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FACULTY OF DENTISTRY  
DEPARTMENT OF THERAPEUTIC DENTISTRY**

**Educational and methodological recommendations for 3rd year students in the discipline  
"Therapeutic dentistry". "Endodontic diseases - pulpitis, periodontitis"  
*Goncharuk-Khomyn M.Y., Biley M.V., Nesterenko M.L.***

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**Educational and methodological recommendations for 3rd year students in the discipline "Therapeutic dentistry". "Endodontic diseases - pulpitis, periodontitis"./ Goncharuk-Khomyn M.Y., Biley M.V., Nesterenko M.L. – Uzhhorod, 2024. – 112 p.**

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Educational and methodical recommendations are developed for studying the program "Endodontic diseases - pulpitis, periodontitis" in the discipline "Therapeutic dentistry" by the 3rd year students of the dental faculty. The manual includes methodological developments for conducting practical classes in conjunction with control tasks and a list of recommended educational and methodological literature. This manual is designed to deepen students' knowledge of generally accepted and modern classifications of endodontic diseases, their etiology, pathogenesis and clinical manifestations, methods of diagnosis, treatment of pulpitis and periodontitis and prevention of these diseases and prevention of their complications.

Educational and methodical recommendations were reviewed and approved at the meeting of the Department of Therapeutic Dentistry of the Faculty of Dentistry. «Uzhhorod National University». Protocol № 1 of January 18, 2024.

## **METHODOLOGICAL RESEARCH №1**

**TOPIC: PULPITIS. ETIOLOGY, PATHOGENESIS, CLASSIFICATION ( Y.M. GOFUNG, KMI (1964), ICD-10), THEIR POSITIVE FEATURES AND DISADVANTAGES. ACUTE TRAUMATIC PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS**

**I. Topic relevance:** Pulp of the tooth (pulpa dentis) is a kind of specialized connective tissue formation that has features of cellular composition and structure of the main substance. The pulp fills the tooth cavity, gradually passing into the periodontal tissue in the apical foramen. The general outline of the pulp to some degree repeats the shape and external relief of the tooth. There can be crown pulp and root pulp. Since the pulp is highly vascularized and highly innervated, its main functions are trophism and innervation of tooth tissues. Consequently, pulp diseases, such as pulpitis, disrupt the above functions, and the vitality of the tooth.

### **II. Study goal:**

#### **2.1. Student has to know:**

- definition of pulpitis, its etiology;
- pathogenesis of pulpitis;
- classification of Y.M. Gofung, KMI (1964), ICD-10, their positive features and disadvantages;
- clinical signs and diagnosis of acute traumatic pulpitis.

#### **2.2 Be able to:**

- correctly identify the etiological factors causing the development of pulpitis;
- clearly differentiate between acute and chronic pulpitis at different stages of their development;
- evaluate the main characteristics of acute traumatic pulpitis;
- justify changes in the structure of tooth tissues in the development of pulpitis.

### **III. Content of the topic**

In the 1960s a number of investigations revealed a lack of a correlation between clinical signs and symptoms and the actual histological status of the pulp. Since the histological diagnosis of a pulp is impossible to determine without removing it and submitting it for histological examination, a clinical classification system was developed. This system was based on the patient's symptoms and the results of clinical tests. A clinical classification of this sort is not meant to list every possible variation of inflammation, ulceration, proliferation, calcification, degeneration of the pulp, or attachment apparatus (M. H. Smulson, 1974; S. Cohen, R.C. Burns, 2002).

#### **Clinical classification: Pulpal disease**

1. Within normal limits
2. Reversible pulpitis.
3. Irreversible pulpitis
4. Asymptomatic irreversible pulpitis
5. Hyperplastic pulpitis
6. Internal resorption
7. Symptomatic irreversible pulpitis
8. Necrosis Periapical disease
  - Acute apical periodontitis

- Acute periradicular abscess
- Chronic apical periodontitis

**Pulp Pain:** Pulpalgia, that is, pulp pain, can be classified into three different categories: hyper reactive, acute, and chronic.

