bifurcation* of pulmonary trunk
3-Beginning & termination of arch of aorta.

*Bifurcation means the splitting of a main body into two parts.
**Superior Mediastinum**

Contents

The superior mediastinum is divided into 3 parts: superficial, intermediate, and deep.

<table>
<thead>
<tr>
<th>(A) Superficial (3 veins and a gland)</th>
<th>(B) Intermediate (4 arteries and 4 nerves)</th>
<th>(c) Deep (structures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymus Gland*</td>
<td>Arch of aorta &amp; its three branches:</td>
<td>Trachea</td>
</tr>
<tr>
<td>Three Veins:</td>
<td>• Brachiocephalic artery (right side)</td>
<td>Esophagus</td>
</tr>
<tr>
<td>• Left brachiocephalic v.</td>
<td>• Left common carotid artery</td>
<td>Thoracic Duct</td>
</tr>
<tr>
<td>• Right brachiocephalic v.</td>
<td>• Left Subclavian artery</td>
<td></td>
</tr>
<tr>
<td><em>Superior vena cava</em>*</td>
<td>Nerves:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• R &amp; L Phrenic (lateral)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• R &amp; L Vagus (medial)</td>
<td></td>
</tr>
</tbody>
</table>

*(in young for immunity, degenerate after age of 15)*

** Left brachiocephalic v. and Right brachiocephalic v join and give superior vena cava.
Superior Mediastinum

Contents
The arch of aorta gives 3 branches:
- Left common carotid
- Left subclavian
- Brachiocephalic

The brachiocephalic then further divides into:
- Right common carotid
- Right subclavian
Superior Mediastinum

Contents

4 ARTERIES:
arch of aorta, brachiocephalic, left common carotid, left subclavian

4 NERVES:
right & left vagus, right & left phrenic

3 VEINS:
right & left brachiocephalic, SVC (superior vena cava)

2 TUBES: trachea & esophagus

1 GLAND: thymus

1 DUCT: thoracic duct
Inferior Mediastinum

The inferior mediastinum is subdivided (according to the relation with the heart) into:
1. Anterior mediastinum (A): in front of Heart
2. Middle mediastinum (M): contains Heart
3. Posterior mediastinum (P): behind Heart

1- Anterior mediastinum:

**Boundaries:**
- **Superior:** Horizontal plane
- **Inferior:** Diaphragm
- **Anterior:** Body & xiphoid process of sternum
- **Posterior:** Heart
- **Lateral:** Lungs & pleurae

**Contents:**
1. Thymus gland*
2. Lymph nodes.

*The thymus gland appears in BOTH the superior and anterior mediastina.
Inferior Mediastinum

2- Middle mediastinum

Site:
Between anterior & posterior mediastina.

Contents:
1. Heart & pericardium*
2. Ascending Aorta (from left ventricle)
3. Pulmonary trunk (originates from the right ventricle. It branches into the right and left pulmonary arteries, which lead to the lungs)
4. Superior** & Inferior vena cava (into right atrium)
5. Right & left pulmonary veins
6. Right & left phrenic nerves***
7. Lymph nodes

*pericardium: a fibrous sac surrounding the heart and roots of great vessels.
** The superior vena cava appears in BOTH the superior (upper part of SVC) and middle (lower part SVC) mediastina.
*** The phrenic nerves pass through BOTH superior and middle mediastina.
Inferior Mediastinum

3- Posterior mediastinum

**Boundaries:**

*Superiorly:* Horizontal plane

*Inferiorly:* Diaphragm

*Anteriorly:* Heart

*Posteriorly:* Thoracic vertebrae from T5 - T12

*Laterally:* Lungs & pleurae

**Content:**

(next slide)
Inferior Mediastinum

3- Posterior mediastinum

Content:

1. **Esophagus** (descending from pharynx)
2. Azygos system of veins: **posterior & to the right of esophagus** (opens on superior vena cava)
3. Right & Left Thoracic Sympathetic trunks
4. Mediastinal lymph nodes
5. **Vagus nerves**: *around esophagus*
6. **Thoracic duct**: *posterior to esophagus.*
7. **Descending aorta**: posterior & to the left of esophagus

