Ministry of health of the Republic of Belarus
Educational institution
«Gomel State Medical University»

Department of general and clinical pharmacology

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METHODOLOGICAL RECOMMENDATIONS

for a practical lesson on the discipline "Pharmacology"
with 3-year students of the Faculty of Foreign Students,
studying at the specialty 1-79 01 01 "General medicine"

TOPIC 7: **« DRUGS AFFECTING THE PERIPHERAL NERVOUS SYSTEM. DRUGS AFFECTING AFFERENT INNERVATION»**

Time: 3 hours

Approved at the meeting of the department of general and clinical pharmacology

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2022

LEARNING AND EDUCATIONAL GOALS, OBJECTIVES, MOTIVATION FOR LEARNING THE TOPIC

Drugs acting on the afferent system have a unique ability to protect a vulnerable nerve ending - the receptor. For this reason, these drugs have found wide application in many areas of practical medicine, which dictates the need for the future physician to know the pharmacology of these substances, regardless of his or her chosen specialty.

Learning objective:

– formation of scientific knowledge about the main pharmacological effects, providing therapeutic and preventive effect of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use for use in medical and preventive activities.

Educational purpose:

– to develop their value-personal, spiritual potential, to form the qualities of a patriot and citizen, ready for active participation in the economic, industrial, socio-cultural and public life of the country; to realize the social significance of their future professional activities, to learn to follow academic and work discipline, standards of medical ethics and deontology.

Tasks:

As a result of the study lesson, the student should

know:

– classification and basic characteristics of the studied drugs, pharmacodynamics and pharmacokinetics, indications and contraindications for their use, side effects;

– features of pharmacokinetics and pharmacodynamics, advantages and disadvantages of different dosage forms of these drugs;

– principles of research and testing of new drugs; information and reference and search systems;

be able to:

– analyze the effect of the studied drugs on the set of their pharmacological properties and the possibility of their use in medical practice; to write them in prescriptions;

– use different dosage forms of these drugs, based on the peculiarities of their pharmacodynamics and pharmacokinetics;

– work with scientific literature, search for information about the use and action of the studied drugs;

possess:

– skills in choice of drugs on the topic of the lesson;

– the rules of prescribing the studied drugs in the treatment of various diseases and pathological conditions, taking into account the indications;

– skills of dosage regime correction in case of pathological changes in functions of organs or systems responsible for biotransformation and elimination of drugs or in case of joint use of different drugs;

– skills to search, analyze and summarize information about the use and effects of the studied drugs.

Motivation for learning the topic:

– the specifics of training doctors in this specialty determines the need for students to purposefully study the main pharmacological effects, providing therapeutic and preventive effects of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use, which will successfully complete the specialized disciplines of the specialty.

MATERIAL EQUIPMENT

Reference and informational literature, charts, tables, presentations, drug collections.

CONTROL QUESTIONS FROM RELATED DISCIPLINES

1. Anatomy of the nervous system: afferent innervation.
2. Mechanism of emergence and transmission of excitation through afferent nerve fibers.
3. Physiological role of afferent innervation in the human body.

CONTROL QUESTIONS ON THE TOPIC OF THE CLASS

1. Classification of anesthetic agents by chemical structure. The main types of local anesthesia and preparations used for surface, infiltration, regional (conductive, intravascular, intraosseous, spinal, peridural, etc.) anesthesia.
2. general properties that a local anesthetic should have. Evaluation criteria: concentration, speed, strength and duration of anesthetic effect, local and resorptive action, stability during sterilization, effect on vascular tone. General chemical structure of local anesthetics, the role of functional elements of the chemical structure in the mechanism of analgesic action. Electrophysiological mechanism of anesthesia.
3. Advantages of local anesthesia, which determine indications for its use and contraindications to it. Pharmacological characteristics of novocaine, anesthesin, lidocaine, pyromecaine, bupivacaine, ultracaine, ultracaine DS.
4. Symptoms of acute and chronic cocaine poisoning, measures of care.
5. Classification of astringents by source of production. Pharmacological characteristics of astringents: mechanism of action; local effects (effect on blood vessels, pain sensitivity, gland secretion, cell membrane permeability, inflamed tissues, microorganisms); types of action of salts of heavy metals depending on concentration; main indications for the use of aluminum, copper, silver, tannin, bismuth, zinc, magnesium.
6. Pharmacological characteristics of envelopes: mechanism of action and main effects; indications for use.
7. Pharmacological characteristics of adsorbents: main effects (effect on receptors of skin and mucous membranes, absorption of poisons, toxins and gases); main indications for use.