Histologically, pulpitis, which leads to pulpalgia, is classified as reversible or irreversible. One hopes that pulp with reversible pulpitis can be saved. Pulp suffering irreversible pulpitis cannot be saved. The vital teeth can have one of the following presentations: Normal: The teeth are asymptomatic with no objective pathosis.

**Reversible pulpitis:** There is a reversible sensitivity to cold and/or osmotic changes (i.e., sweet, salty, and sour).

**Irreversible pulpitis:** The sensitivity to temperature changes is more intense and with a longer duration. International classification pulp diseases (WHO, 1998):

- 1.1. Pulpal: - abscess - polyp
- 1.2. Pulpitis: - acute - chronic (hypertrophic, ulcerative) - purulent.
- 1.3. Pulp necrosis. Pulp gangrene.
- 1.4. Pulp degeneration Denticles.
- 1.5. Pulpal: - petrificates, - stones.
- 1.6. Anomal formation hard tissue in pulp. Secondary or irregular dentin.

In former Soviet Union one of widespread classifications was the classification by Y. M. Gofung. It supposed that the base of different clinical features of pulpitis was pathologic process of inflammation. Clinical features correspond at different stages of inflammation from acute to chronic course. All form of pulpitis was divided in to two groups:

**I. Acute pulpitis:** 1) partial; 2) total; 3) purulent.

**II. Chronic pulpitis:** 1) simple; 2) hypertrophic; 3) gangrenous. On the basis of this classification it developed a classification for the National medical university (former Kiev medical institute).

There are distinguishes in the next pulpitis forms:

I. Acute pulpitis (Inflammatio pulpae acuta):

- 1) Pulp hyperemia (hyperemia pulpae);
- 2) Acute circumscription pulpitis (Pulpitis acuta circumscripta);
- 3) Acute diffusion pulpitis (Pulpitis acuta diffusa)
- 4) Acute purulent pulpitis (Pulpitis acuta purulenta)
- 5) Acute traumatic pulpitis (Pulpitis acuta traumatica)

II. Chronic pulpitis (Inflammatio pulpae chronica):

- 1) Chronic fibrous pulpitis (Pulpitis chronica fibrosa);
- 2) Chronic hypertrophic pulpitis (Pulpitis chronica hypertrophica);
- 3) Chronic gangrenous pulpitis (Pulpitis chronica gangrenosa);
- 4) Chronic concremental pulpitis (Pulpitis chronica concrementosa)

III. Exacerbative chronic pulpitis (Pulpitis chronica exacerbata).

IV. Pulpitis complicated apical periodontitis (Pulpitis complicatus periodontitis).

#### **Clinical features.**

*Chief complaints and chief clinical features:* The main characteristic symptom of acute pulp inflammation is spontaneous (i.e. unprovoked), intermittent, or continuous paroxysms of pain.

Sudden temperature changes (usually cold) elicit prolonged episodes of pain (i.e. pain that lingers after the thermal stimulus is removed). The pain attack arises up suddenly, regardless of external irritants, sometimes it is provoked by chemical, thermal and mechanical irritants. It is characterized by the spontaneous pain and development of acute pain attack, referred from one arch to the other and along the branches of n. trigeminus.



**Pic.1.** Schematic image of pulpitis

The pain differs from that of a hyper reactive pulp in that it is not just a short, uncomfortable sensation but an extended pain. Moreover, the pain does not necessarily resolve when the irritant is removed, but the tooth may go on aching for minutes or hours, or days for that matter. Pain may start spontaneously from such a simple act as lying down. This alone accounts for the seeming prevalence of toothache at night.

Some patients report that the pulp aches each evening, when they are tired. Others say that leaning over to tie a shoe or going up or down stairs - any act that raises the cephalic blood pressure - will start the pain. The list of inciting irritants would not be complete without mentioning hot food or drink, sucking on the cavity, and biting food into the cavity. Most pain, however, is started by eating, usually something cold. The patient can tell which side is involved and frequently whether pain is in the maxilla or the mandible. This may not be absolute, however, for the pain may be referred from one arch to the other.

