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FUNCTIONAL ANATOMY OF THE NERVOUS SYSTEM

TUTORIAL

SAMARKAND STATE MEDICAL UNIVERSITY

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Tutorial

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Comparatively.

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Annotation.

The presented textbook "Functional anatomy of the nervous system" is devoted to a very important section of human anatomy. It summarizes theoretical information about the macromicroscopic anatomy of the nervous system. The authors competently and in an understandable form set forth ideas about the general principles of the structure of the nervous system and the functional significance of its main anatomical formations. illuminated in detailaspects of each topic, including questions for self-control.

The textbook is intended for students of medical universities, can be used in the educational process and is an addition to the main educational literature.

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INTRODUCTION

The nervous system is a miracle of nature. The human brain is the physiological basis of such important mental characteristics as intelligence, mental abilities, and consciousness. It analyzes and responds to external and internal environmental influences. All tissues and organs of the body control each other's activity, ensure the connection of the organism with the external environment and adapt it to the conditions of the external environment.

This tutorial is intended for medical students and is designed to facilitate the study of the structure of the nervous system. The changes that occur during the growth of a child's body after studying the anatomy of an adult are analyzed. This manual is based on the human anatomy curriculum and focuses on:

1. Aims and objectives of the subject.
2. What should the student know about this topic.
3. What practical knowledge should a student have on this topic?
4. What important questions should a student be able to answer.

The authors recommend that this textbook be used by students in self-study, which will help them master this complex but important area - human anatomy.

Practical lesson 1.

Functional anatomy of the central nervous system. Spinal cord, membranes of the spinal cord. Structure, topography, functional anatomy and age features.

Goals and objectives of the lesson:

Target: get acquainted with the functional anatomy of the central nervous system, study the structure of the spinal cord and its membranes, note the age-related features of the spinal cord.

Tasks:to bring to the understanding of the student about the functional anatomy of the central nervous system: the structure of the spinal cord, the formation of segments of the spine, the principles of segmental innervation and its practical significance. Explain the anatomical and clinical features of spinal cord injury. Visually demonstrate the external structure of the spinal cord on anatomical preparations, models and diagrams, the location of the white and gray matter, the spinal membranes and the spaces between them.

In the process of studying the topic, the student must:

Have a general understanding of the nervous system and the characteristic features of the spinal cord in childhood;

Know Latin teminology on the structures of the spinal cord:

- membranes of the spinal cord
- grooves of the spinal cord
- white (what is formed, the cords and borders) and gray matter (the nuclei of the anterior and posterior horns, the neural composition of the gray matter).
- segments and nerves (roots, ganglion, branches) of the spinal cord.
- ponytail
- terminal thread
- pathways of the spinal cord

Data block:

The spinal cord (medulla spinalis) is located inside the spinal canal and passes into the brain at the lower edge of the large cervical opening. In this area, the roots of the right and left first spinal nerves depart from the spinal cord. The spine is cylindrical, slightly flattened from front to back. Its transverse dimension is wider. The lower part of the spinal cord narrows, forming a cone of the brain and ending in the region I-II of the lumbar spine - the "ponytail". Further continuing is called terminalthread. The upper part of the terminal thread, located about 15 cm from the region of the second lumbar spine, contains nervous tissue, which is called the internal part. It is surrounded by the roots of the lumbar and sacral nerves in the ending sac, which is formed by the dura mater of the spinal cord. Below the terminal thread is a connective tissue formation - it is a paired part, which is 8 cm long and is a continuation of the three layers of the membranes surrounding the spinal cord, and at the level of the second coccygeal vertebra grows together with the periosteum. The average length of the spinal cord in adults is 43 cm (45 in men, 41-42 cm in women), weight 34-38 g. It has thickenings in the cervical and lumbosacral regions, contains a large number of nerve cells and fibers due to participation in the innervation of the and lower limbs.

The anterior median fissure on the anterior surface of the spinal cord and the posterior median fissure on the posterior surface divide it into two symmetrical sections. Each part of the spinal cord is divided into three cords: anterior, middle and posterior by means of the anterior lateral sulcus and the posterior lateral sulcus. The anterior and posterior roots of the spinal nerves depart from the lateral branches. The anterior root consists of growths of motor cells located in the anterior branch of the gray matter of the spinal cord. The posterior root is formed by central growths of pseudo-unipolar cells located in the spinal cord. There are 31 pairs of roots in the spinal cord. They are interconnected on the inside of the intervertebral foramen, forming 31 pairs of spinal nerves (n. spinalis).

When we cut the spinal cord horizontally, it consists of two types: gray matter, in the center of which flutters like a flying butterfly or the letter "H", and white matter that surrounds it.

In the middle of the gray matter (substantia grisea) is the central canal of the spinal cord. This is the residual cavity of the neural tube through which the cerebrospinal fluid flows. When its upper end connects to the IV ventricle, the lower end expands slightly to form the last ventricle. The central canal is lined with ependyma surrounded by a central lingual substance.

On a transverse section of the spinal cord in the gray matter, a wide anterior horn (cornu ventralis, anterius), a relatively thin posterior horn and lateral horns are distinguished. Large motor neurons are located in the anterior horns. There are five neurons in the anterior horn:(front and rear outer, front and rear inner, center). In the posterior horn there are small cells in which the central growth of pseudo-unipolar cells of the spinal cord ends, heading to the posterior root. The cells of the posterior horn form the intermediate neuron. They form the thoracic nucleus, private nucleus, intermediate internal nuclei. The lateral horns are located in the region of the SVIII-LII segments, where the center of the sympathetic nervous system is located.

The white matter of the spinal cord is divided by grooves into three cords. The anterior funiculus is located between the anterior median fissure and the anterior lateral sulcus. The white matter has an anterior white commissure on the posterior surface of the anterior middle fissure. It connects the right and left anterior cords. The posterior funiculus is located between the posterior medial lobe and the posterior lateral sulcus. The posterior system is divided into two parts: a thin handle (faciculus gracilis) and a Ponasimonian handle, with an intermediate arc in the region of the cervical and upper thoracic segments.

Lateral cordcomposed of white matter between the anterior and posterior lateral sulci. The white matter of the spinal cord consists of growths of nerve cells that form the spinal cord. In the anterior cord, mainly downwards, the following will pass: the anterior cortical-spinal tract, the reticulo-spinal tract, the anterior spinal thalamic tract, the tectospinal tract and the vestibulo-spinal tract. In the lateral system, descending and ascending are distinguished: the anterior and posterior paths between the spinal cord and the brain, the lateral cortical-spinal path, the red nuclear-spinal path. Proprioceptive sensory pathways between the spinal cord and the cerebral cortex are sent to the posterior cord, and in the region of the cervical segments they are divided into thin and bridge-like bundles.

In a newborn, the lower border of the spinal cord runs along the lower edge of the II or III lumbar vertebra, at the age of one year it reaches the region of the I-II lumbar vertebra, then this border does not change.

As a result of the discrepancy between the length of the spine and the spinal cord, the direction of the nerves changes, and the cauda equina is formed from the lumbar and spinal nerves. An increase in the cervical and lumbar regions develops much faster in the first years of life.

The length of the spinal cord in a newborn is 14-16 cm, and at the age of 10 it doubles. It grows slowly in width, doubling in size by the age of 12, and does not change afterward. The spinal cord of a newborn weighs 5.5 g, at 1 year old - 10 g, at 7 years old - 19 g, at 20 years old - 30 g. The central canal of the spinal cord is wider than in adults. In the first two years of a child's life, the central canal narrows as the mass of gray and white matter increases.

VERIFICATION QUESTIONS

1. What is the size of the spinal cord in adults?

A. Length 35 cm, weight 25 g.
B. Length 40, weight 30 g
C. Average length 43 cm, weight 32 g.
D. Length 40 cm, weight 34-38 g.
E. Average length 43 cm, weight 34-38 g.

2. Where is the lower limit of the spinal cord located?

A. In the region II-III of the lumbar spine
B. In the region I-II of the lumbar spine
C. III-IV in the region of the lumbar spine
D. XIII in the chest area, I in the lumbar spine.
E. III in the region of the lumbar spine

3. What can be seen on a cross section of the spinal cord?

A. White substance, gray substance
B. Central canal, anterior root
C. White substance, gray substance, central channel
D. Spinal cord, cauda equina
E. Terminal ventricle, white and gray adhesions

4. What is in the center of the spinal cord?

A. soft shell of the brain
B. Gray matter
C. white matter
D. Central channel
E. dorsal ventricle

5. What systems of the spinal cord?
A. anterior funiculus, medial, posterior
B. middle funiculus, lateral, posterior
C. cord anterior, superior, posterior
D. middle funiculus, inferior, lateral
E. funiculus anterior, lateral, posterior

6. What tumor cells make up the posterior root of the spinal cord?
A. motivational
B. Sensitive
C. Fake unipolar
D. Bipolar fibers
E. Harakat tolalari

7. At what age does the length of the spine double?
A. 5 years
B. 7 years
C. 8 years
D. 10 years
E. 12 years old

8. What is the number of spinal segments?
A. thirty
B. 32
C. 31
D. 29
E. 33

9. What is in the center of the spinal cord?
A. soft shell of the brain
B. Gray matter
C. white matter
D. Central channel
E. dorsal ventricle

10. What systems of the spinal cord?
A. anterior funiculus, medial, posterior

B. middle funiculus, lateral, posterior
C. cord anterior, superior, posterior
D. middle funiculus, inferior, lateral
E. funiculus anterior, lateral, posterior

Current Security Questions

1. Development of the brain. Brain bubbles and their derivatives.
2. Projection of the nuclei of the cranial nerves in the rhomboid fossa.
3. Furrows and convolutions of the telencephalon.
4. Telencephalon. Furrows and convolutions of the medial and lower surface of the hemispheres.
5. Localization of analyzer nuclei in the brain.
6. Shells of the brain, between shell spaces.

Practical lesson 2.

Theme: General concept of the brain. Base of the brain. Site of exits of 12 pairs of cranial nerves.

Goals and objectives of the lesson:

• Discuss with students the structure, function, and surface structure of the brain. Give general information about the brain and its main parts.

• Be able to show the external structure of the brain on anatomical preparations, dummies and diagrams, the location of the white and gray matter, the meninges and the spaces between them.

• Explain the anatomical and clinical features of traumatic brain injury.

• Be able to pronounce the names of the brain and its parts in Uzbek and Latin in accordance with the new anatomical nomenclature;

• Be able to display the Uzbek and Latin names of the spinal cord and cavities, as well as their presentation on anatomical preparations, models and diagrams; study of 12 pairs of cerebral nerves extending from the brain.

In the process of studying the topic, the student learns the following:

The brain, encephalon, is placed in the cranial cavity and has a shape that, in general terms, corresponds to the internal outlines of the cranial cavity. Its upper lateral, or dorsal, surface is convex in accordance with the cranial vault, while the lower, or base of the brain, is more or less flattened and uneven. In the brain, three large parts can be distinguished: the cerebrum (cerebrum), the cerebellum (cerebellum) and the brain stem (trancus encephalicus). The largest part of the entire brain is occupied by the cerebral hemispheres, followed by the cerebellum in size, the rest, a relatively small part, is the brain stem.

Data block:

The brain of a newborn is relatively large, with an average mass of 390 g for boys and 355 g for girls. By the age of four, the brain flattens in height and height, its mass increases by 2 times a year, at the age of 3-4 years by 3-4 times, after 7 years the brain mass changes slowly, at the age of 20 1355 g in males and 1220 g in bitches. Some parts of the brain grow differently. The forehead and upper limbs grow relatively quickly, while the back of the neck changes very slowly.

The brain (encephalon) is located inside the brain along with the membranes surrounding it. Its upper side surface forms a dome in accordance with the inner surface of the head cover. The lower surface has a complex relief corresponding to the pits on the inner base of the head. The mass of the brain in adults ranges from 1100 to 2000 g, with an average of 1394 g for men and 1245 g for women. The brain consists of three main parts: the cerebral hemispheres, the cerebellum and the cerebral cortex.

The brain (cerebrum) is the largest and most functionally important part of the central nervous system, highly developed in humans. The longitudinal fissure of the brain divides it into the right and left hemispheres. The hemispheres are interconnected by a nozzle. The hemispheres are separated from the brain by a transverse fissure (fissura transversa cerebri) behind. The outer surface of the cerebral hemispheres is located in the reticulum. Deep ridges divide the hemispheres into parts, and shallow ridges delimit the ridges.

Embryogenesis of the brain. Posterior brain bladder, rhombencephalon. Middle cerebral bladder, mesencephalon The neural tube is very early divided into two sections, corresponding to the brain and spinal cord. Its anterior, expanded section, representing the rudiment of the brain, as noted, is dissected by constrictions into three primary cerebral vesicles lying one after another: anterior, prosencephalon, middle, mesencephalon, and posterior, rhombencephalon.

The upper lateral surface of the cerebral hemispheres. Both hemispheres are separated from each other by a fissure, fissura longitudinalis cerebri, running in the sagittal direction. In the depths of the longitudinal fissure, the hemispheres are interconnected by adhesions - the corpus callosum, corpus callosum, and other formations lying under it. In front of the corpus callosum, the longitudinal fissure is through, and behind it passes into the transverse fissure of the brain, fissura transversa cerebri, which separates the posterior parts of the hemispheres from the cerebellum underlying them.

The anterior part of the lower surface of the brain is represented by the frontal lobes of the hemispheres. On the lower surface of the frontal lobes, olfactory bulbs, bulbi olfactorii, are seen, to which thin nerve threads, fila olfactoria, form in their totality the first pair of cranial nerves - olfactory nerves, nn. olfactorii. Usually, when the brain is taken out of the skull, these threads are torn off from the bulbus olfactorius. The olfactory bulbs continue backwards into the olfactory tracts, tractus olfactorii, each ending in two roots, between which there is an elevation called trigonum olfactorium.

Directly behind the latter on both sides is the anterior perforated substance, substantia perforata anterior, so named because of the presence of small holes here through which the vessels pass into the medulla.

The anterior cerebral bladder is closed in front by the so-called end plate, lamina terminalis. This stage of three bubbles, with subsequent differentiation, passes into the stage of five bubbles, giving rise to the five main parts of the brain. At the same time, the brain tube bends in the sagittal direction. First of all, a dorsally convex cephalic flexure develops in the region of the middle bladder, and then, on the border with the spinal cord rudiment, a dorsally convex cervical flexure also develops. Between them, a third bend is formed in the region of the posterior bladder, convex in the ventral side - a bridge bend.

Through this last bend, the posterior cerebral bladder, rhombencephalon, is divided into two sections. Of these, the posterior, myelencephalon, turns into the medulla oblongata during final development, and from the anterior section, called metencephalon, the bridge develops from the ventral side and the cerebellum from the dorsal side. The metencephalon is separated from the midbrain vesicle lying in front of it by a narrow constriction, isthmus rhombencephali. The common cavity of the rhombencephalon, which has the form of a rhombus on a horizontal section, forms the IV ventricle, which communicates with the central canal of the spinal cord. The ventral and lateral walls of it, due to the development of the nuclei of the cranial nerves in them, greatly thicken, while the dorsal wall remains thin. In the region of the medulla oblongata, most of it consists of only one epithelial layer, fused with a soft shell (tela choroidea inferior). The walls of the middle cerebral bladder, mesencephalon, thicken with the development of the medulla in them more evenly. Ventrally, the legs of the brain arise from them, and on the dorsal side, the roof of the midbrain. The cavity of the middle bladder turns into a narrow canal - a water pipe, connecting with the IV ventricle.

The lower surface of the cerebral hemispheres. Olfactory bulbs, tracts (bulbi olfactorii, tractus olfactorii) The lower surface of the cerebral hemispheres. From the side of the lower surface of the brain, facies inferior cerebri, not only the lower side of the hemispheres of the cerebrum and cerebellum is visible, but also the entire lower surface of the brain stem, as well as the nerves extending from the brain. The lower surface or base of the brain consists of the hemispheres, the cerebrum, and the ventral portions of the cerebral cortex. Olfactory bulbs are located in the anterior sections of the lower sections of the forehead. The 1st pair of cranial nerves from 15-20 olfactory nerves, passing through the holes in the iliac plate of the pelvis, emerge on their ventral surface from the nasal cavity. The olfactory bulb points backward from the olfactory bulb. His rear ends are widening forming an olfactory triangle. At the back of the olfactory triangle is the anterior iliac crest, through which the arteries enter the brain. Between the loops there is an intersection of the optic nerve. It is formed by the optic nerve of the second pair of brain nerve fibers. The optic nerve continues into the posterior optic tract. Behind the intersection of the optic nerve lies a mound of gray. Its lower part narrows and forms a crust. At the end of the bladder is the pituitary gland. At the back of the gray hill are two white spherical bodies in the shape of a white ball. On both sides of the sucker body are the legs of the brain, like two thick white bundles, located along the length. Between them there is a groove between the legs, the bottom of which is formed by the rear groove. Through these openings, blood vessels enter the brain. From the inner surface of the cerebral hemispheres, the root of the nerve that sets the eye in motion is the third pair of cerebral nerves. The root of the IV pair of cranial nerves emerges on the outer surface of the cerebral cortex. The hemispheres of the brain are connected by a transverse bridge at the back. The outer parts of the bridge are directed towards the brain, forming the middle legs of the brain. On the border of the bridge and the middle limbs of the brain, the V pair of cranial nerves is the root of the trigeminal nerve. forming the middle legs of the brain. On the border of the bridge and the middle limbs of the brain, the V pair of cranial nerves is the root of the trigeminal nerve. forming the middle legs of the brain. On the border of the bridge and the middle limbs of the brain, the V pair of cranial nerves is the root of the trigeminal nerve.

Below the bridge is the ventral part of the elongated brain. In front of them are pyramids, separated by a median gap, and outside of them is a round top of an olive tree. Between the bridge and the pyramid passes the nerve root, which carries the VI pair of cranial nerves. On the periphery, the roots of the VII-pair of facial nerves and the VIII-pair of vestibular-cochlear nerves emerge, located in a row between the middle legs of the brain and the olive. The roots of the IX-pair of lingual-pharyngeal nerves, the X-pair of vagus nerves and the XI-pair of accessory nerves exit one after the other from the posterior lobe of the elongated brain. The root of the XII-pair hypoglossal nerve emerges from the arc between the pyramid and the olive.

Location of centers in the cerebral cortex.

The center of the brain does not have an even border, but consists of "nuclear" and "common" parts. The nucleus is a direct and deep projection of the receptor onto the cortex, which is the main part of the upper analyzer. Scattered elements are located around the core, in which a much simpler and elementary analysis takes place. When the core of the focus is damaged, the spreading elements to some extent cover the lost activity of the core. The areas occupied by diffuse elements of different analyzers merge. I. Cortical centers of internal analyzers: 1. The core of the motor analyzer is located in front of the center and to the side of the center. In front of the center are parts of the human body with the head down and legs up. The right center is the left side of the body, the left center controls the right side because the path of the pyramid is long and crosses in the spinal cord. 2. The core of the analyzer, which allows the head and eyes to simultaneously move in opposite directions, is located in the back of the middle part of the forehead. 3. The core of purposeful action is located in the supramarginal gyrus of the lower-upper part of the left hemisphere. II Cortical centers of analyzers that perceive external influences. 1. The sensor analyzer center is located at the back of the center. Parts of the human body are located below the head and above the legs, just like in the center of movement. In this area, the corresponding parts of the cortex for oral and manual receptors are large. The network of skin sensations in the upper sections of the right and left upper limbs, palpation of objects is the center of cognition-steregnosis. The auditory analyzer nucleus is located in the middle of the superior temporal lobe. The nucleus of the visual analyzer is located in the sulcus calcarinus cohas on the medial surface of the neck. In one center there is a projection of the retina of the lateral half of one eye and the medial half of the other eye. The core of the olfactory analyzer is a loop on the lower surface of the temporal lobe, partly in the hippocampus. The core of the taste analyzer is located close to the center of smell, since smell and taste are inextricably linked. Second alarm center. 1. The core of the analyzer of syllable movement is located in the back of the lower part of the forehead, closer to the lower part of the center of movement. Here the syllable. The movements of the muscles of the lips, tongue and larynx, which are involved in the formation of words, are analyzed. 2. The auditory speech analyzer is located next to the auditory analyzer, in the back of the upper temporal lobe, since the nucleus is associated with the auditory organ. With the help of this center, a person regulates the quiet volume of speech during speech and understands the other person. 3. The core of the written word movement analyzer is located in the back of the middle part of the forehead, closer to the center of the forehead. The activity of this analyzer is connected with the center of action of the hand, which is carried out for certain purposes. 4. The core of the visual analyzer of the written word is located in the lower-upper part (gyrus angularis) and is directly connected with the visual analyzer.

VERIFICATION QUESTIONS

1. What parts of the brain?
A. Hemispheres, cerebellum, medulla oblongata
B. Cerebral hemispheres, cerebellum, pons
C. Cerebral hemispheres, bridge, elongated brain
D. Interstitial brain, cerebellum
E. Brain, cerebellum, cerebral cortex

2. A section of the nerve that leads the eye out of the brain?
A. from the side of the cerebral hemispheres
B. between the pons and the middle peduncle of the brain
C. on the back side
D. from the previous porous substance
E. from the medial side of the cerebral cortex to the intercostal space

3. Area of exit of the coccygeal nerve from the brain?
A. intercostal space
B. between bridge and pyramid

C. on the lateral side of the superior cerebral cortex
D. from the front
E. on the back side

4. Area of exit of the distal nerve from the brain?
A. between pyramid and olive
B. between the legs
C. between the pons and the pyramid of the medulla oblongata
D. on the back side
E. from the front

5. Area where the trigeminal nerve exits the brain?
A. from the bridge
B. between bridge and pyramid
C. between the pons and the middle peduncle of the brain
D. from the front
E. on the back side

6. Where is the auditory analyzer core located?
A. inferior occipital gyrus
B. angular gyrus
C. precentral gyrus
D. inferior temporal gyrus
E. superior temporal gyrus

7. Where is the core of the security analyzer located?
A. precuneus
B. occipital lobe
C. The forehead is on the medial surface
D. In the region of the peak holder of the neck
E. The neck is on the medial surface

8. Where is the core of the odor analyzer located?
A. Loop temporal lobe, in the hippocampus
B. In the middle of the temple
C. On the underside of the temple
D. In the parahippocampal region

E. The center is in the back corner

9. Where is the core of the syllable movement parser?
A. Behind the top of the forehead
B. In the corner of the corner
C. On the ridge over the edge
D. Behind the lower edge of the forehead
E. On the back of the middle temple

10. Where is the core of the auditory speech analyzer located?
A. in the anterior part of the inferior temporal gyrus
B. in the anterior part of the middle temporal gyrus
C. in the back of the superior temporal gyrus
D. in the anterior part of the postcentral gyrus
E. in the anterior part of the superior temporal gyrus

Current Security Questions

1. Development of the brain. Brain bubbles and their derivatives.
2. Projection of the nuclei of the cranial nerves in the rhomboid fossa.
3. Furrows and convolutions of the telencephalon.
4. telencephalon. Furrows and convolutions of the medial and lower surface of the hemispheres.
5. Localization of analyzer nuclei in the brain.
6. Shells of the brain, between shell spaces.

Practice 3.

Theme: The medulla oblongata and the bridge of Varoliev. Cerebellum. IV - ventricle, rhomboid fossa, Structure, topography and functional anatomy and age features. Groove. Topography of the nuclei of the cranial nerves on the rhomboid fossa.

Goals and objectives:

• To study the structure and function of the cerebellum.

• To study the device and functions of the Varolievsky bridge.

• Study the structure and functions of the brain.

• Formation of the IV ventricle of the brain and its interaction with other ventricles.

• Be able to show the external and internal structure of the cerebellum, pons and cerebellum on anatomical preparations, models, diagrams. Therefore, the study of the projection of the nuclei of the cranial nerves located at the base of the IV ventricle.

• Basic anatomical features of the cerebellum, cerebellum and pons.

3. Tasks of practical training:

• Long brain, cerebellum. To be able to pronounce the Uzbek and Latin names of the bridge, IV ventricle of the brain according to the new anatomical nomenclature.

• Ability to show the elongated brain, bridges, nuclei of the white and gray matter of the brain and their functions, as well as in anatomical preparations, models, diagrams.

• Know the projection of the nuclei in the gray matter to the bottom of the rhombic pit (rhombic pit).

In the process of studying the topic, the student learns the following

• Rhombic structures of the brain, medulla oblongata, white and gray matter.

• White and gray matter of the pons.

• External and internal structure of the brain, nucleus.

• IV ventricle of the brain: roof of the IV ventricle, rhombic fossa, projection of the cranial nerves into the rhomboid fossa, connection of the IV ventricle with other parts of the brain.

Data block:

The medulla oblongata, myelencephalon, medulla oblongata, is a direct continuation of the spinal cord into the brain stem and is part of the rhomboid brain. It combines the features of the structure of the spinal cord and the initial part of the brain, which justifies its name myelencephalon. Medulla oblongata has the appearance of a bulb, bulbus cerebri (hence the term "bulbar disorders"); the upper extended end borders on the bridge, and the lower boundary is the exit point of the roots of the first pair of cervical nerves or the level of the large opening of the occipital bone.

On the anterior (ventral) surface of the medulla oblongata, the fissura mediana anterior passes along the midline, which is a continuation of the sulcus of the spinal cord of the same name. On either side of it, on either side, there are two longitudinal strands - pyramids, pyramides medullae oblongatae, which, as it were, continue into the anterior funiculi of the spinal cord. The bundles of nerve fibers that make up the pyramid partly cross in the depth of the fissura mediana anterior with similar fibers of the opposite side - decussatio pyramidum, after which they descend in the lateral cord on the other side of the spinal cord - tractus corticospinal (pyramidalis) lateralis, partly remain uncrossed and descend in the anterior funiculus of the spinal cord on its side - tractus corticospinalis (pyramidalis) anterior. Pyramids are absent in lower vertebrates and appear as the new cortex develops; therefore, they are most developed in humans, since the pyramidal fibers connect the cerebral cortex, which has reached its highest development in humans, with the nuclei of the cranial nerves and the anterior horns of the spinal cord. Laterally from the pyramid lies an oval elevation - olive, oliva, which is separated from the pyramid by a groove, sulcus anterolateral.

On the posterior (dorsal) surface of the medulla oblongata stretches sulcus medianus posterior - a direct continuation of the sulcus of the spinal cord of the same name. On the sides of it lie the posterior cords, limited laterally on both sides of the weakly expressed sulcus posterolaterals. In the upward direction, the posterior cords diverge to the sides and go to the cerebellum, being part of its lower legs, pedunculi cerebellares inferiores, bordering the diamond-shaped fossa from below. Each posterior funiculus is subdivided by means of an intermediate furrow into medial, fasciculus gracilis, and lateral, fasciculus cuneatus. At the lower corner of the rhomboid fossa, thickenings acquire thin and wedge-shaped bundles -

tuberculum gracilum and tuberculum cuneatum. These thickenings are due to the nuclei of gray matter, the nucleus gracilis and the nucleus cuneatus, which are similar to the bundles. In these nuclei, the ascending fibers of the spinal cord (thin and wedge-shaped bundles) passing in the posterior cords terminate. The lateral surface of the medulla oblongata, located between the sulci posterolateralis et anterolateralis, corresponds to the lateral funiculus. From the sulcus posterolateralis behind the olive exit the XI, X and IX pairs of cranial nerves. The lower part of the rhomboid fossa is part of the medulla oblongata.

The internal structure of the medulla oblongata. The medulla oblongata arose in connection with the development of the organs of gravity and hearing, as well as in connection with the gill apparatus, which is related to breathing and blood circulation. Therefore, it contains the nuclei of gray matter, which are related to balance, coordination of movements, as well as to the regulation of metabolism, respiration and blood circulation.

1. Nucleus olivaris, the core of the olive, has the appearance of a convoluted plate of gray matter, open medially (hilus), and causes the protrusion of the olive from the outside. It is connected with the dentate nucleus of the cerebellum and is an intermediate nucleus of balance, most pronounced in a person whose vertical position requires a perfect gravitational apparatus. (There is also the nucleus olivaris accessorius medialis.) 2. Formatio reticularis, a reticular formation formed from the interweaving of nerve fibers and the nerve cells lying between them. 3. The nuclei of the four pairs of lower cranial nerves (XII-IX), related to the innervation of the derivatives of the branchial apparatus and viscera. 4. Vital centers of respiration and circulation associated with the nuclei of the vagus nerve. Therefore, if the medulla oblongata is damaged, death can occur.

The white matter of the medulla oblongata contains long and short fibers. The long ones include descending pyramidal tracts passing in transit into the anterior funiculi of the spinal cord, partly crossing in the area of \u200b\u200bthe pyramids. In addition, in the nuclei of the posterior cords (nuclei gracilis et cuneatus) are the bodies of the second neurons of the ascending sensory pathways. Their processes go from the medulla oblongata to the thalamus, tractus bulbothalamicus. The fibers of this bundle form a medial loop, lemniscus medialis, which in the medulla oblongata crosses, decussatio lemniscorum, and in the form of a bundle of fibers located dorsal to the pyramids, between the olives - the interolive loop layer - goes further. Thus, in the medulla oblongata there are two intersections of long pathways: ventral motor, decussatio pyramidum, and dorsal sensory, decussatio lemniscorum. Short paths include bundles of nerve fibers that connect individual nuclei of gray matter, as well as the nuclei of the medulla oblongata with neighboring parts of the brain. Among them, it should be noted tractus olivocerebellaris and fasciculus longitudinalis medialis, which lies dorsally from the interolive layer. The topographic relationships of the main formations of the medulla oblongata are visible on a cross section drawn at the level of the olives. The roots extending from the nuclei of the hypoglossal and vagus nerves divide the medulla oblongata on both sides into three regions: posterior, lateral and anterior. In the back lie the nuclei of the posterior funiculus and the lower cerebellar peduncles, in the lateral - the nucleus of the olive and formatio reticularis, and in the anterior - the pyramids. connecting the individual nuclei of the gray matter, as well as the nuclei of the medulla oblongata with neighboring parts of the brain. Among them, it should be noted tractus olivocerebellaris and fasciculus longitudinalis medialis, which lies dorsally from the interolive layer. The topographic relationships of the main formations of the medulla oblongata are visible on a cross section drawn at the level of the olives. The roots extending from the nuclei of the hypoglossal and vagus nerves divide the medulla oblongata on both sides into three regions: posterior, lateral and anterior. In the back lie the nuclei of the posterior funiculus and the lower cerebellar peduncles, in the lateral - the nucleus of the olive and formatio reticularis, and in the anterior - the pyramids. connecting the individual nuclei of the gray matter, as well as the nuclei of the medulla oblongata with neighboring parts of the brain. Among them, it should be noted tractus olivocerebellaris and fasciculus longitudinalis medialis, which lies dorsally from the interolive layer. The topographic relationships of the main formations of the medulla oblongata are visible on a cross section drawn at the level of the olives. The roots extending from the nuclei of the hypoglossal and vagus nerves divide the medulla oblongata on both sides into three regions: posterior, lateral and anterior. In the back lie the nuclei of the posterior funiculus and the lower cerebellar peduncles, in the lateral - the nucleus of the olive and formatio reticularis, and in the anterior - the pyramids. Among them, it should be noted tractus olivocerebellaris and fasciculus longitudinalis medialis, which lies dorsally from the interolive layer. The topographic relationships of the main formations of the medulla oblongata are visible on a cross section drawn at the level of the olives. The roots extending from the nuclei of the hypoglossal and vagus nerves divide the medulla oblongata on both sides into three regions: posterior, lateral and anterior. In the back lie the nuclei of the posterior funiculus and the lower cerebellar peduncles, in the lateral - the nucleus of the olive and formatio reticularis, and in the anterior - the pyramids. Among them, it should be noted tractus olivocerebellaris and fasciculus longitudinalis medialis, which lies dorsally from the interolive layer. The topographic relationships of the main formations of the medulla oblongata are visible on a cross section drawn at the level of the olives. The roots extending from the nuclei of the hypoglossal and vagus nerves divide the medulla oblongata on both sides into three regions: posterior, lateral and anterior. In the back lie the nuclei of the posterior funiculus and the lower cerebellar peduncles, in the lateral - the nucleus of the olive and formatio reticularis, and in the anterior - the pyramids.

Bridgewell developed in humans and has a transverse shape. It is bordered by the cerebral hemispheres at the top and the elongated brain at the bottom. The lateral bridge narrows and passes to the middle peduncle of the brain. The outer border of the bridge is formed by a line between the roots of the three horns and the facial nerve. The ventral surface of the bridge consists of transverse fibers, in the middle of which is the main artery, the dorsal surface of which is involved in the formation of the bottom of the IV ventricle. In the center of the cross section of the bridge is a trapezoid body with a set of transverse fibers. Between its fibers lie the anterior and posterior nuclei of the trapezoid body. The trapezoidal body divides the bridge into a back or covering part and an anterior or main part. The front part of the bridge consists of longitudinal and transverse fibers and special bridge rods between them. Longitudinal fibers consist of pyramidal, corticonuclear, and cortical-bridging fibers that terminate in separate pontine nuclei. The fibers of these stem cells form transverse fibers and pass into the cerebral cortex as part of the midbrain.

In the back of the bridge between the ascending sensory pathways, there are four (V, VI, VII, VIII) pairs of cranial nerve nuclei and a network formation.

In a newborn, the bridge lies in front of the Turkish saddle. The child is pushed back early in life and reaches the back of the head at 5 years of age.

In young children, due to the underdevelopment of the pyramidal and cerebral tracts, its size is small and the nuclei are located close to each other. At the age of 5-7 years, the bridge develops rapidly and looks like an adult.

Cerebellumlies in the back of the upper part of the brain, in the posterior cranial fossa. The transverse fissure of the cerebrum at the top separates the cerebrum from the cervical hemisphere. The development of the brain occurs in connection with the receptors of the reflex adaptation to movement and is the center of coordination of muscle contraction. It links the complex activities of individual muscles and maintains the balance of the body. In addition, it contains the centers of the autonomic nervous system (reflex vascular movement, skin trophism, wound healing rate).

Fourth (IV, 4) ventricle, ventriculus qudratus. Walls, topography of the fourth ventricle. The structure of the fourth ventricle.

The IV ventricle, ventriculus qudratus, is a remnant of the cavity of the posterior cerebral bladder and therefore is a common cavity for all parts of the hindbrain that make up the rhomboid brain, rhombencephalon (medulla oblongata, cerebellum, bridge and isthmus). The IV ventricle resembles a tent, in which a bottom and a roof are distinguished. The bottom, or base, of the ventricle has the shape of a rhombus, as if pressed into the posterior surface of the medulla oblongata and the bridge. Therefore, it is called the diamond-shaped fossa, fossa rhomboidea. In the posterior inferior corner of the rhomboid fossa, the central canal of the spinal cord opens, and in the anterior superior angle of the IV ventricle, it communicates with the water supply. The lateral angles end blindly in the form of two pockets, recessus laterales ventriculi quarti, curving ventrally around the inferior cerebellar peduncles. Roof of the IV ventricle, tegmen ventriculi quarti, has the shape of a tent and is composed of two cerebral sails: the upper one, velum medulldre superius, stretched between the upper legs of the cerebellum, and the lower one, velum medullare inferius, a paired formation adjacent to the legs of the shred. Part of the roof between the sails is formed by the substance of the cerebellum. The lower medullary sail is supplemented by a sheet of soft shell, tela choroidea ventriculi quarti, covered from the inside with a layer of epithelium, lamina choroidea epithelialis, representing a vestige of the posterior wall of the posterior cerebral bladder (the plexus choroideus ventriculi quarti is associated with it).

Tela choroidea initially completely closes the cavity of the ventricle, but then in the process of development three openings appear in it: one in the region of the lower angle of the rhomboid fossa, apertura mecliana ventriculi quarti (the largest), and two in the region of the lateral pockets of the ventricle, aperturae laterales ventriculi quarti. Through these holes, the IV ventricle communicates with the subarachnoid space of the brain, due to which the cerebrospinal fluid flows from the cerebral ventricles into the intershell spaces. In the case of narrowing or overgrowth of these openings due to inflammation of the meninges (meningitis), the cerebrospinal fluid accumulating in the cerebral ventricles does not find its way into the subarachnoid space and dropsy of the brain occurs.

The nuclei of the rhomboid fossa. Nuclei of the cranial nerves. Projection of the nuclei of the cranial nerves on the rhomboid fossa Projection of the nuclei of the cranial nerves on the rhomboid fossa: XII pair - hypoglossal nerve, n.hypoglossus, has a single motor nucleus, laid in the lowest part of the rhomboid fossa, in the depth of trigonum n. hypoglossi. XI pair - accessory nerve, n. accessorius, has two nuclei (both motor): one is embedded in the spinal cord and is called the nucleus n. accessorii, the other is the caudal continuation of the nuclei of the X and IX pairs of nerves and is called the nucleus ambiguus. It lies in the medulla oblongata. dorsolateral to the nucleus of the olive. X pair - vagus nerve, n. vagus, has three nuclei: 1) sensitive nucleus, nucleus solitarius, located next to the nucleus of the hypoglossal nerve, in the depth of trigonum n. vagi; 2) vegetative nucleus, nucleus dorsalis n. vagi, lies in the same area;

IX pair - glossopharyngeal nerve, n. glossopharyngeus, also contains three nuclei: 1) sensory nucleus, nucleus solitarius, lies lateral to the nucleus of the hypoglossal nerve; 2) vegetative (secretory) nucleus, nucleus salivatorius inferior, lower salivary nucleus; its cells are scattered in the formatio reticularis of the medulla oblongata between n. ambiguus and olive kernel; 3) motor nucleus, common with n.vagus and n.accessorius, nucleus ambiguus. VIII pair - vestibulocochlear nerve, n. vestibulocochlearis, has multiple nuclei projecting onto the lateral corners of the rhomboid fossa, in the area vestibularis. The nuclei are divided into two groups corresponding to the two parts of the nerve. One part of the nerve, pars cochlearis, is the nerve of the cochlea, or the auditory nerve itself, has two nuclei: the posterior, nucleus cochlearis dorsalis, and the anterior, nucleus cochlearis ventralis, located laterally and anteriorly from the previous one. Another part of the nerve, pars vestibularis, is the nerve of the vestibule, or the gravitational nerve. has four nuclei (nuclei vestibulares): 1) medial - the main one; 2) lateral; 3) top; 4) bottom. The presence of four nuclei in humans reflects the early stages of phylogenesis, when fish had several separate perceiving gravitational apparatuses.

VII pair - facial nerve, n. facialis, has one motor nucleus located in the pons formatio reticularis partis dorsalis. The nerve fibers departing from it on their way in the thickness of the bridge form a loop that protrudes on the rhomboid fossa in the form of colliculus facialis. Intermediate nerve, n. intermedins, closely connected in its course with the facial nerve, has two nuclei: 1) vegetative (secretory), nucleus salivatorius superior (upper salivary nucleus), is embedded in the formatio reticularis of the bridge, dorsal to the nucleus of the facial nerve; 2) sensitive, nucleus solitarius. VI pair - abducens nerve, n. abducens, has one motor nucleus embedded in the loop of the facial nerve, so the colliculus facialis on the surface of the rhomboid fossa corresponds to this nucleus.

V pair - trigeminal nerve, n.trigeminus, has four nuclei: 1) sensitive, nucleus pontinus n. trigemini, is projected in the dorsolateral part of the upper part of the bridge; 2) the nucleus of the spinal tract, nucleus spinalis n.trigemini, is a continuation of the previous one along the entire length of the medulla oblongata to the cervical spinal cord, where it comes into contact with the substantia gelatinosa of the posterior horns; 3) motor nucleus, nucleus motorius n. trigemini (chewing), located medially sensitive; 4) the core of the midbrain tract, nucleus mesencephdlicus n. trigemini, lies lateral to the aqueduct. It represents the core of proprioceptive sensitivity for the masticatory muscles and for the muscles of the eyeball. It is possible that this nucleus reflects the independent development of the first branch of the trigeminal nerve (n. ophthalmicus), called n in animals.

TEST QUESTIONS

1. What separates the upper surface of the visual cortex from the inner surface?
A. pulvinar thalamus
B. B. Epitalamus
C. habinulae
D. Thalamus medulla strip
E. interthalamic adhesion

2. What connects the right and left visual cortex?
A. habinulae
B. Thalamus medulla strip
C. Interthalamic adhesion
D. commissure habinullarum
E. epitalamic spike

3. What parts does the visual cortex consist of?
A. pulvinar и tuberculum anterius
B. habinula and pineal body
C. Lateral and medial geniculate bodies
D. efipisis and habinula
E. pulvinar and pineal body

4. What is metatalamus?
A. pulvinar thalamus, epitalamus
B. epitalamus, geniculate body
C. knee body, visual tubercle
D. Lateral and medial geniculate bodies
E. lateral knee and pineal
5. What parts does the midbrain consist of?
A. tectum mesencephali, pedunculi base
B. tectum mesencephali, tire
C. tire, peduncle base
D. tegmen mesencephali, pedunculi cerebri
E. pedunculi cerebri, tectum mesencephali

6. Which nuclei are located in the midbrain?
A. red core, n. caudate body
B. nucl.n.abducens, n.ruber
C. nucl.n.ocullomotorius, nucl.ruber
D. n. fastigii, nucl.n.oculomotorius
E. lentiform core, n ruber

7. What connects the upper peaks of the four peaks?
A. anterior thalamus tubercle
B. medial hemiculate body
C. Lateral knee body
D. pulvinar thalamus
E. lower mounds

8. Where is the core of the written word motion analyzer?
A. superior frontal gyrus
B. Nadmorian gyrus
C. Angular gyrus
D. in the middle of the inferior frontal gyrus
E. in the posterior medial frontal gyrus
9. Where is the core of the visual analyzer of the written word?
A. inferior parietal gyrus
B. temporal gyrus
C. frontal gyrus
D. Angular gyrus
E. parietal gyrus

10. What parts does the visual cortex consist of?
A. pulvinar и tuberculum anterius
B. habinula and pineal body
C. Lateral and medial geniculate bodies
D. efipisis and habinula
E. pulvinar and pineal body

Current Security Questions

1. Give a general description of the anatomical structure and physiological functions of the medulla oblongata.

2. List the cranial nerves whose nuclei are located in the medulla oblongata.

3. What is the role of the medulla oblongata in the regulation of the autonomic functions of the body?

4. What are the structure and functions of the reticular formation of neurons.

5. Tell the anatomical structure of the IV ventricle of the brain.

Practice 4.

Theme: Midbrain (quadrigemina, cerebral peduncles). Diencephalon (epithalamus, thalamus, metathalamus), III-ventricle. Structure, topography, functional anatomy and age features

Goals and objectives of the lesson:

After determining the theoretical and practical knowledge of the students, the teacher explains the structure of the midbrain, 3rd ventricle, midbrain and cerebrospinal fluid.

In the process of studying the topic, the student learns the following

you have to be able to show.

• External and internal structure of the midbrain, its parts, white and gray matter, Silviev's aqueduct.

• External and internal structure of the midbrain; nuclei of the thalamus, hypothalamus, thalamus and gopothalamus and their functions.

• Communication with the walls of the ventricles of the brain III and other parts of the brain.

Data block:

The midbrain, mesencephalon, develops in the process of phylogenesis under the predominant influence of the visual receptor, therefore its most important formations are related to the innervation of the eye. Hearing centers also formed here, which, together with the centers of vision, later grew in the form of four mounds of the roof of the midbrain. With the appearance in higher animals and humans of the cortical end of the auditory and visual analyzers in the forebrain cortex, the auditory and visual centers of the midbrain themselves fell into a subordinate position and became intermediate, subcortical. With the development of the forebrain in higher mammals and humans, pathways connecting the cortex of the telencephalon with the spinal cord (peduncles of the brain) began to pass through the midbrain. The diencephalon has a complex structure. It is located between the midbrain and the last brain. In terms of development and activity, the midbrain is divided into two parts: 2. From the point of view of the ventral phylogeny, the old, high vegetative center consists of the subcortical region.

The thalamencephalon, in turn, is divided into the visual cortex, posterior cortex, and superficial cortex.

The thalamus (thalamus opticus) consists of an oval-shaped gray matter on either side of the third ventricle. Its anterior end tapers to form an anterior bulge, while its posterior end widens to form a cushion. The inner surface of the visual cortex forms the lateral wall of the cavity of the third ventricle, and the upper surface forms the bottom of the central part of the lateral ventricles. Its upper surface is separated from the inner by a thin white border. The inner surfaces of the right and left visual cortex are connected by intergranular adhesions. Its lateral surface touches the inner capsule. Borders withlower and posterior midbrain. The visual cortex contains about 40 sets of cells (nuclei) that are separated by thin layers of white matter. Their main ones are the anterior, medial, lateral, central, ventrolateral, and posterior nuclei. The function of the visual cortex is very important. This is the subcortical sensory center where the afferent pathways to the cerebral cortex end. In the anterior nucleus, the path of Vic d'Azir ends, coming from the body of the mammary gland and connecting the visual cortex with the olfactory sphere, and the medial loop ends in the ventrolateral nucleus. The subcortex is the center of vision under the cortex, where the fibers of the visual cortex terminate.

The metathalamus consists of a pair of lateral and medial genuform bodies. The genuate bodies have an elongated oval shape and are connected by their shoulders to the ridges on the roof of the midbrain. The lateral genu is the center of subcortical vision with the upper limbs and pillow, and the medial genu is the center of subcortical hearing with the lower limbs.

The epithalamus includes the edematous body (corpus pineale). It is attached to the medial surface of the right and left visual cortex with the help of a fibrous cord of the tumor. At the junction of their right and left hemispheres, a triangular extension (trigonum habinulae) is formed. The anterior edematous part of the pyloric tumor forms habinularum commissura. The epithalamic (posterior) junction of the transverse fibers is located on the anterior and inferior sides of the tumor body.

The pineal gland (corpus pineale) is located below the four vertebrae of the midbrain and is elongated or spherical in shape. The mass of an adult is 0.2 g, length 8-15 mm, width 6-10 mm, thickness 4-6 mm. The pineal gland is surrounded on the outside by a connective tissue sheath.

From it, trabeculae enter the gland, which divide the gland into parts. The parenchyma of the gland is formed by a large number of pinealocytes and a small number of glial cells. The pineal gland produces two substances: serotonin and melatonin. Serotonin acts as a neurotransmitter, narrowing the arteries. Melatonin is formed from serotonin and acts as a physiological inhibitor of gonadal development.

The swollen body of a newborn is round, without legs and does not reach four peaks. It weighs 7 mg, is 2.5 mm wide, 2 mm long and 3 mm thick. During lactation, iron grows rapidly and has a mass of 100 mg, at the age of 6 it is 157 mg and has a constant size.

The midbrain of the newborn is relatively well developed. Visual bulge increases rapidly when the child is 2 years old and then slows down. Its width increases 3 times in 2 years, and its length doubles in 13 years, its height increases by 40%. While the medial nucleus is well developed in the newborn, the lateral nucleus and ridge grow rapidly after birth. The geniculate bodies are well developed in newborns and then gradually increase.

Hypothalamusparticipates in the formation of the bottom of the ventricle. The subcortical region is divided into two parts: the anterior or visual part, the gray apex, the funnel, the pituitary gland, the intersection of the optic nerve, and the auditory canal. The back, or olfactory, part includes the sucking body, the body of Lewis, located in the subthalamic region.

There are more than 30 nuclei in the hypothalamus, which vary in shape and size. Depending on their location, they are divided into anterior, middle and posterior regions. Nerve cells of the hypothalamus have the ability to produce secrets (neurosecretions) that pass through the fibers of these cells to the pituitary gland. These nuclei are called the neurosecretory nuclei of the hypothalamus. These include the supraoptic nucleus and paraventricular nucleus located in the anterior region of the hypothalamus. The cells of these stem cells form the hypothalamic-pituitary stalk and terminate at the back of the pituitary gland. In the intermediate region of the hypothalamus: the nucleus of the arc, the anterior and posterior medial nuclei of the hypothalamus, the dorsal nucleus of the hypothalamus, the funnel-shaped nucleus, the gray apex. The diameter of a pair of suckers located in the posterior olfactory region of the hypothalamus is 0, In newborns, the pituitary cells are not fully developed. The development and maturation of the nuclei ends at different times. The development of the sucking organ and the body of Louis, associated with olfactory activity, ends by the age of 3 years. Gray lump cells develop at the age of 6 years. The development of the central gray matter under the bulge ends at puberty.

The third ventricle (ventriculus tertius) is located in the middle of the midbrain in the form of a thin sagittal fissure, with six walls. Its inner wall is formed by the inner surface of the visual bulge, the curtain bordering the front wall, the legs of the dome and the front joint. Between the legs of the dome and the anterior part of the visual cortex there is an interventricular opening. The posterior wall of the third ventricle is limited by the posterior commissure and the uncinate commissure. Between them there is a recess (recsesus pinealis). The upper wall of the third ventricle consists of the vascular base of the third ventricle and the epithelial layer covering it (lamina epithelialis), located under the body and dome of the brain. The lower wall of the third ventricle is formed by the subcortical zone. Here is the third ventricle:

Pituitary gland (hypophysis) The bridge is located in the pituitary gland of the Turkish saddle, below the hypothalamus. Its transverse size is 10-17 mm, anterior-posterior size is 5-15 mm, height is 5-10 mm, weight is 0.5 g in men and 0.6 g in women. Outside surrounded by a capsule of connective tissue. Depending on its development, the pituitary gland is divided into two parts: anterior and posterior. The anterior segment (adenohypophysis) is relatively large, accounting for 70-80% of the mass of the gland. It is divided into anterior, middle or intermediate and tuberous parts. The neurohypophysis includes the posterior lobe, infundibulum, middle apex between the adenohypophysis and the hypothalamus.

The adenohypophysis produces growth hormone, adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone, gonadotropic hormone, and melanin-stimulating hormones. In the neurohypophysis, it produces the hormones vasopressin and oxytocin. Neurohypophyseal hormones are formed in the supraoptic and paraventricular nuclei of the hypothalamus and enter the neurohypophysis along the axons.

In a newborn, the pituitary gland is irregular in shape, weighs on average 0.12 g. Its dimensions are 7.9-8.5 mm in the transverse direction, the anterior and posterior dimensions are 5.7-7.5 mm, and the height is 4-4.8 mm. The pituitary gland grows rapidly at 2 years of age, at the age of 4-5 and 11-12 years. At 10, his weight doubles, and at 15, it triples. At the age of 20, it reaches its maximum weight (530-560 mg).

midbrainpart of the brain with a relatively simple structure. It develops in phylogenesis under the influence of visual and auditory analyzers. The ventral surface of the midbrain is bordered above (in front) by the visual pathways and the sucking body, and behind by the anterior edge of the bridge. In the midbrain, its development is associated with: 1. The subcortical visual center and the nuclei of the nerves that innervate the eye muscles. 2. Center of subcortical hearing. 3. Descending and ascending paths connecting the cerebral cortex with the spinal cord. 4. Nerve fibers connecting the midbrain with other parts of the brain. The midbrain consists of two main parts: the roof of the midbrain or the four apical plates and the cerebral hemispheres. The roof of the midbrain (tectum mesencephali) or four apical plates consist of four apexes, separated by longitudinal and transverse branches intersecting at right angles to each other. The two upper peaks contain the subcortical visual center, and the two lower peaks contain the subcortical auditory center. The swollen body sags in an arch between the upper peaks. The shoulders of the hill point outward from each hill. The upper arm is directed towards the lateral knee body and partially passes into the field of view. The shoulders of the lower extremities are directed towards the medial knee body. The legs of the brain, pedunculi cerebri, begin at the upper edge of the bridge and form a pair of white columns going forward and outward, flowing into the last hemispheres of the cerebrum. The depth between them is called the depth between the legs. On a transverse section of the midbrain, the cerebral hemispheres are divided into two parts: the dorsal part of the midbrain and the ventral part of the cerebral hemisphere. The substantia nigra extends from the pons to the midbrain throughout the cerebral cortex and acts in the extrapyramidal system. The melanin pigment in its cells gives it a darker color. In the cover of the cerebral cortex there is an elongated red nucleus extending from the region of the lower lobes to the thalamus. The midbrain is a narrow canal 1.5 cm long. It is surrounded by a central gray matter. Inside the central gray matter, at the bottom of the waterway, are the III and IV pairs of brain stems. In the region of the upper vertebrae, there are nuclei of the III pair of cerebral nerves (nucleus n. oculomatori and Nuclear oculomatorius accessorius) and IV pairs of nuclei of cranial nerves (nucleus n. trochlearis). In the outer sections of the central gray matter lies the mesencephalic nucleus of the fifth pair of cranial nerves. Motor pathways form the basis of the cerebral cortex. The main part of the cerebral cortex grows after birth due to the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system. In the outer sections of the central gray matter lies the mesencephalic nucleus of the fifth pair of cranial nerves. Motor pathways form the basis of the cerebral cortex. The main part of the cerebral cortex grows after birth due to the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system. In the outer sections of the central gray matter lies the mesencephalic nucleus of the fifth pair of cranial nerves. Motor pathways form the basis of the cerebral cortex. The main part of the cerebral cortex grows after birth due to the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system. The main part of the cerebral cortex grows after birth due to the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system. The main part of the cerebral cortex grows after birth due to the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system.

After birth, the main part of the cerebral hemispheres develops in connection with the development of the cortex and pathways between the spinal cord, nuclei and brain. The red nucleus and its connections are part of the extrapyramidal system and appear in ontogeny before the pyramidal system. A newborn in the substantia nigra has islands of cells that do not have pigment, in which the pigment appears at the age of 3-4 years, and at 16 years of age it is highly developed. In children, the gray matter of the midbrain is well developed. The silty water artery expands in the first year of a child's life, and then gradually narrows. The development of the four hilly plate depends on the emergence and development of visual and auditory functions.

VERIFICATION QUESTIONS

1. What separates the upper surface of the visual cortex from the inner surface?

A. pulvinar thalamus
B. B. epithalamus
C. habinulae
D. thalamus medulla
E. interthalamic adhesion

2. What connects the right and left visual cortex?

A. habinulae
B. thalamus medulla
C. interthalamic adhesion
D. commissura habinullarum
E. epithalamic adhesion

3. What parts does the visual cortex consist of?

A. pulvinar and tuberculum anterius
B. habinula and pineal gland
C. lateral and medial geniculate bodies
D. epipisis and khabinula
E. pulvinar and pineal body

4. What is the metathalamus?

A. pulvinar thalamus, epithalamus
B. epithalamus, geniculate body
C. geniculate body, optic tubercle
D. lateral and medial geniculate bodies
E. lateral geniculate body and pineal body

5. What parts does the midbrain consist of?

A. tectum mesencephali, base of pedunculi
B. tectum mesencephali, tire
C. tire, base of peduncle
D. tegmen mesencephali, pedunculi cerebri
E. pedunculi cerebri, tectum mesencephali

6. What nuclei are located in the midbrain?

A. red core, n. caudate body
B. nucl.n.abducens, n.ruber
C. nucl.n.ocullomotorius, nucl.ruber
D. n. fastigii, nucl.n.oculomotorius
E. nucleus lentiform, n. ruber

7. What connects the shoulders of the upper peaks of the four peaks?
A. tubercle of the anterior thalamus
B. medial hemiculate body
C. lateral geniculate body
D. pulvinar thalamus
E. inferior colliculus

9. Where is the core of the visual analyzer of the written word?
A. inferior parietal gyrus
B. temporal gyrus
C. frontal gyrus
D. Angular gyrus
E. parietal gyrus

10. What parts does the visual cortex consist of?
A. pulvinar и tuberculum anterius
B. habinula and pineal body
C. Lateral and medial geniculate bodies
D. efipisis and habinula
E. pulvinar and pineal body

Current Security Questions

1. What are the parts of the midbrain?
2. Describe the structure of the thalamus.
3. Describe the structure of the subthalamic region.
4. Describe the structure of the ventricle, its walls and connections.
5. Describe the external and internal structure of the midbrain.

Practical lesson 5.

Subject: telencephalon. White matter of the cerebral hemispheres. Basal nuclei. Lateral ventricles. The cerebral cortex. Location of centers in the cerebral cortex. Sheaths of the brain.

Goals and objectives of the lesson:

• Discuss the structure of the cerebral cortex and its distinctive features.

• Indicate the location of the cerebral hemispheres on anatomical preparations, models, diagrams, as well as the location of the main analyzers.

• Patterns in the even distribution of analyzers of the cerebral hemispheres in both hemispheres.

• Understand the dynamics of the location of functions in the cerebral hemispheres.

• Explain the main anatomical signs of trauma in different parts of the brain.

In the process of studying the topic, the student learns the following

you have to be able to show.

• Parts of the cerebral hemispheres.

• Poles, edges, hemisphere surfaces.

• Bends and protrusions on the outer side surface.

• Ridges on the medial and basal surfaces.

• Dynamics of the location of the centers in the cerebral hemispheres, the location of the main analyzers.

