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**Methodological elaborations - Physiotherapy in stomatology**

For students of year V, semester X

**Chisinau, 2024**

**Approved**

Department meeting

Minutes, no. \_\_\_ of \_\_\_\_\_\_\_\_\_\_\_, 2024

**Seminar thematic plan**

1. Physiotherapy as a medical science in dentistry. Aims and objectives. Organization of work in physiotherapy office, familiarization with physiotherapeutic appliances and necessary documentation.
2. Physical factors used in the prophylaxis and treatment of stomatological diseases. Direct/continuous electric current of low power and low voltage. Electrophoresis with medication. Phonophoresis. Galvanization.
3. Low voltage and low frequency pulsed currents. Electroodontodiagnostics. Diadynamic therapy (DDT). Amplipulsterapy (modulated sinusoidal currents). Fluctuorization.
4. Alternating electric current and very high frequency electromagnetic field. D'arsonvalization. Very high frequency electric field (VHF). Microwave therapy.
5. Magnetotherapy. Ultrasound therapy. Cryotherapy. Hydrotherapy. Massage. Vacuum-therapy.
6. Laser in dentistry.
7. Ozone therapy in dentistry.
8. Physical methods in the diagnosis and treatment of dental caries, non-carious dental hard tissue diseases, pulpitis and apical periodontitis.
9. Physiotherapeutic treatment in periodontal diseases (gingivitis, marginal periodontitis, periodontosis).
10. Physiotherapy of oral mucosa diseases and stomalgia. Colloquium.

**Methodical elaboration №1**

Theme: Physiotherapy as a medical science in dentistry. Aims and objectives. Organization of work in the physiotherapy office, familiarization with physiotherapeutic appliances and necessary documentation.

**Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Physiotherapy. Concept. Aims and objectives.
2. Peculiarities of physiotherapy as a medical science in dentistry.
3. List the physiotherapeutic methods of treatment. The essence of physiotherapeutic methods of treatment.
4. Pathogenetic mechanism of action of the methods (electrophoresis with medication, phonophoresis, diadynamotherapy, amplipulsterapy, fluctuorization, darsonvalization, very high frequency currents, microwave therapy).
5. Errors and complications in physiotherapy treatment.
6. Safety rules in physiotherapy.
7. Organization and equipment of the physiotherapy office.

**ANNOTATION**

**PHYSIOTHERAPY** - is a discipline that studies the effects of natural and artificial physical factors on the body for the treatment and prophylaxis of stomatological diseases. Physiotherapy is indicated in approximately 90% of inpatients and up to 60% of outpatients. The number of modern physiotherapeutic methods is continually increasing, new physiotherapeutic appliances based on modern electronic technology are emerging.

In this lesson, students familiarize themselves with the basic principles of physiotherapy office operation, documentation and physiotherapeutic appliances. In the context of increasing population allergies and the growing number of complications caused by drug treatments, physical methods of treatment are also used.

The physiotherapy office must be equipped according to the sanitary-hygienic standards and be equipped with various physiotherapeutic treatment appliances. It is located in one or two rooms with ancillary rooms. The rooms must be dry and well-lit, with a surface area of 32-38 m², with wooden floors covered with oil-based paint or linoleum. The walls are also painted with oil-based paint up to a height of 2 meters. Central heating radiators, water and sewage pipes must be encased in wooden casings painted with oil-based paint and electrical cables must be well insulated.

Separate cubicles, divided with soft fabric drapes on metal enclosures or plastic panels, are used for the procedures. The metal constructions of the cubicles shall be insulated. The physiotherapy cubicle must also contain the nurse's workplace. A common electrical panel with a main switch and, for the connection of individual appliances, isolating switches shall be installed in the cabinet. The cabinet shall also be equipped with a sink for rinsing the isolation cloths used under the electrodes and a sterilizer for boiling them.

Safety technique instructions should be posted in a visible place in the practice. A first aid kit is also required.

The physiotherapist is the head of the office, who coordinates the entire activity of the staff, plans and ensures the functioning of the physiotherapy office, receiving patients, checks the correctness of prescriptions for physiotherapeutic procedures, enters them in the procedure sheet and checks the correctness of the activities performed in the physiotherapy office.

**The dental physiotherapy office should be equipped with the following appliances:**

1. Galvanization device: "Поток-1", "ГЭ-5-03".
2. Electrodiagnostics: "ЭОМ-1", "ЭОМ-3".
3. Diadynamic therapy: Тонусус-1, "Модель-717".
4. Low frequency therapy: "Амплипупульс-4Т".
5. Fluctuorization: АСБ-2.
6. Darsonvalization: "Искра-1", "Искра-2".
7. Electroanalgesia of teeth: "Элоз-1", "ИАНН-1".
8. Diathermocoagulation: "ДКС-2М".
9. Ultra-high frequency therapy (UHF): "УВЧ-30", "УВЧ-66".
10. Microwave therapy: "Луч-2" or "Луч-3".
11. Ultrasound therapy: "Ультрадент", "УЗТ-3".0403, "Cavitron", "Woodpeker".
12. Mercury-quartz radiator: ОКН-4, ОНН-82.
13. Laser in dentistry: Helbo laser; SIROLaser Blue (Sirona); Waterlase Er, Cr:YSGG
14. Biodosimeter, safety goggles.
15. "Solux" table lamp: "ЛССН-1".
16. Table clock for procedures.
17. Sets of hydrophilic protective material for galvanization.
18. Lead plates.
19. Mono- and multifilament cable.
20. Spirtieră, dental trays with full set of instruments.

**Physiotherapy office documentation:**

1. Physiotherapy procedure sheets.
2. Forms for advisory conclusions, prescription slips, prescriptions.
3. Doctor and nurse activity register.
4. Report sheet.

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**Methodical elaboration №2**

**Topic:** Physical factors used in the prophylaxis and treatment of stomatological diseases. Direct/continuous electric current of low power and low voltage. Electrophoresis with medication. Phonophoresis. Galvanization.

**Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

* + - 1. Classification of the physical factors used for curative and prophylactic purposes in the

 treatment of stomatological diseases.

* + - 1. Physiologic mechanism of action of physical factors used in dentistry.
			2. Electric current. Concept. Direct/continuous electric current of low power and low voltage. Method of

 treatment.

* + - 1. Electrophoresis with medication. Skin and soft tissue depot formation.
			2. Concentration and polarity of medicaments used in electrophoresis. Phonophoresis.
			3. Galvanizarion. Physico-chemical changes in tissues (skin, oral mucosa) under the action of

 constant electric current.

* + - 1. Apparatus for carrying out electrophoresis and galvanization. Technique and method of

 carrying out.

* + - 1. Common methods of contact therapy with direct/continuous electric current and pulsed current.

**ANNOTATION**

**Electric current** - is a movement of electric charges (electrons) along a conductor.

**Electrical conductor** - is the body through which a direct/continuous electric current can pass.

There are grade I conductors - metallic - through which the current passes without causing chemical reactions; grade II conductors - electrolytic - solutions of acids, bases or salts in which the passage of electric current produces electrolysis; and gaseous conductors - grade III. While in the first two categories, the current only moves electrons, in the other two, ions are also involved.

If the direction of movement of the electrons is the same, maintaining a constant intensity, there is a constant direct/continuous current.