Patients have reported with aching of a maxillary molar when the maxillary lateral incisor has been found to be the offender. The patient may insist that a mandibular molar is aching, whereas examination reveals that a maxillary molar is the offender. Characteristically, that pain lingers after the external irritants is removed. Usually there is the presence of tooth affected with caries process. Character, duration and intensity of pain also depend of the common state of organism, levels of organism resistance and the state of the nervous system of patient. Pain attack arising up spontaneously without a visible reason is the characteristic sign of sharp pulp inflammation. Duration of pain attack depend of irritant force, prevalence and character of inflammatory process in pulp. At pulp inflammation the pain always arises as pain attacks with short painless intervals. A pain attack may be short duration with long painless intervals or long-term with short intermission peri-od. The pain character may be different duration, intensive, pulsatile, unbearable. The pain character depends on pulp area affected by inflammation: the more diffuse inflammation the more duration of pain attack.

These characteristic features are the basis for clinical classification of pulpitis. Clinically, therefore, pulpal pathosis in most instances is diagnosed during routine dental examinations and not as a result of episodes of symptomatic pulpitis. Thus, it is not possible to determine the type and severity of pulpal damage by the absence or presence of clinical symptoms. Histopathological and clinical nomenclature has, therefore, been combined, resulting in a number of descriptions and diagnoses. The diagnosis acute serous pulpitis, for example, has traditionally meant that the patient had pain (acute), that the pulp is inflamed (pulpitis), and that as yet no abscesses have formed in the pulp (serous).

Clinically, it has been assumed that this condition is present when a tooth is especially sensitive to cold and when the pain persists for some time after the cold stimulus is removed. Similarly, acute suppurative pulpitis meant that an abscess has formed in the pulp. Clinically, heat would supposedly increase the pain in a tooth with this diagnosis and cold would cause relief. Four features of pulpal pain are especially important: the intensity of the pain, its duration, whether it occurs after stimulation (provoked) or spontaneously (unprovoked), and whether it occurs repeatedly. Thus, severe, irreversible inflammation should be suspected when a patient has intense

and continuous pain. Similarly, spontaneous pain usually indicates the presence of severe and irreversible pulp pathosis. Anamnestic information about repeated attacks of pain over a long period of time will also give reason to suspect serious pulp damage.



**Pic.2.** Trauma of the tooth (crown fracture)

**Acute traumatic pulpitis** (Pulpitis acuta traumatica): At acute traumatic pulpitis depending on the character of traumatic factor there are three basic clinical forms distinguished: 1. Accidentally opening the pulp. The main cause of this form of acute pulpitis is careless preparation of caries cavity, which results in perforation of pulp chamber with insignificant pulp trauma by rotary instrument (burs). Often enough it occurred during acute caries coarse preparation of carious cavity or removal of leather decal-cinated dentin during excavation and as a result appeared a bleeding point perforation. Through this perforation dentist may see the rose colour pulp. The probing of pulp is very painful and it is not recommend. Pathohistological features. It is characteristic for the acute course of deep caries.

There are sign of reactive changes of the pulp, dilation of vessels located near caries cavity and perforation.

Accidentally pulp wounding. The main cause of this form of acute pulpitis is penetration of instrument (burs, excavator) into the pulp chamber and pulp wound- ing. In these cases usually pulp tissue microbial contamination from caries dentin is occurred. The first sign of wounding is acute pain in moment of trauma. On the caries cavity floor appeared area of wounded bleeding pulp. 2 - 3.

Opening the pulp at crown fracture. This clinical condition occurred as a result of unexpected acute trauma.

The clinical feature depend 3 of the fracture line: it can located in crown (at the crown equator), in cervical area etc. In such 1. cases the pulp tissue quickly contaminated by microorganisms. Acute intensive pain can arise from different irritants (e.g. heat, cold, air etc.). Pathohistological features. It is characteristic for the acute pulp inflammation and depends on the term of trauma and cause of inflammation.

#### **IV. Control questions for the class topic:**

1. Definition of pulpitis and its etiology.
2. Classification of pulpites by Y.M. Gofung.
3. Classification of pulpites by KMI.
4. Classification of pulpites by ICD-10.
5. Factors of acute traumatic pulpitis occurrence.
6. Clinical development and diagnostics of acute traumatic pulpitis.