8. Pharmacological characteristics of irritants: manifestation of local and reflex action on the respiratory and vasomotor centers, system "hypothalamus-adrenal", zones Zakharya - Hed, the occurrence of axon reflexes; mechanisms of mustard therapy: the main components of the therapeutic action of mustards and purified turpentine oil; mechanisms of "distracting" action of mustards and purified turpentine oil and positive trophic effect on internal organs; the active principle of turpentine oil and its properties; mechanism of menthol action (direct effect on skin and mucosa receptors, reflex action on internal organ vessels, possibility of developing distracting and calming effects); composition of validol and types of its therapeutic action; mechanism of action of 10% ammonia solution.

PROCESS OF THE STUDY

Theoretical part

Theoretical questions are described in the appendix to the methodological recommendations.

Practical part

1. Take notes on theoretical material demonstrated by the teacher.
2. Master the methods of solving the tasks and writing out prescriptions on the topic of the class.

Theme learning control

Conducted in the form of independent written work (solution of practical problems and prescriptions for individual task).

METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF STUDENTS' INDEPENDENT WORK (SIW)

The time given for independent work can be used by students for:

– preparing for the practical classes;
– completing the tasks on the topic of the class in the workbook;
– preparing thematic reports, essays and presentations;
– taking notes from academic literature.

The main methods of organizing independent work:

- completing tests and practical tasks of the electronic educational-methodical complex (EEMC) for self-monitoring and self-assessment.

The list of tasks of the SIW:

- solving practical problems in the EEMC;
- completing the test tasks of the EEMC.

Control of the SIW is carried out in the form of:

- assessment of an oral answer to a question, report, report, or solution of a task in a practical class;
- individual conversation.

METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF CONTROLLED INDEPENDENT WORK OF STUDENTS (CIWS)

Recommended forms of CIWS organization:

- doing exercises on the topic of the class in the workbook;
- writing an essay on a given topic;
- preparing a report and a multimedia presentation on a given topic.

The list of tasks of the CIWS:

Topics of essays / multimedia presentations:

1. The role of folk medicine in the formation of the modern group of irritants.
2. Topical anesthetics in cosmetology.

Forms of control of CIWS realization:

- checking and grading an essay on a given topic;
- checking and grading a multimedia presentation on a given topic.

LIST OF REFERENCES

1. Kharkevitch, D.A. Pharmacology: textbook for med. students: transl. of 12th ed. of Russ. textbook "Pharmacology" (2017) / D.A. Kharkevitch. - 2nd ed. - Москва: ГЭОТАР-Медиа, 2019. - 676 с.: ил., табл. - Рек. ФГАУ "ФИРО". – Режим доступа: http://www.studmedlib.ru/book/ISBN5970402648.html – Дата доступа: 23.05.2022.
2. Кратко о лекарственных средствах: учебно – методическое пособие для студентов 3 и 6 курсов факультета иностранных студентов, учреждений высшего мед. образования: в 2 ч.=Drugs in short: partical workbook for 3 and 6 year students Faculty for International Students of medical higher educational institutions: in 2 parts / Е.И. Михайлова [и др.]. – Ч. 1. – Гомель: ГомГМУ, 2020. – 56с. – Режим доступа: http://elib.gsmu.by/xmlui/handle/GomSMU/7128 – Дата доступа: 23.05.2022.
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4. Rang and Dale's Pharmacology / J.M. Ritter [et al.]. - 9th ed. - Edinburg [et al.]: Elsevier, 2020. - xvi, 789 p.: ill., tab. + Student consult online.

Drugs affecting afferent innervation

Drugs affecting afferent innervation are agents affecting transmission from peripheral tissues receptors to the CNS.