Data block:

The cerebral cortex. Location of centers in the cerebral cortex.

Morphological foundations of dynamic localization of functions in the cerebral cortex (centers of the cerebral cortex) Knowledge of the localization of functions in the cerebral cortex is of great theoretical importance, as it gives an idea of the nervous regulation of all body processes and its adaptation to the environment. It is also of great practical importance for diagnosing lesions in the cerebral hemispheres. The idea of the localization of functions in the cerebral cortex is associated primarily with the concept of the cortical center. Back in 1874, the Kievan anatomist V. A. Betz made the statement that each section of the cortex differs in structure from other sections of the brain. This was the beginning of the doctrine of the heterogeneity of the cerebral cortex - cytoarchitectonics (cytos - cell, architectones - system). At present, it has been possible to identify more than 50 different areas of the cortex - cortical cytoarchitectonic fields, each of which differs from the others in the structure and location of the nerve elements. From these fields, denoted by numbers, a special map of the human cerebral cortex was compiled.

According to IP Pavlov, the center is the brain end of the so-called analyzer. The analyzer is a nervous mechanism whose function is to decompose the known complexity of the external and internal world into separate elements, i.e., to perform analysis. At the same time, thanks to extensive connections with other analyzers, synthesis also takes place here, a combination of analyzers with each other and with various activities of the organism. "The analyzer is a complex nervous mechanism that begins with the external perceiving apparatus and ends in the brain" (IP Pavlov). From the point of view of I. P. Pavlov, the brain center, or the cortical end of the analyzer, does not have strictly defined boundaries, but consists of a nuclear and scattered parts - the theory of the nucleus and scattered elements. The "nucleus" represents a detailed and accurate projection in the cortex of all elements of the peripheral receptor and is necessary for the implementation of higher analysis and synthesis. "Scattered elements" are located on the periphery of the nucleus and can be scattered far from it; they carry out a simpler and more elementary analysis and synthesis. When the nuclear part is damaged, scattered elements can to a certain extent compensate for the lost function of the nucleus, which is of great clinical importance for the restoration of this function. Before I. P. Pavlov, the cortex distinguished between the motor zone, or motor centers, the precentral gyrus, and the sensory zone, or sensory centers located behind the sulcus centralis. I. P. Pavlov showed that the so-called motor zone, corresponding to the precentral gyrus, exists, like other zones of the cerebral cortex, perceiving area (cortical end of the motor analyzer). "The motor area is the receptor area ... This establishes the unity of the entire cortex of the hemispheres" (IP Pavlov).

End brain, telencephalon. Hemispheres, hemispheria cerebri As already noted, the telencephalon, telencephalon, is represented by two hemispheres, hemispheria cerebri. The composition of each hemisphere includes: a cloak, or mantle, pallium, olfactory brain, rhinencephalon, and basal nuclei. The remainder of the original cavities of both blisters of the telencephalon are the lateral ventricles, ventriculi laterales. The forebrain, from which the end brain is secreted, first arises in connection with the olfactory receptor (olfactory brain), and then it becomes the organ for controlling the behavior of the animal, and centers of instinctive behavior based on species reactions (unconditioned reflexes) arise in it - subcortical nuclei and centers of individual behavior based on individual experience (conditioned reflexes) - the cerebral cortex.

Accordingly, the following groups of centers are distinguished in the final brain in the order of historical development: 1. The olfactory brain, rhinencephalon, is the oldest and at the same time the smallest part, located ventrally. 2. Basal, or central, nuclei of the hemispheres, "subcortex", - the old part of the telencephalon, paleencephalon, hidden in depth. 3. The gray matter of the cortex, cortex, is the youngest part, neencephalon, and at the same time the largest part, covering the rest with a kind of cloak, hence its name "cloak", or mantle, pallium. In addition to the two forms of behavior noted for animals, a third form arises in humans - collective behavior based on the experience of the human team, which is created in the process of human labor activity and communication between people through speech. This form of behavior is associated with the development of the youngest superficial layers of the cerebral cortex, which constitute the material substrate of the so-called second signal (verbal) system of reality (IP Pavlov). Since in the process of evolution of all parts of the central nervous system the telencephalon grows fastest and most strongly, in humans it becomes the largest part of the brain and takes the form of two voluminous hemispheres - right and left, hemispheria dextrum et sinistrum. Materials for practical exercises

Topic 5: telencephalon. White matter of the cerebral hemispheres. Basal nuclei. Lateral ventricles. The cerebral cortex. Location of centers in the cerebral cortex. Sheaths of the brain.

The cerebral cortex. Location of centers in the cerebral cortex.

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corpus callosum, corpus callosum. Knee corpus callosum.

In the depths of the longitudinal fissure of the brain, both hemispheres are interconnected by a thick horizontal plate - the corpus callosum, corpus callosum, which consists of nerve fibers running transversely from one hemisphere to the other. In the corpus callosum, the anterior end, which is bent downwards, or knee, genu corporis callosi, the middle part, body, truncus corporis callosi, and then the posterior end, thickened in the form of a roller, splenium corporis callosi, are distinguished. All these parts are clearly visible on the sagittal section of the brain between both hemispheres. The knee of the corpus callosum, bending down, sharpens and forms a beak, rostrum corporis callosi, which passes into a thin plate, lamina rostralis, which in turn continues into lamina terminalis.

Code, fornix. Vault pillars. Transparent partition.

Under the corpus callosum is the so-called vault, fornix, representing two arched white strands, which in its middle part, corpus fornicis, are connected to each other, and diverge in front and behind, forming pillars of the vault in front, columnae fornicis, behind the legs of the vault, crura fornicis. Crura fornicis, heading backwards, descend into the lower horns of the lateral ventricles and pass there into the fimbria hippocampi. Between the crura fornicis, under the splenium corporis callosi, transverse bundles of nerve fibers extend, forming the comissura fornicis. The anterior ends of the arch, columnae fornicis, continue down to the base of the brain, where they end in the corpora mamillaria, passing through the gray matter of the hypothalamus. Columnae fornicis limit the interventricular openings lying behind them, connecting the III ventricle with the lateral ventricles. In front of the pillars of the arch is the anterior commissure, commissura anterior, which looks like a white transverse crossbar, consisting of nerve fibers. Between the anterior part of the fornix and the genu corporis callosi, a thin vertical plate of brain tissue is stretched - a transparent septum, septum pellucidum, in the thickness of which there is a small slit-like cavity, cavum septi pellucidi.

In the hemispheres of the telencephalon lie below the level of the corpus callosum symmetrically on the sides of the midline, two lateral ventricles, ventriculi laterales, separated from the upper lateral surface of the hemispheres by the entire thickness of the medulla. The cavity of each lateral ventricle corresponds to the shape of the hemisphere: it begins in the frontal lobe in the form of an anterior horn, cornu anterius, bent down and to the lateral side, from here it stretches through the region of the parietal 3rd lobe called the central part, pars centralis, which is at the level of the posterior edge of the corpus callosum It is divided into the lower horn, cornu inferius, (in the thickness of the temporal lobe) and the posterior horn, cornu posterius (in the occipital lobe). The medial wall of the anterior horn is formed by the septum pellucidum, which separates the anterior horn from the same horn of the other hemisphere.

The lateral wall and partly the bottom of the anterior horn are occupied by a gray elevation, the head of the caudate nucleus, caput nuclei caudati, and the upper wall is formed by the fibers of the corpus callosum. The roof of the central, narrowest part of the lateral ventricle also consists of the fibers of the corpus callosum, while the bottom is made up of the continuation of the caudate nucleus, corpus nuclei caudati, and part of the upper surface of the thalamus. The posterior horn is surrounded by a layer of white nerve fibers originating from the corpus callosum, the so-called tapetum (cover); on its medial wall, a roller is noticeable - a bird's spur, calcar avis, formed by an impression from the side of sulcus calcarinus, located on the medial surface of the hemisphere. The upper lateral wall of the lower horn is formed by the tapetum, which is a continuation of the same formation surrounding the posterior horn. On the medial side, on the upper wall, there is a thinned part of the caudate nucleus, cauda nuclei caudati, which is bent downwards and anteriorly. Along the medial wall of the lower horn, a white elevation stretches all the way - the hippocampus, hippocampus, which is formed as a result of an impression from the sulcus hippocampi, which cuts deep from the outside. The anterior end of the hippocampus is divided by grooves into several small tubercles. Along the medial edge of the hippocampus is the so-called fringe, fimbria hippocampi, which is a continuation of the crus fornicis. At the bottom of the lower horn is a roller, eminentia collaterdlis, originating from an impression outside the furrow of the same name. From the medial side of the lateral ventricle, the pia mater protrudes into its central part and lower horn, forming the choroid plexus in this place, plexus choroideus ventriculi lateralis. The plexus is covered with epithelium, which is the remnant of the undeveloped medial wall of the ventricle. Plexus choroideus ventriculi lateralis is the lateral border of the tela choroidea ventriculi tertii.

Sheaths of the brain. Hard shell, dura mater encephali.

The membranes of the brain, meninges, are the direct continuation of the membranes of the spinal cord - hard, arachnoid and soft. The hard shell, dura mater encephali, is a dense whitish connective tissue shell that lies outside of the other shells. Its outer surface is directly adjacent to the cranial bones, for which the hard shell serves as a periosteum, which is its difference from the same shell of the spinal cord. The inner surface facing the brain is covered with endothelium and is therefore smooth and shiny. Between it and the arachnoid membrane of the brain is a narrow slit-like space, spatium subdurale, filled with a small amount of fluid. In places, the hard shell splits into two sheets. Such splitting takes place in the region of the venous sinuses (see below), and also in the region of the fossa at the top of the pyramid of the temporal bone (impressio trigemini), where the trigeminal ganglion lies. The hard shell gives off several processes from its inner side, which, penetrating between parts of the brain, separate them from each other.

Falx cerebri, the crescent of the cerebrum, is located in the sagittal direction between both hemispheres of the cerebrum. Attached along the midline of the cranial vault to the edges of the sulcus sinus sagittalis superioris, its anterior narrow end adheres to the crista galli, and its wide posterior end fuses with the upper surface of the cerebellar tenon. Tentorium cerebelli, the tentorium of the cerebellum, is a horizontally stretched plate, slightly convex upwards like a gable roof. This plate is attached along the edges of the sulcus sinus transversa of the occipital bone and along the upper face of the pyramid of the temporal bone on both sides to the processus clinoideus posterior of the sphenoid bone. The cerebellar tentorium separates the occipital lobes of the cerebrum from the underlying cerebellum.

Falx cerebelli, the crescent of the cerebellum, is located, like the crescent of the brain, along the midline along the crista occipitalis interna to the large opening of the occipital bone, covering the latter on the sides with two legs; this low process protrudes into the posterior notch of the cerebellum. Diaphragma sellae, diaphragm of the saddle, a plate that limits the top of the receptacle for the pituitary gland at the bottom of the Turkish saddle. In the middle, it is perforated by a hole for passing the funnel, infundibulum, to which the hypophysis is attached.

The arachnoid membrane, arachnoidea encephali, as well as in the spinal cord, is separated from the hard shell by the capillary cleft of the subdural space. The arachnoid membrane does not go into the depths of the furrows and recesses of the brain, like pia mater, but spreads over them in the form of bridges, as a result of which there is a subarachnoid space between it and the soft shell, cavitas subarachnoidealis, which is filled with a transparent liquid. In some places, mainly at the base of the brain, the subarachnoid spaces are especially strongly developed, forming wide and deep receptacles of cerebrospinal fluid, called cisterns.

All subarachnoid spaces communicate widely with each other and, at the foramen magnum of the occipital bone, continue directly into the subarachnoid space of the spinal cord. In addition, they are in direct communication with the ventricles of the brain through openings in the region of the posterior wall of the fourth ventricle: apertura mediana ventriculi quarti, which opens into cisterna cerebellomedullaris, and apertura lateralis ventriculi IV. In the subarachnoid spaces lie the cerebral vessels, which are protected from compression by connective tissue crossbars, trabeculae arachnoideales, and the surrounding fluid. A feature of the structure of the arachnoid membrane is the so-called granulation of the arachnoid membrane, granulationes arachnoideales, which are outgrowths of the arachnoid membrane in the form of round bodies of a gray-pink color, protruding into the cavity of the venous sinuses or into the blood lakes lying nearby. They are present in children and adults, but they reach their greatest size and number in old age. Increasing in size, granulations, by their pressure on the cranial bones, form depressions on the inner surface of the latter, known in osteology under the name foveolae granulares. Granulations serve to drain cerebrospinal fluid into the bloodstream by filtration.

The soft shell, pia mater encephali, closely adheres to the brain, going into all the furrows and crevices of its surface, and contains blood vessels and vascular plexuses. Between the membrane and the vessels there is a perivascular gap that communicates with the subarachnoid space.

VERIFICATION QUESTIONS

1. How many nuclei are there in the brain?
A. 2
B. 3
C. five
D. four
E. 6

2. What is located between the hemispheres of the brain?
A. worm
B. knot
C. lump
D. cerebral hemispheres
E. white matter

3. What are the nuclei of the brain?
A. n. toothed, n. emboliform, n. amygdala
B. n. ruber, black substance
C. n. fastigia, n. emboliform, n. spherical, n. dental
D. n. fastigia, n. olivarius, n. embolibormis, n. globular
E. n. toothed, n. tailed, n. embolyphornis

4. The structures of the final brain include:
A. basal nuclei
B. epitalamus
C. The legs of the brain
D. hypothalamus
E. tire

5. Which surfaces are absent in the hemispheres of the brain:
A. posterior
B. dorsolateral
C. medial
D. Lower
E. lower-medical

6. what belongs to parts of the final brain:
A. All of the above
B. islet
C. wedge
D. corpus callosum
E. vault

7. In which part of the brain are the lateral ventricles:
A. ultimate
B. oblong
C. average
D. intermediate
E. rear

8. What is the name of the lateral furrow of the brain:
A. Silvia furrow
B. Seahorse furrow
C. Spur furrow
D. Roland furrow
E. centrally

9. where the inner capsule is located:
A. between caudate nucleus, thalamus, and soybean nucleus
B. between islet and thalamus cushion
C. between thalamus and soachoid nucleus
D. behind the striated body
E. in the hypothalamus

10. Through the inner capsule pass:
A. Projection Fibers
B. associative fibers
C. commisural fibers
D. Motor only
E. all of the above

Current Security Questions

1. Latin names of parts of the cerebral hemispheres, main limbs and spinal cord.

2. location of cortical analyzers in the cerebral cortex on anatomical preparations, models, models of the brain, diagrams.
3. Dynamics of the arrangement of functions in the hemispheres of the brain.
4. Structures of the cerebral cortex.
5. Location of ridges and ridges in the cerebral cortex on anatomical preparations, models, models of the brain, diagrams.
6. Regularity of the same location of the analyzers of the cerebral hemispheres in the two hemispheres.
7. The main anatomical signs of injuries of various parts of the brain.

Practical lesson 6.

Theme: A simple reflex arc. Sensory and motor pathways of the brain and spinal cord.

Goals and objectives of the lesson:

- Discuss the general principles of the structure of the cerebral and spinal tracts and their classification.
- Discuss the general principles of the structure of sensory pathways in the brain and spinal cord and their classification.
- Indicate the direction of the sensory pathways on the diagram and layout (extraceptive, proprioceptive, and interoceptive).
- Main anatomical features of sensory tract injury and their clinical significance.

In the process of studying the topic, the student learns the following

- Classification of cerebral and spinal tracts.
- Sensory pathways.
- Extraceptive ways.
- Proprioceptive pathways.
- Interoceptive routes.

Data block:

projection fibers. Projection fibers connect the cerebral cortex partly with the thalamus and corpora geniculata, partly with the underlying parts of the central nervous system up to and including the spinal cord. Some of these fibers conduct excitations centripetally, towards the cortex, while others, on the contrary, centrifugally. Projection fibers in the white matter of the hemisphere closer to the cortex form the so-called radiant crown, corona radiata, and then the main part of them converges into the internal capsule, which was mentioned above.

Internal capsule, capsula interna the internal capsule, capsula interna, as indicated, represents a layer of white matter between the nucleus lentiformis, on the one hand, and the caudate nucleus and thalamus, on the other. On the frontal section of the brain, the internal capsule looks like an oblique white stripe continuing into the brain stem. On a horizontal section, it appears in the form of an angle open to the lateral side; as a result, in capsula interna, the anterior leg, crus anterius capsulae internae, is distinguished between the caudate nucleus and the anterior half of the inner surface of the nucleus lentiformis, the posterior leg, crus posterius, is between the thalamus and the posterior half of the lentiform nucleus and the knee, genu capsulae internae, lying in place inflection between both parts of the inner capsule.

1. Pyramidal path, tractus corticospinalis (pyramidalis) 1. Pyramidal path, tractus corticospinalis (pyramidalis) conducts motor volitional impulses to the muscles of the trunk and limbs. Starting from the pyramidal cells of the cortex of the middle and upper parts of the precentral gyrus and lobulus paracentralis, the fibers of the pyramidal pathway go as part of the radiant crown, and then pass through the internal capsule, occupying the anterior two-thirds of its posterior leg, and the fibers for the upper limb go in front of the fibers for the lower limb. Then they pass through the brain stem, pedunculus cerebri, and from there through the bridge into the medulla oblongata. Cortical nuclear pathway, tractus corticonuclearis. Cortical-bridge way, tractus corticopontini.

2. Cortical-nuclear pathway, tractus corticonuclearis - pathways to the motor nuclei of the cranial nerves. Starting from the pyramidal cells of the cortex of the lower part of the precentral gyrus, they pass through the knee of the internal capsule and through the brain stem, then enter the bridge and, passing to the other side, end in the motor nuclei of the opposite side, forming a decussation. A small part of the fibers ends without decussation.

Since all motor fibers are collected in a small space in the internal capsule (the knee and the anterior two-thirds of its posterior leg), if they are damaged in this place, unilateral paralysis (hemiplegia) of the opposite side of the body is observed.

3. Cortical-bridge path, tractus corticopontini - paths from the cerebral cortex to the nuclei of the bridge. They come from the cortex of the frontal lobe (tractus frontopontinus), occipital (tractus occipitoppntinus), temporal (tractus temporopontinus) and parietal (tractus parietopontinus). As a continuation of these pathways, fibers from the nuclei of the bridge go to the cerebellum as part of its middle legs. Using these pathways, the cerebral cortex has an inhibitory and regulatory effect on the activity of the cerebellum.

The conductive path of the vestibular (statokinetic) analyzer ensures the conduction of nerve impulses from the hair sensory cells of the ampulla scallops (ampullae of the semicircular ducts) and spots (elliptical and spherical sacs) to the cortical centers of the cerebral hemispheres. The bodies of the first neurons of the statokinetic analyzer lie in the vestibule node, located at the bottom of the internal auditory meatus. The peripheral processes of the pseudounipolar cells of the vestibular ganglion terminate on the hairy sensory cells of the ampullar ridges and spots. The central processes of pseudounipolar cells in the form of the vestibular part of the vestibulocochlear nerve, together with the cochlear part, enter the cranial cavity through the internal auditory opening, and then into the brain to the vestibular nuclei lying in the vestibular field, area vesribularis of the rhomboid fossa.

The ascending part of the fibers ends on the cells of the superior vestibular nucleus (Bekhterev *) The fibers that make up the descending part end in the medial (Schwalbe **), lateral (Deiters ***) and lower Roller ****) vestibular nuclei pax * Bekhterev V M (1857 - 1927) Russian neuropathologist and psychiatrist. He graduated from the St. Petersburg Medical and Surgical Academy in 1878 Since 1894 he headed the Department of Neuropathology and Psychiatry of the Military Medical Academy In 1918 he founded the institute for the study of the brain and mental activity ** Schwalbe Gustav Albert (1844-1916) - a German anatomist and anthropologist. Born in Caedlingburg. He studied medicine in Berlin, Zurich and Bonn. He was engaged in histology and physiology of muscles, morphology of the lymphatic and nervous systems, sensory organs. Author of "Textbook on neurology" (1881) *** Deiters Otto (Deiters Otto Friedrich Karl 1844-1863) - German anatomist and histologist. Born in Bonn. He received his medical education in Berlin. He worked as a doctor in Bonn, and then was elected professor of anatomy and histology at Bonn University. He studied the subtle structure of the brain. organ of hearing and balance, comparative anatomy of the central nervous system. first described the reticulum of the brain and proposed the term "network reticular formation" **** Roller H.F. (Roller Ch.FW) - German psychiatrist. comparative anatomy of the central nervous system. first described the reticulum of the brain and proposed the term "network reticular formation" **** Roller H.F. (Roller Ch.FW) - German psychiatrist. comparative anatomy of the central nervous system. first described the reticulum of the brain and proposed the term "network reticular formation" **** Roller H.F. (Roller Ch.FW) - German psychiatrist.

Innervating the muscles of the eyeball, which allows you to maintain the direction of gaze, despite changes in the position of the head. Maintaining the balance of the body largely depends on the coordinated movements of the eyeballs and the head. The axons of the cells of the vestibular nuclei form connections with the neurons of the reticular formation of the brain stem and with the nuclei of the tegmentum of the midbrain.

The appearance of vegetative reactions (decrease in heart rate, drop in blood pressure, nausea, vomiting, blanching of the face, increased peristalsis of the gastrointestinal tract, etc.) in response to excessive irritation of the vestibular apparatus can be explained by the presence of connections between the vestibular nuclei through the reticular formation with the nuclei of the vagus and Glossopharyngeal nerves Conscious determination of the position of the head is achieved by the presence of connections between the vestibular nuclei and the cerebral cortex. In this case, the axons of the cells of the vestibular nuclei pass to the opposite side and are sent as part of the medial loop to the lateral nucleus of the thalamus, where they switch to III neurons Axons of III neurons pass through the posterior part of the posterior legs of the internal capsule and reach the cortical nucleus of the stato-kinetic analyzer,which is scattered in the cortex of the superior temporal and postcentral gyri, as well as in the superior parietal lobule of the cerebral hemispheres. The defeat of the vestibular nuclei of the nerve and the labyrinth is accompanied by the appearance of the main symptoms of dizziness, nystagmus (rhythmic twitching of the eyeballs), disorders of balance and coordination of movements.

VERIFICATION QUESTIONS

1. What are the routes?

A. From white matter
B. From gray matter
C. From the sum of nerve fibers
D. From neurons and brain stems
E. From fibers to the spinal cord

2. What are the projection route groups?

A. Aspiring and central
B. Sensitive, moving, intersecting
C. Between the cortex and the brain
D. Intersecting and non-intersecting
E. Afferent-sensory, efferent-motor

3. What are the groups of efferent pathways?
A. Skin and deep sensory pathways
B. Extraceptive, intraceptive, motor pathways
C. Extraceptive, proprioceptive and interoceptive pathways
D. The brain and cortical pathways
E. Skin analyzer and pathways

4. What do sensory pathways have in common?
A. All of them intersect and consist of II neurons
B. Their I neuron is located in the spinal ganglion.
C. Sensory pathways are made up of four neurons.
D. Neurons I and II are located in the spinal cord.
E. These are III neurons, and they all intersect

5. Where is the first neuron of the sensory pathways of the skin (pain, pressure) located?
A. In the dorsal horn of the spinal cord
B. In the spinal cord
C. In the anterior horns of the spinal cord
D. In the posterior horn and node
E. In a bulge of vision

6. Where is the first neuron of the cortical-nuclear pathway located?
A. in the nerve endings of the brain
B. The lower part of the anterior ridge is in the cortex.
C. Center front corner
D. The upper part of the frontal lobe is located in the cortex
E. In the temporal cortex

7. Where is the II neuron of the cortical-nuclear pathway located?
A. In a bulge of vision

B. Center front corner
C. In the nuclei of thin and semi-saturated beams
D. In the midbrain and pons
E. At the heart of the brain nerves

8.Where is the first neuron of tractus rubrospinalis located?
A. In the midbrain
B. In the midbrain
C. In the cerebral cortex
D. in the red core
E. On the hill

9. Where is the II neuron of the rubrospinal tract located?
A. In the midbrain
B. In the lateral branches of the spinal cord
C. In the anterior horns of the spinal cord
D. In the nuclei of the elongated brain
E. In the posterior branches of the spinal cord

10. What impulses pass along the path of the pyramid?
A. Impulses of action that do not obey the will
B. Muscle tone regulator
C. Impulses from the brain
D. Coming from the rear central ridge
E. The impulses of action obey the will of man.

Current Security Questions

1. Names of sensory pathways and their types in Latin based on the new anatomical nomenclature.
2. Identification and explanation of exteroceptive, proprioceptive and interoceptive transmission pathways in schemes and models.
3. Physiological significance of sensory pathways.
4. Signs of damage to the sensory pathways due to their anatomical structure.

Practical lesson 7.

Theme: Functional anatomy of the peripheral nervous system. Formation of spinal nerves. Posterior branches of the spinal nerves. Thoracic spinal nerves. Cervical plexus, branches, area of innervation.

Goals and objectives of the lesson:

• Analyze the formation, composition and structure of the spinal nerves.

• Discuss spinal networks (anterior, posterior, meningeal, connective), areas of innervation.

• To study the formation, branches and topography of the intercostal nerves.

• To study the formation, branches and topography of the cervical plexus.

• Zones of innervation of the cervix, as well as innervating muscles and areas of innervation of the skin.

• Demonstrate the formation of the spinal nerves in the preparation, images and diagrams, the direction of the cervical plexus, the connection with the cranial nerves.

• Explain the main anatomical symptoms of damage to the cervical plexus.

• Discuss the formation and topography of the brachial plexus.

• Explain the short and long branches of the brachial plexus and show their areas of innervation.

• Explain the innervation of the muscles and skin of the hand.

• Demonstrate the formation of the brachial plexus, its branches, as well as the intercostal nerves with the help of preparations, drawings and diagrams.

• Explain the main anatomical symptoms of a brachial plexus injury.

In the process of studying the topic, the student learns the following

• pronounces the names of the spinal nerves, intercostal nerves and cervical vertebrae in Latin in accordance with the new anatomical nomenclature.

• understand the formation of spinal nerves and the importance of each branch separately.

• displays neural networks in drugs, pictures and diagrams.

• defines the zone of innervation of the cervical plexus.

• describes the anatomical features of the injury, due to the anatomical structure of the cervical plexus.

• pronounces the name of the shoulder girdle in Latin based on the new anatomical nomenclature.

• knows the formation and topography of the brachial plexus.

• knows the muscles of the brachial plexus and arms, the innervation of the skin.

• shows plexuses on preparations, pictures and diagrams.

Data block:

Peripheral nervous system. Abnormal or somatic nerves. Spinal nerves, nn. spinales Spinal nerves, nn. spinales, arranged in the correct order (neuromeres), corresponding to the myotomes (myomeres) of the body and alternating with segments of the spinal column; each nerve corresponds to a skin area related to it (dermatome).

There are 31 pairs of spinal nerves in humans, namely: 8 pairs of cervical, 12 pairs of thoracic, 5 pairs of lumbar, 5 pairs of sacral and 1 pair of coccygeal. Each spinal nerve departs from the spinal cord with two roots: posterior (sensory) and anterior (motor); both roots are connected into one trunk, truncus n. spinalis, exiting the spinal canal through the intervertebral foramen. Near and somewhat outward from the junction, the posterior root forms a ganglion spinale, in which the anterior motor root does not participate. Due to the connection of both roots, the spinal nerves are mixed nerves: they contain sensory (afferent) fibers from the cells of the spinal nodes, motor (efferent) fibers from the cells of the anterior horn, as well as autonomic fibers from the cells of the lateral horns, emerging from the spinal cord as part of the anterior root. Vegetative fibers are also present in the posterior root. Vegetative fibers that enter the animal nerves through the roots provide such processes in the soma as trophism, vasomotor reactions, etc. In cyclostomes (lampreys), both roots continue into separate nerves - motor and sensory. In the further course of evolution, beginning with transverse-stomes, the roots approach and merge, so that a separate course is preserved only for the roots, and the nerves become mixed.

Each spinal nerve, when leaving the intervertebral foramen, is divided into two parts of the myotome (dorsal and ventral), respectively, into two branches: 1) the posterior, ramus dorsalis, for the autochthonous muscles of the back developing from the dorsal part of the myotome and the skin covering it; 2) anterior, ramus ventralis, for the ventral wall of the trunk and limbs, developing from the ventral parts of myotomes. In addition, two more kinds of branches depart from the spinal nerve: 3) for the innervation of the viscera and blood vessels - connecting branches to the sympathetic trunk, rr. communicantes; 4) for the innervation of the membranes of the spinal cord - r. meningeus, going back through the intervertebral foramen.

The posterior branches, rami dorsales, of all spinal nerves go back between the transverse processes of the vertebrae, bending around their articular processes. All of them (with the exception of I cervical, IV and V sacral and coccygeal) are divided into ramus medialis and ramus lateralis, which supply the skin of the back of the head, back of the neck and back, as well as deep spinal muscles. The posterior branch of the I cervical nerve, n. suboccipital emerges between the occipital bone and the atlas and then divides into branches supplying the mm. recti capitis major et minor, m. semispinalis capitis, mm. obliqui capitis. To skin n. suboccipitalis does not give branches. The posterior branch of the II cervical nerve, n. occipitalis major, emerging between the posterior arch of the atlas and the second vertebra, then pierces the muscles and, having become subcutaneous, innervates the occipital region of the head. Rami dorsales of the thoracic nerves are divided into medial and lateral branches, giving branches to autochthonous muscles; the cutaneous branches of the superior thoracic nerves arise only from the rami mediales, and those of the inferior ones from the rami laterales. Cutaneous branches of the three upper lumbar nerves go to the upper part of the gluteal region called nn. clunium superiores, and the cutaneous branches of the sacral under the name nn. clunium medii.

The anterior branches, rami ventrales, of the spinal nerves innervate the skin and muscles of the ventral wall of the body and both pairs of limbs. Since the skin of the abdomen in its lower part takes part in the development of the external genital organs, the skin covering them is also innervated by the anterior branches. The latter, except for the first two, are much larger than the hind ones. The anterior branches of the spinal nerves retain their original metameric structure only in the thoracic region (nn. intercostales). In the rest of the departments associated with the limbs, during the development of which segmentation is lost, the fibers extending from the anterior spinal branches are intertwined. This is how the nerve plexuses, plexus, are formed, in which the exchange of fibers of various neuromeres takes place. In the plexuses, a complex redistribution of fibers occurs: the anterior branch of each spinal nerve gives its fibers to several peripheral nerves, and therefore each of them contains fibers from several segments of the spinal cord. It is clear, therefore, that the defeat of one or another nerve is not accompanied by a violation of the function of all the muscles that receive innervation from the segments that gave rise to this nerve. Most of the nerves arising from the plexuses are mixed; therefore, the clinical picture of the lesion consists of motor disorders, sensory disorders and autonomic disorders. There are three large plexuses: cervical, brachial and lumbosacral. The latter is divided into lumbar, sacral and coccygeal. is not accompanied by a dysfunction of all muscles that receive innervation from the segments that gave rise to this nerve. Most of the nerves arising from the plexuses are mixed; therefore, the clinical picture of the lesion consists of motor disorders, sensory disorders and autonomic disorders. There are three large plexuses: cervical, brachial and lumbosacral. The latter is divided into lumbar, sacral and coccygeal. is not accompanied by a dysfunction of all muscles that receive innervation from the segments that gave rise to this nerve. Most of the nerves arising from the plexuses are mixed; therefore, the clinical picture of the lesion consists of motor disorders, sensory disorders and autonomic disorders. There are three large plexuses: cervical, brachial and lumbosacral. The latter is divided into lumbar, sacral and coccygeal.

The cervical plexus, plexus cervicalis, is formed by the anterior branches of the four upper cervical nerves (CI - CIV), which are interconnected by three arcuate loops and are located on the side of the transverse processes between the prevertebral muscles with the medial and vertebral (m. scalenus medius m. levator scapulae, m. splenius cervicis) from the lateral side, anastomosing with n. accessorius, n. hypoglossus and truncus sympathicus. In front, the plexus is covered m. sternocleidomastoideus. The branches extending from the plexus are divided into dermal, muscular and mixed. Cutaneous branches of the cervical plexus: 1. N. occipitalis minor (from CII and CIII) to the skin of the lateral part of the occipital region. 2. N. auricularis magnus (from CIII) innervates the auricle and external auditory meatus. 3. N. transversus colli (from CIII-CIV) departs, like the previous two nerves at the middle of the posterior edge of m. sternocleidomastoideus and, rounding the posterior edge of the sternocleidomastoid muscle, goes anteriorly and supplies the skin of the neck. 4. Nn. supraclaviculars (from CIII and CIV) descend into the skin over the pectoralis major and deltoid muscles.

Muscular branches of the cervical plexus. Neck loop, ansa cervicalis Muscular branches:

1. To mm. recti capitis anterior et lateralis, mm. longi capitis et colli, mm. scaleni, m. levator scapulae and finally to mm. intertransversarii anteriores.
2. Radix inferior ansae cervicalis, departs from CII-CIII, passes in front of v. jugularis interna under the sternocleidomastoid muscle and connects with radix superior, extending from n. hypoglossus, forming together with this branch a cervical loop, ansa cervicalis. The fibers of the cervical plexus, through branches extending from the ansa, innervate m. sternohyoideus, m. sternothyroideus and m. omohyoideus.
3. Branches to m. sternocleidomastoideus and m. trapezius (from CIII and CIV), taking part in the innervation of these muscles together with n. accessorius.

Mixed branches of the cervical plexus. Phrenic nerve, n. phrenicus. Topography of the phrenic nerve Mixed branches: N. phrenicus - phrenic nerve (CIII - CIV), descends along m. scalenus anterior down into the chest cavity, where it passes between the subclavian artery and vein. Further right n. phrenicus descends almost vertically in front of the root of the right lung and goes along the lateral surface of the pericardium, towards the diaphragm. Left n. phrenicus crosses the anterior surface of the aortic arch and in front of the root of the left lung passes along the left lateral surface of the pericardium to the diaphragm. Both nerves run in the anterior mediastinum between the pericardium and pleura. N. phrenicus receives fibers from the two lower cervical nodes of the sympathetic trunk. N. phrenicus is a mixed nerve: with its motor branches, it innervates the diaphragm, thus being the nerve that serves breathing; it gives sensitive branches to the pleura and pericardium. Some of the terminal branches of the nerve pass through the diaphragm into the abdominal cavity (nn. phrenicoabdominales) and anastomose with the sympathetic plexus of the diaphragm, sending branches to the peritoneum, ligaments of the liver and to the liver itself, as a result of which a special phrenicus symptom may occur during its disease. With its fibers in the chest cavity, it supplies the heart, lungs, thymus gland, and in the abdominal cavity it is connected with the celiac plexus and through it innervates a number of viscera. as a result of which, with her illness, a special phrenicus symptom may occur. With its fibers in the chest cavity, it supplies the heart, lungs, thymus gland, and in the abdominal cavity it is connected with the celiac plexus and through it innervates a number of viscera. as a result of which, with her illness, a special phrenicus symptom may occur. With its fibers in the chest cavity, it supplies the heart, lungs, thymus gland, and in the abdominal cavity it is connected with the celiac plexus and through it innervates a number of viscera.

VERIFICATION QUESTIONS

1. What are the routes?
F. From white matter
G. From gray matter
H. From the sum of nerve fibers
I. From neurons and brain stems
J. From fibers to the spinal cord

2. What are the projection route groups?
F. Aspiring and central
G. Sensitive, moving, intersecting
H. Between the cortex and the brain
I. Intersecting and non-intersecting
J. Afferent-sensory, efferent-motor

3. What are the groups of efferent pathways?
F. Skin and deep sensory pathways
G. Extraceptive, intraceptive, motor pathways
H. Extraceptive, proprioceptive and interoceptive pathways
I. The brain and cortical pathways
J. Skin analyzer and pathways

4. What do sensory pathways have in common?
F. All of them intersect and consist of II neurons
G. Their I neuron is located in the spinal ganglion.

H. Sensory pathways are made up of four neurons.
I. Neurons I and II are located in the spinal cord.
J. These are III neurons, and they all intersect

5. Where is the first neuron of the sensory pathways of the skin (pain, pressure) located?
F. In the dorsal horn of the spinal cord
G. In the spinal cord
H. In the anterior horns of the spinal cord
I. In the posterior horn and node
J. In a bulge of vision

6. Where is the first neuron of the cortical-nuclear pathway located?
F. in the nerve endings of the brain
G. The lower part of the anterior ridge is in the cortex.
H. Center front corner
I. The upper part of the frontal lobe is located in the cortex
J. In the temporal cortex

7. Where is the II neuron of the cortical-nuclear pathway located?
F. In a bulge of vision
G. Center front corner
H. In the nuclei of thin and semi-saturated beams
I. In the midbrain and pons
J. At the heart of the brain nerves

8. Where is the first neuron of tractus rubrospinalis located?
F. In the midbrain
G. In the midbrain
H. In the cerebral cortex
I. in the red core
J. On the hill

9. Where is the II neuron of the rubrospinal tract located?
F. In the midbrain
G. In the lateral branches of the spinal cord
H. In the anterior horns of the spinal cord
I. In the nuclei of the elongated brain
J. In the posterior branches of the spinal cord

10. What impulses pass along the path of the pyramid?

F. Impulses of action that do not obey the will

G. Muscle tone regulator

H. Impulses from the brain

I. Coming from the rear central ridge

J. The impulses of action obey the will of man.

Current Security Questions

1. Formation and topography of the spinal nerves.
2. Sensitive branches of the cervical plexus
3. Motor branches of the cervical plexus
4. Mixed branches of the cervical plexus
5. Areas of innervation of the cervical plexus: innervation of the skin of the neck
6. formation and topography of the brachial plexus.
7. Supraclavicular and subclavian parts of the brachial plexus.
8. Short branches of the brachial plexus.
9. Long branches of the brachial plexus.
10. Areas of innervation of the shoulder girdle: shoulder girdle, arm muscles and skin.

Practical lesson 8.

Theme: Formation of the brachial plexus, short branches. Long branches of the brachial plexus. Innervation of the skin of the upper limb.

Goals and objectives of the lesson:

• Discuss the formation and topography of the brachial plexus.

• Explain the short and long branches of the brachial plexus and show their areas of innervation.

• Explain the innervation of the muscles and skin of the hand.

• Demonstrate the formation of the brachial plexus, its branches, and the intercostal nerves with medicines, pictures, and diagrams.

• Explain the main anatomical symptoms of a brachial plexus injury.

In the process of studying the topic, the student learns the following

a) formation and topography of the brachial plexus.

b) supraclavicular and subclavian parts of the brachial plexus.

c) short branches of the brachial plexus.

d) long branches of the brachial plexus.

d) areas of innervation of the brachial plexus: shoulder girdle, arm muscles and skin.

Data block:

Brachial plexus, plexus brachidlis, formed by the anterior branches of the four lower cervical (Cv-Cvni), part of the anterior branch of the IV cervical (Civ) and I thoracic (Thi) spinal nerves.

In the interstitial space, the anterior branches form three trunks: the upper trunk, truncus superior, the middle trunk, truncus medius, and the lower trunk, truncus inferior. These trunks from the interstitial space go into a large supraclavicular fossa and stand out here, together with the branches extending from them, as the supraclavicular part, pars supraclaviculdris, of the brachial plexus. The trunks of the brachial plexus, located below the level of the clavicle, are designated as the subclavian part, pars infraclaviculdris, of the brachial plexus. Already in the lower part of the large supraclavicular fossa, the trunks begin to divide and form three bundles, fasciculi, which surround the axillary artery from three sides in the axillary fossa. On the medial side of the artery is the medial bundle, fasciculus medialis, on the lateral side is the lateral bundle, fasciculus lateralis, and behind the artery is the posterior bundle, branches extending from the brachial plexus are divided into short and long. Short branches depart mainly from the trunks of the supraclavicular part of the plexus and innervate the bones and soft tissues of the shoulder girdle. Long branches depart from the subclavian part of the brachial plexus and innervate the free upper limb. Short branches of the brachial plexus. nerve of the scapula, long thoracic, subclavian, suprascapular ^ subscapular, thoraco-spinal nerve, extending from the supraclavicular part of the plexus, as well as the lateral and medial thoracic nerves and the axillary nerve, which originate from the subclavian part of the bundles of the brachial plexus.

1 The dorsal nerve of the scapula, p. dorsalis scapulae, starts from the anterior branch of the V cervical nerve (Cv), lies on the anterior surface of the muscle that lifts the scapula. Then, between this muscle and the posterior scalene muscle, the dorsal nerve of the "scapula" goes back along with the descending branch of the transverse artery of the neck and branches in the muscle that lifts the scapula and the rhomboid muscle.

2 The long thoracic nerve, p. thordcicus longus, originates from the anterior branches of the V and VI cervical nerves (Cv-Cvi). descends behind the brachial plexus, lies on the lateral surface of the anterior dentate muscle between the lateral thoracic artery in front and the thoracic artery behind, innervates the serratus anterior muscle.

3 The subclavian nerve, n. subcldvius (Cv), goes the shortest way to the subclavian muscle in front of the subclavian artery.

4 The suprascapular nerve, n. suprascapuldris (Cv-Cvn), leaves ^ laterally. back. Together with the suprascapular artery, it passes in the notch of the scapula under its superior transverse ligament into the supraspinous fossa, and then under the acromion into the infraspinatus fossa. Innervates the supraspinatus and infraspinatus muscles, the capsule of the shoulder joint.

5 Subscapular nerve, n. subscapuldris (Cv-Cvii); goes along the anterior surface of the subscapularis muscle, innervates this and the large round muscle.

6 The thoracic nerve, n. thoracodorsalts (Cv-Cvn), along the lateral edge of the scapula descends to the latissimus dorsi muscle, which it innervates.

7 Lateral and medial pectoral nerves, nn. pectorales lateralis et medialis, start from. lateral and medial bundles of the brachial plexus (Cv-Thi), go forward, perforate the clavicular-thoracic fascia and end in the large (medial nerve) and small (lateral nerve) pectoral muscles,

8 The axillary nerve, p. axillaris, starts from the posterior brachial plexus (Cv-Cvtn "). On the anterior surface of the subscapularis muscle, it goes down and laterally, then turns back and, together with the posterior circumflex humerus artery, passes through the quadrilateral opening. Having rounded the surgical neck of the humerus bones behind, the nerve lies under the deltoid muscle. The axillary nerve innervates the deltoid and small round muscles, the capsule of the shoulder joint. The final branch of the axillary nerve is the upper lateral cutaneous nerve of the shoulder, n. cutaneus brachii lateralis superior, goes around the posterior edge of the deltoid muscle and innervates the skin covering the posterior surface of this muscle and the skin of the upper posterolateral region of the shoulder.

Long branches of the brachial plexus. Long branches depart from the lateral, medial and posterior bundles of the subclavian part of the brachial plexus.

The lateral thoracic and musculocutaneous nerves, as well as the lateral root of the median nerve, originate from the lateral bundle. The medial thoracic nerve, medial, cutaneous nerves of the shoulder and forearm, ulnar nerve and medial root of the median nerve begin from the medial bundle. The axillary and radial nerves originate from the posterior bundle.

1 The musculocutaneous nerve, n. musculocutdneus, starts from the lateral bundle (Cv-Cvin) of the brachial plexus in the axillary fossa behind the pectoralis minor muscle. The nerve goes laterally and downwards, pierces the brachiocatorial muscle. Having passed through the abdomen of this muscle in an oblique direction, the musculocutaneous nerve is then located between the posterior surface of the biceps brachii and the anterior surface of the brachialis muscle and exits into the lateral ulnar groove. Having provided these three muscles with muscular branches, rr. musculares, as well as the capsule of the elbow joint, the musculocutaneous nerve in the lower part of the shoulder pierces the fascia and descends onto the forearm as the lateral cutaneous nerve of the forearm, n. cutaneus antebrachii lateralis. The terminal branches of this

nerve are distributed in the skin of the anterolateral surface of the forearm up to the elevation of the thumb.

2 The median nerve, n. medianus, is formed by the fusion of two roots of the subclavian part of the brachial plexus - lateral, radix lateralis (Cvi-Cvn), and medial, radix medialis (Sush-Thi), which merge on the anterior surface of the sub-muscular artery, covering it on both sides in the form of a loop. The nerve accompanies the axillary artery, in the axillary fossa, and then is adjacent to the brachial artery in the medial brachial groove. Together with the brachial artery in the cubital fossa, the nerve passes under the aponeurosis of the biceps brachii muscle, where it gives off branches to the elbow joint. On the forearm, having passed between the two heads of the pronator teres, the median nerve passes under the superficial flexor of the fingers, lies between the last and / deep flexor of the fingers, reaches the wrist joint and goes to the palm. It does not give branches on the shoulder. On the forearm, it innervates with its muscle branches, rr. musculares, a number of muscles: round and square pronators, superficial flexor of the fingers, long flexor of the thumb, long palmar muscle, radial flexor of the wrist, deep flexor of the fingers, (lateral Chshst), i.e. all muscles of the anterior. (flexion) surface of the forearm, except for the ulnar flexor of the hand and the medial part of the deep flexor of the fingers. The largest branch of the median nerve on the forearm is the anterior interosseous nerve, n. interosse-us anterior, which runs along the anterior surface of the interosseous membrane along with the anterior interosseous artery. This branch innervates the deep muscles of the anterior surface of the forearm and gives a branch to the anterior part of the wrist joint. On the palm of the hand, the median nerve passes through the carpal canal along with the flexor tendons of the fingers and divides under the palmar aponeurosis into terminal winds. On the hand, the median nerve with its branches innervates the following muscles: the short abductor muscle of the thumb, the muscle that opposes the pain of the second finger, the superficial head of the short flexor of the thumb, and the first and second worm-like muscles. Even before entering the carpal canal, the median nerve gives off a small palmar branch of the median nerve, r. palmdris n. medidni, which innervates the skin in the area of the wrist joint (anterior surface), the elevation of the thumb and in the middle of the palm. opposing pain th finger, superficial head of the short flexor of the thumb, as well as the first and second worm-like muscles.

Even before entering the carpal canal, the median nerve gives off a small palmar branch of the median nerve, r. palmdris n. medidni, which innervates the skin in the area of the wrist joint (anterior surface), the elevation of the thumb and in the middle of the palm. opposing pain th finger, superficial head of the short flexor of the thumb, as well as the first and second worm-like muscles. Even before entering the carpal canal, the median nerve gives off a small palmar branch of the median nerve, r. palmdris n. medidni, which innervates the skin in the area of the wrist joint (anterior surface), the elevation of the thumb and in the middle of the palm.

The terminal branches of the median nerve are the three common palmar "'digital nerves,' pp, digitales palmares communes.

They are located along the first, second, third intermetacarpal spaces under the superficial (arterial) palmar arch and palmar aponeurosis. The first common palmar digital nerve supplies the first vermiform muscle, and also gives off three cutaneous branches - the proper palmar digital nerves, pp. digitales palmares proprii. Two of them go along the radial and ulnar sides of the thumb, the third - along the radial side of the index finger, innervating the skin of these areas of the fingers. The second and third common palmar digital nerves give two of their own palmar digital nerves, going to the skin of the surfaces of the II, III and LN fingers facing each other, as well as to the skin of the dorsal surface of the distal and middle phalanges of the II and III fingers. In addition, the second vermiform muscle is innervated from the second common palmar digital nerve.

3. The elbow of the nerve in, n. ulnaris, starts from the medial bundle of the brachial plexus at the level of the pectoralis minor muscle! At first, it "is located next to the median nerve and the brachial artery: Then, in the middle of the shoulder, the nerve leaves medially and backward, pierces the medial intermuscular septum of the shoulder, reaches the posterior surface of the medial epicondyle of the shoulder, where it is located in the ulnar groove. Next, the ulnar nerve passes into the ulnar groove of the forearm, where it accompanies the artery of the same name., In the lower third of the forearm, the dorsal branch departs from the ulnar nerve, r. the branch of the ulnar nerve, together with the ulnar artery, passes into the palm ";;; through a gap in the medial part of the flexor retinaculum (retinaculum flexorum).

Between it and the short palmar muscle it is divided into a superficial branch, r. superficia'is, and a deep branch, r. profundus.

Like the median nerve, the ulnar nerve on the shoulder does not give branches. On the forearm, the ulnar nerve innervates the ulnar flexor of the hand and the medial part of the deep flexor of the fingers, giving ^ to them. 'Muscular branches, rr. mustuldres4 as well as the elbow joint. L \ I lnaya, branch of the ulnar nerve goes to the back surface of the forearm between the ulnar flexor, hand and ulna. Perforating the dorsal fascia of the forearm at the level of the head of the ulna, this branch goes to the dorsal surface of the hand, where it divides into three, and the last into five, dorsal digital nerves, n. digitdies dorsales. These nerves innervate the skin of the dorsal surface of the V, IV and ulnar side of the III fingers. On the palmar surface of the hand, the superficial branch of the ulnar nerve innervates the short palmar muscle, gives off its own palmar digital nerve, n. digitalis palmaris prqprius, to the skin of the ulnar edge of the fifth finger and the common palmar digital nerve, n. digitalis palmaris communis, which runs along the fourth, intermetacarpal space. Further, it is divided into two own palmar digital nerves, innervating the skin of the radial edge of the V and the ulnar edge. IV fingers. The deep branch of the ulnar nerve first accompanies the deep branch of the ulnar artery and then the deep (arterial) palmar arch. It innervates all the muscles of the hypothenar (the short flexor of the little finger, the abductor and opposing muscles of the little finger), the dorsal and palmar interosseous muscles, as well as the adductor muscle of the thumb, the deep head of its short flexor, the 3rd and 4th. worm-like muscles and joints of the hand. Further, it is divided into two own palmar digital nerves, innervating the skin of the radial edge of the V and the ulnar edge. IV fingers. The deep branch of the ulnar nerve first accompanies the deep branch of the ulnar artery and then the deep (arterial) palmar arch. It innervates all the muscles of the hypothenar (the short flexor of the little finger, the abductor and opposing muscles of the little finger), the dorsal and palmar interosseous muscles, as well as the adductor muscle of the thumb, the deep head of its short flexor, the 3rd and 4th. worm-like muscles and joints of the hand. Further, it is divided into two own palmar digital nerves, innervating the skin of the radial edge of the V and the ulnar edge. IV fingers. The deep branch of the ulnar nerve first accompanies the deep branch of the ulnar artery and then the deep (arterial) palmar arch. It innervates all the muscles of the hypothenar (the short flexor of the little finger, the abductor and opposing muscles of the little finger), the dorsal and palmar interosseous muscles, as well as the adductor muscle of the thumb, the deep head of its short flexor, the 3rd and 4th. worm-like muscles and joints of the hand.

4 The medial cutaneous nerve of the shoulder, n. cutaneus brachii medialis, starts from the medial bundle (Cvin-Thi) of the brachial plexus, accompanies the brachial artery. Two - three branches perforate the axillary fascia and fascia of the shoulder and innervates the skin of the medial surface of the shoulder. At the base of the axillary fossa, the medial cutaneous nerve of the shoulder connects to the lateral cutaneous branch of the II, and in some cases III intercostal nerves, forming the intercostal-brachial nerves, pp. intercosiobrachidles.

5. Approximately in the middle of the shoulder, where the medial saphenous vein of the arm pierces the fascia of the shoulder, the medial cutaneous nerve emerges from under the fascia and descends under the skin to the forearm, where it innervates the skin of its anteromedial surface.

6 Radial not p in, n. radialis starts from the posterior bundle (Cv-Cvin) of the brachial plexus at the level of the lower edge of the pectoralis minor muscle between the axillary artery and the subscapularis muscle. Together with the deep artery, the brachiol radial nerve passes through the so-called brachio-muscular canal, goes around the humerus and leaves the canal in the lower third of the shoulder on its lateral side. Further, the nerve pierces the lateral intermuscular septum of the shoulder and goes down between the shoulder muscle and the beginning of the brachioradialis muscle. At the level of the elbow joint, the radial nerve divides into superficial and deep branches.

The radial nerve goes to the anterior forearm. The forearm goes down to the radial. groove, located outward from the radial artery. In the lower third of the forearm, the superficial branch passes to the dorsum of the forearm between the brachialis muscle and the radius and pierces the fascia of the forearm. 4-5 cm above the level of the styloid process of the radius, this branch gives off branches to the skin of the dorsal (dorsal) and lateral sides of the base of the thumb and is divided into five dorsal digital nerves, nn. digitdles dorsdles. Two of these nerves go to the radial and ulnar surfaces of the thumb and innervate its skin from the back. The remaining three digital nerves branch in the skin of the II and radial side of the III fingers, at the level of the proximal (basic) phalanx. Skin on the back.

Deep branch, Mr. profundus, The radial nerve from the anterior lateral ulnar sulcus enters the thickness of the arch support muscle, penetrates to the neck of the radius, which it goes around from the lateral side, and innervates all the muscles on the back of the forearm. Its final and longest branch is the posterior interosseous nerve, n. interosseus pos- ^ terior, which accompanies the posterior interosseous artery and gives off branches to nearby muscles.

On the shoulder, the radial nerve innervates the muscles of the posterior group of the shoulder (the triceps muscle of the shoulder and the ulna muscle) and the bag of the shoulder joint. In the axillary fossa, the posterior cutaneous nerve of the shoulder departs from the radial nerve, p. cutaneus brachii posterior, goes posteriorly, penetrates the long head of the triceps muscle of the shoulder, pierces the fascia of the shoulder near the tendon of' the deltoid muscle and branches in the skin of the posterolateral surface of the shoulder.

In the brachial canal, the posterior cutaneous nerve of the forearm departs from the radial nerve, p. cutaneus antebrachii posterior, which first accompanies the radial nerve, and then at the lateral intermuscular septum of the shoulder (above the lateral epicondyle) pierces the fascia of the shoulder and innervates the skin of the posterior surface of the lower shoulder and skin posterior surface of the forearm.

TEST QUESTIONS

1. which nerve innervates the chin-hyoid muscle?
A. Plexus cervicalis
B. N. glossopharyngeus
C. N. vagus
D. N. hypoglossus
E. N. facialis

2. What nerve innervates the sterno-thyroid muscle?
A. Ansa cervicalis
B. N. glossopharyngeus
C. N. vagus
D. N. hypoglossus

E. N. trigeminus

3. What innervates the diaphragmatic nerve in the chest cavity?
A. Pericardium, pleura, diaphragm, thymus
B. Intrinsic intercostal muscles
C. External intercostal muscles
D. Thymus gland, mediastinal lymph nodes, thoracic wall muscles
E. Esophagus, diaphragm, thymus, thoracic wall muscles

4. What is innervated by the supraclavicular nerve?
A. The skin above the pectoralis major and deltoid muscles
B. Subcutaneous muscle in the neck
C. Subclavian muscle
D. Supraclavicular skin, subclavicular muscle
E. The pectoral major muscle and the skin above it

5. What innervates the great ear nerve?
A. Auricle and external auditory canal.
B. Parotid gland
C. Occipital skin and muscles
D. Straight neck muscles, auricle muscles
E. The sternocleidomastoid muscle and the skin above it

6. Which muscle is innervated by the cervical loop?
A. M. thyrohyoideus
B. M. sternocleidomastoideus
C. M. scalenus anterior
D. M. scalenus medius
E. M. scalenus posterior

7. Which muscle is innervated by the muscle branches of the cervical plexus?
A. *M. scalenus anterior
B. M. sternocleidomastoideus
C. M. omohyoideus
D. M. sternohyoideus;
E. M. thyrohyoideus

8. What is innervated by the supraclavicular nerve?
A. The skin above the pectoralis major and deltoid muscles.
B. Subcutaneous muscle in the neck
C. Subclavian muscle
D. Supraclavicular skin, subclavicular muscle
E. The pectoral major muscle and the skin above it

9. What innervates the great ear nerve?
A. Auricle and external auditory canal.
B. Parotid gland
C. Occipital skin and muscles
D. Straight neck muscles, auricle muscles
E. The sternocleidomastoid muscle and the skin above it

10. Which muscle is innervated by the muscle branches of the cervical plexus?
A. M. scalenus medius
B. M. sternocleidomastoideus
C. M. omohyoideus
D. M. sternohyoideus
E. M. Thyrohyoideus

Current Security Questions

1. pronounce the name of the brachial plexus in Latin based on the new anatomical nomenclature.
2. indicate the formation and topography of the brachial plexus.
3. name the muscles of the brachial plexus and arms, innervation of the skin.
4. show plexuses on preparations, drawings and diagrams.
5. show the areas of innervation of the brachial plexus, as well as the anatomical signs of injury, due to its anatomical structure.

Practical lesson 9.

Theme: Formation of the lumbar, sacral and coccygeal plexus, branches, area of innervation. Innervation of the skin of the foot.

Goals and objectives of the lesson:

• Discuss the formation and topography of the lumbar plexus.

• Explain the branches of the lumbar plexus and show their areas of innervation.

• Explain the innervation of the abdominal muscles and skin.

• Demonstrate the formation and network of the lumbar plexus with slides, drawings and diagrams.

• Explain the main anatomical symptoms of a spinal cord injury.

