

BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

Department of human anatomy

GUIDELINES

<i>Academic discipline</i>	Human Anatomy
<i>Module№</i>	2
<i>Study subject</i>	Lumbar plexus. Sacral plexus. Coccygeal plexus
<i>Number of hours</i>	3

Kiev- 2017

1. Relevance of the topic.

The structures of the peripheral nervous system (roots of spinal nerves, sensory nodes, trunks and branches of spinal nerves, areas of peripheral and segmental innervation of the skin plexus anterior branches of spinal nerves, including branches of lumbar, sacral and coccygeal plexus innervate their sensitive fibers of the skin of the abdomen, lower back and lower extremity and motor fibers innervate all muscles of the lower limbs. Acquired knowledge is the basis for many areas of practical medicine, such as neurology, surgery and trauma tolohiya.

2 Specific objectives.:

After the lesson the student should know and be able to:

- 2.1 Describe the sources of formation of the spinal nerve.
- 2.2. Describe the sources of formation thoracic nerves.
- 2.3. Explain the innervation of muscle and skin in the chest.
- 2.4. Describe the sources of the formation of the lumbar plexus.
- 2.5. Classify the nerves of the lumbar plexus.
- 2.6. Classify the nerves of the lumbar plexus.
- 2.7. To be able to demonstrate and define the branches of the lumbar plexus.
- 2.8. Explain the innervation of muscle and skin in the areas of the lower back and lower extremity free branches of the lumbar plexus.
- 2.9 Identify the diffraction Lumbar plexus.
- 2.10. Describe sources of sacral plexus formation.
- 2.11. Classify sacral plexus nerves.
- 2.12. Be able to demonstrate and identify short and long branches of the sacral plexus.
- 2.13. Explain how the innervation of muscle and skin in the pelvic and lower extremity free branches of the sacral plexus.
- 2.14. Determine on radiographs Sacral plexus.
- 2.15. Describe the sources of formation coccygeal plexus.
- 2.16. Classify coccygeal plexus nerves.
- 2.17. Be able to demonstrate and identify branches of coccygeal plexus.
- 2.18. Explain the innervation of muscle and skin in the pelvic branches coccygeal plexus.
- 2.19. Determine on radiographs Sacral plexus.

3. Basic level of preparation

For practical lesson "Sacral plexus. Coccygeal plexus "a student should know and be able:

- 3.1. To know the anatomy of the spine, pelvis, lower extremities.
- 3.2. To be able to analyze and display: large and small pelvis, and his bones kinds of compounds formed basin.
- 3.3. To be able to analyze and demonstrate, bones and joints of the lower limbs types.

- 3.4. Know and be able to demonstrate on the preparations anatomy: the muscles of the chest, abdomen, perineum, pelvic girdle and lower limbs free.
- 3.5. Draw different color schemes to manual muscles of the chest, abdomen, perineum, pelvic girdle and lower limbs free.
- 3.6. Know anatomy (external and internal structure) of the spinal cord, spinal nerve anatomy

1. Tasks for independent work during preparation for the classes

4.1. The list of key terms, parameters, haraktnrysty that student is to assimilate while preparing for classes

term	definition
<i>plexus lumbalis</i>	Lumbar plexus
<i>n. iliohypogastricus</i>	Iliac hypogastric nerve
<i>n. ilioinguinalis</i>	Iliac inguinal nerve
<i>n. cutaneusfemoris lateralis</i>	The lateral cutaneous nerve thigh
<i>n. obturatorius</i>	obturator nerve
<i>n. femoralis</i>	Femoral nerve
<i>plexus sacralis</i>	Sacral plexus
<i>n. Gluteus</i>	sciatic nerve
<i>n. pudendus</i>	pudendal nerve
<i>n. ischiadicus</i>	sciatic nerve
<i>n. tibialis</i>	tibial nerve
<i>n. fibularis</i>	peroneal nerve
<i>plexus coccygeus</i>	Coccygeal plexus

4.2. Control questions for practical lessons

Questions to control the entry level, the output level of knowledge and skills of students

Name the bones that form the torso, pelvis and lower limb bones.

