N. N. Burdenko Voronezh state medical University.
Department of human anatomy

«Утверждаю»
Зав. кафедрой нормальной
анатомии человека,
проф. Н. Т. Алексеева
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GUIDELINES FOR STUDENTS ON THE TOPIC OF THE PRACTICAL LESSON:

“The internal structure of the hemispheres. The lateral ventricles of the brain. The basal ganglia. Diencephalon: thalamic region, hypothalamus. III ventricle. Midbrain. Water supply of the midbrain. External and internal structure, functions ”

Specialty general medicine

Course I

Theme of the lesson: “The internal structure of the hemispheres. The lateral ventricles of the brain. The basal ganglia. Diencephalon: thalamic region, hypothalamus. III ventricle. Midbrain. Water supply of the midbrain. External and internal structure, functions. ”

The purpose of the lesson:
● study the internal structure of the hemispheres, the system of the lateral ventricles;
● learn to explain using Latin terminology and demonstrate on natural preparations the details of the structure and topography of gray and white matter in sections of the hemispheres, various sections of the basal ganglia, given their function;
● study the components of the diencephalon, followed by a demonstration on natural preparations.

Motivation for the topic of the lesson: the formation of knowledge about the structure and functioning of the central nervous system as a whole and its departments is necessary for studying the following sections of anatomy, histology, normal physiology, topographic anatomy, pharmacology, pathological anatomy, pathological physiology, and is the basis for studying clinical disciplines: neurology , psychiatry and neurosurgery.

Competencies: OPK-1, 9.

Test questions on the topic of the lesson (App1)

Lesson plan
1. Testing the assimilation of knowledge obtained in the previous lesson: test control, oral questioning, testing of practical skills.
2. Conversation on the topic of the lesson.
3. Performing assignments.
3.1. Independent classroom work of students.

The cerebral cortex of the cerebral hemispheres consists of six layers (plates), differing mainly among themselves in the form of nerve cells entering them. 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 of great practical importance for the diagnosis of lesions in the cerebral hemispheres.

Currently, the entire cerebral cortex is considered as a continuous perceiving surface. The bark is a collection of cortical ends of analyzers.
Localization of the higher centers of the analyzers in the cerebral cortex is studied on preparations of the dorsolateral and medial surfaces of the hemispheres, as well as on diagrams. The localization of the sensorimotor cortex - the higher motor centers (the initial section of the cortical-spinal and cortical-nuclear pathways), the centers of general sensitivity (somatosensory cortex), vision, hearing, smell and taste are distinguished. In addition, it should be noted the localization of higher motor and sensory centers of speech, stereognosia (speech and writing), praxia.

The core of the motor analyzer, irritations emanating from the bones, joints, skeletal muscles and their tendons, is in the precentral gyrus. The core of the motor analyzer, related to the combined rotation of the head and eyes in the opposite direction, is placed in the middle frontal gyrus. The core of the motor analyzer, through which the synthesis of targeted complex professional, labor and sports movements takes place, is placed in the left (at the right-handed) lower parietal lobe. The core of the analyzer of the position and movement of the head - the static analyzer (vestibular apparatus) in the cerebral cortex is still not exactly localized. The core

of the analyzer of impulses coming from the innards and blood vessels is located in the lower sections of the anterior and posterior central gyrus. The core of the auditory analyzer lies in the middle of the superior temporal gyrus, on the surface facing the islet. The core of the visual analyzer is located in the occipital lobe, along the edges of the spur groove. The nucleus of the olfactory analyzer is placed in the phylogenetically ancient part of the cerebral cortex, in a hook. The core of the taste analyzer, according to some sources, is located in the lower part of the postcentral gyrus, close to the centers of the muscles of the mouth and tongue, and according to others, also in the hook. The core of the skin analyzer (tactile, pain and temperature sensitivity) is located in the postcentral gyrus and in the cortex of the upper parietal region. A particular type of skin sensitivity - recognition of objects by touch - stereognosia, is associated with a section of the cortex of the superior parietal lobule. The motor analyzer of articulation of speech is located in the back of the lower frontal gyrus. The motor analyzer of articulation of speech (speech motor analyzer) is located in the rear of the lower frontal gyrus. Visual analyzer writing.