• Discuss the formation and topography of the lumbar plexus.

• Explain the short and long branches of the sacral plexus and show their areas of innervation.

• Explain the innervation of the muscles and skin of the legs.

• Demonstrate the formation of the sacral plexus on the preparation, drawings and diagrams, show its branches.

• Explain the main anatomical symptoms of sacral plexus injury.

In the process of studying the topic, the student learns the following

you have to be able to show.

• Knows how to pronounce the name of the lumbar vertebrae in Latin based on the new anatomical nomenclature.

• Knows the formation and topography of the lumbar vertebrae.

• Knows the innervation of the abdominal muscles and skin.

• Able to display lumbar networks in drugs, pictures and diagrams.

• Knows and shows the areas of innervation of the lumbar vertebrae, as well as determine the anatomical signs of injury, due to their anatomical structure.

• Can pronounce the name of the dorsal fin in Latin based on the new anatomical nomenclature.

• Knows dome formation and topography.

• Knows leg muscles, skin innervation.

• Able to show bumps on drugs, images and diagrams.

• Knows and shows the areas of innervation of the spinal cord, as well as determine the anatomical features of the injury in connection with its anatomical structure.

Data block:

Lumbar plexus, plexus lumbalis, formed by the anterior branches of the three upper lumbar (Li-Lin), part of the anterior branch of the XII thoracic (Thxn), as well as the anterior branch of the IV lumbar (Liv) spinal nerves. Another part of the anterior branch of the IV lumbar spinal nerve descends into the pelvic cavity, forming, together with the anterior branch of the V lumbar nerve (Lv), the lumbosacral trunk. The lumbar plexus is located anterior to the transverse processes of the lumbar vertebrae in the thickness of the psoas major muscle and on the anterior surface of the square muscle of the lower back. Branches emerging from the lumbar plexus appear from under the lateral edge of the psoas major muscle or pierce it in the lateral direction and then follow to the anterior abdominal wall, to the lower limb and external genitalia.

1 Muscular branches, rr. musculares, short, start from all the anterior branches, forming a plexus even before they are connected to each other, and go to the square muscle of the lower back, the large and small lumbar muscles and the transverse lateral muscles of the lower back.

2 The iliohypogastric nerve, n. iliohypogastricus (Thxn - Li), emerges from the plexus behind the psoas major muscle or from its thickness and goes laterally and downward along the anterior surface of the square muscle of the lower back, parallel to the hypochondrium nerve. First located on the inner surface of the transverse abdominal muscle, the ilio-hypogastric nerve pierces this muscle above the iliac crest and goes to the rectus abdominis muscle between its transverse and internal oblique muscles. The iliac-hypogastric nerve innervates the transverse and rectus abdominis muscles, the internal and external oblique abdominal muscles, as well as the skin in the upper lateral part of the gluteal region, the upper lateral thigh region, where its lateral cutaneous branch, r. cutaneus lateralis, is directed. Anterior cutaneous branch, cutaneus anterior.

3. The ilioinguinal nerve, n. ilioinguinalis (Thxn - Liv), runs almost parallel to the ilio-hypogastric nerve, located downward from the latter. It is located between the opercular and internal oblique muscles of the abdomen, then enters the inguinal canal, where it lies anterior to the spermatic cord or round ligament of the uterus (in women). Coming out

through the external opening of the inguinal canal, the nerve ends in the skin of the pubis, the scrotum - the anterior scrotal nerves, pp. scrotales anteriores, or large lips - anterior labial nerves, pp. la-biales anteriores (in women). The ilioinguinal nerve is innervated by m. transversus abdominis, mm. obliqui abdominis internus et externus, skin of the pubis and inguinal region, skin of the root of the penis and anterior scrotum (skin of the labia majora).

4 The femoral-genital nerve, n. genitofemordlis (Li - Ln), pierces the psoas major muscle and appears on the anterior surface of this muscle at the level of the III lumbar vertebra. In the thickness of the psoas major muscle or after leaving it, the genitofemoral nerve is divided into two branches: the genital branch, r. genitalis, and the femoral branch, r. femoralis. sexual branchlocated in front of the external iliac artery, then enters the inguinal canal, where it passes behind the spermatic cord or round ligament of the uterus. In men, this branch innervates the muscle that lifts the testis, the skin of the scrotum and the fleshy membrane, the skin of the upper medial surface of the thigh. In women, the genital branch branches into the round ligament of the uterus, the skin of the labia majora, and the area of the subcutaneous fissure (outer ring) of the femoral canal. femoral branchpasses to the thigh through the vascular lacuna, located on the anterolateral surface of the femoral artery, perforates the cribriform fascia and innervates the skin in the subcutaneous fissure of the femoral canal and under the inguinal ligament (upper part of the femoral triangle).

5 The lateral cutaneous nerve of the thigh, p. cutaneus femoris laterdlis (Li-Lh), emerges from under the lateral edge of the psoas muscle or perforates it and lies on the anterior surface of this muscle. The nerve runs laterally and down the anterior surface of the iliac muscle (under its fascia) and approaches the inguinal ligament at its attachment to the anterior superior iliac spine. Further, this nerve passes under the lateral part of the inguinal ligament to the thigh, where it is first located in the thickness of the broad fascia of the thigh, and then goes under the skin and divides into terminal branches. One branch of the lateral cutaneous nerve of the thigh innervates the skin of the posterior surface of the gluteal region, the other - the skin of the lateral surface of the thigh to the level of the knee joint.

6 The obturator nerve, n. obturatorius (Ln-Uv), is the second largest branch of the lumbar plexus. The nerve descends along the medial edge of the psoas major muscle, crosses the anterior surface of the sacroiliac joint, goes forward and outward, and joins the obturator artery in the pelvic cavity, located above it. Together with the artery and vein of the same name, the obturator nerve passes through the obturator canal to the thigh, lies between the adductor muscles, giving them muscle branches, rr. musculares, and is divided into terminal branches: the anterior branch, r. anterior, and the posterior branch, r. posterior.

The anterior branch is located between the short and long adductor muscles, innervates these muscles, as well as the comb and thin muscles, and gives the skin branch, r. cutaneus, to the skin of the medial surface of the thigh. The posterior branch of the obturator nerve runs behind the adductor brevis and innervates the obturator externus, adductor magnus, and hip joint capsule.

7 The femoral nerve, n. femoralis (Li-Liv), is the largest branch of the lumbar plexus. It usually begins with three roots, which first go in the thickness of the psoas major muscle. At the level of the transverse process of the V lumbar vertebra, these roots merge and form the trunk of the femoral nerve, which is much larger than the other branches of the lumbar plexus. Further down, the femoral nerve is located under the iliac fascia in the groove between the psoas major and iliac muscles. The nerve enters the thigh through the muscle gap, then in the femoral triangle it is located laterally from the femoral vessels, being covered with a deep sheet of the wide fascia of the thigh.

Slightly below the level of the inguinal ligament, the femoral nerve divides into terminal branches: muscular, rr. musculares, anterior dermal, rr. cutanei anteriores, and saphenous nerve, n. saphenus

Muscular branches of the femoral nerve innervate m. sartorius, t. quadriceps femoris, m. pectineus. Anterior cutaneous branches in an amount of 3 to 5 perforate the fascia lata of the thigh and innervate the skin of the anterior medial surface of the thigh.

Saphenous nerve, n. saphenus, is the longest branch of the femoral nerve. In the femoral triangle, the saphenous nerve is initially located laterally from the femoral artery, and then passes to its anterior surface and, together with the artery, enters the adductor canal. Together with the descending genicular artery, the nerve exits the canal through its anterior opening (tendon gap) and lies under the sartorius muscle. Then the saphenous nerve descends between the adductor muscle and the vastus medialis muscle of the thigh, pierces the wide fascia of the thigh at the level of the knee joint and gives off the subpatellar branch, r. infrapatellaris. The subpatellar branch is directed forward and laterally and innervates the skin in the area of the medial surface of the knee joint, the patella and the anterior surface of the upper leg. In the place where the saphenous nerve goes' next to the great saphenous vein, the medial cutaneous branches of the lower leg, rr. cutanei cruris mediates, which innervate the skin of the anteromedial surface of the leg. On the foot, the saphenous nerve runs along its medial edge and innervates the adjacent areas of the skin up to the big toe. sacral plexus, plexus sacralis, formed by the anterior branches of the V lumbar (Lv). the upper four sacral (Si-Siv) and part of the anterior branch of the IV lumbar (Lfv) spinal nerves. The anterior branch of the V lumbar spinal nerve, as well as the part of the anterior branch of the IV lumbar nerve that joins it, forms the lumbosacral trunk, truncus lumbosacralis. It descends into the pelvic cavity and, on the anterior surface of the piriformis muscle, connects with the anterior branches of the I, II, III and IV sacral spinal nerves. In general, the sacral plexus resembles a triangle in shape, the base of which is located at the pelvic sacral openings, and the apex is at the lower edge of the large sciatic foramen, through which the largest branches of this plexus exit the pelvic cavity. The sacral plexus is located between two connective tissue plates.

The branches of the sacral plexus are divided into short and long. Short branches end in the pelvic girdle, long branches go to the muscles, joints, skin of the free part of the limb.

Short branches of the sacral plexus.The short branches of the sacral plexus include the internal obturator and piriformis nerves, the quadratus femoris nerve, the superior and inferior gluteal nerves, and the pudendal nerve.

First three nerves:

1. N. {musculi obturatdrii interni] obtura-torius internus (Liv-Si);
2. N. [musculi] piriformis (Si-Sn);
3. N. musculi quadrdti femoris (Li-Siv), are sent to the muscles of the same name through the piriformis opening.

4 The superior gluteal nerve, n. gluteus superior (Liv-Lv, Si), exits the pelvic cavity through the suprapiriform opening together with the superior gluteal artery and next to the vein of the same name into the gluteal region, where it passes between the small and middle gluteal muscles. Innervates the middle and small gluteal muscles, as well as the muscle that strains the wide fascia of the thigh.

5 The lower gluteal nerve, n. gluteus inferior (Lv, Si-Sn), is the longest nerve among the short branches of the sacral plexus. From the pelvic cavity, this nerve exits through the subpiriform opening along with the artery of the same name and next to the vein, sciatic nerve, posterior cutaneous nerve of the thigh, and pudendal nerve. Branches of the inferior gluteal nerve lead to the gluteus maximus muscle.

6. The pudendal nerve, n. pudendus (Si-Siv), leaves the pelvic cavity through the piriform opening, goes around the sciatic spine behind and enters the ischiorectal fossa through the small sciatic foramen. In the ischiorectal fossa, this nerve lies on its lateral wall, goes forward in the thickness of the fascia covering the obturator internus muscle, and divides into terminal branches.

In the sciatic-rectal fossa, the pudendal nerve departs: lower rectal nerves, pp. reddles inferiores, heading to the external sphincter of the anus and to the skin in the anus; perineal nerves, nn. perineales, which innervate mm. ischiocavernosus, bulbospongiosus, transversi perinei (superficialis et profundus), the skin of the perineum, as well as the skin of the posterior surface of the scrotum in men - the posterior scrotal nerves, nn. scrotdles posteriores, or labia majora - posterior labial nerves, nn. labiates posteriores, in women. The final branch of the pudendal nerve - the dorsal nerve of the penis (clitoris), n. dorsalis penis (clitoridis), together with the dorsal artery of the penis (clitoris) passes through the urogenital diaphragm and follows to the penis (clitoris). This nerve gives branches to the cavernous bodies, the head of the penis (clitoris),

Long branches of the sacral plexus.The long branches of the sacral plexus include the posterior femoral cutaneous nerve and the sciatic nerve.

1 The posterior cutaneous nerve of the thigh, p. cutaneus femoris posterior (Si-Sin), is a sensitive branch of the sacral plexus. After leaving the pelvic cavity through the subpiriform opening, the nerve goes down and exits from under the lower edge of the gluteus maximus muscle approximately halfway between the greater trochanter and the ischial

tuberosity. On the thigh, the nerve is located under the broad fascia, in the groove between the semitendinosus and biceps femoris. Its branches pierce the fascia and branch out in the skin of the posteromedial surface of the thigh up to the popliteal fossa.

At the lower edge of the gluteus maximus muscle, the lower nerves of the buttocks depart from the posterior cutaneous nerve of the thigh, pp. [gg.] clunium inferiores, which go around the edge of this muscle and innervate the skin of the gluteal region. Perineal branches, rr. perineales, go to the skin of the perineum.

2 The sciatic nerve, n. ischiadicus (Liv - Lv), (Si - Sin), is the largest nerve of the human body. In its formation, the anterior branches of the sacral and two lower lumbar nerves take part, which, as it were, continue into the sciatic nerve. The sciatic nerve enters the gluteal region from the pelvic cavity through the subpiriform opening. Then it goes down, first under the gluteus maximus, then between the adductor maximus and the long head of the biceps femoris. In the lower part of the thigh, the sciatic nerve is divided into two branches: a larger medial branch - the tibial nerve, n. tibialis, and a thinner lateral branch - the common peroneal nerve, n. peroneus [fibu-Idris] communis. Often the division of the sciatic nerve into two terminal branches occurs in the upper third of the thigh or even directly at the sacral plexus,

In the pelvic region and on the thigh, muscle branches depart from the sciatic nerve to the obturator internus and gemelli muscles, to the quadratus femoris, the semitendinosus and semimembranosus muscles, the long head of the biceps femoris, and the posterior part of the adductor magnus. sciatic nerve, n. ischiadicus (Liv - Lv), (Si - Sin), is the largest nerve of the human body. In its formation, the anterior branches of the sacral and two lower lumbar nerves take part, which, as it were, continue into the sciatic nerve. The sciatic nerve enters the gluteal region from the pelvic cavity through the subpiriform opening. Then it goes down, first under the gluteus maximus, then between the adductor maximus and the long head of the biceps femoris. In the lower part of the thigh, the sciatic nerve is divided into two branches: a larger medial branch - the tibial nerve, n. tibialis, and a thinner lateral branch - the common peroneal nerve, n. peroneus [fibu-Idris] communis. Often the division of the sciatic nerve into two terminal branches occurs in the upper third of the thigh or even directly at the sacral plexus, In the pelvic region and on the thigh, muscle branches depart from the sciatic nerve to the obturator internus and gemelli muscles, to the quadratus femoris, the semitendinosus and semimembranosus muscles, the long head of the biceps femoris, and the posterior part of the adductor magnus. tibial nerve, n. tibialis,is a continuation of the trunk of the sciatic nerve on the lower leg and is larger than its lateral branch. In the popliteal fossa, the tibial nerve is located in the middle, directly under the fascia, behind the popliteal vein. At the lower angle of the popliteal fossa, it goes on the popliteal muscle between the medial and lateral heads of the gastrocnemius muscle, together with the posterior tibial artery and vein, passes under the tendon arch of the soleus muscle and goes to the tarsal-popliteal canal. In this canal, the tibial nerve descends and, leaving it, is located behind the medial malleolus under the flexor retinaculum. Here the tibial nerve divides into its terminal branches: the medial and lateral plantar nerves.

The medial plantar nerve, n. plantdris medialis, is larger than the lateral one. It runs along the medial edge of the flexor digitorum brevis tendon in the medial plantar sulcus, accompanied by the medial plantar artery. At the level of the base of the metatarsal bones, it gives off its first plantar digital nerve, n. digitalis plantdris proprius, to the skin of the medial edge of the foot and thumb, as well as three common digital nerves, n. digitalis plantdris communes, which lie under the plantar aponeurosis and accompanied by plantar metatarsal arteries go towards the first three interdigital spaces. Each of these three nerves at the level of the base of the fingers divides into two proper plantar digital nerves, n. digitdles plantdres proprii, which innervate the skin of the sides of the I-IV fingers facing each other.

Lateral plantar nerve, n. plantaris laterlis, is located between the square muscle of the sole and the short flexor of the fingers and runs in the lateral plantar groove along with the lateral plantar artery. At the proximal end of the IV intermetatarsal space, this nerve divides into superficial and deep branches. The superficial branch, r. superficialis, gives off its own plantar digital nerve, n. digitalis plantaris proprius, which innervates the skin of the plantar side of the lateral surface of the fifth finger. In the medial direction, the common plantar digital nerve departs from this branch, n. digitalis plantaris communis, which, having divided into two own plantar digital nerves, n. digitdles plantares prdprii, innervates the skin of the sides of the fourth and fifth toes facing each other. Deep branch, Mr. profundus, accompanies the arterial arch and innervates the interosseous muscles, the 3rd and 4th worm-like muscles, the adductor thumb muscle, and the lateral head of the short flexor thumb. The medial and lateral plantar nerves also innervate the joints of the foot. In addition, muscle branches go from the lateral plantar nerve to the square muscle of the sole, the short flexor of the little finger, and to the muscle that removes the little finger.

Lateral branches of the tibial nerve are muscular branches starting from this nerve in the region of the popliteal fossa and on the lower leg. In the popliteal fossa, muscle branches depart from the tibial nerve, rr. musculares, to the triceps muscle of the lower leg, plantar and popliteal muscles, a sensitive branch to the knee joint, as well as the medial cutaneous nerve of the calf. On the lower leg, the muscular branches of the tibial nerve innervate the posterior tibial muscle, the long flexor of the thumb and the long flexor of the toes.

Medial cutaneous nerve of calf, n. cutdneus surae medidlis, departs from the tibial nerve in the popliteal fossa. Initially, it is located under the fascia on the back of the lower leg, and then - in the splitting of this fascia between the heads of the gastrocnemius muscle, next to the small saphenous vein. In the lower part of the lower leg, the nerve pierces the fascia and exits under the skin and innervates it on the medial part of the posterior surface of the lower leg. At this level, the lateral calf cutaneous nerve, which is the cutaneous branch of the common peroneal nerve, approaches and connects to the medial cutaneous nerve of the calf. As a result of this connection, the sural nerve, n. su-rdlis, is formed, running first behind the lateral malleolus, and then along the lateral edge of the foot.

The sural nerve innervates the skin of the lateral part of the calcaneal region, the lateral edge of the rear of the foot, and the skin of the lateral side of the little finger. Branches of the sural nerve leading to the calcaneus areas, received the name of lateral calcaneal branches, rr. calcdnei laterdles, and the final branch of the sural nerve, heading to the lateral edge of the foot, is the lateral dorsal cutaneous nerve, p. cutdneus dorsdlis laterdlis.

common peroneal nerve, n. peroneus [fibularis] communis,having separated from the sciatic nerve in the lower part of the thigh (or in the upper part of the popliteal fossa), it goes down laterally along the inner (medial) edge of the biceps femoris muscle, and then in the groove between the tendon of this muscle and the lateral head of the gastrocnemius muscle. Descending lower, the common peroneal nerve goes around the head of the fibula and, entering the thickness of the long peroneal muscle, divides into two branches - the superficial and deep peroneal nerves. From the common peroneal nerve in the popliteal fossa, the lateral cutaneous nerve of the calf departs, p. cutdneus surae laterlis, which innervates the skin of the lateral side of the lower leg. In the lower third of the leg, this nerve joins the medial cutaneous nerve of the calf to form the sural nerve. The common peroneal nerve also innervates the capsule of the knee joint.

The superficial peroneal nerve, n. peroneus [fibularis] superficialis, goes down and enters the superior musculo-peroneal canal (between the beginning of the long peroneal muscle and the bone of the same name). Then, at the border of the middle and lower thirds of the lower leg, this nerve exits the canal, pierces the fascia of the lower leg, goes to the rear of the foot, where it divides into its terminal branches. One of them is the medial dorsal cutaneous nerve, n. cutdneus dorsdlis medidlis, goes to the medial edge of the foot, where it innervates the skin of this area, the skin of the medial side of the thumb, and the skin of the surfaces of II and III fingers facing each other. Another branch is the intermediate dorsal cutaneous nerve, n. cutdneus dorsdlis intermedius, descends along the anterolateral surface of the foot and is divided into the dorsal digital nerves of the foot, n. digitdles dorsdles pedis.

In the upper muscular peroneal canal, muscle branches, rr, depart from the superficial peroneal nerve. musculares, to the long and short peroneal muscles.

The deep peroneal nerve, n. peroneus [fibularis] profundus, goes forward from the place of division of the common peroneal nerve, pierces the anterior intermuscular septum of the lower leg, the long extensor of the fingers and is adjacent to the anterior tibial artery on the anterior surface of the interosseous membrane of the lower leg. Accompanying the anterior tibial artery, the deep peroneal nerve exits to the rear of the foot (under the lower extensor tendon retinaculum).

At the level of the distal end of the first intermetatarsal space, the deep peroneal nerve divides into two dorsal digital nerves, n. digitdles dorsales, lateral nerve of the big toe, n. hallucis lateralis, and medial nerve of the second finger, n. digiti secundi medlalis. These nerves innervate only the skin of the sides of the I and II toes facing each other.

Muscular branches also depart from the deep peroneal nerve, rr. musculares, to the following muscles of the leg: tibialis anterior, extensor digitorum longus, extensor pollicis longus, and extensor digitorum brevis and extensor pollicis brevis on the dorsum of the foot. The deep peroneal nerve also innervates the capsule of the ankle joint.

Lateral plantar nerve, n. plantaris laterlis, is located between the square muscle of the sole and the short flexor of the fingers and runs in the lateral plantar groove along with the lateral plantar artery. At the proximal end of the IV intermetatarsal space, this nerve divides into superficial and deep branches. The superficial branch, r. superficialis, gives off its own plantar digital nerve, n. digitalis plantaris proprius, which innervates the skin of the plantar side of the lateral surface of the fifth finger. In the medial direction, the common plantar digital nerve departs from this branch, n. digitalis plantaris communis, which, having divided into two own plantar digital nerves, n. digitdles plantares prdprii, innervates the skin of the sides of the fourth and fifth toes facing each other. Deep branch, Mr. profundus, accompanies the arterial arch and innervates the interosseous muscles, the 3rd and 4th worm-like muscles, the adductor thumb muscle, and the lateral head of the short flexor thumb. The medial and lateral plantar nerves also innervate the joints of the foot. In addition, muscle branches go from the lateral plantar nerve to the square muscle of the sole, the short flexor of the little finger, and to the muscle that removes the little finger.

Lateral branches of the tibial nerve are muscular branches starting from this nerve in the region of the popliteal fossa and on the lower leg. In the popliteal fossa, muscle branches depart from the tibial nerve, rr. musculares, to the triceps muscle of the lower leg, plantar and popliteal muscles, a sensitive branch to the knee joint, as well as the medial cutaneous nerve of the calf. On the lower leg, the muscular branches of the tibial nerve innervate the posterior tibial muscle, the long flexor of the thumb and the long flexor of the toes.

Medial cutaneous nerve of calf, n. cutdneus surae medidlis, departs from the tibial nerve in the popliteal fossa. Initially, it is located under the fascia on the back of the lower leg, and then - in the splitting of this fascia between the heads of the gastrocnemius muscle, next to the small saphenous vein. In the lower part of the lower leg, the nerve pierces the fascia and exits under the skin and innervates it on the medial part of the posterior surface of the lower leg. At this level, the lateral calf cutaneous nerve, which is the cutaneous branch of the common peroneal nerve, approaches and connects to the medial cutaneous nerve of the calf. As a result of this connection, the sural nerve, n. su-rdlis, is formed, running first behind the lateral malleolus, and then along the lateral edge of the foot.

The sural nerve innervates the skin of the lateral part of the calcaneal region, the lateral edge of the rear of the foot, and the skin of the lateral side of the little finger. Branches of the sural nerve leading to the calcaneus areas, received the name of lateral calcaneal branches, rr. calcdnei laterdlles, and the final branch of the sural nerve, heading to the lateral edge of the foot, is the lateral dorsal cutaneous nerve, p. cutdneus dorsdlis laterdlis. common peroneal nerve, n. peroneus [fibularis] communis,having separated from the sciatic nerve in the lower part of the thigh (or in the upper part of the popliteal fossa), it goes down laterally along the inner (medial) edge of the biceps femoris muscle, and then in the groove between the tendon of this muscle and the lateral head of the gastrocnemius muscle. Descending lower, the common peroneal nerve goes around the head of the fibula and, entering the thickness of the long peroneal muscle, divides into two branches - the superficial and deep peroneal nerves. From the common peroneal nerve in the popliteal fossa, the lateral cutaneous nerve of the calf departs, p. cutdneus surae laterlis, which innervates the skin of the lateral side of the lower leg. In the lower third of the leg, this nerve joins the medial cutaneous nerve of the calf to form the sural nerve. The common peroneal nerve also innervates the capsule of the knee joint.

The superficial peroneal nerve, n. peroneus [fibularis] superficialis, goes down and enters the superior musculo-peroneal canal (between the beginning of the long peroneal muscle and the bone of the same name).

Then, at the border of the middle and lower thirds of the lower leg, this nerve exits the canal, pierces the fascia of the lower leg, goes to the rear of the foot, where it divides into its terminal branches. One of them is the medial dorsal cutaneous nerve, n. cutdneus dorsdlis medidlis, goes to the medial edge of the foot, where it innervates the skin of this area, the skin of the medial side of the thumb, and the skin of the surfaces of II and III fingers facing each other. Another branch is the intermediate dorsal cutaneous nerve, n. cutdneus dorsdlis intermedius, descends along the anterolateral surface of the foot and is divided into the dorsal digital nerves of the foot, n. digitdles dorsdles pedis.

In the upper muscular peroneal canal, muscle branches, rr, depart from the superficial peroneal nerve. musculares, to the long and short peroneal muscles.

The deep peroneal nerve, n. peroneus [fibularis] profundus, goes forward from the place of division of the common peroneal nerve, pierces the anterior intermuscular septum of the lower leg, the long extensor of the fingers and is adjacent to the anterior tibial artery on the anterior surface of the interosseous membrane of the lower leg. Accompanying the anterior tibial artery, the deep peroneal nerve exits to the rear of the foot (under the lower extensor tendon retinaculum).

At the level of the distal end of the first intermetatarsal space, the deep peroneal nerve divides into two dorsal digital nerves, n. digitdles dorsales, lateral nerve of the big toe, n. hallucis lateralis, and medial nerve of the second finger, n. digiti secundi medlalis. These nerves innervate only the skin of the sides of the I and II toes facing each other.

Muscular branches also depart from the deep peroneal nerve, rr. musculares, to the following muscles of the leg: tibialis anterior, extensor digitorum longus, extensor pollicis longus, and extensor digitorum brevis and extensor pollicis brevis on the dorsum of the foot. The deep peroneal nerve also innervates the capsule of the ankle joint.

TEST QUESTIONS

1. Which segments of the spinal cord are distinguished by their location

A. cervical, thoracic, lumbar, sacral and coccygeal
B. thoracic, sacral, cervical
C. lumbar, sacral, coccygeal
D. sacral, lumbar, coccygeal
E. coccygeal, costal and lumbar

2. How many sacral segments of the spinal cord there are

A. 5
B. 7
C. 12
D. 8
E. 10

3. How many coccygeal segments of the spinal cord are there

A. 1
B. 5
C. 2-3
D. 3-4
E. 5-6

4. Is the lumbar thickening of the spinal cord at the level of the following vertebrae?

A. X - thoracic KhII
B. VII - X thoracic
C. V - X thoracic
D. II - III sacral
E. I - sacral II

5. Is lumbosacral thickening best distinguished at the level of the following vertebrae?

A. thoracic KhII - lumbar I
B. I - lumbar III
C. V lumbar - II sacral
D. II -V sacral
E. I - sacral II

6. At birth in children, the spinal cord stretches to the level:
A. Third lumbar vertebra
B. Third thoracic vertebra
C. Fourth thoracic vertebra
D. Sixth thoracic vertebra
E. Fifth lumbar vertebra

7. Knee reflex disappears at?
A. Damage to any knee reflex arch link
B. Injuries to the quadriceps of the thigh
C. Spinal cord injuries at the level of 2- 4 lumbar segment
D. Spinal cord injuries at the level of 2- 4 sacral segment
E. Damage to the femoral nerve

8. What function does the spinal cord have?
A. Reflex
B. Information
C. Brake
D. Lead
E. All of the above

9. The end of the spinal cord in an adult is at the level of the intervertebral disc between the vertebrae.
A. 1-2 lumbar
B. 3-4 lumbar
C. 4-5 lumbar
D. 2-3 lumbar
E. 12 thoracic - 1 lumbar

10. Which anatomical structures form the boundary between the spinal and oblong brains:
A. Large occipital orifice, exit point of I pair of spinal roots
B. Place of exit of the roots of the XII pair of cranial nerves
C. Place of exit of roots of XI pair of cranial nerves
D. Lower margin of olive
E. None of the above formations

Current Security Questions

1. Formation and topography of the lumbar plexus.
2. Lumbar plexus branches.
3. Formation of the sacral plexus.
4. Short branches of the sacral plexus.
5. Long branches of the sacral plexus.
6. Areas of innervation of the sacral plexus: leg muscles and skin.

Practical lesson 10.

Theme: Formation of cranial nerves. I, III, IV, VI, XI, XII pairs of cranial nerves, branches, nuclei, innervation area. Innervation of the skin of the foot.

Goals and objectives of the lesson:

• Discuss with students the structure and function of I.III, IV, VI, XI, XII pairs of cranial nerves.

• On anatomical preparations, models and diagrams, show where these nerve endings exit the brain and skull, their branches and muscle innervation.

• I.III, IV, VI, XI, XII Explain the main anatomical symptoms of damage to a pair of cranial nerves and their branches.

In the process of studying the topic, the student learns the following

•Knows the names of I, III, IV, VI, XI, XII pairs of cranial nerves and their branches in Latin based on the new anatomical nomenclature.

• Displays them on anatomical preparations, models and images.

• Able to show the origin of pairs of cranial nerves I.III, IV, VI, XI, XII in the skull, model and images

• Able to display on anatomical preparations, models and images I.III, IV, VI, XI, XII pairs of cranial nerves and innervating muscles.

• I,III, IV, VI, XI, XII to explain the origin of the main anatomical symptoms of damage to a pair of cranial nerves and their branches.

Data block:

The cranial nerves (lat. nervi craniales) are twelve pairs of nerves extending from the brain stem. They are designated by Roman numerals in the order of their location, each of them has its own name.

In Russian-language sources, the term "cranial nerves" is quite often used. According to the anatomical terminology adopted in Sao Paulo in 1997, the term is designated as lat. nervi craniales - cranial nerves [2]. In the 6th edition of Sinelnikov's atlas of human anatomy, monographs on human anatomy, the term is unified under the international anatomical classification. At the same time, the first phrase of the corresponding article of the Great Soviet Encyclopedia testifies to the frequency of use of the combination "cranial nerves":

List of nerves

- I pair - olfactory nerve (lat. Nervus olfactorius)
- II pair - optic nerve (lat. Nervus opticus)
- III pair - oculomotor nerve (lat. Nervus oculomotorius)
- IV pair - trochlear nerve (lat. nervus trochlearis)
- V pair - trigeminal nerve (lat. nervus trigeminus)
- VI pair - abducens nerve (Latin nervus abducens)
- VII pair - facial nerve (lat. Nervus facialis)
- VIII pair - vestibulocochlear nerve (Latin nervus vestibulocochlearis)
- IX pair - glossopharyngeal nerve (Latin nervus glossopharyngeus)
- X pair - vagus nerve (lat. Nervus vagus)
- XI pair - accessory nerve (lat. Nervus accessorius)
- XII pair - hypoglossal nerve (Latin nervus hypoglossus)

Development of cranial nerves in embryogenesis.

Olfactory and optic nerves develop from protrusions of the anterior cerebral bladder and consist of axons of neurons that are located in the mucous membrane of the nasal cavity (organ of smell) or in the retina of the eye. The remaining sensory nerves are formed by evicting young nerve cells from the developing brain, the processes of which form sensory nerves or sensory (afferent) fibers of mixed nerves. Motor cranial nerves were formed from motor (efferent) nerve fibers, which are processes of cells of motor nuclei located in the brain stem. The formation of cranial nerves in phylogenesis is associated with the development of visceral arches and their derivatives, sensory organs, and the reduction of somites in the head region.

Cranial nerves are nerves that are anatomically and functionally connected to the brain. There are 12 pairs of cranial nerves.

I pair - olfactory nerves, nn. olfactorii

Diagram of the extracranial part of the olfactory nerve, olfactory bulb, and olfactory tracts (shown in yellow).

Olfactory nerves are nerves of special sensitivity - olfactory. They start from the olfactory neurosensory cells, which form the first neuron of the olfactory pathway and lie in the olfactory region of the nasal mucosa. In the form of 15-20 thin nerve trunks (olfactory threads), consisting of non-myelinated nerve fibers, they, without forming a common trunk of the olfactory nerve, penetrate through the horizontal plate of the ethmoid bone (Latin lamina cribrosa ossis ethmoidalis) into the cranial cavity, where they enter the olfactory bulb (lat. bulbus olfactorius) (here lies the body of the second neuron), which passes into the olfactory tract (lat. tractus olfactorius), which is the axons of cells that lie in the olfactory bulbs (lat. bulbus olfactorius). The olfactory tract passes into the olfactory triangle (lat. trigonum olfactorium). The latter consists mainly of nerve cells and is divided into two olfactory strips that enter the anterior perforated substance (Latin substantia perforata anterior), lat. area subcallosa and a transparent septum (lat. septum pellucidum), where the bodies of third neurons are located. Then the fibers of the cells of these formations in various ways reach the cortical end of the olfactory analyzer, which lies in the region of the hook (lat. uncus) and the parahippocampal gyrus of lat. gyrus parahyppocampalis of the temporal lobe of the cerebral hemispheres. Then the fibers of the cells of these formations in various ways reach the cortical end of the olfactory analyzer, which lies in the region of the hook (lat. uncus) and the parahippocampal gyrus of lat. gyrus parahyppocampalis of the temporal lobe of the cerebral hemispheres. Then the fibers of the cells of these formations in various ways reach the cortical end of the olfactory analyzer, which lies in the region of the hook (lat. uncus) and the parahippocampal gyrus of lat. gyrus parahyppocampalis of the temporal lobe of the cerebral hemispheres.

The olfactory nerves are nerves of special sensitivity.

The olfactory system begins with the olfactory part of the nasal mucosa (the region of the upper nasal passage and the upper part of the nasal septum). It contains the bodies of the first neurons of the olfactory analyzer. These cells are bipolar.

As noted above, the olfactory analyzer is a three-neuron circuit:

1. The bodies of the first neurons are represented by bipolar cells located in the nasal mucosa. Their dendrites terminate on the surface of the nasal mucosa and form the olfactory receptor apparatus. The axons of these cells in the form of olfactory threads end on the bodies of the second neurons, morphologically located in the olfactory bulbs.
2. The axons of the second neurons form olfactory tracts, which terminate on the bodies of the third neurons in the anterior perforated

substance (Latin substantia perforata anterior), lat. area subcallosa and transparent septum (lat. septum pellucidum)

3. The bodies of third neurons are also called primary olfactory centers. It is important to note that the primary olfactory centers are connected to the cortical territories of both their own and the opposite side; the transition of part of the fibers to the other side occurs through the anterior commissure (Latin comissura anterior). In addition, it provides a link to the limbic system. The axons of the third neurons are directed to the anterior sections of the parahippocampal gyrus, where the cytoarchitectonic field of Brodmann 28 is located. Projection fields and the associative zone of the olfactory system are represented in this area of the cortex.

An appetizing odor simultaneously causes a salivation reflex, while an unpleasant odor leads to nausea and vomiting. These reactions are associated with emotions. Smells can be pleasant or unpleasant. The main fibers that provide communication between the olfactory system and the autonomous areas of the brain are the fibers of the medial bundles of the forebrain and the brain strips of the thalamus.

The medial forebrain bundle consists of fibers that ascend from the basal olfactory region, the perimyndala, and the septal nuclei. On their way through the hypothalamus, part of the fibers ends at the nuclei of the hypothalamic region. Most of the fibers go to the brainstem and make contact with the vegetative zones of the reticular formation, with the salivary and dorsal nuclei of the lat. n.intermedius (Wrisberg's nerve), glossopharyngeal (lat. n. glossopharyngeus) and vagus (lat. n.vagus) nerves.

The brain strips of the thalamus give synapses to the nuclei of the leash. From these nuclei to the interpeduncular nucleus (Ganser's node) and to the nuclei of the tire, there is a pedicle-leaf path, and from them the fibers are directed to the vegetative centers of the reticular formation of the brain stem.

The fibers that connect the olfactory system with the optic thalamus, hypothalamus, and limbic system are probably responsible for accompanying olfactory stimuli with emotions. The area of the septum, in addition to other brain areas, is connected through associative fibers with the cingulate gyrus (lat. Gyrus cinguli).

Anosmia and hyposmia

Anosmia (lack of smell) or hyposmia (decrease in smell) on both sides is more often observed in diseases of the nasal mucosa. Hyposmia or anosmia on one side is usually a sign of a serious illness.

Possible causes of anosmia:

1. Underdevelopment of the olfactory pathways.
2. Diseases of the olfactory nasal mucosa (rhinitis, nasal tumors, etc.).
3. Rupture of the olfactory filaments in a fracture of the lamina cribrosa of the ethmoid bone due to a craniocerebral injury.
4. Destruction of the olfactory bulbs and tracts in the focus of contusion by the type of counterblow, observed when falling on the back of the head
5. Inflammation of the sinuses of the ethmoid bone (Latin os ethmoidale, inflammation of the adjacent pia mater and surrounding areas.
6. Median tumors or other volumetric formations of the anterior cranial fossa.

It should be noted that the interruption of the integrity of the pathways from the primary olfactory centers does not lead to anosmia, since they are bilateral.

Hyperosmia

Hyperosmia - an increased sense of smell is noted in some forms of hysteria and sometimes in cocaine addicts.

Parosmia

A perverted sense of smell is observed in some cases of schizophrenia, damage to the hook of the parahippocampal gyrus, and in hysteria. Parosmia can be attributed to receiving pleasant emotions from the smell of gasoline and other technical fluids in patients with iron deficiency anemia.

Olfactory hallucinations

Olfactory hallucinations are observed in some psychoses. They can be an aura of an epileptic seizure, which are caused by the presence of a pathological focus in the temporal lobe.

Same

The olfactory nerve can serve as an entry gate for brain and meningeal infections. The patient may not be aware of the loss of smell.

Instead, in connection with the disappearance of the sense of smell, he may complain of a violation of taste sensations, since the perception of smells is very important for the formation of the taste of food (there is a connection between the olfactory system and Latin nucleus tractus solitarii).

II pair - optic nerve, n. opticus

Diagram: Left optic nerve and optic pathway

- the second pair of cranial nerves, through which visual stimuli perceived by the sensitive cells of the retina are transmitted to the brain. The optic nerve is a nerve of special sensitivity. Each human optic nerve contains between 770,000 and 1.7 million nerve fibers [2], which are the axons of the ganglion cells of a single retina. In the fovea, which has a high acuity, these ganglion cells connect with 5 photoreceptor cells, in other areas of the retina they connect with many thousands of photoreceptors.

The optic nerve in its development and structure is not a typical cranial nerve, but, as it were, cerebral white matter, brought to the periphery and connected with the nuclei of the diencephalon, and through them with the cerebral cortex. The optic nerve originates from the ganglion cells (third nerve cells) of the retina. The processes of these cells are collected in the disk (or papilla) of the optic nerve, located 3 mm closer to the middle from the posterior pole of the eye. Further, bundles of nerve fibers penetrate the sclera in the region of the cribriform plate, are surrounded by meningeal structures, forming a compact nerve trunk. Nerve fibers are isolated from each other by a layer of myelin.

Among the bundles of fibers of the optic nerve are the central retinal artery (central retinal artery) and the vein of the same name. The artery arises in the central part of the eye, and its capillaries cover the entire surface of the retina. Together with the ophthalmic artery, the optic nerve passes into the cranial cavity through the optic canal formed by the lesser wing of the sphenoid bone.

After passing through the thickness of the fatty body of the orbit, the optic nerve approaches the common tendon ring. This part of it is called lat. pars orbitalis. Then it enters the optic canal (lat. canalis opticus) - this part is called lat. pars intracanalicularis, and lat comes out of the orbit into the cranial cavity. pars intracranialis. Here, in the region of the precrossing groove of the sphenoid bone (lat. os sphenoidale), a partial intersection of the fibers of the optic nerve occurs - lat. chiasma opticum.

The lateral part of the fibers of each of the optic nerves goes further along its side.

The medial part passes to the opposite side, where it connects with the fibers of the lateral part of the optic nerve of the homolateral (own) side and forms with them the optic tract (lat. tractus opticus).

Along its course, the optic nerve trunk is surrounded by the internal sheath of the optic nerve (Latin vagina interna n. optici), which is an outgrowth of the pia mater of the brain. The inner vagina is separated by a slit-like intervaginal space (lat. spatia intervaginalis) from the outer one (lat. vagina externa n. optici), which is an outgrowth of the arachnoid and hard shells of the brain.

In the slit-like intervaginal space (Latin spatia intervaginalis) arteries and veins pass.

Each optic tract goes around the pedunculus of the brain (lat. pedunculus cerebri) from the side and ends in the primary subcortical visual centers, which are represented on each side by the lateral geniculate body, the thalamic cushion and the nuclei of the superior colliculus, where the primary processing of visual information and the formation of pupillary reflexes.

From the subcortical centers of vision, the nerves diverge like a fan on both sides of the temporal part of the brain - the central visual path begins (Graziola's visual radiance). Next, the fibers carrying information from the primary subcortical visual centers come together to pass through the internal capsule. The visual pathway ends in the cortex of the occipital lobes (visual zone) of the brain.

The retina is the receptor for visual impulses. It is a protrusion of the brain and essentially consists of three layers of neurons.

The first neurons are called rods and cones. When light reaches the eye, the photochemical reaction that occurs in these elements is converted into impulses that are transmitted to the visual cortex.

With the exception of the fovea macula, cones and rods are mixed in the retina; the number of rods is ten or more times greater than the number of cones. In the area of the macula, which is the place of the clearest vision, there are only cones, and each cone has a connection with only one bipolar cell, which is the second neuron. Bipolar cells transmit impulses to the third neuron, the ganglion cell of the inner layer of the retina. The axons of ganglion cells converge radially to one area of the retina, located medial to the macula, and form here the optic disc or papilla.

The optic nerve therefore consists of axons of cells whose bodies form the ganglionic layer of the retina. Through the bone canal of the optic nerve (Latin canalis opticus), the optic nerves enter the cranial cavity, go to the base of the brain and here, anterior to the Turkish saddle (Latin sella turcica), they are crossed, forming the so-called. optic chiasm (lat. chiasma opticum). The decussation is partial, since only the fibers coming from the nasal (inner) halves of the retinas are exposed to it; the fibers from the outer or temporal halves pass the chiasm uncrossed. After the chiasm, the optic pathways are called the optic tracts. In the visual tracts, fibers from individual fields of the retina are located in certain areas of the cross section. So, the fibers from the upper fields of the retina go to the upper parts of the nerve and tract; fibers from the lower fields of the retina - in the lower sections. This is important for clarifying the "course" of the process that extends to the optic tracts or nerves (for example, tumors). It should be borne in mind that in the event of a lesion, visual fields opposite to the fallen field of the retina always fall out. As a result of the peculiarities of the decussation in the optic tracts, fibers pass not from one eye, as in the optic nerve, but from the same halves of the retinas of both eyes: for example, in the left optic tract from both left halves of the retinas. It should be recalled that the refractive media of the eye project the reverse image of the visible onto the retina, and, consequently, the left visual tract conducts stimuli from the right, and the right tract from the left visual fields of both eyes. spreading to the optic tracts or nerves (eg tumors). It should be borne in mind that in the event of a lesion, visual fields opposite to the fallen field of the retina always fall out. As a result of the peculiarities of the decussation in the optic tracts, fibers pass not from one eye, as in the optic nerve, but from the same halves of the retinas of both eyes: for example, in the left optic tract from both left halves of the retinas. It should be recalled that the refractive media of the eye project the reverse image of the visible onto the retina, and, consequently, the left visual tract conducts stimuli from the right, and the right tract from the left visual fields of both eyes. spreading to the optic tracts or nerves (eg tumors). It should be borne in mind that in the event of a lesion, visual fields opposite to the fallen field of the retina always fall out. As a result of the peculiarities of the decussation in the optic tracts, fibers pass not from one eye, as in the optic nerve, but from the same halves of the retinas of both eyes: for example, in the left optic tract from both left halves of the retinas. It should be recalled that the refractive media of the eye project the reverse image of the visible onto the retina, and, consequently, the left visual tract conducts stimuli from the right, and the right tract from the left visual fields of both eyes. As a result of the peculiarities of the decussation in the optic tracts, fibers pass not from one eye, as in the optic nerve, but from the same halves of the retinas of both eyes: for example, in the left optic tract from both left halves of the retinas. It should be recalled that the refractive media of the eye project the reverse image of the visible onto the retina, and, consequently, the left visual tract conducts stimuli from the right, and the right tract from the left visual fields of both eyes. As a result of the peculiarities of the decussation in the optic tracts, fibers pass not from one eye, as in the optic nerve, but from the same halves of the retinas of both eyes: for example, in the left optic tract from both left halves of the retinas. It should be recalled that the refractive media of the eye project the reverse image of the visible onto the retina, and, consequently, the left visual tract conducts stimuli from the right, and the right tract from the left visual fields of both eyes.

In its further course, the visual tracts from the base rise upward, bending around the legs of the brain from the outside, and enter the so-called primary or subcortical visual centers, where the fibers of these neurons end.

The subcortical part of the visual analyzer includes: the pillow of the thalamus (lat. pulvinar), the lateral geniculate body (lat. corpus geniculatum lateralis) and the nuclei of the upper mounds of the midbrain (lat. colliculi superiores).

The following neurons, which conduct visual stimuli to the cortex, begin only from the lateral geniculate body (Latin corpus geniculatum lateralis). The fibers from its cells pass through the internal capsule, in the posterior part of the posterior thigh and as part of the Graziole bundle, or lat. radiatio optica, end in the cortical visual areas. These paths are projected onto the inner surface of the occipital lobes, into the region of the spur groove (lat. fissura calcarinae) (wedge (lat. cuneus) and lingual gyrus (lat. gyrus lingualis)), as well as into the depth of the spur groove -

the primary projection field of the visual analyzer. All these primary projection fields are associated with the same halves (of their own side) of the retinas of both eyes, but with the opposite, therefore, halves of the visual fields.

In the area located above the spur furrow, that is, in lat. cuneus, the upper quadrant of the retinas of the same side is represented; in the area located downward, that is, in lat. gyrus lingualis, - lower.

In the anterior tubercles of the quadrigemina, the so-called pupillary fibers of the optic nerves end, which are the first link in the reflex arc of the pupil's reaction to light. From the anterior tubercles, the following neurons go to the Yakubovich nuclei (the nucleus of the oculomotor nerve) of both their own and the opposite side, which causes a friendly or sympathetic reaction in the other pupil when only one eye is illuminated. Also from the superior colliculus through the tectobulbar and tectospinal pathways to other cranial and spinal nuclei, thus causing a rapid response to sudden movements (Darwin's experience). The fibers of the optic tracts end in the thalamus opticus, apparently establishing reflex connections with the diencephalon and midbrain (somatic and visceral reflexes).

Associative and commissural fibers run from the occipital region to other cortical centers (associated with higher functions, such as reading, speech) and to the superior hillocks. As a result, accommodation and convergence are provided through them.

Decreased vision

With a complete break in the conduction of the optic nerve, blindness occurs in this eye (amaurosis) with the loss of a direct reaction of this pupil to light (the pupil of a blind eye narrows to light only friendly when the second, healthy eye is illuminated). Decreased vision is called amblyopia. When only part of the fibers of the optic nerve is affected, there are restrictions on the visual fields, loss in it by sectors or islets (scotomas).

Loss of visual fields

Hemianopsia

With the complete destruction of the chiasma, complete bilateral blindness occurs. But with a number of processes, damage to the optic chiasm can be limited. So, with tumors of the pituitary gland, expansion of the lat. infundibulum due to hydrocephalus and stretching of the third ventricle, pressure can only affect the middle of the chiasm, its crossing fibers from the inner nasal halves of the retinas of both eyes. In this case, the upper or temporal fields of vision will turn out to be blind, that is, the so-called temporal, or bitemporal hemianopsia, which is heteronymous, heteronymous (the right field of vision falls out in one eye, and the left field of vision in the other).

Much more common are the so-called eponymous, or homonymous hemianopsia, which occur when the visual pathways and centers are damaged posterior to the lat. chiasma opticum, that is, with damage to the visual tracts, the visual tubercle, the internal capsule in its posterior section and the occipital lobe.

Beginning with the optic tract, stimuli are conducted and perceived in the pathways and centers; in the right - from the right and in the left - from the left halves of the retinas of both eyes. At a break here there is a homonymous hemianopsia of opposite fields of vision; for example, with a lesion on the left - right-sided hemianopsia of the same name and vice versa.

There are some strong points for distinguishing the same, it would seem, hemianopsia with damage to the paths of the visual analyzer from the visual analyzer to the subcortical centers and the capsule or cortex. The distinguishing features for these hemianopsias will be the following.

With incomplete damage to the cortical projection visual area or the visual pathways leading to them, only quadrant hemianopsia can occur. So, when destroying, say, the left lat. cuneus, only the left upper quadrants of the retina will turn out to be "blind" and, accordingly, only the right lower quadrants will fall out in the visual fields; at the center in the field of the right lat. gyrus lingualis, the left upper quadrants of the visual fields fall out, etc. visual hallucinations

When the region of the spur sulcus is irritated, visual hallucinations occur in opposite fields of vision, such as simple photos, which are usually an aura of a seizure of cortical epilepsy that develops after them. When irritated not in the area of the spur groove, but on the outer surface of the occipital lobes (that is, closer to the junction of the visual analyzer with other analyzers), visual hallucinations are of a more complex type: figures, faces, cinematic pictures, etc.

Oculomotor nerve (Latin nervus oculomotorius)- III pair of cranial nerves, responsible for the movement of the eyeball, raising the eyelid, the reaction of the pupils to light.

The oculomotor nerve is a mixed nerve. Its nuclei lie in the cover of the legs of the brain, on the aqueduct of the brain (Latin aqueductus cerebri), at the level of the upper mounds of the roof of the midbrain.

The oculomotor nerve leaves the substance of the brain in the region of the medial surface of the peduncle, is shown at the base of the brain near the anterior edge of the bridge, in the interpeduncular fossa (Latin fossa interpeduncularis).

Then the oculomotor nerve, heading anteriorly, lies between the posterior cerebral artery (Latin a.cerebri posterior) and the superior cerebellar artery (Latin a.cerebellaris superior), perforates the dura mater and, passing through the upper wall of the cavernous sinus (Latin sinus cavernosus) , outside of the internal carotid artery (lat. a.carotis interna), enters through the superior orbital fissure (lat. fissura orbitalis superior) into the cavity of the orbit.

Even before entering the orbit, n.oculomotorius is divided into two branches - upper and lower.

1. The upper branch (lat. ramus superior) runs along the lateral surface of the optic nerve (lat. n.opticus), is divided into two branches that approach the muscle that lifts the upper eyelid (lat. m.levator palpebrae superioris) and the superior rectus muscle (lat m.rectus superior)
2. The lower branch (lat. ramus inferior) is more powerful, at first, like r.superior, lies outside of n.opticus. R.inferior in the orbit is divided into 3 branches, of which the inner one approaches the medial rectus muscle (lat. m.rectus medialis), the middle, shortest, innervates the lower rectus muscle (lat. m.rectus inferior) and the outer, the longest, runs along the lower rectus muscle (lat. m.rectus inferior) to the lower oblique muscle (lat. m.obliquus inferior). Lat. departs from the last branch. radix oculomotoria (parasympathetic), heading towards the ciliary node.

As part of n.oculomotorius, in addition to these motor and parasympathetic fibers, there are sympathetic fibers coming to it from the sympathetic internal carotid plexus surrounding the internal carotid artery, and sensory fibers extending from the ophthalmic nerve (lat. n.ophtalmicus) - branches of the trigeminal nerve (lat. n.trigeminus).

N.oculomotorius is mixed, since it contains both motor and autonomic fibers. It has two types of nuclei: those that provide innervation of the ciliary body and the pupillary sphincter (vegetative) and those that go to the muscular apparatus of the eye (motor).

This nerve has a group of heterogeneous nuclei located in the anterior tegmentum of the midbrain. The nuclei of the oculomotor nerves consist of five cell groups: two external motor large-cell nuclei, two small-cell nuclei and one internal, unpaired, small-cell nucleus.

The motor paired large cell nuclei of the third nerve occupy a lateral position. They consist of cell groups, each of which is related to certain striated muscles. At the anterior end of the nucleus there is a group of cells whose axons provide innervation for m.levator palpebrae superior, followed by cell groups for m.rectus superior et m.rectus medialis, for m.obliquus inferior and m.rectus inferior.

Medial to the paired large-celled nuclei, there are also paired, but small-celled parasympathetic nuclei of Yakubovich (Edinger-Westphal). The impulses coming from here pass through the lat. ganglion ciliare and reach two smooth muscles, which are sometimes called the internal muscles of the eye, the muscles of the pupil constrictor (Latin m.sphincter pupillae) (provides constriction of the pupil) and lat. m.ciliaris (regulates accommodation). In the middle between the nuclei of Yakubovich (Edinger-Westphal) is the unpaired nucleus of Perlia, which is common to both oculomotor nerves and provides accommodation to the eyes.

The axons of the cells of the n.oculomotorius nuclei go down. At the same time, those that start from the cells laid down in the caudal cell group of the lateral motor nucleus partially pass to the other side. They cross the red nucleus (lat. Nucleus ruber) and leave the midbrain, emerging at the base from the medial groove of the brain stem.

Complete damage to the oculomotor nerve

Complete defeat of n.oculomotorius is accompanied by a characteristic syndrome.

- Ptosis (drooping of the eyelid) is caused by paralysis of the m.levator palpebrae superior.
- Divergent strabismus (lat. Strabismus divergens) - a fixed position of the eye with the pupil directed outward and slightly down due to the action of the unopposed m.rectus lateralis (innervated by the VI pair of cranial nerves) and m.obliquus superior (innervated by the IV pair of cranial nerves - block (lat. n.trochlearis)).
- Diplopia (double vision) is a subjective phenomenon that occurs when the patient looks with both eyes. The severity of doubling increases when fixing the gaze on a nearby object or when trying to turn

the gaze towards the paralyzed internal rectus muscle of the eye. In this case, the image of the focused object in both eyes is obtained not on the corresponding, but on different areas of the retina. Doubling of the object in question occurs as a result of deviation of the visual axis of one eye due to muscle weakness due to impaired innervation. In this case, the image of the object under consideration falls in the correctly fixing eye on the central fossa of the retina, and with a deviation of the axis - on the non-central part of the retina.

- Mydriasis (dilated pupil) with lack of pupillary response to light and accommodation. Mydriasis occurs due to the fact that n.oculomotorius innervates m.sphincter pupillae. The absence of a reaction to light and convergence is due to the fact that this nerve is part of the reflex arc of the pupillary reflex to light.
- Accommodation paralysis causes deterioration of vision at close distances. Accommodation of the eye is a change in the refractive power of the eye to adapt to the perception of objects located at different distances from it. Accommodation is provided by the state of the curvature of the lens, which is regulated by m.ciliaris. Since this internal muscle of the eye is innervated by the oculomotor nerve, if it is damaged, accommodation paralysis will be noted.
- Convergence paralysis is characterized by the inability to turn the eyeballs inwards. Convergence of the eyes is the convergence of the visual axes of both eyes when viewing closely spaced objects. It is carried out due to the simultaneous reduction of m.rectus medialis of both eyes; accompanied by constriction of the pupils (miosis) and tension of accommodation. Since m.rectus medialis is innervated by the oculomotor nerve, and the condition of the pupil and accommodation also depend on its impulsation, when n.oculomotorius is damaged, convergence of the eyes becomes impossible.
- Restriction of the movement of the eyeball up, down and inward - due to paralysis of the muscles innervated by the oculomotor nerve.
- In addition to these symptoms, due to loss of tone of the external muscles of the eye, a slight exophthalmos can be observed.

The defeat of n.oculomotorius is determined by the above violations. Complete loss of function is more often observed with its peripheral lesion. Due to the dismemberment and a certain remoteness of the cell groups of the nuclei of the III nerve from each other, with the localization of the pathological focus in the area of \u200b\u200btheir location, a clinic of damage to not all muscles innervated by the III nerve, but only some of them, may develop.

Argyle Robertson Syndrome

In patients, one can find dissociation between the reaction of the pupils to light and their reaction to accommodation and convergence. Loss or inhibition of pupillary reactions to light while maintaining their reaction to accommodation and convergence is called Argyle Robertson's syndrome. This syndrome is considered to be characteristic of neurosyphilis. Syndrome reverse Argyle Robertson's syndrome, in which the reaction to light is preserved, and their reaction to accommodation and convergence is disturbed, often occurs in epidemic Economo encephalitis, especially in its chronic stage in combination with signs of parkinsonism.