**Physical factors used for curative and prophylactic purposes in dentistry:**

1. Low-power, low-voltage direct/continuous current (electrophoresis with medication, phonophoresis, galvanization, electroanalgesia with direct/continuous current)
2. Low-frequency voltage and low-frequency pulsed currents: electroodontodiagnostics, electrodiagnostics and electrostimulation, electrical sleep, diadynamic therapy (DDT), amplipulsterapy (modulated sinusoidal currents), fluctuorization
3. Alternating electric current and electromagnetic field of very high frequency: d'arsonvalization, diathermy, diathermocoagulation, very high frequency electric field (VHF), very high frequency variable electric field (inductothermia), microwave therapy

4. Magnetotherapy

5. Phototherapy (infrared radiation, laser, ultraviolet radiation)

6. Ultrasound therapy

7. Cryotherapy and hypothermia

8. Hydrotherapy

9. Massage

10. Vacuum-therapy

**Electrophoresis with medication** - is a combined method of treatment involving the influence of a constant electric current and a drug administered through it. This method is related to the ability of complex substances to dissociate in a solvent into positive and negative ions, and when the solution is placed on the electrode, the charged particles are introduced into the tissues. This introduces ions of the same polarity as the electrode, which accumulate in the skin, forming a **'depot'**. In addition to the skin depoupling, tissue depoupling can also occur.

Due to reduced irrigation of the skin, the ion reservoir is slowly reabsorbed, ensuring a constant supply of drug into the blood. Although the amount of drug reaching the blood by this method is small, the high local concentration, the increased electrical activity of the ions and the biophysical and biochemical changes in the tissues caused by the constant current contribute to a marked pharmacotherapeutic effect. Electrophoresis makes it possible to minimize the side effects of the drug, because only the necessary components of the drug are introduced into the tissues. It is therefore necessary to know the most commonly used medicinal substances in dentistry, their concentrations, polarity and the ion introduced.

According to A.E. Shcherbak (1936), drug ions deposited in the tissues cause irritation of nerve receptors in the skin, which leads to the formation of an ion reflex in the central nervous system, specific for the substance.

Another advantage of electrophoresis is that it allows the introduction of a drug into tissues that are difficult to reach by other methods. In dentistry, electrophoresis can be applied to enamel tissue, dentine, dental pulp, periodontal disease, blocked root canals.

Contraindications for the application of galvanization and electrophoresis include acute inflammatory processes, especially purulent ones, malignant neoplasms, decompensated cardiac activity, severe vascular sclerosis of the brain, epilepsy, acute skin diseases, toxic condition, tendency to bleeding, individual intolerance and pharmacological contraindications to the administration of certain drugs.

**Galvanization** - the use of low-voltage (30-80 V), low-intensity (up to 50 mA) direct current for therapeutic purposes. Under the influence of direct/continuous electrical current, a series of changes take place in the tissues, which lead to the creation of new conditions for the development of various biochemical and physical processes.

The action of direct/continuous current on tissues depends on the electrical conductibility, which is related to the presence of electrolytes in the tissues. Different tissues have different resistance, which influences their electrical conductibility. The skin, due to the presence of the stratum corneum, has a high resistance, and the current passes predominantly through the sweat glands and partly through the sebaceous glands. In this context, the electrical conductibility of the skin depends on the number of sweat and sebaceous glands and their functional status. Skin resistance may vary during the day and is closely related to the functional state of the vegetative nervous system, the season, physical labor. Increased perspiration, accelerated blood circulation, fatigue, intoxication, excitation lead to an increase in the electrical conductibility of the skin. After overcoming the resistance of the skin and subcutaneous adipose tissue, the current spreads in depth, predominantly on blood and lymphatic vessels, intercellular fluid and nerve membranes, which have low resistance.

The mucosa of the oral cavity has a good electrical conductibility due to a rich vascular system, a high affinity for water and the lack of a horny layer, which makes it extremely sensitive to electric current. This sensitivity is often individual and may be accompanied by specific sensations such as a metallic taste in the oral cavity.

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**Methodical elaboration №3**

**Topic:** Currents with impulse of low tension and frequency. Electroodontodiagnostics. Diadynamic therapy (DDT). Amplipulsterapy (sinusoidal modulated currents). Fluctuorization.

**Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Currents with impulse of low tension and frequency. Methods of diagnosis and treatment.

 Shapes of impulse for electric current (triangular, rectangular, exponential, half sinusoidal, sinusoidal, sinusoidal modulated, fluctuating).

2. Electroodontodiagnosis in determining the electrical excitability of the dental pulp. Indications.

 Parameters of electrical excitability of the dental pulp in normal and pathology of hard dental tissues. Appliances and method of electroodontodiagnosis.

3. Types of diadynamic currents. Indications. Contraindications. Apparatus and method of carrying out.

4. Amplipulstherapy (modulated sinusoidal currents). Types of amplitude pulsations. Effects

 tissues. Indications and contraindications. Apparatus and method of performance.

5. Fluctuorization as a therapeutic method of treatment. Beneficial effects on tissues. Forms

 current (symmetrical bipolar fluctuating, asymmetrical bipolar fluctuating, unipolar fluctuating current). Apparatus and method.

**ANNOTATION**

**Electroodontodiagnosis - is a method of determining** the electrical excitability of the dental pulp. As early as 1866, A. Magito proposed the use of electric current for the diagnosis of dental caries. This method is based on determining the threshold of excitation of pain and tactile receptors in the dental pulp when stimulated with electric current.

Electroodontodiagnostics is the only method that allows the evaluation of qualitative and quantitative disturbances of the dental pulp and the utilization of these data in diagnosis, differential diagnosis and monitoring of treatment efficacy in various dental diseases. Numerous studies have demonstrated that the pulp of healthy and intact teeth react to current in the range of 2-6 µA (Rubin A.P., 1969 et al.) A decrease in excitability in the range 7-60 µA indicates damage to the coronal pulp, and in the range 60-100 µA - to the radicular pulp. A decrease in excitability up to 101-200 µA indicates necrosis of the dental pulp and reaction of the tactile receptors of the periodontium. In certain conditions (periodontitis, neuritis), an increase in excitability up to 1.5-0.5 µA can be observed, which can be used for diagnostic purposes.

Electroodontodiagnosis is recommended in deep caries, pulpitis, apical periodontitis, marginal periodontitis, root cysts, trauma to the teeth and jaws, sinusitis, osteomyelitis, actinomycosis, tumors of the jaws, neuritis of the facial nerve and trigeminal nerve, neuralgia of trigeminal nerve, radiotherapeutic treatments of the face and orthodontic interventions.

Apparatus: EOM-1, EOM-3, OD-2M are used for electroodontodiagnostics.

**Diadynamic therapy -** is a treatment method that utilizes pulsating currents of a semi-sinusoidal shape with an elongated posterior front, of low intensity and low tension, with frequencies of 50 and 100 Hz. This treatment method was proposed by the french dentist P. Bernard in 1929.

Several types of diadynamic currents are used:

1. **Fixed single-phase current -** semi-sinusoidal current with a frequency of 50 Hz.
2. **Fixed two-phase current -** semi-sinusoidal current with an elongated trailing edge, frequency 100 Hz.
3. **Rhythmic single-phase current (syncopal rhythm)** single-phase current with a frequency of 50 Hz that is alternated with pauses (1s/1s; 1.5s/1.5s).
4. **Long-Period Modulated (PL) -** with slow alternation in 4s/8s. The duration of alternation is longer and the period of action of two-phase current longer than single-phase current by 2 times.
5. **Waved single-phase current** - the fixed single-phase current at which the amplitude gradually increases to the maximum then decreases to 0 and then pauses. For the single-phase ripple current the rise, hold and pause period is 12 sec.
6. **Waved two-phase current** - fixed two-phase current at which the amplitude gradually increases to the maximum then decreases to 0 and then pauses. For waved two-phase current the rise, hold and pause period is 12 sec.

