Odessa National Medical University
Department of Occupational Pathology and Functional Diagnostics

Course syllabus
Dopplersonography of vessels of the brain and neck

Amount	4 credits of 120 hours
Semester, year of study	2 year of study, 4 semester
Days, time, place	Oleksandr Mykhailovych Ignatiev, Honored Worker of Science and Technology of Ukraine, Doctor of Medicine, Professor, Head of the Department of Occupational Pathology and Functional Diagnostics
Teacher(s)	Doctor of Medicine, HWof ST, Prof. O.M. Ignatiev
Contact phone number	(048) 704 78 79
E-mail	prof.cl.lab@onmedu.ua
Workplace	Department of Occupational Diseases and Functional Diagnostics, Sudnobudivna str., 1
Consultations	Consultations: face-to-face Wednesdays 13.00-14.00 Online: Tuesday, Thursday 13.00-14.00

COMMUNICATION

Communication with graduate students will be carried out through face-to-face meetings. In the case of switching to distance education, communication with graduate students will be carried out using the Internet, Telegram, WhatsApp, Zoom, Microsoft Teams, Viber social networks.

COURSE ANNOTATION

The program of the elective course "Doppler sonography of vessels of the brain and neck" in the postgraduate course deals with the study of hemodynamics of vessels of the carotid basin, vertebral-basilar basin and circle of Willis, detection of pathological changes in hemodynamics and in the vascular wall.

The subject of study of the educational discipline "Doppler sonography of vessels of the brain and neck" is ultrasound diagnostics (which includes consideration of issues of ultrasound anatomy and methodology of ultrasound examination of brain vessels, criteria for the main lesions of extracranial arteries, transcranial ultrasound examination of cerebral vessels, pathology of the venous system of the brain,

ultrasound evaluation of the results of reconstructive and endovascular interventions) and basic, basic knowledge of physics (Doppler effect, velocity characteristics of blood flow, vascular wall resistance, etc.).

Course prerequisites and post-requisites (Place of the discipline in the curriculum)

The discipline is based on the studied normal and pathological anatomy, medical chemistry and biological physics, pathophysiology, pathomorphology,
pharmacology, propaedeutics of internal medicine, internal medicine, phthisiology, dermatology, narcology, otorhinolaryngology, neurology, traumatology and orthopedics, oncology, radiation medicine, etc. and lays the foundations for conducting scientific research with the aim of applying knowledge in the process of further education in graduate school and in professional activities.

The purpose of the course

The study of ultrasound diagnosis of diseases of the vessels of the brain and neck is the acquisition by each student of theoretical knowledge and practical skills regarding the main disorders in the hemodynamics of the vessels of the head and neck, the interpretation of the results of ultrasound examination, the justification of the rational and safe for human health use of functional tests.

Course tasks:

1) to acquire in-depth knowledge of ultrasound diagnostics and related specialties;
2) to study in depth the physical characteristics of the main components of dopplerography of vessels and their interpretation in case of some changes in vessels;
3) to acquire the skills of assessing stenoses in the carotid basin using various techniques for further patient management tactics;
4) study in depth the indications for the use of provocative drugs (when conducting pharmacological tests) in accordance with the knowledge of pharmacodynamics, the adequate dosage form, ways of administration and interactions with other drugs and the patient's condition at the time of the examination;
5) to gain in-depth knowledge about the manifestation of possible side effects of the ultrasound itself (especially during long-term scanning of the fundus, pregnant women) and methods of their prevention;
6) mastering the technique of the transtemporal method of ultrasound examination of cerebral vessels;
7) practicing the skills and abilities of analyzing the results of return tests, hypercapnia test, collateral blood circulation reserve;.
8) acquisition of skills in the use of modern information technologies when teaching "Dopplersonography of vessels of the brain and neck".

Expected results.

- According to the requirements of the educational and scientific programs of specialties, the discipline ensures that graduate students acquire the following competencies:

integral:

- The ability to solve complex tasks and problems in a certain field of professional activity or in the learning process, which involves conducting research and/or implementing innovations and is characterized by the complexity and uncertainty of conditions and requirements.

  general:

  1. Ability to abstract thinking, analysis and synthesis.

  2. Ability to know and understand the subject area and professional activity.

  3. Ability to communicate in the national language.

  4. Ability to learn and master modern knowledge, use information and communication technologies; the ability to search, process and analyze information from various sources.

