

Bogomolets National Medical University

Department of Human Anatomy

### **GUIDLINES**

Academic discipline	HUMAN ANATOMY
Modul №	2
Content module №	2
Topic of the lesson	The abdominal aorta. The arteries of the pelvis.
Course	1
Number of hours	3

### **1. Relevance of the topic:**

Damage to major vessels and high mortality as a result of this pathology is an actual medical problem today. The most common cause of death is an abdominal aortic aneurysm, disease Rene Lyarisha, occlusion of the abdominal aorta and iliac arteries. Pathological lesions of major vessels of the abdominal cavity and pelvic cavity are actual medical problem for physicians of any specialty, but especially the surgeon, obstetrician-gynecologist, neonatologist.

Knowledge of the abdominal aorta and its branches, pelvic arteries and their branches, areas of blood supply needed in medical practice of future doctor for differential diagnostics in patients with various lesions of vital important major large vessels.

### **2. Specific goals:**

To demonstrate the preparation of the abdominal aorta, define its branches.

Classify branches of the abdominal aorta. Call parietal branches of the abdominal aorta, to demonstrate the preparation of course and areas of blood supply; Call odd visceral branches of the abdominal aorta, to demonstrate the preparation of progress and areas of blood supply; Call paired visceral branches of the abdominal aorta, to demonstrate the preparation of progress and areas of blood supply; Call and demonstrate on the preparate sources of common iliac artery formation, their progress and location of branching to internal and external iliac artery; Call and demonstrate on the preparate branch of external iliac artery, their course and plots of blood supply; Call and demonstrate on the preparate branches of the internal iliac artery, their course and plots of blood supply.

**3. The basic level of preparation.** Define the organs of abdomen and pelvic cavities and demonstrate them on the preparate. Define

the walls of abdominal and pelvic cavity and demonstrate them on the prepare. To demonstrate and call on the prepare the formation of peritoneal cavity in upper, middle and lower floors. To demonstrate and call on the prepare the parts of the aorta.

#### **4. Tasks for independent work during preparation for the lesson.**

**4.1.** *The list of key terms, parameters, characteristics which the student must assimilate while preparing for lesson*

<b>term</b>	<b>definition</b>
ABDOMINAL PART OF THE AORTA (ABDOMINAL AORTA), PARS ABDOMINALIS AORTAE (AORTA ABDOMINALIS)	This is a direct continuation of the thoracic aorta, which ends bifurcation into right and left common iliac artery, a terminal branches of the abdominal aorta.
BIFURCATION OF AORTA, BIFURCATIO AORTAE	Separation of the abdominal aorta on the right and left common iliac arteries.
CELIAC TRUNK, TRUNCUS COELIACUS	This is a thick and short (1-2 cm) vessel that goes forth from the aorta at the level of the XII thoracic vertebra.
SUPERIOR MESENTERIC ARTERY, ARTERIA MESENTERICA SUPERIOR	It departure from the abdominal aorta one cm below the celiac trunk, goes down behind the pancreatic head to the root of the mesentery of the small intestine and goes between the sheets of rippling reaches the right iliac fossa.
INFERIOR MESENTERIC ARTERY, ARTERIA MESENTERICA INFERIOR	It departure from the abdominal aorta at the level of the third lumbar vertebra, 3-4 cm above the bifurcation of the aorta, retroperitoneal goes down and to the left.
AVERAGE ADRENAL ARTERY, ARTERIA SUPRARENALIS MEDIA	It departure from the lateral surface of the aorta just below the place of departing of the superior mesenteric artery.

RENAL ARTERY, ARTHERIA RENALIS	This is a pair thick vessel that departs from the lateral abdominal aorta floor at the level of I lumbar vertebrae.
OVARIAN ARTERY, ARTERIA OVARICA	This is a pair thin and long vessel, which departs from a front surface of the abdominal aorta at the level of the second lumbar vertebra and reaches the gonads. It goes deep in suspensor ovarian ligament.
TESTICULAR ARTERY, ARTERIA TESTICULARIS	Pair, starting at the level of the second lumbar vertebra, vessel as a thin and long vessel that reaches the gonads. It goes through the inguinal canal as a part of structures of the spermatic cord.
COMMON ILIAC, ARTERIA ILIACA COMMUNIS	This is a pair artery coming from the aorta split down and sideways and at the level the sacroiliac joint divided into internal and external iliac arteries.
EXTERNAL ILIAC ARTERY, ARTERIA ILIACA EXTERNA	This is a direct continuation of the common iliac artery. It goes forward and down, gets under the inguinal ligament throught the vascular gap and goes out on the front of the thigh, which gets the name of the femoral artery.
INTERNAL ILIAC ARTEY, ARTERIA ILIACA INTERNA	Going down to the pelvic cavity to the large sciatic hole and near the top edge divides on the front and back branches. From the anterior branch usually depart viscera, or visceral branches, and from the back - parietal branches.