1. What types of joints connecting the bones of the body, pelvic girdle and lower limb free?
2. Know the classification of the muscles of the lower limbs.
3. Name the show and muscles of the chest, abdomen, perineum, deep and superficial muscles of the lower extremities, pelvic girdle.
4. What external and internal structure of the spinal cord?
5. What is the principle structure of a segment of the spinal cord?
6. What is the structure of the spinal nerve?

Questions to control the final level of training.

1. What the spinal nerve is formed from?
2. What from thoracic nerves are formed?
3. What Lumbar plexus formed from?

4. What Sacral plexus formed from?
5. What coccygeal plexus formed from?
6. Name and show the branches of the lumbar plexus that innervate the skin of the lower limbs.
7. Name and show muscular branches of the lumbar plexus. Which group of muscles do they innervate?
8. Name and show short branches of the sacral plexus. Which group of muscles do they innervate?
9. Name and demonstrate long branches of the sacral plexus. Which group of muscles do they innervate?
10. Name and show long branches of the sacral plexus. Which group of muscles do they innervate?
11. Name the branches of sacral plexus innervating the skin of the lower limbs and demonstrate .
12. Name and show muscular branches of coccygeal plexus. Which group of muscles do they innervate?

4.3. The content of the topic.

The lumbar plexus is a network of nerve fibres that supplies the skin and musculature of the lower limb. It is located in the lumbar region, within the substance of the psoas major muscle and anterior to the transverse processes of the lumbar vertebrae.

The plexus is formed by the anterior rami (divisions) of the lumbar spinal nerves L1, L2, L3 and L4. It also receives contributions from thoracic spinal nerve 12. In this article, we shall look at the anatomy of the lumbar plexus – its formation and major branches.

The spinal nerves L1 – L4 form the basis of the lumbar plexus. At each vertebral level, paired spinal nerves leave the spinal cord via the intervertebral foramina of the vertebral column. Each nerve then divides into anterior and posterior nerve fibres.

The lumbar plexus begins as the anterior fibres of the spinal nerves L1, L2, L3, and L4.

The anterior rami of the L1-L4 spinal roots divide into several cords. These cords then combine together to form the six major peripheral nerves of the lumbar plexus. These nerves then descend down the posterior abdominal wall to reach the lower limb, where they innervate their target structures.

We shall now consider the branches of the lumbar plexus. (Note: In this article we shall include only brief notes on the function of these nerves – for more detailed information click on the title to visit their respective pages)

Iliohypogastric Nerve

The iliohypogastric nerve is the first major branch of the lumbar plexus. It runs to the iliac crest, across the quadratus lumborum muscle of the posterior abdominal wall. It then perforates the transversus abdominis, and divides into its terminal branches.

Roots: L1 (with contributions from T12).

Motor Functions: Innervates the internal oblique and transversus abdominis.

Sensory Functions: Innervates the posterolateral gluteal skin in the pubic region.

Ilioinguinal Nerve

The ilioinguinal nerve follows the same anatomical course as the larger iliohypogastric nerve. After innervating the muscles of the anterior abdominal wall, it passes through the superficial inguinal ring to innervate the skin of the genitalia and middle thigh.

Roots: L1.

Motor Functions: Innervates the internal oblique and transversus abdominis.

Sensory Functions: Innervates the skin on the upper middle thigh. In males, it also supplies the skin over the root of the penis and anterior scrotum. In females, it supplies the skin over mons pubis and labia majora.

Genitofemoral Nerve

After leaving the psoas major muscle, the genitofemoral nerve quickly divides into a genital branch, and a femoral branch.

Roots: L1, L2.

Motor Functions: The genital branch innervates the cremasteric muscle.