  5. Ability to adapt and make a reasoned decision in a new situation.

  6. Ability to work in a team.

  7. Ability to work in an international context, communicate in a foreign language.

  8. Ability to evaluate and ensure the quality of the work performed.

  9. Ability to act on the basis of ethical considerations, socially responsible and consciously.

  10. Ability to be aware of equal opportunities and gender issues; value and respect diversity and multiculturalism.

special (professional, subject):

1. Skills of communication and clinical examination of the patient.
2. The ability to determine the list of necessary clinical and laboratory and instrumental studies and evaluate their results.
3. The ability to establish a preliminary and clinical diagnosis of the disease.
4. The ability to determine the principles of treatment of diseases, the necessary regime of work and rest, and the nature of nutrition.
5. Ability to diagnose emergency conditions.
6. Ability to determine tactics and provide emergency medical assistance.
7. Ability to plan and conduct medical evacuation measures.
8. Ability to perform medical manipulations.
10. Ability to plan and carry out sanitary and hygienic and preventive measures.
11. The ability to determine the management tactics of persons subject to dispensary supervision
13. The ability to conduct an examination of work capacity..
14. Ability to keep medical documentation.

15. Ability to conduct epidemiological and medical-statistical research on the health of the population; evaluate the influence of the environment, socio-economic and biological determinants on the health of an individual, family, and population.

16. The ability to plan, carry out and analyze measures for the organization and integration of the provision of medical assistance to the population

COURSE DESCRIPTION

Forms and methods of education

The course will be taught in the form of lectures (10 hours), practical (50 hours), independent work of graduate students (46 hours).

1) *Lectures* (topics of the lecture course reveal the problematic issues of the relevant sections of the discipline. Lecturers can use such options for conducting lectures as educational, informative, lecture-visualization, lecture-discussion, lecture-consultation).

2) *Practical classes* (when conducting a practical class, an oral and written survey, solving test tasks, solving situational problems, working with the settings of the ultrasound machine and subsequent sonication of the vessels of the head and neck are expected). The teacher uses interactive teaching methods).

3) *Seminar classes.* Active forms of the seminar are considered the most fruitful: debates, discussions, round tables, role-playing games, press conferences, etc. The task of the seminar is meaningful, purposeful acquisition of skills and deepening of acquired knowledge in accordance with the topic of the seminar. Conducting seminars contributes to the development of activity and independence of graduate students.

The final control is not conducted, the study of the discipline ends with a credit at the last seminar.

Control methods:

- entrance and final knowledge level control tests on the topic of the seminar;
- oral answer to questions based on the material of the current topic;
- solving typical and atypical clinical situational problems;
- control of practical skills on an ultrasound machine;
- balance

The study of the discipline is implemented on the basis of the following teaching methods:

- according to the dominant teaching methods (verbal, visual);
- blitz survey;
- solving creative problems;
- drawing up graphic schemes;
- group discussions on problem situations;
- performing manual tasks on the ultrasound machine;
- individual control interview;
- logical exercises;
- business games;
- situational tasks;
- performance of individual studies;
- problematic teaching method;

- "brain storm"

Course content

Topic 1. Physical foundations of dopplerography
Topic 2. Physiological aspects of hemodynamics
Topic 3. Ultrasound criteria of the main vascular lesions
Topic 4. Ultrasound anatomy of vessels of the head and neck
Topic 5. Methods of research of vessels of the brain and neck
Topic 6. Ultrasound diagnosis of diseases of extracranial vessels
Topic 7. Transcranial ultrasound examination
Topic 8. Study of the venous system of the brain

COURSE DESCRIPTION

Types of educational classes: lectures, practical classes, seminar classes for graduate students.

Thematic plans of lectures, practical classes and seminars reveal the problematic issues of the relevant sections of Doppler sonography of vessels of the brain and neck. The lecture course uses didactic tools (multimedia presentations, educational videos, demonstration of thematic patients).

Practical classes are held at the department's clinical base. The method of organizing practical classes on Doppler sonography of the vessels of the brain and neck requires the following:

• to make the graduate student a participant in the process of ultrasound examination of the head and neck of patients from the moment of his examination, diagnosis, treatment to the determination of further reconstructive interventions on extra- and intracranial vessels.

• master professional practical skills; skills of working in a team of graduate students, doctors, other participants in the process of providing medical care;

• to form in the graduate student, as in the future specialist, an understanding of responsibility for the level of his training, its improvement during training and professional activity.

