

BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

Department of human anatomy

GUIDELINES

<i>Academic discipline</i>	<i>HUMAN ANATOMY</i>
<i>Module №</i>	<i>2</i>
<i>The theme of the lesson</i>	<i>Brachial plexus</i>
<i>Course</i>	I
<i>The number of hours</i>	<i>3</i>

Kiev 2017

1. The relevance of the topic

The structures of the peripheral nervous system (roots of spinal nerves, sensory ganglia, stems and ramus of spinal nerves, area of peripheral and segmental innervation of skin, plexus of anterior ramus of spinal nerves), in particular brachial plexus is one of the largest and most important plexus, because the axons of this plexus take part in innervation of all muscles of upper extremity, muscles of back and chest. Acquired knowledge is the basis for various branches of Practical Medicine, such as Neurology, Surgery, Traumatology.

2. Specific objectives:

To engage the student should know and be able to:

2.1 Definition of spinal nerve.

2.2 Classify the ramus of spinal nerve.

2.3 Draw a scheme of spinal nerve:

a – in cervical region of spinal cord;

b – in thoracic region.

2.4 Define the concept of “Plexus of somatic nerves”.

2.5 Formation of brachial plexus.

2.6 Name and show on preparation the brachial plexus: parts, trunks, ramus and beams.

2.7 Assess the information about state of nerves of upper extremity for definition (on next departments) of malfunctions, availability and localization of pathological processes.

2.8 Draw the scheme: peripheral innervation of skin of neck, trunk and upper extremity.

3. Basic level of student's knowledge.

To lesson student must know and be able to:

3.1 Anatomy of the vertebrae and their specific features of structure according to the location.

3.2 Structure of upper extremity, joints, muscles, topography and fascia of upper limb.

3.3 Structures of muscles of neck, chest and back.

3.4 General information about the structure of spinal cord.

3.5 Acquired skills. Ability to describe the formation of muscles of back, chest and upper limbs.

3.6 Know the embryonic classification of muscles of neck, back, chest and upper limbs.

4. Task for independent during preparation to practical classes

4.1. List of basic terms, options, features, that student must know to when preparing to the lesson.

Term	Definition
<i>plexus brachialis</i>	<i>Brachial plexus</i>
<i>truncus superior</i>	<i>Superior trunk</i>
<i>truncus medius</i>	<i>Middle trunk</i>
<i>truncus inferior</i>	<i>Inferior trunk</i>
<i>n. dorsalisscapulae</i>	<i>Spinal nerve of scapula</i>
<i>n. subclavius</i>	<i>Subclavian nerve</i>
<i>n. thoracodorsalis</i>	<i>Thoracodorsal nerve</i>
<i>n. thoracicus longus</i>	<i>Long thoracic nerve</i>
<i>n. pectoralis medialis</i>	<i>Medial pectoral nerve</i>
<i>n. suprascapularis</i>	<i>Suprascapular nerve</i>
<i>n. subscapulares</i>	<i>Subscapular nerve</i>
<i>n. axillaris</i>	<i>Axillary nerve</i>
<i>n. medianus</i>	<i>Median nerve</i>
<i>n. ulnaris</i>	<i>Ulnar nerve</i>
<i>n. radialis</i>	<i>Radial nerve</i>

4.2. Theoretical questions for the lesson:

Questions for control of the basic level of students skill

- 1. Demonstrate on the skeleton all anatomy structures of vertebral column on cervical and thoracic sections.*
- 2. Know the classification of muscles of neck, trunk and upper limb.*
- 3. What are the components of spinal ganglion?*
- 4. Where is the spinal ganglion located? Where is their roots located?*
- 5. Define the spinal ganglion and their location.*
- 6. Name ramus of spinal nerve.*
- 7. Formation and localization of brachial plexus.*
- 8. Name all trunks, roots and divisions of brachial plexus.*
- 9. Localization of supraclavicular part of brachial plexus, their components.*
- 10. Localization of subclavicular part of brachial plexus, their components.*
- 11. Name short roots of brachial plexus, define their topography.*
- 12. Name long roots of brachial plexus, define their topography.*

