ABDOMINAL AORTA

PR.M.D.EL AMRANI DR.CHAIMA KASSI

PLAN:

I. INTRODUCTION

II. DESCRIPTIVE ANATOMY

III. ANATOMICAL RELATIONS

IV. COLLATERAL BRANCHES

V. TERMINAL BRANCHES

VI. CLINICAL APPLICATIONS

VII. SURGICAL APPROACH ROUTES

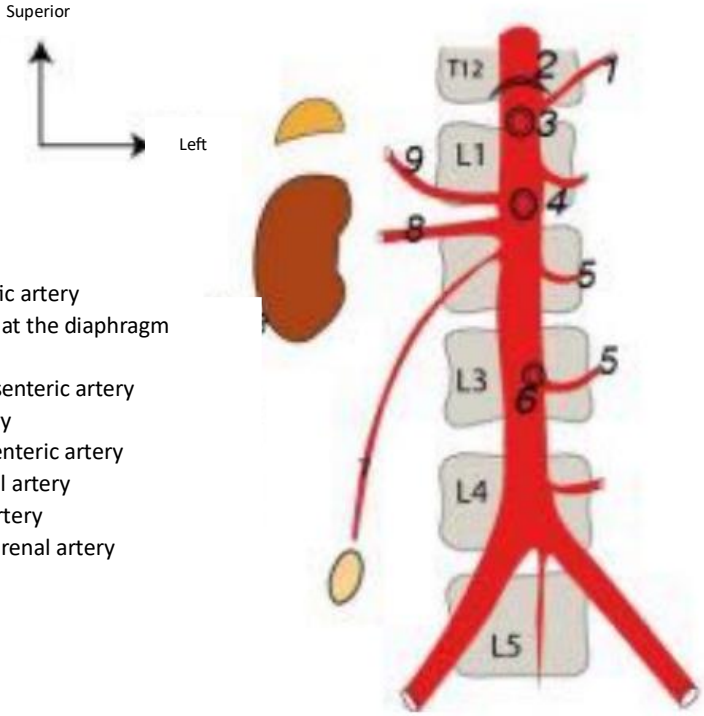
VIII. CONCLUSION

I – INTRODUCTION:

- The abdominal aorta is the terminal portion of the descending aorta located within the abdominal cavity.
- It serves both as a conduit artery for the lower limb and as a nutritive artery supplying most of the abdominal and pelvic organs.

II – DESCRIPTIVE ANATOMY:

Schematic representation of the aorta



1- Diaphragmatic artery
2- Aortic hiatus at the diaphragm
3- Celiac trunk
4- Superior mesenteric artery
5- Lumbar artery
6- Inferior mesenteric artery
7- Right gonadal artery
8- Right renal artery
9- Middle suprarenal artery

1. Origin – course :

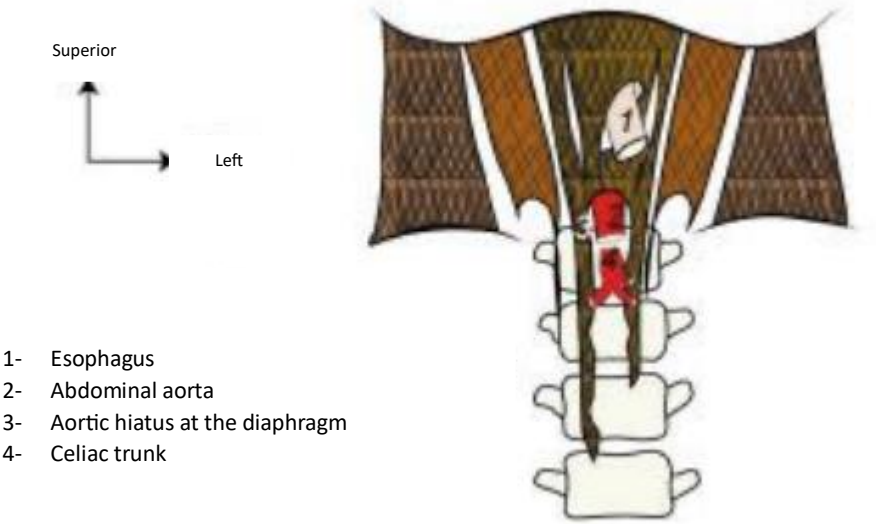
- The abdominal aorta originates at the level of the aortic hiatus, opposite the inferior border of the T12 vertebra.
- It is located in the midline retroperitoneal space and descends vertically, slightly to the left of the midline.