## V. Control test tasks and/or case tasks:

1. A 19-year-old patient visited a dentist because of a tooth injury. The day before, a part of the crown of the 21st tooth broke off as a result of the injury. Objectively: the medial angle of the 21st tooth is missing, the dentin is exposed, and painful pulp is visible at one point. Probing in this point is painful, percussion of the 21st tooth is painless, EOD is 25 mcA. Determine the diagnosis:
  - a. Acute traumatic pulpitis
  - b. Chronic fibrinous pulpitis
  - c. Pulp hyperaemia
  - d. Acute localized pulpitis
  - e. Acute deep caries.
2. The reason for the development of acute traumatic pulpitis is:
  - a. hypersensitivity to antibiotics in the treatment of pulpitis
  - b. toxic effects of eugenol-containing linings
  - c. accidental exposure of the pulp during preparation
  - d. microorganisms and their waste products
  - e. everything is correct.
3. The death of pulp tissues occurs when they are exposed to temperature:
  - a. below 40°C
  - b. over 70°C
  - c. over 50°C
  - d. below 50°C
  - e. over 100°C.
4. According to the KMI classification, the following types of chronic pulpitis are distinguished, except for:
  - a. fibrous
  - b. purulent
  - c. concremental
  - d. gangrenous.
5. Painless intervals between pain attacks in pulpitis:
  - a. remission
  - b. intermission
  - c. emission
  - d. interpretation
  - e. transmission

## VI. References

### 6.1. Main literature

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## 6.2. Additional literature

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
6. Cohen's Pathways of the Pulp 12th Edition by Louis H. Berman, Kenneth M. Hargreaves. Publisher: Elsevier; 12th edition, 2020. –992 p.



## METHODOLOGICAL RESEARCH №2

### TOPIC: PULP HYPERAEMIA AND ACUTE PARTIAL PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSIS, DIFFERENTIAL DIAGNOSTICS

**I. Topic relevance:** In most cases, the result of untreated or poorly treated acute or chronic deep caries is pulpitis, which is preceded by pulp hyperaemia. Pulp hyperaemia is sometimes called initial pulpitis, which does not exclude the need for its correct diagnosis and treatment. Acute pulp inflammation can result in purulent pulp dissolution, necrosis, or the transition of an acute process to a chronic one if spontaneous exudate evacuation occurs.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- clinical signs of pulp hyperaemia;
- pathomorphological picture of acute partial pulpitis;
- clinic of acute partial pulpitis;
- diagnostics of pulp hyperaemia and acute partial pulpitis.

##### **2.2 Be able to:**

- correctly identify the etiological factors that lead to the development of pulp hyperaemia;
- clearly differentiate between pulp hyperaemia and acute partial pulpitis;
- evaluate the main characteristics of acute partial pulpitis;
- explain the changes in the structure of tooth tissues in the development of pulpitis.

#### **III. Content of the topic**

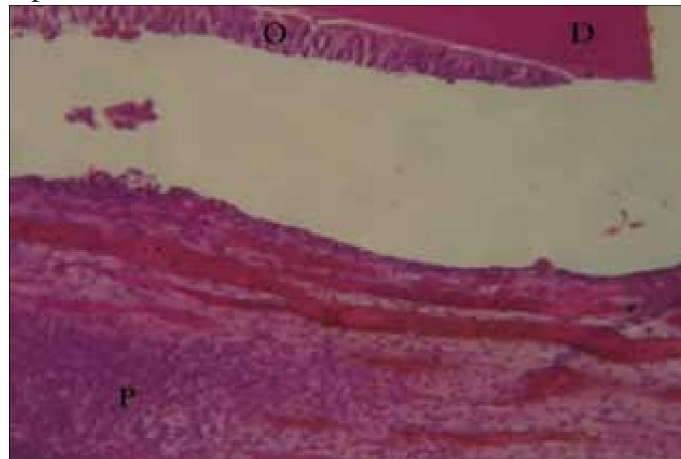
**Pulp hyperemia (Hyperemia pulpaе, incipient acute pulpalgia):** All minor pulp sensations were once thought to be associated with hyperemia, an increased blood flow in the pulp. An increase in intrapulpal tissue pressure is produced only when heat is applied to the tooth, not when cold is applied. The increased pressure against the sensory nerve endings in the pulp might well produce the sensation associated with hyperemia. Quite possibly, this will explain why the pain appears to be of a different intensity and character with applications of cold or heat, the cold producing a sharp hypersensitivity response and the heat producing true transient hyperemia and a dull pain.

