LECTURE COMPLEX

The discipline: «Neurology»

The code of the discipline: Nevr 5306

EP: 6B10101 «General medicine»

The volume of training hours (credits): 150 hours /5 credits

The course and semester of study: 5 year, 9 semester

The volume of lectures: 15 hours

Shymkent, 2023

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Protocol № 1 dated 28.08.2023

Head of Department Zharkinbekova N.A.

Lecture №1

1. Topic: Introduction to the specialty. Structural elements of the nervous system. The transfer of information in the nervous system.

2. Purpose: to acquaint students with the history of the development of neurology, the development of the nervous system in ontogenesis. To explain to students the role of neurology in the structure of modern healthcare, to explain the structure of the study of the discipline.

3. Theses of the lecture:

The nervous system (NS) provides the relative constancy of the internal environment of the organism, the interaction of its organs and tissues, obtaining information about its own body, the external environment, as well as all types of movements, determines the emotional and mental state, and higher mental functions. It is one of the main integrative systems, and neuroscience integrates all the main theoretical and clinical areas of medical science.

So, neurology (from the Greek. Neuron-nerve-logos + teaching) is a biomedical science that studies the structure and functions of NS in normal and pathological conditions, the laws of development of the nervous system and develops methods for recognizing, treating and preventing its diseases.

The first information about diseases of the nervous system is found in written sources of ancient times. In Egyptian papyri about 3000 years BC. e. paralysis, sensitivity disorders are mentioned. In the ancient Indian book of Ayur-Veda, convulsive seizures, fainting, headaches are reported. The works of Hippocrates, Razi, Ibn Sina describe the clinical manifestations of various neurological diseases, methods for their diagnosis and treatment. Already at that time, certain conditions were clearly designated as diseases of the brain (epilepsy, migraine, etc.). An important contribution to the development of the doctrine of the morphology of the nervous system was made by Andrei Vesalius, Jacob Sylvius, Constance Varoly. Descartes formulated the concept of reflex. So the foundations of neurophysiology were laid. XVIII century was a descriptive period in the development of neurology. There was more and more information about individual symptoms, syndromes and diseases of the nervous system. Attempts were made to treat them. In the XIX century. Intensively developed methods of studying the structure and functions of the nervous system, methods of chemical research of the brain. Pathological studies were systematized. There was an opportunity to fix and stain the nervous tissue, get serial sections, carry out microscopic studies of the nervous system. Comparative anatomical, embryological and experimental studies played a large role in the development of neurology. They served as the methodological basis for progress in the study of the physiology of the nervous system. The development of this direction is associated with the names of I.M.Sechenov, I.P. Pavlov, N.E. Vvedensky, A.A. Ukhtomsky, Magnus, Sherrington, etc. I.M.Sechenov (1829-1905) was the founder of reflex theory mental activity of a person, he showed that reflex is a universal way of the reaction of the brain to a wide variety of external influences. However, the brilliant assumption of I.M.Sechenov that any manifestations of a person's mental life are reflexes could become a scientific theory only as a result of the discovery of specific forms of reflex activity of the brain.

This problem was solved by I.P. Pavlov (1849-1936) and his school, who developed the doctrine of higher nervous activity. The term "conditioned reflex" proposed by I. P. Pavlov, by its definition, means a temporary, variable, flexible connection of any signal variation with the response activity of the body. The conditioned reflexes are formed in the process of the individual experience of animals or humans according to the principle of the greatest correspondence to the current conditions. The successes achieved in the field of neurology created the prerequisites for separating the doctrine of diseases of the nervous system into an

independent branch of scientific medicine. This industry is called neuropathology. In the XIX century. Charcot created the French school of neuropathologists. Its representatives were Duchenne, Degerin, Babinsky, Raymond, Bourneville, Brissot and others. Authors of classical works on neuropathology in Germany were Shrumpel, Westphal, Wernicke, Romberg, Friedreich, Erb, Oppenheim and others. In England in the XIX century. representatives of neuropathology were such scientists as Jackson, Govers, Parkinson, Thomsen. In Russia, the formation of neuropathology as a separate clinical discipline is associated with the name of A.Ya. Kozhevnikov (1836-1902), who created the world's first neuropathological clinic and in 1869 headed the first department of nervous and mental diseases at Moscow University. A.Ya. Kozhevnikov created a school of Russian neuropathologists, whose prominent representatives were V.K. Roth, V.A. Muratov, S. S. Korsakov, M. S. Minor, G. I. Rossolimo, L. O. Darkshevich. An outstanding representative of the Moscow school of neuropathologists and psychiatrists was S. S. Korsakov (1854-1900). He became the founder of the nosological trend in psychiatry (nosology - the doctrine of quality independence, isolation of individual diseases). One of the founders of child psychoneurology is G.I.Rossolimo (1860-1928). He was a talented clinician with the outstanding abilities of a medical doctor. He owns the work on children's neuropathology, psychoneurology, medical psychology. The St. Petersburg school of neuropathologists and psychiatrists, whose founders were I.M. Balinsky and I.P. Merzheevsky, made a great contribution to the development of the national science of diseases of the nervous system. Traditions I.M. Balinsky and I.P. Merzheevsky was worthily continued by V.M. Bekhterev (1857-1927), who went down in the history of Russian science not only as one of the founders of the St. Petersburg school, but also as one of the founders of all Russian psychoneurology. An important place in the structure of the pathology leading to disability is occupied by genetically determined disorders, diseases caused by chromosome disorders, and others. S.N. was the founder of the study of hereditary diseases. Davidenkov. The study of hereditary forms of pathology of the nervous system was carried out using biological and genetic research methods. This approach made it possible to significantly increase the level of diagnosis of these diseases. The successes of domestic neuropathology and psychiatry made it possible to develop scientific principles for organizing specialized care for people in need.

The transfer of information in the nervous system. Mediators and receptors. Functional groups of neurons. Glial cells and the development of the nervous system in ontogenesis.

The common basic functions of the nervous system are the integration of tissues and organs into a single whole, and the coordination of their specific activity as part of holistic homeostatic and behavioral functional systems (P.K. Anokhin).

Particular functions of the nervous system include the management of the musculoskeletal system: the nervous system regulates muscle tone, initiates all types of movements in the process of labor, physical education and sports.

Regulation of the work of internal organs with the help of the autonomic nervous system and endocrine glands. Providing homeostasis for them of adaptive activity.

Providing consciousness and all types of mental activity. Mental activity is an ideal, subjectively conscious activity of the body, carried out using neurophysiological processes. Higher nervous activity is a combination of neurophysiological processes that provide consciousness, subconscious assimilation of information and the acquisition of various types of activity in ontogenesis. Mental activity is carried out with the help of higher nervous activity. Mental activity proceeds consciously, and HNA, both consciously and unconsciously.

The formation of targeted behavior of the body in a social society and the environment. It is realized through protective reactions and regulation of metabolic rate.

Structural and functional organization of the nervous system. The structural and functional unit of the nervous system is a neuron. The neuron consists of catfish and processes. Soma is the body of a neuron. It synthesizes macromolecules, which it transfers to its processes. The processes of a neuron are the dendrite formed by the outgrowths of the cytoplasm, and the axon is a tubular formation branched at the end. The accumulation of bodies of neurons forms gray matter, and the accumulation of processes - white matter. Soma and dendrites are covered with synaptic buds of other nerve cells and processes of glial cells.

CNS neurons are classified according to the following criteria:

By type of mediator - adrenergic, serotonergic, cholinergic.

By the effect on other cells - excitatory and inhibitory.

By the specificity of the perceived information, neurons of the higher parts of the brain can be mono- (neurons of the primary centers of hearing in the cortex), bi- (neurons of the secondary zone of the visual analyzer) and polysensor (neurons of the associative zones of the cerebral cortex, motor cortex). Primary afferent neurons are all monosensory.

By activity - background active and silent.

Depending on the department of the nervous system - neurons of the autonomic and somatic nervous systems.

In the direction of transmission of information - afferent, efferent and intercalary.

Glial cells make up about 50% of the central nervous system. These cells are capable of dividing; their number increases with age. Glial cells surround the soma of neurons and their axons. Glial cells perform the following functions:

Electrical insulating - gliocytes envelop neurons in the form of a case and produce myelin. Myelin is a fat-like substance, so it is very electronically stable.

Support and protective.

Exchange - the synthesis of memory proteins, the supply of neurons with nutrients, maintaining the optimal concentration of potassium ions in the interstitium, are involved in the formation of the blood-brain barrier.

Cerebrospinal fluid (cerebrospinal fluid) is a colorless, transparent fluid that fills the ventricles of the brain, spinal canal and subarachnoid space. Liquor consists of a filtrate of blood plasma and interstitial fluid. It contains a small amount of protein, amino acids and glucose. Liquor is renewed 4-8 times a day. The cerebrospinal fluid pressure in the horizontal position is 7-14 mm. Century, in the vertical - 2 times more. Liquor has a protective function, as it has bactericidal properties, contains immunoglobulins G and A, a compliment system, monocytes and lymphocytes, and is also a kind of hydraulic “pillow” of the brain, that is, it protects the brain from mechanical damage.

Trophic function - brings nutritious products to the brain and carries away metabolic products.

Drainage function - cerebrospinal fluid outflow occurs in several ways: 30-40% - through the subarachnoid space into the longitudinal sinus of the venous system; 10-20% - through the perineural spaces of the cranial and spinal nerves, the lymphatic system; and part of the cerebrospinal fluid is reabsorbed by the vascular plexuses of the brain. Depending on the location, the CNS synapses are divided into axosomatic, axodendritic, dendrodendritic, dendrosomatic. According to the mechanism of signal transmission to other cells, there are several options for synapses: chemical, electrical, and mixed synapses.

Mediators and receptors of the central nervous system. A mediator is a chemical substance with the help of which a signal is transmitted from one cell to another. Mediators are obtained by

turning the mediator. The premeditor can be synthesized in the catfish of a neuron, or enters it from the blood or cerebrospinal fluid.

In the human body, there are 20 mediators. The main ones include: amines (dopamine, norepinephrine, serotonin, histamine), acetylcholine, amino acids (glycine and γ-aminobutyric acid), polypeptides, purines - ATP, adenosine, ADP, hypothalamic hormones.

The properties of the nerve centers are associated with some features of the distribution of excitation in the central nervous system, the special properties of chemical synapses and the properties of the membranes of nerve cells. Nerve centers are characterized by the phenomenon of summation of excitation. Distinguish between temporary (sequential) and spatial summation. The most important property of nerve centers is plasticity - the ability to restructure functional properties. It includes a number of phenomena: synaptic potentiation, dominant, synaptic depression, compensation for impaired functions.

Inhibition in the central nervous system: currently two types of inhibition are known - presynaptic and postsynaptic and three types of inhibitory insertion neurons - glycerinergic, GABAergic and mixed-type neurons that secrete both GABA and glycine. Inhibition in the central nervous system: two types are currently known inhibitions - presynaptic and postsynaptic and three types of inhibitory insertion neurons - glycerinergic, GABAergic and mixed type neurons that secrete both GABA and glycine.

Both types of braking perform a protective role. The absence of inhibition would lead to depletion of the mediator and the cessation of the central nervous system. Inhibition plays an important role in processing incoming information: a) the number of impulses reaching the neuron is determined by presynaptic inhibition; b) inhibition of the lateral paths provides the selection of significant signals from the background.

Inhibition is an important factor in ensuring coordination of the central nervous system.

Coordination activity of the central nervous system. Coordination activity of the central nervous system is the coordination of the activities of various departments of the central nervous system by streamlining the distribution of excitation between them. Special centers for coordination of the central nervous system do not exist. It is carried out through the interaction of processes of excitation and inhibition. There are a number of factors that ensure the interaction of centers among themselves, centers and working organs and forming the adaptive activity of the body.

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
2. Ахметова Ж.Б. Семиотика поражения черепно-мозговых нервов : учебное пособие / Ж. Б. Ахметова. - 2-е изд. - Караганда : АҚНҰР, 2019. - 162 с. Экземпляры: всего:15 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(12)
3. Киспаева Т. Т. Атлас по неврологии : учебное пособие / Т. Т. Киспаева. - 2-е изд. - Караганда : АҚНҰР, 2019. - 126 с. Экземпляры: всего:25 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(22)

Supplementary:

1. Неврология. Национальное руководство. Краткое издание: руководство / под ред. Е. И. Гусева. - М. : ГЭОТАР - Медиа, 2016.**в)**
2. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева,

Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. - Караганда : ИП "Ақнұр", 2015

Electronic resources:

1. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
2. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
3. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.
4. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

№	Name	Link
1	Repository SKMA	http://lib.ukma.kz/repository/
2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

5. Control questions:

1. Define the concept of "Neurology"
2. Who was one of the first to formulate the concept of reflex
3. Who is one of the founders of child psychoneurology in Russia
4. Who is one of the founders of the study of hereditary diseases
5. What are the private functions of the nervous system
6. What are the characteristics of central nervous system neurons?
7. What functions do glial cells perform?
8. What are mediators and receptors of the central nervous system

Lecture No. 2

1. Topic: Sensitivity, symptoms and syndromes of the lesion, research methods. Autonomic nervous system, symptoms and syndromes of damage, research methods.

2. Purpose: to acquaint students with the basic functions, symptoms and syndromes of damage to the sensitive sphere, autonomic nervous system. To consolidate theoretical knowledge and practical skills.

3. Theses of the lecture:

To perform its functions, the nervous system needs to receive continuous information about the state of the internal and external environment, which is perceived by the huge receptor apparatus, including the sensory organs. From the general stream of impulses, the body perceives only a part, which, unlike reception, is defined as sensitivity. *Sensitivity*is the ability of a person to feel the effects of internal and external stimuli. *Front desk* perception of the outside world, which is provided by all senses. It is customary to distinguish between sensitivity and sensory organs.