Mechanism of action: increases blood circulation, increases lymphatic circulation, increases resorption properties, analgesic effect, anti-inflammatory and antidestructive effect.

Indications for the use of diadynamic current: lesions of the trigeminal and facial nerves; paresis and paralysis of the soft palate, tongue, muscles of the oral cavity floor, contusions, strains of muscles, ligaments, accompanied by pain; painful syndromes in inflammatory-dystrophic processes of the temporomandibular joint; migraine, angiospasm, pulpitis, apical periodontitis, periodontosis, alveolitis, acute inflammatory processes.

Contraindications: purulent processes prior to surgery, bone fractures, severe degrees of blood circulation disorders, tendency to bleeding, individual intolerance, malignant tumors. Models of devices for realization of diadynamotherapy: SNIM-1, Модель-717, "Tonus-1", "Tonus-2".

**Amplipulstherapy (modulated sinusoidal currents) - electrotherapeutic method by means of which a modulated sinusoidal current of medium frequency (1000-5000 Hz-10000 Hz) is used for curative or prophylactic purposes, which can be modulated depending on the frequency and oscillator mode. Medium-frequency sinusoidal alternating currents are used - currents that pass easily through the skin, spread to deep tissues, muscles and possess weak excitation. Under the electrodes there is a sensation of slight vibration, which disappears because the receptors adapt easily to the energy.**

**Physical characteristic of modulated sinusoidal currents:**

* **Type of operation 1 (permanent current modulation, constant current modulation), modulated oscillations with frequency selection of modulation directed as required within the range 10-150 Hz.**
* **Current 2 (pause pulse), is characterized by a series of oscillations modulated at a frequency of 10-150 Hz followed by a pause.**
* **Current 3 (modulated and unmodulated oscillations)**, presents series of modulated oscillations with frequency 10-150 Hz depending on the pathologic process, followed by series with carrier frequency 5000 Hz.
* **Current 4 (alternating frequency current)**, is characterized by series of freely selectable frequency modulated oscillations 10-150 Hz followed by stable frequencies 150 Hz.
* **Current 5,** is characterized by series of oscillations with freely selectable frequency 10-150 Hz followed by stable series of 150 Hz and then pause.

Amplipulstherapy is indicated in case of disorders of peripheral circulation, nervous-muscular system functions, tissue trophicity, chronic inflammatory processes, trigeminal neuralgia, after trauma in the maxillofacial area, for electrostimulation of muscles in children, in periodontosis, apical periodontitis.

Contraindications: oncologic diseases, decompensated cardiovascular system, acute infectious diseases, bleeding tendency, pronounced edema, purulent inflammatory processes, fractures until their consolidation.

Apparatus: "Amplipuls-4".

**Fluctutuorization** - the use of alternating sinusoidal current for therapeutic purposes, which changes chaotically in amplitude and frequency in a range from 100 to 2000 Hz.

It has an analgesic effect, accelerates the wound healing process, contributes to the isolation of the purulent focus from the "healthy" tissue, favors the regression of the inflammatory infiltrate, stimulates the regeneration processes by intensifying blood and lymphatic circulation, increasing the permeability of the vascular wall, accelerating metabolic processes, activating phagocytosis and enzyme activity. At a significant current density, fluctuation causes arrhythmic muscle contractions, which leads to changes in the lumen of blood vessels, increased blood flow, elimination of decomposition products and a shift of pH to the alkaline side. Under the action of chaotically changing impulses, the pain in the pathologic focus is reduced and disappears, and the pain impulses are blocked in the cerebral cortex (Rubin L.R., 1969; Azov S.H., 1974).

Three forms of current generated by the pain relief device (ASB-2) are used: symmetric bipolar fluctuating current with identical pulse amplitudes for both polarities; asymmetric bipolar fluctuating current, in which two thirds of the pulses are negative; unipolar fluctuating current, in which the pulses of one of the polarities are completely absent, which allows its use for polar treatments and the introduction of drug ions - fluctuophoresis.

Fluctuorization is indicated for pain caused by exacerbation of chronic apical periodontitis, alveolitis, alveolonevritis, pulpitis, arthritis, enamel hypersensitivity, neuralgias and inflammatory processes - periostitis, abscess, phlegmon, periodontosis in the developed stage, actinomycosis, salivary gland diseases, inflammatory contracture.

Contraindications are malignant tumors, Meniere's syndrome, tendency to bleeding.

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**Methodological elaboration №4**

**Topic:** Alternating electric current and electromagnetic field of very high frequency. D'arsonvalization. Very high frequency electric field (VHF). Microwave therapy.

**Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

* + - 1. D'arsonvalization. Concept. Mechanism of action on tissues. Apparatus and method of performance.
			2. Very high frequency electric field (VHF). Concept. Mechanism of action on tissues. Apparatus and method of performing.
			3. Microwave therapy. Concept. Mechanism of action on tissues. Apparatus and method of application.

**ANNOTATION**

**Darsonvalization** - application of alternating current with pulses of high frequency (100-300 kHz), high tension (20 kV) and low power (0.02 mA) for therapeutic purposes. In dental practice only local darsonvalization is used, in which alternating current pulses of 110 µs, which are alternating at a frequency of 50 times per second, are applied to tissues through glass electrodes. In this process, a mild electrical discharge is formed between the electrode and the tissue when the electrode comes into direct contact with the tissue, and a spark discharge occurs when applied at a distance. The electrical discharges produced irritate surface nerve receptors. The afferent impulses from the area of action reach the central nervous system where, via an efferent pathway, a reflex regulatory influence is achieved, leading to normalization of muscle and vascular tone, improving trophicity. Spark discharge has a modest physiologic effect, with significant local reactions in addition to reflexes. It causes dilation of arterial and venous vessels, acceleration of microcirculation, increased supply of nutrients and activation of metabolic exchange in tissues, which contributes to improved repair processes. Increases tissue permeability and phagocytosis. The tonus of the vegetative nervous system increases, which leads to constriction of sweat and sebaceous glands and a decrease in their secretion. There is a decrease in superficial tenderness and a reduction in pain, which is related both to the development of parabiosis and to the change in the adaptive function of vegetative nerves to cutaneous analyzers. In the skin and mucosa of the oral cavity circular cell infiltration and foci of micronecrosis are observed, which leads to nonspecific activation of tissue protective processes. The heat generation in the tissues is little pronounced, as a low current intensity and a pulsed action regimen are applied.

Topical darsonvalization is recommended in cases of wounds and ulcers, jaw fractures, periodontosis, acute arthritis of the temporomandibular joint, apical periodontitis, catarrhal and hypertrophic gingivitis, chronic relapsing aphthous stomatitis, simple form of lichen planus, glosalgia, trigeminal nerve neuralgia and prosopalgia.

Contraindications are malignant tumors, insufficiency of the cardiovascular system, tendency to bleeding, active process of tuberculosis.

Apparatus: Искра -1.

**Very high frequency (VHF) electric field**
VHF therapy - the application of a very high frequency (40 MHz) alternating electric field for therapeutic purposes.