Pulp pain causes first a fall and then, when removed, a rise in intrapulpal tissue pressure. Incipient acute pulpalgia should be completely reversible. It is characterized by mild discomfort such as that experienced following cavity or crown preparation. It may be gone by the next day. If one could study the cells of the pulp at this time, one would find a marginal increase in leukocytes and fluid pressure against the nerves that accompany the odontoblasts into the tubules. When pressure returns to normal, the discomfort disappears. Some patients may report slight discomfort from a carious lesion that has just broken through the enamel into the dentin. Development of hyperemia is more frequent to manifest in sub acute pain, rarer pul- 2 satile, pulsating.

Pain arises up spontaneously or as result of irritant action, pulp attacks shot duration 1-2 minutes with large painless intervals (intermission) up to 6-12-24 hours. Pain attacks more frequent and arises up at night. The affected tooth usually had deep caries cavity. The softened

dentine which covers a cavity, has grey-white or yellow colour, rarely is it pigmented. The degree of dentine softening depend of activity of caries process: at acute (rampant) caries the hard tooth tissues are most softened like a cartilage, at chronic course it may be harder and pigmented. Probing of carious cavity is practically painless except denti-noenamel junction and floor of the cavity. Tooth usually responds to applications of cold: ice, carbon dioxide «ice» with pain 1-2 minutes duration. Pathohistological features.

The end result, whether induced by direct irritation or from the immune system, is the release of chemical mediators that initiate inflammation. This is a vascular response. The increase in the permeability of vessels nearest the site of injury and extravasations of fluid into the connective tissue spaces (edema) cause an elevation in local pressure. This edema alters or destroys the odontoblast layer. Chemical modification of the ground substance also occurs, as evidenced by an increased eosinophilia. Marked dilation of vessels leads to slowing of erythrocytes and the margination of leukocytes along the walls. The leukocytes then squeeze through the intracellular spaces of the vessel endothelia in response to chemotactic signals originating in the damaged tissue. This is called diapedesis.



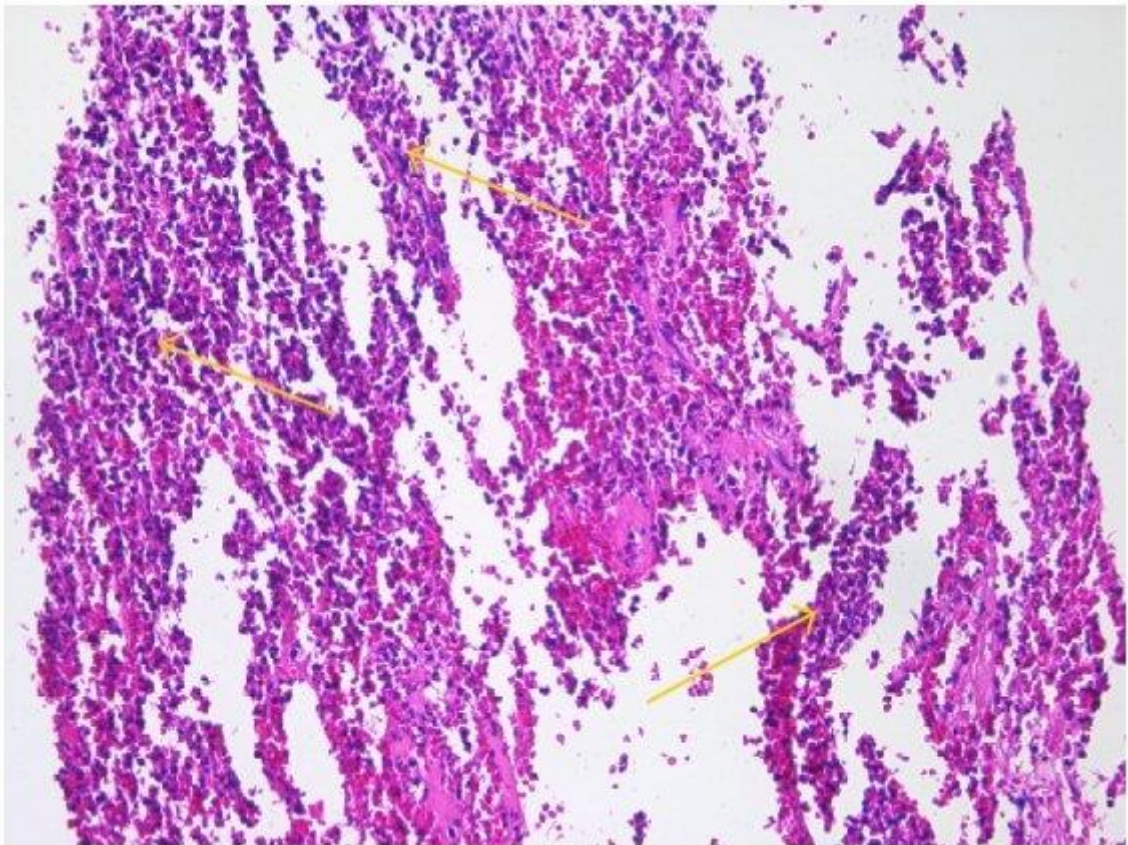
**Pic.3.** Microscopical image of pulp hyperaemia