*The esophagus passes through BOTH the superior and posterior mediastina
**The vagus nerves pass through BOTH the superior and posterior mediastina
***The thoracic duct passes through BOTH the superior and posterior mediastina
Doctor’s tips for memorizing contents of posterior mediastinum

First thing -> esophagus
Posterior to esophagus->thoracic duct
Posterior to the right -> azygos veins
Posterior to the left -> descending Aorta
Surrounded by -> R&L thoracic sympathetic trunks
In every mediastinum -> lymph nodes

Don’t Forget!
Structures passing through more than one mediastina

<table>
<thead>
<tr>
<th>Structure</th>
<th>Mediastina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymus</td>
<td>Superior and Anterior</td>
</tr>
<tr>
<td>Superior vena cava</td>
<td>Superior and Middle</td>
</tr>
<tr>
<td>Phrenic nerves</td>
<td>Superior and Middle</td>
</tr>
<tr>
<td>Esophagus</td>
<td>Superior and Posterior</td>
</tr>
<tr>
<td>Thoracic duct</td>
<td>Superior and Posterior</td>
</tr>
<tr>
<td>Vagus nerves</td>
<td>Superior and Posterior</td>
</tr>
</tbody>
</table>
Inferior Mediastinum

Right Sympathetic Trunk
Right & left Vagus nerves (esophageal plexus)
Left Sympathetic Trunk

- Inferior vena cava
- Superior vena cava
- Azygos vein
- Collecting trunk
- Esophagus
- Diaphragm
- Right lymphatic duct
- Subclavian trunk
- Bronchomediastinal trunk
- Right brachiocephalic vein
- Thoracic duct
- Bronchomediastinal trunk
- Left brachiocephalic vein
- Subclavian vein
- Left superior intercostal vein
- Descending thoracic aorta
- Esophagus
### Summary of Inferior Mediastinum

<table>
<thead>
<tr>
<th>Boundaries</th>
<th>Anterior</th>
<th>Middle</th>
<th>Posterior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Superior</strong></td>
<td>Horizontal plane</td>
<td>Between anterior and posterior mediastina</td>
<td>Horizontal plane</td>
</tr>
<tr>
<td><strong>Inferior</strong></td>
<td>Diaphragm</td>
<td></td>
<td>Diaphragm</td>
</tr>
<tr>
<td><strong>Anterior</strong></td>
<td>Body &amp; xiphoid process of sternum</td>
<td></td>
<td>Heart</td>
</tr>
<tr>
<td><strong>Posterior</strong></td>
<td>Heart</td>
<td></td>
<td>Thoracic vertebrae (T5-T12)</td>
</tr>
<tr>
<td><strong>Lateral</strong></td>
<td>Lungs &amp; pleurae</td>
<td></td>
<td>Lungs &amp; pleurae</td>
</tr>
</tbody>
</table>

#### Content

1. Thymus gland
2. Lymph nodes

1. Heart & pericardium
2. Ascending Aorta
3. Pulmonary trunk
4. Superior & Inferior vena cava
5. Right & left pulmonary veins
6. Right & left phrenic nerves
7. Lymph nodes

1. Esophagus (descending from pharynx)
2. Azygos system of veins, posterior & to the right of esophagus (opens on superior vena cava)
3. Right & Left Thoracic Sympathetic trunks
4. Mediastinal lymph nodes
5. Vagus nerves
6. Thoracic duct: (posterior to esophagus).
7. Descending aorta: posterior & to the left of esophagus
Phrenic Nerves

- **Root Value**: C3,4,5
- They pass through the **Superior & Middle mediastina**
- **Course in Thorax**
  - The right phrenic descends on the right side of SVC & heart.
  - The left phrenic descends on the left side of heart.
  - Both nerves terminate in the diaphragm (pass through the diaphragm and innervate it)
- **Branches**:
  1) Motor & Sensory fibers to Diaphragm
  2) Sensory fibers to pleurae & pericardium
Vagus Nerve

- It is the 10th cranial nerve.