To study the structure of the basal nuclei and lateral ventricles, it is necessary to consider the preparation of a horizontal section of the cerebral hemispheres at the level of the basal nuclei and lateral ventricles. Using a textbook and atlas, study the internal structure of the cerebral hemispheres. In addition to the cortex covering the outer surface of the hemisphere, in its thickness of the hemispheres there are also accumulations of gray matter, called basal nuclei, which make up what is called a subcortex for brevity. Among them, there are clusters of subcortical nuclei: the striatum, the fence and the amygdala.

The striped body consists of two parts that are not completely separated from each other - the caudate nucleus and the lenticular nucleus. The caudate nucleus lies higher and more medial than the lenticular nucleus, separated from the latter by a layer of white matter called the internal capsule. The thickened anterior part of the caudate nucleus, its head, forms the lateral wall of the anterior horn of the lateral ventricle, while the posterior refined section of the caudate nucleus, the body and tail of the caudate nucleus, stretch back along the bottom of the central part of the lateral ventricle. The lenticular nucleus lies laterally from the caudate nucleus and the thalamus, separated from them by an internal capsule. On a horizontal section of the hemisphere, the medial surface of the lenticular nucleus facing the inner capsule has the shape of an angle with the apex directed toward the middle; the front side of the corner is parallel to the caudate nucleus, and the rear side is parallel to the thalamus. The lateral surface is slightly convex and faces the lateral side of the hemisphere in the islet region. The lenticular nucleus, with two parallel white layers, is divided into three segments, of which the lateral, dark gray color is called the shell, and the two medial, lighter, are called medial and lateral pale balls.

The fence, represents a thin plate of gray matter, laid in the region of the island, between it and the shell. It is separated from the latter by a layer of white matter, the outer capsule, and from the cortex of the islet, by a layer called the outermost capsule.

The white matter of the cerebral hemispheres is represented by various systems of nerve fibers, among which there are: 1) associative; 2) commissural and 3) projection. They are considered as pathways of the brain (and spinal cord). Associative nerve fibers that exit from the cortex of the hemisphere are located within the same hemisphere, connecting various functional centers. Commissural nerve fibers pass through the commissures of the brain (corpus callosum, anterior commissure). Projection nerve fibers going from the cerebral hemisphere to its lower parts (intermediate, middle, etc.) and to the spinal cord, as well as following in the opposite direction from these formations, make up the inner capsule.

The corpus callosum contains fibers (commissural conduction nougat) that pass from one hemisphere to another and connect cortical areas belonging to the right and left hemispheres in order to combine (coordinate) the functions of both halves of the brain into a single whole. The corpus callosum is a thick, specially curved plate made up of transverse

fibers. Distinguish the knee, continuing down to the beak. The middle part is called the trunk, posterior to the trunk continues into the thickened part - the roller.

In the cerebral hemispheres, two lateral ventricles, ventriculi laterales, separated from the upper lateral surface of the hemispheres by the entire thickness of the cerebral substance, lie symmetrically below the corpus callosum below the level of the corpus callosum. The cavity of each lateral ventricle corresponds to the shape of the hemisphere: it begins in the frontal lobe in the form of a front horn bent down and to the lateral side, from here it stretches through the parietal lobe under the name of the central part, which at the level of the posterior edge of the corpus callosum is divided into the lower horn, (in the thickness of the temporal lobe) and the horn, (in the occipital lobe).

The medial wall of the anterior horn is formed by a transparent septum that 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, 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 fibers of the corpus callosum, the bottom is composed of a continuation of the caudate nucleus, 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 cover; a roller is visible on its medial wall - a bird's spur 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 constitutes a continuation of the same formation surrounding the horn. From the medial side on the upper wall there passes a bending downward and anteriorly refined part of the caudate nucleus, its tail.

A white elevation stretches along the medial wall of the lower horn throughout the entire length - the hippocampus, which is formed as a result of pressure from the groove of the hypocampus that deeply cuts from the outside. The front end of the hippocampus is divided by grooves into several small tubercles. Along the medial edge of the hippocampus is the so-called fringe, which is a continuation of the foot of the arch. At the bottom of the lower horn there is a roller, a collateral elevation, resulting from an impression from the outside of the groove of the same name.