2. Termination :

- It terminates by dividing into three branches:
  - the right and left common iliac arteries,
  - and a small branch called the median sacral artery.

- The aortic bifurcation is located in front of the L4 vertebra or at the L4–L5 intervertebral disc.

Origin of the abdominal aorta



1- Esophagus
2- Abdominal aorta
3- Aortic hiatus at the diaphragm
4- Celiac trunk

III – ANATOMICAL RELATIONS:

1. At the aortic hiatus:

Posteriorly, it is related to the thoracic duct and the medial root of the hemiazygos vein.

2. In the abdomen:

- Along its course, the abdominal aorta is accompanied by lumbar lymph nodes, which are classified as preaortic, lateroaortic, or postaortic.

- **Anteriorly**, from top to bottom, it is related to :
  - the body of the pancreas,
  - the horizontal portion of the duodenum,
  - and the small intestinal loops.
- Posteriorly, it lies against the lumbar vertebrae from L1 to L4, over which the lumbar veins run.

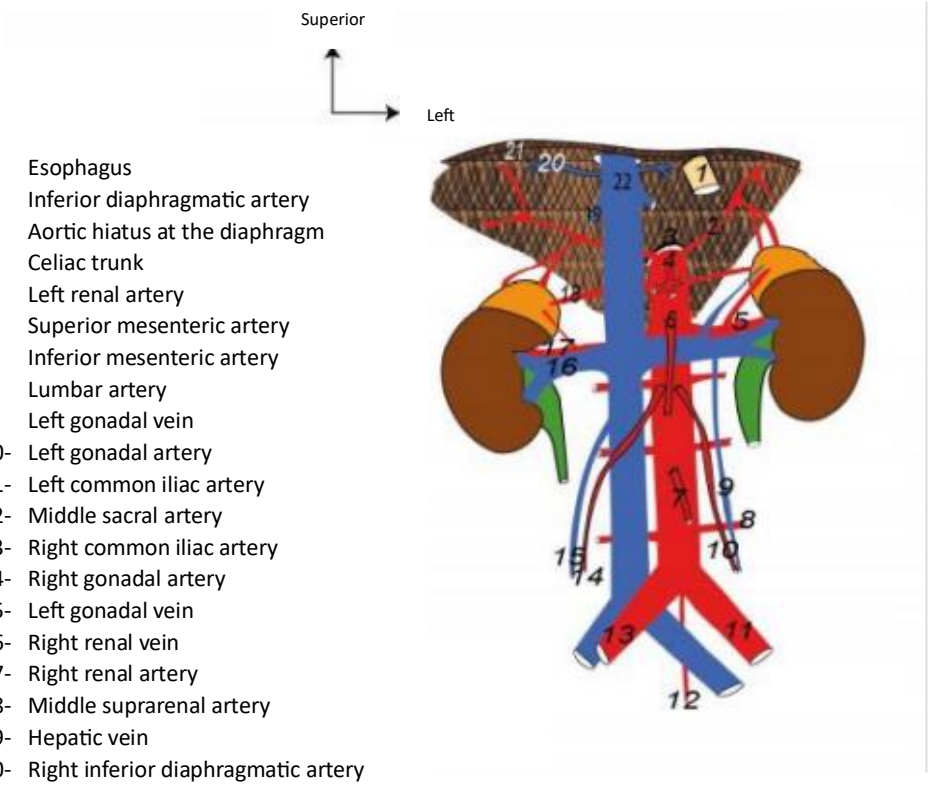
Note: *This explains the erosion of vertebral bodies seen in cases of posterior aortic aneurysms, as well as aortic wall erosion caused by osteophytes.*

- **On the right side**, the aorta is related to :
  - the cisterna chyli,
  - the thoracic duct,
  - the right coeliac ganglion,
  - and the azygos vein.