**Acute circumscription pulpitis** (Pulpitis acuta circumscripta, a moderate acute pulpalgia): Moderate acute pulpalgia is a true but tolerable toothache, often described as «nagging» or «boring». In such cases inflammation of the pulp is present, so the pulp may be either reversible or irreversible. This is extended pain, often diffuse and hard to locate as it refers to other areas. The pain may start spontaneously or from a simple act such as lying down. Interestingly, cold may be the irritant that starts the pain, but hot food or drink and biting down on the cavity are more common. If the pain has been mild and has had a short duration then the pulpitis may be reversible.

*This pulpitis is characterized* by spontaneous (i.e., unprovoked), intermittent, or 4 continuous paroxysms of pain. The pain is frequently described as a «nagging» or a «bor-ing» pain, which may at first be localized but finally becomes diffuse or referred to another area. The pain may start spontaneously or 2 from a simple act such as lying down. Interestingly, cold may be the irritant that starts the pain, but hot food or drink and biting down on the cavity are more common. Pain attacks at first lasted 15-30 minutes, but with development of the inflammatory process in pulp its duration increase to 1-2 hours. Pain attacks increase and become more frequent at night.

*Painless intervals* usually last 2-3 hours and then decreased to more short. Usually patients indicate on a causal caries tooth, but in some cases the pain may be referred from one arch to the other. If this pain has been mild and has had a short duration, then the pulpitis may be reversible. Examination revealed the tooth with caries cavity, frequently deep, rarer middle caries. The pain is diffuse, and two or three teeth may give similar responses to electric pulp testing. The walls and

floor of cavity covered with soft demineralized den-tin; in some cases it can be more dense and pigmented. During probing the cavity floor is painful, especially in the areas located near the pulp horn. Pathohistological features. It is determined marked dilation of vessels leads to slowing of erythrocytes and the margination of leukocytes along the walls. In some areas located near the caries cavity there are hemorrhages into pulp tissue, which is saturated with serous exudate. There are accumulations of erythrocytes and leukocytes in the pulp near the caries cavity. With increasing of vascular wall permeability the inflammatory infiltration increased. As a result the odontoblast layer altered or destroyed.



**Pic.4.** Microscopical image of acute partial pulpitis

**IV. Control questions for the class topic:**

1. Etiology of pulp hyperaemia.
2. The difference between pulp hyperaemia and acute partial pulpitis.
3. Differential diagnostics of pulp hyperaemia.
4. Factors of occurrence of acute partial pulpitis.
5. Pathological anatomical picture of acute partial pulpitis.