Alternating syndromes with damage to the oculomotor nerve[

Symptoms of n.oculomotorius lesions can occur in the presence of a pathological focus in the midbrain. Weber syndrome - characterized by paralysis of the muscles innervated by the oculomotor nerve on the side of the lesion, and central hemiplegia on the opposite side of the lesion. It usually occurs when the base of the brain stem is damaged.

Benedict's syndrome - consists of paralysis of the muscles innervated by the oculomotor nerve on the side of the pathological focus, in combination with choreoathetosis and intentional tremor in opposite limbs (lesion of the dentorubral tract and the red nucleus). The syndrome occurs when the pathological focus is localized in the medial part of the midbrain tegmentum.

Claude's syndrome - paralysis of n.oculomotorius on the side of the focus, and cerebellar pathology on the opposite side. Occurs with damage to the posterior part of the red nucleus and the root of the III nerve passing through it (lower nucleus ruber syndrome).

With a large pathological focus in the midbrain, Notnagel's syndrome may develop. Then, on both sides, cerebellar ataxia, intentional trembling, sometimes choroidal hyperkinesis, paralysis of the muscles that ensure the movement of the eyeballs and deafness occur. Notnagel's syndrome is caused by a combined lesion of the red nuclei and roots of the third nerve and medial geniculate bodies.

Damage in the region of the cavernous sinus and superior orbital fissure

If the pathological process affects the outer wall of the cavernous venous sinus, in which the nerves pass that provide movement of the eyeball (III, IV and VI and the first branch of the V nerve), then the patient develops paralysis of the eyeball (ophthalmoplegia), pain or hypesthesia in the zone of innervation of the first branches of the trigeminal nerve, as well as swelling of the tissues of the eyeball and eyelids, due to a violation of the outflow of venous blood from them (Foy's syndrome). When the pathological process is localized in the region of the superior orbital fissure, the same symptoms occur, but without the phenomena of edema of the tissues of the orbital region (superior orbital fissure syndrome).

Block nerve - IV pair of cranial nerves, innervates the superior oblique muscle (Latin m. obliquus superior), which turns the eyeball outwards and downwards.

The nuclei of the trochlear nerves are located at the level of the inferior colliculi of the roof of the midbrain in front of the central gray matter, below the nuclei of the oculomotor nerve. The inner nerve roots envelop the outer part of the central gray matter and cross in the superior medullary velum, which is a thin gray plate that forms the roof of the rostral part of the fourth ventricle. After decussation, the nerves leave the midbrain downward from the inferior colliculus. The trochlear nerve is the only nerve that emerges from the dorsal surface of the brainstem.

From the substance of the brain, the trochlear nerve exits behind the lower colliculus of the midbrain.

Each trochlear nerve bends around the brain stem from the lateral side.

At the base of the brain, the trochlear nerve emerges from the gap between the temporal lobe of the cerebral hemisphere and the brain stem. Then, heading anteriorly, it pierces the dura mater and follows in the outer wall of the cavernous sinus, enters the orbital cavity through the superior orbital fissure, is located on top of the tendon ring next to the optic nerve, above the oculomotor nerve and, heading somewhat medially, approaches the superior oblique eye muscle.

Since this nerve innervates only one muscle, its function is identical to that of this muscle. Paralysis of the muscle causes the affected eyeball to deviate upward and somewhat inward, due to the antagonistic influence of the inferior oblique muscle, as well as the medial rectus. Diplopia (double vision) does not occur when the patient looks up, out and in; in all other directions of gaze, double vision is characteristic. It is most distinct in the case when the patient looks at his feet, in particular when walking up the stairs. To avoid doubling, the patient tilts his head to the healthy side, lowers his chin and turns his head to the opposite shoulder. Isolated trochlear nerve palsy is rare and may be caused by trauma resulting from a fall on the forehead or crown.

The paired nucleus of the Block nerve (nuci. n. trochlearis) is located in the midbrain (mesencephalon) at the level of the inferior tubercles of the quadrigemina, in the central gray matter surrounding the cerebral aqueduct (Sylvius). In part, it protrudes into the posterior longitudinal bundle directly downward from the nuclei of the oculomotor nerve. B. n. contains in humans from 2000 to 3500 pulpy nerve fibers with diameters from 2 to 5 microns. Spine B. n. upon exiting the nucleus, it goes through the central gray matter to the superior medullary velum, where the roots of both B. n. cross and go out near the frenum of the cerebral sail, bending around the lateral surface of the upper part of the bridge (varoli) and the legs of the Brain; next to the oculomotor nerve (n. oculomotorius) B. n. perforates the dura mater, passes to the lateral wall of the cavernous sinus, where it receives sympathetic fibers from the cavernous plexus (plexus cavernosus) and sensory fibers from the ophthalmic nerve (n. ophthalmicus, V pair), enters the orbital cavity through the superior orbital fissure and, located outside the muscular cone, goes to the superior oblique muscle of the eye. As a result of partial crossing of roots B. n. upper oblique muscle of the eye as part of B. n. receives fibers from the nuclei of its own and opposite sides. Connection of both nuclei B. n. between themselves is carried out through the axons of the intercalated cells, the posterior longitudinal bundle and other systems. Associative links for Combined movements are the same as for the oculomotor nerve. goes to the superior oblique muscle of the eye. As a result of partial crossing of roots B. n. upper oblique muscle of the eye as part of B. n. receives fibers from the nuclei of its own and opposite sides. Connection of both nuclei B. n. between themselves is carried out through the axons of the intercalated cells, the posterior longitudinal bundle and other systems. Associative links for Combined movements are the same as for the oculomotor nerve. goes to the superior oblique muscle of the eye. As a result of partial crossing of roots B. n. upper oblique muscle of the eye as part of B. n. receives fibers from the nuclei of its own and opposite sides. Connection of both nuclei B. n. between themselves is carried out through the axons of the intercalated cells, the posterior longitudinal bundle and other systems. Associative links for Combined movements are the same as for the oculomotor nerve.BLOCK NERVE (nervus trochlearis; synonym n. patheticus) - IV pair of cranial nerves, innervates the superior oblique muscle of the eyeball (m. obliquus sup.).

Pathology Usually B. n. it is affected in inflammatory processes of the base of the brain: arachnoiditis, tumors, arterial aneurysms, carotid-cavernous anastomoses, in the region of the superior orbital fissure and in stem encephalitis. The isolated B.'s paralysis of n. meets seldom, is more often simultaneously with B. n. oculomotor and abducens nerves are affected. The superior oblique muscle, and more often the block through which its tendon is thrown, can be damaged during injuries and operations in the orbit. Congenital paralysis of the superior oblique muscle is rare. More often entire groups of external muscles of the eye are affected. The reason for the change in the muscles themselves may be their aplasia or hypoplasia, as well as improper attachment of the tendons of the muscles to the sclera of the eyeball. Rice. The direction of the visual axes in case of damage to the left trochlear nerve (the visual axis is indicated by an arrow): 1 - the direction of the visual axis in the left eye does not coincide with the axis of the healthy eye, which causes double vision; 2 - with a forced tilt of the head to the right shoulder, the direction of the visual axes of both eyes coincides with the object under consideration, there is no doubling. The arrow above the visual axis of the right eye indicates the direction of displacement of the visual axis. With B.'s paralysis of N, which normally innervates the superior oblique muscle, contraction of a cut causes the eye to turn downward and outward, vertical strabismus appears, the fields of view and the mobility of the eyeball downward, especially in the position of bringing the eye, are limited. The lowering of the eye in the position of abduction occurs in full due to the functioning of the superior rectus muscle. The patient feels doubling in the lower-inner half of the field of view. Doubling of the same name; the imaginary image is localized lower than the true one. The images diverge more vertically from one another when adducting the eye. The patient avoids doubling by a peculiar turn of the head - downwards towards the healthy eye). With this position of the head, binocular vision can be preserved (see). Due to the prolonged forced position of the head, scoliosis and torticollis sometimes develop.

Abducens nerve (VI pair, 6 pair, sixth pair of cranial nerves), n. abducens.

N. abductens (VI pair). The nuclei of the abducens nerves are located on both sides of the midline in the tire of the lower part of the bridge near the medulla oblongata and under the floor of the IV ventricle. The internal knee of the facial nerve passes between the nucleus of the abducens nerve and the fourth ventricle. The fibers of the abducens nerve go from the nucleus to the base of the brain and exit as a stem at the border of the pons and medulla oblongata at the level of the pyramids. From here, both nerves travel upward through the subarachnoid space on either side of the basilar artery. Then they pass through the subdural space anterior to the clivus, pierce the membrane and join in the cavernous sinus to other oculomotor nerves. Here they are in close contact with the first and second branches of the trigeminal nerve and with the internal carotid artery, which also pass through the cavernous sinus. The nerves are located near the upper lateral parts of the sphenoid and ethmoid sinuses. Further, the abducens nerve goes forward and enters the orbit through the superior orbital fissure and innervates the lateral muscle of the eye, which turns the eyeball outwards. Symptoms of the lesion. When the abducens nerve is damaged, the outward movement of the eyeball is disturbed. This is because the medial rectus muscle is left without an antagonist and the eyeball deviates towards the nose (converging strabismus - strabismus convergens). In addition, double vision occurs, especially when looking towards the affected muscle. Damage to any of the nerves that provide movement of the eyeballs is accompanied by double vision, since the image of the object is projected onto different areas of the retina. The movements of the eyeballs in all directions are carried out due to the friendly action of the six eye muscles on each side. These movements are always very precisely coordinated, because the image is projected mainly to only the two central foveae of the retina (the place of best vision). None of the muscles of the eye is innervated independently of the others. If all three motor nerves of one eye are damaged, it is deprived of all movements, looks straight, its pupil is wide and does not respond to light (total ophthalmoplegia). Bilateral paralysis of the eye muscles is usually the result of damage to the nuclei of the nerves. The most common causes leading to damage to the nuclei are encephalitis, neurosyphilis, multiple sclerosis, circulatory disorders, hemorrhages and tumors. The most common causes of nerve damage are also meningitis, sinusitis, aneurysm of the internal carotid artery, thrombosis of the cavernous sinus and communicating artery, fractures and tumors of the base of the skull, diabetes mellitus, diphtheria, botulism. It should be borne in mind that transient ptosis and diplopia can develop as a result of myasthenia gravis. Only with bilateral and extensive supranuclear processes extending to the central neurons going from both hemispheres to the nuclei, bilateral ophthalmoplegia of the central type can occur, since, by analogy with most motor nuclei cranial nerve nuclei III, IV and VI nerves have bilateral cortical innervation.

N. abducens, the abducens nerve, is the motor root of the third anterior myotome, is a muscular nerve and contains efferent (motor) fibers coming from its somatic motor nucleus, embedded in the bridge, to the lateral rectus muscle of the eye. It leaves the brain at the posterior edge of the bridge, passes through the fissura orbitalis superior into the orbit and enters m. rectus lateralis. Afferent (proprioceptive) fibers for the external eye muscles, corresponding to the efferent fibers of the III, IV and VI nerves, go as part of the first branch of the V nerve, n. ophthalmicus. Many authors admit the presence of afferent (proprioceptive) fibers in all three motor nerves of the eyeball.

N. accessorius, an accessory nerve, develops from the last gill arches, is muscular, contains efferent (motor) and afferent (proprioceptive) fibers and has two motor nuclei embedded in the medulla oblongata and spinal cord. According to the nuclei in it, the cerebral and spinal parts are distinguished. The cerebral part exits the medulla oblongata immediately below n. vagus. The spinal part of the accessory nerve is formed between the anterior and posterior roots of the spinal nerves and partly from the anterior roots of the three upper cervical nerves, rises in the form of a nerve trunk and joins the cerebral part. Because n. accessorius is a split off part of the vagus nerve, and it leaves the cranial cavity with it through the foramen jugulare and innervates m. trapezius and separated from it m. sternocleidomastoideus. The cerebral portion of the accessory nerve as part of n. laryngeus recurrens goes to innervate the muscles of the larynx. The spinal portion of the accessory nerve takes part in the motor innervation of the pharynx, reaching its muscles as part of the vagus nerve, from which the accessory nerve has not completely split off. The commonality and proximity of the accessory and glossopharyngeal nerves with the vagus is explained by the fact that the IX, X and XI pairs of cranial nerves make up one group of gill nerves - the group of the vagus nerve, from which the IX nerve stood out and the XI cleaved off.

Accessory nerve - motor. It consists of two parts - cerebral and spinal. This is due to the fact that the nuclei of the accessory nerve (nervus accessorius) are located in two places. One nucleus (cerebral) is a double nucleus (lat. Nucleus ambiguus), common with the glossopharyngeal and vagus nerves. The fibers extending from this nucleus form the cerebral part of the accessory nerve, which emerges from the sulcus of the medulla oblongata, behind the olive.

The second nucleus - the nucleus of the accessory nerve (Latin nucleus n.accessorii) lies in the posterolateral section of the anterior horn of the gray matter of the spinal cord along the upper 5-6 cervical segments.

Roots emerging from the medulla oblongata in the amount of 4-5 form the upper or cerebral root.

The roots extending from the lateral funiculus of the spinal cord, between the anterior and posterior spinal roots, uniting, form the spinal root n.accessorius (lat. radix spinalis nervi accessorii), which rises up and through the large occipital foramen (lat. foramen magnum) penetrates into the cavity skulls. Here, both groups of fibers are connected and form the trunk n.accessorii. This trunk through the jugular foramen (Latin foramen jugulare) (together with IX and X pairs) leaves the cranial cavity and is divided into 2 branches:

1. The internal branch (lat. ramus internus) approaches the vagus nerve and is part of it
2. The outer branch (lat. ramus externus) follows down and, at the level of the angle of the lower jaw, deviates posteriorly under the sternocleidomastoid muscle (lat. m.sternocleidomastoideus); here n.accessorius gives a number of muscle branches to it, connecting in its thickness with the branches of the cervical plexus (the third cervical nerve). Further, the nerve emerges from under the outer edge of this muscle, above the middle of its extension, into the region of the lateral

cervical triangle, enters under the anterior edge of the trapezius muscle (lat. m.trapezius) and innervates the latter.

The accessory nerve carries motor nerve fibers to mm.sternocleidomastoideus et trapezius, respectively, the function of the accessory nerve is identical to the function of these muscles. Thus, the function of n.accessorius is to turn the head in the opposite direction (m.sternocleidomastoideus), raise the shoulder, scapula and acromial part of the clavicle upward (shrug), pull the shoulder girdle backwards and bring the scapula to the spine, and also raise the shoulder above the horizontal (what m.trapezius is responsible for).

It should be noted that the neurons of the spinal portion of n.accessorius receive impulses from the cerebral cortex on both sides, but mainly from the opposite side. In addition to this, neurons receive extrapyramidal and reflex nerve impulses along the tectospinal (lat. tractus tectospinalis), vestibulospinal (lat. tractus vestibulospinalis) pathways and the medial longitudinal bundle (lat. fasciculus longitudinalis medialis), which, apparently, are responsible for involuntary turning the head in response to sound or harsh light.

Damage to the accessory nerve can be either due to central (intramedullary, intracerebral) or peripheral pathological processes. Violation of its function may be due to a primary infectious or toxic lesion of the nerve itself or its nucleus (poliomyelitis, tick-borne encephalitis, etc.), but it can also be of secondary origin and occur with damage to the cervical vertebrae and pathological processes in the posterior cranial fossa or on the neck.

- With unilateral damage to the projection zones of the n.accessorius cortex, its function is usually not impaired, due to the fact that the core of the accessory nerve receives nerve impulses from both hemispheres.
- The n.accessorius nucleus receives fibers from the extrapyramidal system. Spasms of the muscles innervated by the XI nerve are more often unilateral and are the result of cortical or subcortical irritations. Tonic spasm gives a picture of spastic torticollis (Latin torticollis spasticus); clonic - twitching the head in the opposite direction, sometimes with simultaneous raising of the shoulder.
- Bilateral clonic spasm leads to nodding movements of the head (Salaam spasm, spasmus nutans).

- The defeat of the XI nerve leads to the development of peripheral paralysis or paresis mm.sternocleidomastoideus et trapezius. Their atrophy sets in, usually leading to asymmetry. The shoulder on the diseased side is lowered, the scapula departs from the spine with its lower angle and turns outward and upward ("pterygoid scapula"). Difficulty raising the shoulder girdle ("shoulder shrug") and the ability to raise the arm above the horizontal level. Significantly difficult to turn the head in the opposite direction, due to paresis m. sternocleidomastoideus. With a bilateral lesion, a hanging of the head is noted.
- The defeat of n.accessorius is usually accompanied by deep, difficult to localize pain in the arm on the side of the lesion, which is caused by overstretching of the articular bag and ligamentous apparatus of the shoulder joint due to paralysis or paresis of the trapezius muscle.
- In the case of unilateral destruction of the anterior horns of the spinal cord at the level of 1-4 cervical segments (poliomyelitis, trauma, asymmetric syringomyelia), flaccid paralysis of the n.accessorius develops on the side of the lesion. Flaccid paralysis of n.accessorius is also observed with a peripheral lesion of its external branch. Flaccid paralysis of n.accessorius, caused by damage to the anterior horns of the spinal cord and its external branch, has one slight difference. So the peripheral lesion is accompanied by flaccid paralysis of m.sternocleidomastoideus, while in m.trapezius paresis develops only in its rostral (upper) part, since this muscle is also innervated by the spinal motor roots C3-C4.

After examination and palpation of the muscles innervated by the accessory nerve, the patient is asked to turn his head first to one side and then to the other, raise his shoulders and arm above the horizontal level, and bring the shoulder blades together. To identify muscle paresis, the examiner resists these movements. For this purpose, the patient's head is held by the chin, and the hands of the examiner are placed on the shoulders. While raising the shoulders, the examiner holds them with force.

Due to excessive sagging of the arm on the side of the lesion in a patient standing at attention with his hands down at the seams, it can be noted that the arm on the side where there is a lack of function of the XI nerve is lower than on the healthy side. If the patient is asked to stretch his arms forward in front of him, so that the palms touch each other, and the fingers are extended, then the ends of the fingers on the affected side will protrude more than on the healthy side.

Hypoglossal nerve (Latin nervus hypoglossus) - XII pair of cranial nerves. The nucleus of the hypoglossal nerve is motor, located in the medulla oblongata. The motor fibers leaving it go to the muscles of the tongue and ensure their movement.

From the substance of the brain, the hypoglossal nerve leaves 10-15 roots from the groove between the pyramid and the olive of the medulla oblongata. The roots are combined into a common trunk, which through the canal of the hypoglossal nerve (lat. canalis n. hypoglossus) exits the cranial cavity, follows down between the vagus nerve and the internal jugular vein, goes around the external carotid artery, passing between it and the internal jugular vein. Further, it crosses the external carotid artery in the form of an arc convex downwards, fits under the posterior belly of the digastric muscle into the region of the submandibular triangle (lat. trigonum submandibulare) and, having entered the muscles of the tongue, gives off lingual branches (lat. rr. linguales) [2].

Lingual branches - terminal branches of the hypoglossal nerve, approach the lower surface of the tongue and innervate both its own and skeletal muscles of the latter.

In its course, the hypoglossal nerve gives off a number of branches that connect it to other nerves:

1. connecting branch with the superior cervical ganglion of the sympathetic trunk,
2. connecting branch with the inferior node of the vagus nerve,
3. connecting branch with the lingual branch of the mandibular nerve from the trigeminal nerve,
4. connecting branch with a cervical loop (lat. ansa cervicalis) [3].

In addition to the connecting branches, the hypoglossal nerve at the very beginning (in the region of the hypoglossal nerve canal) gives off branches to the dura mater of the transverse sinus (Latin sinus transversus).

The nucleus of the hypoglossal nerve (lat. nucleus n. hypoglossi) is motor, lies in the middle sections of the back of the medulla oblongata. From the side of the rhomboid fossa, it is projected in the region of the hypoglossal nerve triangle (lat. trigonum n. hypoglossi). The nucleus of the hypoglossal nerve consists of large multipolar cells and a large number of fibers located between them, by which it is divided into three more or less separate cell groups. Each of these groups innervates its own muscle of the tongue. In evolutionary terms, these neurons are identical to the motor neurons of the anterior horns of the spinal cord.

The hypoglossal nerve innervates the muscles of the tongue: the styloglossus (lat. m. styloglossus), the hyoid-lingual (lat. m. hyoglossus) and the genio-lingual muscles (lat. m. genioglossus), as well as the transverse and rectus muscles of the tongue. Innervation of voluntary movements is carried out along the corticonuclear pathways, which begin in the precentral gyrus of the cerebral cortex. The nucleus of the hypoglossal nerve receives impulses predominantly along the contralateral cortical-nuclear pathway. In addition, information is carried to it by afferent fibers from the reticular formation, the nucleus of the solitary pathway (lat. Nucleus tractus solitarii) (receiving taste fibers from the facial and glossopharyngeal nerves), from the midbrain and from the nuclei of the trigeminal nerve. Accordingly, the nucleus of the hypoglossal nerve and the nerve itself are components of the reflex arcs that provide swallowing, chewing, sucking and licking.

If the pathological process is localized in the lower part of the motor zone of the cerebral cortex or along the cortical-nuclear fibers going to the nucleus of the hypoglossal nerve from the opposite hemisphere of the brain, then central paralysis of the hypoglossal nerve develops. Usually it is combined with hemiparesis or hemiplegia on the side opposite to the pathological focus. In this case, there is no atrophy of the tongue. When protruding, it deviates towards paretic or paralyzed limbs, "turning away" from the pathological focus. This is due to the fact that hypertonicity is a sign of central paralysis. Since the phenomena of central paralysis are observed on the side of the tongue contralateral to the pathological focus, it pulls the tongue to its side (opposite to the pathological focus).

In the presence of hemiplegia, there is slight dysarthria, but there are no swallowing disorders, since the function of the motor part of the glossopharyngeal and vagus nerves is not impaired due to the fact that they receive bilateral innervation, in contrast to the hyoid, which receives one-sided from the opposite hemisphere.

When the hypoglossal nerve is damaged, peripheral paralysis or paresis of the muscles of the tongue occurs. If its lesion is one-sided, then the tongue in the oral cavity is shifted to the healthy side, and when protruding from the mouth, it necessarily deviates towards the pathological process ("the tongue points to the focus"). The muscles of the paralyzed half of the tongue atrophy, therefore, the relief of its surface changes, folding occurs, giving reason to call the language changed in this way geographical, because it to some extent resembles the uneven edge of the earth's surface. Unilateral peripheral paralysis of the tongue has almost no effect on the acts of speech, chewing, swallowing, etc. Possible causes of damage to the peripheral trunk of the XII nerve are a fracture of the base of the skull, aneurysm, a tumor, and the effects of certain toxic substances (alcohol, lead, arsenic).

The defeat of the nuclei of the XII nerve is usually accompanied by phenomena of atrophic paresis of the circular muscle of the mouth (Latin m. Orbicularis oris). At the same time, the lips become thinner, it is difficult for the patient to whistle, blow out the candle. This phenomenon is explained by the fact that the bodies of peripheral neurons that send axons that go to this muscle pass as part of the facial nerve, themselves lying in the nucleus of the hypoglossal nerve.

A lesion in the region of the nucleus of the hypoglossal nerve can also capture the nucleus of the opposite side due to the proximity of these nuclei. This may develop bilateral flaccid paresis with atrophy and fasciculations in the muscles of the tongue. In the case of progression of the disease, the paralyzed hypotonic tongue lies at the bottom of the oral cavity, and there are markedly pronounced fasciculations in it. Speech and swallowing are severely impaired (dysarthria, dysphagia). During the conversation, it seems that the patient's mouth is full of something. The pronunciation of consonant sounds is especially difficult, and in connection with this, phrases containing difficult-to-pronounce combinations of consonants. Glossoplegia leads to difficulty in the process of eating, because it becomes very difficult for the patient to move the food bolus into the throat.

N. hypoglossus, hypoglossal nerve, is the result of the fusion of 3-4 spinal (occipital) segmental nerves that exist independently in animals and innervate the hyoid muscles. According to the isolation of the muscles of the tongue from it, these nerves (occipital and anterior spinal) in higher vertebrates and humans merge together, forming, as it were, a transitional group from the spinal nerves to the cranial. This explains the position of the nerve nucleus not only in the brain, but also in the spinal cord, the position of the nerve itself in the anterolateral groove of the medulla oblongata near the spinal cord and its exit by many radicular filaments (10-15), as well as the connection with the anterior branches of the I and II cervical nerves. in the form of ansa cervicalis. The hypoglossal nerve, being a muscular one, contains efferent (motor) fibers to the muscles of the tongue and afferent (proprioceptive) fibers from the receptors of these muscles. It also contains sympathetic fibers from the superior cervical sympathetic ganglion. He has connections with n. lingualis, with the lower node n. vagi, with I and II cervical nerves. The only somatic-motor nucleus of the nerve, incorporated in the medulla oblongata, in the region of trigonum n. hypoglossi of the rhomboid fossa, descends through the medulla oblongata, reaching the I-II cervical segment; it is part of the reticular formation system. Appearing at the base of the brain between the pyramid and the olive with several roots, the nerve then passes through the occipital canal of the same name, canalis hypoglossalis, descends along the lateral side of a. carotis interna, passes under the hind belly of m. digastricus and goes in the form of an arc, convex downwards, along the lateral surface of m. hyoglossus. Here, the arch of the hypoglossal nerve limits Pirogov's triangle from above. With a high location of the arch of the hypoglossal nerve, Pirogov's triangle has a large area and vice versa. At the front edge m. hyoglossus, the hypoglossal nerve splits into its terminal branches, which enter the muscles of the tongue. Part of the fibers of the hypoglossal nerve goes as part of the branches of the facial nerve to the circular muscle of the mouth, which is why the function of this muscle also suffers somewhat when the nucleus of the nerve is damaged. One of the branches of the nerve, radix superior, goes down, connects with the radix inferior of the cervical plexus and forms with it a cervical loop - ansa cervicalis. Therefore, ansa cervicalis - cervical loop, represents the connection of the last cranial nerve (hyoid) with the first plexus of spinal nerves, the cervical plexus. From this loop, the muscles located below the hyoid bone are innervated, and m. geniohyoideus. Radix superior of the hypoglossal nerve consists entirely of fibers of the I and II cervical nerves, joined to it from the cervical plexus. This morphological connection of the hypoglossal nerve with the cervical plexus can be explained by the development of the nerve, as well as by the fact that the muscles of the tongue during the act of swallowing are functionally closely related to the neck muscles acting on the hyoid bone and thyroid cartilage.

Among the possible causes of damage to the nucleus of the hypoglossal nerve, the most common are bulbar palsy, amyotrophic lateral sclerosis, syringobulbia, poliomyelitis, and vascular diseases.

The combination of peripheral nuclear palsy of the hypoglossal nerve on the side of the pathological focus, in combination with hemiparesis or central hemiplegia on the opposite side, usually occurs with thrombosis of the anterior spinal artery or its branches and is called Jackson syndrome (see alternating syndromes).

TEST QUESTIONS

1. what is the function of the olfactory nerve?

A. Sensitive

B. Motor

C. Mixed

D. Sympathetic

E. Parasympathetic

2. Through which holes do the fibers of the olfactory nerve enter the cranial cavity?

A. Through the openings of the lattice plate

B. Upper and lower orbital slits

C. Round and stiff openings

D. Oval and jugular openings

E. Lacerated hole

3. Where are the olfactory receptors located?

A. In the upper nasal mucosa

B. In the mucosa of the middle nasal passage.

C. In the mucous membrane of the lower nasal passage.

D. In the nasal mucosa of the pharynx.

E. In the mucous membrane of the tongue and soft palate.

4. Damage to which core of the brainstem will lead to impaired function of the submandibular and sublingual salivary glands?

A. Upper salivary

B. Yakubovich's nuclei

C. Lower salivary

D. Dorsal

E. Single Path

5. Which nerve innervates the inferior oblique muscle of the eye?

A. Oculomotor nerve

B. Abductive nerve.

C. Block nerve.

D. Trigeminal nerve.
E. Suborbital nerve

6. What is the function of the optic nerve?
A. Sensitive
B. Motor
C. Mixed
D. Sympathetic
E. Parasympathetic

7. Where is the cortical center of the visual analyzer localized?
A. Spur furrow and wedge
B. Geshl's gyrus
C. Central gyrus
D. Superior temporal gyrus
E. Frontal particle

8. Which muscle of the eye is innervated by the abducting nerve?
A. Lateral straight line
B. Upper oblique
C. Lower oblique
D. Upper line
E. Lower straight

9. Which muscle of the eye is innervated by the block nerve?
A. Upper oblique
B. Lower oblique
C. Upper straight
D. Lateral line
E. Medial line

10. The accessory nerve emerges from the skull along with:
A. X, IKh in pairs
B. IKh, KhI, KhII in pairs
C. IKh, KhII in pairs of

D. XII, VII in pairs of
E. VII, IX in pairs of

Current Security Questions

1. Pronounce the names of I,III, IV, VI, XI, XII pairs of cranial nerves and their branches in Latin based on the new anatomical nomenclature.
2. Display them on anatomical preparations, models and images.
3. Show the origin of pairs of cranial nerves I.III, IV, VI, XI, XII in the skull, model and images.
4. Display on anatomical preparations, models and images I.III, IV, VI, XI, XII pairs of cranial nerves and innervating muscles.
5. I.III, IV, VI, XI, XII to explain the origin of the main anatomical symptoms of damage to a pair of cranial nerves and their branches.
6. Nerve, oculomotor (pair III): location and function of the nuclei, exit from the brain and skull, superior and inferior branches, and innervation of the muscles of the eyeball. Message on the eyelash knot, signs of injury.
7. The location of the trochlear nerve is the nucleus, the exit from the brain and skull, the zone of innervation, signs of injury.
8. Location of the nucleus of the abducens nerve, exit from the brain and skull, zone of innervation, signs of injury.
9. Location of accessory nerve nuclei (located in the spinal cord and medulla oblongata), formation of two segments of the brain and exit from the skull, internal and external networks innervating muscles, connection with other nerves, signs of injury, damage.
10. Location of the hypoglossal nerve trunk, points of exit from the brain and skull, connection with the cervical vertebrae (formation of the cervical vertebrae), innervating muscles, signs of injury.

Practice 11.

Trigeminal nerve. Branches, nuclei and area of innervation. Vegetative nodes of the trigeminal nerve.

Goals and objectives

1. Know the nuclei of the V pair of cranial nerves
2. Know the exit area of the trigeminal nerve from the base of the brain.
3. Explain the outlets of the V pair of cranial nerve branches from the skull and show their areas of innervation.
4. Explain the innervation of the 1st horn of the trigeminal nerve.

In the process of studying the topic, the student learns the following

1. Development of the fifth pair of cranial nerves.
2. General patterns of age-related changes in the nervous system.

TRINAL NERVE (V PAIR), N. TRIGEMINUS. FIFTH PAIR OF CRANIAL NERVES. TRIPLE KNOT, GANGLION TRIGEMINALE.

N. trigeminus, the trigeminal nerve, develops in connection with the first branchial arch (mandibular) and is mixed. With its sensitive fibers, it innervates the skin of the face and the anterior part of the head, it borders behind the distribution area in the skin of the posterior branches of the cervical nerves and branches of the cervical plexus. The cutaneous branches (posterior) of the II cervical nerve enter the territory of the trigeminal nerve, as a result of which a border zone of mixed innervation arises 1–2 finger diameters wide. The trigeminal nerve is also a conductor of sensitivity from the receptors of the mucous membranes of the mouth, nose, ear and conjunctiva of the eye, except for those parts of them that are specific receptors of the sense organs (innervated from I, II, VII, VIII and IX pairs). As a nerve of the first branchial arch n. trigeminus innervates the chewing muscles and muscles of the floor of the mouth that developed from it and contains afferent (proprioceptive) fibers emanating from their receptors, ending in the nucleus mesencephalicus n. trigemini. As part of the branches of the nerve, in addition, secretory (vegetative) fibers pass to the glands located in the area of \u200b\u200bthe facial cavities. Since the trigeminal nerve is mixed, it has four nuclei, of which two are sensory and one motor are in the hindbrain, and one is sensory (proprioceptive) in the midbrain. The processes of cells laid down in the motor nucleus (nucleus motorius) exit the bridge on the line separating the bridge from the middle cerebellar peduncle and connecting the exit site nn. trigemini et facialis (linea trigeminofacialis), forming the motor nerve root, radix motoria. Next to it, a sensitive root, radix sensoria, enters the substance of the brain. Both roots make up the trunk of the trigeminal nerve, which, after leaving the brain, penetrates under the hard shell of the bottom of the middle cranial fossa and lies on the upper surface of the pyramid of the temporal bone at its apex, where the impressio trigemini is located. Here, the hard shell, bifurcating, forms a small cavity for it, cavum trigeminale. In this cavity, the sensitive root has a large trigeminal ganglion, ganglion trigeminale. The central processes of the cells of this node make up the radix sensoria and go to the sensitive nuclei: nucleus pontinus n. trigemini, nucleus spinalis n. trigemini and nucleus mesencephalicus n. trigemini, and peripheral go as part of the three main branches of the trigeminal nerve, extending from the convex edge of the node Both roots make up the trunk of the trigeminal nerve, which, after leaving the brain, penetrates under the hard shell of the bottom of the middle cranial fossa and lies on the upper surface of the pyramid of the temporal bone at its apex, where the impressio trigemini is located. Here, the hard shell, bifurcating, forms a small cavity for it, cavum trigeminale. In this cavity, the sensitive root has a large trigeminal ganglion, ganglion trigeminale. 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These branches of the trigeminal nerve are as follows: the first, or ophthalmic, n. ophthalmicus, second, or maxillary, n. maxillaris, and the third, or mandibular, n. mandibularis. The motor root of the trigeminal nerve, which does not take part in the formation of the node, passes freely under the latter and then joins the third branch. The human trigeminal nerve is the result of the fusion of two animal nerves: 1) n. ophthalmicus profundus, or n. trigeminus I, and 2) n. maxillomandibularis, or n. trigeminus II. Traces of this fusion are also visible in the ganglion trigeminale of the nerve, which is often double. Accordingly, ramus ophthalmicus is the former n. ophthalmicus profundus, and the other two branches make up n. maxillomandibularis, which, being the nerve of the first gill arch, has the structure of a typical visceral nerve: its ganglion trigeminale is homologous to the supragillary node, ramus maxillaris to the prebranchial branch, and ramus mandibularis to the branchial branch. This explains why the ramus mandibularis is a mixed branch, and the radix motoria bypasses the nerve node. Each of the three branches of the trigeminal nerve sends a thin branch to the dura mater of the brain. In the branching area of each of the three branches n. trigeminus there are several more small nerve nodules related to the autonomic nervous system, but usually described with the trigeminal nerve. These vegetative (parasympathetic) nodes were formed from cells that had settled in the process of embryogenesis along the paths of the branches of the trigeminal nerve, which explains the lifelong connection with them, namely: with n. ophthalmicus - ganglion ciliare, with n. maxillaris g. pterygopalatinum, with n. mandibularis-g. oticum and with n. lingualis (from the third branch) - g. submandibularis.

The first branch of the trigeminal nerve. N. ophthalmicus, the ophthalmic nerve, exits the cranial cavity into the orbit through the fissura orbitalis superior, but before entering it is still divided into three branches: n. frontalis, n. lacrimalis and n. nasociliaris. 1.N. frontalis, the frontal nerve, runs straight anteriorly under the roof of the orbit through the incisura (or foramen) supraorbitalis into the skin of the forehead, here it is called n. supraorbitalis (the video shows the technique of blocking the supraorbital nerve), giving branches along the way into the skin of the upper eyelid and medial angle of the eye. 2. N. lacrimalis, the lacrimal nerve, goes to the lacrimal gland and, passing through it, ends in the skin and conjunctiva of the lateral corner of the eye. Before entering the lacrimal gland n. lacrimalis connects with n. zygomaticus (from the second branch of the trigeminal nerve). Through this "anastomosis" n. lacrimalis receives secretory fibers for the lacrimal gland and supplies it with sensory fibers as well. 3. N. nasociliaris, nasociliaris nerve, innervates the anterior part of the nasal cavity (nn. ethmoidales anterior et posterior), eyeball (nn. ciliares longi), skin of the medial angle of the eye, conjunctiva and lacrimal sac (n. infratrochlearis). A connecting branch to the ganglion ciliare also departs from it. N. ophthalmicus carries out sensitive (proprioceptive) innervation of the eye muscles through connections with the III, IV and VI nerves. Gandlion ciliare, the ciliary ganglion, in the form of an oblong lump about 1.5 mm long, lies in the back of the orbit on the lateral side of the optic nerve. In this node, related to the autonomic nervous system, parasympathetic fibers are interrupted, coming from the accessory nucleus of the oculomotor nerve as part of n. oculomotorius to the muscles of the eye. From the front end of the node depart 3 - 6 nn. ciliares breves, which pierce the sclera of the eyeball in the circumference of the optic nerve and go inside the eye. Through these nerves pass (after their break in the node) the indicated parasympathetic fibers to m. sphincter pupillae and m. ciliaris.

The second branch of the trigeminal nerve. N. maxillaris, the maxillary nerve, exits the cranial cavity through the foramen rorundum into the pterygopalatine fossa; hence its immediate continuation is n. infraorbitalis, going through the fissura orbitalis inferior to the sulcus and canalis infraorbitalis on the lower wall of the orbit and then exiting through the foramen infraorbitale to face x, where it breaks up into a bundle of branches. These branches, connecting partly with branches n. facialis, innervate the skin of the lower eyelid, lateral surface of the nose and upper lip. From n. maxillaris and its extensions, n. infraorbitalis, in addition, the following branches depart: 1. N. zygomaticus, zygomatic nerve, to the skin of the cheek and anterior part of the temporal region. 2. Nn. alveolares superiores in the thickness of the maxilla form a plexus, plexus dentalis superior, from which rami dentales superiores depart to the upper teeth and rami gingivales superiores to the gums. 3.Rr. ganglionares connect n. maxillaris with ganglion pterygopalatinum.

Ganglion pterygopalatinum, the pterygopalatine node, is located in the pterygopalatine fossa medially and downward from n. maxillaris. In the node related to the autonomic nervous system, parasympathetic fibers coming from the autonomic nucleus n are interrupted. intermedius to the lacrimal gland and glands of the mucous membrane of the nose and palate as part of the nerve itself and further in the form of n. petrosus major (branch of the facial nerve). Ganglion pterygopalatinum gives off the following (secretory) branches: 1) rami nasales posteriores go through the foramen sphenopalatinum to the glands of the nasal mucosa; the largest of them, n. nasopalatinus, passes through the canalis incisivus, to the glands of the mucous membrane of the hard palate; 2) nn. palatini descend along the canalis palatinus major and, exiting through the foramina palatina majus et minus, innervate the glands of the mucous membrane of the hard and soft palate. As part of the nerves extending from the pterygopalatine node, pass, in addition to secretory fibers, still sensitive (from the second branch of the trigeminal nerve) and sympathetic fibers. Thus, fibers n. intermedius (parasympathetic part of the facial nerve), passing along n. petrosus major, through the pterygopalatine node innervate the glands of the nasal cavity and palate, as well as the lacrimal gland. These fibers go from the pterygopalatine node through n. zygomaticus, and from it to n. lacrimalis. and from it to n. lacrimalis. and from it to n. lacrimalis.

The third branch of the trigeminal nerve. Mandibular nerve, n. mandibularis. Ear knot, ganglion oticum.

The third branch of the trigeminal nerve. N. mandibularis, the mandibular nerve, has in its composition, in addition to the sensory, the entire motor root of the trigeminal nerve, coming from the mentioned motor nucleus, the nucleus motorius, to the muscles that arose from the mandibular arch, and therefore innervates the muscles attached to the lower jaw, the skin, its covering, and other derivatives of the mandibular arch. Upon exiting the skull through the foramen ovale, it divides into two groups of branches.

A. Muscular branches: To the same muscles: n. massetericus, nn. temporales profundi, nn. pterygoidei medialis et lateralis, n. tensoris tympani, n. tensoris veli palatini, n. mylohyoideus; the latter departs from n. alveolaris inferior, branches n. mandibularis, and also innervates the anterior abdomen m. digastricus. B. Sensitive branches: 1. N. buccalis to the buccal mucosa. 2. N. lingualis lies under the mucous membrane of the bottom of the mouth. Giving n. sublingualis to the mucous membrane of the floor of the mouth, it innervates the mucous membrane of the back of the tongue throughout its anterior two-thirds. Where n. lingualis passes between both pterygoid muscles, a thin branch of the facial nerve, chorda tympani, emerging from the fissura petrotympanica, joins it. It passes outgoing from the nucleus salivatorius superior n. intermedii parasympathetic secretory fibers for the sublingual and submandibular salivary glands. It also carries taste fibers from the anterior two-thirds of the tongue. Fibers of Samrgo n. lingualis, spreading in the tongue, are conductors of general sensitivity (touch, pain, temperature sensitivity).

3. N. alveolaris inferior through the foramen mandibulae, together with the artery of the same name, goes into the canal of the lower jaw, where it gives branches to all the lower teeth, having previously formed a plexus, plexus dentalis inferior. At the anterior end of canalis mandibulae n. alveolaris inferior gives a thick branch, n. mentalis, which emerges from the foramen mentale and extends into the skin of the chin and lower lip. N. alveolaris inferior is a sensory nerve with a small admixture of motor fibers that come out of it in the foramen mandibulae as part of n. mylohyoideus (see above). 4. N. auriculotemporalis penetrates into the upper part of the parotid gland and goes to the temporal region, accompanying a. temporalis superficialis. Gives secretory branches to the parotid salivary gland (see below for their origin), as well as sensitive branches to the temporomandibular joint, to the skin of the anterior part of the auricle, external auditory canal and to the skin of the temple. In the region of the third branch of the trigeminal nerve, there are two nodules belonging to the autonomic system, through which the salivary glands are mainly innervated. One of them is ganglion oticum, the ear node is a small roundish body located under the foramen ovale on the medial side n. mandibularis. Parasympathetic secretory fibers come to it as part of n. petrosus minor, which is a continuation of n. tympanicus, originating from the glossopharyngeal nerve. These fibers are interrupted at the node and go to the parotid gland through n. auriculotemporalis, with which ganglion oticum is in conjunction. Another nodule, the ganglion submandibular submandibular node, is located at the anterior edge of m. pterygoideus medialis, over the submandibular salivary gland, under n. lingualis. The node is connected by branches to n. lingualis. Through these branches go to the node and end in it fibers of the chorda tympani; they are continued by fibers emanating from the ganglion submandibularis, innervating the submandibular and sublingual salivary glands.

TEST QUESTIONS

1. All of the following formations do not pass through the superior orbital gap except:

A. I branches of the trigeminal nerve
B. II branches of the trigeminal nerve
C. III branches of the trigeminal nerve
D. Optic nerve
E. Great stony nerve

2. Through which hole of the skull does the maxillary nerve pass?
A. Round hole
B. Oval opening
C. Stiff orifice
D. Lacerated hole
E. Upper orbital gap

3.What hole does nervus mandibularis pass through the skull?
A. Oval opening
B. Round hole
C. Stiff orifice
D. Lacerated hole
E. Upper orbital gap

4. What name does V pair of cranial nerves have?
A. N. trigeminus
B. N. abducens
C. N. vestibulocochlearis
D. N. vagus
E. N. glossopharyngeus

5. For the V pair of cranial nerves - the trigeminal nerve is characteristic:
A. Inervates the muscle-pulling palatine curtain;
B. Innervates mimic muscles;
C. Performs motor innervation of sublingual muscles;
D. Performs motor innervation of the deep muscles of the neck;
E. The function of the nerve is motor.
6. Which muscle is innervated by the trigeminal nerve?
A. M. pterygoideus medialis
B. M. zygomaticus minor
C. M. zygomaticus major
D. M. buccinator
E. M. levator labii superioris

7. Which muscle is innervated by the trigeminal nerve?
A. Venter anterior m. digastrici
B. M. zygomaticus minor
C. M. zygomaticus major
D. M. buccinator
E. M. levator labii superioris

8. Which muscle is innervated by the trigeminal nerve?
A. M.masseter
B. M.zygomaticus minor
C. M.zygomaticus major
D. M.buccinator
E. M.levator labii superioris

9. Which cranial nerve branch is damaged when the overall sensitivity of the anterior two-thirds of the tongue mucosa is lost?
A. V
B. VIII
C. IX
D. X
E. XI

10. Is trigeminal nerve damage causing?
A. Damage to facial skin sensitivity
B.Paresis buccal muscle
C.Paresis of the chin muscle;
D. Nasal muscle paresis
E. Paresis laughter muscles

Current Security Questions

1. Know the fifth pair of cranial nerves.
2. Show the exit area of the trigeminal nerve from the base of the brain.
3. Explain the exit openings of the branches of the cranial nerves of the V-pair and show their areas of innervation.
4. Explain the origin of the main anatomical symptoms in explaining the innervation of the first horn of the trigeminal nerve.

Practice 12.

Theme: VII - IX, cranial nerves. Branches, nuclei and area of innervation.

Goals and objectives of the lesson:

• Discuss with students the location, structure, and function of the nuclei of the facial and glossopharyngeal cranial nerves.

• Anatomical preparations, models and diagrams show the location of these nerve endings in the brain, the exits of the brain and skull, their networks, as well as the innervating muscles and zones.

• Explain the main anatomical symptoms of damage to the VII and IX pairs of cranial nerves and their branches.

In the process of studying the topic, the student learns the following

• Pronounces the names of VII, IX pairs of cranial nerves and their branches in Latin based on the new anatomical nomenclature.

• Shows VII, IX pairs of cranial nerves on anatomical preparations, models and drawings.

• Shows the branches of VII, IX pairs of cranial nerves and innervating muscles on anatomical preparations, models and drawings.

• Explains the origin of the main anatomical symptoms of damage to the VII, IX pairs of cranial nerves and their branches.

Data block:

Facial nerve (lat.nervus facialis), seventh (VII) of twelvecranial nerves, comes out of the brain betweenponsandmedulla oblongata. facial nerveinnervatesfacial muscles. Also in the facial nerve passes the intermediate nerve responsible for the innervation of the lacrimal gland, stapedius muscle and taste sensitivity of the two anterior thirds language.

Diagram of the facial nerve

The processes of the cells that form the nucleus of the facial nerve first follow in the dorsal direction, bending around the nucleusabducens nerve, then forming the knee of the facial nerve, are directed ventrally and exit to the lower surface of the brain at the posterior edgebridge, above and lateral to the olivemedulla oblongata.

The facial nerve itself is motor, but after the intermediate nerve is attached to it (lat.n.intermedius), represented by sensitive (taste and secretory) and motor fibers, becomes mixed.

At the base of the brain, the intermediate nerve (lat.n.intermedius) appears along with the front. Subsequently, both nerves, together withvestibulocochlear nerve (lat.n.vestibulocochlearis) (VIII paircranial nerves) enter through the internal auditory opening (lat.porus acusticus internus) pyramidstemporal boneinto the internal auditory canallat.meatus acusticus internus). Here the facial and intermediate nerves are connected and through the field of the facial nerve (lat.area n.facialis), enter the canal of the facial nerve. At the bend of this canal, the knee of the facial nerve is formed (lat.geniculum n.facialis), and thickens due to the knee knot (lat.ganglion geniculi). This node contains the first nuclei of the sensitive part of the intermediate nerve.

The facial nerve repeats all the bends of the eponymous bone canal and, exiting the temporal bone through the stylomastoid foramen (lat.foramen stylomastoideum), lies in the thicknessparotid gland(lat.glandula parotis), where it divides into its main branches.

Inside the pyramid of the temporal bone, a number of branches depart from the intermediate nerve:

1. Greater stony nerve (lat.N. petrosus major), begins near the node of the knee and consists of parasympathetic fibers. It exits the pyramid of the temporal bone through a cleft in the canal of the greater petrosal nerve (lat.hiatus canalis n. petrosi majoris), lies in the groove of the same name and exits the cranial cavity through a torn hole (lat.foramen lacerum). In the future, this nerve, passing through the pterygoid canalsphenoid bone (lat.canalis pterygoideus ossis sphenoidalis), enters the pterygopalatine fossa (lat.fossa pterygopalatina), reaching the pterygopalatine node (lat.ganglion pterygopalatinum). The preganglionic fibers of the greater stony nerve switch on the cells of this node. Postnodal fibers go as part of the zygomatic nerve, and then as part of the connecting branch with the lacrimal nerve and the lacrimal nerve, reaching and innervating the lacrimal gland (lat.glandula lacrimalis). Thus, the large stony nerve innervates the lacrimal gland.

2. Connecting branch with tympanic plexus (lat.Ramus communicans cum plexus tympanico) departs from the knee node or from

the large stony nerve and follows the small stony nerve (lat.n.petrosus minor).

3. stapedial nerve (lat.N.stapedius) is a very thin branch that starts from the descending part of the facial nerve, approaches the stirrupmuscleand innervates it.

4. Connecting branch with vagus nerve (lat.Ramus communicans cum nervo vago) - thin nerve, coming to the lower nodevagus nerve.

5. Drum string (lat.Chorda tympani) is the terminal branch of the intermediate nerve. It departs from the trunk of the facial nerve slightly above the stylomastoid foramen, enterstympanic cavity(lat.cavum tympani) from the side of the back wall, forming a small arc, concave downward, and lies between the handle of the malleus and the long leg of the anvil. Approachingpetrotympanic fissure (lat.fissura petrotympanica), the drum string leaves through itscull. In the future, it goes down and, having passed between the medial and lateral pterygoid muscleslat.m.pterygoideus medialis et lateralis, enters the lingual nerve at an acute anglelat.n.lingualis. In its course, the drum string does not give off branches, only at the very beginning, after leaving the skull, it is connected by several branches to the ear node. The drum string consists of two types of fibers: prenodal parasympathetic, which areaxonscells of the superior salivary nucleus (lat.nucleus salivatorius superior), and fibers of taste sensitivity -dendritescells of the geniculate ganglion of the facial nerve. Central processes (axons) knee nodes end at the core of a single path (lat.nucleus tractus solitary). Part of the fibers of the tympanic string, which are part of the lingual nerve, goes to the submandibular and sublingual nodes as part of the nodal branches, and the other part reaches the mucous membrane of the back of the tongue.

Having exited through the stylomastoid foramen from the pyramid of the temporal bone, the facial nerve, even before entering the thickness of the parotid gland, gives off a number of branches:

1. Posterior ear nerve (lat.N.auricularis posterior), starts directly under the stylomastoid opening, turns backward and upward, goes behind the outer ear and is divided into two branches: the anterior ear branch (lat.r.auricularis), and back - occipital (lat.r.occipitalis). The auricular branch innervates the posterior and anterior auricularmuscles, transverse and oblique musclesauricle, antitragus muscle. The occipital branch innervates the occipital belly of the supracranial muscle (lat.m.epicranius)

and connects with the large ear and small occipital nerves of the cervical plexus and with the ear branch of the vagus nerve.

2. stylohyoid branch (lat.R.stylohyoideus) can depart from the posterior ear nerve (lat.n.auricularis posterior). This is a thin nerve that goes down, enters the thickness of the muscle of the same name, having previously connected to the sympathetic plexus located around the external carotid artery

3. digastric branch (lat.R. digastricus) can depart both from the posterior ear nerve and from the facial trunk. It is located slightly below the stylohyoid branch, descends along the posterior belly of the digastric muscle (lat.m.digastricus) and gives branches to it. Has a connecting branch withglossopharyngeal nerve.

4. lingual branch (lat.R.lingualis) is unstable, is a thin nerve that envelops the styloid process and passes underpalatine tonsil. Gives a connecting branch to the glossopharyngeal nerve and sometimes a branch to the styloglossus muscle (lat.m.stylohyoideus).

Having entered the thickness of the parotid gland, the facial nerve divides into two main branches: a more powerful upper and a smaller lower one. Further, these branches are divided into branches of the second order, which diverge radially: up, forward and down to the muscles of the face. Between these branches in the thickness of the parotid gland, connections are formed that make up the parotid plexus (lat.plexus parotideus).

The following branches depart from the parotid plexus - the so-called.big goose foot (lat.pes anserinus major):

1. Temporal branches (lat.Rr.temporales) - back, middle and front. They innervate the superior and anterior auricular muscles, the frontal abdomensupracranial muscle, the circular muscle of the eye, the muscle wrinkling the eyebrow.

2. zygomatic branches (lat.Rr.zygomatici) - two, sometimes three, go forward and up and approach the zygomatic muscles and the circular muscle of the eye.

3. buccal branches (lat.Rr.buccales) are three or four rather powerful nerves. They depart from the upper main branch of the facial nerve and send their branches to the following muscles: the large zygomatic, laughter muscle, buccal, raising and lowering the corner of the mouth, the circular muscle of the mouth and nasal. Occasionally, there are

connecting branches between the symmetrical nerve branches of the circular muscle of the eye and the circular muscle of the mouth.

4. marginal branchmandible(lat.R.marginalis mandibulae) heading anteriorly, runs along the edge of the lower jaw and innervates the muscles that lower the corner of the mouth and lower lip, the chin muscle.

5. cervical branch (lat.R.colli) in the form of 2-3 nerves goes behind the angle of the lower jaw, approaches the subcutaneous muscle, innervates it and gives off a number of branches that connect to the upper (sensory) branch of the cervical plexus.

The facial nerve is mainly motor, but sensory (gustatory) and parasympathetic (secretory) fibers pass through its trunk, which are usually considered as components of the intermediate nerve (lat.n.intermedius) (synonyms - Wrisberg's nerve, Sapolini's nerve, XIII cranial nerve).

Accordingly, fibers from several nuclei pass in the facial nerve. Its main (motor) part in the caudal parts of the tegmentum of the pons has one motor nucleus, consisting of several cell groups, each of which provides innervation of certain facial muscles. Those parts of the nucleus of the facial nerve that give rise to branches for the forehead and eyelids have bilateral cortical innervation. The muscles of the forehead provide an excellent example for the synergistic act of both areas; in the same way, the circular muscle of the eye, under ordinary conditions, contracts simultaneously on the right and left. In contrast, the lower part of the facial nerve nucleus, which gives off fibers to the mouth and cheeks, has a cross-cortical innervation; when eating, facial expressions, etc. muscles of the same name often function asymmetrically. It should also be noted that the corehypoglossal nervetakes part in the innervation of the circular muscle of the mouth, the area that is innervated by the lower branches of the facial nerve. thereforeparesisof the lips, observed next to the nuclear hypoglossal nerve palsy does not prove damage to the facial nerve, if there are no other symptoms of paralysis.

The nuclei of the intermediate nerve are located mainly in the medulla oblongata and are common withglossopharyngeal nerve(lat.n.glossopharyngeus). These are the upper parts of the single path kernel (lat.nucleus tractus solitarii) and superior salivary nucleus (lat.nucleus salivatorius superior). The intermediate nerve also includes an accumulation of parasympathetic cells located near the motor nucleus n.facialis, which provide innervation to the lacrimal gland.

Kernels n.facialis and n.intermedius

1. Nucleus motorius n.facialis - the course of the fibers of the nucleus of the facial nerve in the thickness of the bridge is very complex: the axons that emerge from the cells of the nucleus first go dorsally and medially, reaching almost to the bottom of the fourth ventricle. The protrusion at the bottom of the rhomboid fossa formed by these fibers is called the facial tubercle. The nucleus of the abducens nerve is located in the loop formed by these fibers. Further, the fibers of the facial nerve pass through the thickness of the bridge and, at its border with the oblong bridge, exit the substance of the brain. This area is called the cerebellopontine angle. The motor nucleus of the facial nerve is an integral part of several reflex arcs. Corneal reflex - sensory impulses from the mucous membrane of the eye are carried along the ophthalmic nerve to the base of the sensory nucleus. Here they switch to the nucleus of the facial nerve on the same side. The efferent part of the reflex arc is represented by the peripheral neuron of the facial nerve. Visual impulses reach the nucleus of the facial nerve, passing from the upper hillocks of the roof of the midbrain along the tecto-bulbar path, causing the eyelids to close when the eyes are sufficiently brightly lit - the blinking reflex, or the squinting reflex. Auditory impulses reach the nucleus n.facialis through the dorsal nucleus of the trapezoid body. Depending on the intensity of the noise, this reflex arc provides either relaxation or tension in the stapedius muscle. Auditory impulses reach the nucleus n.facialis through the dorsal nucleus of the trapezoid body. Depending on the intensity of the noise, this reflex arc provides either relaxation or tension in the stapedius muscle. Auditory impulses reach the nucleus n.facialis through the dorsal nucleus of the trapezoid body. Depending on the intensity of the noise, this reflex arc provides either relaxation or tension in the stapedius muscle.