Questions for control of the final level of students skill

- 1. What are core components of brachial plexus? Define the localization, parts and roots of brachial plexus.*
- 2. Describe and demonstrate on preparation the trunks and fascicles of brachial plexus.*
- 3. Localization of supraclavicular part of brachial plexus, their components, and demonstrate it on preparation.*

4. *Localization of subclavicular part of brachial plexus, their components, and demonstrate it on preparation.*
5. *Name short ramus of brachial plexus, location of innervation, describe and demonstrate on preparation.*
6. *Name long ramus of brachial plexus, location of innervation, describe and demonstrate on preparation.*
7. *Demonstrate on preparation the musculocutaneous nerve, define their formation, location of innervation and describe their ramus.*
8. *Demonstrate on preparation the median nerve, define their formation, location of innervation and describe their ramus.*
9. *Demonstrate on preparation the radial nerve, define their formation, location of innervation and describe their ramus.*
10. *Demonstrate on preparation the ulnar nerve, define their formation, location of innervation and describe their ramus.*
11. *Describe the innervation of muscles of shoulder girdle and demonstrate it on preparation.*
12. *Describe the innervation of muscles of shoulder and demonstrate it on preparation.*
13. *Describe the innervation of forearm muscles and demonstrate it on preparation.*
14. *Describe the innervation of muscles of the hand and demonstrate it on preparation.*
15. *Name the joints of shoulder girdle, describe their innervation and demonstrate on preparation.*
16. *Describe the innervation of shoulder joint and demonstrate it on preparation.*
17. *Describe the innervation of elbow joint and demonstrate it on preparation.*
18. *Describe the innervation of wrist joint and demonstrate it on preparation.*
19. *Describe the innervation of fingers and demonstrate it on preparation.*
20. *Describe the innervation of first finger(all surface) and demonstrate it on preparation.*
21. *Describe the innervation of the skin of shoulder girdle and demonstrate it on preparation.*
22. *Describe the innervation of the skin of forearm and demonstrate it on preparation.*
23. *Describe the innervation of the skin of wrist(all surface) and demonstrate it on preparation.*

4.3. The content of the topic

*The brachial plexus is a **network** of nerve fibres that supplies the skin and musculature of the upper limb. It begins in the root of the neck, passes through the axilla, and enters the upper arm.*

*The plexus is formed by the **anterior rami** (divisions) of the cervical spinal nerves C5, C6, C7 and C8, and the first thoracic spinal nerve, T1.*

In this article, we shall look at the anatomy of the brachial plexus – its formation and anatomical course through the body.

The brachial plexus is divided into five parts; roots, trunks, divisions, cords and branches. There are no functional differences between these divisions – they are simply used to aid explanation of the brachial plexus.

The ‘roots’ refer the beginning of the brachial plexus. They are formed by the spinal nerves C5, C6, C7, C8 and T1.

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

*Each nerve then divides into anterior and posterior nerve fibres. The roots of the brachial plexus are formed by the **anterior divisions** of spinal nerves C5-T1 (the posterior divisions go on to innervate the skin and musculature of the trunk).*

*After their formation, these nerves pass between the **anterior** and **medial scalene** muscles to enter the base of the neck.*

Trunks

*At the base of the neck, the roots of the brachial plexus converge, forming three **trunks**. These structures are named by their anatomical position:*

- **Superior trunk:** A combination of C5 and C6 roots.
- **Middle trunk:** A continuation of C7.
- **Inferior trunk:** A combination of C8 and T1 roots.

The trunks begin to move laterally, crossing the posterior triangle of the neck.