On the medial side of the lateral ventricle, the soft medulla protrudes into its central part and lower horn, forming a vascular plexus in this place. The plexus is covered with epithelium, representing the remainder of the undeveloped medial wall of the ventricle.

Next, the structure of the inner capsule is considered - this is a thick plate of white matter bent at an angle. On the lateral side, it is bounded by a lenticular nucleus, and on the medial side, by the head of the caudate nucleus (front) and the thalamus (back). The inner capsule is divided into three sections. Between the caudate and lenticular nuclei is the front leg of the inner capsule, between the thalamus and lenticular nucleus is the back leg of the inner capsule. The junction of these two departments at an angle open laterally makes up the knee of the inner capsule. All projection fibers that connect the cerebral cortex to other parts of the central nervous system pass through the inner capsule. In the knee of the inner capsule are the fibers of the cortical-nuclear pathway, which is directed from the cortex of the precentral gyrus to the motor nuclei of the cranial nerves. In the anterior section of the hind leg, directly adjacent to the knee of the inner capsule, there are cortical-spinal cord fibers. This motor path, like the previous one, begins in the precentral gyrus and follows the motor nuclei of the anterior horns of the spinal cord. Thalamocortical (thalamotemic) fibers are located posterior to the listed pathways in the hind leg. They are represented by processes of thalamic cells, heading to the cortex of the postcentral gyrus. The composition of this pathway contains fibers of conductors of all kinds of

general sensitivity (pain, temperature, touch and pressure, proprioceptive). Even more posterior to this tract in the central parts of the hind leg is the temporal-parietal-occipital-bridge bundle. The fibers of this bundle start from the cells of various sections of the cortex of the occipital, parietal and temporal lobes of the hemisphere and follow to the nuclei of the bridge located in its anterior (basilar) part. In the rear sections of the hind leg are auditory and visual pathways. Both originate from the subcortical centers of hearing and vision and end at the corresponding cortical centers. The front leg of the inner capsule contains the frontal-bridge path. The fibers of the ascending pathways, diverging in different directions to the hemisphere cortex, form the so-called radiant crown. From top to bottom, the fibers of the descending pathways of the inner capsule in the form of compact bundles are sent to the leg of the midbrain.
With the help of a textbook and an atlas, it is necessary to consider the structure of the brain vault. Under the corpus callosum is the arch, which consists of two arcuate curved cords connected in their middle part with transversely extending fibers - adhesions. The middle part of the vault is called the body; forward and downward, it continues into a rounded paired cord - a pillar of the arch. The column of the arch goes down and somewhat laterally to the base of the brain, where it ends in the right and left mastoid bodies. Behind the body of the arch continues into a paired flat cord - the leg of the arch, spliced with the lower surface of the corpus callosum. The paired pedicle of the arch on the right and on the left side gradually leaves laterally and downward, separates from the corpus callosum, flattenes even more and fuses with the hippocampus on one side, forming the fringe of the hippocampus. The other part of the fringe is free and facing the cavity of the lower horn of the lateral ventricle. The fringe of the hippocampus in the hook ends, thus connecting the temporal lobe of the terminal brain with the diencephalon. In front of the arch in the sagittal plane is a transparent partition, which consists of two plates lying parallel to each other. Each plate of the transparent septum is stretched between the body and the arch pillar at the back, the corpus callosum above, the knee and beak of the corpus callosum in front and bottom. Between the plates of the transparent septum is a slit-like cavity of the transparent septum containing a transparent liquid. The plate of the transparent septum serves as the medial wall of the anterior horn of the lateral ventricle. In front of the pillars of the arch is the front commissure, the fibers of which are oriented transversely. On the sagittal section, the commissure has the shape of a small oval. The anterior part of the adhesion is thin, connecting the gray matter of the olfactory triangles of both hemispheres. The large posterior part contains nerve fibers that bind the cortex of the anteromedial sections of the temporal lobes.

The structure and functions of the limbic system are studied in various sections of the cerebral hemispheres. The limbic system is a complex of formations of the final, intermediate and midbrain, participating in the regulation of various autonomic functions, maintaining the constancy of the internal environment of the body (homeostasis) and in the formation of emotionally colored behavioral reactions. Therefore, some authors designate the limbic system as the “visceral brain”. The main part of it consists of the structures of the cerebral cortex, located mainly on the medial surface of its hemispheres, and closely related subcortical formations, namely: amygdaloid region, terminal stripe, hypothalamus, hippocampus, arch, septal region, mastoid bodies, mastoid thalamic bundle , thalamus, cingulate gyrus. On the medial surface of the cerebral hemispheres, the limbic system is represented by the cingulate and parahippocampal convolutions.