Under the action of the electric field, ions oscillate in the tissues and the charged particles' dipoles are oriented along the lines of force, which causes the transition of electrical energy into thermal energy. Since the physico-chemical structure of tissues is different, the heat generation is most intense in tissues that have a higher resistance (nerves, brain, bones, tendons). At a low field strength, the oscillatory (vibrational) effect plays an important role, which leads to changes in the natural rhythms of biophysical and chemical processes and the creation of new conditions for physiological reactions. The VHF electric field causes dilation of vessels, especially in deep tissues, activation of blood and lymphatic circulation, substance exchange and enzyme activity. It increases vascular wall permeability, leukocyte and phagocyte formation, activating cellular and tissue protective mechanisms, dehydration of tissues in inflamed sites occurs against a background of low bacterial activity. Due to the accumulation of calcium ions, the pH shifts towards the alkaline side. At low doses, a calming reflex effect is observed via the central nervous system. Thus, the VHF electric field exerts an anti-inflammatory effect, stimulates the regeneration of damaged tissues, eliminates spasms of vessels and muscles, relieves pain and increases saliva secretion.
Physiological reactions are largely related to the intensity of the field used. The low-intensity field has a pronounced anti-inflammatory effect, the medium-intensity field stimulates metabolic processes well, and the high-intensity field contributes to the intensification of inflammation due to the breakdown of large protein molecules and the formation of amino acids, which causes a pH shift towards acidic pH and a sudden increase in tissue permeability. The application of the VHF electric field should be differentiated according to the severity and stage of the pathological process.
The VHF electric field is indicated in dentistry in cases of acute inflammatory processes, including purulent, soft tissue and jaw trauma, erosive-ulcerative lesions of the skin and mucous membrane of the oral cavity, frostbite, facial nerve damage. Contraindications include malignant tumors, blood diseases, insufficiency of the cardiovascular system, hypotensive disease and pregnancy. Units: UVC-30, UVC-60.

**Microwave therapy** - the application of alternating electromagnetic oscillations of ultra-low frequency (2.38 GHz) in the centimeter (12.4 cm) and decimeter (65 cm) range for therapeutic purposes. Electromagnetic waves of this frequency are intensely absorbed by tissues at depths of up to 5-7 cm, leading to the formation of heat. Tissues containing a lot of water (blood, lymph, mucous membranes) are heated most intensely, which is due to the orientational rotation of dipolar water molecules. The temperature increase reaches its maximum within 6-10 minutes after the start of exposure and normalizes on the face within 20-30 minutes. When the skin of the cheek is irradiated, its temperature increases by 3.9 °C, and in the cheek mucosa - by 2.9 °C (Mihailova R.I., 1967). Dilation of vessels and acceleration of blood and lymphatic circulation in the exposure zone and symmetrical zones, increased permeability of the vascular wall, exchange of substances and tissue defense reactions are observed. The irritation of nerve receptors in the exposure zone leads to the formation of positive reflex reactions and a secondary humoral effect. The specific oscillatory effect of this factor is most evident when a mild heat dose is applied.
Compared to centimeter waves, decimeter waves penetrate deeper (8-10 cm) and are more uniformly absorbed, making them a milder irritant.

Microwave therapy is indicated in subacute and acute inflammatory processes with the presence of exudate drainage, periodontitis, jaw fractures. Contraindications include malignant tumors, blood disorders, insufficiency of the cardiovascular system, hypotensive disease and pregnancy.

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**Methodological elaboration №5**

**Subject:** Magnetotherapy. Ultrasound therapy. Cryotherapy. Hydrotherapy. Massage. Vacuum-therapy.

**Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Magnetotherapy. Concept. Mechanism of action on tissues. Apparatus and method

 the performance.

2. Ultrasound therapy. Concept. Mechanism of action on tissues. Apparatus and method

 the performance.

* + - 1. Cryotherapy. Concept. Mechanism of action on tissues. Apparatus and method.
			2. Hydrotherapy. Concept. Mechanism of action on tissues. Apparatus and method.
			3. Massage. Concept. Mechanism of action on tissues. Apparatus and method.
			4. Vacuum-therapy. Concept. Mechanism of action on tissues. Apparatus and method.

**ANNOTATION**

**Magnetotherapy.** The application of a low-frequency alternating magnetic field for therapeutic purposes is called magnetotherapy. When a low-frequency alternating magnetic field acts, low-frequency currents are induced in the tissues by the movement of charged particles. The indications for the application of the method are physico-chemical processes that change as the external magnetic field creates specific conditions for them. This type of influence helps to improve blood circulation, metabolism and tissue trophicity. It has analgesic and anti-inflammatory effects.

Under the influence of an alternating magnetic field in the gingival mucosa in periodontosis, microcirculation is accelerated, tissue permeability is reduced, peripheral capillary tonus is increased, the elasticity index is decreased, venous stasis is eliminated, fibrinolytic activity of periodontal tissues and saliva is reduced, and the level of blood oxygen saturation increases. Morphologically, there is a rapid reduction in inflammation, hardening of the vascular wall, a decrease in epithelial proliferation and sclerosis of connective tissue.

Indications for magnetotherapy are: periodontosis, catarrhal gingivitis, ulcerative and traumatic lesions of the mucosa of the oral cavity, postoperative trauma and wounds, acute arthritis of the temporomandibular joint.

**Massage** - mechanical tissue irritation used for therapeutic purposes.
Massage causes mechanical irritation of superficial and deep tissues, peripheral nerve receptors, which provokes various reflex reactions, leading to changes in organ and tissue function. Impulses efferent to the massage from peripheral nerve receptors (extrareceptors and intrareceptors) lead to the development of an inhibitory process in the central nervous system, which can sometimes manifest itself as sleepiness after the procedure. The degree of influence on the nervous system depends on the massage techniques, intensity and duration of the procedure. For example, rubbing and smoothing decrease excitability, which leads to analgesia, while gentle stroking and vibration increase excitability.

Massage contributes to the mechanical cleansing of the skin and mucous membranes from epidermal debris and the products of gland activity, which leads to increased functional activity of the skin glands. Due to mechanical irritation there is dilation of blood vessels of the skin and deep tissues, which leads to increased blood and lymphatic circulation, improved metabolism, enhanced biochemical processes and protective functions of tissues. In the skin, due to acceleration of protein breakdown and enzyme activity, biologically active substances (histamine, acetylcholine) appear, which have a humoral effect on the tone of blood vessels. In the muscle, fatigue disappears due to accelerated elimination of energy breakdown products. Edema is reduced and metabolism in tissues is stimulated, which improves their contractile function and work capacity. There is a redistribution of blood in the massaged tissues, which influences the functions of the cardiovascular system. Massage stimulates regenerative processes in tissues due to improved microcirculation and increased tissue mobility.

The massage is indicated in cases of chronic inflammatory processes of the maxillofacial region, periodontosis, scars, dense infiltrations, hematomas, adhesions and contractures, spastic pain, neuritis, neuralgia of the facial and trigeminal nerve, contractures of the masticatory muscles. Massage is contraindicated in cases of acute inflammation, purulent diseases, disorders of the excretory function of the kidneys, exhaustion and insufficiency of the cardiovascular system. Common techniques include: digital self-massage, manual massage, vibrating massage.

**Ultraviolet radiation.** Ultraviolet rays penetrate into tissues to a depth of up to 0.6-1 mm and are absorbed mainly by the epidermis in unaffected skin. Due to their high quanta energy, they are activated in the tissues and transition of atoms to a higher level takes place, which explains the pronounced photochemical effect of UV radiation. The direct action leads to denaturation and subsequent coagulation of the protein, and after its enzymatic breakdown, biologically active substances (histamine, acetylcholine) are formed. These substances, absorbed into the bloodstream, have a secondary humoral effect on the tone of blood vessels, muscles, nerve receptors and metabolic processes, in particular on the hydro-electrolyte balance of tissues.