2. Nucleus salivatorius superior - this nucleus is located caudal and medial to the nucleus of the facial nerve, namely, on the border between the pons and the medulla oblongata, near the bottom of the fourth ventricle. The superior salivary nucleus receives impulses from the olfactory system through the posterior longitudinal bundle. Appetite-stimulating odors trigger the salivation reflex. Lacrimation is caused by

central stimuli from the hypothalamus (emotions) coming through the reticular formation, and impulses from the spinal node of the trigeminal nerve (irritationconjunctiva)

3. Nucleus tractus solitarii is the relay point for taste fibers. From here, taste impulses go to the contralateral thalamus (the exact path is unknown) and terminate in the most medial part of the postero-medial ventral nucleus. From the thalamus, the axons of other neurons go to the base of the opercular partpostcentral gyrusnear the islet.

4. Accumulation of parasympathetic cells near the motor nucleus of the facial nerve - most likely the axons of these cells are sent to the stapedius muscle m.stapedius

The branches of the intermediate nerve perform the following functions:

1. N. petrosus major contains secretory fibers that innervate the lacrimal gland and mucous glands of the nasal and oral cavities

2. N.stapedius innervates the muscle of the same name, which closes the fenestra ovalis of the tympanic cavity with the base of the stirrup

3. Chorda tympani - the drum string innervates the anterior 2/3 of the tongue (gustatory fibers - the bodies of the first neurons are located in the ganglion geniculi). The second part of the fibers that enter the drum string go to the submandibular and sublingual nodes, and from them to the submandibular and sublingual glands.

Peripheral paralysis of the facial nerve

The defeat of the motor portion of the facial nerve leads to peripheral paralysis of the innervated muscles - the so-called. peripheral paralysis n.facialis. At the same time, it developsasymmetryface, noticeable at rest and sharply intensifying with mimic movements. Half of the face on the side of the lesion is motionless. The skin of the forehead, when trying to wrinkle it into folds, does not gather on this side, the patient fails to cover the eye. When you try to close your eyes, the eyeball on the side of the lesion turns up (Bell's symptom) and a strip of sclera becomes visible through the gaping palpebral fissure (hare's eye, lagophthalmos). In case of moderateparesisthe circular muscle of the eye, the patient usually has the ability to cover both eyes, but cannot cover the eye on the side of the lesion, while leaving the eye on the healthy side open (eyelid dyskinesia, or Revillo's symptom). It should be pointed out that during sleep the eye closes better (relaxation of the muscle that lifts the upper eyelid). When the cheeks are puffed up, air escapes through the paralyzed corner of the mouth, the cheek on the same side "sails" (sail symptom). The nasolabial fold on the side of muscle paralysis is smoothed, the corner of the mouth is lowered. Passive lifting of the corners of the patient's mouth with the fingers leads to the fact that the corner of the mouth on the side of the lesion of the facial nerve rises higher due to reduced muscle tone (Russetsky's symptom) .. When you try to bare the teeth on the side of the paralyzed circular muscle of the mouth, they remain covered with lips. In this regard, the asymmetry of the oral fissure is roughly expressed, the oral fissure is somewhat reminiscent of a tennis racket turned with the handle in the direction of the lesion (racquet symptom). A patient with paralysis of facial muscles due to damage to the facial nerve has difficulty eating, food constantly falls over the cheek and has to be removed from there with the tongue. Sometimes there is biting of the buccal mucosa on the side of the paralysis. Liquid food and saliva may flow from the corner of the mouth on the affected side. The patient also experiences a certain awkwardness when talking. It is difficult for him to whistle, to blow out a candle. Sometimes there is biting of the buccal mucosa on the side of the paralysis. Liquid food and saliva may flow from the corner of the mouth on the affected side. The patient also experiences a certain awkwardness when talking. It is difficult for him to whistle, to blow out a candle. Sometimes there is biting of the buccal mucosa on the side of the paralysis. Liquid food and saliva may flow from the corner of the mouth on the affected side. The patient also experiences a certain awkwardness when talking. It is difficult for him to whistle, to blow out a candle.

Due toparesiscircular muscle of the eye (paretic lower eyelid)a teardoes not fall completely into the lacrimal canal and flows out - it gives the impression of increased tearing.

With neuropathy of the facial nerve in the late period, a contracture may appear with a pull of the face in a healthy direction.

After peripheral paralysis of n.facialis, partial or incorrect regeneration of damaged fibers, especially vegetative ones, is possible. Surviving fibers can send new axons to damaged parts of the nerve. Such pathological reinnervation can explain the occurrence of contractures or synkinesis in the mimic muscles of the face. Associated with imperfect reinnervation crocodile tear syndromeor Bogorad's syndrome (paradoxical taste-lacrimal reflex). The secretory fibers for the salivary glands are thought to grow into the Schwann sheaths of the degenerated damaged fibers that originally supplied the lacrimal gland.

The anatomical and physiological conditions that represent the course of the facial nerve make it possible, according to the clinical picture, to very accurately diagnose the place where the conduction of these systems was interrupted:

Damage to the facial nerve in the pyramid of the temporal bone

- Proximal to the drum string (lat.chorda tympani) - peripheral paralysis of the facial nerve, lack of taste sensitivity in the anterior 2/3language. Patients often have dry mouth due to a disorder in the secretion of the submandibular and sublingual salivary glands.
- Proximal to the stapedial nerve (lat.n.stapedius) - peripheral paralysis of the facial nerve, lack of taste sensitivity in the anterior 2/3 of the tongue. Patients often have dry mouth due to a disorder in the secretion of the submandibular and sublingual salivary glands, hyperacusis-abnormally fine hearing and special sensitivity to low tones
- Proximal to the greater petrosal nervelat.n.petrosus major - peripheral paralysis of the facial nerve, lack of taste sensitivity in the anterior 2/3 of the tongue. Patients often have dry mouth due to a disorder in the secretion of the submandibular and sublingual salivary glands; often nervous deafness due to combined damagevestibulocochlear nervelat.n.vestibulocochlearis; only when it is absent - hyperacusis; lack of tearing - xerophthalmia.

The following syndromes may occur:

- Syndrome of the internal auditory canal (Lyanitz syndrome), consisting of signs of damage to the auditory and facial nerves on the side of the pathological focus. In this case, there may be noise in the ear, hearing loss according to the sound-perceiving type, signs of peripheral paralysis of the facial nerve. More common in the early stages of growthneuromas of the VIII nerve.
- Syndrome of the lateral cistern of the pons or pontocerebellar angle syndrome consists of a combination of signs of damage to the cranial nerves passing through the lateral cistern of the pons, that is, the VIII, VII and V cranial nerves. This syndrome most often occurs with neurinomas of the VIII nerve.

Damage to the facial nerve in the cranial cavity

The above symptoms. Often bilateral facial paralysis (basal meningitis). In most cases, other nerves are also affected, and there are also cerebral symptoms.

Damage to the nucleus of the facial nerve

The nuclei can suffer from degenerative diseases (progressive bulbar palsy, syringobulbia), dyscirculatory and inflammatory processes (polioencephalitis), tumors of the pons or hemorrhages in the pons. Clinically, damage to the nucleus of the facial nerve is manifested by its peripheral paralysis. Since pathological processes rarely affect only the nucleus of the facial nerve in isolation, the following syndromes are distinguished

- Miylard-Gubler syndrome, consisting of a combination of signs of peripheral paralysis of the facial nerve on the side of the pathological focus, due to damage to the nucleus or root of the facial nerve, and central hemiparalysis or hemiparesis on the opposite side of the pathological focus, which arose in connection with the defeat of the pyramidal tract
- Fauville's syndrome, manifested by paralysis of the muscles innervated by the facial andabducens nerveson the side of the pathological focus, and central hemiparalysis or hemiparesis, and sometimes hemianesthesia or hemihypesthesia on the opposite side. Fauville and Miyyard-Gubler syndromes occur with obstruction of the circumferential branches of the basilar artery.
- Syndrome of the caudal tegmentum of the bridge - the cause is obstruction of the short and long circumferential branches of the basilar artery. Symptoms - ipsilateral nuclear palsy of the facial and abducens nerves;nystagmus(due to damage to the medial longitudinal bundle); gaze paralysis towards the lesion; ipsilateral hemiataxia andasynergy(due to damage to the middle cerebellar peduncle); contralateralanalgesiaand termanesthesia (due to damage to the lateral spinothalamic pathway); hypoesthesia of tactile, vibrational, sensitivity, sense of position (due to damage to the medial loop); ipsilateral myorhythmiassoft palateandpharynx(due to the defeat of the central tire path).

Central facial paralysis

With the localization of the pathological focus in the cerebral cortex or along the corticonuclear pathways related to the facial nerve system, central paralysis of the facial nerve develops. In this case, central paralysis or more oftenparesisdevelops on the side opposite to the pathological focus, only in the muscles of the lower part of the face, the innervation of which is provided through the lower part of the nucleus of the facial nerve.Paresismimic muscles of the central type is usually combined with hemiparesis.

With a purely limited focus in the cortical projection zone of the facial nerve, the lag of the corner of the mouth on the opposite half of the face in relation to the pathological focus is ascertained only with an arbitrary grin of the teeth. This asymmetry is completely leveled with emotionally expressive reactions (withlaughterandcrying), because the reflex ring of these reactions closes at the level of the limbic-subcortical-reticular complex. In this regard, despite the existence of supranuclear palsy, the muscles of the face are capable of involuntary movements in the form of a clonic tic, or tonic facial spasm, since the connections of the facial nerve with the extrapyramidal system are preserved. Possible combination of isolated supranuclear palsy with attacks of Jacksonianepilepsy.

Vestibulocochlear nerve (lat.nervus vestibulocochlearis) - (VIII pair of cranial nerves) special nervesensitivityin charge of transmissionauditoryimpulses, as well as impulses emanating from the vestibular regioninner ear.

The vestibulocochlear nerve is a nerve of special sensitivity, consisting of two roots of different function: the vestibular root (lat.radix vestibularis), which carries impulses from the static apparatus, represented by the semicircular ducts of the vestibular labyrinth, and the cochlear root (lat.radix cochlearis), which conducts auditory impulses from the spiral organcochlear labyrinth.

On the lower surface of the brain, it is shown belowfacial nerve (lat.n.facialis), outside of the olivemedulla oblongata.

Peripheral fibers (dendrites) radix cochleare originate from the ganglion of the cochlea (lat.ganglion cochleare) and end inspiral organ, which is the perceiving device of the auditory pathway.

Central processes (axons) cochlear ganglion cells form the radix cochleare, which emerges from the pyramidtemporal bonethrough the internal auditory opening and enters the substancebrain. It ends in the posterior and anterior cochlear nuclei.

The vestibular root originates from the vestibular ganglion (lat.ganglion vestibulare), which lies in the crevice of the internal auditory canal. The vestibular ganglion is divided into two parts: superior and inferior.

The peripheral processes (dendrites) of the ganglion vestibulare cells approach the receptor cells of the sac spherical, the elliptical sac, and the semicircular ducts. The central processes (axons) are part of the vestibular root, approach the vestibular nuclei of the vestibular field of the rhomboid fossa (lat.fossa rhomboidea).

Auditory system

The auditory system consists of the outer, middle and inner ear. Only the inner ear, which consists ofsnails (lat.cochlea) containingorgan of cortiand spiral organ (lat.organum spirale), and the auditory nerve. Sound waves coming from the outer ear in the organ of Corti are transformed into nerve impulses. In addition to air conduction, there is also bone conduction (transmission of sound vibrations through bonesskulls). Postganglionic fibers of the spiral ganglion come from the node of Corti, which go to this node and switch in it, forming the auditory nerve. The auditory nerve, in turn, joins the vestibular nerve on its way through the internal auditory foramen of the temporal bone. At the cerebellopontine angle, both nerves enter the brainstem just behind the inferior cerebellar peduncle (lat.pedunculus cerebellaris inferior). In the brainstem are the second neurons of the auditory nerve, represented by the anterior and posterior cochlear nuclei (lat.nuclei cochleares ventralis et dorsalis), which occupy the most lateral position of the vestibular field of the rhomboid fossa.

Axons originating from the anterior cochlear nucleus, for the most part, pass to the opposite side in the form of "trapezoid" fibers and participate in the formation of the trapezoid body, located on the border between the base and the tirepons. Axons originating in the posterior cochlear nucleus run dorsally from the inferior cerebellar peduncle to the opposite side, partly within the medullary stria of the fourth ventricle (lat.striae medullares ventriculi quarti), partly as part of the reticular formation.

Crossed fibers transmit impulses to the nucleus of the trapezoid body, the superior nucleus of the olive, the nucleus of the lateral loop, or the reticular formation. The fibers that have not undergone a crossover mainly end in the upper olives of the same side. Thus, the bodies of the third neurons of the auditory pathways are located in the upper olives and nuclei of the trapezoid body. Their axons form a lateral or auditory loop, consisting of crossed and non-crossed auditory pathways, which rises and reaches the subcortical auditory centers - the medial geniculate bodies and the inferior colliculus colliculi.

From the cells of the subcortical auditory centers, the last auditory axons originate, which pass through the posterior leginternal capsuleand corona radiata, ending in the temporal lobe of the cerebral cortex (the posterior section of the superior temporal gyrus and the transverse gyrus of Heschl, located deep in the Sylvian sulcus).

The primary cortical field is surrounded by secondary projection fields, in which the analysis, identification and comparison of auditory stimuli takes place. They are also interpreted and recognized as noises, tones, melodies, vowels and consonants, words and sentences, in other words, symbols of speech. In the case of damage to these cortical areas in the dominant hemisphere, the ability to recognize sounds and understand speech is lost (sensory aphasia).

On the way from the organ of Corti to the cortex, the fibers of the auditory pathway make 4-6 switchings (in the nucleus of the superior olive, neurons of the reticular formation, the nucleus of the lateral loop, inferior colliculi, medial geniculate bodies). At these points, they give off collaterals that are part of the reflex arcs. Some collaterals are associated withcerebellum. Others pass along the medial longitudinal fasciculus to the nuclei that innervate the muscles of the eyes, and participate in the organization of a friendly turn of the eyes in the direction of sound. Part of the fibers goes through the lower and upper mounds of the roofmidbrainto the pretectal nucleus and from it as part of the tectobulbar tract to the nuclei of various cranial nerves, including the nucleus of the facial nerve (to adjust the tone of the stapedius muscle (lat.m.stapedius)), as well as to the motor cells of the anterior horns of the cervical regionspinal cord. The latter connection ensures that the head turns towards or away from the sound source. Collaterals that send impulses to the ascending activating system of the reticular formation contribute to the organization of the awakening process. Some impulses descend as part of the lateral loop to the intercalary neurons, which have a regulatory, presumably, partially inhibitory effect on the tone of the basement membrane. It is believed that these neurons provide the ability of the ear to focus on certain frequencies of sound by simultaneously suppressing adjacent frequencies.

Balance system

The receptors of the vestibular analyzer are located in the semicircular canals and in the otolithic apparatus of the inner ear. From here, impulses follow along the dendrites of the first neurons of the vestibular pathways to the vestibular ganglion of Scarpa (lat.ganglion vestibulare), lying in the internal auditory canal. It contains the bodies of the first sensitive neurons. From here, the impulses follow along the axons of the same cells passing as part of the common trunk of the VIII nerve. Entering the substance of the brain, the central processes of the Scarpe ganglion follow to the vestibular nuclei, which are located in the projection of the vestibular field of the rhomboid fossa on the border with the bridge andmedulla oblongata.

The complex of vestibular nuclei includes

1. Superior vestibular nucleus (Bekhterev's nucleus)
2. Lateral vestibular nucleus (Deiters nucleus)
3. Medial vestibular nucleus (Schwalbe's nucleus)
4. Inferior vestibular nucleus (Roller's nucleus)

The fibers of the vestibular nerve separate before approaching certain cell groups of the vestibular nuclei, where the second neurons begin. Some of its fibers transmit impulses directly, without switching tocerebellum, and in its oldest ontogenetic part - archicerebellum. Efferent impulses from the nucleus fastigii (archicerebellum) return to the vestibular nuclei and then along the vestibular nerve to the hair cells of the labyrinth, exerting a regulatory, predominantly inhibitory effect.

Archicerebellum also receives secondary fibers from the vestibular nuclei. It sends efferent impulses back to the complex of vestibular nuclei, as well as to the spinal cord to motor neurons through the cerebellar-reticular and reticulospinal connections. In the lateral vestibular nucleus (Deiters' nucleus), an important lateral vestibulospinal pathway begins. It descends ipsilaterally in the anterior funiculus to γ- and α-motoneuronsspinal cord, reaching the sacral segments. This pathway has a facilitating effect on extensor reflexes and keeps muscle tone high enough to maintain balance.

Fibers from the medial vestibular nucleus (Schwalbe's nucleus) join on each side to the medial longitudinal bundle, communicate with the motor cells of the anterior horns of the cervical segments of the spinal cord and descend in the form of a medial vestibulospinal path to the rostral (upper) part of the thoracic spinal cord. These fibers are located near the anterior median sulcus of the cervical spinal cord. They form the fasciculus sulcomarginalis, which descends and ends in the rostral part of the thoracic spinal cord. These fibers influence the tone of the neck muscles according to different head positions. It is also possible that they take part in reflex arcs that help maintain balance by making initial compensatory hand movements.

All vestibular nuclei are associated with nucleioculomotor nervesthrough the medial longitudinal bundle. Thanks to the vestibulo-oculomotor connections, the friendliness of the movements of the eyeballs and fixation of the gaze is achieved when the position of the head changes. Violation of impulse conduction along them leads to the appearance of vestibular nystagmus. It has been shown that some fibers are in contact with the interstitial nucleus of Cajal and the nucleus of Darshkevich and continue untilthalamus.

Part of the axons of the vestibular nuclei come into contact with the formations of the autonomic nervous system and, in particular, with the posterior nucleusvagus nerveand with the nuclei of the hypothalamic region. The presence of these connections explains the appearance of pronounced autonomic reactions in the pathology of the vestibular analyzer in the formnausea, vomiting, blanching or redness of the skin, sweating, increased intestinal motility, lowering blood pressure, bradycardia, hyperglycemia, etc.

auditory system

Clinically, there are 2 main forms of hearing loss:deafnessmiddle ear, orconductive hearing loss(associated with impaired sound conduction) and deafness of the inner ear, orsensorineural hearing loss.

Conductive hearing loss is caused by pathological processes inexternal auditory canalor, more commonly, in the middle ear. At the same time, ininner earand therefore inorgan of cortinosoundwaves are either carried out only by some of them. Causes of conductive hearing loss can beotitis media, otosclerosis, tumors.

When irritated by the pathological process of the peripheral parts of the auditory analyzer, noise usually occurs in the ear on the side of irritation. Causes of tinnitus may includeinflammatory process, as well as irritation of the fibers of the cochlear portion of the VIII nervetumorgrowing from its Schwann shell -neuroma of the VIII nerve. Defeatsnailsor the trunk of the VIII nerve, as well as its nuclei inVaroliy bridgecan lead to hearing loss or deafness on the sidepathological focus.

If the pathological process is localized in the region of the cerebellopontine angle, then not only hearing loss is observed on the side of the lesion, but also a violation of the function of the vestibular, trigeminalandfacial nerves. In addition, the growth of the acoustic neuroma in the directionbrain stemandcerebellummay be accompanied by developmentalternating syndromeand the addition of cerebellar symptoms on the side of the lesion.

When the process is localized at the level of the tire plate, hearing loss is observed in both ears with rapid progression and the development of complete deafness.

Due to the fact that both crossed and non-crossed fibers run in the lateral loop, interruption of one lateral (auditory) loop does not cause unilateral deafness. Rather, there is a slight decrease in hearing on the opposite side (hypoacusia) and some impairment in recognizing the direction of the sound.

If the auditory pathways are affected at the levelthalamus, in patients the sensation of tonality changes, the sounds move away or approach. Acoustic disorders in the form of hyperpathy are characteristic. All sounds are perceived as very loud. Noise and loud sounds cause pain.

Cortical foci in the region of the left (dominant hemisphere) temporal lobe causeauditory hallucinations. There may be auditoryagnosia. If the right temporal lobe is affected, there is auditory hyperpathy, as with the thalamus. If the pathological focus irritates the cortical end of the auditory analyzer, auditory hallucinations occur, which in such cases may be a harbinger of a general convulsive epileptic seizure. Then they say that the patient has seizuresepilepsywith auditory aura.

Balance system

nystagmus- involuntary oscillatory movementseye. Since the vestibular nerve affects the position of the eyeballs in such a way that visual orientation in space is ensured at any position of the head. Thus, with any lesions of the vestibular system, the position of the eyeballs is disturbed and the phenomenon of nystagmus occurs. The presence of both a fast and a slow component in nystagmus testifies to the defeat of the vestibular system. The slow component is a real signal of defeat, while the fast component is due only to a jerky, reflex return of the eyes to its original position. It is customary to designate the direction of nystagmus in accordance with its fast component.

Topical diagnosis of damage to different levels of the vestibular analyzer

1. The defeat of the receptors of the vestibular analyzer in the labyrinth and the inner ear is characterized by systemic syncope, horizontal nystagmus and hearing loss
2. If n.vestibularis is affected, systemic syncope of a rotating nature occurs, directed towards the fast component of nystagmus. Fainting occurs and depends on a change in the position of the head. There is nystagmus horizontal-rotary, small- and medium-sized. In the Romberg position, the patient falls to the side of the lesion (toward the slow component of nystagmus). Often, simultaneously with the defeat of n.vestibularis, the defeat of n.cochlearis is noted.
3. Vestibular disorders in the presence of foci in the brain stem depend on the level of the lesion. If Roller's nucleus (lower vestibular nucleus) is affected, rotatory nystagmus is observed towards the focus. With the defeat of the nuclei of Schwalbe and Deiters, horizontal nystagmus is observed in one or two directions. The severity of nystagmus varies depending on the position of the head. If the ankylosing spondylitis nucleus is affected, vertical nystagmus is observed. At the same time, in the presence of damage to the nuclei of the trunk, vestibular ataxia and lateropulsion appear (deviation during movement to the side).
4. The lesion in the area of the tegmental plate is characterized by convergent nystagmus. The fast component of nystagmus in both eyes is directed towards the middle. Pronounced oculomotor disorders.
5. In the presence of damage to the cortical zones (frontal-temporal, parietal regions), vestibular disorders are manifested by a feeling of instability, falling, floor fluctuations, etc.

Peripheral damage (of labyrinths or vestibular nerves) can be caused by the following reasons: labyrinthitis, Meniere's syndrome, perilymphatic fistula, trauma of the labyrinth (fracture of the pyramid of the temporal bone), labyrinth apoplexy, vertebrobasilar insufficiency, toxic damage to the labyrinthstreptomycinor other drugs, neurinoma in the internal auditory canal. A connection was also established between the occurrence of Ménière's attacks and the close attachment of the vessel to the proximal unmyelinated part of the root of the vestibulocochlear nerve. Operational movement of the vessel led to the disappearance of an attack of the disease.

The central lesion can be caused by circulatory disorders (softening, bleeding) in the vertebrobasilar basin,multiple sclerosis,syphilis, cancer or other diseases.

Research methodology auditory system

Checkinghearing, it should be borne in mind that with normal hearing, a person hears whispered speech at a distance of 5-6 m.

Loss of function n.cochlearis, of course, causes hearing loss (hypoacusia) or deafness. But since these disorders can also occur with lesions of the apparatus that transmitssound, that is, the middle and outer ear (otolaryngologist area), then the taskneurologistis primarily to determine the location of the pathological process.

The two main signs of neural hearing loss are a decrease or absence of auditory conduction of the bones of the skull and partial loss in the perception of a number of tones. It should be noted that with damage to the middle and outer ear, the time of bone auditory conduction increases, which can be explained by a decrease in the sensitivity threshold of the cells of the organ of Corti, into which sound vibrations from the middle ear do not pass.

To determine bone auditory conduction, the following tests are used: Schwabach, Weber and Rinne test.

Schwabach test

The tuning fork is placed on the mastoid process. In the pathology of the inner ear and n.vestibularis, the bone conduction time is reduced or equal to 0. When the middle ear is affected, the bone conduction time increases.

Rinne test

The test provides information on whether sound is better conducted through bone or through air. A vibrating tuning fork is placed on the mastoid process. When the patient stops hearing it, the tuning fork is placed in front of the subject's ear to determine if the tone of the tuning fork is heard in that position. The tuning fork is heard if the patient's ear is healthy - a positive Rinne test. If there is a pathology of the middle ear, then the patient hears the tone of the tuning fork through the bone longer than through the air - a negative Rinne test.

Weber test

A vibrating tuning fork is placed in the middle of the patient's crown. If the hearing loss is due to impaired sound conduction, the patient will hear the tuning fork better on the affected side. With damage to the inner ear, the tuning fork is better heard on the healthy side.

Audiometry

In the case of a study usingaudiometershearing loss in the low frequency region indicates a pathology of the middle ear, and hearing loss in the high frequency region suggests a neural genesis of hearing loss.

Evaluation of the symptoms of the lesion

Diseases of the middle and outer ear belong to the fieldotolaryngology. Objective and subjective symptoms of damage to the cochlear nerve and its pathways should be evaluated by a neurologist.

Symptoms of n.cochlearis lesions can be caused by acoustic neuroma. In these cases, irritation of the cochlear fibers in the initial stages leads to tinnitus as the first symptom. The lesion progresses very slowly, so that the progressive hearing loss and disturbance in determining the direction of sound often escape the attention of the patient. Usually, patients with neurinomas of the VIII nerve go to the doctor when the tumor grows so much that it begins to damage neighboring structures (vestibular nerve, cerebellum, facial nerve, trigeminal nerve) - cerebellopontine angle syndrome and will causeincreased intracranial pressure, headache, nausea and vomiting.

Sudden hearing loss can occur with viral infection and dyscirculatory disorders such asvertebrobasilar insufficiency.

Other causes of damage to the organ of Corti and n.cochlearis aremeningitis, vascular aneurysms, perilymphatic fistula, overdose of certain drugs (streptomycin, quinine and aspirin) and heavy-duty sudden noise (explosion).

The central pathways in the brain stem suffer from vascular diseases due to circulatory failure, inflammatory processes and tumors. The result is hypoacusis. Only bilateral interruption of the auditory pathways leads to bilateral deafness.

Balance system

Romberg pose

Examine the movement of the patient with open and closed eyes, putting them in the Romberg position. The instability in Romberg's position increases during the rotation of the head to the sides.

Mittelnaer test

The patient is asked to take a step in place. Gradually, the patient turns towards the focus of irritation in the vestibular analyzer.

Availabilitynystagmus

Also of great help in the study of the balance system is the identification of nystagmus in the study of the oculomotor nerves. The correct interpretation of the revealed nystagmus allows for a topical diagnosis of lesions of the vestibular system.

Glossopharyngeal nerve (lat.nervus glossopharyngeus) - IX paircranial nerves. It is mixed, contains motor, parasympathetic and sensory fibers, respectively, extending from three nuclei: a double nucleus (lat.nucleus ambiguus), lower salivary nucleus (lat.nucleus salivatorius inferior) and the nucleus of the solitary path (lat.nucleus tractus solitary). The functions of the glossopharyngeal nerve include:

Schemebrain, brain stemand cranial nerves (glossopharyngeal nerve marked in light yellow)

- motor innervationstylopharyngeal muscle(lat.m. stylopharyngeus), raisingthroat
- parasympathetic innervationparotid gland(lat.glandula parotis), providing its secretory function
- general sensitivity of the pharynx,tonsils,soft palate,eustachian tube, tympanic cavity
- taste sensation in the posterior thirdlanguage.

The glossopharyngeal nerve appears on the inferior surfacebrain4-6 roots behind the olive, belowvestibulocochlear nerve (VIII pair of cranial nerves). It travels outward and forward and exits the skull through the anterior jugular foramen. In the region of the opening, the nerve thickens somewhat due to the superior ganglion located here (lat.ganglion superius (rostralis)). Having exited through the jugular foramen, the glossopharyngeal nerve thickens again due to the inferior ganglion (lat.ganglion inferius (caudalis)), lying in a stony dimplelat.fossula petrosa on the underside of the pyramidtemporal bone.

From the base of the skull, the glossopharyngeal nerve goes down, goes between the internal carotid artery and the internal jugular vein, and then, forming an arc, follows forward, slightly upward and enters the thickness of the root of the tongue.

In its course, the glossopharyngeal nerve gives off a number of branches.

I. Branches originating from the inferior ganglion

Tympanic nerve (lat.N.tympanicus) in its composition is afferent and parasympathetic. It enters the tympanic cavity and goes along its medial wall. Here it forms a small tympanic node (lat.ganglion tympanica), and then splits into branches, which in the mucous membrane of the middle ear make up the tympanic plexus (lat.plexus tympanicus).

The next section of the nerve, which is a continuation of the tympanic plexus, exits the tympanic cavity through the cleft of the canal of the small stony nerve (lat.hiatus canalis n.petrosi minoris) called the small stony nerve (lat.n.petrosus minor). The connecting branch from the large stony nerve approaches the latter (lat.n. petrosus major). Leaving the cranial cavity through the stony-sphenoid fissure (lat.fissura sphenopetrosa), a small stony nerve approaches the ear ganglion, where the parasympathetic fibers switch.

All 3 departments: the tympanic nerve, tympanic plexus and small petrosal nerve - connect the lower ganglion of the glossopharyngeal nerve with the ear ganglion.

The sensory fibers of the tympanic nerve, together with the sympathetic carotid-tympanic nerves from the internal carotid plexus, as well as the connecting branch of the facial nerve, form the tympanic plexus, from which the small stony nerve departs.

II. Branches originating from the trunk of the glossopharyngeal nerve:

1. Pharyngeal branches (lat.Rr.pharyngei) - these are 3-4 nerves, start from the trunk of the glossopharyngeal nerve where the latter passes between the external and internal carotid arteries. The branches go to the lateral surface of the pharynx, where, connecting with the same name branches of the vagus nerve, they form the pharyngeal plexus.
2. Carotid branch - 1-2 thin branches, enter the thickness of the carotid glomus (lat.glomus caroticus)

3. Branch of the styloghargngeal muscle (lat.R. musculi stylopharyngei) goes to the corresponding muscle and enters into it with several branches

4. Branches of the tonsils (lat.Rr.tonsillares) depart from the main trunk with 3-5 branches in the place where it passes near the tonsil. These branches are short, go up and reach the mucous membrane of the palatine arches and tonsils.

5. Lingual branches (lat.Rr.linguales) are the terminal branches of the glossopharyngeal nerve. They pierce the thickness of the root of the tongue and are divided in it into thinner, interconnected branches. The terminal branches of these nerves, which carry both gustatory and general sensory fibers. end in the mucous membrane of the posterior third of the tongue, occupying the area from the anterior surface of the epiglottis to the gutter-shaped papillae of the tongue, inclusive. Not reaching the mucous membrane, these branches are connected along the midline of the tongue with the branches of the same name on the opposite side, as well as with the branches of the lingual nerve fromtrigeminal nerve).

6. The glossopharyngeal nerve is mixed, as it contains motor, sensory (including taste) and parasympathetic fibers. Accordingly, fibers from several nuclei pass through it. It should be noted that from the nuclei in which the fibers of the glossopharyngeal nerve begin, the fibers of othercranial nerves, namelywandering,additional, sublingual, as well as an intermediate one that is included in the systemfacial nerve.In this regard, some authors distinguish these nerves in the concept of "vagal system".

7. Motor fibers originate from the double nucleus (lat.nucleus ambiguus), in common with the vagus nerve. Nucleus ambiguus is located in the reticular formation, deeper than the posterior nucleus of the vagus nerve in the projection of the triangle of the vagus nerve (lat.trigonum n.vagi). The motor portion of the fibers of this nucleus, which are part of the glossopharyngeal nerve, innervates only one muscle - the stylopharyngeal, raising the pharynx.

8. Secretory, more precisely salivary, nerve fibers begin in the lower salivary nucleus (lat.nucleus salivatorius inferior), its cells are scattered in the reticular formationmedulla oblongatabetween the double core and the olive core. The proganglionic fibers of this nucleus go as part of the tympanic nerve, pass through the tympanic plexus, and as part of

the small stony nerve reach the ear ganglion. Postganglionic parasympathetic fibers come out of here, which pass through the anastomosis into the branch of the trigeminal nerve (n.auriculotemporalis) and reach the glandula parotis, providing its secretory function.

9. Nucleus alae cinereae is the second nucleus of general susceptibility. The bodies of the first nuclei are located in the superior ganglion of the glossopharyngeal nerve, located in the region of the jugular foramen.Dendritesthese neurons are sent to the pharynx, tonsils, tongue, soft palate (as part of rr.tonsillares, rr.pharyngei and rr.linguales), as well as to the mucous membrane of the tympanic cavity and Eustachian tube (as part of the tympanic nerve and plexus). Accordingly, the nucleus alae cinereae is the second core of sensitivity for the above areas.

10. Single Path Kernel (lat.nucleus tractus solitarii) is a common core for the glossopharyngeal and intermediate nerves. It is a relay point fortaste fibers. If as part of the intermediate nerve (drum string) there are fibers of taste sensitivity from the anterior 2/3 of the tongue, then the glossopharyngeal nerve contains fibers of taste sensitivity from the posterior third of the tongue andepiglottis, which are part of its lingual branches.

11. The glossopharyngeal nerve is part ofreflex arcspharyngeal and palatal reflex. The pharyngeal reflex is caused by touching a piece of paper folded into a tube to the back wall of the pharynx; swallowing, sometimes coughing and vomiting movements occur. The palatal reflex is obtained by touching the soft palate; the response is the raising of the latter and the tongue. These reflexes play an important role in eating. The reflex arc of these reflexes: sensory fibers of the glossopharyngeal and vagus nerves → nucleus alae cinereae → nucleus ambiguus → motor fibers of the glossopharyngeal and vagus nerves.

Isolated lesions of the glossopharyngeal nerve are rare. In most cases, the vagus and accessory nerves also suffer along with it.

The causes of damage to the glossopharyngeal nerve, among others, may be a fracture of the base of the skull, thrombosissigmoid sinus, tumor of the base of the posterior cranial fossa; aneurysm of the vertebral and basilar arteries,meningitis,neuritis, progressive bulbar palsy and syringobulbia.

Glossopharyngeal nerve syndrome includes the following objective and subjective symptoms:

- loss of taste sensitivity in the back third of the tongue (hypo- or ageusia). At the same time, a disorder of taste sensitivity (as, by the way, a violation of other types of sensitivity in the oral cavity) is important for neurological topical diagnosis on the one hand, since sensory disorders on both sides can be caused by inhibition of the receptor apparatus due to the pathology of the mucous membrane of the tongue and walls of the oral cavity
- the absence of the pharyngeal and (or) palatine reflex (two points should be taken into account - firstly, only the difference between these reflexes on the right and left sides is of topical importance. Bilateral absence is often purely functional. Secondly, a violation of the pharyngeal and palatine reflexes is also observed with the defeat of the wandering nerve)
- anesthesiaandanalgesiain the upper parts of the pharynx, in the soft palate, pharynx, tonsils, anterior surface of the epiglottis and the base of the tongue. Due to the disorder of proprioceptive sensitivity in the tongue, the sense of its position in the oral cavity may be disturbed, which makes it difficult to chew and swallow solid food.
- Motor function disorders (swallowing) are not clinically expressed due to the insignificant functional role of m.stylopharyngeus
- Patients may experience some dry mouth, but this symptom is unstable and unreliable, since a decrease and even loss of the function of one parotid salivary gland (lat.glandula parotis) usually successfully compensate for othersalivary glands

The phenomena of irritation of the glossopharyngeal nerve include spasm of the pharyngeal muscles - pharyngospasm, which is already the result of damage to the higher parts of the central nervous system or a manifestation of neurosis.

Irritation of the cortical projection area in the deep structures of the temporal lobe leads to the appearance of false taste sensations (paragesia). Sometimes they can be harbingers (aura) of an epileptic seizure.

Glossopharyngeal neuralgia - neuralgia of the glossopharyngeal nerve is a specific disease. Pain with her, as withtrigeminal neuralgia, paroxysmal and painful. Its onset is sudden, and the duration is usually short. Pain most often begins at the base of the tongue, tonsils, or soft palate and spreads into the ear. Paroxysms can be triggered by swallowing, chewing, coughing, or talking. If the pain is persistent, a malignant tumor of the pharynx should be suspected. Just as in the case of trigeminal neuralgia, it is possible that the pain is caused by compression of the proximal unmyelinated part of the glossopharyngeal nerve root by a blood vessel.

Nervus vagus (lat.nervus vagus) - the tenth paircranial nerves(X pair), paired nerve. Goes from the brain to the abdominal cavity. Innervatesorgans of the head, neck, thoracic and abdominal cavities.

It is mixed - contains motor, sensory andvegetative(sympathetic and parasympathetic) fibers[2]. Provides:

- motor innervation of musclessoft palate,pharynx,larynx, as well as striated musclesesophagus
- parasympathetic innervation of smooth muscleslungs, esophagus,stomachandintestines(up to the splenic flexure of the colon), as well as the muscleshearts. Also affects the secretion of the glands of the stomach andpancreas
- sensitive innervation of the mucous membrane of the lower part of the pharynx and larynx, the skin area behindearand parts of the external auditory canal,eardrumanddura materposterior cranial fossa.

On the bottom surfacebrainthe vagus nerve is shown by 10-15 roots from the thicknessmedulla oblongatabehindolives. Heading laterally and down, he leavesscullthrough the anterior part of the jugular foramen along withglossopharyngealandaccessory nerves, located between them. In the region of the jugular foramen, the vagus nerve thickens due to the superior node (lat.ganglion superius), and a little lower, after 1.0-1.5 cm, there is another node of a somewhat larger size -lat.ganglion inferius.

In the interval between these nodes, an internal branch approaches itaccessory nerve. Descending lower, the vagus nerve in the neck lies on the anterior posterior surface of the internal jugular vein (lat.v.jugularis interna) and follows to the upper aperturechest, located in the gutter between the indicated vein and the medial initially located internal carotid artery (lat.a.carotis interna), and then the common carotid artery (lat.a.carotis communis).

The vagus nerve with the internal jugular vein and the common carotid artery is enclosed in one common connective tissue sheath, forming the neurovascular bundle of the neck.

In the region of the upper thoracic inlet, the vagus nerve is located between the subclavian artery (lat.a.subclavia) (behind) and subclavian vein (lat.v.subclavia) (in front).

Having entered the chest cavity, the left vagus nerve lies on the anterior surface of the arcaorta, and the right one - on the anterior surface of the initial section of the right subclavian artery. Then both vagus nerves deviate somewhat backward, go around the back surface of the bronchi and approach the esophagus, where they break up into a number of large and small nerve branches and lose the character of isolated nerve trunks.

The branches of the left and right vagus nerves are sent to the anterior (mainly from the left) and posterior (mainly from the right) surfaceesophagusand form the esophageal plexuslat.plexus oesophageus).

From the branches of the specified plexus at the esophageal opening (lat.ostium oesophageum) diaphragmanterior and posterior vagus trunks are formed, respectively (lat.trunci vagales anterior et posterior), which, together with the esophagus, penetrate intoabdominal cavity. Both the anterior and posterior trunk contain fibers of the left and right vagus nerves.

In the abdominal cavity, the vagus trunks send a series of branches to the abdominal organs andsolar plexus.

In its course, each vagus nerve is divided into four sections: head, cervical, thoracic and abdominal.

Head of the vagus nerve

The head section of the vagus nerve is the shortest, reaching the lower node (lat.ganglion inferius). It has the following branches:

1. meningeal branch (lat.Ramus meningeus) departs directly from the upper node, goes into the cranial cavity and innervatesdura materbrain (transverse and occipitalvenous sinuses).

2. ear branch (lat.Ramus auricularis), as a rule, starts from the upper node or lower - from the nerve trunk, goes backwards, follows the outer surface of the bulb of the internal jugular vein, approaches the jugular fossa (lat.fossa jugularis) and enters the mastoid tubule (lat.canaliculus mastoideus). Inside the pyramidtemporal boneear branch exchanges fibers withfacial nerveand leaves the pyramid of the temporal bone through the tympanomastoid fissure (lat.fissura tympanomastoidea). The auricular branch then divides into two branches that appear behind the outer ear, near the outer end of the bony part of the external auditory

canal. One of the branches connects to the posterior auricular nerve (lat.n.auricularis posterior) fromfacial nerve, the other innervates the skin of the posterior wall of the external auditory canal.

3. connecting branch withglossopharyngeal nerve(lat.Ramus communicans cum nervo glossopharyngeus), connects the upper node of the vagus nerve with the lower node of the glossopharyngeal nerve.

4. connecting branch withaccessory nerve(lat.Ramus communicans cum nervo accessorius) is represented by the internal branch of the accessory nerve. This is a fairly powerful trunk that enters into the vagus nerve between the upper and lower nodes. In addition, small branches from the vagus nerve go to the accessory one.

The cervical vagus nerve extends from the lower node to the outletrecurrent laryngeal nerve (lat.nervus laryngeus recurens). Along this length, the following branches depart from the vagus nerve:

1. Pharyngeal branches (lat.Rr.pharyngei) often depart from the lower node, but may also depart lower. There are two branches: the upper - large and the lower - smaller. The branches go along the outer surface of the internal carotid artery forward and somewhat medially, connect with the branches of the glossopharyngeal nerve and the branches of the sympathetic trunk (lat.truncus sympathicus), forming a pharyngeal plexus on the middle constrictor of the pharynx (lat.plexus pharyngeus). Branches extending from this plexus innervate muscles and mucous membranes.pharynx. In addition, nerves go from the upper branch to the muscle that lifts the palatine curtain and to the muscletongue.

2. Superior laryngeal nerve (lat.N.laryngeus superior) starts from the lower node, goes down along the internal carotid artery, taking branches from the upper cervical sympathetic node (lat.ganglion cervicale superius) and pharyngeal plexus, and approaches the lateral surfacelarynx. Before that, it splits into branches:

- outer branch (lat.r.externus) innervates the mucous membrane of the pharynx, partiallythyroid gland, as well as the inferior constrictor of the pharynx and the cricothyroid muscle, often this branch connects to the external carotid plexus
- inner branch (lat.r.internus) goes along with the superior laryngeal artery, pierces the thyroid-hyoid membrane and with its branches innervates the mucous membrane of the larynx (above the glottis),epiglottisand part of the rootlanguage

• connecting branch with inferior laryngeal nerve (lat.r.communicans (cum nervo laryngeo inferiori)) departs from the internal branch of the superior laryngeal nerve

3. Superior cervical cardiac nerves (lat.Nn.cardiaci cervicales superiores) in the amount of 2-3, depart from the trunk of the vagus nerve and go along the common carotid artery, and the branches of the right vagus nerve go ahead of the brachiocephalic trunk (lat.truncus brachiocephalicus), left - in front of the aortic arch. Here they connect with the cardiac branches from the sympathetic trunk and, going up toheart, is part of the cardiac plexus (lat.plexus cardiacus).

4. Lower cervical cardiac nerves (lat.Nn.cardiaci cervicales inferiores) are more numerous and much thicker than the upper ones, depart slightly below the recurrent laryngeal nerve. Heading towards the heart, the branches connect with the rest of the cardiac branches from the vagus nerve and from the sympathetic trunk and also take part in the formation of the cardiac plexus.

5 recurrent laryngeal nerve(lat.N.laryngeus reccurens) departs from the main trunk on the right - at the level of the subclavian artery, and on the left - at the level of the aortic arch. Having rounded from below the indicated vessels from front to back, they go up in the groove betweentracheaand the esophagus, reaching the larynx with its terminal branches.

In its course, the recurrent laryngeal nerve gives off a number of branches:

• tracheal branches (lat.rr.tracheales) are sent to the anterior surface of the lower part of the trachea. In their course, they connect with sympathetic branches and approach the trachea;

• esophageal branches (lat.rr.esophagei) innervate the esophagus

• inferior laryngeal nerve (lat.n.laryngeus inferior) is the terminal branch of the recurrent laryngeal nerve. In its course, it divides into anterior and posterior branches. The anterior branch innervates the lateral cricoarytenoid, thyroid-arytenoid, thyroid-epiglottic, vocal, and aryepiglottic muscles. Posterior or connecting branch with internal laryngeal branch (lat.r.communicans cum nervo laryngeo superiori) contains both motor and sensory fibers. The latter approach the mucous membrane of the larynx below the glottis. The motor fibers of the posterior branch innervate the posterior cricoarytenoid and transverse arytenoid muscles.

In addition, there are several more connecting branches in the cervical vagus nerve:

1. with superior cervical sympathetic ganglion
2. Withhypoglossal nerve
3. between the recurrent laryngeal nerve and the cervicothoracic ganglion of the sympathetic trunk

Thoracic vagus nerve

The thoracic vagus nerve begins at the origin of the recurrent laryngeal nerve and ends at its passage through the esophageal opening of the diaphragm. In the chest cavity, it gives off the following branches:

1. Thoracic cardiac branches (lat.Rr.cardiaci thoracici) begin below the recurrent laryngeal nerve, follow down and medially, connect with the lower cervical cardiac branches, send branches to the gates of the lungs and enter the cardiac plexus.
2. bronchial branches (lat.Rr.bronchiales) are divided into less powerful anterior branches (4-5) and more powerful and numerous posterior branches
3. pulmonary plexus (lat.Plexus pulmonalis) is formed by the anterior and posterior bronchial branches, connecting with the branches of the upper 3-4 thoracic sympathetic nodes of the sympathetic trunk. The branches extending from the pulmonary plexus are interconnected and enter with the bronchi and vessels into the gates of the lungs, branching out in the parenchyma of the latter.
4. esophageal plexus (lat.Plexus esophageus) is represented by many different diameters of nerves that extend from each vagus nerve below the root of the lung. In their course, these branches connect with each other and with branches from the upper 4-5 thoracic nodes of the sympathetic trunks and form the esophageal plexus around the esophagus. It surrounds the entire lower part of the esophagus and sends part of the branches to its muscular and mucous membranes.

Abdominal vagus nerve

The abdominal region of the vagus nerve is represented by the anterior and posterior vagus trunks. Both trunks are formed from the esophageal plexus and enter into the anterior and posterior surfaces of the esophagus.abdominal cavityeither single stems or multiple branches.

The posterior trunk of the vagus nerve in the region of the cardia sends a number of branches - the posterior gastric branches (lat.rr. gastrici posteriores), on the back surfacestomach, and itself deviates backwards, forming celiac branches (lat.rr.celiaci), running along the left gastric artery to the solar plexus. The fibers that make up the celiac branches pass through the solar plexus to the abdominal organs.

The anterior trunk of the vagus nerve in the region of the stomach connects with the sympathetic nerves accompanying the left gastric artery, and sends 1-3 branches between the leaves of the lesser omentum to the liver - the hepatic branches (lat.rr.hepatici). The rest of the anterior trunk follows along the anterior periphery of the lesser curvature of the stomach and gives off here numerous anterior gastric branches (lat.rr.gastrici anteriores), to the anterior surface of the stomach.

Gastric branches from the anterior and posterior trunks in the subserous layer form the anterior and posterior plexus of the stomach.

The vagus nerve is mixed, as it contains motor, sensory and parasympathetic fibers. Accordingly, fibers from several nuclei pass through it. It should be noted that from the nuclei in which the fibers of the vagus nerve begin, fibers also originate. glossopharyngeal and accessory nerves.

Motor fibers originate from the double nucleus (lat.nucleus ambiguus), common with the glossopharyngeal and accessory nerves. It is located in the reticular formation, deeper than the posterior nucleus of the vagus nerve in the projection of the triangle of the vagus nerve (lat.trigonum n.vagi). It receives supranuclear impulses from both hemispheres of the brain through the corticonuclear pathways. Therefore, unilateral interruption of the central fibers does not lead to a significant disruption of its function. Axons of the nucleus innervate musclessoft palate, pharynx, larynx, as well as the striated muscles of the upper esophagus. The nucleus binos receives impulses from the spinal nucleustrigeminal nerve (lat.nucleus tractus spinalis n.trigemini) and from the nucleus of the solitary path (lat.nucleus tractus solitarii) (relay point fortastefibers). These nuclei are part of the reflex arcs starting from the mucous membrane of the respiratory and digestive tracts and are responsible for the occurrencecough, vomiting.

Dorsal nucleus of the vagus nerve (lat.Nucleus dorsalis n.vagi) is located deep in the triangle of the vagus nerve of the rhomboid fossa. The axons of the posterior nucleus of the vagus nerve are preganglionic parasympathetic fibers. Short postganglionic fibers send motor impulses to the smooth muscles of the lungs, intestines, down to the splenic flexurecolonand to the heart muscle. Stimulation of these parasympathetic fibers causes a slowdownheart ratecontraction of bronchial smooth muscle. In the digestive tract, there is an increase in the secretion of the glands of the gastric mucosa andpancreas.

The posterior nucleus of the vagus nerve receives afferent impulses fromhypothalamus, olfactory system, vegetative centers of the reticular formation and the nucleus of the solitary pathway. Impulses from baroreceptors in the wall of the carotid glomus are transmitted alongglossopharyngeal nerveand are involved in the regulation of blood pressure. Chemoreceptors in the carotid tangle are involved in the regulation of tensionoxygeninblood. Receptors for the aortic arch and para-aortic bodies have similar functions; they transmit their impulses along the vagus nerve.

It should be noted that postganglionic sympathetic fibers from the cells of the paravertebral sympathetic nodes also enter the vagus nerve and spread along its branches to the heart, blood vessels, and internal organs.

In the nucleus alae cinereae are the bodies of the second neurons of the commonsensitivitycommon to the glossopharyngeal and vagus nerves. The bodies of the first neurons are laid in the upper and lower ganglia of these nerves, which are located in the region of the jugular foramen. Afferent (sensory) fibers of the vagus nerveinnervatethe mucous membrane of the lower part of the pharynx and larynx, the skin area behind the car and part of the external auditory canal, the tympanic membrane and the dura mater of the posterior cranial fossa.

The causes of damage to the vagus nerve can be both intracranial and peripheral. Intracranial causes includetumor, hematoma, thrombosis, multiple sclerosis, syphilis, amyotrophic lateral sclerosis, syringobulbia, meningitisand an aneurysm. Peripheral causes may beneuritis (alcoholic, diphtheria, lead poisoning, and arsenic), tumor, diseases of the glands, trauma, aortic aneurysm.

Bilateral fullparalysisvagus nerve is rapidly fatal. With a unilateral lesion, there is a hanging of the soft palate on the side of the lesion, its immobility or lagging behind in this half when pronouncing the sound "a". The tongue is deviated to the healthy side. In addition, with a unilateral lesion of the vagus nerve, vocal cord paralysis is observed - the voice becomes hoarse. The pharyngeal reflex from the mucous membrane of the affected side of the pharynx may be lost. In addition, there may be slight dysphagia and, temporarily, tachycardia andarrhythmia.

A bilateral decrease in the function of the vagus nerves can cause a speech disorder in the form of aphonia (the voice loses its sonority as a result of paralysis or pronouncedparesisvocal cords) ordysarthria (in connection withparesismuscles of the speech motor apparatus, a decrease in sonority and a change in the timbre of the voice, a violation of the articulation of vowels and especially consonants, a nasal tone of speech). Also characteristicdysphagia- swallowing disorder (choking on liquid food, difficulty in swallowing any food, especially liquid). This whole triad of symptoms (dysphonia, dysarthria, dysphagia) is due to the fact that the vagus nerve carries motor fibers to the striated muscles of the pharynx, soft palate and palatine curtain, epiglottis, which are responsible for the act of swallowing and human speech. The weakening of the swallowing reflex leads to the accumulation of saliva and sometimes food in the patient's mouth, a decrease in the cough reflex when liquid and pieces of solid food enter the larynx. All this creates conditions for the development of aspiration in the patient.pneumonia.

Since the vagus nerves carry parasympathetic fibers to all organs of the chest cavity and most of the abdominal organs, their irritation can lead to bradycardia, broncho- and esophagospasms, increased peristalsis, increased secretion of gastric and duodenal juice, etc. Reduced function of these nerves leads to respiratory disorders, tachycardia, inhibition of the enzymatic activity of the glandular apparatus of the digestive tract, etc.

Accessory nerve (lat.nervus accessorius) - XI paircranial nerves. Contains motor nerve fibersinnervatingmusclesresponsible for turnsheads, liftingshoulderand bringingshoulder bladestospine.

Accessory nerve - motor. It consists of two parts - cerebral and spinal. This is due to the fact that the nuclei of the accessory nerve (nervus accessorius) are located in two places. One nucleus (cerebral) - a double nucleus (lat.nucleus ambiguus), common with glossopharyngeal and wandering nerves. The fibers extending from this nucleus form the cerebral part of the accessory nerve, which emerges from the sulcusmedulla oblongata, Behind The Olive Tree.

The second nucleus is the nucleus of the accessory nerve (lat.nucleus n.accessorii) lies in the posterolateral section of the anterior horn of the gray matterspinal cordalong the upper 5-6 cervical segments.

Roots emerging from the medulla oblongata in the amount of 4-5 form the upper or cerebral root.

The roots extending from the lateral funiculus of the spinal cord, between the anterior and posterior spinal roots, uniting, and form the spinal root n.accessorius, which rises up and through the foramen magnum (lat.foramen magnum), penetrates into the cavityskulls. Here, both groups of fibers are connected and form the trunk n.accessorii. This trunk through the jugular foramen (lat.foramen jugulare) (together with IX and X pairs) emerges from the cranial cavity and is divided into 2 branches:

1. Inner branch (lat.ramus internus) approaches the vagus nerve and is part of it
2. Outer branch (lat.ramus externus) follows down and at the level of the cornermandibledeviates posteriorly under the sternocleidomastoid muscle (lat.m.sternocleidomastoideus); here n.accessorius gives a number of muscle branches to it, connecting in its thickness with the branches of the cervical plexus (the third cervical nerve). Further, the nerve emerges from under the outer edge of this muscle, above the middle of its extension, into the region of the lateral cervical triangle, enters under the anterior edge of the trapezius muscle (lat.m.trapezius) and innervates the latter.

Accessory nerve carries motor nerve fibers tomm.sternocleidomastoideuset trapezius, respectively, the function of the accessory nerve is identical to the function of these muscles. Thus, the function of n.accessorius is to turn the head in the opposite direction (m.sternocleidomastoideus), raise the shoulder, scapula and acromial part of the clavicle upward (shrug), pull the shoulder girdle backwards and bring the scapula to the spine, and also raise the shoulder above the horizontal (what m.trapezius is responsible for).

It should be noted thatneuronsthe spinal portion of n.accessorius receives impulses from the cerebral cortex on both sides, but mostly from the opposite side. In addition to this, neurons receive extrapyramidal and reflex nerve impulses along the tectospinal (lat.tractus tectospinalis), vestibulospinal (lat.tractus vestibulospinalis) to the pathways and the medial longitudinal bundle (lat.fasciculus longitudinalis medialis), which appear to be responsible for the involuntary turning of the head in response to sound or harsh light.

Damage to the accessory nerve can be either due to central (intramedullary, intracerebral) or peripheral pathological processes. Violation of its function may be due to a primary infectious or toxic lesion of the nerve itself or its nucleus (poliomyelitis, tick-borne encephalitis, etc.), but it can also be of secondary origin and occur with damage to the cervical vertebrae and pathological processes in the posterior cranial fossa or on the neck.

- With unilateral damage to the projection zones of the n.accessorius cortex, its function is usually not impaired, due to the fact that the core of the accessory nerve receives nerve impulses from both hemispheres.
- The n.accessorius nucleus receives fibers from the extrapyramidal system. Spasms of the muscles innervated by the XI nerve are more often unilateral and are the result of cortical or subcortical irritations. Tonic spasm paints a picturespastic torticollis (lat.torticollis spasticus); clonic - twitching the head in the opposite direction, sometimes with simultaneous raising of the shoulder.
- Bilateral clonic spasm leads to nodding movements of the head (Salaam spasm, spasmus nutans).
- The defeat of the XI nerve leads to the development of peripheralparalysisorparesismm.sternocleidomastoideus et trapezius. Coming thematrophy, usually leading to asymmetry. The shoulder on the diseased side is lowered, the scapula departs from the spine with its lower angle and turns outward and upward ("pterygoid scapula"). Difficulty raising the shoulder girdle ("shoulder shrug") and the ability to raise the arm above the horizontal level. Significantly difficult to turn the head in the opposite direction, due toparesism sternocleidomastoideus. With a bilateral lesion, a hanging of the head is noted.
- The defeat of n.accessorius is usually accompanied by deep, difficult to localizepainin the hand on the side of the lesion, which is caused by overstretching of the articular bag and ligamentous apparatus of the shoulder joint due to paralysis orparesistrapezius muscle.

- In case of unilateral destruction of the anterior horns of the spinal cord at the level of 1-4 cervical segments (polio, trauma, and asymmetricsyringomyelia) develops flaccid paralysis n.accessorius on the side of the lesion. Flaccid paralysis of n.accessorius is also observed with a peripheral lesion of its external branch. Flaccid paralysis of n.accessorius, caused by damage to the anterior horns of the spinal cord and its external branch, has one slight difference. So the peripheral lesion is accompanied by flaccid paralysis of m.sternocleidomastoideus, while in m.trapeziusparesisdevelops only in its rostral (upper) part, since this muscle is also innervated by the spinal motor roots C3-C4.