The classification of types of sensitivity is based on determining the role of receptors, the structural features of which determine the function of the entire analyzer system. Which includes the receptor department, the pathways of the final (cortical) department. In the cerebral cortex, an analysis and synthesis of irritation is carried out, as a result of which a sensation arises. *Types of receptors* exteroreceptors located in the skin and mucous membranes; proprioreceptors located in the muscles, tendons, joints, semicircular canals and labyrinth; viscероreceptors (interoreceptors) located in the internal organs, vessels.

Sensitivity Classification:

- simple types of sensitivity — superficial (tactile, pain, temperature) and deep (muscular-articular sensation, a sense of vibration, a sense of weight, a sense of pressure);
- complex types of sensitivity - superficial (sense of localization, two-dimensional spatial sense, discriminatory feeling) and deep (stereognosis, skin-kinesthetic feeling).

General characteristics of sensitive pathways: afferent, three-neuronal, crossed (go to the opposite side).

Ways surface sensitivity (pain, temperature):

Starting with path ekstraretseptorov

Localization neuron I - in the intervertebral ganglia

neuron

Localization II - posterior horn of the spinal cord (tractus spino-talamicus)

Localization III neuron - ventrolateral thalamus nuclei (tractus thalamo-corticalis)

on Perekrest level of the anterior gray commissure of the spinal cord.

The path ends in the postcentral gyrus of the cerebral cortex.

Ways deep sensitivity (tactile, musculo-articular):

Starting with path proprioceptors

Localization neuron I - in the intervertebral ganglia (fasciculus gracilis, fasciculus cuneatus)

Localization II neuron - Gaulle Burdach nucleus in the medulla oblongata (tractus bulbo-thalamicus)

Localization neuron III - ventrolateral nuclei of the optic tubercle (tractus thalamo-corticalis)

Crossing at the level of the medulla oblongata (lemniscus medialis)

The path ends in the postcentral gyrus of the cerebral cortex.

Types of sensitive disorders

Quantitative: anesthesia - loss of sensation; hypesthesia - decreased sensitivity; hyperesthesia - increased sensitivity.

Qualitative: dysesthesia - a perversion of sensitivity (perception of touch as pain); alloheria - a pathological perception of irritation, when it is not at the site of application, but in the symmetrical half of the body; polysthesia - a type of perversion of pain sensitivity, in which individual irritations are perceived as multiple; hyperpathy is a type of sensitive disorder in which the slightest irritation can be accompanied by extremely unpleasant sensations with a long-term effect; senestopathy - a variety of painful, long-disturbing patients with a burning sensation, pressure, etc. without obvious organic reasons; synesthesia - perception not only in the irritation zone, but also in the symmetrical region; paresthesia - burning sensation, tingling, crawling creeps, etc., arising spontaneously, without visible external influences.

Pain —hardly any other particular and diverse phenomenon and its causes cause clinical pain in pain medicine, such as pain. Pain is initially a vital protective biological phenomenon. Types of pain: Local - occur in the field of causing pain irritation. Projection - arise in the area of projection of the innervation of a given nerve or nerves. This also includes phantom pain in people who have had amputation of an extremity; an illusion of pain in absent limbs is created. Radiating - irritation spreads from one branch of a nerve to another (pain in both jaws in the presence of pulpitis of one tooth). Reflected - also the result of irradiation of irritation in diseases of internal organs (pain in the arm and under the scapula with angina of the Zakharyino-Ged zone).

Among the pain symptoms, tension symptoms are important when the nerve trunks and roots of the spinal cord are damaged. Symptoms of Laseg, Neri, Sekar, Matskevich, Wasserman.

Types of Sensory Disorder: *I - peripheral type* (Mononeurotic type - violation of all types of sensitivity in the innervation zone of the affected nerve. Polyneurotic - multiple nerve damage is accompanied by a symmetrical distal disorder of all types of sensitivity like "stockings", "socks", "gloves." Plexus - damage to the plexuses causes a disorder all types of sensitivity in the zone of nerve innervation emanating from this plexus Radicular - in case of damage to the posterior root of the spinal cord, there is a disorder of all types of sensitivity in the corresponding segmental zones.); *II- spinal type* (In case of damage to the posterior horn of the spinal cord, a dissociated sensitivity disorder occurs: loss of surface sensitivity in the corresponding segmental zone on the same side while maintaining deep sensitivity. If the anterior gray commissure is damaged, there is a disorder of surface sensitivity in segmental type on both sides (intersection paths) .In case of damage to the posterior cords of the spinal cord, a deep sensitivity disorder is observed while surface sensitivity is preserved. Sensitivity is disturbed by the conductor type, i.e. throughout its length below the level of its localization. A disorder of coordination of movement develops in the clinic - posterior or sensitive ataxia. the cord of the spinal cord leads to a disorder of superficial sensitivity on the opposite side, and on the side of the focus to the appearance of central paresis and paralysis. (Brown-Secar syndrome) to these signs is added a disorder of deep sensitivity below the level of the lesion. At a break of the entire diameter of the spinal cord, it is expressed by the loss of all types of superficial and deep sensitivity from the level of damage in combination with para- or tetraplegia, impaired function of the pelvic organs and pressure sores.);

III - cerebral type (in case of brain damage (cerebral type) - conduction and cortical type of sensitivity disorders (stem and hemispheric). Damage to half of the brain stem is accompanied by alternating (cross) syndromes. Hemispheric sensitivity disorder consists in the development of contralateral hemianesthesia or hemigipesthesia. It has some peculiarities depending on the localization of the lesion: with lesions in the inner capsule, hemianesthesia is combined with hemiplegia and hemianopsia (half loss of the visual fields) on the opposite side (“three hemi” syndrome). If lesions occur in the visual tubercle on the opposite side, hemianesthesia , sensitive hemataxia and peculiar thalamic pains (burning sensation) .With a focus in the sensory region of

the cerebral cortex, mono- or hemianesthesia is observed on the opposite side, violation of thin and complex types of sensitivity (while maintaining rough and elementary) , and with irritation - sensory focal epilepsy.).

The autonomic nervous system

(autonomic, visceral, nodal nervous systems- it is a department of the nervous system that regulates the activity of internal organs, glands of internal and external secretion, blood and lymph vessels, tissue trophism and homeostasis, as well as the body's adaptation to changing external environmental conditions.

The ANS operates on the principles of autonomy, self-regulation, its activity is mainly involuntary and is not directly controlled by consciousness. On the basis of physiological, morphological and morphological and functional features in the ANS, the segmental and suprasegmental departments are distinguished, as well as the sympathetic and parasympathetic parts in the segmental department.

The suprasegmental (central) ANS (the reticular formation of the brain stem, hypothalamus, thalamus, tonsil, limbic system, cerebral cortex) unites all segmental apparatuses, subordinating their activities to the general functional tasks of the whole organism. The segmental nervous system provides the vegetative innervation of individual segments of the body and related internal organs. *Segment of the autonomic nervous system:* sympathetic division of the ANS; parasympathetic division of the ANS.

The sympathetic nervous system. In its composition, theandare distinguished cerebralextra cerebral parts. The intracerebral part of the SNA is represented by nerve cells located in the lateral horns of the spinal cord at the level of the VIII cervical - II lumbar segment of the spinal cord of the SNA has the features of segmental organizations. In the SNA, there is an additional link between the spinal cord and the working organ, this is an accumulation of nerve cells called ganglia. The ganglia form a chain, which is called the sympathetic trunk, which is located along the lateral surface of the spine and has 24 pairs of sympathetic nodes: 3 cervical, 12 thoracic, 5 lumbar and 4 sacral. The main mediator of sympathetic nerves is norepinephrine. The main function of the SNA is trophic, which regulates oxidative processes, nutrient intake, and oxygen supply to the muscles. It activates vasoconstrictors, dilates the pupil and palpebral fissure, relaxes the smooth muscles of the bronchi and gastrointestinal tract, and causes constipation.

Parasympathetic nervous system. The bodies of parasympathetic neurons lie in the brain stem and sacral spinal cord.

Neurons originate in the lateral horns of the spinal cord at the level of 2-4 sacral segments controlling the function of the pelvic organs, as well as in the vegetative nuclei of the brain stem (III, VII, IX, X cranial nerves). This paired and unpaired small cell nucleus (narrows the pupil, accommodates the eye), secretory, tear-separating nucleus, upper inferior salivary nucleus (innervate the salivary glands), dorsal nucleus of the vagus nerve, from which the fiber goes to the entire internal organ.

Supersegmental division of the autonomic nervous system represented by the limbic-reticular complex (LRK) (another name for nonspecific brain formations) - which includes

- reticular formation,

- hypothalamus,

- thalamus

- tonsils,

- hippocampus,

-partition.

Limbic-reticular complex participates in the regulation of vegetative-viscerogormonal functions aimed at providing various forms of activity (eating and sexual behavior) the processes of maintaining the species in the regulation of the system, providing sleep and wakefulness attention, the emotional sphere, memory processes, thus realizing somatovegetative integration. The limbic system primarily regulates behavior and mental activity while satisfying congenital needs - instincts (obtaining food, self-preservation, reproduction, education.

*The main syndromes of segmental*lesion of the ANS *Sympathetic syndrome* is manifested by pains of a burning, pressing, bursting nature as a result of damage to the sympathetic nodes, sympathetic nerves, sympathetic fibers in mixed nerves (sciatic, median, trigeminal, etc.). Most often, sympatheticgias are localized on the limbs and in the face (trigeminal neuralgia, neuralgia of the wing-palatine node), (syndrome Sloder).

Vascular syndrome is expressed by a local discoloration of the skin and mucous membranes (Raynaud's disease, Quincke's edema). *Trophic syndrome is* characterized by a variety of local disorders of tissue trophism (skin, mucous membranes, muscles, ligaments), depending on segmental-vegetative innervation. The severity from dry skin to ulceration, spontaneous bone fractures, etc., (syringomyelia). Visceral syndromes depend on segmental innervation by the ANS of one or another internal organ. This group of diseases of the nodes of the sympathetic trunk (gangliotruncites). It should be noted that sympathetic innervation does not coincide with somatic.

Claude-Bernard-Horner syndrome - develops with damage to the ciliospinal center of the lateral horn of C8 – D1 segments of the spinal cord, manifests itself in a triad of symptoms: ptosis, myosis, enophthalmos.

Pelvic Disorder Syndrome (urination, bowel movements). With damage to segments S1 - S4, the center of parasympathetic innervation, pelvic organs, urinary and fecal incontinence occurs due to relaxation of the sphincters.

Syndromes of the suprasegmental level of affection of the ANS. A.V. Vane distinguishes the following clinical forms of damage to the hypothalamus: neuroendocrine exchange form; vegetative - vascular; vegetative - visceral; violation of thermoregulation; neuromuscular; disturbance of wakefulness and sleep; pseudo-neurotic and pseudo-psychopathological epilepsy.

If the limbic brain is affected, temporal lobe epilepsy, paroxysmal psychomotor agitation, intellectual-mnestic disorders, etc. are observed.

The defeat of the reticular formation causes akinetic mutism, myasthenic and pseudomyopathic syndromes, symptomatic hypertension, sleep and wakefulness.

Research methods

In the study of the autonomic nervous system, it is necessary to identify the initial vegetative status. To do this, check the state of regulation of vascular tone, examine skin autonomic reflexes (dermographism), pain vegetative points, thermoregulation and sweating, conducting pharmacological tests if necessary (tests with adrenaline, pilocarpine, atropine).

1. The study of the regulation of vascular tone:

1.1. Dagnini-Ashner's cardiac reflex. The patient is in a prone position. The heart rate is calculated in 1 min., Then pressed on both eyeballs (until a feeling of pressure appears) for 15 - 25 s, after which the heart rate is re-calculated. Normally, the slowdown of the pulse should be in the range of 4-8 beats per 1 min., With a predominance of parasympathetic tone - more than 8 - 12, and with a predominance of sympathetic tone, either there is no slowdown in the number of heart contractions, or the reaction is reversed - the pulse increases in compared to the original.

1.2. Clinoorthostatic test. When the subject moves from a vertical to a horizontal position, the normal heart rate slows down by 10 - 12 beats per minute. When moving from horizontal to vertical, the normal heart rate is increased by 10 - 12 beats per minute. Acceleration of the pulse when rising by more than 20 beats per minute is considered sympathicotonia, and the absence of acceleration or even slowing of the pulse as a sign of vagotonia.

2. The study of dermographism.

2.1. Small dermographism. White dermographism. Draw the blunt end of the injection needle (or the handle of a neurological hammer) over the skin of the chest or usually the back with slight pressure. After 10 - 20 s, a lily of white dermographism appears on the irritated skin area, which disappears within 10 minutes. Blanching of the skin due to spasm of the capillaries with weak irritation.

2.2. Red dermographism. Vertical lines are drawn on the skin with a blunt object with a slightly greater force than to cause white dermographism. After 10 - 15 s, a red band appears at the site of irritation, disappearing within an hour or an hour and a half. Redness of the skin caused by the expansion of the capillaries with their significant irritation.

2.3. Sublime dermographism. Vertical lines are drawn on the skin with a blunt object with considerable effort. After which, first, a red, and then a white, elevated band appears at the site of skin irritation, surrounded by a red scalloped rim.

2.4. Reflex dermographism. Draw a light touch of the needle line on the skin. After 10 - 30 s, a bright red strip 1 to 6 mm wide with uneven edges appears, inside of which there are paler or normal skin areas. Redness occurs due to the reflex expansion of arterioles and is a vasomotor reflex.

3. Painful vegetative points.

3.1. Points Birbraer A. These are pain points on the surface of the body, various combinations of which are characteristic for determining diseases of internal organs. Pressure in the temporal arteries, in the projection of the carotid arteries on the medial side of the pectoral-clavicular-mastoid muscle, in the corner between the clavicle and sternocleidomastoid muscle leads to pain.