Under the influence of UV rays, provitamin D is converted into vitamin D3, which is an important factor in regulating mineral exchange and related enzymatic processes. UV deficiency leads to increased permeability of blood vessels, bone demineralization, caries and rickets in children. The body's resistance and working capacity are significantly reduced and immunobiological processes are impaired, which is also associated with an imbalance of vitamin C. Indications for use: acute inflammatory and purulent processes in the maxillofacial area, ulcerative lesions of the mucous membrane of the oral cavity, pain in periodontosis, trauma of soft tissues and jaws, dental caries prevention, erysipelas, acne eruptions. Contraindications: malignant tumors, blood diseases, lupus erythematosus, cardiovascular system insufficiency, endocrinopathies, active pulmonary tuberculosis.

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**Methodological elaboration №6**

**Topic:**Laser in dentistry.

Location: University Dental Clinic No. 1

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Light therapy/phototherapy (infrared radiation, ultraviolet radiation, laser).

2. The laser. Concept. Operating principle of the laser. Laser construction.

3. Laser radiation properties (coherence, directionality, intensity, monochromaticity)

 Characteristics of laser radiation in dentistry.

5. Specific characteristics of laser radiation.

6.Apparatus and method of performance.

**ANNOTATION**

**LASER** - *Light Amplification by the Stimulated Emission of Radiation*.

**Laser** - a device for the amplification or generation of electromagnetic waves in the optical field based on the forced emission effect of atomic systems, which allows us to concentrate energy corresponding to a temperature of tens of thousands of degrees (DEX, 1996, p. 559)

**Radiation** - energy emitted as waves or particles.

**Wavelength** - the distance photons travel during a complete oscillation. Wavelength is a physical property that determines the classification of electromagnetic energies and lasers. Units in: Meters (m), Micrometers (1 mm=10-6 m), Nanometers (1 nm=10-9 m).

Laser **construction** involves three essential parts [L. Pop, 2005]:

* active amplifier environment
* mechanism
* resonant cavity

**Properties of laser radiation.** The laser is a system (a facility) in which the emission of radiation is amplified. So the stimulation is achieved by applying to ions, atoms or molecules an excitation energy which, under given conditions, produces light emission with characteristics that are different from those of natural light:

1. **Coherence** is the most important property of laser radiation that distinguishes lasers from other light sources. The production of laser light causes the systems of atoms inside the resonant cavity to emit in correlation with each other, resulting in a strong, coherent light wave. For this reason a laser can be correctly defined as a coherent light source.
2. **Directionality** is the laser's property of emitting in only one direction. Due to the special shape of the resonant cavity, the waves are reflected a very large number of times by the reflecting surfaces at the ends, and therefore only those waves, which propagate parallel to the axis of the resonant cavity, are amplified; for this reason the laser wave will be highly directional.
3. **The intensity** is the energy density carried by the beam. The very high laser intensity is a consequence of the other two properties: coherence and directionality. This property has made it possible to use lasers to melt or evaporate various materials.
4. **Monochromaticity** is the property of lasers to emit light of a single color in a particularly narrow spectral range, favored by the selective qualities of the resonant cavity.

In dentistry, radiation can be visible or invisible, with other characteristics such as **collimation, coherence and efficiency**. The essential characteristic of the clinical use of laser light is **efficiency.**

In this context, it is necessary to mention some specific characteristics of laser radiation, without which we cannot know the working principle and types of lasers, but most importantly - the responsibility of clinical application:

* The radiation emitted by a laser is a laser energy wave.
* Laser light is unique in that it travels in a straight line at the speed of light until it is reflected or absorbed.
* The laser radiation, very well directed, causes the formation of a wave with a very small divergence called collimated.
* The divergence coefficient plays a particularly important role in the interaction of laser radiation with the target tissue.
* Focal point - the distance at which the radiation is minimized in diameter; at this point the laser beam is focused.
* The power density is the value of the incident power/surface element (W/cm2).

Laser devices: Helbo laser; SIROLaser Blue (Sirona); Waterlase Er, Cr:YSGG

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**Methodological elaboration №7**

**Topic:** Ozone in dentistry.

Location: University Dental Clinic No. 1

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Concept of medical ozone. Therapeutic effects in the treatment of dental disorders.

2.Indications and contraindications of ozone therapy.

3.The mechanism of action of medical ozone on soft and hard tissues in the oral cavity.

4.Apparatus and methodology of ozone therapy procedure.

**ANNOTATION**

In recent years, traditional methods of drug treatment of dental diseases are gradually losing their value due to the increasing number of cases of microbial resistance to antibiotics, the increasing occurrence of allergies, the large number of contraindications and side effects of drugs. All this calls for new approaches and research into alternative treatment methods.

In this context, therapy with **active oxygen in its allotropic form (medical ozone**) is a highly effective method of treatment of many diseases, the pathogenesis of which is based on bacterial inflammatory syndrome and the host's *immune-inflammatory* response.

**Ozone** (from the Greek *ozein*, meaning -to smell‖, the second (active) allotropic (active) form of oxygen - is a bluish gaseous body with a characteristic odor; in low concentrations it is pleasant - ‖the smell of purified and fresh air‖, in high concentrations it is pungent and intensely irritating. The molecule consists of three oxygen atoms (O3), has strong electron affinity (1.9 eV) and a molecular weight of 48.00 g/mol. The ozone molecule is unstable and self-decomposes into oxygen with the release of heat.

Medical ozone is produced from pure oxygen (min. 99.5%) in an ozone generator, a device containing a tube in which an endothermic process produces high-voltage electrical discharges between electrodes. Medical ozone is actually a mixture of oxygen and ozone (95%O2-5%O3). Medical ozone cannot be produced from air, as toxic nitrogen oxides are formed in the presence of nitrogen.

The action of medical ozone on the human body is diverse and multidirectional. Medical ozone possesses antimicrobial, antioxidant, immunomodulatory, antihypoxic, detoxification, antiviral, antifungal, stimulates metabolic processes and improves the rheological properties of blood. In comparison with antibiotic therapy, ozone therapy has a much broader spectrum of therapeutic action and does not create microbial resistance, does not produce mutagenic and carcinogenic effects, moreover, in the case of antibiotic-resistant microflora, supplementing antibiotic therapy with medical ozone leads to neutralization of antibiotic resistance and enhancement of the effect of antibiotics.

Ozone is first mentioned by the Dutch physicist M. van Marum in 1785, who observed the formation of an oxidizing gas with a characteristic odor during experiments with electric discharges, but the name ozone comes from the German chemist Christian Friedrich Schonbein in 1840, who first discovered ozone's ability to react with biological substrate.

In 1857, the German engineer and inventor Werner von Siemens developed the first technical ozone device, and in the 1880s, the first medical papers appeared in America, attesting to its therapeutic effectiveness. The first ozone generator was patented in 1896 by the physicist Nicola Tesla and marketed from 1900. He was later the first to ozonate olive oil for medical use. During World War I, ozone was used to disinfect and heal wounds, treat wounds and gangrene.

In 1935 surgeon Erwin Payr applied ozone in surgery and Swiss dentist E. A. Fisch was the first to use ozone in dentistry. In the following years, thanks to Dr. J. Hansler, the first medical ozone generator was created.