#### 4.2. Theoretical questions to the lesson:

1. Classify branches of the abdominal aorta.
2. Name and demonstrate on the preparate parietal branches, even and odd visceral branches of the abdominal aorta.
3. Describe the celiac trunk and its branches.

4. Name the variants departing the branches of the ventral trunk.
5. What is blood supplies by splenic artery?
6. Name the general branches of the hepatic artery.
7. Which artery branching gastrico-duodenalegaslrical artery?
8. Name and demonstrate artery, which runs in hepato-duodenal ligament.
9. Name the arteries that blood supply stomach
10. Name and demonstrate the arteries that blood supply all parts of the small intestine.
11. Name and demonstrate the arteries that blood supply all parts of the colon.
12. Name arteries that blood supply adrenal glands.
13. Identify the features of blood supplying to the kidney.
14. Name the branches of the abdominal aorta, which blood supply walls and organs of small pelvic.
15. At what level the abdominal part of aorta divides into right and left common iliac arteries?
16. Name and demonstrate the artery that blood supply the sacral plexus.
17. Which organs are blood supplying by superior mesenteric artery branches?
18. Which organs are blood supplying by lower mesenteric artery?
19. Name the intersystem and intrasystem arterial anastomosis in organs of abdominal cavity.
20. Name the branches of external iliac artery and what are they blood supply?
21. Categorize branches of the internal iliac artery.
22. Name the parietal branches of internal iliac artery. What are they are blood supplying?
23. Name the visceral branches of the internal iliac artery. What are they blood supplying?
24. Describe the course and plots of blood supplying the inside unclean artery.
25. Name and demonstrate the arteries that blood supplying bladder.
26. What feature of blood supplying the testicles and ovaries?
27. Which vessel blood supplying vagina?
28. Which artery branches blood supplies the external genitalia of men and women?
29. Name and demonstrate the vessels that blood supplying different parts of the rectum.
30. Name the intersystem and intrasystem arterial anastomosis in the area of the pelvis

### **4.3. The list of standardized practical skills:**

- Aorta
- Parts of the aorta: the ascending, arch, descending
- Aortic bifurcation
- The abdominal aorta
- Common iliac
- The internal iliac
- External iliac
- Lower epigastric artery

### **4.4. The content of the topic**

The aorta is the largest artery in the body, initially being an inch wide in diameter. It receives the cardiac output from the left ventricle and supplies the body with oxygenated blood via the systemic circulation.

The aorta can be divided into four sections: the **ascending aorta**, the **aortic arch**, the **thoracic (descending) aorta** and the **abdominal aorta**. It terminates at the level of L4 by bifurcating into the left and right common iliac arteries. The aorta classified as a large elastic artery.

In this article we will look at the anatomy of the aorta – its anatomical course, branches and clinical correlations.

The ascending aorta arises from the **aortic orifice** from the left ventricle and ascends to become the aortic arch. It is 2 inches long in length and travels with the pulmonary trunk in the pericardial sheath.

#### **Branches**

The left and right aortic sinuses are dilations in the ascending aorta, located at the level of the aortic valve. They give rise to the **left and right coronary arteries** that supply the myocardium.

The aortic arch is a continuation of the ascending aorta and begins at the level of the second sternocostal joint. It arches superiorly, posteriorly and to the left before moving inferiorly.

The aortic arch ends at the level of the T4 vertebra. The arch is still connected to the pulmonary trunk by the **ligamentum arteriosum** (remnant of the foetal ductus arteriosus).

#### **Branches**

There are three major branches arising from the aortic arch. Proximal to distal:

- **Brachiocephalic trunk:** The first and largest branch that ascends laterally to split into the right common carotid and right subclavian arteries. These arteries supply the right side of the head and neck, and the right upper limb.

- **Left common carotid artery:** Supplies the left side of the head and neck.
- **Left subclavian artery:** Supplies the left upper limb.

The thoracic (descending) aorta spans from the level of T4 to T12. Continuing from the aortic arch, it initially begins to the left of the vertebral column but approaches the midline as it descends. It leaves the thorax via the **aortic hiatus** in the diaphragm, and becomes the abdominal aorta.

### Branches

In descending order:

- **Bronchial arteries:** Paired visceral branches arising laterally to supply bronchial and peribronchial tissue and visceral pleura. However, most commonly, only the paired left bronchial artery arises directly from the aorta whilst the right branches off usually from the third posterior intercostal artery.
- **Mediastinal arteries:** Small arteries that supply the lymph glands and loose areolar tissue in the posterior mediastinum.
- **Oesophageal arteries:** Unpaired visceral branches arising anteriorly to supply the oesophagus.
- **Pericardial arteries:** Small unpaired arteries that arise anteriorly to supply the dorsal portion of the pericardium.
- **Superior phrenic arteries:** Paired parietal branches that supply the superior portion of the diaphragm.
- **Intercostal and subcostal arteries:** Small paired arteries that branch off throughout the length of the posterior thoracic aorta. The 9 pairs of intercostal arteries supply the intercostal spaces, with the exception of the first and second (they are supplied by a branch from the subclavian artery). The subcostal arteries supply the flat abdominal wall muscles.