Hypoglossal nerve (lat.nervus hypoglossus) - XII paircranial nerves. The nucleus of the hypoglossal nerve is motor, located in the medulla oblongata. The motor fibers leaving it go to the muscles of the tongue and ensure their movement.

From the substance of the brain, the hypoglossal nerve leaves 10-15 roots from the groove between the pyramid and the olivemedulla oblongata. The roots are combined into a common trunk, which through the canal of the hypoglossal nerve (lat.canalis n.hypoglossus) leaves the cavityskulls, follows down betweenvagus nerveand the internal jugular vein, goes around the outside of the internal carotid artery, passing between it and the internal jugular vein. Then it crosses the external carotid artery in the form of a downward convex arc, fits under the posterior abdomendigastric musclein the region of the submandibular triangle (lat.trigonum submandibulare) and, having entered the muscles of the tongue, gives off lingual branches (lat.rr.linguales).

Lingual branches - terminal branches of the hypoglossal nerve, approach the lower surface of the tongue and innervate both its own and skeletal muscles of the latter.

In its course, n.hypoglossus gives off a number of branches that connect it to other nerves:

1. connecting branch with the superior cervical ganglion of the sympathetic trunk
2. connecting branch with lower nodevagus nerve
3. communicating branch with the lingual branch of the mandibular nerve from the trigeminal nerve
4. connecting branch with neck loop (lat.ansa cervicalis)

In addition to the connecting branches, the hypoglossal nerve at the very beginning (in the region of the hypoglossal nerve canal) gives off branches todura matertransverse sinus (lat.sinus transverse).

The nucleus of the hypoglossal nerve (lat.Nucleus n.hypoglossi) motor lies in the middle sections of the back of the medulla oblongata. From the siderhomboid fossait is projected in the region of the triangle of the hypoglossal nerve (lat.trigonum n. hypoglossi). The nucleus of the hypoglossal nerve consists of large multipolar cells and a large number of fibers located between them, by which it is divided into three more or less separate cell groups. Each of these groups innervates its own muscle of the tongue. In evolutionary terms, these neurons are identical to the motor neurons of the anterior horns.spinal cord.

The hypoglossal nerve innervates the muscles of the tongue:awl-lingual(lat.m.styloglossus),sublingual(lat.m.hyoglossus) andgeniolingual muscles(lat.m.genioglossus), as well as the transverse and rectus muscles of the tongue. Innervation of voluntary movements is carried out along the corticonuclear pathways, which begin inprecentral gyruscerebral cortex. The nucleus of the hypoglossal nerve receives impulses predominantly along the contralateral cortical-nuclear pathway. In addition, information is carried to it by afferent fibers from the reticular formation, the nucleus of the solitary pathway (lat.nucleus tractus solitarii) (receiving taste fibers fromfacialandglossopharyngeal nerves), from the midbrain and from the nucleitrigeminal nerve. Accordingly, the nucleus of the hypoglossal nerve and the nerve itself are components of the reflex arcs that provide swallowing, chewing, sucking and licking.

If the pathological process is localized in the lower part of the motor zone of the cerebral cortex or along the cortical-nuclear fibers going to the nucleus of the hypoglossal nerve from the opposite hemisphere of the brain, then central paralysis of the hypoglossal nerve develops. It is usually combined with hemiparesisorhemiplegiaon the side opposite to the pathological focus. Whereinatrophythere is no language. When protruding, it deviates towards paretic or paralyzed limbs, "turning away" from the pathological focus. This is due to the fact that hypertonicity is a sign of central paralysis. Since the phenomena of central paralysis are observed on the side of the tongue contralateral to the pathological focus, it pulls the tongue to its side (opposite to the pathological focus).

In the presence of hemiplegia, there is a slightdysarthria, but there are no swallowing disorders, since the function of the motor partglossopharyngealandvagus nerveare not disturbed due to the fact that they receive bilateral innervation, in contrast to the hyoid, which receives unilateral from the opposite hemisphere.

If the hypoglossal nerve is damaged, peripheral paralysis occurs orparesistongue muscles. If its lesion is one-sided, then the tongue in the oral cavity is shifted to the healthy side, and when protruding from the mouth, it necessarily deviates towards the pathological process ("the tongue points to the focus"). The muscles of the paralyzed half of the tongue atrophy, therefore, the relief of its surface changes, folding occurs, giving reason to call the language changed in this way geographical, because it to some extent resembles the uneven edge of the earth's surface. Unilateral peripheral paralysis of the tongue has almost no effect on the acts of speech, chewing, swallowing, etc. Possible causes of damage to the peripheral trunk of the XII nerve are a fracture of the base of the skull, aneurysm and tumorand the effects of certain toxic substances (alcohol, lead, arsenic, carbon monoxideother)

Damage to the nuclei of the XII nerve is usually accompanied by symptoms of atrophicparesiscircular muscles of the mouth (lat.m.orbicularis oris). At the same time, the lips become thinner, it is difficult for the patient to whistle, blow out the candle. This phenomenon is explained by the fact that the bodies of peripheral neurons that send axons that go to thismusclearc part offacial nerve, themselves lying in the nucleus of the hypoglossal nerve.

A lesion in the region of the nucleus of the hypoglossal nerve can also capture the nucleus of the opposite side due to the proximity of these nuclei. In this case, bilateral flaccidparesiswith atrophy and fasciculations in the muscles of the tongue. In the case of progression of the disease, the paralyzed hypotonic tongue lies at the bottom of the oral cavity, and there are markedly pronounced fasciculations in it. Speech and swallowing are severely impaired (dysarthria, dysphagia). During the conversation, it seems that the patient's mouth is full of something. The pronunciation of consonant sounds is especially difficult, and in connection with this, phrases containing difficult-to-pronounce combinations of consonants. Glossoplegia leads to difficulty in the process of eating, because it becomes very difficult for the patient to move the food bolus into the throat.

Among the possible causes of damage to the nucleus of the hypoglossal nerve, the most common are bulbar palsy, amyotrophic lateral sclerosis, syringobulbia, polioand vascular diseases.

The combination of peripheral nuclear palsy of the hypoglossal nerve on the side of the pathological focus, in combination with hemiparesis or central hemiplegia on the opposite side, usually occurs with thrombosis of the anterior spinal artery or its branches and is called Jackson's syndrome.

TEST QUESTIONS

1. The motor branches of the facial nerve innervate:
A. Stirrup muscle
B. Jawbone
C. Mental hyoid muscle
D. Anterior abdomen of the DVT muscle
E. The muscle straining the eardrum

2. Which of the following nerves have parasympathetic fibers that fit the ear node?
A. Glossopharyngeal
B. Great stony nerve
C. Wandering
D. Trigeminal
Oculomotor
3. What nerves pass through the internal ear canal?
A. Vestibular snail, facial nerves
B. Complementary, intermediate nerves
C. Great rocky, glossopharyngeal
D. Small rocky, facial nerves
E. Glossopharyngeal, vestibular snail

4. Mimic muscles help change facial expression. What nerve damage can create a phenomenon of lack of facial expressions?
A. Facial nerve
B. Maxillary nerve
C. Trigeminal nerve

D. Cheek nerve
E. Auricular-temporal nerve

5. Does the facial nerve have the following nucleus?
A. Nucleus salivatorius superior
B. Nucleus salivatorius inferior
C. Nucleus ambiquus
D. Nucleus mesencephalicus nervi facialis
E. Nucleus pontinus nervi facialis

6. The facial nerve passes through which skull formation?
A. Facial Canal
B. Sleepy Canal
C. Drum-rocky gap
D. Drumline
E. Mastoid tubule

7. Nerve drum string passes through:
A. Fissura petrotympanica
B. Fissura petrosquamosa
C. Fissura tympanomastoidea
D. Fissura tympanosquamosa
E. Canaliculus mastoideus
8. VII pair, facial nerve has:
A. Nucleus tractus solitarii
B. Nucleus salivatorius inferior
C. Nucleus ambiquus
D. Nucleus mesencephalicus nervi facialis
E. Nucleus pontinus nervi facialis
9. Are the designated structures nuclei of the glossopharyngeal nerve except?
A. Upper salivary core
B. Double core
C. Lower salivary core
D. Single Path Kernels
E. Parasympathetic nucleus
10. Where are the nuclei IX pairs of cranial nerves located?

A. Medulla oblongata
B. Telencephalon
C. Diencephalon
D. Mesencephalon
E. Rhinencephalon

Current Security Questions

1. Facial nerve (pair VII): location, function of the nuclei, exit point from the brain and skull, knee joint, branches, innervation zones, signs of injury.
2. Location of the glosso-pharyngeal nerve centers, exit points from the brain and skull, ear node, innervation zone, signs of injury.
3. Facial expressions, innervation of the salivary glands.
4. Current Security Questions
5. Development of VII, IX cranial nerves.
6. General patterns of age-related changes in the nervous system.

Practice 13.

Subject: Vagus nerve. Topography, parts, area of innervation and branches of the vagus nerve.

Goals and objectives of the lesson:

- Discuss with students the structure, topography, functional significance of the nuclei, branches and areas of innervation of the X pair of cranial nerves.
- Show the location of vagus nerve endings in the brain, points of exit from the skull, their networks and areas of innervation on anatomical preparations of models and diagrams.
- Explain the main anatomical symptoms of damage to the cranial nerve X-pair and its branches.

In the process of studying the topic, the student learns the following you have to be able to show.

- o Vagus nerve (pair X): arrangement of nuclei, function, exit from the brain and skull.
- o Vagus nerve parts, zone of innervation.
- o Symptoms of damage to the vagus nerve.
- o Development of the X pair of cranial nerves.
- o General patterns of age-related changes in the nervous system.

Data block:

Vagus nerve (X pair, 10 pair of cranial nerves), n. vagus.

N. vagus, the vagus nerve that developed from the 4th and subsequent branchial arches, is so named because of the vastness of its distribution. It is the longest of the cranial nerves. With its branches, the vagus nerve supplies the respiratory organs, a significant part of the digestive tract (up to the colon sigmoideum), and also gives branches to the heart, which receives fibers from it that slow the heartbeat. N. vagus contains three kinds of fibers: 1. Afferent (sensory) fibers coming from the receptors of the named viscera and vessels, as well as from some part of the hard shell of the brain and the external auditory canal with the auricle to the sensitive nucleus (nucleus solitarius). 2. Efferent (motor) fibers for voluntary muscles of the pharynx, soft palate and larynx and efferent (proprioceptive) fibers emanating from the receptors of these muscles. These muscles receive fibers from the motor nucleus (nucleus ambiguus). 3. Efferent (parasympathetic) fibers coming from the autonomic nucleus (nucleus dorsalis n. vagi). They go to the myocardium of the heart (slow down the heartbeat) and the muscular membrane of the vessels (dilute the vessels). In addition, the composition of the cardiac branches of the vagus nerve includes the so-called n. depressor, which serves as a sensitive nerve for the heart itself and the initial part of the aorta and is in charge of the reflex regulation of blood pressure. Parasympathetic fibers also innervate the trachea and lungs (narrow the bronchi), the esophagus, stomach and intestines to the colon sigmoideum (increase peristalsis), the glands and glands of the abdominal cavity embedded in the named organs - the liver, pancreas (secretory fibers), kidneys. The parasympathetic part of the vagus nerve is very large, as a result, it is predominantly an autonomic nerve, important for the vital functions of the body. The vagus nerve is a complex system consisting not only of nerve conductors of heterogeneous origin, but also containing intrastem nerve nodules. Fibers of all kinds, connected with the three main nuclei of the vagus nerve, exit the medulla oblongata in its sulcus lateralis posterior, below the lingual tract nerve, 10-15 roots, which form a thick nerve trunk, leaving the cranial cavity together with the lingual tract and accessory nerves through the foramen jugulare. In the jugular foramen, the sensitive part of the nerve forms a small knot - ganglion superius, and at the exit from the hole - another ganglion spindle-shaped thickening - ganglion inferius. Both nodes contain pseudo-unipolar cells, the peripheral processes of which are part of the sensitive branches going to the named nodes or receptors of the viscera and blood vessels (ganglion inferius) and the external auditory canal (ganglion superius), and the central ones are grouped into a single bundle, which ends in the sensitive nucleus, nucleus solitarius. Upon exiting the cranial cavity, the trunk of the vagus nerve descends to the neck behind the vessels in the groove, first between v. jugularis interna and a. carotis interna, and below - between the same vein and a. carotis communis, and it lies in the same vagina with the named vessels. Further, the vagus nerve penetrates through the upper aperture of the chest into the chest cavity, where its right trunk is located in front of a. subclavia, and the left one is on the anterior side of the aortic arch. going down both vagus nerves bypass the root of the lung behind on both sides and accompany the esophagus, forming plexuses on its walls, with the left nerve running along the anterior side, and the right along the posterior. Together with the esophagus, both vagus nerves penetrate through the hiatus esophageus of the diaphragm into the abdominal cavity, where they form plexuses on the walls of the stomach. The trunks of the vagus nerves in the uterine period are located symmetrically on the sides of the esophagus. After turning the stomach from left to right, the left vagus moves forward, and the right back, as a result of which the left vagus branches on the anterior surface, and the right one on the back. where they form plexuses on the walls of the stomach. The trunks of the vagus nerves in the uterine period are located symmetrically on the sides of the esophagus. After turning the stomach from left to right, the left vagus moves forward, and the right back, as a result of which the left vagus branches on the anterior surface, and the right one on the back. where they form plexuses on the walls of the stomach. The trunks of the vagus nerves in the uterine period are located symmetrically on the sides of the esophagus. After turning the stomach from left to right, the left vagus moves forward, and the right back, as a result of which the left vagus branches on the anterior surface, and the right one on the back.

Branches of the vagus nerve in the head and neck n. vagus. From n. vagus the following branches depart: A. In the head part (between the beginning of the nerve and the ganglion inferius): 1. Ramus meningeus to the dura mater in the region of the posterior cranial fossa. 2. Ramus auricularis to the back wall of the external auditory canal and part of the skin of the auricle. This is the only cutaneous branch of the cranial nerves that is not related to n. trigeminus. B. In the neck: 1. Rami pharyngei together with branches n. glossopharyngeus and truncus sympathicus form a plexus, plexus pharyngeus. The pharyngeal branches of the vagus nerve innervate the constrictors of the pharynx, the muscles of the palatine arches and the soft palate (with the exception of m. tensor veli palatini). The pharyngeal plexus also gives sensitive fibers to the pharyngeal mucosa. 2.N. laryngeus superior supplies sensory fibers to the mucous membrane of the larynx above the glottis, part of the root of the tongue and epiglottis, and motor fibers - part of the muscles of the larynx and the lower constrictor of the pharynx. 3. Rami cardiaci cervicales superiores et inferiores, partly can come out of n. laryngeus superior, form the cardiac plexus.

Branches of the vagus nerve in the thoracic and abdominal parts n. vagus. Recurrent laryngeal nerve, n. laryngeus recurrents. B. In the thoracic part: 1. N. laryngeus recurrens, the recurrent laryngeal nerve, departs in the place where n. vagus lies in front of the aortic arch (left) or subclavian artery (right). On the right side, this nerve bends around from below and behind a. subclavia, and on the left - also below and behind the aortic arch and then rises upward in the groove between the esophagus and trachea, giving them numerous branches, rami esophagei and rami tracheales. The end of the nerve, called n. laryngeus inferior, innervates part of the muscles of the larynx, its mucous membrane below the vocal cords, a section of the mucous membrane of the root of the tongue near the epiglottis, as well as the trachea, pharynx and esophagus, thyroid and thymus glands, lymph nodes of the neck, heart and mediastinum. 2. Rami cardiaci thoracici originate from n. laryngeus recurrens and thoracic part n. vagus and go to the cardiac plexus. 3. Rami bronchiales et tracheales, together with the branches of the sympathetic trunk, form a plexus, plexus pulmonalis, on the walls of the bronchi. Due to the branches of this plexus, the muscles and glands of the trachea and bronchi are innervated, and in addition, it also contains sensory fibers for the trachea, bronchi and lungs. 4. Rami esophagei go to the wall of the esophagus. bronchi and lungs. 4. Rami esophagei go to the wall of the esophagus. bronchi and lungs. 4. Rami esophagei go to the wall of the esophagus.

D. In the abdominal part: Plexuses of the vagus nerves, going through the esophagus, continue to the stomach, forming pronounced trunks, trunci vagales (anterior and posterior). Each truncus vagalis is a complex of nerve conductors not only of the parasympathetic, but also of the sympathetic and afferent animal nervous system and contains fibers from both vagus nerves. The continuation of the left vagus nerve, descending from the anterior side of the esophagus to the anterior wall of the stomach, forms a plexus, plexus gastricus anterior, located mainly along the lesser curvature, from which the rami gastrici anteriores, mixed with sympathetic branches, depart to the wall of the stomach (to the muscles, glands and mucous membrane). Some branches go through the lesser omentum to the liver. Right n. vagus on the back wall of the stomach in the region of the lesser curvature also forms a plexus, plexus gastricus posterior, giving rami gastrici posteriores; in addition, most of its fibers in the form of rami coeliaci go along the path a. gastrica. sinistra to ganglion coeliacum, and from here along the branches of blood vessels, along with sympathetic plexuses, to the liver, spleen, pancreas, kidneys, small and large intestine to colon sigmoideum. In cases of unilateral or partial damage to the X nerve, the disturbances mainly concern its animal functions. Disorders of visceral innervation can be relatively unsharply expressed. This is explained, firstly, by the fact that there are areas of overlap in the innervation of the viscera, and secondly, by the fact that there are nerve cells in the trunk of the vagus nerve on the periphery - autonomic neurons.

TEST QUESTIONS

1. The roots of which cranial nerve depart from the brain from the dorsolateral sulcus of the oblong brain?

A. Wandering
B. Sublingual
C. Diverter
D. Facial
E. Vestibular snail

2. What is the name of X pair of cranial nerves?

A. N. vagus
B. N. glossopharyngeus
C. N. accessorius
D. N. hypoglossus
E. N. abducens

3. What anatomical formation of the skull does the vagus nerve pass through?

A. Jugular hole
B. Oval hole
C. Round hole
D. Lacerated hole
E. Stiff hole

4. Specify what symptoms occur when the nuclei or vagus nerve column is irritated?

A. Bradycardia
B. Increased blood pressure

S. Tachycardia
D. Reduction of gastric secretion
E. Sphincter reduction

5. The vagus nerve emerges from the skull cavity along with which nerves?
A. IKh, KhI by pairs of cranial nerves
V. IKh, KhI, KhII pairs of cranial nerves
S. IKh, KhII by pairs of cranial nerves
D. XII, VII by pairs of cranial nerves
E. VII, IX cranial nerve pairs

6. Which muscle is innervated by the vagus nerve?
A. M. constrictor pharyngis superior
B. M. platysma
C. M. geniohyoideus
D. M. palatopharyngeus
E. M. stylopharyngeus

7. Laryngeal inervation is carried out by branches:
A. vagus nerve
B. Trigeminal nerve
C. facial nerve
D. of the glossopharyngeal nerve
E. sublingual nerve

8. Which of these nuclei relates to the vagus nerve?
A. dorsal nucleus
B. salivary superior
C. lower salivary
D. Middle Ozozkov nucleus
E. additional

9. Does the vagus nerve come out of the skull through the next hole of the skull?
A. jugular
B. round

C. oval
D. spinous
E. torn

10. Which of the following nuclei refers to the vagus nerve?
A. Twofold
B. Salivary superior
C. Lower salivary
D. Mid-cerebral pathway
E. Incremental

Current Security Questions

1. Be able to pronounce the name of the X-pair cerebral nerve and its branches in Latin based on the new anatomical nomenclature.
2. Be able to show them on anatomical preparations, dummies and drawings.
3. Be able to show the origin of the X pair of cranial nerves in the skull preparations, dummies and drawings.
4. Be able to show X pairs of branches of cranial nerves and innervating muscles on anatomical preparations, dummies and drawings.
5. Explain the main anatomical symptoms of damage to the X-pair nerve endings and their branches.

Practice 14.

Theme: Sympathetic and parasympathetic parts of the autonomic nervous system.

Goals and objectives of the lesson:

• Discuss the sympathetic innervation of internal organs.

• Demonstrate the centers of the autonomic nervous system on anatomical preparations, models and diagrams, and also show the sympathetic trunk and peripheral parts of the sympathetic nervous system.

• Explain the main anatomical symptoms of damage to the sympathetic nervous system.

• Explain the main anatomical symptoms of damage to the parasympathetic nervous system.

In the process of studying the topic, the student learns the following

• Distinctive features of the structure of the autonomic nervous system, its difference from the somatic nervous system.

• Centers of the sympathetic nervous system.

• Peripheral division of the sympathetic nervous system.

• Sympathetic innervation of organs.

autonomic (vegetative) nervous system, systema nervosum autonomicum (pars antonomica), - part of the nervous system that innervates the heart, blood and lymphatic vessels, viscera and other organs that include smooth muscle cells and glandular epithelium. This system coordinates the work of all internal organs, regulates metabolic, trophic processes in all organs and tissues of the human body, maintains the constancy of the internal environment of the body. The function of the autonomic (vegetative) nervous system is not autonomous, although it is not controlled by our consciousness; it is subordinate to the spinal cord, cerebellum, hypothalamus, basal nuclei of the telencephalon and higher parts of the nervous system - the cerebral cortex. However, in the cerebral cortex, specialized sections (nuclei) directly responsible for the functions of the autonomic nervous system have not yet been found.

The isolation of the autonomic (vegetative) nervous system is due to some features of its structure. These features include the following: 1) focal localization of vegetative nuclei in the central nervous system; 2) accumulation of bodies of effector neurons in the form of nodes (ganglia) as part of autonomic plexuses; 3) two-neuronality of the nerve pathway from the autonomic nucleus in the central nervous system to the innervated organ.

The autonomic (vegetative) nervous system is divided into central and peripheral parts. The central section includes: 1) parasympathetic nuclei III, VII, IX and X pairs of cranial nerves, lying in the brain stem (mesence-phalon, pons, medulla oblongdta); 2) the vegetative (sympathetic) nucleus, which forms the lateral intermediate column, columna inter mediolateralis (autonomica), VIII of the cervical, all thoracic and two upper lumbar segments of the spinal cord (Cvin, Thi-Ln); 3) sacral parasympathetic nuclei, nuclei parasym-pdthici sacrales, located in the gray matter of the three sacral segments of the spinal cord (Sn-Siv).

The peripheral section includes: 1) autonomic (autonomous) nerves, branches and nerve fibers, nn., rr. et neurofibrae autonomici (viscerates), emerging from the brain and spinal cord; 2) vegetative (autonomous, visceral) plexuses, plexus autonomici (viscerates); 3) nodes of autonomic (autonomous, visceral) plexuses, ganglia plexum autono-micorum (visceralium); 4) sympathetic trunk, truncus sympathicus [sympatheticus] (right and left), with its nodes, internodal and connecting branches and sympathetic nerves; 5) terminal nodes, ganglia terminalia, of the parasympathetic part of the autonomic nervous system.

The neurons of the nuclei of the central part of the autonomic nervous system are the first efferent neurons on the way from the central nervous system (spinal cord and brain) to the innervated organ. Nerve fibers formed by the processes of these neurons are called prenodular (preganglionic) fibers, since they go to the nodes of the peripheral part of the autonomic nervous system and end in synapses on the cells of these nodes. Vegetative nodes are part of the sympathetic trunks, large autonomic plexuses of the abdominal cavity and pelvis, are located in the head area and in the thickness or near the organs of the digestive and respiratory systems, as well as the genitourinary apparatus, which are innervated by the autonomic nervous system. The pre-ganglionic fibers are myelinated, giving them a whitish color. They leave the brain as part of the roots of the corresponding cranial nerves and the anterior roots of the spinal nerves. The nodes of the peripheral part of the autonomic nervous system contain the bodies of the second (effector) neurons that lie on the way to the innervated organs. The processes of these second neurons of the efferent pathway, which carry the nerve impulse from the vegetative nodes to the working organs (smooth muscles, glands, tissues), are post-nodular (postganglionic) nerve fibers. Due to the lack of myelin sheath, they are gray in color. glands, tissues), are post-nodular (postganglionic) nerve fibers. Due to the lack of myelin sheath, they are gray in color. glands, tissues), are post-nodular (postganglionic) nerve fibers. Due to the lack of myelin sheath, they are gray in color.

The structure of the reflex autonomic arc differs from the structure of the reflex arc of the somatic part of the nervous system. In the reflex arc of the autonomic part of the nervous system, the efferent link does not consist of one neuron, but of two. In general, a simple vegetative reflex arc is represented by three neurons. The first link of the reflex arc is a sensitive neuron, the body of which is located in the spinal nodes and in the sensory nodes of the cranial nerves. The peripheral process of such a neuron, which has a sensitive ending - a receptor, originates in organs and tissues. The central process, as part of the posterior roots of the spinal nerves or sensory roots of the cranial nerves, goes to the corresponding nuclei in the spinal cord or brain. The second link of the reflex arc is efferent, because it carries impulses from the spinal cord or brain to the working organ. This efferent pathway of the autonomic reflex arc is represented by two neurons. The first of these neurons, the second in a row in a simple autonomic reflex arc, is located in the autonomic nuclei of the CNS. It can be called intercalary, since it is located between the sensitive (afferent) link of the reflex arc and the second (efferent) neuron of the efferent pathway. The effector neuron is the third neuron of the autonomic reflex arc. The bodies of effector (third) neurons lie in the peripheral nodes of the autonomic nervous system (sympathetic trunk, autonomic nodes of cranial nerves, nodes of extraorganic and intraorganic autonomic plexuses). The processes of these neurons are sent to organs and tissues as part of organ autonomic or mixed nerves.

To the sympathetic partpars sympdthica (sympathetica),include: 1) lateral intermediate (gray) substance (vegetative nucleus) in the lateral (intermediate) columns from the VIII cervical segment of the spinal cord to the II lumbar; 2) nerve fibers and nerves running from the cells of the lateral intermediate substance (lateral column) to the nodes of the sympathetic trunk and autonomic plexuses; 3) right and left sympathetic trunks; 4) connecting branches; 5) nodes of autonomic plexuses located anterior to the spine in the abdominal cavity and pelvic cavity and nerves lying near large vessels (perivascular plexus); 6) nerves going from these plexuses to the organs; 7) sympathetic fibers that go as part of somatic nerves to organs and tissues.

Sympathetic preganglionic nerve fibers are usually shorter than postganglionic fibers.

Sympathetic trunk. Sympathetic trunk, triincus sympathicus [sympatheticusJ—

a paired formation located on the sides of the spine. It consists of 20-25 nodes connected by internodal branches, rr. inter gangliondres.

Nodes of the sympathetic trunk, ganglia trunci sympdthici (sympathetici), spindle-shaped, ovoid and irregular (polygonal) shape. The sympathetic trunk is located on the anterior-lateral surface of the spine. Only one type of branches approaches the sympathetic trunk - the so-called white connecting branches, and gray connecting branches go out, as well as nerves to the internal organs, blood vessels and large prevertebral plexuses of the abdominal cavity and pelvis. The white connecting branch, Mr. communicans albus, is a bundle of preganglionic nerve fibers that branches off from the spinal nerve and enters the nearby node of the sympathetic trunk.

As part of the white connecting branches, there are preganglionic nerve fibers, which are processes of neurons of the lateral columns of the spinal cord. These fibers pass through the anterior columns (horns) of the spinal cord and exit as part of the anterior roots, and then go to the spinal nerve, from which they branch off after it exits the spinal foramen. White connecting branches are present only in the VIII cervical, all thoracic and two upper lumbar spinal nerves and are suitable only for all thoracic (including cervicothoracic) and two upper lumbar nodes of the sympathetic trunk. The white connecting branches are not suitable for the cervical, lower lumbar, sacral and coccygeal nodes of the sympathetic trunk. Preganglionic fibers enter the named nodes along the internodal branches of the sympathetic trunk, passing without interruption,

Gray connecting branches, rami communicantes gri-sei, emerge from the nodes of the sympathetic trunk all the way to the nearest spinal nerve. Gray connecting branches contain postganglionic nerve fibers - processes of cells lying in the nodes of the sympathetic trunk.

As part of the spinal nerves and their branches, postganglionic sympathetic fibers are sent to the skin, muscles, all organs and tissues, blood and lymphatic vessels, sweat 7 and sebaceous glands, to the muscles that raise the hair, and carry out their sympathetic innervation. From the sympathetic trunk, in addition to the gray connecting branches, to the internal organs and vessels, nerves depart, containing postganglionic fibers, as well as nerves following to the nodes of the autonomic plexuses and containing preganglionic fibers that have passed through the nodes of the sympathetic trunk. Topographically, 4 sections are distinguished in the sympathetic trunk: cervical, thoracic, lumbar, sacral.

The cervical region of the sympathetic trunk is represented by three nodes and internodal branches connecting them, which are located on the deep muscles of the neck behind the prevertebral plate of the cervical fascia. Preganglionic fibers approach the cervical nodes along the internodal branches of the thoracic sympathetic trunk, where they come from the autonomic nuclei of the lateral intermediate (gray) substance of the VIII cervical and six to seven upper thoracic segments of the spinal cord. The superior cervical ganglion, ganglion cervicale superius, is the largest node of the sympathetic trunk. The node is fusiform, its length reaches 2 cm or more, thickness - 0.5 cm. The upper cervical node is located in front of the transverse processes of the II-III cervical vertebrae. In front of the node are the carotid artery, laterally - the vagus nerve, behind - the long muscle of the head.

1 gray connecting branches, rr. communicntes grisei,connect the upper cervical node with the first three (sometimes IV) cervical spinal nerves;

2 internal carotid nerve, n. caroticus internus,goes from the upper pole of the node to the artery of the same name and along its course forms the internal carotid plexus, plexus caroticus internus. Together with the internal carotid artery, this plexus enters the carotid canal, and then into the cranial cavity. In the carotid canal, the carotid-tympanic nerves depart from the plexus to the mucous membrane of the middle ear. After the exit of the internal carotid artery from the canal, the deep stony nerve, n. petrosus profundus, is separated from the internal carotid plexus. It passes through the fibrocartilage of the torn foramen and enters the pterygoid canal of the sphenoid bone, where it connects with the large stony nerve, forming the nerve of the pterygoid canal, n. canalis

pterygoidei. The latter, entering the pterygopalatine fossa, joins the pterygopalatine node. Having passed through the pterygopalatine node, sympathetic fibers along the pterygopalatine nerves enter the maxillary nerve and spread as part of its branches, carrying out sympathetic innervation of blood vessels, tissues, glands, mucous membranes of the oral cavity and nasal cavity, conjunctiva of the lower eyelid and facial skin. Part of the internal carotid plexus, located in the cavernous sinus, is often called the cavernous plexus, plexus cavernosus. Sympathetic fibers enter the orbit in the form of the periarterial plexus of the ophthalmic artery, a branch of the internal carotid artery. The sympathetic root, radix sympdthicus, branches off from the ophthalmic plexus to the ciliary ganglion. The fibers of this root pass through the ciliary ganglion and, as part of short ciliary nerves, reach the eyeball. Sympathetic fibers innervate the vessels of the eye and the muscle that dilates the pupil.

3 external carotid nerves, pp. carotid externi,- these are 2-3 trunks, they go to the external carotid artery and form the external carotid plexus, plexus caroticus externus, along its course. This plexus spreads along the branches of the artery of the same name, carrying out sympathetic innervation of the vessels, glands, smooth muscle elements and tissues of the organs of the head. The internal and external carotid plexuses are connected at the common carotid artery, where the common carotid plexus, plexus caroticus communis, is located;

The jugular nerve, n. jugularis, rises along the wall of the internal jugular vein to the jugular foramen, where it is divided into branches leading to the upper and lower nodes of the vagus nerve, to the lower node of the glossopharyngeal nerve and to the hypoglossal nerve. Due to this, sympathetic fibers are distributed as part of the branches of the IX, X and XII pairs of cranial nerves;

5 laryngeal-pharyngeal branches, rr. laryngopharyngei flaryngo-pharyngeales], participate in the formation of the laryngeal-pharyngeal plexus, innervate (sympathetic innervation) blood vessels, the mucous membrane of the pharynx and larynx, muscles and other tissues. Thus, the postganglionic nerve fibers extending from the upper cervical ganglion carry out sympathetic innervation of the organs, skin and vessels of the head and neck;

6 the upper cervical cardiac nerve, n. cardiacus cervicalis superior, descends parallel to the sympathetic trunk anteriorly from the

prevertebral plate of the cervical fascia. The right nerve runs along the brachiocephalic trunk and enters the deep part of the cardiac plexus on the posterior surface of the aortic arch. The left upper cervical cardiac nerve is adjacent to the left common carotid artery, descends into the superficial part of the cardiac plexus, located between the aortic arch and the bifurcation of the pulmonary trunk.

The middle cervical ganglion, ganglion cervicale medium, is unstable, located anterior to the transverse process of the VI cervical vertebra, behind the inferior thyroid artery. The dimensions of the node do not exceed 5 mm. The middle cervical node is connected to the upper cervical node by one internodal branch, and to the cervicothoracic (stellate) node by two, rarely three internodal branches. One of these branches passes in front of the subclavian artery, the other behind, forming the subclavian loop, ansa subclavia.

The following branches depart from the middle cervical node:

1 gray connecting branches to the V and VI cervical spinal nerves, sometimes to VII;

2 middle cervical cardiac nerve, n. cardiacus cervicalis medius. It runs parallel and lateral to the superior cervical cardiac nerve. The right middle cervical cardiac nerve is located along the brachiocephalic trunk, and the left along the left common carotid artery. Both nerves enter the deep part of the cardiac plexus;

One or two thin nerves from the middle cervical ganglion are involved in the formation of the common carotid plexus and the plexus of the inferior thyroid artery, innervating the thyroid and parathyroid glands. In the absence of the middle cervical node, all of these branches depart from the internodal branches at the level of the transverse process of the VI cervical vertebra, and the post-nodal fibers enter these branches from the cervicothoracic node.

The cervicothoracic (stellate) node, ganglion cervicothoracicum, lives at the level of the neck of the 1st rib behind the subclavian artery, at the place where the vertebral artery originates from it. The node was formed as a result of the fusion of the lower cervical node with the first thoracic node. The cervicothoracic node is flattened in the anteroposterior direction, has an irregular (star-shaped) shape, its average diameter is 8 mm. The following branches depart from the node:

1 gray connecting branches, rr. communicntes grisei,sent to the VI, VII, VIII cervical spinal nerves;

2 several branches, including from the subclavian loop, form the subclavian plexus, plexus subclavius [subclavia], continuing to the vessels of the upper limb. Together with the branches of the subclavian artery, the sympathetic fibers of this plexus reach the thyroid gland, parathyroid glands, organs of the superior and anterior mediastinum, and also innervate the branches of the subclavian artery;

3 several branches join the vagus nerve and its branches, as well as the phrenic nerve;

4 vertebral nerve, n. vertebrdlis, approaches the vertebral artery and participates in the formation of the sympathetic vertebral plexus, plexus vertebralis. Almost constantly at the point of entry of the vertebral artery into the opening of the transverse process of the VI cervical vertebra along the course of the vertebral nerve, a small vertebral ganglion, ganglion vertebrate, is found. The vertebral plexus innervates the vessels of the brain and spinal cord and their membranes;

5 the lower cervical cardiac nerve, n. cardiacus cerviclis Inferior, runs on the right behind the brachiocephalic trunk, and on the left behind the aorta. The right and left nerves enter the deep part of the cardiac plexus.

The thoracic section of the sympathetic trunk includes 10-12 thoracic nodes, ganglia thoracica, flattened, fusiform or triangular in shape. The dimensions of the nodes are 3-5 mm. The nodes are located anterior to the heads of the ribs on the lateral surface of the vertebral bodies, behind the intrathoracic fascia and parietal pleura. Behind the sympathetic trunk in the transverse direction are the posterior intercostal vessels. To the thoracic nodes of the sympathetic trunk from all the thoracic spinal nerves, white connecting branches containing pre-ganglionic fibers approach. Several types of branches depart from the thoracic nodes of the sympathetic trunk:

1 gray connecting branches, rr. communictes grisei, containing postganglionic fibers, join adjacent spinal nerves;

2 thoracic cardiac branches, pp. (rr.) cardidci thordclci, depart from the second, third, fourth, fifth thoracic nodes, go forward and medially and participate in the formation of the cardiac plexus;

The thin sympathetic nerves (pulmonary, esophageal, aortic) extending from the thoracic nodes of the sympathetic trunk, together with the branches of the vagus nerve, form the right and left pulmonary plexus, plexus pulmondlis, the esophageal plexus, plexus esophagealis [oesophagedlis], and the thoracic aortic plexus, plexus adrticus thoracicus. The branches of the thoracic aortic plexus continue to the intercostal vessels and other branches of the thoracic aorta, forming periarterial plexuses along their course. Sympathetic nerves also approach the walls of the unpaired and semi-unpaired veins, the thoracic duct and participate in their innervation.

The largest branches of the sympathetic trunk in the thoracic region are the large and small splanchnic nerves;

3 large splanchnic nerve, n. splanchnicus major,It is formed from several branches extending from the 5-9th thoracic node of the sympathetic trunk and consisting mainly of preganglionic fibers. On the lateral surface of the thoracic vertebral bodies, these branches are combined into a common nerve trunk, which goes down and medially, penetrates into the abdominal cavity between the muscle bundles of the lumbar diaphragm next to the unpaired vein on the right and the semi-unpaired vein on the left and ends at the nodes of the celiac plexus. At the level of the XII thoracic vertebra, along the course of the large internal nerve, there is a small size [thoracic! internal node, ganglion [thoracicus] spldnchnicum;

5 small splanchnic nerve, n. splanchnicus minor, starts from the 10th and 11th thoracic nodes of the sympathetic trunk and also contains predominantly preganglionic fibers. This nerve descends lateral to the large splanchnic nerve, passes between the muscle bundles of the lumbar part of the diaphragm (together with the sympathetic trunk) and enters the nodes of the celiac plexus. The renal branch departs from the small splanchnic nerve, g. rendlis, ending in the aorto-renal node of the celiac plexus;

6 lower splanchnic nerves, n. splanchnicus imus, unstable, goes next to the small splanchnic nerve. It starts from the 12th (sometimes the 11th) thoracic node of the sympathetic trunk and ends in the renal plexus.

The lumbar section of the sympathetic trunk is represented by 3-5 lumbar nodes and internodal branches connecting them.

Lumbar nodes, ganglia lumbdia, spindle-shaped, their dimensions do not exceed 6 mm. The nodes are located on the anterior-lateral surface of the bodies of the lumbar vertebrae medial to the psoas major muscle and are covered by the retroperitoneal fascia. The inferior vena cava adjoins the lumbar nodes of the right sympathetic trunk in front, the nodes of the left trunk are adjacent to the left semicircle of the abdominal aorta. The lumbar nodes of the right and left sympathetic trunks are connected by transversely oriented connecting branches lying on the anterior surface of the lumbar vertebrae, behind the aorta and inferior vena cava.

From the I and II lumbar spinal nerves belonging to the corresponding segments of the spinal cord (Li-Lh), white connecting branches approach the upper two lumbar nodes of the sympathetic trunk. The remaining lumbar nodes do not have white connecting branches.

Two types of branches depart from each lumbar node: 1) gray connecting branches containing postganglionic fibers heading to the lumbar spinal nerves; 2) lumbar splanchnic nerves, nervi spldnchnici lumbdles, which go to the celiac plexus and organ (vascular) autonomic plexuses: splenic, hepatic, gastric, renal, adrenal. These nerves have both preganglionic and postganglionic nerve fibers.

The pelvic section of the sympathetic trunk is formed by four sacral nodes. The sacral nodes, ganglia sacrdlia, are fusiform, about 5 mm in size each, connected by internodal branches. These nodes lie on the pelvic surface of the sacrum medially to the pelvic sacral foramen. Below, the right and left sympathetic trunks converge and end in an unpaired node, ganglion impar, which lies on the anterior surface of the 1st coccygeal vertebra. As in the lumbar region, there are transverse connections between the nodes of the sympathetic trunks of the right and left sides. Branches depart from the sacral nodes:

1) gray connecting branches go to the sacral spinal nerves, in which the post-nodal sympathetic fibers are sent to innervate blood vessels, glands, organs and tissues in those areas where the somatic sacral nerves branch;

2) sacral splanchnic nerves, nervi spldnchnici sacra-les, follow the upper and lower hypogastric (pelvic) autonomic plexuses.

Vegetative plexus of the abdominal cavity and pelvis

In the abdominal cavity and the pelvic cavity there are autonomic nerve plexuses of various sizes, consisting of autonomic nodes and bundles of nerve fibers connecting them. The bodies of the second neurons of the efferent pathway are located in the vegetative nodes, the processes of which are sent from these plexuses to the internal organs and vessels for their innervation. Nerves from autonomic (visceral) plexuses, containing post-ganglionic nerve fibers, follow the organs along with blood vessels, forming plexuses of the same name along the vessels, or independently. One of the largest autonomic plexuses of the abdominal cavity is the abdominal aortic plexus, plexus aorticus abdomindlis, located on the aorta and continuing on its branches.

The largest and most important in terms of value in the composition of the abdominal aortic plexus is the celiac plexus, plexus coeliacus ("solar plexus", "brain" of the abdominal cavity), which is located on the anterior surface of the abdominal aorta around the celiac trunk. The celiac plexus consists of several large nodes and numerous nerves connecting these nodes. The composition of the celiac plexus includes two crescent-shaped celiac nodes, ganglia coeliaca, lying to the right and left of the celiac trunk, two aorto-renal nodes, ganglia aortorendlia [aorticorendlia], each of which is located at the place of origin of the corresponding renal artery from the aorta, and an unpaired superior mesenteric node, ganglion mesentericum superior, lying at the beginning of the artery of the same name. The right and left large and small splanchnic nerves from the thoracic nodes and the lumbar splanchnic nerves from the lumbar nodes of the sympathetic trunk approach the celiac plexus. They also fit here, but pass through its nodes in transit, the fibers of the posterior trunk of the vagus nerve, as well as the sensory fibers of the right phrenic nerve. From the nodes of the celiac plexus, nerves depart, containing postganglionic and preganglionic parasympathetic nerve fibers, which, together with the vessels, are sent to the organs. Located around the vessels, the nerves form the so-called vascular (peri-arterial) autonomic plexus. as well as sensory fibers of the right phrenic nerve. From the nodes of the celiac plexus, nerves depart, containing postganglionic and preganglionic parasympathetic nerve fibers, which, together with the vessels, are sent to the organs. Located around the vessels, the nerves form the so-called vascular (peri-arterial) autonomic plexus. as well as sensory fibers of the right phrenic nerve. From the nodes of the celiac plexus, nerves depart, containing postganglionic and preganglionic parasympathetic nerve fibers, which, together with the vessels, are sent to the organs. Located around the vessels, the nerves form the so-called vascular (peri-arterial) autonomic plexus.

Several groups of branches depart from the celiac nodes:. 1) two or three branches enter the paired vegetative plexus on the lower phrenic arteries and participate in the sympathetic innervation of the diaphragm covering its peritoneum and their vessels. Along these plexuses there are small diaphragmatic nodes, ganglia phrenica.

2 numerous branches go to the celiac trunk and its branches, forming plexuses of the same name around the common hepatic, splenic, left gastric arteries. Thus, unpaired splenic plexus, plexus lienalis [splenicus], gastric, plexus gastrici, hepatic, plexus hepaticus, pancreatic, plexus pancredticus are formed, which, in addition to autonomic fibers, contain sensory fibers from the right phrenic nerve. The organ plexuses of parenchymal organs are located around the blood vessels and in the connective tissue stroma of the organs. The nerve plexuses of hollow organs: the stomach, small and large intestines, and the gallbladder lie between the layers of the walls of the organs. There are subserous, intermuscular and submucosal plexuses that innervate the muscles of the walls of organs and glands;

About 20 branches extending from the lateral side of each celiac node go to the adrenal glands, forming a paired adrenal plexus, plexus suprarenalis. The adrenal medulla contains preganglionic nerve fibers that innervate the adrenal medulla. Thus, the adrenal medulla, which has a common origin with the nodes of the autonomic nervous system, unlike any other organs, receives sympathetic innervation directly from the preganglionic nerve fibers.

Thin branches depart from the celiac and aortorenal nodes, continuing into the paired renal plexus surrounding the renal arteries, plexus renalis, which includes small renal nodes, ganglia renalia. The renal plexus, along the branches of the artery of the same name, enters the kidney, and also passes to the ureter, participating in the formation of the ureteric plexus, _ plexus uretericus. The branches of the abdominal aortic plexus form autonomic plexuses that accompany the blood vessels of the gonads. In men, along the course of the testicular artery, there is the testicular plexus, plexus testicularis, in women, along the course of the ovarian artery, the ovarian plexus, plexus ovaricus, descends into the small pelvis.

The branches of the superior mesenteric node, as well as the abdominal aortic plexus, pass to the superior mesenteric artery, where they form the superior mesenteric plexus, plexus parasentericus superior. This plexus continues on the intestinal and colon arteries, reaches the thin, blind, ascending colon and transverse colon, in the walls of which there are subserous, musculo-intestinal and submucosal plexuses.

The part of the abdominal aortic plexus, located between the superior and inferior mesenteric arteries, is called the intermesenteric plexus, plexus intermesentericus. The inferior mesenteric plexus, plexus mesentericus inferior, originates from it, located along the course of the artery of the same name and its branches and having at the beginning of this artery the inferior mesenteric node, ganglion mesentericum inferior, and sometimes several small nodes. Along the branches of the inferior mesenteric artery, the nerves of this plexus reach the colon (sigmoid, descending and left half of the transverse), form subserous, musculo-intestinal and submucosal plexuses in their walls. From the inferior mesenteric plexus originates the superior rectal plexus, plexus rectlis superior, which accompanies the artery of the same name.

The abdominal aortic plexus, in particular the intermesenteric one, continues to the common iliac arteries in the form of the right and left iliac plexuses, plexus iliaci, and also gives off several fairly large nerves that pass into the superior hypogastric plexus, plexus hypogastricus superior. This plexus is located on the anterior surface of the last lumbar vertebra and promontory below the aortic bifurcation.

Parasympathetic nervous system. The parasympathetic part of the autonomic nervous system is divided into central and peripheral parts. The central section is represented by parasympathetic nuclei III, VII, IX and X pairs of cranial nerves and parasympathetic sacral nuclei of the spinal cord. The peripheral section includes parasympathetic fibers and nodes. The latter, unlike the sympathetic nervous system, are located either in the wall of the organs they innervate or next to them.

The fibers of the parasympathetic (accessory) nucleus of the oculomotor nerve (III pair of cranial nerves) in the orbit end on the cells of the ciliary node. From it, postganglionic parasympathetic fibers begin, which penetrate the eyeball and innervate the muscle that constricts the pupil and the ciliary muscle (provides accommodation). Sympathetic fibers extending from the superior cervical ganglion of the sympathetic trunk innervate the muscle that dilates the pupil.

The parasympathetic nuclei (superior salivary and lacrimal) of the facial nerve (VII pair of cranial nerves) are located in the bridge. Their axons branch off from the facial nerve and, as part of the greater stony nerve, reach the pterygopalatine node located in the fossa of the same name. Postganglionary fibers begin from it, carrying out parasympathetic innervation of the lacrimal gland, glands of the mucous membranes of the nasal cavity and palate. Part of the fibers, not included in the large stony nerve, passes into the drum string. The latter carries preganglionic fibers to the submandibular and sublingual nodes. The axons of the neurons of these nodes innervate the salivary glands of the same name.

The inferior salivary nucleus belongs to the glossopharyngeal nerve (IX pair). Its preganglionic fibers pass first

From the dorsal nucleus of the vagus nerve (X pair), parasympathetic fibers as part of its branches pass to numerous intramural nodes located in the wall of the internal organs of the neck, chest and abdominal cavities. Postganglionic fibers depart from these nodes, carrying out parasympathetic innervation of the organs of the neck, chest cavity, and most organs of the abdominal cavity.

The spinal sacral region is represented by sacral parasympathetic nuclei located at level II -IV sacral segments. From them originate the fibers of the pelvic splanchnic nerves, which carry impulses to the intramural nodes of the pelvic organs. Postganglionic fibers extending from them provide parasympathetic innervation of the internal genital organs, bladder and rectum.

The concept of the metasympathetic nervous system. Relatively recently, scientists have identified another division of the autonomic nervous system - the metasympathetic nervous system. It is understood as extensive nerve plexuses and microscopic nodes located in the walls of hollow organs with motor skills (food, stomach, intestines, bladder, gallbladder and bile ducts, fallopian tubes).

Metasympathetic ganglions differ from parasympathetic ones in their histological structure, their neurocytes are surrounded by a connective tissue stroma, and gamma-aminobutyric acid (GABA) or purine bases are involved as mediators. Sometimes these nodes are represented by only 4-5 neurons. These neurocytes are able to generate impulses without the participation of the central nervous system and send them to smooth muscle cells. Thus, the peristalsis of the organ and the contraction of its wall occur. The neurons of the metasympathetic nodes have connections with the sympathetic and parasympathetic parts of the autonomic nervous system, which coordinate the frequency of impulse formation.

Nervous regulation of organ functions. The main role in the regulation of the activity of internal organs, heart, blood vessels, glands is played byautonomic nervous system. Most of the effects of the sympathetic and parasympathetic systems are opposite to each other. Sympathetic or parasympathetic fibers are not suitable for some organs and tissues; their activity is regulated only by one of the divisions of the autonomic nervous system. Structures that are not subject to the action of the parasympathetic nervous system include, for example: arteries, pilomotor muscles, muscle that dilates the pupil, sweat glands.

In a simplified form, the main sympathetic and parasympathetic effects are presented in Table. 15.1.

It should be noted that, as a rule, the sympathetic nervous system is activated during stress, vigorous activity. The parasympathetic system, on the other hand, dominates at rest. Indeed, during a sharp change in the situation, in situations where significant efforts are required, concentration of attention, the frequency and strength of heart contractions increase, breathing intensifies, etc.

Thus, the combined action of the sympathetic and parasympatheticpathic systems on the organ ensures its adequate responsenie to change any external conditions.

TEST QUESTIONS

1. What segmental-level structures make up the parasympathetic division of the autonomic nervous system?

A. Yakubovich's core

V. Lobova particle
S. Hypothalamus
D. Reticular formation
E. Limbic particle

2.What function does parasympathetic innervation of the eye provide?
A. Narrowing of the sunnies
B. Zenitz expansion
S. Convergence
D. Upper Eyelid Uplift
E. Lowering the Upper Eyelid

3. What symptoms are observed with irritation of the sympathetic fibers that innervate the eyeball?
A. Pupil dilation
B. Narrowing of the eye gap
C. Ptosis
D. Enophthalmos
E. Accommodation violation

4. What segmental-level formations make up the sympathetic division of the autonomic nervous system?
A. Spinal cord lateral horn neurons
B. Fine spinal cord matter
C. Spinal cord spongiform zone
D. Spinal cord proper nucleus
E. Thoracic spinal cord nucleus

5. Where are the autonomic ganglia of the sympathetic part of the autonomic nervous system localized?
A. in prevertebral nodes
B. In the wall of the internal organ or near the internal organs
C. in the stem of the brain
D. in the hypothalamus
E. in thalamus

6. What physiological influence does the excitation of the sympathetic part of the autonomic nervous system have?
A. increases bronchial lumen
B. constricts pupil
C. enhances the motor function of the digestive canal
D. slows heart rate
E. all of the above

7. What physiological effect does the excitation of the parasympathetic part of the autonomic nervous system have?
A. slows down cardiac activity
B. inhibits the motor function of the digestive canal
C. dilates pupil
D. increases bronchial lumen
E. improves cardiac activity

8. Where are the sympathetic centers of the autonomic nervous system located?
A. in the spinal cord
B. in the medulla oblongata
C. in the hypothalamus
D. in the midbrain
E. in the final brain

9. In what proportion are the cortical centers of the autonomic part of the nervous system located?
A. frontal
B. temporal
C. occipital
D. parietal
E. islet

10. In what proportion are the cortical centers of the autonomic part of the nervous system located?

A. frontal
B. temporal
C. occipital
D. parietal
E. islet

Current Security Questions

1. Be able to pronounce the name of the X-pair cerebral nerve and its branches in Latin based on the new anatomical nomenclature.
2. Be able to show them on anatomical preparations, dummies and drawings.
3. Be able to show the origin of the X pair of cranial nerves in the skull preparations, dummies and drawings.
4. Be able to show X pairs of branches of cranial nerves and innervating muscles on anatomical preparations, dummies and drawings.
5. Explain the main anatomical symptoms of damage to the X-pair nerve endings and their branches.

Practice 15.

Subject: Organs of vision. The structure and age features of the eyeball Auxiliary apparatus of the eyeball, age features. visual tract. II - a pair of cranial nerve.

Goals and objectives of the lesson:

• Discuss with students the anatomy of the eyeball, the ancillary apparatus of the eye, and the pathways of the eye.

• Show the layers of the eyeball, its internal structure, eye muscles, lacrimal apparatus and eyelids in museum preparations, models and drawings.

• Discuss eye flow charts.

• Explain the formation of images, translucent and visual objects.

Objectives of practical training:

• Be able to pronounce the layers of the eyeball, the internal structure of the eyeball, the name of the lacrimal apparatus and muscles in Latin in accordance with the new anatomical nomenclature.

• Be able to show the layers of the eyeball, the internal structure of the eyeball, the lacrimal apparatus and muscles on anatomical preparations, models and images.

• Tell us about your vision.

• Explain the mechanism of vision.

• Explain the main symptoms of eye injuries in terms of their anatomy.

The structure of the sense organs.

Sense organs are called anatomical formations that perceive the energy of external influence, transform it into a nerve impulse and transmit this impulse to the brain. Various kinds of external influences are perceived by the skin, specialized sense organs: the organ of vision, the vestibulocochlear organ (the organ of hearing and balance), the organs of smell and taste. With the help of sense organs capable of detecting and transmitting to the brain external influences of different nature and strength, transformed into a nerve impulse, a person orients himself in the external environment, responds to these influences with certain actions. Some external influences are perceived by direct contact of the human body with objects (contact sensitivity). So, the sensitive nerve endings located in the skin react to touch, pressure (tactile sensitivity), pain and environmental temperature (pain and temperature sensitivity). Special sensitive devices located in the mucous membrane of the tongue (the organ of taste) perceive the taste of food. Other external influences are caught by the body at a distance (distant sensitivity). The organ of vision perceives light, the organ of hearing captures sound, the organ of balance - changes in the position of the body (head) in space, the organ of smell - smells.

The sense organs developed and formed in the process of adapting the body to changing environmental conditions, their structure and functions became more complex in conjunction with the development and complication of the central nervous system.

The sense organs only perceive external influences. The highest analysis of these influences takes place in the cerebral cortex, where nerve impulses arrive along the nerve fibers (nerves) that connect the sense organs with the brain. It is no coincidence that IP Pavlov called the sense organs in their broadest sense analyzers. Each analyzer includes:

1) a peripheral device that perceives external influences (light, sound, smell, taste, touch) and transforms it into a nerve impulse;

2) pathways belonging to the group of projection exteroceptive pathways of the brain, through which the nerve impulse enters the corresponding nerve center;

3) nerve center in the cerebral cortex (cortical end of the analyzer).

As a result of the interaction of the organism with the external environment with the participation of the sense organs, the reality of the external world is reflected in the human mind. A person forms his attitude to external influences, responds to them with specific actions for each situation.

Organ of vision

The organ of vision (orgranum visus) plays an important role in human life, in its communication with the external environment. In the process of evolution, this organ has gone from light-sensitive cells on the surface of the animal's body to a complex organ capable of moving in the direction of the light beam and sending this beam to special light-sensitive cells in the thickness of the back wall of the eyeball, which perceive both black and white and color image.

The organ of vision is located in the orbit and includes the eye and auxiliary organs of vision.

Eye striation

The eye (oculus) consists of the eyeball and the optic nerve with its membranes. The eyeball is rounded. The poles are distinguished in it - the anterior (corresponds to the most protruding point of the cornea) and the posterior (located lateral to the exit point of the optic nerve from the eyeball). The line connecting these points is called the outer axis of the eye, it is approximately 24 mm. The internal axis of the eyeball (from the posterior surface of the cornea to the retina) is 21.75 mm. In the presence of a longer internal axis, the rays of light, after being refracted in the eyeball, are concentrated in front of the retina. At the same time, a good vision of objects is possible only at close distances - myopia, myopia. The focal length of myopic people is shorter than the inner axis of the eyeball.

Organ of vision. Diagram of the structure of the eyeball. A section in a horizontal plane. Different curvature of the lens is shown: words - with relaxation of the ciliary muscle, on the right - with contraction.