The effectiveness of the use of medical ozone has been demonstrated and substantiated in various systemic diseases, predominantly inflammatory in both surgical and therapeutic fields. In dental practice medical ozone is used alone or in combination with other treatment methods. Thus in maxillo-facial surgery ozonated solutions are widely applied as antiseptic remedies for local treatment of lesions and the oral cavity, which considerably improves postoperative convalescence and accelerates the epithelialization of the operated wound.

Ozone has a beneficial influence on bone metabolism and bone repair. It has been observed that in patients with chronic mandibular chronic osteomyelitis, exposure to medical ozone more rapidly and completely normalizes non-specific resistance and T-cellular immunity, thereby accelerating clinical healing and reducing the incidence of complications.

In the treatment of oral cavity disorders, medical ozone is applied locally, in periodontal and gingival pockets, in the form of instillations, ozonated solutions or semi-solid ozonated oils, injectable application of medical ozone in the form of gas (infiltrations) in the submucous region, which shows considerable anti-inflammatory potential.

Ozone therapy device: Medozon (Herrmann, Germany).

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**Methodological elaboration №8**

**Topic:** Physical methods in the diagnosis and treatment of dental caries, non-carious dental hard tissue diseases, pulpitis and apical periodontitis.

**Location: University Dental Clinic No. 1**

 The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

* + - 1. Electrical excitability of the dental pulp in normal, caries, pulpitis and apical periodontitis. The significance of electrical excitability in the choice of rational treatment methods.
			2. Methodology to investigate the electrical excitability of the dental pulp in intact and decayed teeth.
			3. Electrical excitability of dental hard tissues in carious cavity preparation. Apparatus. Methodology.
			4. Methodology of electrophoresis with anesthetic preparations for anesthesia of dental hard tissues and dental pulp.
			5. Electrophoresis of root canals in pulpitis. Methodology. Indications in use.
			6. Treatment of pulpitis using diathermocoagulation. Methodology, apparatus, indications.
			7. Indications and contraindications for electrophoresis with medication in root canals. The choice of drugs depending on the clinical picture of the condition.
			8. Electrophoresis of root canals in apical periodontitis. Preparing the tooth for electrophoresis. Methodology.
			9. Anod-galvanization of root canals in chronic exacerbated periodontitis.
			10. Physiotherapy of complications after root canal filling.

**ANNOTATION**

In multiple caries, it is necessary to apply a combination of medicinal remedies and physiotherapeutic methods.

An effective treatment is electrophoresis with 1% sodium fluoride solution, combined with per/oral addministration of calcium gluconate or calcium glycerophosphate (course of treatment lasts 4-6 weeks). Ultraviolet irradiation is also recommended, starting with 0.25 biodoses, gradually increasing the dosage up to 3 biodoses. Treatment is carried out over one day. The total number of procedures is 25-30.

For the treatment of hyperesthesia of hard dental tissues, electrophoresis with vitamin B1 and novocaine as well as 1% sodium fluoride solution is recommended.

Procedures are performed daily or every other day.

Sometimes up to 20 procedures are needed to eliminate painful sensitivity.

In the case of pronounced hyperesthesia of hard dental tissues, an analgesic effect can be rapidly obtained by calcium glycerophosphate electrophoresis.

Electrophoresis with a solution of 10% calcium gluconate and 1% sodium fluoride is recommended for the treatment of dental hard tissue erosion.

Treatment is done daily or every other day. The treatment course comprises 10-15 procedures.

For cuneiform defects, ultraviolet irradiation, electrophoresis with vitamins C, B1, 10% calcium gluconate solution, 1% sodium fluoride, galvanization of the cervical sympathetic nodule region, daily or over one day, is recommended.

In case of hypoplasia, electrophoresis with 1% sodium fluoride solution is recommended, 10-16 procedures, followed by the use of quartz.

In the diagnosis of pulpitis, a significant role is played by the assessment of the electroexcitability of the dental pulp. In all forms of pulpitis, electroexcitability is reduced.

**Treatment methods for apical periodontitis are**:

* Transcanal electrophoresis
* Darsonvalization
* Microwave therapy
* Ultrasound therapy
* Diathermy and diathermocoagulation
* Laser therapy
* Magnetotherapy

For analgesic and anti-inflammatory purposes in apical periodontitis, it is recommended to darsonvalize the gingival region with sparks at a distance of 1.5-2 mm for 2-3 minutes on each side, followed by very-high frequency electromagnetic alternating current therapy in the tooth area for 10 minutes. Treatment is performed daily or microwave therapy.

In the case of pain associated with overfilling material in periapical region, local darsonvalization is recommended. In parallel, extraoral darsonvalization of the tooth region is also recommended.

For acute and chronic periodontitis, ultrasound on the skin in the area of the affected tooth is recommended daily or every other day, and for root canal iodine electrophoresis, daily or every other day.

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**Methodological elaboration №9**

Topic: Physiotherapeutic treatment in periodontal diseases (gingivitis, marginal periodontitis, periodontosis)

**Location: University Dental Clinic No. 1**

 The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. Treatment of periodontal diseases with thermal factors (balneotherapy, irrigation, hydromassage, mud treatment, paraffin treatment).
2. Light therapy used in the treatment of periodontitis (ultraviolet light).
3. Methodology of performing massage, vacuum massage and vacuum electrophoresis.
4. Principles and methods of electrotherapy in the treatment of periodontal diseases (galvanization and electrophoresis, dyadynamotherapy, fluctuarization, darsonvalization, very high frequency electromagnetic alternating current therapy, microwave therapy).
5. Polarity and concentration of drugs used in the treatment of periodontal diseases.

**ANNOTATION**

In the complex treatment of periodontal diseases, physiotherapeutic methods play an important role and are indicated in almost all forms and stages of the disease. They are used during the different stages of diagnosis, complex therapy, prophylaxis and rehabilitation, with the aim of acting on specific pathogenetic elements of the process and providing symptomatic treatment.

**Heat treatment** - under the influence of heat, the blood vessels dilate, blood circulation improves, and the optimization of the distribution of nutrients is accelerated, facilitating elimination of pathological products. It also increases metabolism in tissues.
Therefore, the use of heat is recommended for the purpose of absorption of decomposition products in inflammatory processes, stimulation of tissue growth and regeneration, and reduction of pain sensations.

To act on the body with heat and cold for therapeutic purposes, water, mud, paraffin and ozokerite are used.

**Balneotherapy** - the main irritation factor in balneotherapy is thermal.
In addition to the thermal influence, balneotherapy also produces mechanical irritation. This is applied in the form of mouth rinses and irrigations. Before starting water treatments, it is essential to completely remove subgingival and supragingival calculus and to curettage periodontal pockets.
When irrigating the mucosa of oral cavity, pressure is an important factor, which is why for the treatment of periodontitis, pressurized irrigation - **hydromassage** - is more effective than simple irrigation.

**Hydromassage** - irrigation of the oral cavity with various liquids under pressure of 1.5-2 atmospheres using special equipment. Hydromassage is most effective when using a jet of warm water saturated with carbon dioxide. Irrigation is carried out for 10 minutes.
During irrigation there is a spasm of the gingival capillaries, and 2-3 minutes after irrigation they dilate, improving blood circulation in the periodontal tissue, which stimulates the healing processes of periodontal tissues.