The abdominal aorta is a continuation of the thoracic aorta beginning at the level of the T12 vertebrae. It is approximately 13cm long and ends at the level of the L4 vertebra. At this level, the aorta terminates by bifurcating into the **right and left common iliac arteries** that supply the lower body.

### Branches

In descending order:

- **Inferior phrenic arteries:** Paired parietal arteries arising posteriorly at the level of **T12**. They supply the diaphragm.
- **Coeliac artery:** A large, unpaired visceral artery arising anteriorly at the level of **L1**. It is also known as the celiac trunk and supplies the liver, stomach, abdominal oesophagus, spleen, the superior duodenum and the superior pancreas.

- **Superior mesenteric artery:** A large, unpaired visceral artery arising anteriorly, just below the celiac artery. It supplies the distal duodenum, jejunum-ileum, ascending colon and part of the transverse colon. It arises at the **lower level of L1**.
- **Middle suprarenal arteries:** Small paired visceral arteries that arise either side posteriorly at the level of **L1** to supply the adrenal glands.
- **Renal arteries:** Paired visceral arteries that arise laterally at the level **between L1 and L2**. They supply the kidneys.
- **Gonadal arteries:** Paired visceral arteries that arise laterally at the level of **L2**. Note that the male gonadal artery is referred to as the testicular artery and in females, the ovarian artery.
- **Inferior mesenteric artery:** A large, unpaired visceral artery that arises anteriorly at the level of **L3**. It supplies the large intestine from the splenic flexure to the upper part of the rectum.
- **Median sacral artery:** An unpaired parietal artery that arises posteriorly at the level of **L4** to supply the coccyx, lumbar vertebrae and the sacrum.
- **Lumbar arteries:** There are four pairs of parietal lumbar arteries that arise posterolaterally between the levels of **L1 and L4** to supply the abdominal wall and spinal cord.

## LITERATURE

### Base:

1. Human anatomy: book in 3 volumes / A. S. Holovatsky, V.G.Cherkasov, N. G. Sapin [et al.] – Ed. 3-rd edition, modified – Vinnitsa: Nova knyga, 2015. – T. 3.
2. Sviridov, O. I. Human Anatomy / Sviridov O. I. – Kyiv: High school, 2000.

### Additional:

1. Tests "KROK-1" - human anatomy: textbook / under the editorship of V. G. Cherkasova, I. V. Dzevulska., O.I. Kovalchuk. 5-th Edition, revised.
2. Human anatomy: in 3 volumes / ed. by V. G. Koveshnikov. – Lugansk: Virtual reality, 2008. – T. 3.
3. Netter F. Atlas of human anatomy / F. Netter; [transl. from eng. A. A. Tsegelsky]; ed. by U.B. Tchaikovsky. – Lviv: Nautilus, 2004.
4. International anatomical nomenclature. Ukrainian standard / edited by I. I. Bobryk, V. G. Koveshnikov. - Kiev: Health, 2001.

**Tests:**

**1. At which level does the abdominal aorta terminate?**

- A. Th12
- B. L2
- C. L4
- D. S2

**2. Which foetal shunt connects the aorta to the pulmonary artery?**

- A. Foramen ovale
- B. Ductus arteriosus
- C. Ductus venosus
- D. Umbilical vein

**3. Which of the following is not a branch of the arch of the aorta?**

- A. Coronary arteries
- B. Brachiocephalic trunk
- C. Left common carotid artery
- D. Left subclavian artery

**4. Which artery is not a branch of the thoracic aorta?**

- A. Oesophageal
- B. Superior phrenic
- C. Superior mesenteric
- D. Mediastinal

**5. Which arteries arise from the bifurcation of the aorta?**

- A. Common iliac
- B. External iliac
- C. Internal iliac
- D. Renal

**6. At which vertebral level do the gonadal arteries arise?**

- A. Th12
- B. L1
- C. L2
- D. L3

**7. Where is an aortic aneurysm most likely to occur?**

- A. Ascending aorta
- B. Aortic arch

- C. Thoracic aorta
- D. Abdominal aorta

**8. Which of the following is a paired artery from the abdominal aorta?**

- A. Inferior phrenic
- B. Coeliac
- C. Median sacral
- D. Superior mesenteric

**9. Which of the following is not contained within the supracolic compartment?**

- A. Stomach
- B. Liver
- C. Small Intestine
- D. Spleen

**10. What is the most common cause of ascites?**

- A. Peritonitis
- B. Portal hypertension secondary to Liver Cirrhosis
- C. Malnutrition
- D. Heart Failure

**Answers:**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>C</b>	<b>B</b>	<b>A</b>	<b>C</b>	<b>A</b>	<b>C</b>	<b>D</b>	<b>A</b>	<b>C</b>	<b>B</b>