**V. Control test tasks and/or case tasks:**

1. A 32-year-old female patient complains of acute spontaneous attack-like pain in the 14th tooth, lasting 10-20 minutes, "light intervals" - 2-3 hours. Objectively: on the occlusional surface of the 14th tooth there is a deep carious cavity filled with softened dentin. Cold stimulus causes pain, percussion is painless. Determine the diagnosis:
  - a. Pulp hyperaemia
  - b. Acute deep caries.
  - c. Acute limited pulpitis
  - d. Acute chronic pulpitis

- e. Acute diffuse pulpitis
2. A 20-year-old patient complains of attacks of acute spontaneous pain lasting 10-20 minutes. The attacks occur 1-3 times a day, worsen at night. The tooth has been in pain for 2 days. Objectively: on the chewing surface of tooth 35 there is a deep carious cavity filled with pigmented dentin. Probing of the bottom is painful at the point of projection of the pulp horn, percussion is painless. Determine the diagnosis:
- Acute limited pulpitis
  - Acute diffuse pulpitis
  - Acute purulent pulpitis
  - Acute deep caries
  - Hyperemia of the pulp.
3. A 22-year-old woman complained of acute attacks of spontaneous pain lasting 15-20 minutes, which occurred several hours ago in the 25th tooth. Objectively: on the chewing surface of the 25th tooth there is a deep carious cavity that does not connect with the tooth cavity, cold stimulus causes a pain attack. Determine the diagnosis:
- Acute purulent pulpitis
  - Acute deep caries
  - Pulp hyperaemia
  - Acute limited pulpitis
  - Acute diffuse pulpitis.
4. What indicators of EOD indicate pulp hyperaemia:
- 2-6 microA
  - 8-10 microA
  - 10-12 microA
  - 12-20 microA
  - 20-40 microA
5. The patient complained of the presence of a carious cavity and the appearance of short-term "flash" pain, which disappears in 1 - 2 minutes after the termination of thermal and chemical stimuli. Objectively, a deep carious cavity, the walls and bottom of the cavity contain softened dentin with a cartilaginous consistency. During probing, there is pain along the bottom of the carious cavity. Your diagnosis:
- Pulp hyperaemia
  - Acute traumatic pulpitis
  - Acute purulent pulpitis
  - Acute limited pulpitis
  - Acute diffuse pulpitis.

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
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### METHODOLOGICAL RESEARCH №3

#### TOPIC: ACUTE GENERALISED PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Considering the biological protective properties of the pulp, its neuro-reflex activity and resistance, it can be assumed that the pulp is a powerful anti-infective barrier. Under favourable conditions, it mobilises tissue protective elements that localise or even eliminate the pathological process. The activity of these changes depends on the nature of the applied stimulus and the body's protection properties. If the protective forces of the pulp are exhausted, virulent microflora attaches, and one or another form of inflammatory reaction develops, including acute general pulpitis.

#### II. Study goal:

##### 2.1. Student has to know:

- pathomorphological picture of acute general pulpitis;
- clinic of acute general pulpitis;
- the difference between acute general pulpitis and acute partial pulpitis;
- diagnosis of acute general pulpitis.

##### 2.2 Be able to:

- evaluate the main characteristics of acute traumatic pulpitis;
- correctly explain the pathomorphological picture of acute generalised pulpitis;
- clearly differentiate acute generalised pulpitis from other forms of pulpitis;

#### III. Content of the topic

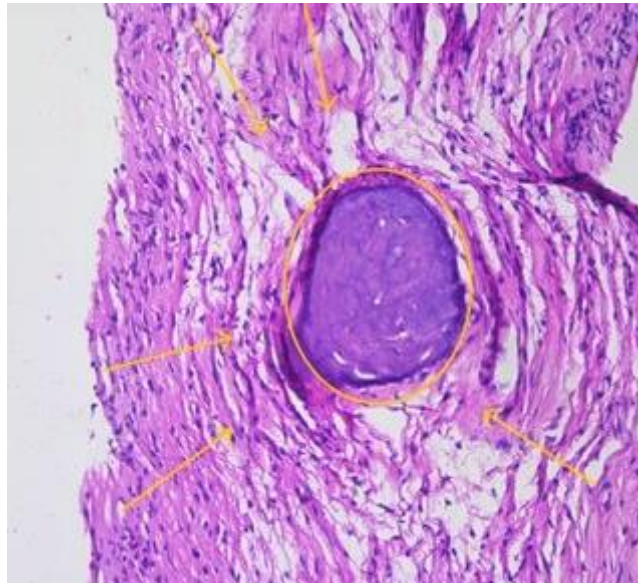
**Acute diffuse pulpitis (Pulpitis acuta diffusa):** It is characterized by the spontaneous pain and development of acute pain attack, referred from one arch to the other and along the branches of n. trigeminus. Acute diffuse pulpitis usually is a result of further development of circumscription inflammation. The character of pain attack is like of neuralgic attacks: often described as «nag-ging» or «boring». This is extended pain, often diffuse and hard to locate as it refers to other areas. The pain may start spontaneously or from a simple act such as lying down. Interestingly, cold may be the irritant that starts the pain, but hot food or drink and 1 3 biting down on the cavity are more common. 2 If this pain has been mild and has had a short duration, then the pulpitis may be reversible. One-two days ago the durability of pain attack was 10-30 minutes and presently the attacks are lasting an hour.