If the inner axis of the eyeball is relatively short, then the rays of light after refraction are collected in focus behind the retina. Far-sightedness is better than close-up vision - farsightedness, hypermetropia. The focal length of the far-sighted is longer than the inner axis of the eyeball.

The vertical size of the eyeball is 23.5 mm, and the transverse size is 23.8 mm. These two dimensions are in the plane of the equator.

The visual axis of the eyeball is isolated, which extends from its anterior pole to the central fossa of the retina - the point of best vision.

The eyeball consists of the membranes that surround the nucleus of the eye (aqueous humor in the anterior and posterior chambers, the lens, the vitreous body). There are three membranes: external fibrous, middle vascular and internal sensitive.

Fibrous membrane of the eyeballperforms a protective function. The front part of it is transparent and is called the cornea, and the large back part, because of the whitish color, is called the albuginea, or sclera. The boundary between the cornea and the sclera is a shallow circular groove in the sclera.

The cornea is one of the transparent media of the eye and is devoid of blood vessels. It has the appearance of an hour glass, convex in front and concave in the back. Corneal diameter - 12 mm, thickness - about 1 mm. The peripheral edge (limb) of the cornea is, as it were, inserted into the anterior part of the sclera, into which the cornea passes.

The sclera is composed of dense fibrous connective tissue. In its back part there are numerous openings through which bundles of optic nerve fibers exit and vessels pass. The thickness of the sclera at the exit of the optic nerve is about 1 mm. On the border with the cornea in the thickness of the sclera there is a narrow circular channel filled with venous blood - the venous sinus of the sclera (shleynov channel).

choroideyeball is rich in blood vessels and pigment. It is directly adjacent to the sclera from the inside, with which it is firmly fused at the exit from the eyeball of the optic nerve and at the border of the sclera with the cornea. The choroid is divided into three parts: the choroid proper, the ciliary body, and the iris.

The choroid itself lines the large posterior part of the sclera, with which, in addition to the indicated places, it is loosely fused, limiting the perivascular space between the membranes from the inside.

The ciliary body is a middle thickened section of the choroid, located in the form of a circular roller in the region of the transition of the cornea to the sclera, behind the iris. The ciliary body is fused with the outer ciliary edge of the iris. The back part of the ciliary body - the ciliary circle, has the form of a thickened circular strip 4 mm wide, passes into the choroid proper. The anterior part of the ciliary body forms about 70 radially oriented folds up to 3 mm long thickened at the ends - ciliary processes that make up the ciliary crown. In the thickness of the ciliary body lies the ciliary muscle, which consists of intricately intertwined bundles of smooth muscle cells. When the muscle contracts, accommodation of the eye occurs - an adaptation to a clear vision of objects located at different distances. In the ciliary muscle, meridional, circular and radial bundles of unstriated (smooth) muscle cells. Meridional (longitudinal) fibers originate from the edge of the cornea and from the sclera and are woven into the anterior part of the choroid itself. With their contraction, the shell is mixed anteriorly, as a result of which the tension of the ciliary band, on which the lens is fixed, decreases. In this case, the lens capsule relaxes, the lens changes its curvature, becomes more convex, and its refractive power increases. Circular fibers, starting together with meridional fibers, are located medially from the latter in a circular direction. With its contraction, the ciliary body is narrowed, bringing it closer to the lens, which also contributes to the relaxation of the lens capsule. Radial fibers originate from the cornea and sclera in the region of the iriocorneal angle, are located between the meridional and circular bundles of the ciliary muscle, bringing these bundles together during their contraction. The elastic fibers present in the thickness of the ciliary body straighten the ciliary body when its muscles are relaxed.

The iris is the most anterior part of the choroid, visible through the transparent cornea. It has the form of a disk about 0.4 mm thick, in the center of which there is a round hole - the pupil. The pupil diameter is variable: the pupil constricts in strong light and expands in the dark, acting as the diaphragm of the eyeball. The pupil is limited by the pupillary edge of the iris. The outer ciliary margin is connected to the ciliary body and to the sclera by the pectinate ligament. This ligament fills the iridocorneal angle formed by the iris and cornea. The anterior surface of the iris faces the anterior chamber of the eyeball, while the posterior surface faces the posterior chamber and lens.

The connective tissue stroma of the iris contains blood vessels. The cells of the posterior epithelium are rich in pigment, the amount of which determines the color of the iris (eye). In the presence of a large amount of pigment, the color of the eye is dark (brown, hazel) or almost black. If there is little pigment, then the iris will have a light gray or light blue color. In the absence of pigment (albinos), the iris is reddish in color, as blood vessels shine through it. Two muscles lie in the thickness of the iris. Around the pupil, bundles of smooth muscle cells are circularly located - the sphincter of the pupil, and thin bundles of the muscle dilating the pupil extend radially from the ciliary edge of the iris to its pupillary edge.

Inner (sensitive) membrane of the eyeball (retina)tightly adjacent from the inside to the choroid along its entire length, from the exit point of the optic nerve to the edge of the pupil. In the retina, which develops from the wall of the anterior cerebral bladder, two layers (leaves) are distinguished: the outer pigment part and the complex inner light-sensitive part, called the nervous part.

Accordingly, the functions distinguish a large posterior visual part of the retina, containing sensitive elements (photoreceptors) - rods (about 120 million) and cones (about 6 million), and a smaller - "blind" part of the retina, devoid of rods and cones. The "blind" part of the retina combines the ciliary part and the iris part of the retina. The boundary between the visual and "blind" parts is the jagged edge, clearly visible on the preparation of the opened eyeball. It corresponds to the place of transition of the choroid proper to the ciliary circle of the choroid. There are also glial cells (Müllerian cells) and pigment cells in the retina. Photoreceptors are connected by synaptic contacts with bipolar and horizontal cells. Bipolars transmit signals from photoreceptors to the layer of amacrine and ganglion cells. The axons of ganglion cells bordering the vitreous go to the optic disc, or blind spot, where they come together, pass through the sclera and form the optic nerve. At the intersection of the retina with the optical axis, there is a recess (fovea), which contains only cones of photoreceptors.

In the posterior part of the retina at the bottom of the eyeball, one can see a whitish spot with a diameter of about 1.7 mm - the optic disc, with raised edges in the form of a roller and a small depression. The disk is the exit point of the optic nerve fibers from the eyeball, forming the external and internal sheaths of the optic nerve, which is directed towards the optic canal, which opens into the cranial cavity. Due to the absence of light-sensitive visual cells (rods and cones), the disc area is called the blind spot. In the center of the disk, its central artery entering the retina is visible. Lateral to the optic disc by about 4 mm, which corresponds to the posterior pole of the eye, there is a yellowish spot with a small depression - the central fossa.

The fovea is the place of the best vision: only cones are concentrated here. There are no sticks in this place.

Ophthalmoscopic picture of the fundus: 1 - spot, 2 - central fossa, 3 - optic disc, 4 - blood vessels.

The inner part of the eyeball is filled with aqueous humor located in the anterior and posterior chambers of the eyeball, the lens and the vitreous body. Together with the cornea, all these formations are the refractive media of the eyeball. The anterior chamber of the eyeball, containing aqueous humor, is located between the cornea in front and the anterior surface of the iris behind. Along the circumference, where the edges of the cornea and iris converge, the chamber is limited by the pectinate ligament, between the bundles of which there are gaps-spaces of the iris-corneal (fountain spaces) limited by flat cells. Through these spaces, aqueous humor from the anterior chamber flows into the venous sinus of the sclera (Schlemm's canal), and from it enters the anterior ciliary veins.

Through the opening of the pupil, the anterior chamber communicates with the posterior chamber of the eyeball, which is located behind the iris and bounded behind by the lens. The posterior chamber communicates with the spaces between the lens fibers connecting the lens sac to the ciliary body. Girdle spaces have the form of a circular fissure (petite canal) lying along the periphery of the lens. They, like the posterior chamber, are filled with aqueous humor, which is formed with the participation of numerous blood vessels and capillaries that lie in the thickness of the ciliary body.

Located behind the chambers of the eyeball, the lens has the shape of a biconvex lens and has a large light refractive power. The imaginary line connecting the anterior and posterior poles of the lens, having an average length of 4 mm, is called the lens axis. It coincides with the optical axis of the eyeball. The rounded peripheral edge of the lens, where the anterior and posterior surfaces of the lens converge, is called the equator. The substance of the lens is colorless, transparent, dense, does not contain blood vessels and nerves. The inner part, the nucleus of the lens, is much denser than the peripheral part, the cortex of the lens. Outside, the lens is covered with a thin transparent elastic capsule, which, with the help of a ciliary girdle (zinn ligament, is attached to the ciliary body. When the ciliary muscle contracts, the choroid proper moves forward, the ciliary body approaches the equator of the lens, the ciliary band weakens and the lens sort of straightens out. It becomes more convex, its refractive power increases. When the ciliary muscle is relaxed, the ciliary body moves away from the lens equator, the ciliary girdle stretches, and the lens flattens. Its refractive power is reduced.

Vitreous body, covered along the periphery with a membrane, is located in the vitreous chamber of the eyeball behind the lens, where it is tightly adjacent to the inner surface of the retina. The lens is, as it were, pressed into the anterior part of the vitreous body, which in this place has a depression - the vitreous fossa. The vitreous body is a jelly-like mass, transparent, devoid of blood vessels and nerves. The refractive power of the vitreous body is close to the refractive index of the aqueous humor filling the chambers of the eye.

Accessory organs of the eye

Muscles of the eyeball. Six striated muscles are attached to the eyeball: four straight - upper, lower, lateral and medial, and two oblique - upper and lower. All rectus muscles and the superior oblique originate deep in the orbit from a common tendon ring fixed to the sphenoid bone and periosteum around the optic canal, and partly from the edges of the superior orbital fissure. This ring surrounds the optic nerve and the ophthalmic artery. From the common tendon ring begins the muscle that raises the upper eyelid.

The rectus muscles rotate the eyeball around two mutually intersecting axes: vertical and horizontal (transverse). The lateral and medial rectus muscles rotate the eyeball outward and inward around the vertical axis, each in its own direction, and the pupil also rotates accordingly. The superior and inferior rectus muscles rotate the eyeball around the transverse axis. The pupil, under the action of the superior rectus muscle, is directed upward and somewhat outward, and during the operation of the inferior rectus muscle, downward and inward.

The superior oblique muscle lies in the superomedial part of the orbit between the superior and medial rectus muscles. The inferior oblique muscle, unlike the rest of the muscles of the eyeball, starts from the orbital surface of the upper jaw near the opening of the nasolacrimal canal, on the lower wall of the orbit, goes between it and the inferior rectus obliquely upward and backward. Both oblique muscles rotate the eyeball around the anterior-posterior axis: the superior oblique muscle rotates the eyeball and pupil downward and laterally, the inferior oblique muscle rotates upward and laterally. The movements of the right and left eyeballs are coordinated due to the friendly action of the oculomotor muscles.

Fascia of the orbit.The orbit, in the cavity of which the eyeball is located, is lined with the periosteum of the orbit, fused in the region of the optic canal and the superior orbital fissure with the dura mater of the brain. The eyeball is surrounded by its shell - the vagina, or Tenon's capsule, loosely connected to the sclera. The gap between the eyeball and its vagina is the episcleral (Tenon's) space. On the posterior surface of the eyeball, the sheath is fused with the external sheath of the optic nerve; in front, the sheath approaches the fornix of the conjunctiva. The vagina of the eyeball is perforated by vessels and nerves, as well as tendons of the oculomotor muscles, whose own fascia are fused with this vagina.

Between the vagina of the eyeball and the periosteum of the orbit, around the oculomotor muscles and the optic nerve lies adipose tissue permeated with connective tissue bridges - the fatty body of the orbit, which acts as an elastic pillow for the eyeball.

Eyelids. The upper and lower eyelids are formations that lie in front of the eyeball and cover it from above and below, and completely cover it when the eyelids close. At the level of the edge of the orbit, the skin of the eyelids passes into the skin of adjacent areas of the face. On the border of the upper eyelid and forehead, a transversely oriented skin roller covered with hair protrudes - the eyebrow.

The anterior surface of the eyelid is convex, covered with thin skin with short vellus hair, sebaceous and sweat glands. The back surface of the eyelid, facing the eyeball, concave. This surface of the eyelid is covered by the conjunctiva.

In the thickness of the upper and lower eyelids there is a connective tissue plate - these are the upper and lower lid cartilages. The secular part of the circular muscle of the eye is also located here. From the upper and lower eyelid cartilages to the anterior and posterior lacrimal crests, the medial ligament of the eyelid common to these cartilages is directed, covering the lacrimal sac in front and behind. The lateral ligament of the eyelid follows from the cartilages to the lateral wall of the orbit.

A thin wide tendon of the muscle that lifts the upper eyelid is attached to the upper edge and anterior surface of the cartilage of the upper eyelid. The free edge of the eyelid, limited by its posterior and anterior surfaces, forms the anterior and posterior margins of the eyelids, respectively, and bears hairs located closer to the anterior margin in 2-3 rows - eyelashes. Closer to the posterior edge, openings of altered sebaceous (meibomian) glands of the cartilage of the eyelids open, the initial part of which is located inside the cartilaginous plate of the eyelid. There are more such glands in the thickness of the upper eyelid (30-40) than in the lower eyelid (20-30). The edges of the upper and lower eyelids limit the transverse palpebral fissure, which is closed on the medial and lateral sides by fusion of the eyelids - medial and lateral adhesions of the eyelids.

Conjunctivais a connective tissue membrane of pale pink color. It contains the conjunctiva of the eyelids, which covers the inside of the eyelids, and the conjunctiva of the eyeball, which is represented on the cornea by a thin epithelial cover. In the place of transition of the conjunctiva from the upper and lower eyelids to the eyeball, depressions are formed - the upper and lower fornix of the conjunctiva. The entire space in front of the eyeball, bounded by the conjunctiva, is called the conjunctival sac, which closes when the eyelids close. The lateral angle of the eye is more acute. The medial angle of the eye is rounded and on the medial side limits the deepening - the lacrimal lake. Here, at the medial corner of the eye, there is a slight elevation - the lacrimal caruncle, and laterally from it - the semilunar fold of the conjunctiva, the remnant of the nictitating (third) eyelid of lower vertebrates.

lacrimal apparatusincludes the lacrimal gland with its excretory tubules opening into the conjunctival sac and the lacrimal ducts. The lacrimal gland is a complex alveolar-tubular gland of a lobular structure, lies in the fossa of the same name in the lateral corner, near the upper wall of the orbit. The tendon of the muscle that lifts the upper eyelid divides the gland into a large upper orbital part, and a smaller lower eyelid part, lying near the upper fornix of the conjunctiva.

The excretory tubules of the lacrimal gland, up to 15, open into the conjunctival sac in the lateral part of the upper fornix of the conjunctiva. The tear (tear fluid) coming out of them washes the front of the eyeball. Further, the lacrimal fluid flows through the capillary gap near the edges of the eyelids along the lacrimal stream into the region of the medial angle of the eye, into the lacrimal lake. In this place, short (about 1 cm) and narrow (0.5 mm) curved upper and lower lacrimal canaliculi originate. move. The lacrimal part of the circular muscle of the eye is fused with the anterior wall of the lacrimal sac, which, when contracted, expands the lacrimal sac, which contributes to the absorption of tear fluid into it through the lacrimal canaliculi.

Vessels and nerves of the organ of vision.The eyeball and its accessory organs receive blood from the branches of the ophthalmic artery, which in turn is a branch of the internal carotid artery. Venous blood from the organ of vision flows through the eye veins into the cavernous sinus. The retina is supplied with blood by the central retinal artery, which penetrates into the eyeball in the thickness of the optic nerve and gives off the upper and lower branches in the region of the disc. The central retinal vein and its tributaries are adjacent to the arteries of the same name. Short and long posterior and anterior ciliary arteries branch in the choroid. The branches of these arteries in the thickness of the iris anastomose with each other and form two arterial circles: a large one, at the ciliary edge of the iris, and a small one, at the pupillary edge. From the dense venous network of the choroid itself, 4-6 vortex veins are formed, which pierce the sclera and flow into the ophthalmic veins.

Muscles, fascia, fatty body of the orbit are also supplied with blood by the branches of the ophthalmic artery. Lymphatic vessels from the eyelids, the conjunctiva are sent to the mandibular, as well as to the superficial and deep parotid (preotic) lymph nodes.

The contents of the orbit receive sensitive innervation from the first branch of the trigeminal nerve - the ophthalmic nerve. From its branch - the nasociliary nerve, long ciliary nerves depart, suitable for the eyeball. The lower eyelid is innervated by the infraorbital nerve, which is a branch of the second branch of the trigeminal nerve. The muscle constricting the pupil and the ciliary muscle receive parasympathetic fibers of the oculomotor nerve (from the ciliary ganglion as part of the short ciliary nerves), and the dilator muscle is innervated by sympathetic fibers of the internal carotid plexus, reaching the eyeball along with the blood vessels. The upper, lower, medial rectus, inferior oblique muscles of the eye and the muscle that lifts the upper eyelid receive motor innervation from the oculomotor nerve, the lateral rectus from the abducens nerve, and the superior oblique from the trochlear nerve.

The conductive path of the visual analyzer.

Light entering the retina first passes through the transparent light-refracting media of the eyeball: the cornea, the aqueous humor of the anterior and posterior chambers, the lens, and the vitreous body. The pupil is in the path of the light beam. Under the influence of the muscles of the iris, the pupil either narrows or expands. Light-refracting media direct a beam of light to a more sensitive place on the retina, the place of best vision is a spot with its central fovea. An important role in this belongs to the lens, which, with the help of the ciliary muscle, can increase or decrease its curvature when seeing at close or far distances. This ability of the lens to change its curvature (accommodation) ensures that the light beam is always directed to the central fovea of the retina, which is in line with the observed object.

The light that hits the retina penetrates into its deep layers and causes complex photochemical transformations of visual pigments there. As a result, a nerve impulse occurs in light-sensitive cells (rods and cones). Then the nerve impulse is transmitted to the next neurons of the retina - bipolar cells (neurocytes), and from them - neurocytes of the ganglionic layer, ganglionic neurocytes. The processes of ganglionic neurocytes are directed towards the disc and form the optic nerve. Shrouded in its own sheath, the optic nerve exits the orbital cavity through the optic nerve canal into the cranial cavity and forms an optic chiasm on the lower surface of the brain. Not all fibers of the optic nerve intersect, but only those that follow from the medial part of the retina facing the nose. In this way, the optic tract following the chiasm is made up of nerve fibers of the ganglion cells of the lateral (temporal) part of the retina of the eyeball on its side and the medial (nasal) part of the retina of the eyeball on the other side. That is why, when the chiasm is damaged, the function of conducting impulses from the medial parts of the retina of both eyes is lost, and when the visual tract is damaged, in the lateral part of the retina of the same side and the medial part of the other.

Nerve fibers as part of the optic tract follow the subcortical visual centers: the lateral geniculate body and the superior mounds of the roof of the midbrain. In the lateral geniculate body, the fibers of the third neuron (ganglion neurocytes) of the visual pathway end and come into contact with the cells of the next neuron. The axons of these neurocytes pass through the sublentiform part of the internal capsule, form visual radiation and reach the area of the occipital lobe of the cortex near the spur groove, where the highest analysis of visual perceptions is carried out. Part of the axons of ganglion cells do not end in the lateral geniculate body, but pass through it in transit and, as part of the handle, reach the superior colliculus. From the gray layer of the superior colliculus, impulses enter the nucleus of the oculomotor nerve and the accessory nucleus (Yakubovich's nucleus), from where the innervation of the oculomotor muscles is carried out, as well as the muscle that narrows the pupil, and the ciliary muscle. In response to light stimulation, the pupil constricts along these fibers (pupillary, pupillary, reflex) and the eyeballs turn in the desired direction.

Topic: The structure of the eyeball. Auxiliary apparatus. Characteristics of features in children.

Goals and objectives of the lesson:

After determining the theoretical and practical knowledge of students, the teacher explains the structure of the eyeball and parts of its curtains.

In the process of studying the topic, the student learns the following

you have to be able to show.

1. Viewing method
2. Muscles that move the eye
3. lacrimal apparatus
4. Light refracting products
5. Conjunctiva.
6. The choroid of the eye is the tunica vasculosa bulbi.
7. The eyeball is the bulb of the eye
8. The development of the organs of vision.
9. Characteristics of children
10. The retina is the retina

Data block:

The organ of vision (organon visus) plays an important role in human life in its interaction with the external environment. The organ of vision is located in the eyeball and consists of the eye and auxiliary organs of the eye.

The eye (oculus) (Greek ophthalmos) consists of the eyeball and the optic nerve.

The eyeball (bulbus oculi) has a rounded shape, in which the anterior and posterior poles are distinguished. The anterior pole is at the outermost point of the cornea, and the posterior pole is outside the exit of the optic nerve. The line connecting these two points is called the outer axis of the eye and is 24 mm long. The internal axis of the eyeball runs from the posterior surface of the cornea to the retina and has a length of 21.75 mm. The vertical size of the eyeball is 23.5 mm, the transverse size is 23.8 mm. The line connecting the anterior pole of the eye with the central cavity of the retina is called the visual axis of the eye. The eyeball consists of the internal environment of the eye (fluid of the anterior and posterior chambers, the eyeball, the vitreous body) and three layers covering it.

The fibrous membrane (tunica fibrosa bulbi) serves as a protective function. Consists of two: front horn and back white curtain. Between them there is a shallow scleral groove. The cornea (sornea) is clear and looks like a dial. Diameter 12 mm, thickness 1 mm. It is called the white cornea (limbus corneae). The sclera is a fibrous connective tissue. In the back there are holes through which the fibers of the optic nerve exit. On the border of the cornea with the cornea is a narrow blood channel of the venous sinus (sinus venosus sclerae) (helmet channel), filled with venous blood.

Firechoroid (tunica vasculosa bulbi) is rich in blood vessels and pigment. It is located directly under the white curtain and connects to the right in the region of the optic nerve. The vascular curtain consists of three parts: a special vascular curtain, a ciliated body, and a colored curtain. A special choroid (shorioidea) forms a large area in the back. Between it and the white shell there is a gap (spatium perichorioidale). The ciliary body (corpus ciliare) is a thickened part of the choroid, located around the circumference at the point of transition from the cornea to the sclera. Its back part (orbiculus ciliaris) passes into a special choroid. The anterior part of the ciliated body forms about 70 ciliated outgrowths up to 3 mm long in the radial direction. The fibers inside the ciliary body are located meridional. The ciliary muscle consists of smooth muscle fibers in the radial and circular directions. The anterior part of the choroid (iris). It has a round shape 0.4 mm thick, in the middle of which is the pupil. The colored curtain has edges facing the outer pupil and eyelashes facing the body. There is a pigment in the cornea, and the color of the eye depends on its amount. Inside the cornea there is an annular muscle surrounding the pupil (m. pupil spincter) and a radially located muscle that dilates the pupil (m. pupil dilatator). The color of the eye depends on its size. Inside the cornea there is an annular muscle surrounding the pupil (m. pupil spincter) and a radially located muscle that dilates the pupil (m. pupil dilatator). The color of the eye depends on its size.

Internal networkthe retina is attached to the inner side of the choroid. The retina distinguishes between the outer layer of pigment and the inner transparent layer or original retina. Depending on the activity of light perception, it is divided into back and front blind. The junction of these parts corresponds to the transition zone of the special choroid into the ciliary body (ora serrata). In the visible part of the retina are the light-sensitive elements of the rods and cones. In the back of the retina, at the bottom of the eyeball, when viewed through an ophthalmoscope, there is an optic disc, and in its center is the central retinal artery that flows into the retina. Outside, it has a yellow spot in the region of the posterior pole and its central depression. There are only cones in the central pit, which is the best field of view.

In newborns, the eyeball is relatively large, measuring 17.5 mm in length and 16.7 mm in the transverse direction. The eyeball grows rapidly in the first year of a child's life. The cornea of a newborn is relatively wide and flat, its curvature does not change throughout life. The white curtain is thin, a vascular curtain is visible from under it, giving an airy shade. The choroid is slightly colored, and the eyes of the newborn are gray or blue. Permanent color appears at the age of 2 years. It is narrow (1.5-2 mm) due to underdeveloped pupillary muscles. At the age of 5-6 years, the pupil dilates and then narrows. The ciliary body in a newborn is less developed. It has little connective tissue and thin growths. The eyelash muscle is thin and short. The retina is relatively thin and lacks pigment cells.

The light of the eye is refractingThe apparatus includes the cornea, eyeball and vitreous body.

EyeThe lens is like a convex lens on both sides and has the ability to refract strong light. Its anterior surface and anterior pole face the posterior chamber of the eyeball. The posterior surface is more convex and touches the vitreous body with its posterior pole. The conditional line connecting its poles with a length of 4 mm is called the axis of the rhombus. The edge where the anterior and posterior surfaces of the eyeball meet is called the equator. The ore is colorless, hard, without vessels and nerves. Its inner part is solid in relation to the core, the peripheral cortex. The eyeball is covered on the outside with a transparent elastic bag, which is attached to the ciliated body through tinnitus.

The vitreous body (corpus vitreum) is located on the back of the rhombus. It is a transparent dense mass without vessels and nerves. There is a fossa (fossa hyoloidea) into which the eyeball sinks. Its refractive power is close to the refractive power of the liquid in the chambers of the eye.

EyeThere are anterior chambers of the eyeball between the cornea and cornea and posterior chambers of the eyeball between the cornea and cornea. At the junction of the horn and the colored curtain, the front camera is bordered by a scallop. Between its fibers there is a cavity bounded by flat cells (fountains), through which fluid flows from the anterior chamber into the helmet channel, and from there into the anterior ciliary veins. The anterior and posterior chambers communicate with each other through the pupil. The posterior chamber is connected by a petit canal between the fibers of the ciliary girdle (Zinnon's length). This cavity (spatia zonularia) lies in a ring around the eyeball.

NewbornThe eyeball of a child has a spherical shape and has the same thickness of the anterior and posterior roundings. It is inelastic and does not have a hard core. The pearl sac and the length of the zinnon are thin. The eyeball grows rapidly in the first year of a child's life.

EyeThe apple and its constituent parts grow rapidly in the first year of life and then slow down.

The auxiliary apparatus of the eye includes the muscles of the eyeball, eyelids, conjunctiva, and lacrimal apparatus.

Eye the movement of the apple is carried out by four straight and two curved muscles. They belong to a group of transverse skeletal muscles, five of which (except for the inferior cruciate ligament) begin at the base of the eyeball, around the optic canal and the common ring, attached to the bone and bone marrow. The superior, inferior, external, and internal rectus muscles of the eyeball run along the walls of the eyeball and are connected to the sclera 5–8 mm behind the edge of the cornea with a short stake. When the right eyeball muscles contract, it pulls the eyeball to the side and directs the pupil in that direction. The superior arcuate muscle passes between the superior and internal rectus muscles, rotates on a roller with a thin stake, and connects to the upper outer surface of the eyeball behind the equator. The muscle of the inferior curvature begins near the opening of the lacrimal canal and connects to the outer surface of the eyeball behind the equator. The upper joints had two cutouts, front and rear, the lower joints had two cutouts, nose and rear.

In newborns, the muscles of the eyeball are well developed, except for the pelvis. Therefore, they have eye movements, but their coordinated movements begin when the baby is 2 months old. The newborn has a physiological curvature of the eye, which disappears by the end of the first month.

The eyeball is surrounded on the outside by the sclera, which is loosely connected to the sclera. There is an episcleral space between the sclera and Tenon's bursa. The space between the eyeball and the bone covering the eyeball is filled with the fatty body of the eyeball. This body acts as an elastic cushion for the eyeball.

In newborns and breastfed children, the eyelids are thin, and the fatty body of the eyeball is underdeveloped.

Ustka inThe lower eyelids (palpebra superior et inferior) are skin folds covering the front of the eyeball. They protect the eyeball when closed. On the border of the upper eyelid with the forehead there is an eyebrow (supercilum), covered with transverse feathers. The anterior surface of the eyelids is convex, the skin is thin and delicate. The posterior surface of the eyeball is concave and covered with conjunctiva. On their front edge are 2-3 rows of eyelashes (eyelash). Meibomian gland openings open near the posterior margin. Inside the upper and lower eyelids there is a layer of connective tissue with a density similar to the upper eyelid, the upper eyelid, the circulatory muscle of the eyeball, blood vessels and muscle bundles that lift the upper eyelid.

Scaly ridges of newborns are well developed. Its height is half that of an adult, and by the age of 5 it reaches its constant size. Pumpkin length 18-19 mm. Eyelashes are thinner and longer than in adults. After the birth of a child, his eyelids open and close well. Newborns have narrow eyelids and twisted inner corners. The pupil then expands rapidly.

Questionconjunctivae (conjunctiva) pale pink sheath of connective tissue. Distinguish between the conjunctiva of the eyelids, tunica conjunctiva palpebrarum and the conjunctiva of the eyeball, tunica conjunctiva bulbi. At the junction of one of them, the upper and lower conjunctival domes (fornix conjunctivae superior et inferior) are formed. The space in front of the eyeball, bordered by the conjunctiva, is called the conjunctival sac, saccus conjunctivae. In the inner corner of the eye are a lacrimal lake (lacus lacrimalis), lacrimal pulp (caruncula lacrimalis), lacrimal sucker (papilla lacrimalis), at the end of which there are lacrimal openings (punctum) lacrimale).

The lacrimal apparatus (apparatus lacrimalis) consists of the lacrimal gland and excretory ducts. The lacrimal gland (glandula lacrimale) is a complex alveolar tubular gland, consisting of fragments located in the outer corner of the upper wall of the eyeball. About 15 of its excretory tubules open into the conjunctival sac outside of the upper dome of the conjunctiva. The tear washes the front of the eyeball and flows along the edge of the eyelids to the inner corner of the eye towards the lake of tears. It passes through the superior and inferior lacrimal ducts into the lacrimal sac. The lacrimal sac lies in the fossa of its name and opens into the lower nasal passage through the nasopharynx.

The lacrimal apparatus is not developed at birth, and tears begin to appear when the child is 2 months old. The reason for this is that the centers of the brain are underdeveloped. The lacrimal gland is small, the perforations are narrow, the walls are thick, there is a lot of connective tissue. The lacrimal canal is wide and short.

See youThe optic tract (tractus opticus) consists of 4 neurons. The first neurons are light-sensitive retinal cells (rods and cones). The second neuron is the bipolar cells and the third neuron is the ganglion cells. Ganglion cell tumors form the optic nerve. The resulting optic nerve enters the cranial cavity through the canal of the same name. In the cranial cavity at the anterior edge of the Turkish saddle, the nerve fibers partially intersect, forming the optic nerve chiasm, chiasma opticum. Fibers from the inner half of the right and left retinas are involved in the intersection. Therefore, the optic nerve formed after the intersection of the optic nerve contains the fibers of the outer part of the eye on its side and the fibers of the inner part of the eye on the opposite side. The optic tract ends in the lateral genicular body, which is the center of vision under the cortex and the pad of the visual cortex. The fourth neuron, formed from the axons of the cells of the subcortical centers of vision, passes through the posterior legs of the internal capsule and ends on the inner surface of the cervical spine in the pixel cortex (sulcus calcarinus). The image on the retina reaches the center of vision in 0.05 seconds.

TEST QUESTIONS

1. In what structure of the hemispheres of the human brain is the center of vision placed?

A. Spur furrow
B. Zacentral gyrus
C. Precentral gyrus
D. Superior temporal gyrus
E. Inferior frontal gyrus

2. All of the following statements regarding the functions of aqueous moisture are true, except?

A. Produced by lens

B. Fills the anterior chamber of the eye
C. Fills the posterior chamber of the eye
D. Constantly washes the lens
E. Outflow into the venous sinus of the sclera

3. What is the name of the outer lining of the eyeball?
A. Fibrous
B. Retina
C. Cornea
D. Vascular
E. Rainbow

4.Do you want to specify specific sensitivities?
A. Vision
B. Deep sensitivity
C. Temperature sensitivity
D. Memory
E. Pain sensitivity

5. What parts does the organ of vision consist of?
A. Eyeball, muscle
B. Green eye, what is vision
C. Eye and auxiliary organ glazari
D. Ocular and lacrimal apparatus
E. Eyelids and lacrimal glands
6. What are the layers of the eyeball?
A. Front. Middle, Rear Shells
B. Fibrous membrane, vessels, retina
C. Outer sheath, medial, inner
D. Anterior, choroid, medial
E. Cornea, body, iris

7. What parts does the fibrous sheath consist of?
A. Paris front, middle, rear
B. Cornea, choroid
C. Cornea, sclera
D. Skler, retina

E. Cornea, iris

8. What is the eye?
A. Eyelids and muscle
B. Eyelids and lacrimal glands
C. Eyelids and conjunctiva
D. Eyeball and optic nerve
E. Eyelids and Eyelids

9. What are the parts of the vascular curtain?
A. Choroids, body cilia, iris
B. Skler, cilia, iris
C. Choroidea, cornea, iris
D. Choroidea, retina, iris
E. Cilia, iris, retina

10. What parts does the retina consist of?
A. Pigment layer, visual part
B. caeca. retina
C. Pars caeca, pigment layer
D. Optical part, blind part
E. optics. retina

Current Security Questions

1. 1.The development of the organ of vision.
2. General patterns of age-related changes in the nervous system.
3. Diagram of the nervous system.
4. Current Security Questions
5. Parts and structure of the visual organ.
6. Layers of the eyeball.
7. Eye accessory.
8. Structures.

Practice 16.

Theme: Hearing organs. Functional and age anatomy of the outer and middle ear. Inner ear. Ways of transmission of analyzers of hearing and balance. Vestibulocochlear nerve. Skin and its derivatives: hair, nails, sebaceous glands. Organs of smell and taste. I - pairs of cranial nerve.

Goals and objectives of the lesson:

• Explore with students the structure of the outer, middle, and inner ear.

• External, middle and internal ear on museum preparations, models and drawings.

• Explain the mechanism of operation of a sound receiver and a statokinetic analyzer.

• Review of auditory and statokinetic pathway analyzers.

In the process of studying the topic, the student learns the following

• Pronounces the names of the outer, middle and inner ear in Latin according to the new anatomical nomenclature.

• Shows the outer, middle and inner ear on anatomical preparations, models and drawings.

• Responds to the ways of transmission of the auditory and statokinetic analyzer.

• Explains the perception of sound based on its anatomy.

• Explains the anatomical structure of the main symptoms of injuries of the sound transmission and reception organs.

Data block:

Topic: Organ of hearing, outer, middle, inner ear. Characteristics of features in children.

Goals and objectives of the lesson:

After determining the theoretical and practical knowledge of students, the teacher explains the structure of the outer, middle and inner ear.

In the process of studying the topic, the student learns the following

you have to be able to show.

1. Organs of hearing and balance.
2. Outer ear - auris externa.
3. The middle ear is the auris media.
4. inner ear
5. Hearing methods.
6. balancing methods.
7. Middle ear
8. drum cavity
9. bone maze
10. Explain the importance of hearing and balance.

Data block:

The auditory balance or vestibulo-shell organ consists of three structurally and functionally interconnected parts: the outer, middle and inner ear. The function of the outer and middle ear is related to the organ of hearing.

TThe outer part of the auricle consists of the supraspinatus muscle and the external auditory meatus. The auricle consists of an elastic band and has a complex shape, covered with leather. Below, instead of the ridge, the soft part with fatty tissue. The free edge of the ear wrap forms a twist. Its front end ends with a folding leg above the external auditory meatus. Inside the fold lies the opposite fold in a direction parallel to the right. There is a deep ditch between them. There is a bulge in front of the external auditory canal and opposite to the right. Between them is the shell cavity, which continues into the external auditory meatus. The external auditory canal (meatus acusticus externus) is S-shaped, with an average length of 35 mm, a width of 9 mm at the beginning and 6 mm at the base. 1/3 of the length of its crest, bone fraction 2/3. The external auditory meatus is covered with skin which thins and passes through the eardrum. On the skin of the upper part of the ear canal there are ceruminous glands that produce a special type of sulfurous substance.

The tympanic membrane consists of a thin oval plate measuring 11x9 mm. At the end of the external auditory canal in the tympanic membrane is the temporal bone, which separates the external auditory canal from the tympanic membrane. The bottom is wide and the top is

2mm wide. In the middle of the drum curtain is the core of the drum curtain. In the dense part of the tympanic membrane there is a layer of fibrosis, which is covered with skin on the outside and mucous membranes on the inside. The empty part consists only of skin and mucous membranes.

New bornThe supraspinatus muscle of the child is soft, the skin covering it is thin. Its height in a circle is 34 mm. The external auditory canal in a newborn is narrow and long (15 mm), oblique. The other part of its wall, except for the ring, consists of a mountain. The skin that covers it is thin and delicate. In a year, the length of the external auditory meatus is 20 mm, at 5 years 22 mm. The tympanic membrane in newborns is relatively large, its height is 9 mm, its width is 8 mm. In young children, the color of the tympanic membrane is dark gray, somewhat thicker than in adults.

Fire the ear (auris media) includes the eardrum and ear canal. The tympanic cavity (cavum tympani) is located inside the pyramid of the temporal bone. from the inside it is covered with a mucous membrane, the volume of which is 1 cm3. It has six walls:

1. The upper wall (paries tegmentalis) consists of a thin bone plate (tegmen tympani) that separates the tympanic cavity from the cavity of the head.

2. The wall facing the inferior jugular vein (paries jugularis) corresponds to the region of the jugular fossa.

3. The wall facing the medial labyrinth, parirs labyrinthicus, separates the tympanic cavity from the bony labyrinth. In the middle of this wall is a cape protruding into the tympanic cavity. Above it and a little behind it there is an oval opening (fenistra vestibuli) leading to a corridor. it is covered by the base of the stirrup. Behind and below the back there is a snail (fenista cochleae).

4. At the bottom of the posterior parietal wall (paries mastoideus) is the top of the pyramid (eminentia pyralis), from which the sphincter (m.stapedius) begins. In the upper part of the posterior wall, the tympanic cavity continues into the suction cavity (antrum mastoideum).

5. The anterior wall (paries caroticus) separates the tympanic cavity from the internal carotid artery. In the upper part of this wall is the internal opening of the ear canal.

6. The lateral wall (paries membranaceus) is formed by the tympanic membrane and the surrounding part of the temporal bone. From which the sphincter muscle (m.stapedius) begins. In the upper part of the posterior wall, the tympanic cavity continues into the suction cavity (antrum mastoideum).

In the abdominal cavity there are 3 auditory bones, ligaments and muscles. The auditory bones, ossiculaauditus, are joined together to form a chain of bones running from the tympanic membrane to the foramen ovale. When the hammer handle (hammer) is attached to the drum, the head forms a connection with the surface of the box. Uncus has two legs: short and long, and the long leg is attached to the head of the stirrup. The stirrup has a head, front and back legs, and the legs are connected by the base of the stirrup. The base of the stirrup is fixed in an oval hole around the circumference of the stirrup (lig. Annullarae stapedis). The joints between the bones are strengthened by very small segments, forming a chain of bones that transmits the vibrations of the tympanic membrane to the foramen ovale.

Tuba Audiva 35 mm, width 2 mm. It allows air to pass from the throat into the tympanic cavity, and the pressure in the tympanic cavity is equal to the external pressure. The ear canal is formed by bones and ligaments. At the junction of these parts, the auditory canal narrows, isthmus tubae audinivae. The bone part forms the upper 1/3 of the tube and opens into the cavity of the tympanic membrane in the form of ostium tympanicum tubae Audivae. The lower part of the larynx is 2/3 of the tube and opens into the nasal part of the larynx with the auditory opening pharyngeum tubae. The mucous membrane of the tube is covered with ciliated epithelium, forming longitudinal folds, rich in lymphoid tissue.

New born in infants, the tympanic cavity is relatively small and oblique due to the thickness of the submucosal layer. At birth, it is filled with fluid that is squeezed out of the larynx through the ear canal when the baby breathes. The walls of the tympanic cavity, especially the upper one, are thin. Its lower wall consists of connective tissue. In the back wall there is a wide opening leading to the suction cavity. Due to the underdevelopment of the mammary gland, the newborn lacks mammary cells. They have folds on the mucous membrane of the tympanic cavity. The ear canal in a newborn is straight, wide, short (17 mm), the bone tissue is more developed. In the first year of a child's life, the car canal grows slowly. Its length is 20 mm per year, 30 mm at 2 years, 35 mm at 5 years. The ear canal narrows with age. At the age of 6 months it is 2.5 mm, auditory bonebees take their size from a 4-month-old baby and do not change with age.

Inner ear (auris interna)vthe temporal bone consists of a labyrinth of bones and membranes located inside the pyramid. The wall of the bone labyrinth (labyrinthus osseus) consists of bone tissue that lies between the tympanic cavity and the internal auditory canal. There are corridors, sinks and semi-circular channels.

The vestibule is a small cavity of irregular shape. It has an oval hole in the outer wall, covered by the base of the stirrup. On the back wall of the corridor there are five holes of semicircular pipes, and on the front wall there is a hole leading to the sink. The edge of the inner wall of the corridor divides it into two parts: a round groove and an oblong groove. The inner opening of the corridor conduit is located in an oblong pit.

snailpart of the inner ear, forming two semicircular spiral canals around the axis. The base of the shell faces inward, into the internal auditory canal, and the apex faces into the tympanic cavity. The shell is a bone axis, around which there is a spiral bone plate in the middle of the spiral channel in the form of an incomplete barrier. The modiolus is pierced by thin longitudinal canals, in which the fibers of the ciliary part of the vestibular nerve pass. At the base of the skeletal spiral plate is the canalisspiralis module, which contains the shell node.

Bone semicircular canals (canales semicircularis ossei) are located at three levels in the form of three arcuate tubes. Their cavity has a diameter of 2 mm. The anterior (sagittal) semicircular canal (canalis semicircularis anterior) is located perpendicular to the axis of the pyramid of the temporal bone and forms an arc on the anterior surface of the pyramid. The posterior (frontal) semicircular canal, canalis semicircularis posterior, is the longest, parallel to the posterior surface of the pyramid. The lateral (horizontal) semicircular canal, canalis semicircularis lateralis, protrudes the tympanic cavity in the wall of the labyrinth. The three semicircular canals open into a corridor with 5 holes, as the legs of the anterior and posterior semicircular canals merge to form a common pedicle (crus osseum commune). The remaining four legs open separately.

The membranous labyrinth (labyrinthus membranaceus) is located inside the bony labyrinth and restores its shape. Its wall consists of a plate of connective tissue. Between the bony and membranous labyrinths there is a narrow split perilymphatic cavity (spatium perilymphaticum), filled with perilymphatic fluid. From this cavity, fluid can flow through the perilymphatic duct (ductus perylymphaticus) into the retina. The labyrinth of membranes is filled with endolymphatic fluid, from which the fluid flows through the endolymphatic tube (ductus endolymphaticus) into the endolymphatic sac (saccus endolymphaticus). In the labyrinth of the veil in the corridor there are two cavities: the uterus and the sac, which are connected by a tube. The uterus has 5 curly semicircular tubes with holes. The membrane resembles a semicircular tube, the bone resembles a semicircular tube, but three times already. In the region of the ampulla parts of the bony semicircular tubes, the membrane semicircular tubes also form an ampulla. The uterus and sac, as well as the inner surface of the ampoule shell, are covered with a mucous substance containing sensitive cells. In the area of the uterus and the sac, they form white spots containing lime particles - otoliths. The membrane has edges inside the ampullae of the semicircular canals, from which the vestibular part of the vestibular nerve begins. Fluctuations in the endolymphatic fluid act on sensitive cells in the white spot and are perceived by nerve endings that perceive changes in balance. The body of the first neuron of this nerve lies in the corridor node at the bottom of the internal auditory meatus. Its central growths enter the head through the internal auditory canal as part of the vestibular nerve and terminate in the vestibular nuclei. These growths of stem cells travel to the brain and spinal cord. The shell part of the curtain labyrinth starts from the corridor of the shell pipe with the head closed and passes into the spiral channel of the shell. At the top of the shell, the shell tube ends in a closed position and has a triangular cross section. The shell pipe is located in the middle of the skeletal spiral channel separating the tympanic ladder from the corridor one. At the top of the shell, two ladders are connected to each other by a hole in the shell (helicotrema). At the base of the shell, the drum ladder ends in the region of a round hole covered with a secondary drum curtain. The corridor staircase connects with the perilymphatic cavity of the corridor. Inside the spiral sheath inside the sheath tube is a member of the auditory spiral (cortex). The base of the spiral organ is formed by a basilar membrane containing up to 24,000 collagen fibers from the base of the shell to the end of the bone spiral plate, which acts as a narrow auditory resonator drawn from the end of the canal spiral to the opposite wall of the shell. The perilymph oscillations, formed by the movement of the base of the stirrup attached to the corridor window, are directed along the corridor stairs to the top of the body, and through the hole in the body they pass to the ladder of the body drum and hit the secondary drum curtain. Perilymph oscillations in the tympanic membrane pass to the basilar membrane and endolymph in the shell tube. Oscillations of the endolymph fall on the auditory cords of the cortical organ, and receptor cells convert mechanical action into nerve impulses. The impulse body receives the peripheral ends of the bipolar cells located in the sheath node. Its central growths form the sheath part of the vestibulocochlear nerve and terminate in the ventral and dorsal nuclei located in the rhomboid fossa through the internal auditory meatus. The axons of the ventral stem cells are oriented in opposite directions, forming a trapezoid body. The axons of the dorsal stem cells join the trapezoid body, forming the fourth ventricular border of the brain, located on the surface of the rhomboid fossa. The fibers of the trapezoidal body bend outward, forming a lateral loop, subcortical auditory centers: the inner knee body and goes to the lower limbs of the four vertebrae.

In newborns, the inner ear is well developed and has the same size and structure as in an adult. The wall of the semicircular canals is thin, expanded due to the bony points of the pyramid of the temporal bone.

Organ of hearing.

Outer ear, auris externa. auricle, auricula. External auditory canal, meatus acousticus externus.

The outer ear, auris externa, consists of the auricle and the external auditory canal. The auricle, auricula, usually called simply the ear, is formed by elastic cartilage covered with skin. This cartilage determines the outer shape of the auricle and its protrusions: the free curved edge is the curl, helix, and parallel to it is the antihelix, anthelix, as well as the anterior protrusion, the tragus, tragus, and the antitragus lying behind it, antitragus. At the bottom, the auricle ends with an earlobe that does not contain cartilage, which is a progressive feature characteristic of humans. In the depths of the shell, behind the tragus, the opening of the external auditory meatus opens.

The external auditory canal, meatus acousticus externus, consists of two parts - cartilaginous and bone. The cartilaginous auditory meatus is a continuation of the cartilage of the auricle in the form of a gutter, open upward and backward. It connects with its inner end through the connective tissue with the edge of the tympanic part of the temporal bone. The cartilaginous auditory canal generally makes up one third of the length of the entire external auditory canal. The bony auditory meatus, which is two-thirds of the length of the entire auditory meatus, opens outwards through porus acusticus externus; along the edge of this hole there is a circular bone groove, sulcus tympanicus. The direction of the whole auditory canal is generally frontal, but it does not go straight, but forms an S-shaped bend both in the horizontal and in the vertical plane. Due to the curvature of the ear canal, in order to see the tympanic membrane located in depth, it is necessary to straighten it, pulling the auricle back, up and out. The skin covering the auricle continues into the external auditory canal. In the cartilaginous part of the passage, the skin is very rich in both sebaceous and a special kind of glands, glandulae ceruminosae, which secrete a yellowish secret, the so-called earwax (cerumen).

The tympanic membrane, membrana tympani, is located on the border between the outer and middle ear, being inserted with its edge into the sulcus tympanicus at the end of the external auditory canal, as in a frame. In the sulcus tympanicus, the tympanic membrane is reinforced by a fibrous ring, anulus fibrocartilagineus. Due to the oblique position of the inner end of the auditory canal, the membrane is inclined, in newborns it is almost horizontal. The tympanic membrane in an adult has the shape of an oval with a long diameter (11 mm) and a short one (9 mm); it represents a thin semi-translucent plate, which in its center, called the navel, umbo membranae tympani, is drawn inward like a flat funnel. Its outer surface is covered with a thin continuation of the skin of the ear canal (stratum cutaneum), and the inner - the mucous membrane of the tympanic cavity (stratum mucosum). The very thickness of the membrane between these two layers consists of fibrous connective tissue, the fibers of which in the peripheral part of the membrane go in a radial direction, and in the central part - circularly. At the top, the tympanic membrane does not contain fibrous fibers, it consists only of the skin and mucous layers with a thin layer of loose fiber between them; this part of the tympanic membrane is softer and slightly stretched and therefore is called pars flaccida in contrast to the rest of the tightly stretched part, pars tensa. At the top, the tympanic membrane does not contain fibrous fibers, it consists only of the skin and mucous layers with a thin layer of loose fiber between them; this part of the tympanic membrane is softer and slightly stretched and therefore is called pars flaccida in contrast to the rest of the tightly stretched part, pars tensa. At the top, the tympanic membrane does not contain fibrous fibers, it consists only of the skin and mucous layers with a thin layer of loose fiber between them; this part of the tympanic membrane is softer and slightly stretched and therefore is called pars flaccida in contrast to the rest of the tightly stretched part, pars tensa.

The outer ear receives arterial blood from the branches of two arteries - a. temporalis superficialis and a. auricularis posterior (both from a. carotis externa); terminal branches of a. auricularis profunda (from a. maxillaris). Venous blood flows into v. auricularis posterior and v. retromandibularis, as well as through the veins accompanying a. auricularis profunda, in plexus pterygoideus. The lymph from the entire external ear is carried away to the lymph nodes lying in front and behind the auricle.

The tympanic membrane, the entire anterior wall of the external auditory canal, as well as the anterior part of the auricle, are innervated by sensory branches n. auriculotemporalis (from the third branch n. trigemini). The rest of the auricle, together with the lobe, is supplied from n. auricularis magnus (from the cervical plexus). The posterior and inferior walls of the external auditory meatus receive sensitive branches from ramus auricularis n. vagi.

Middle ear, auris media. Tympanic cavity, cavitas tympanica. The walls of the tympanic cavity The middle ear, auris media, consists of the tympanic cavity and the auditory tube, which communicates the tympanic cavity with the nasopharynx. The tympanic cavity, cavitas tympanica, is located at the base of the pyramid of the temporal bone between the external auditory meatus and the labyrinth (inner ear). It contains a chain of three small bones that transmit sound vibrations from the eardrum to the labyrinth.

The tympanic cavity has a very small size (about 1 cm3 in volume) and resembles a tambourine placed on edge, strongly inclined towards the external auditory canal. Six walls are distinguished in the tympanic cavity:

1. The lateral wall of the tympanic cavity, paries membranaceus, is formed by the tympanic membrane and the bone plate of the external auditory canal. The upper dome-shaped expanded part of the tympanic cavity, recessus membranae tympani superior, contains two auditory ossicles; head of the malleus and anvil. With the disease, pathological changes in the middle ear are most pronounced in this recessus. 2. The medial wall of the tympanic cavity is adjacent to the labyrinth, and therefore is called the labyrinth, paries labyrinthicus. It has two windows: round, the snail window - fenestra cochleae, leading to the snail and tightened membrana tympani secundaria, and an oval, vestibule window - fenestra vestibuli, opening into the vestibulum labyrinthi. The base of the third auditory ossicle, the stirrup, is inserted into the last hole. 3. The back wall of the tympanic cavity, paries mastoideus, carries an elevation, eminentia pyramidalis, to accommodate m. stepedius. Recessus membranae tympani superior posteriorly continues into the mastoid cave, antrum mastoideum, where the air cells of the latter, cellulae mastoideae, open. Antrum mastoideum is a small cavity protruding towards the mastoid process, from the outer surface of which it is separated by a layer of bone bordering the posterior wall of the auditory canal immediately behind the spina suprameatica, where the cave is usually opened during suppuration in the mastoid process. 4. The anterior wall of the tympanic cavity is called paries caroticus, since the internal carotid artery is close to it. In the upper part of this wall is the internal opening of the auditory tube, ostium tympanicum tubae auditivae, which gapes widely in newborns and young children, which explains the frequent penetration of infection from the nasopharynx into the middle ear cavity and further into the skull. 5. The upper wall of the tympanic cavity, paries tegmentalis, corresponds to the front surface of the pyramid tegmen tympani and separates the tympanic cavity from the cranial cavity. 6. The lower wall, or bottom, of the tympanic cavity, paries jugularis, faces the base of the skull next to the fossa jugularis. which explains the frequent penetration of infection from the nasopharynx into the cavity of the middle ear and further into the skull. 5. The upper wall of the tympanic cavity, paries tegmentalis, corresponds to the front surface of the pyramid tegmen tympani and separates the tympanic cavity from the cranial cavity. 6. The lower wall, or bottom, of the tympanic cavity, paries jugularis, faces the base of the skull next to the fossa jugularis. which explains the frequent

penetration of infection from the nasopharynx into the cavity of the middle ear and further into the skull. 5. The upper wall of the tympanic cavity, paries tegmentalis, corresponds to the front surface of the pyramid tegmen tympani and separates the tympanic cavity from the cranial cavity. 6. The lower wall, or bottom, of the tympanic cavity, paries jugularis, faces the base of the skull next to the fossa jugularis.

Three small auditory ossicles located in the tympanic cavity are in their appearance the names of the hammer, anvil and stirrup. 1. The malleus, malleus, is equipped with a rounded head, caput mallei, which, through the neck, collum mallei, is connected to the handle, manubrium mallei. 2. The anvil, incus, has a body, corpus incudis, and two divergent processes, of which one is shorter, crus breve, directed backwards and rests against the hole, and the other is a long process, crus longum, runs parallel to the handle of the malleus medially and posteriorly from it and at its end has a small oval thickening, processus lenticularis, which articulates with the stirrup. 3. The stirrup, stapes, lives up to its name in its form and consists of a small head, caput stapedis, bearing the articular surface for the processus lenticularis of the anvil and two legs: the front, more straight, crus anterius, and posterior, more curved, crus posterius, which are connected to an oval plate, basis stapedis, inserted into the vestibule window. At the joints of the auditory ossicles, two true joints with limited mobility are formed: articulatio incudomallearis and articulatio incudostapedia. The stirrup plate is connected to the edges of the fenestra vestibuli through connective tissue, syndesmosis tympano-stapedia. The auditory ossicles are strengthened, in addition, by several more separate ligaments. In general, all three auditory ossicles represent a more or less mobile chain that runs across the tympanic cavity from the tympanic membrane to the labyrinth. The mobility of the bones gradually decreases in the direction from the malleus to the stirrup, which protects the spiral organ located in the inner ear, from excessive shaking and harsh sounds. The chain of bones performs two functions: 1) bone conduction of sound and 2) mechanical transmission of sound vibrations to the oval window of the vestibule, fenestra vestibuli.

Muscle straining the tympanic membrane, m. tensor tympani. Stirrup muscle, m. stepedius. Functions of the muscles of the middle ear. The chain of bones performs two functions: 1) bone conduction of sound and 2) mechanical transmission of sound vibrations to the oval window of the vestibule, fenestra vestibuli. The latter function is carried out due to the two small muscles associated with the auditory ossicles and located in the tympanic cavity, which regulate the movements of the ossicular chain.

One of them, m. tensor tympani, embedded in semicanalis m. tensoris tympani, which makes up the upper part of the canalis musculotubarius of the temporal bone; its tendon is attached to the handle of the malleus near the neck. This muscle, pulling the handle of the malleus, strains the eardrum. In this case, the entire system of bones is shifted inward and the stirrup is pressed into the window of the vestibule. The muscle is innervated from the third branch of the trigeminal nerve through the branch n. tensoris tympani. Another muscle, m. stapedius, is placed in the eminentia pyramidalis and is attached to the back leg of the stirrup at the head. By function, this muscle is an antagonist of the previous one and produces a reverse movement of the bones in the middle ear, in the direction from the window of the vestibule. The muscle receives its innervation from n. facialis, which, passing in the neighborhood, gives a small branch, n. stepedius. In general, the function of the muscles of the middle ear is diverse: 1) maintaining the normal tone of the tympanic membrane and the ossicular chain; 2) protection of the inner ear from excessive sound irritations and 3) accommodation of the sound-conducting apparatus to sounds of various strengths and heights. The basic principle of the middle ear as a whole is sound conduction from the tympanic membrane to the oval window of the vestibule, fenestra vestibuli. Auditory tube, or Eustachian tube, tuba auditiva. Vessels and nerves of the middle ear. Blood supply to the middle ear. The basic principle of the middle ear as a whole is sound conduction from the tympanic membrane to the oval window of the vestibule, fenestra vestibuli. Auditory tube, or Eustachian tube, tuba auditiva. Vessels and nerves of the middle ear. Blood supply to the middle ear. The basic principle of the middle ear as a whole is sound conduction from the tympanic membrane to the oval window of the vestibule, fenestra vestibuli. Auditory tube, or Eustachian tube, tuba auditiva. Vessels and nerves of the middle ear. Blood supply to the middle ear.