3.2. Greenstein's point. Pain point at the inner corner of the eye socket. It is determined by pressing the tip of the little finger on the inner surface of the bone wall of the orbit in the upper-internal direction. The occurrence of pain indicates damage to the sympathetic plexus of the infraorbital artery.

3.3. The exit point of the large palatine nerve. Pressing with a spatula (or finger) alternately on the sky on the right and left (on the point) in the case of autonomic pathology leads to the appearance of pain on the affected side .

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
2. Ахметова Ж.Б. Семиотика поражения черепно-мозговых нервов : учебное пособие / Ж. Б. Ахметова. - 2-е изд. - Караганда : АҚНҰР, 2019. - 162 с. Экземпляры: всего:15 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(12)
3. Киспаева Т. Т. Атлас по неврологии : учебное пособие / Т. Т. Киспаева. - 2-е изд. - Караганда : АҚНҰР, 2019. - 126 с. Экземпляры: всего:25 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(22)

Supplementary:

4. Неврология. Национальное руководство. Краткое издание: руководство / под ред. Е. И. Гусева. - М. : ГЭОТАР - Медиа, 2016.**в)**
5. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева, Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. - Караганда : ИП "Ақнұр", 2015

Electronic resources:

6. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
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8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. Define sensitivity
2. List the main types of receptors
3. List the simple types of sensitivity
4. List the complex types of sensitivity
5. What is the general characteristic of sensitive paths
6. Outline the ways of surface sensitivity (pain, temperature)
7. State the ways of deep sensitivity (tactile, muscular-articular)
8. List the types of sensitive disorders
9. Give the concept of pain
10. List the types of sensory disorder
11. Define the autonomic nervous system
12. Which departments includes the ANS
13. What are the main functions of the sympathetic nervous system
14. What are the main functions of the parasympathetic nervous system
15. What is included in the suprasegmental department of the autonomic nervous system
16. What are the main functions of the limbic-reticular complex

17. Highlight the main syndromes of affection of the segmental level of the ANS

18. Highlight the main syndromes of the suprasegmental level of affection of the ANS

19. What are the main research methods of ANS

Lecture № 3

1. Topic: Pyramidal system, symptoms and syndromes of damage, research methods.
2. Purpose: to acquaint students with the basic functions, symptoms and syndromes of the defeat of the pyramidal system. To consolidate theoretical knowledge and practical skills.
3. Theses of the lecture: The human motor system is regulated by many levels of the nervous system: cerebral cortex, subcortical formations, trunk, cerebellum, spinal cord**.**
All movements are usually divided into: arbitrary (targeted), involuntary (automated).
Arbitrary movements are regulated by the pyramidal system, involuntary movements - by the extrapyramidal (strio-pallidar) and cerebellum. The coordinated activity of these systems makes every human movement proportionate, smooth and accurate. The anatomical basis of the nerve mechanisms of voluntary movements is the cortico-muscular path (pyramidal path).
The cortico-muscular pathway is an efferent pathway consisting of two neurons: central and peripheral. The bodies of the central neurons are located in the anterior central gyrus, and the peripheral ones in the anterior horns of the spinal cord and the motor nuclei of the cranial nerves. The path from the motor cells of the cortex to the cells of the anterior horns of the spinal cord is called the cortico-spinal path.
The part of the pyramidal pathway that goes to the motor nuclei of the cranial nerves forms the cortico-nuclear pathway. Most of the pyramidal fibers cross in the projection of the large occipital foramen (85-90%) - go into the lateral cord of the spinal cord of the opposite side, a smaller part (10%) remains in the anterior cord (Türk bundle) of its side. The cortico-nuclear pathway partially crosses in front of the motor nuclei of the cranial nerves. Axons of peripheral neurons form the motor part of the cranial and spinal nerves and innervate the entire musculature of the head, trunk and extremities of a person.
In the precentral gyrus there is a certain projection of the opposite half of the human body. In the topmost departments
the leg is represented, in the middle - the trunk and arm, in the lower - the muscles of the face, tongue, pharynx. Pathology of the cortico-muscular pathway at any level leads to the fact that conducting an impulse to the muscle becomes impossible and it becomes paralyzed. Paralysis may be full - plegia and partial - parez.
Depending on the prevalence of paralysis, there are: monoplegia, monoparesis (paralysis of one limb), hemiplegia, hemiparesis (loss or restriction of movement in one half of the body, paraparesis, paraplegia (loss or restriction of movement in a pair of upper or lower extremities) tetraparesis, tetraplegia (loss or restriction of movement of all 4 limbs.).
Topically paralysis are:
- central (spastic) paralysis - if the central neuron of the cortico-muscular pathway is damaged,
- Peripheral (flaccid) paralysis - with damage to the peripheral neuron at any level.
Syndrome of central (spastic) paralysis
Muscular hypertension - an increase in muscle tone;
Hyperreflexia is an increase in tendon and periosteal reflexes.
Clonuses are rhythmic, long undamped contractions of a muscle group with certain methods of

induction.
Extensor and flexor pathological reflexes. Extensor (reflex of Babinsky, Oppenheim, Gordon), flexion (reflex of Rossolimo, Zhukovsky, Jacobson-Lask).
Protective reflexes with irritation of a paralyzed limb (injection).
Pathological synkinesia - involuntary friendly movements in paralyzed limb.
Pathological reflexes
Methods of causing pathological reflexes.
Hand pathological reflexes:
1 - analogue of the Rossolimo reflex;
2 - Zhukovsky reflex;
3 - Jacobson-Lask reflex.
Extensor and flexor foot pathological reflexes:
4 - Babinsky reflex;
5 - Oppenheim reflex;
6 - Schaeffer reflex;
7 - Gordon's reflex;
8 - Rossolimo reflex;
9 - ankylosing spondylitis 1;
10 - Zhukovsky reflex;
11 - ankylosing spondylitis II.
Methods of inducing the main pathological protective reflexes:
12 - test Marie - Foix;
13 - cold test
The pathophysiological basis of central paralysis syndrome is the loss of inhibitory effects of the cerebral cortex on intraspinal automatisms.
Syndrome of peripheral (flaccid) paralysis: muscle atony or hypotension - loss or decrease in muscle tone; Areflexia or hyporeflexia - the absence or decrease in tendon reflexes; muscle atrophy - a violation of muscle nutrition; violation electroexcitability myshts- reaction of degeneration (katodzamykatelnoe reduction - GLC - equal to or less anodzamykatelnogo reduction - gas station), fibrillar or fascicular twitching.
Topical diagnosis I - cerebral lesions: with foci in the precentral gyrus: monoplegia (monoparesis) or hemiplegia on the side opposite to the lesion; irritation of the anterior central gyrus causes epileptic convulsive seizures; with a lesion in the knee and in the hind leg of the inner capsule: hemiplegia or hemiparesis develops with damage to the VII and XII nerves of the central type. The defeat of the pyramidal pathway in the brain stem: central hemiplegia on the opposite side. Usually the nuclei of the cranial nerves are involved in the process with the development of alternating syndromes.
A lesion in the area of the pyramidal intersection leads to paralysis of the arm on the side of the outbreak and legs on the opposite side.
Topical diagnosis II - spinal lesions: spinal cord lesions at the upper cervical level (C1-C4): central tetraplegia, loss of all types of sensitivity below the lesion level, central urination disorder (delay, periodic urinary incontinence);
Damage to the spinal cord at the level of the cervical thickening (C5-D1): peripheral paralysis of the upper extremities and central paralysis of the lower extremities, conduction disturbance of sensitivity, central urination disorder; Damage to the spinal cord at the level of the thoracic region (D2-D12): spastic paralysis of the lower extremities, central urination disorder, conduction-type sensory disturbances;
Lesion at the level of lumbar enlargement (L1-S1): flaccid paralysis and lower limb anesthesia,

central urination disorder;
The defeat of the anterior horns, anterior roots and peripheral nerves causes peripheral paralysis in the corresponding innervation zone.

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

4. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
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Supplementary:

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6. Control questions:

1. What departments of the nervous system are provided with the motor function of a person
2. What is the cortico-muscular pathway
3. Where are the central and peripheral motor neurons
4. What is central paralysis
5. List the main symptoms of central paralysis.
6. What is peripheral paralysis
7. List the main symptoms of peripheral paralysis
8. List pathological reflexes

Lecture № 4

1. **Topic:** Extrapyramidal system, symptoms and syndromes of the lesion, research methods.

2. **Purpose:** to introduce students to the main functions, symptoms and syndromes of the extrapyramidal system lesion. To consolidate theoretical knowledge and practical skills.

3. **Thesess of the lecture:**

pointsStriopallidar system (extrapyramidal) - a complex self-regulating system with numerous ring bonds and different levels of switching.

Functions of the extrapyramidal system: complex automated movements (movement, swimming, etc.); instinctive movements of self-preservation (start reflexes, maintaining the segmental apparatus in readiness for action); providing expressive facial movements; regulation of plastic tone.

The main formations of the striopallid system: caudate nucleus (nucl. Caudatus); lenticular nucleus (n. lenticularis), consisting of a shell (putamen) and a pale ball (globus pallidus); red core (n. ruber); black substance (substantia nigra) of Sommering; Lewis's subthalamic body.

Some authors include Darkshevich's nuclei, amygdala, olives and other structures. *According to phylogenesis, the*

*striopallidar system is divided:*into the younger part - the striatum, which includes the caudate nucleus and the shell and the older - the pallidum, which includes a pale ball, black substance, red core and subthalamic nucleus. In the cortex, the extrapyramidal system is represented mainly in the frontal lobe.

The extrapyramidal system is connected to arbitrary movements due to the powerful cortical-pallidar and cortical-striatal paths. The connections between the cortex, extrapyramidal system and the thalamus are bilateral and form circular neural circles to perform various movements. At

the level of the spinal cord, extrapyramidal effects are realized by alpha-small and gamma-motor neurons.

When the striio-pallidar system is damaged, two main syndromes of damage develop: *hypertonic-hypokinetic*(akinetic-rigid, Parkinson's syndrome), which develops when the pallidum is damaged (mainly black substance, *hypotonic-hyperkinetic syndrome*, which occurs when the striatum (caudate nucleus and shell) is damaged) Under normal conditions, there is a balance between acetylcholine and histamine (inhibitory mediators) on the one hand, and dopamine and serotonin (excitation mediators) on the other hand.

Pathogenesis of extrapyramidal disorders: Imbalance between mediators leads to the clinical manifestation of extrapyramidal pathology. In the presence of Parkinson's syndrome a decrease in excitation mediators was established, and in case of a hypotonic hyperkinetic syndrome, a decrease in inhibitory and an excess of excitatory mediators.

Akinetic-rigid syndrome: Oligokinesia (movement poverty) and bradykinesia (slow movements). Oligo and bradypsychia (poverty and substitution duration of mental functions). A “flexion posture” and a slow, “senile” shuffling gait. Hypomimia, rare flashing, tonic fixation of facial expressions. Slow, fading, monotonous, and slightly modulated speech (bradylalia). Increased muscle tone by type of gear (Negro symptom). Tremor of rest (head, lower jaw, in hands - such as “counting coins” or “rolling pills”). Loss of physiological synkinesia. Propulsion, retro-pulse, lateropulsion. Paradoxical phenomena. Micrography (small, fuzzy handwriting). Vegetative disorders (hyperhidrosis, hypersalivation).

*Hypotonic-hyperkinetic*syndrome: muscle hypotension; various hyperkinesis - involuntary movements of limbs and trunk.

Types of hyperkinesis: Athetosis (Greek unstable) occurs with damage to the caudate nucleus and shell, characterized by slow stereotyped, vermiform movements of the distal extremities in the facial muscles.

Chorea (Greek dance) - hyperkinesis with fast erratic, scattered, arrhythmic contractions of the muscles of the face, trunk, extremities (similar to grimacing).

Torsion dystonia (lat. Rotation, twisting), a pale ball, thalamic nuclei, subthalamic nuclei are affected, manifested by slow tonic, rotating movements, twisting of the trunk, neck, limbs.

Hemiballism (Greek. Throw) occurs when the Lewis body is damaged on the side opposite to hyperkinesis. The movements are sharp, sweeping, throwing character, expressed in the hands.

Tremor (lat. Trembling) - rhythmic hyperkinesis in the distal extremities, less often in the lower jaw, tongue.

Myoclonia (Greek crush, erratic movements) are quick, erratic short contractions without a noticeable motor effect.

Tics (French twitching) - clonic twitches of the muscles of the face, neck, fast, irregular, stereotyped.

Spastic torticollis (torticollis) is a localized hyperkinesis of a tonic, tonic-clonic nature, characterized by a contraction of the muscles of the neck with rotation or deviation of the head to the side.

Writing spasm - convulsive contractions of the fingers of the hand that occur during writing.

Facial hemi- or paraspasm occurs in one half of the face or symmetrically and synchronously on both sides at rest or during speech, eating, smiling.

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
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Supplementary:

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6. Control questions:

1. What is the striopallidar system (extrapyramidal)
2. List the main functions of the extrapyramidal system
3. List the main formations of the striopallid system
4. What sections divide the striopallidar system according to phylogenesis
5. What are the two main syndromes that develop with the defeat of the strio pallidar system
6. Pathogenesis of extrapyramidal disorders
7. List the symptoms of akinetic-rigid syndrome
8. List the symptoms of hypotonic hyperkinetic syndrome
9. List the main types of hyperkinesis

Lecture № 5

1. Topic: Peripheral nervous system, symptoms and syndromes of damage, research methods.

2. Purpose: to introduce students to the structure of the peripheral nervous system, the main issues in the diagnosis of symptoms and syndromes of damage, and methods for the study of the peripheral nervous system.