- It descends through the Superior & Posterior mediastina close from trachea and medial to phrenic nerve.

- The right vagus descends to the right side of trachea, forms the posterior esophageal plexus & continues in abdomen as posterior gastric nerve.

- The left vagus - away from trachea - descends between left common carotid & left subcalavian arteries, forms the anterior esophageal plexus & continues in abdomen as anterior gastric nerve.
Aorta

ASCENDING AORTA: الصاعد
Beginning: at aortic orifice of left ventricle.
Course: in middle mediastinum
End: continues as arch of aorta (at level of T4)

ARCH OF AORTA: القوس
Course: in superior mediastinum
End: continues as descending thoracic aorta (at level of T4)

DESCENDING AORTA: النازل
Course: in posterior mediastinum
End: continues as abdominal aorta after it passes through diaphragm (through aortic opening at level of T12)
Thoracic Duct

Beginning:
- It is the continuation of Cisterna Chyli* (at the level of L1).

* Cisterna chyli: a dilated sac of lymphoid tissue

Course:
- It passes through aortic opening of diaphragm.
- It ascends in Posterior mediastinum (posterior to esophagus).
- It ascends in Superior mediastinum (to the left of esophagus).

End:
- It opens in the left brachiocephalic vein.

Tributaries:
- It receives: Lymphatics from all body

Except:
- Right side of thorax, Right upper limb & Right side of head & neck.
This slide describes the lymphatic drainage of the lymph coming from the upper body (thorax, upper limb, head and neck) from each side (right and left) and where it goes. The lymph from the right side ends up in the right lymphatic duct, while that from the left side goes into the thoracic duct. They both eventually drain into the superior vena cava via the brachiocephalic vein.
**Summary**

**Boundaries**
- **Posterior**
  - The 12 thoracic vertebrae.
- **Anterior**
  - Sternum
- **Superior**
  - Thoracic outlet: (manubrium, 1st rib & 1st thoracic v)
- **Inferior**
  - Diaphragm

**Superior mediastinum**
- **Superficial**
  - Thymus Gland
  - Left brachiocephalic v
  - Right brachiocephalic v
  - Superior vena cava
- **Intermediate**
  - Arch of aorta & Brachiocephalic artery.
  - L common carotid artery.
  - L Subclavian artery.
  - Nerves: Phrenic, vagus
- **Deep**
  - Trachea, Esophagus, Thoracic Duct

**Contents**
- Heart & pericardium
- Ascending Aorta
- Pulmonary trunk
- Superior & Inferior vena cava
- Right & left pulmonary veins
- Right & left phrenic nerves
- Lymph nodes

**Middle mediastinum**
- Contents
  - Thymus gland
  - Lymph nodes

**Anterior mediastinum**
- Contents
  - 1- Esophagus
  - 2- Azygos system of veins: posterior & to the right of esophagus
  - 3- R & L Thoracic Sympathetic trunks,
  - 4- Mediastinal lymph nodes
  - 6- Thoracic duct: (posterior to esophagus).
  - 7- Descending aorta: posterior & to the left of esophagus

**Inferior mediastinum**
- Contents
  - Thymus gland
  - Lymph nodes
**Summary**

**Vagus Nerve**
- **Course in mediastinum**: It descends through the Superior & Posterior mediastina.
- **Course in mediastinum**: They pass through the Superior & Middle mediastina.
- **Root Value**: C3,4,5

**Ascending Aorta**
- **Beginning**: at aortic orifice of left ventricle
- **Course**: in superior mediastinum
- **End**: continues as descending thoracic aorta (at level of T4)

**Arch of Aorta**
- **Course**: in posterior mediastinum

**Descending Aorta**
- **Course**: in posterior mediastinum
- **End**: continues as abdominal aorta after it passes through diaphragm

**Phrenic Nerves**
- **Branches**:
  1) Motor & Sensory fibers to Diaphragm
  2) Sensory fibers to pleurae & pericardium

**Thoracic Duct**
- **Beginning**: It is the continuation of Cisterna Chyli (at the level of L1).
- **Course**: It passes through aortic opening of diaphragm.
  - It ascends in Posterior mediastinum (posterior to esophagus).
  - It ascends in Superior mediastinum (to the left of esophagus).
- **Tributaries**: It receives Lymphatics from all body.
  - Except Right side of thorax, Right upper limb & Right side of head & neck
- **End**: It opens in the left brachiocephalic vein.
Questions

