

BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

Department of Human Anatomy

GUIDELINES

<i>Academic discipline</i>	HUMAN ANATOMY
Module №	2
The theme of the lesson	The vessels of the lower limb.
Course	I
Faculties	Medical 1,2,3,4, military, dental
The number of hours	3

1. Theme relevance:

The anatomy of the thigh, leg, foot are very importance, because without the knowledge about peculiarities and variants of structure, form, location and mutual location of their anatomical structures, their age-specific it is impossible to diagnose in a proper time and correctly and to prescribe a necessary treatment to the patient.

2. Specific objectives:

Describe, classify, analyze blood vessels of the thigh, gluteal region, leg, foot.

- a. femoralis –determine the borders of femoral artery, designate and demonstrate the branches femoral artery.

Lateral femoral circumflex artery- determine the meatus, borders, branches .

Medial femoral circumflex artery- branches.

obturator artery- determine the borders, branches.

popliteal artery- determine the borders.

Know the posterior tibial artery, fibular artery, dorsalis pedis.

3. Basic level of preparation, including a knowledge of osteology, myology.

The student should know the anatomy of the course: the structure, classification of the tubular bones of the lower limb, muscles of the thigh, leg, foot, classification of the junction of the bones of the skeleton.

4. Tasks for independent work during preparation for classes.

femoral artery	It is a continuation of the external iliac artery (terminal branch of the abdominal aorta)
femoral triangle	is a hollow area in the anterior thigh. Many large neurovascular structures pass through this area, and can be accessed relatively easily.
obturator artery	It descends via the obturator canal to enter the medial thigh, bifurcating into two branches.
popliteal artery	It moves through the popliteal fossa, exiting sandwiched between the gastrocnemius and popliteus muscles.
dorsal venous arch	mostly drains into the superficial veins. Some veins from the arch penetrate deep into the leg, forming the anterior tibial vein.

4.1. Theoretical question for the class:

1. Describe the common iliac artery
2. Describe the parietal branches of the internal iliac artery
3. Describe the visceral branches of the internal iliac artery
4. Describe the external iliac artery
5. Describe femoral artery
6. Describe the deep artery of thigh
7. Describe the popliteal artery
8. Describe the anterior tibial artery
9. Describe the posterior tibial artery
10. Describe the genicular anastomoses
11. Describe the medial plantar artery
12. Describe the lateral plantar artery
13. Describe the dorsal artery of foot
14. Discuss the arterial anastomoses of foot
15. Describe the internal iliac vein
15. Describe the parietal tributaries of the internal iliac artery. Describe the superficial veins of the lower limbs.
16. Describe the great saphenous vein
17. Describe the deep veins of lower limb
18. Describe the femoral vein

4.2. The list of standardized practical skills:

- a.axillaris:
 - a. thoracic superior
 - a. thoracica lateralis
 - a. subscapularis
 - a. thoracodorsalis
 - a. thoracoacromialis
 - a. circumflexa scapulae
 - a. circumflexa anterior humeri
 - a. circumflexa posterior humeri
- a. brachialis
 - rr. muscularis
 - a. profunda brachii
 - a. collateralis superior ulnaris
 - a. collateralis inferior ulnaris
- a. radialis
 - a. recurrens radialis
 - r. palmaris superficialis
 - r. carpalis palmaris dorsalis
- a. ulnaris
 - rr. muscularis
 - a. recurrens ulnaris
 - a. interossea communis
 - a. carpalis palmaris

a.carpalis dorsalis
r.palmaris profunda
aa.digitales palmares propriae

4.3. The content of the topic

Femoral Artery

The main artery of the lower limb is femoral artery. It is a continuation of the external iliac artery (terminal branch of the abdominal aorta). The external iliac becomes the femoral artery when it crosses under the inguinal ligament and enters the femoral triangle.

In the femoral triangle, the profunda femoris artery arises from the posterolateral aspect of the femoral artery. It travels posteriorly and distally, giving off three main branches:

Perforating branches – consists of three or four arteries that perforate the adductor magnus, contributing to the supply of the muscles in the medial and posterior thigh.

Lateral femoral circumflex artery – Wraps round the anterior, lateral side of the femur, supplying some of the muscles in the lateral side of the thigh.

Medial femoral circumflex artery – Wraps round the posterior side of the femur, supplying the neck and head of the femur. In a fracture of the femoral neck, this artery can easily be damaged, and avascular necrosis of the femur head can occur.

After exiting the femoral triangle, the femoral artery continues down the anterior surface of the thigh, via a tunnel known as the adductor canal. During its descent the artery supplies the anterior thigh muscles.

The adductor canal ends at an opening in the adductor magnus, called the adductor hiatus. The femoral artery moves through this opening, and enters the posterior compartment of the thigh, proximal to the knee. The femoral artery now known as the popliteal artery.

In addition to the femoral artery, there other vessels supplying the lower limb.