3. Theses of lecture:

Peripheral nerves are a combination of axons of spinal cord motor neurons, dendrites of cells of the intervertebral ganglia and postganglionic vegetative fibers. Upon exit from the intervertebral foramen, the front branches of the spinal nerves are intertwined with each other and form plexuses: cervical (C1-C4), brachial (C5-C8), lumbar (L1-L4), sacral (L4-S3). In the thoracic anterior branches of the spinal nerves continue into the intercostal. After the plexuses, the fibers are grouped into separate nerve trunks, which are suitable for the corresponding muscles, skin areas and other tissues (ligaments, bones). Most of these nerves are mixed, only some contain predominantly motor fibers, others are only sensitive. Here is a brief description of the most common symptom complexes of peripheral nervous system damage.

They are composed of the following individual features. Turning off the motor fibers leads to peripheral paralysis of the corresponding muscles, sensitivity is lost in the branching zone of this nerve (this zone does not coincide with the dermatoma). Often there are symptoms of irritation of sensitive fibers in the form of pain and paresthesia. Often there are vegetative disorders (marbling of the skin, its pallor or cyanosis, decreased skin temperature, pastiness, change in sweating, etc.). A deep reflex corresponding to the affected nerve may decrease or fall out, hypotension and muscle loss may appear. Amyotrophy usually becomes noticeable after 2-3 weeks. Valuable diagnostic information can be obtained by electrophysiological studies.

Damage to the brachial plexus

The front branches of the V and VI cervical nerves merge and form the upper trunk of the brachial plexus, VIII of the cervical and I-II pectoralis - the lower, VII cervical nerve continues into the middle trunk.

The defeat of the entire brachial plexus is accompanied by flaccid atrophic paralysis and anesthesia of all kinds on the upper limb. Biceps, triceps, and carporadial reflexes disappear. Scapular muscles are also paralyzed, Bernard-Horner syndrome is observed.

In clinical practice, a lesion of one of the brachial plexus trunks is often found.

The defeat of the *upper trunk of the brachial plexus* leads to paralysis of the proximal arm, involving the deltoid, biceps, brachial, supra- and infraspinatus, subscapularis, anterior dentate muscles. Hand and finger function is maintained. Biceps reflex is lost, carpo-radial is reduced. Sensitivity is upset on the outer surface of the shoulder and forearm in the zone of the roots CV-CVI. This clinical picture is called Duchenne-Erb paralysis.

In case of damage to the *lower trunk of the brachial plexus (Dejerine-Klumpke paralysis)* , the distal parts of the upper limb (flexors of the hand and fingers, interosseous and other small muscles) suffer. Sensitivity falls in the zone of roots CVIII-DII (the inner surface of the hand, forearm and shoulder). With high damage to the roots, the Bernard-Horner symptom joins on the same side.

The defeat of the *middle trunk of the brachial plexus* is manifested by paralysis of the extensors of the fingers and hand, flexor of the hand, round pronator. Anesthesia is localized on the back surface of the hand in the root zone of CVII.

In the subclavian fossa, depending on the topographic relationship with a. Axillaris trunks of the brachial plexus receive the names: lateral, posterior and medial. Below them peripheral nerves are formed, the main among them are radial, ulnar and median.

Radial nerve (n.radialis). It is formed by the fibers of the root CVII (partially CV-CVIII, DI) and is a continuation of the posterior (middle) trunk of the brachial plexus. The following muscles innervate the motor fibers: the triceps of the shoulder, the ulnar, radial and ulnar extensors of the wrist, the extensor of the fingers, the arch support of the forearm, the long abduction thumb and the shoulder-beam. In case of damage to the radial nerve, extension of the forearm, extension of the hand and fingers are disturbed, a “hanging” hand appears, and it is impossible to retract the thumb. Such a test is used: when the hands folded together with the palms of the fingers are straightened so that the wrists continue to touch, the fingers of the affected hand do not move away, they bend and glide over the palm of a healthy hand. The triceps reflex disappears and the carpo-radial decreases. In addition to motor disorders, when this nerve is damaged, sensitivity on the dorsal surface of the shoulder, forearm, hand, thumb and forefinger is impaired. The joint-muscle feeling does not suffer.

Approximately in the middle of the shoulder, the radial nerve is adjacent to the bone. It is at this level that the nerve can be compressed during sleep. The ischemic nerve damage that occurs under these conditions is called "sleepy" neuritis.

The ulnar nerve (n.Ulnaris) begins from the medial (lower) trunk of the brachial plexus (roots CVII, CVIII, DI). At the level of the medial epicondyle of the shoulder, the nerve passes under the skin, and here it can be felt. With trauma to this area, paresthesia may occur in the form of a sensation of an electric current in the area of the end of the skin branches of the nerve (ulnar side of the hand and V finger, medial surface of the fourth). In the same area, anesthesia occurs with a complete nerve break. The motor muscles of the ulnar nerve supply the following muscles: ulnar flexor of the hand, deep flexor of the IV, V fingers, short palmar, all interosseous, III and IV vermiform, leading the I finger of the hand and the deep head of the short flexor of the I finger.

If the ulnar nerve is damaged, paralysis and atrophy of the muscles listed above develop: interosseous spaces sink, the elevation of the V finger (hypothenar) is flattened, the hand takes the form of a “clawed paw” (extension of the main phalanges and flexion of the middle and terminal fingers). The following tests can be used:

a) when compressed into a fist, the V, IV and partially III fingers are not bent enough;

b) the inability to bring fingers, especially V and IV;

c) with tightly pressed palm to the table, scratching movements of the terminal phalanx of the V finger are impossible;

d) thumb test: the patient grabs a strip of paper with the index and straightened thumbs of both hands and stretches it; on the side of the affected ulnar nerve, the strip of paper is not held (paralysis of the muscle of the thumb, m.adductor pollicis). To hold the paper, the patient bends the terminal phalanx of the thumb (contraction of the flexor of the thumb supplied with the median nerve).

The median nerve (n.medianus). It is formed by the branches of the medial and lateral trunks of the brachial plexus (root fibers CV-CVIII, DI). The motor portion of the nerve supplies the following muscles: the radial flexor of the hand, the long palm, square pronator, I, II and III worm-shaped, deep and superficial flexor of the fingers, the long flexor of the I finger, II and III interosseous, contrasting and short abduction of the first finger of the hand.

In case of damage to the median nerve, flexion of the hand, I, II, III fingers, extension of the middle phalanges of II and III are weakened, pronation is disturbed, opposition of the first finger is impossible.

Due to atrophy of the muscles of the elevation of the I finger (thenar), flattening of the palm occurs. This is further aggravated by the fact that due to paralysis of m.opponens pollicis, the finger becomes in one plane with the rest of the fingers. The palm acquires a peculiar flattened shape in the form of a spatula and resembles a monkey’s brush.

The following tests are used to recognize motor disorders with suffering from the median nerve:

a) scratching the flexion of the terminal phalanges of the index finger is impossible when the hand is firmly pressed to the table;

b) when the hand is compressed into a fist, I, II and III fingers are not bent;

c) when testing the thumb, the patient cannot hold a strip of paper with the bent thumb, keeps it straightened (due to the muscle leading to the thumb; it is supplied with the ulnar nerve).

Sensitive fibers innervate the skin of the palmar surface of the I, II, III fingers and the radial side of the IV finger, as well as the rear skin of the terminal phalanges of these fingers. When the median nerve is damaged in this zone, anesthesia sets in and the joint-muscle feeling in the terminal phalanx of the II and III fingers is lost.

When a nerve is damaged, especially partial, pain with the features of causalgia, as well as vasomotor trophic disorders (cyanotic-pale coloration of the skin, its atrophy, dullness and brittleness, streaked nails) can occur.

Lesions of the lumbar plexus and femoral nerve

The lumbar plexus is formed by the anterior branches of the spinal nerves LI-LIII and partially DXII, LIV. Two main nerves begin from them: obturator and femoral. The first of them innervates the adductors of the thigh. When this nerve is affected, the patient cannot put one leg on the other (lying or sitting), rotation of the leg to the outside is difficult, sensitivity on the inner surface of the thigh is frustrated. The femoral nerve is formed from the roots of LII-LIV. Its motor portion innervates the muscles: iliac-lumbar, quadriceps femoris, tailor, scallop, etc. Sensitive fibers of this nerve supply the skin of the anterior thigh and medial tibia. If the nerve is damaged, extension of the lower leg, hip flexion (when leading the leg to the stomach) is lost, the anterior group of thigh muscles atrophy. The knee jerk disappears. In the area of the skin supply of the nerve, sensitivity disorders appear. With irritation of the femoral nerve, a symptom of Wasserman is revealed: the patient lies on his stomach, at the moment of passive lifting of the straightened leg up, pain occurs in the inguinal region and the anterior surface of the thigh.

The defeat of the sacral plexus, sciatic nerve and its branches

The sacral plexus is composed of roots LV, SI, SII and partially LIV, SIII; A direct continuation of this plexus is the largest nerve of the human body - the sciatic (n.ishiadicus), which at the level of the upper part of the popliteal fossa, sometimes even higher, is divided into two branches: the fibular nerve (n.peroneus s.fibularis) and the tibial (n. tibialis).

The clinic often observes the defeat of not only the entire sciatic nerve, but also one of its branches. First, we present the symptoms of damage to individual branches.

The fibular nerve (fibers of the roots LIV, LV, SI) supply the following muscles: the anterior tibial, long extensor of the fingers and fibula. If this nerve is damaged, the back flexion of the foot and fingers is impossible, as well as turning the foot outward. The foot dangles and is slightly reduced inwards (pes equinovarus). The patient’s gait is characteristic: in order not to touch the ground with his toe, the leg rises high, when lowering it touches the soil first with the toe, then with the outer edge of the foot and only then with the sole (step). The patient can not stand and walk on his heels, as well as beat a musical beat in the foot. Sensitive disorders are localized on the outer surface of the lower leg and rear foot. The joint-muscle feeling is usually not disturbed.

The tibial nerve (fibers of the roots LIV-SIII) provides: the triceps muscle of the lower leg, flexors of the toes, the posterior tibial and some others. If this nerve is damaged, plantar flexion of the foot and fingers becomes impossible, turning the foot inward. The foot is slightly bent, its arch is deepened, the fingers are bent in the middle and terminal phalanges, the heel protrudes (pes calcaneus); walking on the toe of a sore leg is impossible. The Achilles reflex disappears. Sensitivity is frustrating on the back of the leg, sole and toes. Similar to the median, with partial damage to this nerve, intense, excruciating pain, causation, often occurs.

Damage to the common trunk of the sciatic nerve is accompanied by paralysis of the foot and fingers, paresis of the flexors of the lower leg. Achilles reflex disappears, all kinds of sensation on the foot and lower leg are lost, i.e. at the same time the function n.peroneus and n.tibialis drop out. Pain on the back of the thigh, in the lower leg and foot is characteristic. Lasegus symptom is caused.

In case of damage to the sacral plexus, in addition to the symptoms of loss of the n.ishiadicus function, paresis and gluteal muscles join (extension and abduction of the thigh are difficult).

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

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5. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева, Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. - Караганда : ИП "Ақнұр", 2015

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7. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
8. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.

9. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

№	Name	Link
1	Repository SKMA	http://lib.ukma.kz/repository/
2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

Control questions:

1. Give the definition of the peripheral nervous system
2. Outline the structure of the brachial plexus
3. What are the symptoms of brachial plexus lesion?
4. What are the symptoms of damage to the radial nerve
5. What are the symptoms of ulnar nerve damage?
6. What are the symptoms of median nerve damage?
7. Outline the structure of the lumbar plexus
8. Name the symptoms of damage to the lumbar plexus and femoral nerve
9. What are the symptoms of damage to the sacral plexus, sciatic nerve and its branches

Lecture No. 5

1. Topic: Functions and methods of the examination 12 pairs of cranial nerves. I, II, III, IV, V, VI pairs of cranial nerves.

2. Purpose: to introduce students to the methods of studying the function of the cranial nerves, the basics of the topical diagnosis of the main syndromes of damage to the cranial nerves and brain stem at different levels.

3. Theses of the lecture:

The motor function of the muscles of the face, eyeballs, soft palate, pharynx, vocal cords and tongue, as well as the sensitivity of the skin of the face, mucous membranes of the eye, mouth, nasopharynx and larynx are provided by cranial nerves. Of the 12 pairs of cranial nerves, I, II, and VIII pairs are purely sensitive, motor — III, IV, VI, VII, XI, and XII pairs and mixed — V, IX, X pairs. Many of them contain vegetative fibers (III, VII, IX and Xpairs). *Sensitive nerves* make up the peripheral sections of the analyzers: olfactory (I), visual (II), auditory (VIII), vestibular (VIII) and taste (VII, IX). These nerves transmit environmental information mainly through distant receptors. The first two of the cranial nerves (olfactory and visual) in structure are different from the others (they are, as it were, parts of the brain brought to the periphery). The other 10 pairs of cranial nerves, in addition to the peculiarity of each of them, have common features with the spinal roots and nerves. *The motor nucleus of the* cranial nerve is a complex of neurons homologous to the cells of the anterior horns of the spinal cord. Damage to the motor nucleus of one or another cranial nerve leads to unilateral paralysis of the innervated muscles. Paralysis will have signs of damage to a peripheral neuron. Unilateral damage to the nucleus of the cranial nerve of the cortical-nuclear fibers as a result of their incomplete intersection of central paralysis does not cause, since their function is compensated by non-crossed fibers. Only the lower part of the VIIth and completely XII pairs intersect completely.