The list of anatomical formations that a student should be able to find and demonstrate on natural preparations

Corpus callosum	Corpus callosum
Corpus callosum	Splenium corporis callosi
Corpus callosum	Truncus corporis callosi
Corpus callosum	Genu corporis callosi
Corpus callosum	Rostrum corporis callosi
Anterior commissure (of the brain)	Comissura anterior (rostralis)
Vault of the brain	Fornix cerebri
Transparent septum (brain)	Septum pellucidum
Central part of the lateral ventricle	Pars centralis ventriculi lateralis
Anterior horn of the lateral ventricle	Cornu anterior ventriculi lateralis
Posterior horn of the lateral ventricle	Cornu posterior ventriculi lateralis
Lower horn of the lateral ventricle	Cornu inferior ventriculi lateralis
Collateral elevation of the lateral ventricle	Eminentia collateralis ventriculi lateralis
Hippocampus	Hippocampus
The head of the caudate nucleus	Caput nuclei caudati
The body of the caudate nucleus	Corpus nuclei caudati
The tail of the caudate nucleus	Cauda nuclei caudati
Lenticular nucleus	Nucleus lentiformis
Fence	Claustrum
The outermost capsule (terminal brain)	Capsula extrema
Outer capsule (end brain)	Capsula externa
Inner capsule (end brain)	Capsula interna
Front leg of the inner capsule	Crus anterior capsulae internae
Knee Inner Capsule	Genu capsulae internae
The back leg of the inner capsule	Crus posterior capsulae internae

3.2. Monitoring knowledge gained in this lesson (App2).

3.3. The solution of situational problems.
1. The patient had hemorrhage in the knee region of the inner brain capsule. Indicate which pathways pass through the knee of the inner capsule and what are possible dysfunctions?
2. The patient has bradykinesia (active movements are very slow), muscle rigidity (resistance to passive movements, the limb as if freezes in the pose that is given to it), rhythmic trembling of the limbs. These symptoms are characteristic of Parkinson's syndrome. Indicate which subcortical nuclei are affected by this syndrome.
3. The patient as a result of cerebral hemorrhage lost the ability to pronounce words. Indicate the location of the pathological focus.

4. Assignment for the next lesson. Topic: “Localization of functions in the cerebral cortex. The internal structure of the hemispheres. The lateral ventricles of the brain. The basal ganglia. ”

Attachment 1

Test questions on the topic of the lesson

1. What is the residual cavity of the finite brain?
2. What is the functional significance of the extrapyramidal system?
3. What anatomical formations are part of the extrapyramidal system?
4. Name and show the basal nuclei of the hemispheres?
5. Name and show parts of the lenticular nucleus?
6. Name and show the parts of the caudate nucleus?
7. In what proportion of the brain is the amygdala located?
8. What are the anatomical formations of the striatum?
9.Define the functional value of the striopallidar system?
10. What are the parts of the inner capsule?
11. What are the pathways that connect the two hemispheres of the brain?
12. Where is the bulk of the commissural fibers of the cerebral hemispheres located?
13. What nerve fibers form the outer and outermost capsules?
14. Name and show parts of the lateral ventricles. What proportion of the hemisphere corresponds to each of these parts?
15. Through which openings do the lateral ventricles communicate with the III ventricle?
16. What are the walls of the anterior horn of the lateral ventricle?
17. What is the posterior horn of the lateral ventricle formed?
18. What is the anterior horn of the lateral ventricle formed?
19. What is the formation of the lower horn of the lateral ventricle?
20. What is the posterior horn of the lateral ventricle formed?
21. What is the central part of the lateral ventricle formed?
22. What are the boundaries of the diencephalon?
23. What is the name of the parts of the thalamus?
24. What are the combined right and left thalamus?
25. What are the main groups of nuclei of the thalamus, give their functional characteristics?
26. What is part of the epithalamus?
27. What is the functional significance of the epithalamus?
28. What anatomical formations are part of metatalamus, hypothalamus?
29. What is the proportion of the pituitary gland associated with the nucleus of the anterior hypothalamus?
30. What is the proportion of the pituitary gland associated with the nucleus of the posterior hypothalamus?
31. What is the functional characteristic of the hypothalamus?
32. Name and show on the preparation anatomical formations that form the walls of the third ventricle?