The obturator artery arises from internal iliac artery in the pelvic region. It descends via the obturator canal to enter the medial thigh, bifurcating into two branches:

Anterior branch – This supplies the pectineus, obturator externus,

adductor muscles and gracilis.

Posterior branch – This supplies some of the deep gluteal muscles.

The gluteal region is largely supplied by the superior and inferior gluteal arteries. These arteries also arise from the internal iliac artery, entering the gluteal region via the greater sciatic foramen.

The superior gluteal artery leaves the foramen above the piriformis muscle, the inferior below the muscle. In addition to the gluteal muscles, the inferior gluteal artery also contributes towards the vasculature of the posterior thigh.

In the Leg

The popliteal artery descends down the posterior thigh, giving off genicular branches that supply the knee joint. It moves through the popliteal fossa, exiting sandwiched between the gastrocnemius and popliteus muscles. At the lower border of the popliteus, the popliteal artery terminates by dividing into anterior and posterior tibial arteries.

The posterior tibial artery continues inferiorly, along the surface of the deep muscles (such as tibialis posterior). It accompanies the tibial nerve in entering the sole of the foot via the tarsal tunnel. During the descent of the posterior tibial artery in the leg, the fibular artery arises. This artery moves laterally, penetrating the lateral compartment of the leg. It supplies muscles in the lateral compartment, and adjacent muscles in the posterior compartment.

The other division of the popliteal artery, the anterior tibial artery, passes anteriorly between the tibia and fibula, through a gap in the interosseous membrane. It then moves inferiorly down the leg. It runs down the entire length of the leg, and into the foot, where it becomes the dorsalis pedis artery.

Arterial supply to the foot is delivered via two arteries:

Dorsalis pedis (a continuation of the anterior tibial artery)

Posterior tibial

The dorsalis pedis artery begins as the anterior tibial artery enters the foot. It passes over the dorsal aspect of the tarsal bones, then moves inferiorly, towards the sole of the foot. It then anastomoses with the lateral plantar artery to form the deep plantar arch. The dorsalis pedis artery supplies the tarsal bones and the dorsal aspect of the metatarsals. Via the deep plantar arch, it also contributes to the supply of the toes.

The posterior tibial artery enters the sole of the foot through the tarsal tunnel. It then splits into the lateral and medial plantar arteries. These arteries supply the plantar side of the foot, and contributes to the supply of the toes via the deep plantar arch.

The veins of the lower limb drain deoxygenated blood and return it to the heart. They can be divided into two groups – deep and superficial:

Deep veins are located underneath the deep fascia of the lower limb, accompanying the major arteries.

Superficial veins are found in the subcutaneous tissue. They eventually drain into the deep veins.

In this article, we shall examine the anatomy and clinical correlations of the major veins of the lower limb.

The Deep Veins of the Lower Limb

The deep venous drainage system of the lower limb is located beneath the deep fascia of the lower limb. As a general rule, the deep veins accompany and share the name of the major arteries in the lower limb. Often, the artery and vein are located within the same vascular sheath – so that the arterial pulsations aid the venous return.

The Foot and Leg

The main venous structure of the foot is the dorsal venous arch, which mostly drains into the superficial veins. Some veins from the arch penetrate deep into the leg, forming the anterior tibial vein.

On the plantar aspect of the foot, medial and lateral plantar veins arise. These veins combine to form the posterior tibial and fibular veins. The posterior tibial vein accompanies the posterior tibial artery, entering the leg posteriorly to the medial malleolus.

On the posterior surface of the knee, the anterior tibial, posterior tibial and fibular veins unite to form the popliteal vein. The popliteal vein enters the thigh via the adductor canal.

The Thigh

Once the popliteal vein has entered the thigh, it is known as the femoral vein. It is situated anteriorly, accompanying the femoral artery.

The deep vein of the thigh (profunda femoris vein) is the other main venous structure in the thigh. Via perforating veins, it drains blood from the thigh muscles. It then empties into the distal section of the femoral vein.

The femoral vein leaves the thigh by running underneath the inguinal ligament, at which point it is known as the external iliac vein.

The Gluteal Region

The gluteal region is drained by inferior and superior gluteal veins. These empty into the internal iliac vein.

The superficial veins of the lower limb run in the subcutaneous tissue. There are two major superficial veins – the great saphenous vein, and the small saphenous vein.

The Great Saphenous Vein

The great saphenous vein is formed by the dorsal venous arch of the foot, and the dorsal vein of the great toe. It ascends up the medial side of the leg, passing anteriorly to the medial malleolus at the ankle, and posteriorly to the medial condyle at the knee.

As the vein moves up the leg, it receives tributaries from other small superficial veins. The great saphenous vein terminates by draining into the femoral vein immediately inferior to the inguinal ligament.

Surgically, the great saphenous vein can be harvested and used as a vessel in coronary artery bypasses.

The Small Saphenous Vein

The small saphenous vein is formed by the dorsal venous arch of the foot, and the dorsal vein of the little toe. It moves up the posterior side of the leg, passing posteriorly to the lateral malleolus, along the lateral border of the calcaneal tendon. It moves between the two heads of the gastrocnemius muscle and empties into the popliteal vein in the popliteal fossa.