Bilateral break of cortical-nuclear fibers leads to bilateral paralysis of the corresponding cranial nerves. Paralysis will have signs of damage to the central neuron. Sensitive conductors, cranial nerves, also have common signs with similar formations of the spinal nerves. In both of them, the three-neuronal structure, the peripheral (receptor) neuron is located in the ganglion of the corresponding cranial nerve, the second neuron is in the sensitive nucleus, and the third neuron is in the ventrolateral nucleus of the optic tubercle. Impulses to the nuclei of the motor cranial nerves come not only from the central motor neuron, but also from other suprasegmental structures, and above all, from the extrapyramidal and cerebellar systems. Therefore, when lesions of these systems is observed not only motor dysfunction of the cranial nerves, but amimia, quiet unmodulated speech as display bradykinesia, chanting speech disorders due to interaction of synergists and antagonists involved in the articulation,*etc.Oculomotor group of cranial nerves*. This group of cranial nerves is designed to ensure the effective functioning of the organ of vision. The movements of the eyeballs are carried out by muscles innervated by three pairs of nerves (oculomotor, block and abduction). They provide maximum visibility with limited visual fields. The abducent nerve (VI pair), innervates the external rectus muscle of the eye, the block nerve (IV pair), innervates the superior oblique muscle of the eye, and the oculomotor nerve (III pair), provides the innervation of the five external muscles of the eye: raising the upper eyelid, lower oblique, and three straight - inner, upper and lower. Function of the rectus muscles: they rotate the eyeball in the corresponding direction. The upper oblique muscle is involved in turning the eyeball down and out, the lower oblique is down and out, the lower oblique is up and out. The function of the muscle that lifts the upper eyelid is clear from its very name. Innervation of the gaze. For the implementation of arbitrary movements of the eyeballs, impulses from the cerebral cortex must go to the nuclei of the group of oculomotor nerves. Normally, the eyeballs move in all directions in a friendly manner.

Reflex combined movements of the eyeballs in a horizontal plane. In the posterior section of the second frontal gyrus (near the area of the face of the precentral gyrus) there is an area that affects the rotation of the eye in the opposite direction. The axons of these central neurons pass as part of the anterior pedicle of the internal capsule, then in the pedicle of the brain, and in the brain bridge, the main part of them passes to the opposite side to the nucleus of the abducent nerve. The connection of neurons of the abduction nerve - (the external rectus muscle of the eye)

with the neurons of the heterolateral large-cell nucleus of the oculomotor nerve (internal rectus muscle) is provided by the medial longitudinal bundle system.

Combined turns of the eyes in the directions up, down, circular movements. To perform such movements requires simultaneous contraction of many muscles of both eyeballs. This provides a medial longitudinal bundle. The movements of the eyeballs, in most cases combined with turning the head and even the body in the corresponding direction, are caused both voluntarily and reflexively - to certain visual, as well as vestibular, auditory and other irritations. The nuclei of this beam are the nucleus of the medial longitudinal beam and the intermediate nucleus of Darshkevich and Kakhal. They are located at the bottom of the water supply and 4 ventricles. Conductors begin in the lining of the midbrain and descend along the bottom of the aqueduct of the brain and IV ventricle into the spinal cord and approach the cells of the anterior horns of the cervical segments. The medial longitudinal bundle connects the nuclei of the nerves of the oculomotor group with the auditory and vestibular nuclei, as well as the spinal cord. This provides gaze when turning the head. The visual analyzer also takes part in the combined movements of the eyeballs. In the occipital region, an occipital oculomotor bundle is formed, which goes in the opposite direction to the Graziole beam and passes through the back leg of the inner capsule and ends in the upper hills of the quadruple. It is believed that the rapid movements of the eyeballs are controlled by the premotor zone of the frontal cortex of the opposite hemisphere, and the smooth focused ones are controlled by the occipital-parietal cortex. When the frontal oculomotor pathway is affected, friendly movements in the horizontal plane are disturbed and gaze paralysis occurs: eyeballs cannot be arbitrarily taken away in the opposite direction, they turn out to be looking towards the affected hemisphere “the patient is looking at the focus”. If the focus is located at the level of the bridge, then the eyeballs are reflexively diverted to the side opposite to the focus, “the patient turns away from the focus”. With irritation of the cortex of the second frontal gyrus (Jacksonian epilepsy), convulsive twitching of the eyeballs occurs in the direction opposite to the focus.

When the area of the roof of the midbrain is affected, gaze paralysis occurs upward, less often downward, often combined with convergence paralysis and pupil disorders (Parino syndrome). Violated the combined movement of the eyeballs vertically.

Partial damage to the medial longitudinal bundle can lead to the fact that the eyeballs are in a different position relative to the horizontal line - diverging strabismus vertically: the eyeball on the side of the focus deviates downward and inward, and the other upward and outward (Gertwig-Magandie symptom) . With a complete interruption of the medial longitudinal beam, internuclear ophthalmoplegia occurs. The defeat of the medial longitudinal bundle system is usually accompanied by nystagmus.

Violation of the associated movements of both eyes causes the appearance of double vision, since the image is then projected onto asymmetric sections of the retina.

4. Illustrative material: presentation, video materials on the department’s YouTube channel.

5. Literature:

Basic:

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Supplementary:

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5. Electronic database

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2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. Name FMN with only motor function
2. Name FMNs with only sensitive function
3. What are FMNs with motor and sensory nuclei in their composition?
4. How is the innervation of the gaze

Lecture No. 6

1. Topic: Functions and research methods of 12 pairs of cranial nerves. VII, VIII, IX, X, XI, XII pairs of cranial nerves

2. Purpose: to introduce students to the methods of studying the function of the cranial nerves, the basics of the topical diagnosis of the main syndromes of damage to the cranial nerves and brain stem at different levels.

3. Theses of the lecture:

A group of nerves of the cerebellopontine angle. The junction of the bridge and the medulla oblongata, covered from above by the cerebral hemisphere, is called the cerebellopontine angle. Here come out of the brain stem: caudally - the roots of the vestibulo-cochlear nerve (VIII pair), and anteriorly - the facial nerve (VII pair). Anterior to the root of the facial nerve at the exit level of the transverse fibers of the bridge (middle cerebellar legs) comes out the root of the trigeminal nerve. The vestibular cochlear nerve has a sensitive function, the trigeminal and facial nerves are mixed, i.e. possess motor, sensory and autonomic functions.

The caudal group of cranial nerves The

caudal group of cranial nerves consists of the hyoid nerve (XIIpair), accessory (XIpara), vagus (Xpair) and glossopharyngeal (IXpara). These nerves are also called nerves of the bulbar group, since their nuclei are located in the lining of the medulla oblongata.

The nucleus of the hyoid nerve lies most caudally in the lower corner of the rhomboid fossa, and the motor nucleus XiIXpar (double nucleus) is located anterior and posterior to it, in the thickness of the reticular formation of the tire. In topographic terms, it is important to remember that the XII nerve leaves the cranial cavity separately through the eponymous canal of the base of the occipital bone, while the IX, X, and XI nerves go through the jugular opening.

The hyoid nerve innervates the muscles of the corresponding half of the tongue, and the vagus and glossopharyngeal - the muscles of the pharynx, larynx and soft palate.

The accessory nerve has a spinal part originating from the anterior horns C1-C5, and a cerebral, called vagus, since it starts from the aforementioned double nucleus of X and IX nerves, and its fibers then join the vagus nerve.

The cerebrospinal part is interesting in that the fibers of the roots C1-C5 that form it rise to the large occipital foramen, enter through it into the cranial cavity, where they connect to the vagus part and form together the accessory nerve. However, the fibers of the cerebral part then leave it to the vagus nerve, and the remaining fibers of the cerebrospinal part exit the cranial cavity through the jugular opening and are sent to the trapezius and sternocleidomastoid muscles.

Assessment of the functions of the caudal group of cranial nerves begins when communicating with the patient. Symptoms of the lesion are the nasal tone of the voice - rhinolalia, as well as slurred speech - dysarthria, "porridge in the mouth." The patient often chokes when swallowing - dysphagia (you need to offer the patient to drink water, chew or swallow, for example, a piece of bread, etc.). Also, the patient is offered to open his mouth and examine the nasopharynx and tongue. The overhang of the soft palate and the decrease or absence of its mobility during phonation (you should ask the patient to utter the sound "aa") is a sign of damage to IX - X pairs of cranial nerves. This is usually accompanied by a decrease or absence of a pharyngeal reflex.

Bulbar and pseudobulbar syndromes.

Bulbar syndrome. The combined lesion of the glossopharyngeal, vagus and sublingual nerves in the peripheral type leads to the development of so-called bulbar paralysis. It occurs when the nuclei of IX, X and XII pairs of cranial nerves are damaged in the region of the medulla oblongata or their roots on the basis of the brain, or the nerves themselves. This can be either a

unilateral or a bilateral lesion. The latter is incompatible with life. It is observed with amyotrophic lateral sclerosis, circulatory disturbances in the region of the medulla oblongata, stem tumors, stem encephalitis, syringobulbia, polyencephalomyelitis, polyneuritis, anomalies of the large occipital foramen, fracture of the base of the skull, etc.

Soft paralysis, epiglottis. The voice becomes nasal, deaf and hoarse (aphonia), slurred speech (dysarthria) or impossible (anarthria), the act of swallowing is violated: liquid food enters the nose, larynx (dysphagia), pharyngeal and palatine reflexes are absent. On examination, immobility of the palatine arches and vocal cords, fibrillar twitching of the muscles of the tongue, their atrophy, and mobility of the tongue are limited up to glossoplegia. Violations of the vital functions of the body (respiration and cardiac activity) are observed.

Similar disorders of swallowing, phonation, and articulation of speech can occur when not the IX, X, and XII pairs of cranial nerves are affected, but the cortical-nuclear pathways connecting the cerebral cortex to the corresponding nuclei of the cranial nerves. Since in this case the medulla oblongata is not affected, this syndrome is called "false" bulbar paralysis (pseudobulbar syndrome).

Pseudobulbar syndrome. The main difference between the pseudobulbar syndrome is that, being central paralysis, it does not lead to the loss of unconditioned stem reflexes associated with the medulla oblongata.

With unilateral damage to the supranuclear paths, no disorders of the glossopharyngeal and vagus nerves occur due to the bilateral cortical innervation of their nuclei. The resulting violation of the sublingual nerve function is manifested only by a deviation of the tongue when protruding to the side opposite to the lesion (i.e., towards the weak muscle of the tongue). Speech disorders are usually absent. Thus, the pseudobulbar syndrome occurs only with bilateral damage to the central motor neurons IX, X and XII pairs of cranial nerves. As with any central paralysis, muscle atrophy and changes in electrical excitability do not occur. In addition to dysphagia, dysarthria, reflexes of oral automatism are expressed: nasolabial, labial, proboscis, palmar chin Marinescu - Radovichi and others, as well as violent crying and laughter. Damage to the cortical-nuclear pathways can occur in various cerebral processes: vascular diseases, tumors, infections, intoxications and brain injuries.

ALTERNATING SYNDROMES AT DAMAGE OF THE BRAIN OF THE BRAIN

During pathological processes in the base of the brain stem, alternating syndromes arise: peripheral paralysis of one or another cranial nerve on the side of the pathological focus and central - on the opposite side, with the involvement of sensitive pathways in the pathological process, an alternating hemianest is possible.

The most frequent alternating syndromes are Jackson (paralysis of the XII pair), Avelis (X and IX pairs), Schmidt (IX and X, XI pairs), Millar-Gubler (VII pair), Fauville (VI or VI and VII pairs), Weber (III couple).

Accordingly, the localization of the lesion in the brain stem alternating syndromes are divided into:

a) pedunculate (with damage to the legs of the brain); b) pontine, or bridge (with damage to the brain bridge); c) bulbar (with damage to the medulla oblongata).

Peduncular alternating syndromes. Weber's syndrome is characterized by damage to the oculomotor nerve on the side of the lesion and hemiplegia with central paresis of the muscles of the face and tongue (damage to the cortical-nuclear pathway) on the opposite side. Benedict's syndrome occurs when localized in the medial-dorsal part of the midbrain, is manifested by damage to the oculomotor nerve on the side of the focus, choreoathetosis and intentional trembling of the opposite limbs. Claude's syndrome is characterized by damage to the oculomotor nerve on the side of the lesion and cerebellar symptoms (ataxia, adiadokhokinez,

dysmetria) on the opposite side. Sometimes, dysarthria and swallowing disorder are noted. Foix syndrome develops with an isolated lesion of the anterior red nucleus without involvement of the oculomotor nerve (upper red nucleus syndrome); consists of cerebellar symptoms, intentional hemitremor, choreoathetosis, sensitivity disorders, changes in visual fields.
Pontinous (bridge) alternating syndromes Miyyar-Gubler syndrome occurs with damage to the lower part of the bridge, is characterized by peripheral damage to the facial nerve on the side of the outbreak, central paralysis of opposite limbs. Brissot-Sikar syndrome is detected by irritation of the cells of the nucleus of the facial nerve in the form of contraction of facial muscles on the side of the focus and spastic hemiparesis or hemiplegia of opposite limbs. Fauville syndrome is characterized by damage to the facial and abducent nerves (in combination with paralysis of the gaze) on the side of the focus and hemiplegia, and sometimes hemianesthesia (due to damage to the medial loop) of the opposite limbs. Raymond-Sestan syndrome is characterized by a combination of paresis of the gaze towards the pathological focus, ataxia and choreoathetosis on the same side with hemiparesis and hemianesthesia on the opposite side.
Bulbar Alternating Syndromes Jackson Syndrome is characterized by peripheral lesion of the hyoid nerve on the side of the focus and hemiplegia or hemiparesis of the extremities of the opposite side. Avellis syndrome includes lesions of the glossopharyngeal and vagus nerves (paralysis of the soft palate and vocal cord on the side of the focus with choking when eating, getting liquid food in the nose, dysarthria and dysphonia) and hemiplegia on the opposite side.
Babinsky-Najott syndrome is manifested by cerebellar symptoms in the form of hemataxia, hemiasinergy, lateropulse (as a result of damage to the lower cerebellar peduncle, olive-cerebellar fibers), myosis or Bernard-Horner syndrome on the outbreak side and hemiplegia and hemianesthesia on the opposite side. Schmidt's syndrome includes paralysis of the vocal cords, soft palate, trapezius and sternocleidomastoid muscles on the affected side (IX, X and XI nerves), hemiparesis of the opposite limbs. Wallenberg-Zakharchenko syndrome is characterized by symptoms on the side of the lesion: paralysis of the soft palate and vocal cords, anesthesia of the pharynx and larynx, facial sensitivity disorder, Bernard-Horner syndrome, hemataxia with damage to the cerebellar tract and respiratory distress (with an extensive lesion in the medulla oblongata) and opposite side: hemiplegia, analgesia and thermoanesthesia.