Practical classes are held with the inclusion of:

1. control the level of knowledge of the anatomy of vessels of the neck and brain (with the help of test questions), setting up the ultrasound device according to the research tasks, differentiating the main extra- and intracranial vessels with the help of the ultrasound device;

2. ultrasound dopplerography of the vessels of the head and neck of a patient with diseases corresponding to the topic of the lesson, followed by a discussion of establishing an ultrasound diagnosis, differential diagnosis and treatment measures using the principles of evidence-based medicine, in accordance with National and European guidelines and protocols;

3. the skills of adjusting the parameters of the Doppler spectrum, to determine the presence of arterial stenosis and its degree from the ultrasound picture; assess the state of the vascular wall;

4. conduct an ultrasound examination of blood vessels independently and make assumptions about the detected pathology, taking into account the analysis of the general results of laboratory and instrumental research methods, provided for by the topic of the practical session;

Teaching methods: verbal, explanatory and demonstrative, practical, visual, working with a book, video method, working in groups, discussions, solving situational tasks, cases, applying methods of modeling clinical situations, problem-oriented learning. etc.

List of recommended literature

Main:

1. Neurosonology and neuroimaging of stroke har/dvd edition by José Valdueza M., Schreiber S., Röhl J.-E., Klingebiel R. Thieme; 2nd edition (14 dec. 2016), 630 p.
2. Vinke E.J., Kortenbout A.J., Eyding J., Slump C.H., van der Hoeven J.G., de Korte C.L., Hoedemaekers C.W. Potential of Contrast-Enhanced Ultrasound as a Bedside Monitoring Technique in Cerebral Perfusion: A Systematic Review. Ultrasound Med. Biol. 2017;43:2751–2757. doi: 10.1016/j.ultrasmedbio.2017.08.935.
3. Naritaka H., Ishikawa M., Terao S., Kojima A., Kagami H., Inaba M., Kato S. Ultrasonographic Superb Microvascular Imaging for Emergency Surgery of Intracerebral Hemorrhage. J. Clin. Neurosci. 2020;75:206–209. doi: 10.1016/j.jocn.2020.03.002.
4. Doppler imaging of the main vessels of the neck / R. Ya. Abdullaev., V. Y. Kalashnikov. V. G. Marchenko et al. — Study guide. — Kharkiv.: New word. 2008. — 48 p.
5. Ultrasound detection of cerebral microembolism in carotid stenoses: achievements and prospects (literature review) M.V. Globa Endovascular neuroradiological surgery - 2020. - No. 1(31). - P. 56-67 https://doi.org/10.26683/2304-9359-2020-1(31)-56-67
6. Assessment of cerebral blood flow in patients with vertebrobasilar insufficiency according to the presence of structural changes in the posterior circulation system / M.V. Globa, L.M. Sulii, V.V. Vashchenko, T.G. Novikova // Collection. scientific works of employees of the P. L. Shupyk N MAPE. - 2018. - Release. 30. - pp. 557-566.
7. Altey J., Hoey E. Practical Ultrasound: An Illustrated Guide, 2nd edition. FL, USA: CRC Press, 2013. 296 p.
8. Delorme S., Debus J., Jenderka K.-V. Sonographie. Georg Thieme Verlag, 2012. 385 p.

9. Welkoborsky H.-J., Jecker P., Maurer J., Mann W.J. Ultraschalldiagnostik Kopf-Hals. Thieme, 2018. 160 p.
10. Clinical Doppler Ultrasound: Expert Consult: Online and Print 3rd Edition by Myron A. Pozniak MD, Paul L Allan BSc MBChB DMRD FRCR FRCPE 2013) Churchill Livingstone; 3rd edition 400 p.
11. Widder B., Hamann G.F. Duplexsonographie der hirnversorgenden Arterien. Springer Berlin, Heidelberg, 2018. 336 p.
12. Pellerito J., Polak J.F. Introduction to Vascular Ultrasonography, 7th Ed. Elsevier, 2020, 882 p.
13. https://info.odmu.edu.ua/chair/occupational diseases and functional diagnostics /files/en

Additional:

1. Daneman A., Epelman M. Neurosonography: in pursuit of an optimized examination. Pediatr Radiol. 2015; 45(3): 406–12.
2. Yum S.K., Im S.A., Seo Y.M., Sung I.K. Enlarged subarachnoid space on cranial ultrasound in preterm infants: Neurodevelopmental implication. Sci Rep. 2019; 9(1): 19072.
3. Xiaohong Chen, Jialiang Xu, Yumeng Zhang, Muhui Lin, Hao Wang, Ying Song, Evaluation of hemodynamic characteristics in posterior circulation infarction patients with vertebral artery dominance by color doppler flow imaging and transcranial doppler sonography, International Journal of Neuroscience, 10.1080/00207454.2020.1773820, 131, 11, (1078-1086), (2020).
4. Caterina Kulyk, Chiara Voltan, Marialaura Simonetto, Anna Palmieri, Filippo Farina, Francesca Vodret, Federica Viaro, Claudio Baracchini, Vertebral artery hypoplasia: an innocent lamb or a disguise?, Journal of Neurology, 10.1007/s00415-018-9004-7, 265, 10, (2346-2352), (2018).
5. Nasra K, Osher M. Sonography Vascular Peripheral Arterial Assessment, Protocols, And Interpretation. [Updated 2022 Apr 30]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK570577/
6. The official website of the Ministry of Health of Ukraine https://moz.gov.ua

EVALUATION

Current control: oral control during the survey, conversations, written in the form of a test, practical, test, self-control, etc.
For mastering each topic of the section, the graduate student receives an assessment on a 4-point (traditional) scale, all types of work provided by the methodical development for studying the topic are taken into account. At the end of the study of the discipline,

the current success rate is calculated as the arithmetic average of all the marks received by the graduate student on a traditional scale, rounded to 2 (two) decimal places.
Assessment of current discipline control:

The meaning of the **"excellent"** grade: the graduate student shows special creative abilities, is able to independently acquire knowledge, without the help of a teacher finds and processes the necessary information, knows how to use acquired knowledge and skills to solve problems, is able to produce innovative ways of solving problems, convincingly argues answers.

The value of the grade "**good**": the graduate student is fluent in the studied volume material, applies it in practice, solves exercises and problems freely in standard situations, independently corrects the mistakes made.

The value of the rating is "**satisfactory**": the graduate student is able to master a significant amount part of the theoretical material, but mainly in a reproductive form, demonstrates knowledge and understanding of the main provisions, with the help of the teacher can analyze educational material, correct errors.

The value of the assessment is "**unsatisfactory**": the graduate student has mastered the material at the level individual fragments that make up a small part of the educational material. Only those graduate students who do not have the final certification are admitted academic debt and have an average score for the current academic year activity is not less than 3.00.

Forms and methods of final control: complex testing on a paper carrier with manual verification, independent visualization of vessels of the head and neck, color mapping of vessels, determination of speed characteristics of blood flow, degree of stenosis.

The evaluation of the discipline is carried out in accordance with the "Regulations on the Organization of the Educational Process at Odesa National Medical University". The final control is carried out in the form of a credit.

Individual work

Assessment of independent work of graduate students and applicants, which provided in the topic along with classroom work, is carried out during current control of the topic in the corresponding classroom session, as well as on final control (exam).

COURSE POLICY

Deadlines and Rescheduling Policy

Tasks must be completed on time according to the deadline. For untimely completing the task, the graduate student receives an unsatisfactory grade. If the acquirer of higher education was absent from classes for any reason, then practice is carried out within the deadlines set by the teacher in accordance with the "Regulations on the organization of the educational process at ONMedU" (link to the regulations on the university's website https://onmedu.edu.ua/wp-content/uploads/2020/01/osvitnijproces.pdf). Rearranging is carried out in accordance with the approved schedule.

Academic Integrity Policy

The policy of the educational component is based on the principles of the academic one integrity (link to the regulations on the university's website https://onmedu.edu.ua/wp-content/uploads/2020/07/polozhennja

prodobrochesnist.pdf) and is determined by the system of requirements that the teacher presents to the applicant when studying the educational component:

- independent performance of educational tasks, tasks of the current and final control of learning results (for persons with special educational needs, this requirement is applied taking into account theirs individual needs and capabilities);
- links to sources of information in the case of using ideas, developments, statements, information.

Attendance and Tardiness Policy

Attendance and work are required to obtain a satisfactory grade in classroom classes (lectures, practical and seminar classes). The lateness of the graduate student allowed for no more than 10 minutes.

The use of mobile devices is permitted in class with permission teacher

Behavior

The following values should be cultivated while in the audience: respect for colleagues; tolerance for others; receptivity and impartiality; argumentation of agreement or disagreement with the opinion of other participants in the discussion, as well as one's own opinion; respecting the dignity of the opponent's personality during communication; compliance with the ethics of academic relationships.