Sensory Functions: The genital branch innervates the skin of the anterior scrotum (in males) or the skin over mons pubis and labia majora (in females). The femoral branch innervates the skin on the upper anterior thigh.

Lateral Cutaneous Nerve of the Thigh

This nerve has a purely sensory function. It enters the thigh at the lateral aspect of the inguinal ligament, where it provides cutaneous innervation to the skin there.

Roots: L2, L3

Motor Functions: None.

Sensory Functions: Innervates the anterior and lateral thigh down to the level of the knee.

Obturator Nerve

Roots: L2, L3, L4.

Motor Functions: Innervates the muscles: obturator externus, pectineus, adductor longus, adductor brevis, adductor magnus, gracilis.

Sensory Functions: Innervates the skin over the medial thigh.

Femoral Nerve

Roots: L2, L3, L4.

Motor Functions: Innervates the muscles: Iliacus, pectineus, sartorius, all the muscles of quadriceps femoris.

Sensory Functions: Innervates the skin on the anterior thigh and the medial leg.

A lumbosacral plexopathy is a disorder affecting either the lumbar or sacral plexus of nerves. They are rare syndromes, caused by damage to the nerve bundles.

A plexopathy is suspected if the symptoms cannot be localised to a single nerve. Patients may complain of neuropathic pains, numbness or weakness and wasting of muscles.

One of the main causes of lumbosacral plexopathy is diabetic amyotrophy, also known as lumbosacral radioplexus neurophagy. In this condition, the high blood sugar levels damage the nerves. Idiopathic plexopathy is another cause, being the lumbosacral equivalent of Parsonage-Turner syndrome (which affects the brachial plexus). Tumours and other local invasions can cause the plexopathy due to the compression of the plexus.

Treatment depends on what is causing the symptoms. For tumours and space-occupying lesions, they should be removed if possible. For diabetic and idiopathic causes, treatment with high-dose corticosteroids can be useful.

The sacral plexus is a network of nerve fibres that supplies the skin and muscles of the pelvis and lower limb. It is located on the surface of the posterior pelvic wall, anterior to the piriformis muscle.

The plexus is formed by the anterior rami (divisions) of the sacral spinal nerves S1, S2, S3 and S4. It also receives contributions from the lumbar spinal nerves L4

and L5.

In this article, we shall look at the anatomy of the sacral plexus – its formation and major branches.

The spinal nerves S1 – S4 form the basis of the sacral plexus.

At each vertebral level, paired spinal nerves leave the spinal cord via the intervertebral foramina of the vertebral column.

Each nerve then divides into anterior and posterior nerve fibres. The sacral plexus begins as the anterior fibres of the spinal nerves S1, S2, S3, and S4. They are joined by the 4th and 5th lumbar roots, which combine to form the lumbosacral trunk. This descends into the pelvis to meet the sacral roots as they emerge from the spinal cord.

The anterior rami of the S1-S4 spinal roots (and the lumbosacral trunk) divide into several cords. These cords then combine together to form the five major peripheral nerves of the sacral plexus.

These nerves then descend down the posterior pelvic wall. They have two main destinations:

Leave the pelvis via the greater sciatic foramen – these nerves enter the gluteal region of the lower limb, innervating the structures there.

Remain in the pelvis – these nerves innervate the pelvic muscles, organs and perineum.

The superior gluteal nerve leaves the pelvis via the greater sciatic foramen, entering the gluteal region superiorly to the piriformis muscle. It is accompanied by the superior gluteal artery and vein for much of its course.

Roots: L4, L5, S1.

Motor Functions: Innervates the gluteus minimus, gluteus medius and tensor fascia lata.

Sensory Functions: None.

The inferior gluteal nerve leaves the pelvis via the greater sciatic foramen, entering the gluteal region inferiorly to the piriformis muscle.

It is accompanied by the inferior gluteal artery and vein for much of its course.