4. Illustrative material: presentation, video materials on the department’s YouTube channel.

5. Literature:

Basic:

10. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
11. Ахметова Ж.Б. Семиотика поражения черепно-мозговых нервов : учебное пособие / Ж. Б. Ахметова. - 2-е изд. - Караганда : АҚНҰР, 2019. - 162 с. Экземпляры: всего:15 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(12)
12. Киспаева Т. Т. Атлас по неврологии : учебное пособие / Т. Т. Киспаева. - 2-е изд. - Караганда : АҚНҰР, 2019. - 126 с. Экземпляры: всего:25 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(22)

Supplementary:

13. Неврология. Национальное руководство. Краткое издание: руководство / под ред. Е. И. Гусева. - М. : ГЭОТАР - Медиа, 2016.**в)**
14. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева, Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. -

Караганда : ИП "Ақнұр", 2015

Electronic resources:

15. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
16. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
17. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.
18. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

№	Name	Link
1	Repository SKMA	http://lib.ukma.kz/repository/
2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. Name FMN with only motor function
2. Name FMNs with only sensitive function
3. What are FMNs with motor and sensory nuclei in their composition?
4. How is the innervation of the gaze
5. List FMN included in the caudal group of cranial nerves
6. State symptoms of Bulbar Syndrome
7. State the symptoms of Pseudobulbar Syndrome
8. What are alternating syndromes
9. What alternating syndromes develop when a brain leg is affected
10. What alternating syndromes develop when a brain bridge is damaged
11. What alternating syndromes develop with damage to the medulla oblongata

Lecture No. 7

1. Topic: Higher mental /cognitive functions, symptoms and syndromes of lesion.Research methods.

2. Purpose: to introduce students to the structure of the cerebral cortex, the main symptoms of damage to higher mental functions, as well as research methods used in the diagnosis of cognitive impairment.

3. Theses of the lecture:

The cerebral cortex is called the plate of gray matter as a mantle covering the surface of the hemispheres. A large number of brain gyrus, separated by furrows, significantly increases the area of the hemispheres. The thickness of the cerebral cortex ranges up to 5 mm.

According to Economo, there are about 14 billion cells in the cerebral cortex of both hemispheres. The deepest furrows divide each hemisphere into four lobes: frontal, temporal, parietal and occipital. The human brain is characterized by the predominance of the frontal and temporal regions, the surface of which in total is 47% of the entire surface of the hemisphere. Six layers are distinguished in the cortex: the molecular layer, the outer granular layer, the pyramidal layer, the inner granular layer, the ganglion layer (Betz's large pyramidal cells), and the polymorphic layer. As A.A.Bets first showed, not only the type of nerve cells, but also their relative position in different parts of the cortex, is denoted by the term "cytoarchitectonics".

Features of the distribution of fibers in the cerebral cortex are defined by the term "myeloarchitectonics". White matter occupies the space between the cortex and the basal nuclei and consists of nerve fibers that form conducting pathways.

Nerve fibers are divided into projection, associative and commissural. Projection fibers connect the cerebral cortex with all the underlying parts of the nervous system (radiant crown - corona radiata, inner capsule). Associative fibers interconnect various functional centers within the same hemisphere. Commissural fibers connect both hemispheres and pass through commissures of the brain (corpus callosum, anterior commissure). The cerebral cortex is the highest part of the central nervous system, the anatomical base of conditioned reflex activity, the organ of higher analysis and synthesis, all the irritations of the external world and internal organs, the bearer of individual experience, carrying out acts of behavior and the most complex functions - mental activity and speech.

Ensuring the implementation of mental activity according to A.R. Luria (1973) is due to three main functional blocks of the brain: *I block* - regulation of tone, wakefulness and sleep is represented by the

reticular formation and limbic system. *Block II* - the receipt, processing and storage of information is represented by the occipital-parietal-temporal sections of the cortex, which control vision, hearing and general sensitivity. *Block III* - programming, regulation and control of mental activity is represented by the frontal lobes.

Localization of functions in the cerebral cortex. The front central gyrus and the posterior sections of the upper and middle gyrus adjacent to it constitute the motor zone of the cerebral cortex for the opposite side, a projection in the form of an inverted person. The sensory representation is located in the region of the posterior central gyrus. The center of sensitivity for the entire opposite half of the body in the same order as the motor centers. In the occipital lobe of the brain is the cortical center of vision, which occupies the area of the spur groove. The auditory region covers the middle of the superior temporal gyrus and Geshl gyrus. Near the auditory is the

vestibular zone. The olfactory region occupies the hippocampal gyrus, its inner surface and the hook region of the temporal lobe. Asymmetric centers in most people are located in the dominant left hemisphere; these include centers of speech, writing, reading, praxis. All these centers are associative.

The motor center of speech (Broca) is located in the posterior sections of the lower frontal gyrus of the dominant hemisphere.

The sensitive (sensory) or auditory center of Wernicke's speech is located in the posterior part of the superior temporal gyrus of the dominant hemisphere.

With the function of speech, reading and writing are closely related. In the process of writing, several areas of the core of the motor analyzer of written language (an analyzer of arbitrary movements associated with writing letters and other characters) are involved in the posterior section of the middle frontal gyrus. The core of the visual analyzer of written language is located in the angular gyrus of the lower parietal lobe. With a lesion, which develops a reading disorder (alexia). Gyrus sypramarginalis or supra marginal gyrus of the inferior parietal lobe of the dominant hemisphere is the center of praxis. *Praxis (praxis-practice)* - targeted complex combined movements acquired by the individual during his life as a result of practical activity and the accumulation of experience.

The implementation of targeted movements occurs due to the formation of temporary connections between the cells of the precentral and supra marginal gyrus.

The defeat of the center does not cause paralysis, but only leads to a loss of ability to produce complex purposeful movements - apraxia. *Apraxia.* Distinguish: ideator, motor, constructive apraxia. Ideator apraxia - the action plan is violated, the usual sequence in actions develops with diffuse brain lesions.

Motor apraxia - the action and imitation of the action that occurs when the premotor parts of the brain of the dominant hemisphere are damaged are disrupted.

Constructive apraxia - the inability to draw or stack figures (for example, from a square match), occurs when the parietal-occipital parts of the brain are damaged.

Aphasia is a speech disorder that occurs when the cortical centers of speech or pathways connecting these centers with other parts of the nervous system involved in the speech act are affected. Distinguish: motor, sensory, amnestic semantic aphasia. Sensory aphasia is a disorder of speech understanding that occurs when the Wernicke region is affected (upper temporal lobe). Motor speech is retained, but control is lost over it, speech turns into an incomprehensible set of words or syllables (verbal okroshka). Motor aphasia - loss of speech ability in the absence of paralysis of the speech muscles (a person “forgot” how to use his speech apparatus), Brock's speech center (frontal lobe on the left)

Amnestic aphasia - forgetting the name of objects. The patient cannot name the subject, but describes it (in the place of the pen - “this is what they write”), while in the speech there are many verbs and few nouns.

Semantic aphasia is a violation of the semantic side of speech, a violation of understanding of complex logical and grammatical constructions, sentences (draw a circle under the square, etc.)

Gnosis - recognition. Agnosia - loss of the ability to recognize familiar objects and people. Auditory agnosia - unrecognition of familiar sounds (ticking the clock) develops when the upper temporal lobe is affected.

Tactile agnosia - unrecognition of objects withfeelings *Alalia*-noor delay speech development innate nature (cortical violation)-..

*memory*is an important component of higher nervous activity, without it can not be trained, where disrupted gnosis disorders, praxis, thought, speech storage mechanisms are not yet fully disclosed

distinction..mechanical and semantic memory, short-term and long-term. Amnesia - complete loss of memory for events, communication data with injury. Hypomnesia - memory loss. HypermenesI - high mechanical memory.

Thinking - the highest sphere of mental activity includes logical operations with verbal images of objects. Thinking is included in the concept of intelligence, which characterizes the degree of mental development and the ability to complex mental operations. There are congenital dementia (oligophrenia) and acquired (dementia).

Oligrophrenia of the most severe degree (idiocy), is characterized by complete social maladaptation, lack of speech, lack of self-care skills. The average degree of oligophrenia is imbecility, in which patients can serve themselves elementarily, speak a primitive speech. The easiest degree of oligophrenia is moronicity, in which patients suffer from abstract thinking, logical analysis, but they are socially adapted. To assess thinking in a number of countries, a methodology for calculating the coefficient of intelligence (IQ) is used. To assess thinking in children's practice, these techniques are adapted to age.

The recognition of neurological diseases is a complex process, due to the impossibility of a simple vision of pathological changes hidden by nature behind the durable case of the skull and spinal column of the populations associated with parenteral interventions. In the process of differential diagnosis, not only the assessment of symptoms and syndromes is taken into account, but also the data of additional examination methods (radiological, electrophysiological, clinical genetic, laboratory, cerebrospinal fluid and hemodynamics studies, etc.).
Puncture (from lat.- punctio - injection) - puncture of tissues with a needle, made for diagnostic and therapeutic purposes. Diagnostic punctures are performed for: obtaining fluid and cellular elements, measuring pressure, introducing air or oxygen into the cavity, introducing contrasting substances into the blood vessels. Medical punctures for: removal of pathologically altered fluid or pus, bloodletting and blood transfusion, injection of drugs into cavities and blood vessels.
The method of lumbar puncture. An important and widely used method in neurology. Objective: macro, microscopic, biochemical, bacteriological, virological examination of cerebrospinal fluid. Provides valuable information and allows you to prescribe rational therapy.
Indications and contraindications for medication. Indications: infectious diseases of the central nervous system, subarachnoid hemorrhage. Contraindications: absolute: volumetric process in

the posterior cranial fossa (tumor, abscess, hematoma, etc.), infectious processes in the lumbar region (epidural abscess)

Relative: confirmed intracranial hypertension, coagulopathy, thrombocytopenia, severe manifestations of cerebral atherosclerosis, with high blood pressure.

Fundus examination is used to diagnose: swelling of the optic disc, optic disc atrophy, malformations, degeneration and inflammation of the retina, hemorrhage, ischemia, tumors, non-inflammatory infiltrates, etc.

Survey radiography of the skull is often used in clinical neurology, but the study is especially early age has its technical difficulties, because The R-shot must be accurate and clear. The main projections are straight and lateral. The most informative lateral projection, giving an idea of the size of the skull, its shape, thickness, bone structure, the configuration of the arches of the arch and base of the skull, the condition of the sutures, fontanelles, the relief of the internal bone plate, vascular grooves, and the Turkish saddle, allows detecting foreign bodies and various calcareous inclusions in the cranial cavity. These data provide judgments about many important processes in the brain. In particular, about an increase in intracranial pressure, for example, during volumetric brain processes. Microcephaly, craniostenosis, hydrocephalus, etc. can be diagnosed.

X-ray of the spine (spondylography) - is performed with lesions of the spine and spinal cord. Usually, photographs are taken in 2 mutually perpendicular areas - separately for the cervical, thoracic, lumbosacral spine. It is possible to diagnose subluxations in the cervical spine, volume processes in the spine, in the spinal cord, with injuries, compression fractures, congenital malformations, etc.

Contrast radiological methods. These studies of the brain and spinal cord are widespread and are based on the use of gaseous (air or oxygen) or contrast agents (mayodil, amipak, etc.). Usually they are used in the diagnosis of tumors of the brain and spinal cord, the effects of trauma, inflammatory diseases of the central nervous system, malformations.

Neuroimaging research methods. *Computed tomography* (CT) scan of the brain and spinal cord. Computed tomography is a modern type of X-ray examination, in which you can get images of the finest sections of the brain.

The study is conducted with suspected tumor, acute (stroke) and chronic cerebrovascular insufficiency, traumatic brain injury, developmental abnormalities. In some cases, the study is conducted with the introduction of a contrast medium.

Magnetic resonance imaging (NMR, MRI) of the brain and spinal cord. MR angiography Nuclear magnetic resonance or magnetic resonance imaging is a modern, highly informative and safe research method. In NMR, the body is irradiated with radio waves in a magnetic field, resulting in the resonance of hydrogen nuclei, which is then converted into an image of the organ under study. When conducting research in angiography, you can fairly objectively assess the state of the vessels of the brain.

It is characterized by high diagnostic value in cases of suspected tumor, vascular damage to the brain, multiple sclerosis, herniated disc, developmental abnormalities. MR angiography is highly informative for the detection of pathology of the main arteries of the head.

Electrophysiological methods. Of the electrophysiological diagnostic methods in neurology use: electroencephalography, electromyography. *Electroencephalography.* A hardware method for studying brain activity by recording the electrical activity of brain cells fixed on the surface of the head. The research method is based on the graphic recording of the received electrical signals and their interpretation. Samples are used with opening and closing eyes, with irritation by light and sound, hyperventilation (asked to breathe deeply for 3 minutes).

EEG is used in the diagnosis of diseases such as epilepsy, headache, panic attacks (vegetative crises), hysteria, drug poisoning, in any episodes of blackout or falls.