Classification	Drugs dicreasing afferent innervation				Drugs improving afferent innervation		
	Astringents*	**Enveloping agents****	**Adsorbents*****	**Local anesthetics**	**Irritant agents**	**Reflex actiong expectorants**	**Amarines, laxatives**
Drugs	1. Oak bark 2. St. John's wort 3. Flowers of chamomile 4. Sage leaf 5. Grass of the string 6. Tanin	7. Flax seed 8. Aluminum hydroxide 9. Magnesium oxide 10. Almagel 11. Phosphalugel 12. Maalox 13. Vicair 14. Bismuth sub-Citrate (De-nol) * / **	15. Activated carbon 16. Polyphepane 17. Diosmectite (Smecta) 18.Enestros-gel 19. Sorbogel	See below	1. Menthol 2. Validol 3. Mint peppery 4. Mustard 5. Camphor 6. Ammonia alcohol	These agents will be discussed on the other lessons	
Mechanism of actions	* Causes the precipitation of proteins and form a albumins film to protect the wound surface from the action of irritants ** Envelope nerve endings, ↓ irritating effect on nerve endings of the mucosa of the gastrointestinal tract *** Adsorb chemical substances on its surface				Irritate afferent nerve endings, reflexively dilate arterioles and capillaries		
Pharmacological effects	**1. Astringent (1-6,14)** **2. Enveloping (7-14)** **3. Absorbent (15-19)** **4.** Antacid (8-14) **5.** Antibacterial (2-5,14)				**1. Distracting (1,4-6)** **2. Trophic (4,5)** **3.** Sedative (2.3) **4.** Spasmolytic (1,2)		
Side effects	1. Constipation 2. Diarrhea 3. Dark feces (13-16) 4. Violation of electrolyte balance (8-14) 5. ↓ nutrient, drug, vitamin and mineral absorption (15-19)				1. Skin irritation 2. Allergic reactions		
Indications for use	1. Inflammatory processes, skin and mucous membrane damage * 2. Inflammatory diseases of the digestive tract ** + (2,3) 3. ↓ irritating effects of other drugs ** 4. Poisoning *** 5. Flatulence ***				1. Neuralgia, myalgia, arthralgia (4,5) 2. Inflammatory diseases of the respiratory system (1,3-5) 3. Cardialgia (2) 4. Neuroses (2.4) 5. Loss of consciousness (6)		
Contraindications	1. Individual intolerance 2. GIT ulcers (15-19) 3. Git bleeding (15-19)				1. Hypersensitivity		

Local anesthetics

Local anesthetics are drugs that reversibly block the conduction of a nerve impulse and cause localized temporary anesthesia with no significant CNS effects.

Classification	Ethers	Amides	Mixed agents
Drugs	**1. 1. Procaine (Novocaine)** **2. 2. Benzocaine (Anestezin)** **3. 3. Tetracaine hydrochloride (Dicain)** **4. 4. Benzofurocaine**	**5. Articaine (Ultracaine)** **6. Lidocaine** **7. Bupivacaine** **8. Trimecaine hydrochloride**	**9. Lidocaton (**Lidocaine + Epinephrine) **10. Ultracaine D-C (**Artikain + Epinephrine)
Mechanism of action	1. ↓ Membrane permeability for Na^+ и K^+ ions → no action potential 2. ↓ release of neurotransmitters 3. Change the surface tension of cell membrane phospholipids		
Pharmacological effects	**1. Local anesthesia** 2. Antiarrhythmic (1,6,9) 3. Hypotensive (1,6)		
Side effects	1. Allergic reactions 2. On the CNS: dizziness, headache, tinnitus, nausea, vomiting, disorientation, tremor, tonic-clonic seizures 3. On the CVS: ↓ heart automaticity, excitability, conductivity, contractility (except for cocaine)		
Indications for use	1. Superficial anesthesia (bronchoscopy, ophthalmological operations, surgeries of ENT organs) (2,3,5,6) 2. Infiltration anesthesia (dental practice) (1,5-10) 3. Conducting anesthesia (dental practice, surgery of the limbs, phantom pain) (1,5-10) 4. Epidural and spinal anesthesia (obstetric and surgical operations) (1, 6-8)		
Contraindications	1. Allergic reactions 2. Hypotension 3. CA blockade, II-III degree AV blockade		
NB!	1. Ethers are rapidly hydrolyzed by plasma esterases → a more short-term effect than that of amides 2. Esters have a high allergy risk, since they are derivatives of para-aminobenzoic acid. 3. To reduce the absorption of anesthetics, vasoconstrictors such as adrenaline are added to their solutions. It reduces the absorption of anesthetics into the systemic circulation, thereby ↓ their toxicity and duration of action 4. Dicaine is not used today due to high toxicity		