- **On the left,** it is related to :
  - the left diaphragmatic crus,
  - the duodenojejunal flexure,
  - and the sympathetic trunk.

IV – COLLATERAL BRANCHES:

Collateral branches of the abdominal aorta



1- Esophagus
2- Inferior diaphragmatic artery
3- Aortic hiatus at the diaphragm
4- Celiac trunk
5- Left renal artery
6- Superior mesenteric artery
7- Inferior mesenteric artery
8- Lumbar artery
9- Left gonadal vein
10- Left gonadal artery
11- Left common iliac artery
12- Middle sacral artery
13- Right common iliac artery
14- Right gonadal artery
15- Left gonadal vein
16- Right renal vein
17- Right renal artery
18- Middle suprarenal artery
19- Hepatic vein
20- Right inferior diaphragmatic artery
21- Diaphragm
22- Inferior vena cava

They are divided into three paired and symmetrical groups:

- Parietal branches,
- Urogenital branches,
- Visceral branches (unpaired).

1. Parietal arteries :

❖ Inferior phrenic arteries

These arise just below the aortic hiatus. They ascend in front of the diaphragmatic crura and branch out beneath the diaphragm.

❖ Lumbar arteries

- There are four pairs.
- They originate from the posterior surface of the aorta, at the mid-level of the corresponding vertebral bodies.
- They extend laterally along the vertebral bodies. The right lumbar arteries pass behind the inferior vena cava and also posterior to the quadratus lumborum muscle.

2. Urogenital arteries :

❖ Renal arteries :

- These are the largest of the collateral branches. They arise from the lateral aspects of the aorta at the level of L1.
- They run obliquely downward and laterally toward the corresponding kidney.
- The right renal artery is longer than the left and passes behind the inferior vena cava.
- Before reaching the renal hilum, each renal artery divides into two branches:
    - An anterior (pre-pelvic) branch,
    - A posterior (retro-pelvic) branch.

❖ Gonadal arteries (testicular or ovarian) :

- These originate from the anterolateral surfaces of the aorta, at the level of L2 or the L2–L3 disc.
- The testicular artery descends through the lumbo-abdominal and pelvic regions, traverses the inguinal canal, follows the spermatic cord, and ends at the upper pole of the testis, where it divides into two branches:
    - A lateral branch,
    - A medial branch.

3. Visceral arteries :

❖ Celiac trunk :

- It arises from the anterior surface of the aorta, at the level of the T12–L1 intervertebral disc, about 1 cm below the aortic hiatus.
- It descends obliquely downward and forward, reaching the upper border of the pancreas, where it divides into three terminal branches:
    - Common hepatic artery,
    - Left gastric artery,
    - Splenic artery.

❖ Superior mesenteric artery :

- It arises from the anterior surface of the aorta at the level of L1, just below the renal arteries.
- It descends vertically behind the pancreas and terminates near the jejunum. It supplies blood to the entire small intestine (except the proximal duodenum) and the right colon.
- It is related to :
    - **Posteriorly:** left renal vein,
    - **Anteriorly:** body of the pancreas,
    - **To the right:** inferior vena cava and superior mesenteric vein.
- Collateral branches include:
    - Inferior pancreaticoduodenal artery,
    - Jejunal arteries,
    - Right colic artery,
    - Middle colic artery.

❖ Inferior mesenteric artery :

- It arises from the anterior surface of the aorta at the level of the L3–L4 disc.
- It runs obliquely downward to the left toward the left common iliac vein, then turns vertically downward and ends as the superior rectal artery.