Electroneuromyography (ENMG). A method for studying the electrical activity of muscles, also aimed at diagnosing peripheral parts of the nervous system. This is a method of graphic and sound recording of electrical impulses in the area of contact of the muscle and nerve. The study is carried out either with the help of electrodes attached to the surface of the skin above the muscle under study, or with needle electrodes that are superficially inserted into the muscle.

The study is necessary for complaints of muscle weakness, weight loss of the extremities, support in the muscles, muscle cramps or cramps. Electromyography is mandatory for suspected myotonia, myopathy, myasthenia gravis, amyotrophic lateral sclerosis, myoclonus, muscular dystonia, and tremor.

Ultrasonic research methods. Echoencephalography. A method for recognizing changes in brain tissue using ultrasound with a frequency of 0.5 to 15 MHz in 1 s. Sound waves of this frequency have the ability to penetrate body tissues and are reflected from all surfaces lying on the border of tissues of different composition and density. An ultrasound beam is sent to the studied part of the brain using a probe fixed at certain points of the head, the reflected signal is processed by an electronic device, and the result is displayed on the oscilloscope screen in the form of a curve (echogram) showing peaks in a straight line. The peak height corresponds to the acoustic density of the medium, and the distance between the peaks corresponds to the interface between the media.

Echoencephalography is widely used to recognize brain diseases: volumetric processes - tumors, abscesses, cysts, hematomas, etc., as well as to diagnose an increase in intracranial pressure.

Doppler ultrasound of the main arteries of the head (Doppler ultrasound scan MAG). A hardware method for studying blood flow in blood vessels, showing real-time graphical, sound, and quantitative indicators of blood flow in the test vessels. This method is named for Christian Andreas Doppler, an Austrian physicist and astronomer. The method is based on changing the frequency of ultrasonic waves reflected from moving particles of blood. The study is shown to people with complaints of headache, pain in the arms and legs, with suspected acute (stroke) and chronic disturbance of cerebral circulation.

Duplex scanning of the main arteries of the head (DS MAG) Diagnostic method performed by an ultrasound scanner. The device generates and captures ultrasonic waves, and on the principle of echolocation, in real time it builds a spatial two-dimensional image of the lumen and the walls of the vessel. Depending on the installation of the sensor, the lumen of the vessel can be shown both along and across. The study allows you to assess the condition of the vessel wall, to analyze the blood flow (including direction and speed). The study allows to identify patients with stenosis or blockage of cerebral vessels, to determine the presence of congenital pathology of the studied vessels. The method is highly informative when determining the effect of the spine on the vertebral arteries. The results of the study can serve as the basis for vascular surgery (carotid endarterectomy, stenting, extra-intracranial microanastamosis).

Neurosonography Ultrasonic cerebral tomography is a method of non-invasive two-dimensional ultrasound examination of the anatomical structures of the brain, using the Doppler effect as a source of information, recognition of structural changes in the cranial cavity using ultrasound sector scanning.

Adult neurosonography is feasible only if there is a defect in the bones of the cranial vault that occurs after resection trepanation or during surgery. In this case, it is possible to diagnose various intracranial pathological formations (tumors, hematomas, abscesses, etc.), as well as the topometry of normal brain structures. Neurosonography in newborns and infants is carried out through acoustic windows - large, small and lateral fontanelles. In newborns, neurosonography is

performed in cases of severe asphyxia, pathology with mechanical ventilation, persistent or increasing neurological symptoms, and others. In infants, neurosonography can be indicated for anomalies of psychomotor development, the sudden onset of neurological disorders, in order to monitor the revealed structural damage.
Genetic methods include: clinical and genealogical research (pedigree analysis), cytogenetic, biochemical, dermatoglyphic.

4. Illustrative material: presentation, video materials on the department's YouTube channel.
5. Literature:
Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
2. Ахметова Ж.Б. Семиотика поражения черепно-мозговых нервов : учебное пособие / Ж. Б. Ахметова. - 2-е изд. - Караганда : АҚНҰР, 2019. - 162 с. Экземпляры: всего:15 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(12)
3. Киспаева Т. Т. Атлас по неврологии : учебное пособие / Т. Т. Киспаева. - 2-е изд. - Караганда : АҚНҰР, 2019. - 126 с. Экземпляры: всего:25 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(22)

Supplementary:

4. Неврология. Национальное руководство. Краткое издание: руководство / под ред. Е. И. Гусева. - М. : ГЭОТАР - Медиа, 2016.**в)**
5. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева, Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. - Караганда : ИП "Ақнұр", 2015

Electronic resources:

6. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
7. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
8. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.
9. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

№	Name	Link
1	Repository SKMA	http://lib.ukma.kz/repository/
2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information	https://zan.kz/ru

	sector)	
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. What is the “cerebral cortex"
2. How many layers are distinguished in the cerebral cortex
3. What are the functions of projection fibers
4. What are the functions of associative fibers
5. What are the functions of commissural fibers
6. Highlight the functions of the right hemisphere
7. What cortical center is located in the occipital lobe of the brain
8. What is the center of Brock and where is it located?
9. What is praxis
10. List the main types of praxis
11. List the main types of aphasia
12. What is amnesia and when does it develop
13. What is the method of lumbar puncture
14. List the indications and contraindications for the drug
15. For what purpose is the fundus examination method used
16. What changes can be identified during a survey radiography of the skull
17. When contrast radiological methods are used
18. What are the differences between computed tomography and magnetic resonance imaging of the brain and spinal cord
19. In the diagnosis of which diseases is EEG used
20. What ultrasound research methods are used in neurology

Lecture No. 8

1. Topic: The meninges of the brain. Liquor. Meningeal syndrome, intracranial hypertension syndrome. Modern laboratory instrumental, neuroimaging research methods in neurology

2. Purpose: to introduce students to the methods of studying the function of the cranial nerves, the basics of the topical diagnosis of the main syndromes of damage to the cranial nerves and brain stem at different levels.

3. Theses of the lecture:

The meninges are the three membranes that envelop the brain and spinal cord and separate them from the walls of their bony cases (skull and vertebral column). Based on their location, meninges are referred to as the cranial meninges which envelop the brain, and spinal meninges which envelop the spinal cord. However, the cranial and spinal meninges are continuous with each other and consist of the same three meningeal layers. From superficial to deep the meninges are the:

- Dura mater, also known as the pachymeninx
- Arachnoid mater
- Pia mater

These layers bound three clinically important potential spaces: the epidural, subdural, and subarachnoid spaces. The function of the meninges is to protect the brain and spinal cord from mechanical trauma, to support the blood vessels and to form a continuous cavity through which the cerebrospinal fluid (CSF) passes. Specifically, the CSF passes between the inner two meningeal layers (arachnoid and pia) which are together called the leptomeninges.

This article will discuss the anatomy and function of the cranial and spinal meninges.

The cranial dura mater is the outermost meningeal layer, consisting of dense irregular connective tissue. It is composed of two layers;

- The superficial layer is the periosteal cranial dura. It overlies the inner table of the cranial vault bones, acting like the periosteal layer of the cranium.
- The meningeal cranial dura, which lies superficial to the arachnoid mater.

The two dural layers are firmly attached to each other, except in places where they separate to enclose the dural venous sinuses. In these places, the meningeal layer projects inward, towards the cerebral tissue, forming the fibrous septa that partially separate the cranial cavity. The fibrous septa within the cranium are the:

- Falx cerebri, which is the largest of fibrous septa. It extends across the midline on the inner surface of the calvaria, from crista galli to the internal occipital protuberance. It separates the left and right cerebral hemispheres and houses the superior sagittal and inferior sagittal sinuses. Posteriorly, the falx blends with tentorium cerebelli.
- Tentorium cerebelli, which spans in a transverse plane from the inner surface of the occipital bone. It separates the cerebrum from the cerebellum and contains the transverse, straight and superior petrosal sinuses. The tentorium divides the intracranial space into supratentorial and infratentorial compartments that contain the forebrain and hindbrain, respectively.
- Falx cerebelli, which projects from the midline of the occipital bone. It separates the hemispheres of the cerebellum and houses the occipital sinus.
- Diaphragma sellae, which is a flat membrane that surrounds the pituitary stalk and forms a roof over the hypophyseal fossa. It contains the anterior and posterior intercavernous sinuses.

The meningeal dura mater overlies the trigeminal ganglion, enclosing it in a compartment known as the trigeminal cave (Meckel’s cave).

The cranial arachnoid mater is a spiderweb-like meningeal layer, interposed between the dura and pia. The potential space between the arachnoid and dura is called the subdural space and according to some authors, it contains a very thin layer of fluid. The space between the arachnoid and pia is called the subarachnoid space and it is filled with the cerebrospinal fluid (CSF). Additionally, all cerebral arteries and veins are located in this space.

The outer surface of the arachnoid attaches to the dura mater forming a barrier that prevents the leakage of CSF into the subdural space. At the sites where dura forms the venous sinuses, the arachnoid shows mushroom-like protrusions called the arachnoid granulations. The inner surface of arachnoid shows thin fibrous projections called the arachnoid trabeculae that traverse the subarachnoid space and attach to the outer surface of the pia mater. Due to their embryological and cellular similarities the pia mater and arachnoid together are referred to as the leptomeninges.

The arachnoid granulations (Pacchionian bodies) are protrusions of the arachnoid mater that pierce the meningeal dura and protrude into the lumina of the dural venous sinuses. The core of each arachnoid granulation is continuous with the subarachnoid space, therefore, containing the cerebrospinal fluid.

The CSF diffuses through the lining of the arachnoid granulations into the dural venous sinuses. Therefore, the function of the arachnoid granulations is to enable the continuous drainage of the cerebrospinal fluid from the subarachnoid into the vascular system. It is important that the CSF drainage is held in balance with the production of new CSF from the choroid plexus, warranting a constant amount of the CSF in the brain (normally around 150 milliliters). Since the skull is a rigid case, any increase in the amount of CSF in the brain increases the intracranial pressure and can cause various neurological disorders (e.g. hydrocephalus)

4. Illustrative material: presentation, video materials on the department’s YouTube channel.
5. Literature:
Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
2. Ахметова Ж.Б. Семиотика поражения черепно-мозговых нервов : учебное пособие / Ж. Б. Ахметова. - 2-е изд. - Караганда : АҚНҰР, 2019. - 162 с. Экземпляры: всего:15 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(12)
3. Киспаева Т. Т. Атлас по неврологии : учебное пособие / Т. Т. Киспаева. - 2-е изд. -

Караганда : АҚНҰР, 2019. - 126 с. Экземпляры: всего:25 - ЧЗ-2(2), ЧЗ-3(1), АУЛ(22)

Supplementary:

4. Неврология. Национальное руководство. Краткое издание: руководство / под ред. Е. И. Гусева. - М. : ГЭОТАР - Медиа, 2016.**в)**

5. Абдрахманова, М. Г. Современные принципы реабилитации неврологических больных : учебно методическое пособие / М. Г. Абдрахманова, Е. В. Епифанцева, Д. С. Шайкенов ; М-во здравоохранения и социального развития РК. КГМУ. - Караганда : ИП "Ақнұр", 2015

Electronic resources:

6. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
7. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
8. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.
9. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

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2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

Lecture No. 9

1. Topic: Blood supply to the brain and spinal cord. Vascular diseases of the central nervous system.

2. Purpose: to introduce students to the issues of diagnosis, prognosis, differential diagnosis, clinic of vascular diseases of the central nervous system. To consolidate theoretical knowledge and practical skills.

3. Theses of the lecture:

The frequency of cerebral stroke in economically developed countries is 143-145 cases per 100,000 inhabitants of Gizonoi M. EtaI 1989. During the first days after a stroke, 25 patients die and 40 the next 2-3 weeks. Among the survivors of a stroke, 19-35 patients remain disabled and require care, and no more than 2 patients return to work (Vereshchagin N.V. 1980). Among the dead in neurological hospitals, 10% show various strokes.

Prevalence and consequences of stroke 3rd place among causes of death in developed countries. Frequency of cases: 1–2 per 1 thousand of the population in the USA 2–2.5 per 1 thousand, in Western Europe 3–3.5 per 1 thousand in Eastern Europe. Every year, 20 million people worldwide suffer a stroke of 25% of total deaths in the Western world. Although 75% of strokes are nonfatal, but: 33% of patients become disabled. Stroke increases the risk of dementia. Stroke limits personal independence.

Blood supply to the brain. The internal carotid artery (a.carotis interna). Orbital artery. Anterior cerebral artery (a.cerebri anterior.) Middle cerebral artery (a.cerebri media). Vertebral artery. Anterior and posterior spinal artery, posterior lower cerebellar artery. The basilar artery is the anterior inferior cerebellar artery, the artery of the labyrinth, the artery of the bridge, the superior cerebellar artery. The posterior cerebral artery (a. Cerebri posterior). Zones of adjacent blood supply are areas of the brain whose vascularization is carried out by the border zones of the adjacent vascular pools and their anastomoses. The definition of territories related to areas of adjacent blood circulation of the brain is of great clinical importance, since it turns out to be the most vulnerable in cases of cerebral geodynamics disturbances. The main arterial system of the brain has an amazing ability to anastomose with each other, forming a system of collaterals. They play an important role in compensating for circulatory disorders as a result of blockage of one of the cerebral arteries. There are three main types of anastomoses: arterial connection between the extra- and intracranial arteries; arterial anastomoses at the level of cerebral vessels; arterial circle of the large brain (willis circle). The most important anastomosis is the Willis polygon (Willis circle). For the normal functioning of the brain, a constant cerebral blood flow, a certain blood flow rate (this is the amount of blood flowing through the brain per unit time. According to some authors, 750 ml of blood flows through the brain. The flow rate depends on perfusion pressure, blood circulation speed, blood viscosity, current resistance blood, vascular diameter.In pathological processes in the vessels of the brain, the blood flow rate decreases sharply which leads to a change in the activity of the nervous*system.Circulatory disorders in the anterior cerebral artery* Uneven hemiparesis and hemigipesthesia with predominant lesion of the projection of the leg on the side opposite to the focus. Paresis of the arm passes quickly. Central paresis of VII and XII pairs of cranial nerves

Left-sided apraxia. Urinary incontinence. Frontal hemataxia. Changes in the psyche - “frontal psyche”. Hyperkinesis of the face and hands. Violation of smell.