**Sludge treatment** - the therapeutic effect of sludge procedures is determined by the thermal, mechanical and chemical factors of the sludge. A good therapeutic effect of sludge treatment of periodontitis patients can be explained by the action of heat, which improves local circulation, by the influence of biologically active substances contained in the sludge, but also by the ameliorating effect of sludge application on the microflora of the oral mucosa. It is important to note the analgesic and anti-inflammatory effect of the sludge, which leads to a reduction in pain and swelling of the gingival margin, as well as gradual resorption of inflammatory foci. Slime treatment is carried out in the form of applications. After heating the mud in a water bath at a temperature of 37-42°C, it is applied to the gum margin for 15-20 minutes. The mud treatment course includes 10-15 procedures. Indications for mud treatment include all forms of marginal periodontitis except those in the exacerbation phase. The presence of abscess is a contraindication for mud treatment.

**Paraffin treatment** - paraffin has a high heat capacity and very low heat conductivity. Having a high coefficient of thermal expansion, paraffin, when going from liquid (melted) to solid state, reduces its volume by 10-15%, which exerts pressure on tissues during application. This property of paraffin helps to remove venous blood and edematous fluid from the inflammatory focus. For paraffin therapy, purified and dehydrated melted white medical paraffin with a melting point of 52-55°C is used. The paraffin is melted in a water bath, taking care not to get water into the paraffin, as this can cause burns to the mucous membrane. Indications for paraffin application include all forms of periodontitis without suppuration.

(The assistant demonstrates to the students the methods and techniques of applying paraffin to the lining of the oral cavity).

**Light treatment (phototherapy**) - in the treatment of the mucous lining of the oral cavity, ultraviolet radiation (UVR) is commonly used topically as an anti-inflammatory agent and stimulator of metabolic processes. The physiologic effect of ultraviolet radiation consists in blocking nerve receptors, stimulation of osteogenesis, bactericidal and dehydrating effect. For treatment with UV radiation in dental practice short-wave UV lamps such as ЛКУФ - 3 или ОКУФ - 5 are used. Local UV irrigation is performed daily or over a day for 5-10 procedures.

(The assistant demonstrates the UV irradiation technique).

**Laser therapy** - for the treatment of moderate and severe periodontitis, laser therapy is combined with surgical methods of treatment; anti-inflammatory parameters are applied.
Effects: anti-inflammatory, hyposensitizing, increase of the body's general protective and adaptive reactions, stimulation of cell and tissue reparative regeneration.
Equipment: source - neodymium-ionized laser УЛЛФ-01 with laser radiation power.
Parameters: 20-50 mW/cm² with an exposure of 20 seconds - 2 minutes on the irradiation zone. Number of procedures - up to 15.

**Massage** - a therapeutic method of treatment consisting in mechanical action on periodontal tissues by various special techniques performed by the hand of the masseur or with specialized appliances.
The main massage techniques include rhythmic repetition of smoothing, friction and vibration movements.
Massage can be performed manually or with special instruments.

Vibrational massage - has a pronounced reflective impact, having a deeper action on periodontal tissues, activating the exchange of substances in the tissues.
It is recommended to apply vibrational massage in the early stage of periodontitis.
Vibrational massage is performed using special vibrating tips, connected to an angled piece.

Vacuum massage - is a method in the treatment of periodontitis with low-dose vacuum.
For this purpose, a special device AЛП and a set of electrodes are used, which allows the diagnosis and treatment of gingivitis, periodontitis and periodontitis. The massaging effect occurs under the influence of a short action of negative pressure on the tissues of the periodontium, resulting in the redistribution of fluids in the pathological focus and enrichment of tissues with oxygen.

**Galvanization and electrophoresis** in the treatment of periodontal diseases. The application of direct current for therapeutic purposes is called galvanization. During galvanization not only superficial blood vessels are expanded, but also deeply located ones. This improves blood and lymphatic circulation, creating conditions for a better supply of nutrients and oxygen to the tissues. The action of the electric current during galvanization depends on the sign of the electrodes.
Under the cathode there is an increase in excitability, and under the anode a decrease in tissue excitability.
The method of introducing medicinal substances into the body's tissues using electric current is called electrophoresis. When drugs are administered into the skin or mucous membrane by means of an electric current, a "depot" of the drug is created, which gradually becomes resorbed. For electroplating in the oral cavity, АГН-1; "Поток -1", ГР-1; ГР-2 devices are used . Electrophoresis is particularly effective in periodontitis with the introduction of vitamins C and P, vitamin B1 and novocaine, 1% solution of nicotinic acid, 5-10% solution of calcium chloride, 1-2% solution of fluoride and 2.5% solution of calcium glycerophosphate.

Vacuum-electrophoresis - is a method that combines the application of electrophoresis of medicinal substances with dosed vacuum. For this purpose, V.I. Kulajenko proposed a vacuum- -electro-phosphorization (VAK) apparatus and a set of electrodes of different sizes (vacuum sink).

**Diadynamic therapy** - according to P. Bernard (1961), the action of diadynamic current is based on its ability to cause redistribution of ions in tissues, which leads to decreased sensitivity, as well as rhythmic compression of blood vessels during each half-cycle. It also improves the elasticity of blood vessels, normalizes their permeability, which leads to reduction of exudation in the focus of inflammation and increase of anti-inflammatory protective properties of tissues. The source of the diadynamic current is the Soviet СНИМ-1 apparatus. Nowadays, diadynamic current is used for electrophoresis of medicinal substances, it is called diadinamophoresis.

**Fluctutuorization** - is a method of electrotherapeutic treatment with unsteady (fluctuating) alternating current (fluctuating) of sound frequency, proposed by Prof. Л.Р. Руббяным. The application of fluctuating current in the treatment of periodontitis reduces pain, eliminates purulent discharge from periodontal pockets, bleeding gums, unpleasant mouth odor, etc. Fluctuating is indicated in the treatment of acute gingivitis and mild and moderate forms of marginal periodontitis. For fluctuorization is used the Soviet appliance АСБ-2, a pain relieving appliance.

**Darsonvalization** - is a method of periodontosis treatment based on the use of pulsating current of high frequency, high voltage and low intensity. The devices "ИСКРА-1" и "ИСКРА-2" are used. Darsonvalization has an analgesic effect, improves the trophicity of periodontal tissues, the functional state of blood vessels, intensifies leukocyte migration and increases tissue reactivity. Darsonvalization is prescribed in cases of (hypertrophic) gingivitis, marginal periodontitis with chronic evolution. In the case of hypertrophic gingivitis, the method of spark darsonvalization may be used. (The assistant demonstrates the technique of darsonvalization to the students).

**Therapy with very-high frequency electric field (VHF)** - is used in periodontal diseases, for the formation of single or multiple abscesses, by applying a high-frequency electric field (15-30 W). For this purpose, the devices УВЧ -30, УВЧ -60 are used. Very high frequency (VHF) electric field therapy has a beneficial effect on nerve endings and blood vessels, causing an analgesic effect and temporary contraction, followed by dilation of capillaries, which lasts for several hours. Very high frequency electric field (VHF) therapy stimulates the hematopoietic organs, improves metabolic processes and helps to limit the inflammatory focus. The treatment course consists of 5-6 procedures, performed daily, lasting 5-8 minutes.