App2

The list of questions for the test control of knowledge gained in the current lesson

1. What are the anatomical formations of the inner capsule on the medial side?
2. What applies to the basal nuclei of the hemispheres?
3. What is the medial wall of the anterior horn of the lateral ventricle?
4. What is the formation of the anterior and upper walls of the anterior horn of the lateral ventricle?
5. What is on the lower wall of the lower horn of the lateral ventricle?
6. What is on the medial wall of the posterior horn of the lateral ventricle?
7. Where is the bird spur located?
8. What connect commissural (adhesive) nerve fibers?

9. What applies to commissural fibers?
10. What formations of the arch of the brain consists of?
11. Indicate which part of the brain a gray tubercle is part of.
12. What anatomical formations are parts of the inner capsule of the brain?
13. What anatomical formations are parts of the corpus callosum?
14. What is metatalamus represented by?
15. What is the pineal gland part of?
16. What are the anatomical formations of the inner capsule on the lateral side?
17. What are the basal nuclei of the hemispheres?
18. What is the anatomical formation, which is facing towards the third ventricle?
19. What is the lateral wall of the anterior horn of the lateral ventricle formed?
20. What forms the medial wall of the lower horn of the lateral ventricle?
21. What forms the medial wall of the central part of the lateral ventricle?
22. What is on the lower wall of the posterior horn of the lateral ventricle?
23. What formations connect associative nerve fibers?
24. What are parts of the corpus callosum?
25. What is part of the finite brain?
26. What is the cavity of the finite brain?
27. What belongs to the metatalamus?
28. What anatomical formations are parts of the inner capsule of the brain?
29. What are parts of the corpus callosum?
30. What is the pituitary gland part of?
31. What is the epithalamus represented by?
32. What is formed the lower wall of the third ventricle?
33. What is the formation of the anterior wall of the third ventricle?
34. What is the formed lateral wall of the third ventricle?
35. What anatomical structures make up the lenticular nucleus?
36. What is the corpus callosum formed?
37. What limits the front leg of the inner capsule to the medial side?
38. In which section of the inner capsule does the cortical-nuclear pathway pass?
39. In which section of the inner capsule is the frontal-bridge path?
40. What anatomical formations are part of the finite brain?
41. What is the upper wall of the third ventricle formed?
42. What formations are part of the diencephalon?
43. What formations are part of the thalamic region?
44. What are the anatomical formations that belong to the epithalamus?
45. What formations are part of the diencephalon?
47. What is the formation of the arch of the brain?
48. What is the anatomical formation, the medial wall of which is facing the third ventricle?
49. What are the interconnected medial surfaces of the posterior thalamus?
50. What formations are part of the epithalamus?
51. What is the lower wall of the third ventricle?
52. What is the formation of the inter-foot fossa?
53. What is the upper wall of the third ventricle?
54. What does the diencephalon develop from?
55. What is the cavity of the diencephalon?
56. What formations are part of the hypothalamus?
57. What kind of sensitivity is the subcortical center of the thalamus?
58. Where is the bird spur located?
60. What anatomical structures belong to the hypothalamus?

61. Indicate the boundaries of the diencephalon.
62. Through which openings do the lateral ventricles communicate with the III ventricle?
63. What is the upper surface of the thalamus separated from the medial?
64. What is the posterior end of the thalamus called?
65. What is missing in the thalamic region?
66. What is metatalamus represented by?
67. What is the limitation of the inner capsule on the medial side?
68. What applies to the basal nuclei of the hemispheres?
69. What is the medial wall of the anterior horn of the lateral ventricle?
70. What are commissural fibers?
71. What does the arch of the brain consist of?
72. What are the basal nuclei of the hemispheres?
73. What are the main groups of nuclei of the thalamus, give their functional characteristics.
74. What is the functional significance of the epithalamus?
75. What is the functional characteristic of the hypothalamus?