Roots: L5, S1, S2.

Motor Functions: Innervates gluteus maximus.

Sensory Functions: None.

Sciatic Nerve

Motor Functions:

Tibial Portion – Innervates all of the muscles in the posterior compartment of the thigh, including the hamstring portion of adductor magnus, apart from the short head of the biceps femoris. All muscles in the posterior compartment of the leg. All muscles in the sole of the foot.

Common Fibular Portion – Short head of biceps femoris, all muscles in the anterior and lateral compartments of the leg and extensor digitorum brevis.

Sensory Functions:

Tibial Portion: Innervates the skin on the posterolateral and medial surfaces of the foot as well as the sole of the foot.

Common Fibular Portion: Innervates the skin on the anterolateral surface of the leg and the dorsal aspect of the foot.

The posterior cutaneous nerve of thigh leaves the pelvis via the greater sciatic foramen, entering the gluteal region inferiorly to the piriformis muscle. It descends deep to the gluteus maximus and runs down the back of the thigh to the knee.

Roots: S1, S2, S3

Motor Functions: None

Sensory Functions: Innervates the skin on the posterior surface of the thigh and leg. Also innervates the skin of the perineum.

This nerve leaves the pelvis via the greater sciatic foramen, then re-enters via the lesser sciatic foramen. It moves anterosuperiorly along the lateral wall of the ischiorectal fossa, and terminates by dividing into several branches.

Roots: S2, S3, S4

Motor Functions: Innervates the skeletal muscles in the perineum, the external urethral sphincter, the external anal sphincter, levator ani.

Sensory Functions: Innervates the penis and the clitoris and most of the skin of the perineum.

In addition to the five major nerves of the sacral plexus, there are a number of smaller branches. These tend to be nerves that directly supplying muscles (with the exception of the perforating cutaneous nerve, which supplies the skin over the inferior gluteal region and the pelvic splanchnic nerves, which innervate the

abdominal viscera):
Nerve to piriformis
Nerve to obturator internus
Nerve to quadratus femoris

Informational resources
www.anatom.ua

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

Which nerve roots form the sacral plexus?

- 1.L1-L4
- 2.L2-S1
- 3.L4-S4
- 4.L5-S4

№2

Which nerve of the sacral plexus innervates the external urethral sphincter?

- A.Superior gluteal
- B.Sciatic
- C.Inferior gluteal
- D.Pudendal

№3

Damage to which of these nerve roots would prevent the function of gluteus maximus?

- A.L4-L5
- B.L5-S2
- C.S1-S3
- D.S2-S4.

№4

The tibial part of the sciatic nerve has its cutaneous distribution in the..

- A.Anterior thigh
- B.Medial leg
- C.Dorsum of foot
- D.Sole of the foot

№5

Which of these nerves does not pass through the greater sciatic foramen?

- A.Sciatic
- B.Superior gluteal
- C.Inferior gluteal
- D.None of the above

№6

What are the nerve roots of the sciatic nerve?

- A.L2-L4
- B.L3-S1
- C.L4-S3
- D.S1-S3

№7

Which of these options show the nerves which make the basis of the lumbar plexus?

- A.L1-L5
- B.L1-L4
- C.L2-L4
- D.L2-L5

№8

Which two nerves have motor functions in the lower limb?

- A.Iliinguinal and iliohypogastric
- B.Femoral and Iliohypogastric
- C.Femoral and obturator
- D.Genitofemoral and obturator

№9

Damage to the L2-L4 spinal roots will not affect. which of these nerves?

- A.Iliohypogastric
- B.Lateral cutaneous nerve of thigh
- C.Femoral
- D.Obturator.

№10

Where does the obturator nerve provide sensory innervation?

- A.Gluteal region
- B.Superomedial thigh
- C.Anterior thigh
- D.Medial leg

1	2	3	4	5	6	7	8	9	10
C	D	B	D	D	C	B	C	A	B