Divisions

*Within the posterior triangle of the neck, each trunk divides into two branches. One division travels **anteriorly** (toward the front of the body) and the other **posteriorly** (towards the back of the body). Thus, they are known as the anterior and posterior divisions.*

*The **lateral cord** is formed by:*

- The anterior division of the superior trunk
- The anterior division of the middle trunk

*The **posterior cord** is formed by:*

- The posterior division of the superior trunk
- The posterior division of the middle trunk
- The posterior division of the inferior trunk

The **medial cord** is formed by:

- The anterior division of the inferior trunk.

The cords give rise to the major branches of the brachial plexus.

In the axilla and the proximal aspect of the upper limb, the three cords give rise to five major branches. These nerves continue into the upper limb to provide innervation to the muscles and skin present. In this section, we shall concentrate on these five nerves.

Note: these are only brief notes on the function of the nerves – for more detailed information click on the title to visit their respective pages.

Musculocutaneous Nerve

Roots: C5, C6, C7.

Motor Functions: Innervates the brachialis, biceps brachii and coracobrachialis muscles.

Sensory Functions: Gives off the lateral cutaneous branch of the forearm, which innervates the lateral half of the anterior forearm, and a small lateral portion of the posterior forearm.

Roots: C5 and C6.

Motor Functions: Innervates the teres minor and deltoid muscles.

Sensory Functions: Gives off the superior lateral cutaneous nerve of arm, which innervates the inferior region of the deltoid (“regimental badge area”).

Roots: C6 – T1. (Also contains fibres from C5 in some individuals).

Motor Functions: Innervates most of the flexor muscles in the forearm, the thenar muscles, and the two lateral lumbricals that move the index and middle fingers.

Sensory Functions: Gives off the palmar cutaneous branch, which innervates the lateral part of the palm, and the digital cutaneous branch, which innervates the lateral three and a half fingers on the anterior (palmar) surface of the hand.

Roots: C5-C8 and T1.

Motor Functions: Innervates the triceps brachii, and the extensor muscles in the posterior compartment of the forearm.

Sensory Functions: Innervates the posterior aspect of the arm and forearm, and the posterior, lateral aspect of the hand.

Roots: C8 and T1.

Motor Functions: Innervates the muscles of the hand (apart from the thenar muscles and two lateral lumbricals), flexor carpi ulnaris and medial half of flexor digitorum profundus.

Sensory Functions: Innervates the anterior and posterior surfaces of the medial one and half fingers, and associated palm area.

Applications:**Control methods :**

- Tests "STEP – I"
- Practical tasks, about allustrarion in guidelines
- Control questions:

a) basic level

б) final level

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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 "STEP – I"
Theme: brachial plexus

№1

Which of the following nerve roots does not contribute to the brachial plexus?

1.C4

2.C5

3.C7

4.T1

№2

Which of the following nerve roots contributes to the superior trunk of the brachial plexus?

1. C6

2. C7

3. C8

4. T1

Nº3

Which group of muscles does the musculocutaneous nerve innervate?

1. Anterior forearm

2. Posterior forearm

3. Anterior arm

4. Posterior arm

Nº4

Which of the following muscles does the axillary nerve innervate?

1. Biceps brachii

2. Trapezius

3. Supraspinatus

4. Infraspinatus

Nº5

Which of the following nerve roots does not contribute to the median nerve?

1. C5

2. C6

3. C7

4. C8

Nº6

Which group of muscles does the median nerve innervate the majority of?

1. Anterior arm

2. Anterior forearm

3. Posterior arm

4. Posterior forearm

Nº7

Which area does the radial nerve not provide sensory innervation to?

1. Anterior arm

2. Posterior arm

3. Postero-lateral aspect of the hand

4. Posterior forearm

Nº8

Which of the following is a minor branch of the roots of the brachial plexus?

1. Suprascapular nerve

2. Lateral pectoral nerve

3. Medial pectoral nerve

4. Long thoracic nerve

Nº9

What deformity occurs in Erbs palsy?

1. Ulnar claw

2. Hand of benediction

3. Waiter's tip

4. Wrist drop

Nº10

Which root is typically damaged in Klumpkes palsy?

1. C5

2. T1

3. C8

4. C7