**Microwave therapy** - is a method of physiotherapy using ultra-high frequency electromagnetic oscillations. It is believed that, in addition to the thermal effect, microwave therapy on tissues can produce electromechanical changes in cell structure and intercellular fluid. To carry out microwave therapy in dentistry, it is recommended to use the "ЛУЧ-2" internal magnetotron generator. For the treatment of periodontal diseases, irradiation with a diameter of 2 cm is recommended. Radiation intensity - 5 W, duration of irradiation - 5-8 minutes, number of procedures - 3 to 12 daily. Microwave therapy may be recommended in the treatment of acute gingivitis, marginal periodontitis, in the period of exacerbation and abscess, as well as after drainage of an abscess, on the same day. (The assistant demonstrates the microwave therapy application technique to the students).

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**Methodical elaboration №10**

Topic: Physiotherapy of oral mucosal disorders and stomalgia. Colloquium.

 **Location: University Dental Clinic No. 1**

The subject material is taught in 6 academic hours, of which: 2 hours of theoretical lectures, 4 hours of seminars and practical lessons.

**Verification questions:**

1. What are the effective physical methods used in the complex therapy of oral mucosal disorders.
2. What physiotherapy treatments are indicated for glossalgia.

**ANNOTATION**

Physical methods of treatment are an important component in the therapy of oral mucosal disorders. The prescription of certain procedures is made taking into account the data of the general examination of the patient and the recommendations of the neurologist, therapist, endocrinologist. There are contraindications for physiotherapeutic methods of treatment, which are usually determined by somatic pathology.

In the complex therapy of mucosal disorders of the oral cavity, drug electrophoresis, vacuum-electrophoresis, ultrasound therapy, hyidotherapy, UVR (ultraviolet irradiation), aerosol therapy, cryotherapy, laser irradiation and others are effectively used.

Of the electrotherapy methods, the most common is the application of constant electric current in the form of electrophoresis of the mucous membrane of the oral cavity, which combines the action of galvanization with the effect of ions of introduced medicinal substances. It is important to draw the students' attention to the fact that the mucosa of the oral cavity has a very rich vascular network and is moistened with saliva. This conducts the electric current very well, and the medicinal substances immediately reach the vascular system, are transported by the blood flow and a specific "depot" of medicinal substances is formed. In the choice of drug substances for electrophoresis, not only the action of the polarity from which the substance is introduced should be taken into account. Electrophoresis with novocaine, aloe and trypsin are used successfully.

Of particular interest in creating the conditions for long-acting drug substances introduced by electric current is vacuum-electrophoresis, but not in the same procedure, but in performing electrophoresis immediately after the formation of a vacuum-hematoma. It appears that hematomas can act as a concentration of electric current and therefore of drug ions, and thus a depot of drug substances can be created.

**Note:** Vacuum therapy according to Kulajenko gives positive results in the exudative-hyperemic form of oral lichen.

For all forms of chronic relapsing chronic aphthous stomatitis in patients with digestive system disorders, phonophoresis with heparin and apricot oil in a 1:1 ratio may be recommended. The number of procedures depends on the activity of the reparative processes and, on average, varies between 3 - 6.

**Hydrotherapy** - Hydrotherapy is the external application of water for therapeutic and prophylactic purposes. Mineral waters, waters saturated with oxygen and carbon dioxide are used for irrigation. Irrigation with these waters enrich the tissues with oxygen, eliminate bacteria, toxins, decomposition products, increase the number of functional capillaries, accelerate blood flow in them and improve the immunobiological properties of the oral mucosa.

**IUV (ultraviolet irradiation**) - ultraviolet irradiation of the mucosa of the oral cavity has a favorable effect in relapsing stomatitis of various etiologies and trophic disorders. For irradiation of the oral cavity, a tube is used, which allows limiting the mucosal areas of the alveolar processes and lips.

**Aerosol therapy (Aerosol therapy**) - for diseases of the lining of the oral cavity.
The advantage of the aerosol method is that the active substance is able to reach all areas of the mucous membrane, especially the hard-to-reach regions of the oral cavity and where it is not possible to attach an applicator (retromolar area, root of the tongue, hard and soft palate, tonsils, etc.).
The advantage of this method is also the minimal traumatization of the mucosa, suppression of microbial flora and stimulation of repair processes.

In dental practice, the most widely used portable aerosol inhaler type AИ-1 is used to obtain therapeutic aerosols. Thermal, oily and alkaline inhalations can be obtained with this device.
For this purpose, for catarrhal stomatitis, nitrofuran derivatives (Furacilin 1:5000, Furazolidon 0.5%, Furacin 1:1300), antibacterial preparations of plant origin (1% Imanin, Kalanchoe juice, Romazulan), 1% Citral, 1% Galascorbin, 25% ascorbic acid solution, 1% sodium mefenaminate solution, 1% etopium solution; for ulcerative-necrotic processes: trypsin, chymotrypsin, chymiopsin, deoxyribonuclease, ribonuclease, in combination with antibiotics, followed by keratoplastic agents; for erythema exudativum multiforme: a combination of the following ingredients - Trasilol 5000 IU, hydrocortisone - 2.3 ml, 1% solution novocaine - 5.0; in case of symptoms of intolerance to drugs, 0.1% solution of dimedrol with hydrocortisone suspension is recommended; for trophic ulcers - enzymatic solutions are recommended first, then oils (fruit pit oil, sea buckthorn oil, rosehip oil); for fungal stomatitis - inhalations with 0.5% potassium iodide solution, alkaline inhalations with 1-2% sodium bicarbonate solution, mineral waters of the type "Borjomi", "Yessentuki no. 17, 18", 0.5% solution of etonia, nicotine solution, levorin; in case of pemphigus - inhalations with corticosteroid aerosols.

**Cryotherapy** - nowadays, in biology and medicine, great attention is paid to the influence of low temperatures on the body. It is known that low temperature stimulates regenerative processes and contributes to epithelialization of the lesion surface. Cryotherapy is rational and effective for foci of hyperkeratosis in various forms of leukoplakia, for slow-healing erosions and ulcers, for erosive-ulcerative forms of leukokeratosis and oral lichen.

One of the highly active physical influencing factors is **laser radiation**. The effect of helium-neon laser radiation with a wavelength of 632.8 nm is manifested by stimulation of cell proliferation, anti-inflammatory and analgesic action, change in the intensity of blood flow of the mucous membrane of the oral cavity and photodynamic effect. This method is indicated for patients with glosalgia, paresthesia, desquamated glossitis, relapsing chronic aphthous stomatitis, Melkinson-Rosenthal syndrome.

Physical methods of treatment of glossalgia and paresthesias of the mucosa of the oral cavity are widely used in dental practice.

If a somatic pathology is identified, patients should be treated by appropriate specialists.

In case of severe nervous system disorders, procedures with calming effect, such as general conifer and rhodoton baths, are widely recommended, and good results are obtained by using galvanic collar according to Щербак, calcium electrophoresis in the collar area, electrophoresis with bromine in the nasal mucosa according to Палкин, butsonvalization of cervical sympathetic nodes according to Макиенко, diadynamic currents in the area of the upper cervical sympathetic node on the route of the branches of the trigeminal nerve, on the areas with paresthesias.

Good results are also obtained after applying diatherapy in the solar plexus area, especially in patients with gastrointestinal tract disorders, and in patients with functional disorders of the nervous system - after the use of electric sleep. Locally, in the area of the tongue, electrophoresis with novocain, B1, 0.5% galactam solution, analgin phonophoresis, ultrasound, laser irradiation (5-10 procedures) is recommended. Good results are also obtained with electrophoresis with 0.5% galactam solution, iodine, in the area of the parotid salivary glands, at intervals of more than one day (20 procedures) in the case of paresthesias accompanied by xerostomia of the oral cavity.

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