- Relations at its origin: It is covered anteriorly by the horizontal part of the duodenum, which crosses over the aorta and the sympathetic trunk.

- As it continues into the pelvis, it passes:

  - **Medial** to the left psoas muscle,
  - **Medial** to the left ureter,
  - And **to the left** gonadal vessels.

- It supplies the left colon and the pelvic rectum.

V – TERMINAL BRANCHES:

The abdominal aorta bifurcates into 3 branches at the level of L4:

1. One medial branch: the median sacral artery :

It arises from the posterior surface of the abdominal aorta and descends along the anterior surface of L5 and the sacrum.

2. Two lateral branches: the common iliac arteries :

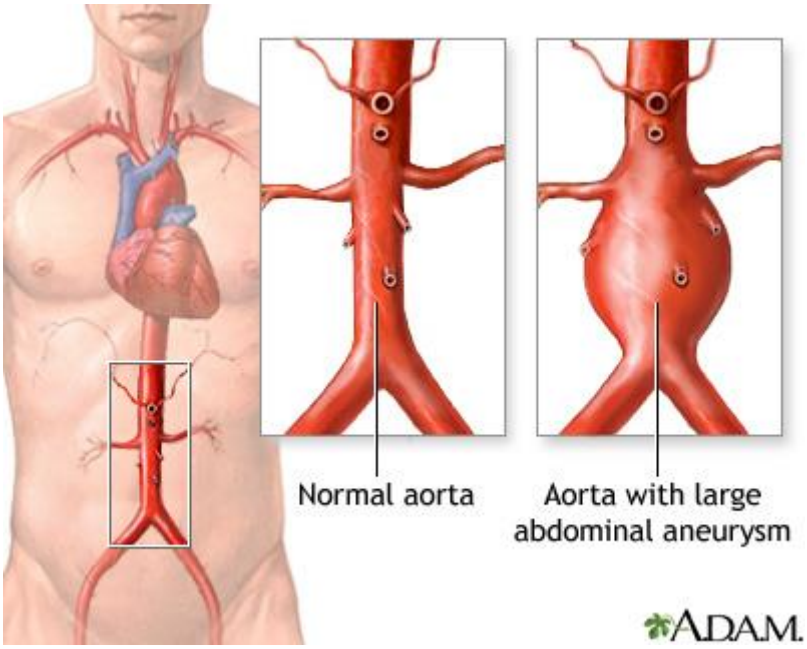
- These are primarily conduit arteries. They arise from the aortic bifurcation and are short and voluminous.
- They terminate by bifurcating into the internal and external iliac arteries, near the sacroiliac joint.

VI – CLINICAL APPLICATIONS:

❖ Abdominal aortic aneurysm :

- An abdominal aortic aneurysm (AAA) is a localized dilation of the abdominal aorta, usually occurring below the renal arteries.

- It is often asymptomatic until it reaches a significant size.
- Risk factors include age, hypertension, smoking, and a family history of aneurysms.
- If left untreated, an AAA can rupture, leading to life-threatening internal bleeding.
- Surgical intervention, either through open repair or endovascular aneurysm repair (EVAR), is typically recommended when the aneurysm exceeds 5 cm in diameter, or if there is rapid enlargement or symptoms.



VII – SURGICAL APPROACH ROUTES:

1. Median xiphopubic laparotomy :

This is performed from the xiphoid process to the subumbilical region.

2. Bilateral subcostal laparotomy :

The incision is made two finger widths below the costal margin.

VIi – CONCLUSION:

The abdominal aorta is a vital artery that supplies blood to the abdominal organs, pelvis, and lower limbs. It is crucial for the distribution of oxygenated blood to these regions and is susceptible to various conditions such as aneurysms and occlusions. Early detection and surgical intervention are essential for preventing complications, especially in cases of aneurysms. Understanding the anatomy and function of the abdominal aorta is critical for both diagnostic and therapeutic purposes in clinical practice.