Symptoms of circulatory disorders in the middle cerebral artery Hemiplegia on the side opposite to the outbreak. Hemigipesthesia or hemianesthesia. Turning the head and gaze towards the focus. Motor aphasia. Sensory aphasia. Bilateral apraxia. Astereognosis, anosognosia, violation of the body scheme. Contralateral hemianopsia. Thalamic syndrome.

Symptoms of circulatory disorders in the posterior cerebral artery. Central homonymous hemianopsia, quadrant on the side opposite to the focus. Visual agnosia. Thalamic syndrome on

the side opposite to the focus. Amnestic aphasia, alexia. Athetoid choreoform hyperkinesis. Alternating syndromes of damage to the midbrain. Peripheral hemianopsia.

Clinic clogging of the main artery. Paralysis of the limbs. Sensory disorders on one or both sides. Damage to the cranial nerves - alternating syndromes. Change in muscle tone - hypotension, hypertension, decerebral rigidity, hormone. *Symptoms of circulatory disorders in the pool of the vertebral artery.* Hemiplegia and hemianesthesia on the side opposite to the focus. Violations of surface sensitivity on the face and symptoms of lesions of bulbar FMN on the side of the outbreak. Alternating Wallenberg-Zakharchenko syndrome. Vestibular disturbances, violation of statics and coordination.

Risk factors for cerebrovascular accident.

·arterial hypertension is the most important risk factor for the development of both hemorrhagic and ischemic stroke. The risk of stroke in patients with blood pressure greater than 160/95 mm Hg increases by about 4 times compared with people with blood pressure below 140/90 mm Hg, and with blood pressure more than 200/115 mm Hg - 10 times;

· smoking - doubles the risk of developing a stroke. Quitting smoking after 2-4 years reduces the risk of stroke.

· heart pathology - the risk of stroke is increased in the presence of IHD by 2 times, left ventricular myocardial hypertrophy by 3 times, heart failure by 3-4 times.

· pathology of the main arteries of the head - the risk of stroke with vascular stenosis of more than 70% of its lumen and with the manifestation of TIA, reaching 13% per year.

· lipid metabolism disorders - data have now been obtained that long-term lipid-correcting therapy with statins for 3-5 years reduces the risk of stroke by 30%.

· diabetes mellitus - patients with this disease often have lipid metabolism disorders, arterial hypertension and various manifestations of atherosclerosis.

· hemostatic disorders - elevated fibrinogen levels are an independent risk factor for stroke, as well as the progression of carotid stenosis.

· alcohol - alcohol abuse increases the risk of cerebral hemorrhage.

· oral contraceptives - when using drugs with an estrogen content of more than 50 mg, the risk of ischemic stroke significantly increases. Especially unfavorable is the combination of their

intake with smoking and an increase in blood pressure.

Classification of cerebrovascular accidents

A. Initial manifestations of insufficient blood supply to the brain.

1. The initial manifestations of insufficient blood supply to the brain.

2. Initial manifestations of insufficient blood supply to the spinal cord.

B. Transient cerebrovascular accident.

1. Transient ischemic attacks.

2. Hypertensive cerebral crises.

B. Acute cerebrovascular accident

1. Subarachnoid nontraumatic hemorrhage.

2. Hemorrhagic stroke-non-traumatic hemorrhage.

3. Ischemic stroke (heart attack).

G. Chronic (progressive) disturbances of cerebral circulation.

1. Chronic subdural hematoma.

2. Consequence of stroke;

3. Circulatory encephalopathy.

4. Illustrative material: presentation, video materials on the department's YouTube channel.

5. Literature:

Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М. Сеченова". - М.: ГЭОТАР - Медиа, 2015.
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Supplementary:

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4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. What are the prevalence and consequences of stroke?
2. What are the main arteries supplying the brain
3. List the main three types of anastomoses in the brain
4. Describe the classification of cerebrovascular accidents
5. List the symptoms of circulatory disorders in the anterior cerebral artery
6. List the symptoms of circulatory disorders in the middle cerebral artery
7. List the symptoms of circulatory disorders in the posterior cerebral artery
8. What are the clinical symptoms of obstruction of the main artery?
9. What are the symptoms of circulatory disorders in the pool of the vertebral artery
10. List the risk factors for cerebrovascular accident.

Lecture No. 10

1. **Topic:** The concept of epilepsy. Etiology, pathogenesis, classification of epilepsy.
2. **Purpose:** to introduce students to the issues of diagnosis, prognosis, differential diagnosis, epilepsy clinic. To consolidate theoretical knowledge and practical skills.
3. **Theses of lecture:** Epilepsy is a chronic brain disease characterized by repeated unprovoked attacks of impaired motor, sensory, autonomic, mental or mental functions resulting from excessive neural discharges.

From the history of the study of epilepsy. Aristotle compiled a list of people with epilepsy. Heracles, who killed his family in a seizure, and Socrates entered. There is a reference to the Egyptian pharaoh Amenhotep IV, who lived around 1300 BC. he suffered hallucinations and partial epileptic seizures.

Prevalence. In the population of 0.3 - 2.0%. In Western and Central Europe, 6 million people suffer from epilepsy. Over 20 years, about 15 million people will be ill. In Russia, the incidence is about 0.5 million people, with an incidence of 54 thousand per year.

International classification of epilepsy, epileptic syndromes. (New Delhi -1989).

1. Epilepsy and epileptic syndromes ,associated with a certain localization of the epileptic focus (focal, local: partial epilepsy).

1.1. Idiopathic locally caused epilepsy (associated with age-related characteristics).

1.2. Symptomatic locally caused epilepsy.

1.3. Cryptogenic locally caused epilepsy.

2. Generalized epilepsy and epileptic syndromes.

2.1. Idiopathic generalized epilepsy (associated with age-related features).

2.2. Generalized cryptogenic or symptomatic epilepsy (associated with age-related features).

2.3. Generalized symptomatic epilepsy and epileptic syndromes.

2.3.1. Generalized symptomatic epilepsy of non-specific etiology (associated with age-related features).

2.3.2. Specific syndromes.

3. Epilepsy and epileptic syndromes, which cannot be classified as focal or generalized.

3.1. Epilepsy and epileptic syndromes with generalized and focal seizures.

3.2. Epilepsy and epileptic syndromes without specific manifestations characteristic of generalized or focal seizures.

4. Specific syndromes.

4.1. Seizures related to a specific situation.

4.2. Single seizures or status epilepticus. Types of seizures are reflected in the international classification of epileptic seizures. Thus, the classification is based on 2 main factors:

1st — localization: localized and generalized forms,

2nd — origin:

a) symptomatic forms with a clearly established role of structural brain lesions;

b) cryptogenic, where this factor is detected indirectly, but cannot be proved;

c) idiopathic, in which clinical, electroencephalographic and other (CT, MRI) data do not reveal changes and the genetic factor is given primary importance.

With idiopathic generalized epilepsy, the main role in the trigger mechanism is assigned to the non-specific nuclei of the optic tubercle. In symptomatic epilepsy, the main role belongs to neurons located on the periphery of the epileptogenic lesion. The basis of the occurrence of epileptic seizures is the trigger mechanism, the carrier of which are the so-called epileptic neurons. The electrical activity of epileptic neurons is characterized by the appearance of a paroxysmal depolarization shift (PDS) of the membrane potential, followed by a phase of hyperpolarization. With generalized idiopathic epilepsy, the question of the epileptic focus remains open.

Modern studies show that neuronal ectopies, as a result of microdysontogenesis, are the basis of generalized idiopathic epilepsy.

The concept of epileptogenesis: Stage I - maturation of the epileptic focus from brain damage to the development of the first epileptic seizure. Stage II - after the clinical debut. The spread of epileptic activity outside the focus increases synaptic conduction in the pathways and

distribution, reduces the threshold for the excitation of neurons facilitating the development of the following seizures, the epileptic system is formed.
To explain the epilepticization of neurons, there are three concepts:
1. violation of the membrane of the neuron or its metabolism;
2. changing the environment surrounding the neuron;
3. pathological changes in the populations of neurons associated with deficiency of inhibition.
All disorders are detected at the metabolic and neurotransmitter, as well as at the structural level. Individual genetic predisposition. External effects - trauma, infectious and allergic diseases, intoxication, hypoxia, etc.
Epilepsy does not inherit the disease, but certain enzymatic and metabolic changes that lower the threshold of convulsive activity of the brain and are designated as increased brain epileptic readiness, which contributes to the formation of the epileptic focus and spread its effects on other parts of the brain. And therefore, with an epileptic disease, a minor external effect may be a provoking factor.
Clinic. Jackson attacks are characterized by local seizures or numbness attacks associated with irritation of one or another part of the anterior and posterior central gyrus. Jackson seizures can cover the hand, foot, one limb, sometimes they tend to gradually spread from the distal limb to the entire half of the body or to generalization into a large convulsive seizure. There are motor, sensory, sensorimotor Jackson attacks. Typical absences are characterized by short-term (3-5 s) disabling of consciousness, freezing in a pose of interrupted movement. Sometimes there is a slight blanching or redness of the face, tilting of the head, the institution of eyeballs up.
With the return of consciousness, the patient continues the interrupted activity. Others often do not notice the state of absence or incorrectly evaluate it. Teachers of kindergartens and schools sometimes perceive absences as inattention, the child's distraction, especially in cases of serial attacks. A generalized tonic-clonic seizure is characterized by a symmetric tonic tension of the body, followed by symmetrical clonic seizures in the limbs, lasts about 30, rarely 60 seconds. In both phases of the convulsive syndrome, biting of the tongue and lips may occur. In connection with the involvement of the respiratory muscles, apnea occurs, involuntary urination is observed. The pupils dilate, their reaction to light is lost. The veins of the neck and head are tense, the face is cyanotic and edematous. During a seizure, the eyes are open, the pupils are behind the superciliary arches or set aside. After a seizure, there may be a dream-like state, gradual agitation followed by confusion, drowsiness, or agitation.
Diagnosis includes: Establishing the epileptic nature of seizures (or impaired mental function). Determination of the localization of the epileptic focus (or primary-generalized type of disorders)
Clarification of the etiology of the disease. The attribution of epileptic disorders to a specific form, according to the International Classification.
The role of EEG in the diagnosis. Different types of seizures have a specific EEG picture. EEG objectively registers an epileptic disorder of brain neurons in the form of epileptiform activity: spike, acute wave, acute - slow wave. In most patients with epilepsy, epileptiform activity cannot be detected with a routine EEG study. The role of video EEG monitoring and the holter (outpatient) EEG is important.
4. Illustrative material: presentation, video materials on the department's YouTube channel.
5. Literature:
Basic:

1. Е.И. Гусев Неврология и нейрохирургия. В 2 т. Т. 1. Неврология.: учебник / Е. И. Гусев, А. Н. Коновалов, В. И.Скворцова. - 4-е изд. доп.; Мин. образования и науки РФ. Рекомендовано ГБОУ ВПО "Первый Московский гос. мед.ун-т им. И.М.

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Supplementary:

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Electronic resources:

6. Консультант врача. Неврология. Версия. 1. 2 [Электронный ресурс]: руководство. - Электрон.текстовые дан. (127 Мб). - М. : ГЭОТАР - Медиа, 2009.
7. Нейрохирургия [Электронный ресурс] : учебник / С.В. Можаев [и др.]. - 2-е изд., перераб. и доп. - Электрон. текстовые дан. (50,3 Мб). - М.: Изд. группа "ГЭОТАР-Медиа", 2009.
8. Нервные болезни для врачей общей практики [Мультимедиа]: учебное пособие / под ред. И. Н. Денисова. - Электрон. дан. (105 Мб). - Алматы: ATPG Kazakhstan при участии Кордис & Медио, 2006.
9. Физиология высшей нервной деятельности [Электронный ресурс]: методические рек. для студентов мед. фак. / сост. Д. А. Адильбекова.- Электрон. текстовые дан. (388 Кб). - Шымкент : Б. и., Б. г. - эл. опт. диск (CD-ROM).

5. Electronic database

№	Name	Link
1	Repository SKMA	http://lib.ukma.kz/repository/
2	Republican Interuniversity Digital Library	http://rmebrk.kz/
3	Student Advisor	http://www.studmedlib.ru/
4	Open University of Kazakhstan	https://openu.kz/kz
5	Law (access to the information and information sector)	https://zan.kz/ru
6	Paragraph	https://online.zakon.kz/Medicine/
7	Scientific Electronic Library	https://elibrary.ru/
8	Ashyk kitaphana	https:// kitap.kz/
9	Thomson Reuters	www.webofknowledge.com
10	ScienceDirect	http://www.sciencedirect.com/
11	Scopus	https://www.scopus.com/

6. Control questions:

1. Give a definition of epilepsy
2. Describe the classification of the International Classification of epilepsy, epileptic syndromes. (New Delhi -1989).
3. Highlight the leading syndromes and symptoms of epilepsy

4. What are the concepts of epileptogenesis
5. What are Jackson attacks and how are they characterized
6. What clinical picture is characteristic for absences
7. What is characteristic of generalized tonic-clonic seizures
8. What diseases of the nervous system should be used for differential diagnosis of epilepsy
9. What intuitive methods should be prescribed for verification of epilepsy
10. Assign a plan for examining a patient with suspected epilepsy

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