The auditory, or Eustachian, tube, tuba auditiva (Eustachii; hence the name of the inflammation of the tube - Eustachitis), serves to access air from the pharynx into the tympanic cavity, which maintains a balance between the pressure in this cavity and external atmospheric pressure, which is necessary for proper conduction to the labyrinth fluctuations of the tympanic membrane. The auditory tube consists of bone and cartilage parts, which are interconnected. At the place of their connection (isthmus tubae) the pipe channel is the narrowest. The bone part of the tube, starting in the tympanic cavity with an opening, ostium tympanicum tubae auditivae, occupies the lower large section of the musculo-tubal canal (semicanalis tubae auditivae) of the temporal bone. The cartilaginous part, which is a continuation of the bone part, is formed by elastic cartilage. Down the tube ends on the lateral wall of the nasopharynx with a pharyngeal opening, ostium pharyngeum tubae auditivae, and the edge of the cartilage, going into the pharynx, forms torus tubarius. The mucous membrane lining the auditory tube is covered with ciliated epithelium and contains mucous glands, glandulae tubariae, and lymphatic follicles, which accumulate in large numbers at the pharyngeal mouth (tubal tonsil). From the cartilaginous part of the tube originate fibers m. tensor veli palatini, as a result of which, when this muscle contracts during swallowing, the lumen of the tube can expand, which contributes to the entry of air into the tympanic cavity which at the pharyngeal mouth accumulate in large quantities (tubal tonsil). From the cartilaginous part of the tube originate fibers m. tensor veli palatini, as a result of which, when this muscle contracts during swallowing, the lumen of the tube can expand, which contributes to the entry of air into the tympanic cavity which at the pharyngeal mouth accumulate in large quantities (tubal tonsil). From the cartilaginous part of the tube originate fibers m. tensor veli palatini, as a result of which, when this muscle contracts during swallowing, the lumen of the tube can expand, which contributes to the entry of air into the tympanic cavity.

Vestibulocochlear organ

The vestibulocochlear organ (organum vestibule-cochleare) in the process of evolution in animals arose as a complexly arranged balance organ (vestibule), perceiving the position of the body (head) when it moves in space, and an organ of hearing.

The structure and functions of the vestibulocochlear organ.

They are divided into three parts, closely related anatomically and functionally: these are the outer, middle and inner ear. The outer ear includes the auricle and external auditory canal, the middle ear includes the tympanic cavity with mastoid cells and the auditory (Eustachian) tube. The most complex structure is the inner ear, in which the bony and membranous labyrinths are distinguished, which form the actual organ of hearing and the organ of balance (the vestibule organ), located only in the inner ear. The outer, middle ear and part of the inner (cochlea) belong to the organ of hearing.

outer ear (auris externa)) includes the auricle and external auditory canal, which form a kind of funnel to capture sounds and direct the sound wave to the eardrum. The auricle basically has a complex form of elastic cartilage. There is no cartilage in the lower part of the auricle; instead, there is a skin fold with adipose tissue inside - a lobule of the auricle (lobe). The free edge of the shell is wrapped, forming a curl, which ends in the anterior part of the shell above the external auditory canal in the form of a curl leg. On the inner side of the curl, in its posterior upper part, there is not always a clearly defined protrusion - the tubercle of the auricle (Darwin's tubercle). On the inner side of the shell, parallel to the curl, there is an elevation - the antihelix. In front of the ear canal is a protrusion - a tragus, opposite which, in the lower part of the antihelix, an antitragus is visible. The size and shape of the auricle is individual.

external auditory meatus, open from the outside, in depth ends blindly, separated from the cavity of the middle ear by the tympanic membrane. The length of the auditory meatus in an adult is on average 35 mm, the diameter reaches 9 mm at the beginning and 6 mm at the narrowest point, where the cartilaginous external auditory meatus passes into the bone one. The cartilaginous external auditory canal, which is a continuation of the auricle, is 1/3 of the length of the entire auditory canal, and 2/3 belong to the bony auditory canal, the temporal bone. The auditory meatus is S-shapedly bent mainly in the horizontal plane. The ear canal is lined with skin, which, thinning, continues onto the eardrum. In the skin covering the cartilaginous part of the ear canal, there are many sebaceous and a special kind of ceruminous glands that produce earwax.

Eardrum (ittembrana tympani) - a thin translucent oval plate that separates the external auditory canal from the tympanic cavity (middle ear). The large lower part of the membrane is the stretched part, and the upper, adjacent to the squamous part of the temporal bone, is called the loose part. With respect to the axis of the external auditory canal, the tympanic membrane is located obliquely and forms an angle with its lower wall, open outwards and equal to 45-550. In the center, the membrane has a recess - the navel, corresponding to the attachment on its inner side of the end of the handle of the malleus. The tympanic membrane consists of fibrous tissue, the fibers of which are oriented mainly radially in the peripheral sections, and circularly in the center. Outside, the tympanic membrane is covered with the epidermis, and from the side of the tympanic cavity - with a mucous membrane.

Middle ear (auris mehia) includes a tympanic cavity lined with a mucous membrane and filled with air (about 1 cm3 in volume) and an auditory (Eustachian) tube. The cavity of the middle ear communicates with the mastoid cave and through it with the mastoid cells located in the thickness of the mastoid process.

tympanic cavitylocated in the thickness of the pyramid of the temporal bone, in shape they are compared with a tambourine, 6 walls are distinguished:

1. The upper tire wall is formed by a thin plate of bone substance that separates the tympanic cavity from the cranial cavity.

2. The lower jugular wall corresponds to the lower wall of the pyramid in the place where the jugular fossa is located.

3. The medial labyrinth wall is complex and separates the tympanic cavity from the bony labyrinth of the inner ear. On this wall there is a cape protruding towards the tympanic cavity. Above the cape and somewhat posteriorly, there is an oval window of the vestibule leading to the vestibule of the bony labyrinth; it is closed by the base of the stirrup. Slightly above the oval window and behind it is a transverse protrusion of the facial canal (walls of the facial nerve canal). Behind and below the promontory is the cochlear window, closed by a secondary tympanic membrane that separates the tympanic cavity from the scala tympani.

4. The posterior mastoid wall in the lower part has a pyramidal elevation, inside which the stirrup muscle begins. In the upper part of the posterior wall, the tympanic cavity continues into the mastoid cave, into which the mastoid cells of the process of the same name also open.

5. The anterior carotid wall in its lower part separates the tympanic cavity from the carotid canal, in which the internal carotid artery passes. In the upper part of the wall there is an opening of the auditory tube connecting the tympanic cavity with the nasopharynx.

6. Lateral membranous wall, formed by the tympanic membrane and surrounding parts of the temporal bone.

In the tympanic cavity there are three auditory ossicles covered with a mucous membrane, as well as ligaments and muscles.

Hearing bones, miniature in size, connecting with each other, make up a chain that continues from the eardrum to the end of the vestibule, which opens into the inner ear. In accordance with their shape, the bones were named: hammer, anvil, stirrup. The malleus (malleus) has a rounded head, which passes into a long handle with two processes: lateral and anterior. The anvil (incus) consists of a body with a glenoid fossa for articulation with the head of the malleus and two legs: one is short, the other is long with a thickening at the end - a lenticular process for connection with the head of the stirrup. The stirrup (stapes) has a head, two legs - front and back. The malleus with its handle is fused with the tympanic membrane throughout its entire length so that the end of the handle corresponds to the navel on the outside of the membrane.

Auditory ossicles.

With the help of a chain movable in the joints, consisting of three auditory ossicles, the vibrations of the tympanic membrane resulting from the impact of a sound wave on it are transmitted to the window of the vestibule, in which the base of the stirrup is movably fixed with the help of the annular ligament of the stirrup. Two muscles that attach to the auditory ossicles regulate the movements of the bones and protect against excessive vibrations with strong sound: the muscle that strains the tympanic membrane (pulling up the handle of the malleus, strains the eardrum) and the stirrup muscle (when contracted, the pressure of the base of the stirrup inserted into the window of the vestibule is weakened).

Auditory (Eustachian) tube(tuba auditiva) with an average length of 35 mm, a width of 2 mm, serves to allow air to enter the tympanic cavity from the pharynx and maintain the same pressure in the cavity as the external one, which is important for the normal operation of the sound-conducting apparatus (tympanic membrane and auditory ossicles). The auditory tube consists of bone and cartilage parts (elastic cartilage). The lumen of the tube at the point of their connection - the isthmus of the auditory tube, narrows to 1 mm. The upper bony part of the tube opens on the anterior wall of the tympanic cavity with the tympanic opening of the auditory tube. The lower cartilaginous part, which accounts for 2/3 of the length of the tube, has the form of a gutter, open from below, formed by the medial and lateral cartilaginous plates and the membranous plate connecting them. From the cartilaginous part of the auditory tube originate the muscle that strains and the muscle that lifts the palatine curtain. When they contract, the cartilage of the tube and its membranous plate are retracted, the tube channel expands, and air from the pharynx enters the tympanic cavity. The mucous membrane of the tube forms longitudinal folds and is covered with ciliated epithelium, the movements of the cilia of which are directed towards the pharynx. In the mucous membrane of the auditory tube there are many mucous glands, lymphoid tissue, which forms an accumulation near the tube roller and around the pharyngeal opening of the auditory tube - the tubal tonsil.

The inner ear (auris interna) is located in the thickness of the pyramid of the temporal bone, separated from the tympanic cavity by its labyrinthine wall. It consists of a bone labyrinth and a membranous labyrinth inserted into it.

The bone labyrinth, the walls of which are formed by the compact bone substance of the pyramid of the temporal bone, lies between the tympanic cavity on the lateral side and the internal auditory canal medially. The size of the bony labyrinth along its long axis is about 20 mm. In the bony labyrinth, a vestibule is distinguished; anterior to it lies the cochlea, behind the semicircular canals.

Threshold- a cavity of small size, irregular shape. There are two windows on the lateral wall of the bony labyrinth. One of them is oval and opens into the vestibule. From the side of the tympanic cavity, it is closed by the base of the stirrup. The second window of the cochlea is round, it opens into the beginning of the spiral canal of the cochlea and is closed by the secondary tympanic membrane. Five small openings are visible on the posterior wall of the vestibule, through which the semicircular canals open into the vestibule, and on the anterior wall there is a rather large opening leading to the cochlear canal. On the medial wall of the vestibule there is a crest of the vestibule separating two pits from each other. The front of them is rounded, called a spherical depression. The posterior fossa is elongated, lies closer to the semicircular canals - this is an elliptical depression.

The bony labyrinth of the inner ear.

Snail -the anterior part of the bony labyrinth is a convoluted spiral canal, forming two and a half turns around the axis of the cochlea. The base of the cochlea faces the internal auditory canal; top - the dome of the cochlea, directed to the tympanic cavity. The axis of the cochlea, which lies horizontally, is the bony rod. A bone spiral plate is wrapped around the rod, which does not completely block the spiral canal of the cochlea, and in the area of the dome, with the help of a hook of the spiral plate, limits the oval opening of the cochlea. At the base of the cochlea, at the beginning of the scala tympani, is the internal opening of the canaliculus of the cochlea.

bony semicircular canalsare three arcuate curved thin tubes lying in three mutually perpendicular planes. The width of the lumen of each bony semicircular canal in a transverse section is about 2 mm. The anterior (sagittal, superior) semicircular canal is oriented perpendicular to the longitudinal axis of the pyramid. It lies above the other semicircular canals. The posterior (frontal) semicircular canal is the longest of the canals and lies almost parallel to the posterior surface of the pyramid. The lateral (horizontal) semicircular canal forms a protrusion on the labyrinthine wall of the tympanic cavity; it is shorter than the other semicircular canals.

The three semicircular canals open into the vestibule with five openings (neighboring bony pedicles of the anterior and posterior semicircular canals merge into a common bony pedicle). One of the legs of each semicircular canal before it flows into the vestibule is expanded in the form of a bone ampulla.

The location of the semicircular canals (diagram).

membranous labyrinthlocated inside the bone, basically repeats its outlines. The walls of the membranous labyrinth consist of a thin connective tissue plate covered with a squamous epithelium. Between the inner surface of the bony labyrinth and the membranous labyrinth is a narrow gap - perilymphatic space filled with fluid - perilymph. From this space, along the perilymphatic duct, passing in the cochlear canaliculus, the perilymph can flow into the subarachnoid space on the lower surface of the temporal bone pyramid. The membranous labyrinth is filled with endolymph, which can flow through the endolymphatic duct into the endolymphatic sac, which lies in the thickness of the dura mater on the posterior surface of the pyramid.

In the membranous labyrinth, the elliptical and spherical sacs, three semicircular ducts and the cochlear duct are isolated. An oblong elliptical sac (natochka) is located in the recess of the vestibule of the same name, and a pear-shaped spherical sac occupies a spherical recess. The elliptical sac and the spherical sac communicate with each other with the help of a thin tubule - the duct of the elliptical and spherical sacs. Five openings of the anterior, posterior and lateral semicircular ducts open into the elliptical sac, which lie in the bony semicircular canals of the same name. In places of expansion of the bony semicircular canals (bone ampullae), each membranous semicircular duct has a membranous ampulla. According to the ducts, anterior, posterior and lateral membranous ampullae are distinguished.

Scheme of the conduction path of the vestibular analyzer.

In the elliptical and spherical sacs, as well as on the inner surface of the walls of the membranous ampullae of the semicircular ducts, there are formations covered with a jelly-like substance containing hairy sensory (sensitive) cells. During fluctuations of the endolymph, static head positions and rectilinear movements are perceived. In the membranous ampullae of the semicircular ducts there are ampullar scallops that catch the turns of the head in different directions. Irritations of the hair sensory cells present in the spots and scallops are transmitted on these cells to the sensitive endings of the vestibular part of the vestibulocochlear nerve. The bodies of the neurons of this nerve are located in the vestibular node, which lies at the bottom of the internal auditory canal, and the central processes as part of the vestibulocochlear nerve are directed through the internal auditory canal into the cranial cavity, and then to the brain to the vestibular nuclei lying in the region of the vestibular field of the rhomboid fossa. The processes of the cells of the vestibular nuclei (the next neuron) are sent to the nuclei of the tent of the cerebellum and the spinal cord, forming the pre-door-spinal tract, and also enter the dorsal longitudinal bundle (Bekhterev's bundle) of the brain stem. Part of the fibers of the vestibular part of the vestibulocochlear nerve goes directly to the cerebellum - to the nodule.

The membranous labyrinth of the cochlea - the cochlear duct, begins blindly in the vestibule, behind the confluence of the connecting duct into it, and continues forward inside the spiral canal of the cochlea. In the region of the apex of the cochlea, the cochlear duct ends blindly. The outer wall of the cochlear duct fuses with the periosteum of the outer wall of the spiral canal of the cochlea. The other - the tympanic (lower) wall of the cochlear duct (spiral membrane) is, as it were, a continuation of the bone spiral plate. The third - the upper vestibular wall of the cochlear duct (reissner vestibular membrane) extends from the free edge of the bone spiral plate obliquely upward to the outer wall of the cochlear duct. The cochlear duct occupies the middle part of the bony spiral canal of the cochlea and separates its lower part - the scala tympani bordering the spiral membrane, from the upper stairs of the vestibule. The staircase of the vestibule communicates with the perilymphatic space of the vestibule, the oval window of which is closed by the base of the stirrup.

VERIFICATION QUESTIONS

1. What are parasympathetic nuclei?

A. n. accessory, n. ambiguous, n. dorsal
B. n. dorsal, n. tractus solitarii, n. accessory
C. n. dorsal, n. salivation above and below
D. n. dorsal, n. lower salivary, n ambigius
E. n. salivarius inferior et n. single tract

2. Which nerves contain preganglionic fibers of the parasympathetic nerve?

A. III, VII, XI, IX
B. III, VII, VIII, IX
C. III, V, VI, VII
D. III, VII, IX, X
E. IV, VII, IX, X

3. What nerve contains the parasympathetic fiber of the facial nerve?

A. n. cardrum
B. n. stirrups

C. n. ear temporalis muscle
D. n. drum string
E. n. zygomatic

4. What innervates the ciliary node?
A. m. upper rectus and m. pupil dilator
B. m. inferior rectus muscle and m spincter pupil
C. m. pupillary spinkter, etc. ciliaris
D. m. lifting the upper eyelid and ciliary
E. m. oblique muscle of the eye upper and lower

5. What innervates the wing node?
A. ear and palatine glands
B. submandibular and parotid glands
C. salivary glands
D. tears, nasal and palatine glands
E. oral glands

6. What innervates the ear node?
A. nasal tears and glands
B. to be heard
C. under the tongue and under the jaw bezini
D. palatine and buccal glands
E. oral glands

7. What fibers of the sacral part of the parasympathetic system?
A. to Gorburuvchi
B. vagus nerve branch
C. to the rays of the sun
D. abdominal nerves
E. pelvic nerve

8. Where is the sacral part of the parasympathetic system located?
A. In segments I-III
B. In segments I-IV of the tail
C. In the intermediate lateral nuclei of II-IV segments
D. In intermediate medial nuclei of caudal segments II-IV

E. On the lateral branches of the caudal segments

9. In what sequence from the eardrum are the auditory bones placed?
A. Hammer, anvil, stirrup
B. Hammer, stirrup, anvil
C. Anvil, hammer, stirrup
D. Stirrup, anvil, hammer
E. Stirrup, hammer, anvil

10. The inner ear consists of:
A. Bone and membranous labyrinths
B. Auditory tubes
C. Eardrums
D. Auditory ossicles
E. Drum cavity

Current Security Questions

1. Explain the significance of the proliferation of parasympathetic nerve fibers.
2. Nuclei of the sacral branch of the parasympathetic nervous system
3. Describe the nuclei of the parasympathetic nervous system.
4. Describe the nuclei of the autonomic nervous system.
5. Parasympathetic nervous system.
6. Mesenteric division of the parasympathetic nervous system.

SITUATIONAL QUESTIONS OF THE FUNCTIONAL ANATOMY OF THE NERVOUS SYSTEM

A 15-year-old patient consulted a neurologist with complaints of vision problems. In which part of the patient's brain did the changes occur?

= in the midbrain and neck
~ on the forehead
~ in the temple
~ on the forehead

A 19-year-old patient has growth retardation. In what part of the visual field does the patient have a pathological condition and what gland is disturbed?

= Hypothalamus and pituitary gland
~ Epithalamus and Epiphysis
~ Fabric Irisimon
~ Adrenals

A 22-year-old man consulted a doctor complaining about the absence of development of secondary sexual symptoms. The doctor said that the pineal gland is broken. In which part of the brain is the epiphyseal gland located?

= Interstitial brain
~ Midbrain
~ Brain
~ Long brain

A 23-year-old patient received a concussion as a result of a car accident. As a result, the work of the center of vision was disrupted. In which part of the brain is the subcortical visual center located?

= In the midbrain
~ In the midbrain
~ Miyachada
~ On the brain bridge

A 3-year-old patient has not spoken or looked at sounds since the birth of a child. What happened to the patient?

= Mute buttons
~ Don't press the button
~ Damage to the inner ear
~ Birth trauma

A 32-year-old patient consulted an ENT doctor with complaints of hearing loss and pain. MRI of the brain in the pyramid of the temporal bone n. petrosus major. What is the damage to the branch of the nerve?

= [moodle] facial nerve
~ [moodle] glossopharyngeal nerve
~ [moodle] ophthalmic nerve
~ [moodle] trigeminal nerve

A 33-year-old man was taken to the hospital by ambulance with a cut on his neck. Jarro m. sternokleidomastoideus found damage to the nerve coming out of the temple below the back. There was damage to the nerves with a violation of the skin sensitivity of the neck. What nerve is damaged?

= N. minor occipital muscle
~ N. transverse neck muscle
~ N. large auricle
~ N. Supraclavicular

A 35-year-old man fell from a height onto a sharp object, resulting in neck muscle injury and nerve damage. What nerve horn?

= [moodle] facial nerve
~ [moodle] glossopharyngeal nerve
~ [moodle] ophthalmic nerve
~ [moodle] trigeminal nerve

A 36-year-old man was hospitalized with a severe neck injury. During surgical cleaning, the surgeon identified nerve damage on the anterior surface of the anterior scalene muscle. What nerve is damaged?

= N. frenik
~ N. transverse stick
~ N. vagus nerve
~ N. sublingual tongue

A 38-year-old patient was examined by an ENT doctor with a diagnosis of inflammation of the nasal mucosa, as a result of which a lesion of the lower nasal mucosa was found.

= n. jaw
~ n. lower jaw
~ glossopharyngeal nerve
~ ophthalmic nerve

A 40-year-old patient has symptomatic epilepsy, in which convulsions are a manifestation of a limited process in the cerebral cortex - tuberculosis. The patient had clonic tonic convulsions in the facial area, which made it possible to accurately determine their localization in the cerebral cortex. In what part of the brain is the clonic process localized?

= Inferior precentral gyrus

~ Upper precentral gyrus

~ Middle regions of the precentral gyrus

~ Hypus supramarginal

A 40-year-old man lost his hearing as a result of a blow to the head, paresis of the facial muscles developed. The doctor diagnosed him with a hematoma of the cerebellopontine angle. In the cerebellopontine angle, the following nerves depart from the brain stem?

= VII, VIII pair

~ V, VI, VII couples

~ VIII, IX pair

~ IX, X, XI couples

41-year-old D. The patient's voice is unusually loud for him. Which part of the patient's ear is damaged?

= auris media

~ Auris externa

~ Iris interna

~ tympanic membrane

A 45-year-old man came to the clinic with complaints of loss of general sensitivity of the mucous membrane of the posterior third of the tongue. Clinical signs caused by compression of the fibers of the IX pair of male cerebral nerves by a tumor product at the exit site. Where is the exit point n. glossopharyngeal?

= posterolateral sulcus

~ Medial sulcus on the cerebral peduncle

~ Anterolateral groove

~ Bulbopontineus furrows

A 52-year-old patient developed a sudden asymmetry of the face. The entire half of the face is motionless, the nasolabial folds are smoothed out, the palpebral fissure is widened; the eye does not close, the corner of the mouth drops. What nerve emerges from the lateral part of the arc between the cerebellum and the pons?

= facial nerve

~ trigeminal nerve

~ Lost nerve

~ Extra

A 52-year-old man has a limbic form of Alzheimer's disease, the main manifestation of which is progressive memory loss. What structures are damaged in the limbic system?

= Vault, mammillary bodies, nameless substance

~ Bulbus olfactorius, olfactory tract

~ Cornu Ammonis

~ cingulate gyrus

After examining a 54-year-old woman, the doctor found that she could hardly bend her head and neck forward and to the side, and also identified the cause of the violation - an injury to some muscle branches of the cervical joint. What violation of muscle innervation led to the violation of these movements?

= mm. long neck and head, scalene muscles, anterior and lateral rectus capitis

~ M. trapezius, m. sternocleidomastoid muscle

~ Over the years

~ M. splenius capitis, m. splenius of the cervix

A 66-year-old patient consulted a neurologist about the impossibility of performing carpentry work that requires certain accuracy, since the right hand performs multi-purpose movements. Which road is damaged?

= rubrospinal tract

~ Pontoreticulospinal tract

~ Vestibulospinal tract

~ Tire-vertebral tract

Complications after removal of a neck tumor in a 68-year-old woman... :: After removal of a neck tumor in a 68-year-old woman, a complication arose - dysfunction of the triceps muscle. This complication is associated with damage to the nerve fibers that innervate these muscles during surgery. What fibers were damaged during the operation?

= Ansa cervical

~ N. frenik

~ N. transverse neck muscle

~ N. glossopharyngeal tongue

A 27-year-old patient with a craniocerebral injury along the primary curvature... :: A 27-year-old patient with a craniocerebral injury along the primary curvature was diagnosed with impaired pupillary constriction reflex when light was applied to the eye in the primary curvature. Which cranial nerve innervates the muscle that constricts the pupil?

= n.opticus

~ p. trochlearis

~n.abducens

~ n.oculomotorius

A patient with high blood pressure had a decrease in visual activity. In this case, the activity of which nerve was impaired?

= [moodle] n. opticus

~ [moodle] n.olfactorius

~ [moodle]

~ [moodle] n.trochlearis

After the accident, the patient was taken to the hospital, when the patient regained consciousness, he had blurred vision, where is the subcortical visual center?

= Superior colliculi

~ Inferior colliculi

~ Pineal body

~ Lamina tecti mesencephali

As a result of the accident, the first was injured in the thoracic spine. What segment of the spine is located at the level of this spine in the patient?

= [moodle] 2nd chest segment

~ [moodle] 1st chest segment

~ [moodle] 4th chest segment

~ [moodle] 5th chest segment

A patient with a fracture of the femur as a result of a car accident complains of severe pain in this area. What nerve branches innervate the boulder branch?

= N.ischiadicus

~ N.cutanei lateral femur

~ N. obturatorius

As a result of the accident, the thoracic spine was damaged. How many segments of the chest are there in the thoracic region?

= 12 ta

~ 10 t

~ 9 t

A 2-year-old patient is restless, crying, scratching his ear.

= Foreign body in outer ear

~ Foreign body in inner ear

~ Foreign body in the supraspinatus muscle

~ Foreign body in ear canal

A 26-year-old patient Complaints of itching in the ear, hearing loss, dark and yellow discharge, which were admitted to the ENT department. What part of the ear is affected?

= Glandulae ceruminosae in the external auditory canal

~ Gl.uricularis in the internal auditory canal

~ to the malleus in the middle ear, sandongs, uzangs

~ All answers are correct

A 38-year-old patient, as a result of a pathological process in which the patient's palate was damaged. What nerve innervates the palate?

= [moodle] glossopharyngeal nerve

~ [moodle] ophthalmic nerve

~ [moodle] trigeminal nerve

~ [moodle] n. kidnapping

A 44-year-old patient, as a result of a pathological process, the skin of the temporal region and the outer corner of the eye has lost secretions. Which nerve horn is damaged?

= trigeminal nerve

~ glossopharyngeal nerve

~ ophthalmic nerve

~ facial nerve

A 54-year-old patient, as a result of a pathological process in a patient, 1/3 of the tongue was damaged by the mucous membrane. Which branch of the nerve is damaged?

= [moodle] glossopharyngeal nerve

~ [moodle] ophthalmic nerve

~ [moodle] trigeminal nerve

~ [moodle] n. kidnapping

The patient has been suffering from symptomatic epilepsy since childhood, and epilepsy is one of the symptoms of brain glioma. The attacks were accompanied by visual hallucinations, which allowed the doctor to detect a tumor. In what part of the brain is the pathological process localized?

= occipital lobe

~ Temporal lobe

~ Hypus supramarginal

~ Frontal lobe

The patient complained of hearing loss. It is known from the patient's anamnesis that he worked as a builder. What part of the patient's ear could be damaged?

= Ear nostrils

~ Earplugs

~ Inner ear

~ Middle ear

Patient F. at the age of 70 complained of itching, tinnitus, hearing loss, nausea. What part of the patient's ear was damaged?

= No correct answer

~ Middle ear lesion

~ Damage to the ear supra

~ Injury to the outer ear

The patient has swollen area around the eyes. At the first examination, an abscess was found in the product. If abscesses are not removed in time, to what areas can pus spread in the fall?

= all answers are correct

~ Brain cavity

~ Into the wing groove

~ to the face area

The patient complains of drooping of the upper eyelid during a fall. What nerve can be damaged?

= n.opticus

~ n.oculamothyrius

~ n.ophthalmicus

~ p. trochlearis

Patient M., 41 years old, was admitted to the infectious diseases department of the hospital with a high body temperature. Objectively *expressed meningeal symptoms. The examination revealed a large number of leukocytes in the cerebrospinal fluid. In what cavity is the cerebrospinal fluid located?*

= spatium subarahnoideum

~ subdural space

~ epidural space

~ trigeminal cavum

As a result of the fight, the patient received a concussion and is now going to the doctor. On the first day, he had a blood clot in his eyeball and severe eye pain for 1 day. What part of the fall is damaged?

= Autumn Sox

~ Color curtain

~ Apprentice

~ Pumpkins

The patient lost his position in the cavity of the body parts, his movements became erroneous.

= gangliobulbotalamocortical tract

~ Gangliospinothalamocortical tract

~ ganglionucleotalamocortical tract

~ Spinovestibular tract

The patient reported to the doctor that he could not move the free part of his right hand after previous injuries. Passive actions during verification are not limited. Atrophy of the delta muscles was revealed. What nerve is damaged?

= armpits

~ Elbow

~ Medium

~ Above the chest

Patient P.52, a young man, turned to a neurologist with complaints of a decrease in the sensitivity of the skin of the right half of the face to the lower eyelid, back of the nose, and upper lip. Which of the following symptoms is associated with a violation of the pathway?

= Ganglionucleotalamocortical tract

~ Gangliospinothalamocortical tract

~ Corticospinal tract

~ Gangliobulbotalamocortical tract

The patient was admitted to the hospital with a neck injury. Examination revealed a damaged nerve located in the anterior part of the anterior scapular muscle. What nerve is damaged?

= [moodle] Phrenic nerve

~ [moodle] Vagus nerve

~ [moodle] Til-halqum nerv

~ [moodle] Telosti nerve

The patient went to the doctor with complaints of increased pain sensitivity of the skin behind the back wall of the auricle and external auditory canal. Objectively: palpation of the posterior surface of the sternocleidomastoid muscle is painful. What sign of nerve tension can give such a clinical appearance?

= N. minor occipital muscle

~ N. large auricle

~ N. transverse neck muscle

~ N. supralivicular

The patient went to the doctor with increased pain sensitivity of the skin of the parotid and external auditory canal. What nerve is affected in this case?

= Greater ear nerve

~ Right lesser occipital nerve

~ Left lesser cervical nerve

~ Superficial nerve

The patient complains of a violation of the sensitivity of the skin in the lateral region of the thigh. What intertwined branches innervate the lateral skin of the thigh?

= Bel Chigali

~ Neck brace

~ Dumgaz chigali

~ Christmas tree chigali

The patient complained of frequent sore throats; at the first examination, signs of redness in the ears were also found.

= Answers A and C are correct

~ Evstaksiev nayi

~ canal of auditory tubes

~ Muscular no

The patient cannot raise an eyebrow on one side of the face, completely close his eyes or open his teeth. What nerve is affected?

= facial nerve

~ Maxillary
~ Ophthalmic
~ Mandibular

A 45-year-old patient does not bend the thumb and cannot resist it, the hand takes on the usual form of a "monkey's claw". What nerve is damaged?

= interstitial nerve
~ Elbow
~ Medial cutaneous nerve of the wrist
~ Skin fly

The patient lost the ability to write letters and numbers after a cerebrovascular accident. In which part of the brain did the pathology occur?

= frontal lobe
~ parietal lobe;
~ Islet;
~ Occipital lobe.

Computed tomography revealed a tumor in the region of the pontine tire. What nerve ganglions are located in this part of the brain bridge?

= B
~ II
~XI
~ me

The patient noted a violation of the sensitivity of the skin in the anterior part of the wrist at the edge of the temple of the wrist. What nerve is involved in this disease?

= N.musculocutaneus
~ N.radialis
~ N.medianus
~N.axillaris

A patient after surgery to remove a hernia has skin sensitivity in the left hypochondrium, the sensitivity of which nerve is impaired?

= N. iliogypogastricus
~ N.femoralis
~ N.medianus
~ N. tibialis

A patient has hydrocephalus - brain drops. MRI revealed dilatation of the lateral and III ventricles. IV ventricle - without pathological *changes. Where did the occlusive (constrictor) circulation of cerebrospinal fluid originate?*

= Brain plumbing

~ IV ventricular median opening (Magendi)

~ IV lateral openings of the roof of the ventricle (Lyushka)

~ Ventricular orifices of Monroe

After a stroke, in addition to motor and emotional disorders, the patient has a speech disorder, the inability to count, write, read, understand what is written. What area of the brain is affected in the patient?

= Left brain

~ Cerebellum

~ Spine

~ Pituitary

In a patient on half of the V and IV fingers of the palmar surface of the hand after injury, there was a decrease in pain and temperature sensitivity of the skin. What nerve is damaged?

= elbow

~ Medium

~ Skin-muscles

~ Medial cutaneous nerve of the wrist

The patient has a thoracic spine injury. In the upper thoracic region, the vertebral segments are located above the corresponding spine?

= One spine

~ Two vertebrae

~ Three vertebrae

~ Four vertebrae

The patient has forced irregular movements due to the contraction of individual muscles of the limbs (myoclonus). Attacks are exacerbated by emotional stress, which disappears during sleep. What nuclei of the basal part of the telencephalon are damaged, which leads to myoclonus?

= striatum

~ Ruberny core

~ Kernel of olivarius

~ Amygdala

The patient showed signs of violation of the vegetative tangle of the abdominal stem nerve. Locate this abomination?

= around the abdomen and at the root of the superior mesenteric artery

~ in the region of the root of the superior mesenteric artery
~ in the region of the root of the inferior mesenteric artery
~ around the abdomen

The patient has impaired skin sensitivity in the anterior lower abdomen at the border of the pelvic region. What nerve is involved in this disease?

= N. iliogypogastricus
~ N.femoralis
~ N.medianus
~ N. tibialis

The patient was diagnosed with autonomic nervous innervation of the ovaries and uterus. Innervation of what nerve branches is disturbed in this case?

= nerve under forearm
~ upper limb nerve entanglement
~ Abdominal congestion - pinching of the aortic nerve
~ entanglement of the nerves of the lower extremities

The patient lost the ability to abduct his arm as a result of a surgical fracture of the humerus. Which nerve is damaged as a result of the injury?

= n. armpit
~ n. ulnar muscle
~ n. ray
~ n. median

The patient complained of sensory disturbances in the skin of the medial wall of the eyeball, in the region of the upper eyelid, after a facial injury. The horn of what nerve is damaged in the patient?

= trigeminal nerve
~ glossopharyngeal nerve
~ ophthalmic nerve
~ facial nerve

The patient has facial asymmetry, in particular, the implementation of active contraction of facial muscles is impaired. Show 7 pairs of cranial nerves?

= n.facialis
~ n. wandering
~ p.opticus
~ p. trochlearis

The patient had impaired function of the upper curvature of the eye after the operation. Which nerve innervates the superior arcuate muscle of the eye?

= IV pair
~ I'm a couple
~ II pair
~ III pair

The patient was diagnosed with hydrocephalus - brain drops. MRI revealed an expansion of the anterior branches of the lateral ventricles based on signs of compression of the structures of the lateral wall. How is the lateral wall of the anterior horns of the lateral ventricles formed?

= Head of caudate nucleus
~ Corpus callosum of the knee
~ Prodigal vault
~ Transparent partition

The patient was diagnosed with hydrocephalus - cerebral vesicle. MRI revealed dilatation of the anterior branches of the lateral ventricles with compression of the structures of the medial wall. How is the medial wall of the anterior horns of the lateral ventricles formed?

= transparent partition
~ Rostrum of the corpus callosum
~ Corpus callosum of the knee
~ Prodigal vault

Examination of the patient revealed a decrease in sensitivity to light, what muscle was damaged in the patient?

= sphincter pupil
~ m.ciliaris
~ m. direct pupil
~ d.delatorius pupils

When examining a patient, a neuropathologist found increased pain sensitivity of the skin on the surfaces of the I, II, III palms and on the radial edge of the IV fingers, in the middle of the palm and at the top of the thumb. What nerve function is impaired?

= N. radial
~ N. median
~ N. ulnar muscle
~ N. musculoskeletal

When examining the patient, the neurologist found that tactile sensitivity in the anterior 2/3 of the tongue was impaired. Find the damaged nerve?

= n.facialis

~ n. vestibulocochlearis

~ p.trigtminus

~ n.oculomotorius

An MRI of the lumbar region of the patient revealed damage in the L1-L2-L3 region of the spine. What kind of disorder is formed in this area?

= Bel Chigali

~ Neck brace

~ Dumgaz chigali

~ Christmas tree chigali

Pain when touching the eyelid of a diseased eye, sensitivity to light, many tears, but no pus, what are the symptoms of this disease?

= irritation

~ conjunctivitis

~ astigmatism

~ myopia

The patient's ear has been hurting for the 3rd day already, in the morning a purulent discharge appeared from the ear, the pain subsided. What part of the patient's ear was damaged?

= curtain Nogora perforated

~ Sandoncha, the uzangs are broken

~ Evtsakhiev nay wounded

~ Brain damaged

The feeling of the patient's tongue in the posterior 1/3 is impaired. What nerve innervates this area?

= IX

~ X

~XII

~ VIII

After being bitten by a malarial mosquito, he was admitted to the infectious department with meningeal symptoms. To confirm the diagnosis, a lumbar puncture was performed between the lumbar vertebrae. Which vertebra is pierced?

= 3-4

~ 2-3

~ 1-2

~ 1-5

After neck surgery, the patient lost sensation on the anterior surface. What branch of the cervical vertebra was damaged during the operation?

= transverse cervical nerve

~ Superficial nerve

~ Lesser cervical nerve

~ Neck brace

Since the child did not speak even at the age of 4, the parents took him to the doctor. The doctor discovered that the child had hearing loss. Where is the subcortical hearing center located?

= In the midbrain

~ In the midbrain

~ Miyachada

~ In the elongated brain

A child has impaired salivary function of the parotid gland after left-sided mumps. The doctor suspected damage to the ganglion of the auditory canal. The parasympathetic roots of the lower saliva are attached to this node. What branch of the nerve is this?

= glossopharyngeal nerve

~ ophthalmic nerve

~ trigeminal nerve

~ facial nerve

In a patient after a traumatic brain injury, venous blood flows from the superior sagittal sinus. In what layer of the brain are these venous sinuses located?

= pia mater

~ dura mater

~ gossamer

~ subarachnoid cavity

After a hemorrhagic stroke in patients with cerebral palsy, the patient's right arm and leg were paralyzed.

= precentral gyrus.

~ Postcentral gyrus.

~ Superior temporal gyrus

~ Inferior temporal gyrus

During the initial examination of a patient with a craniocerebral injury, it was found that the pupillary constriction reflex is impaired when *the eye is exposed to light. Which cranial nerve innervates the muscle that narrows the pupil?*

= n.opticus

~ p. trochlearis

~n.abducens

~ n.oculomotorius

The patient, brought to the ward, temporarily lost his sense of smell after the operation. How many pairs of cranial nerves arise from the nasal mucosa?

= I'm a couple

~ II pair

~ III pair

~ IV couple

An MRI scan revealed a brain hemorrhage. How many pairs of nerve endings are in the pons?

= V-VI

~ IX-X

~III-IV

~VIII-X

A patient with a neck injury has impaired function of the trapezius muscle. What nerve innervates the trapezius muscle?

= Accessory nerve

~ Lost nerve

~ Removed nerve

~ Hypoglossal nerve

A patient who underwent surgery on a bull had hoarseness of voice, difficulty in breathing due to narrowing of the vocal folds at the end of the day, and an increase in cyanosis. What innervates the main muscle that extends the vocal cords?

= n. lower part of the larynx

~ n. upper larynx

~ n. phrenic

~ n. sublingual tongue

He was diagnosed with chronic inflammation of the nasal mucosa, as a result of which a lesion of the lower nasal mucosa was found. Which nerve horn is damaged?

= n. jaw

~ r. meninges

~ n. lacrimal bone

~ n. supraorbital

:: After a neck injury, the victim's heartbeat and breathing... :: After a neck injury, the victim's heartbeat and breathing stopped.

= cerebellum

~ medulla oblongata

~ spinal cord

~ bridge

:: Puncture to remove pus in a patient with sinusitis ... :: Damage to the nerve during puncture to remove pus in a patient with sinusitis. The horn of what nerve is damaged in the patient?

= trigeminal nerve

~ optic nerve

~ r. meninges

~ ophthalmic nerve

:: After a hemorrhagic stroke, the patient's right arm and leg were paralyzed. ... :: After a hemorrhagic stroke, the patient's right arm and leg were paralyzed. Determine which part of the brain was transfused?

= postcentral gyrus

~ superior temporal gyrus

~ inferior temporal gyrus

~ precentral gyrus

As a result of a stroke, the patient has no voluntary movements of the muscles of the head and neck. An MRI of the brain revealed a hematoma. Which path is damaged during bleeding?

= corticonuclear tract

~ Corticospinal tract

~ Frontal-bridge tract

~Thalamocortical tract

After an ischemic stroke, the patient has a violation of sensitivity in the right arm and leg. Which part of the brain is being transfused?

= postcentral gyrus

~ Precentral gyrus.

~ Superior temporal gyrus

~ Inferior temporal gyrus

A 22-year-old victim, a contusion of the facial area, chewing muscle is damaged. Which nerve innervates this muscle?

= n. lower jaw

~ glossopharyngeal nerve

~ ophthalmic nerve
~ n. kidnapping

When examining the victim revealed paralysis of the lower leg - the right hand. What part of the central nervous system is damaged as a result of trauma?

= Anterior horn of the spinal cord
~ Dorsal horn of the spinal cord
~ Lateral horns of the spinal cord
~ medulla oblongata

As a result of the injury, the 12th thoracic spine was damaged. What segment of the spine is located at the level of this spine in the patient?

= 3-bel
~ 12th thoracic segment
~ 11th thoracic segment
~ 10th chest segment

As a result of the injury, the patient lost skin sensitivity in the anterior-lateral section of the radiocarpal-ulnar region. What nerve is damaged?

= n. musculocutaneous
~ n. ulnar muscle
~ n. median
~ n. armpit

As a result of the injury, the patient lost the ability to bend the wrist at the elbow joint. What nerve is damaged?

= n. musculocutaneous
~ n. ulnar muscle
~ n. ray
~ n. median

As a result of the injury, the patient had a dysfunction of the first finger, and the position of the flexion of the I, II, III fingers in the process of striking was also observed. The palms of the hands are shortened, the symptom of "monkey claw" is revealed. What nerve is affected by this clinic?

= p.medianus
~ p.radialis
~n.axillaris
~ n. musculocutaneus

As a result of the injury, the patient developed a "lion's paw": in the extension of the main phalanges, the middle and distal phalanges were *bent. When bending the claw of the hand to the IV-V fist position, the fingers do not bend. What kind of nerve damage are we talking about?*

= ulnar nerve

~ carpal nerve

~n.medianus

~ axillary nerve

After an injury, the patient has impaired skin sensitivity of 1-4 fingers on the palm of the foot. Which nerve activity can be impaired in this case?

= N. tibialis

~ N.cutanei lateral femur

~ N.femoralis

~ N. iliogypogastricus

The victim complains of a violation of skin sensitivity in the lateral region of the thigh. What nerve innervates the skin of the lateral surface of the thigh?

= N.cutanei femur lateral

~ N.femoralis

~ N. iliogypogastricus

~ N. tibialis

An MRI of a patient admitted to the hospital revealed a blood clot at the base of the brain. How many pairs of nerve endings are in the pons?

= VII-VIII couples

~ IX-X couples

~ III-IV couples

~ VIII-X pair

Computed tomography of a hospitalized patient revealed a thrombus at the base of the brain. What is included in the brain stem?

= Bridge

~ Interstitial brain

~ Inner capsule

~ Packed case

Computed tomography of a patient admitted to the neurosurgical department of the hospital revealed a hemorrhage in the base of the brain. How many pairs of nerve endings are located in the elongated brain?

= XI-XII couples

~ V-VI pair

~ III-IV couples

~ VI-VII pair

The victim, who turned to the clinic, stopped beating and breathing after a neck injury. In which part of the central nervous system are the centers that control the activity of the heart and respiration located?

= medulla oblongata

~ Cerebellum

~ spinal cord

~ Pons

A patient who applied to the neurological department of the polyclinic was diagnosed with a tumor in the 3rd ventricle of the brain. 3 What structures make up the anterior wall of the ventricle?

= domed column, cerebral commissure, marginal plate

~ Epithalamus

~ Hypothalamus

~ Vaccines and optical pockets

Computed tomography of a patient admitted to the neurosurgical department of the polyclinic revealed a hemorrhage in the base of the brain. What is included in the brain stem?

= long brain

~ Interstitial brain

~ Inner capsule

~ Packed case

X-ray examination of the chest showed immobility of the pericardium on the right side of the patient. What nerve is damaged?

= Right phrenic nerve

~ Right vagus nerve

~ Right side of the sympathetic nerve trunk

~ Accessory nerve

What are 2 parts of the ear that help us receive information from the external environment even when we close our eyes?

= labyrinth

~ dam

~ message

~ shunt

In a patient who applied to the ophthalmology department with complaints about the loss of the ability to turn the eye inwards, the examination revealed a dysfunction of the nerve. What nerve is it?

= n.oculomatorius

~n.olfactorius

~ n. opticus

~ p. trochlearis

After the burn, the patient's tongue was broken in the posterior 3/1. What nerve innervates this area?

= glossopharyngeal nerve

~ facial nerve

~ ophthalmic nerve

~ trigeminal nerve

The patient, delivered to the ENT department, temporarily lost his sense of smell after the operation. How many pairs of cranial nerves arise from the nasal mucosa?

= n.olfactorius

~ n. opticus

~n.oculomatorius

~ p. trochlearis

The patient was hospitalized in the ENT department, after which he was diagnosed with chronic otitis media. The patient has hearing loss. What nerve provides hearing?

= VIII pair

~ V pair

~ IV couple

~ III pair

What can be injured if the ENT doctor steps out of the ceiling triangle during surgery?

= front - facial nerve,

~ anterior wall of the ear

~ back - facial nerve

~ top - middle ear

ENT - A 22-year-old patient consulted a doctor with complaints of hearing loss. MRI of the brain revealed damage to the sphincter muscle. Which nerve innervates this muscle?

= facial nerve

~ glossopharyngeal nerve

~ ophthalmic nerve

~ trigeminal nerve

After the examination, the function of the lateral rectus muscle was impaired in an athlete who received a facial injury during training. What nerve is damaged in the patient?

= VI pair

~ V pair

~ IV couple
~ III pair

The patient underwent a lumbar puncture to compare the diagnosis of meningitis. Where is the lumbar puncture performed?

= LIII - LIV
~ LII - LII
~ LEE - LII
~TXII-LI

A patient with a diagnosis of meningitis was admitted to the infectious diseases hospital. What part of the brain is inflamed in the patient?

= dura mater
~ Pia mater
~ Arochnaidea
~ Pia mater, Arochnaidea

A patient with a localized lesion of the brain stem (diagnosed with neurosyphilis) had damaged pathways in the legs of the brain. How is the ventral decussatio formed?

= Tivertebral tract
~ rubrospinal tract
~ Anterior cortical-spinal tract
~ Lateral corticospinal tract

As a result of a long-term chronic disease of the brain, the patient has involuntary movements, a violation of the tone of the muscles of the body. What route of transmission do these symptoms indicate?

= rubrospinal tract
~ Corticospinal tract
~ Corticonuclear tract
~ Olivospinal tract

The patient was taken to the neurological department. Examination revealed an increase in pressure in the patient's brain. How does the 4th ventricle communicate with the 3rd ventricle?

= Brain waterway.
~ Nerve fiber
~ Nerve tumor.
~ The length of the nerve.

The patient went to the neurological department with complaints of irritability and pain in the area of the medial surface of the big toe of the right foot. Which nerve activity is impaired in the patient?

= N.femoralis

~ N. iliogypogastricus

~ N.medianus

~ N. tibialis

During the operation in the Department of Neurosurgery, the patient underwent spinal puncture. How to pronounce hard veil of the spine in Latin?

= dura mater

~ Pia mater

~ Arachnoids

~ Cavum subarochnoidale

A patient admitted to the neurosurgical department was diagnosed with a tumor of the third ventricle of the brain. What structures make up the lower wall of the third ventricle?

= Vaccines and optical pockets

~ Dome column, brain commissure, border plate

~ Epithalamus

~ Packed case

Computed tomography of a patient admitted to the neurosurgical department revealed a hemorrhage in the base of the brain. How many pairs of nerve endings are located in the elongated brain?

= IX-X

~V-VI

~III-IV

~VI-VII

Examination of a patient with a stab wound to the right hand revealed a decrease in the sensitivity of the skin on the back of the hand and the back surfaces of 1, 2 and partially 3 fingers. What nerve is damaged?

= Wrist

~ Medium

~ Elbow

~ Under the arm

In the soft tissues of the neck on the right during the operation, the regular motor excursion of the right opening of the diaphragm was disturbed. What nerves were damaged?

= Right iris

~ Right transverse nerve of the neck

~ Left transverse nerve of the neck

~ Superficial nerve

When a tumor damages the elongated pyramids of the brain, in which pathways of the elongated brain of the patient is the conduction of nerve impulses disturbed?

= tr. cortical-spinal

~ Tr. jagged red

~ Tr. dorsal-cerebellar

~ Tr. cortico bridge

Scientists have proven that the transparent part is responsible for the sensation of pleasure. What system does the transparent partition belong to?

= Limbic system

~ Pyramidal system

~ Extrapyramidal system

~ Circumventricular system

During the operation, the patient underwent a lumbar puncture. How do you pronounce the soft tissues of the spine in Latin?

= Pia mater

~ Dura mater

~ Arachnoids

~ Cavum subarochnoidale

After the operation, the patient's bowel function was impaired due to atony and paresis. What nerve innervation is impaired?

= n. wandering

~ n. glossopharyngeal

~n.accesorius

~ n. sublingual

The patient had impaired function of the upper curvature of the eye after the operation. Which nerve innervates the superior arcuate muscle of the eye?

= n.trochlearis

~n.oculomatorius

~n.olfactorius

~ n. opticus

In a patient with a tumor process, the vegetative (parasympathetic) nucleus of the IX pair of nerves, located between the ambiguus and *olivaris nuclei in the reticular pharmacy of the elongated brain, is damaged. What is this core?*

= inferior salivary nucleus

~ superior salivary nucleus

~ kernel p. kidnapping

~ single core

In a patient infected with poliomyelitis, muscle atrophy is observed as a result of movement disorders. Where are the nuclei of the affected area located by pathology?

= Cornu ventralis medullae spinalis

~ Cornu dorsalis medullae spinalis

~ Cornu lateralis of the spinal cord

~ Funiculus ventralis medullae spinalis

A patient was delivered to the emergency department with a tilt of the face to the right; on examination, paralysis of the left mimic muscles was revealed. Which cranial nerve innervates these muscles?

= n.trigtininus

~n.facialis

~ n. vestibulocochlearis

~ n.oculomotorius

What nerves innervate the skin of the anterior abdominal wall, pelvic area and pelvic region?

= sciatic nerve

~ hypochondrium nerve

~ closed nerve

~ pudendal nerve

The diagnosis was made: a violation of the innervation of the autonomic nerves of the internal organs in the abdominal cavity. What autonomic nerve ganglions are part of the solar plexus?

= abdominal trunk, aorta-liver, superior mesentery

~ top handle

~ bottom handle

~ aortic-renal

A 30-year-old patient S..s. complains of drooping of the upper eyelid when falling. What nerve can be damaged?

= n.opticus

~ n.oculamothyrius

~ n.ophthalmicus

~ p. trochlearis

The doctor performed a lumbar puncture in the region of the 1st lumbar spine and damaged the spinal cord. In which region of the spine does the spinal canal end?

= II lumbar spine

~ III-lumbar spine

~ IV lumbar spine

~ V-lumbar spine

During the initial examination of a patient with a craniocerebral injury who was admitted to the hospital, a violation of the pupillary constriction reflex was found when the eye was exposed to light. Which cerebral nerve innervates the muscle that narrows the pupil?

= n.opticus

~ p. trochlearis

~n.abducens

~ n.oculomotorius

The injured teenager was placed in the upper part of the arm above the elbow joint in the trauma department. On examination, the doctor did not find medial skin sensitivity in the anterior region of the shoulder. Damage to what nerve is associated with loss of skin sensitivity in the area shown?

= N. medial skin of the shoulder

~ N. radial

~ N. musculoskeletal

~ N. ulnar muscle

The athlete fell awkwardly during training, and the examination revealed a midbrain injury. What center is damaged in the upper part of the midbrain?

= View Center

~ Hearing Center

~ Action Center

~ Odor Center

The athlete suffered a facial injury during training, after which the function of the lateral rectus muscle was impaired. What nerve is damaged in the patient?

= n.abducens

~ n. trigeminus

~ p.facialis

~n.oculomatorius

The athlete complained of increased pain in the calf muscles after training. What nerve innervates the back muscles of the boulder?

= N. tibialis

~ N.femoralis

~ N. iliogypogastricus

~ N.medianus

After swimming, the athlete complained of a violation of sensitivity in the back of the thigh. Which nerve activity is impaired in an athlete?

= back of thigh N.cutanei

~ N. sciatica

~ N. obturatorius

~ N.cutanei lateral femur

The dentist anesthetized the area of the upper jaw to remove the patient's damaged tooth. Which nerve loses sensitivity in this case?

= n. jaw

~ r. meninges

~ n. lacrimal bone

~ n. supraorbital

The student looked at the phone at night. and when he woke up in the morning, his eyes were clouded, that is, he could not see distant objects well. What is this disease?

= myopia

~ Glaucoma

~ Hyperopia

~ Conjunctivitis

Suddenly, the man hit his elbow, causing pain and tingling at the edge of his wrist. What nerve is damaged?

= N. ulnar muscle

~ N. axilla

~ N. radial

~ N. median

During the examination, the neuropathologist ordered the patient to remove the tongue. As a result, the tongue turned to the right. The neurologist concluded that in this case the function of a certain cerebral nerve was impaired. What nerve are we talking about?

= n. wandering

~ n. glossopharyngeal

~n.accesorius

~ n. sublingual

As a result of the development of a brain tumor in the upper limb, there is a loss of pain sensitivity in the half of the body opposite to the focus under the head. What is the neural pathway of this sensitivity?

= gangliospinothalamocortical tract
~ Spinovestibular tract
~ Posterior dorsal tract
~ ganglionucleotalamocortical tract

A CT scan of a patient admitted to the trauma department revealed a hemorrhage in the brainstem. What is included in the brainstem?

= bridge, midbrain, longbrain
~ Interstitial brain
~ Inner capsule
~ Packed case

A long-term athlete D.B., 37 years old, complains of loss of balance and hearing. What part of the brain is damaged in the patient?

= Chakka part
~ Part of the neck
~ Forehead
~ Part of the neck

When examining a patient, the doctor diagnosed a violation of the innervation of the bladder and rectum. What branches of autonomic nerve fibers are damaged in this case?

= lower pancreas
~ inferior mesentery of the intestine
~ superior mesentery of the intestine
~ solar nerve entanglement

When analyzing a patient admitted to the surgical department, ulcers of the stomach and duodenum were revealed. Where is the nucleus X of the pair of cranial nerves leading to the wound?

= In the elongated brain
~ On the bridge
~ Miyachada
~ In the midbrain

Computed tomography of a patient who applied to the neurosurgical department of a private clinic revealed a hemorrhage in the brain stem. What is included in the brain stem?

= midbrain
~ Interstitial brain
~ Inner capsule

~ Packed case

The patient, who had undergone an inflammatory process, began to feel weakness when bending the hand on fingers I, II, III and IV, a decrease in the size of the muscles of the thumb. Examination revealed pain and temperature sensitivity on the palms and palms of I, II, III and partially the fourth fingers. What nerve is damaged?

= Medium

~ Elbow

~ Wrist

~ Medial cutaneous nerve of the wrist

In newborns, the telencephalon, skull bones, soft tissues and spinal cord are damaged. What is the last defect in the development of the brain in a child?

= Anencephaly

~ Exencephaly

~ Ionencephaly

~ Agenesia

The newborn is restless, cries a lot, the medial area of the eye is swollen, red. fill in the initial diagnosis?

= Nasolacrimal duct closed

~ Lower gourd abscess

~ Phlegmon of the eye

~ Damage to the medial muscle

After a shoulder injury, the patient cannot straighten his arm. On examination, a decrease in pain and temperature sensitivity of the skin of the first half of the fingers, II and III of the back of the hand was revealed. What nerve is damaged?

= skin-muscles

~ Under the arm

~ Interval

~ Wrist

A patient with a diagnosis of "purulent mastoiditis" underwent trepanation of the Thorn's triangle of a breast tumor. However, the surgeon accidentally damaged the nerve passing through the canal along the anterior border of the triangle. Show damaged nerve?

= n.facialis, paralysis of facial muscles

~ n.facialis, paralysis of masticatory muscles

~ n.trigeminus, paralysis of masticatory muscles

~ n.trigeminus, paralysis of mimic muscles

Does a small child experience nausea while riding in a car? Which part of the patient's ear is still underdeveloped?

= inner ear

~ Middle ear

~ Outer ear

~ All answers are correct

As a result of the accident, one person suffered a spinal injury. Examination revealed right-sided paralysis of the leg. Which road is damaged?

= cortical-spinal tract

~ Tire-vertebral tract

~ Corticonuclear tract

~ Spinal thalamic tract

A patient with a diagnosis of meningitis was admitted to the infectious diseases hospital. What part of the brain is inflamed in the patient?

= dura mater

~ Pia mater

~ Arochnaidea

~ Pia mater, Arochnaidea

RECOMMENDATIONS

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Tutorial

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