1. All of the following structures are located in the middle mediastinum except for:
   a. Lymph nodes
   b. Pericardium
   c. Left subclavian artery
   d. Left Phrenic nerve

   Answer: C

2. The posterior mediastinum lies posterior to the:
   a. Diaphragm
   b. Heart
   c. Thoracic vertebrae (T5-T12)
   d. Lungs and pleura

   Answer: B

3. Which of the following structures is posterior and to the left of the esophagus?
   a. Vagus nerve
   b. Azygos vein
   c. Ascending aorta
   d. Descending aorta

   Answer: D

4. The aorta is located in which mediastinal compartment(s)?
   a. Anterior only
   b. Anterior and middle
   c. Middle only
   d. Middle and posterior

   Answer: D

5. Which compartments of the mediastinum does the vagus nerve descend through?
   a. Superior and anterior
   b. Superior and posterior
   c. Superior and middle
   d. Middle and posterior

   Answer: B

6. Which of the following nerves forms the anterior esophageal plexus as it descends?
   a. Right phrenic nerve
   b. Left phrenic nerve
   c. Right vagus nerve
   d. Left vagus nerve

   Answer: D
7. Which part of the aorta is located within the posterior mediastinum?
   a. Ascending aorta
   b. Arch of aorta
   c. Descending aorta
   d. Abdominal aorta

   Answer: C

8. Which part of the aorta begins at the aortic orifice of the left ventricle?
   a. Ascending aorta
   b. Aortic arch
   c. Descending aorta
   d. Abdominal aorta

   Answer: A

9. Which of the following statements is incorrect?
   a. The thoracic duct is the continuation of Cisterna Chyli.
   b. The thoracic duct ascends in the anterior mediastinum.
   c. The thoracic duct ascends in the posterior mediastinum.
   d. The thoracic duct ascends in the superior mediastinum.

   Answer: B

10. Which of the following is true regarding the thoracic duct?
    a. It passes through aortic opening of the diaphragm.
    b. It starts at the level of T3.
    c. It receives tributaries from all over the body.
    d. All of the above

    Answer: A

11. The Thoracic outlet composed of all these except :
    A. manubrium.
    B. first rib.
    C. first thoracic vertebra.
    D. diaphragm.

    Answer: D

12. The mediastinum is subdivided by a Horizontal plane (extending from the Sternal angle to the lower A border of :
    A. T4       B. C6       C. T12       D. L1

    Answer: A
Questions

13. Superficial compartment of Superior Mediastinum contains:
   A. vagus nerve.  B. thymus gland.
   C. phrenic nerve.  D. arch of aorta.

   Answer: B

14. Arch of aorta has three branches, what is not one of them:
   A. Brachiocephalic artery.  B. Left common carotid artery.
   C. Left Subclavian artery.  D. superior vena cava.

   Answer: D

15. Root Value of the phrenic nerve:

   Answer: B

16. Inferior Mediastinum subdivided into:
   A. anterior Mediastinum.  B. middle Mediastinum.
   C. posterior Mediastinum.  D. all of them

   Answer: D

17. Which one of the following structures is present in the superior mediastinum?
   A. Ascending aorta  B. Arch of aorta
   C. Descending aorta  D. Pulmonary trunk

   Answer: B

18. Which one of the following structure is present in both superior and posterior mediastinum?
   A. Superior vena cava  B. Pulmonary trunk
   C. Trachea  D. Esophagus

   Answer: D

19. Which one of the following structures lies on the left side of esophagus in the posterior mediastinum?
   A. Superior vena cava  B. Descending aorta
   C. Azygos vein  D. Pulmonary trunk

   Answer: B
Leaders:
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Jawaher Abanumy

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Alanoud Alsaikhan
Ameera Niazi
Dania Alkelabi
Deena AlNowiser
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