The lymphatic system functions to drain tissue fluid, plasma proteins and other cellular debris back into the blood stream, and is also involved in immune defence. Once this collection of substances enters the lymphatic vessels it is known as lymph; lymph is subsequently filtered by lymph nodes and directed into the venous system.

This article will explore the anatomy of lymphatic drainage throughout the lower limb, and how this is relevant clinically.

The lymphatic vessels of the lower limb can be divided into two major groups; superficial vessels and deep vessels. Their distribution is similar to the veins of the lower limb.

Superficial Lymphatic Vessels

The superficial vessels can be divided into two major subsets; (i) medial

vessels, which closely follow the course of the great saphenous vein and; (ii) lateral vessels which are more closely associated with the small saphenous vein.

Medial Vessels

The medial group originate on the dorsal surface of the foot. They travel up the anterior and posterior aspects of the medial lower leg, with the great saphenous vein, passing with it behind the medial condyle of the femur. This group of vessels ends in the groin, draining into the sub inguinal group of the inguinal lymph nodes.

Lateral Vessels

The lateral vessels arise from the lateral surface of the foot and either accompany the small saphenous vein to enter the popliteal nodes, or ascend in front of the leg and cross just below the knee joint to join the medial group.

Deep Lymphatic Vessels

These are far fewer in number than their superficial counterparts and accompany the deep arteries of the lower leg. They are found in 3 main groups: anterior tibial, posterior tibial and peroneal following the corresponding artery respectively, and entering the popliteal lymph nodes.

Lymphatic Nodes

Inguinal Nodes

The inguinal nodes are found in the upper aspect of the femoral triangle and are 1—20 in number.

They are subdivided into 2 groupings determined by their position relative to a horizontal line drawn at the level of termination of the great saphenous vein. Those below this line are the sub-inguinal nodes (consisting of a deep and superficial set) and those above are the superficial inguinal nodes.

Superficial Inguinal Nodes

These form a line directly below the inguinal ligament and receive lymph from the penis, scrotum, perineum, buttock and abdominal wall.

Superficial Sub-Inguinal Nodes

These are located on each side of the proximal section of the great saphenous vein. They receive afferent input primarily from the superficial lymphatic vessels of the lower leg.

Deep Sub-Inguinal Nodes

These are often found in one to three in number and are most commonly found on the medial aspect of the femoral vein. The afferent supply to these nodes is from the deep lymphatic trunks of the thigh which accompany the femoral vessels.

Popliteal Nodes

The popliteal lymphatic nodes are small in size, usually between five and seven in number, and are often found imbedded in fat reserves in the popliteal fossa. They receive lymph from the lateral superficial vessels.

The efferent vessels of the popliteal nodes pass almost entirely alongside the femoral vessels to empty into the deep inguinal nodes. However, some will accompany the great saphenous vein and drain into the sub-inguinal nodes.

LITERATURE

Base:

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3. Netter F. Atlas of human anatomy / F. Netter; [transl. from eng. A. A. Tsegelsky]; ed. by U.B. Tchaikovsky. – Lviv: Nautilus, 2004.
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www.anatom.ua

Tests:

1 Which of the following arteries provides most of the blood supply to the head and neck of the femur?

- A. Femoral
- B. Lateral femoral circumflex
- C. Medial femoral circumflex
- D. External iliac

2. The adductor hiatus is a space in which of the muscles of the thigh?

- A. Rectus femoris
- B. Adductor Longus
- C. Adductor magnus
- D. Biceps femoris

3. From which artery do the superior and inferior gluteal arteries arise?

- A. External iliac

- B. Internal Iliac
- C. Obturator
- D. Femoral

4. What is the name of the series of arteries which supply the knee joint?

- A. Periarticular
- B. Genicular
- C. Dorsalis Pedis
- D. Medial Circumflex.

5. The fibular artery arises from which artery of the leg?

- A. Popliteal
- B. Femoral
- C. Posterior tibial
- D. Anterior tibial

6. Which of the following arteries does the dorsalis pedis arise from?

- A. Anterior tibial
- B. Posterior tibial
- C. Fibular
- D. Medial plantar

7. The posterior tibial vein runs posteriorly to which landmark of the foot/ankle?

- A. Lateral malleolus
- B. Medial Malleolus
- C. Calcaneus
- D. Calcaneal Tendon

8. The deep vein of the thigh drains into which vein?

- A. External iliac
- B. Internal Iliac
- C. Femoral
- D. IVC

9. Which type of shock can a pulmonary embolism lead to?

- A. Mechanical
- B. Anaphylactic
- C. Toxic
- D. Cardiogenic

10. The small saphenous vein drains into the deep vasculature at which level?

- A. Fibular vein
- B. Popliteal Vein
- C. Great Saphenous Vein
- D. Femoral Vein