The durability of pain- 5 less intervals decreases up to 10-30 minutes. Pain attacks increase and become more frequent at night and at horizontal position of patient. Usually patients indicate on a causal caries tooth, but in some cases the pain may be referred from one arch to the other. This pulpitis is irreversible; the pulp must be sacrificed. Pinpointing the exact tooth involved in moderate pulpalgia is often difficult. Examination revealed the tooth with caries cavity, frequently deep, rarer middle caries. The pain is diffused and two or three teeth may give similar responses to electric pulp test-ing.

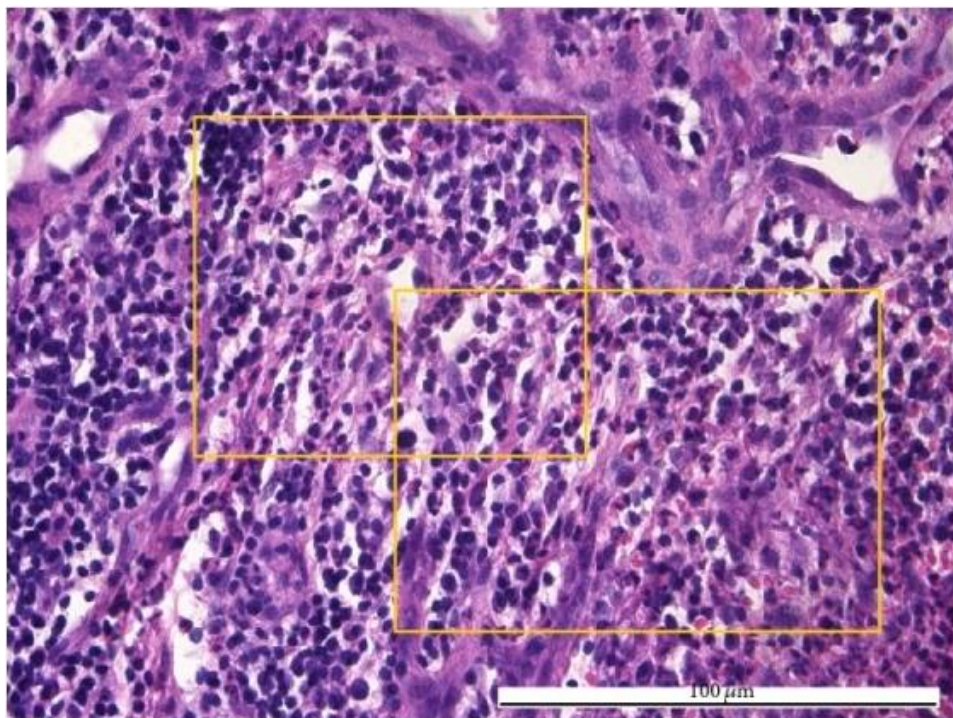
The walls and floor of cavity covered with soft demineralized dentin; in some cases it can be more dense and pigmented. During probing the cavity floor is painful. Percussion may reveal a slight difference in response between teeth. A warm rinse does not relieve the pain, and cold may make it worse. Thermal testing with cold should be attempted first. If pain response from the suspected tooth increases but then goes away, stop! Do not test other teeth, but wait for the rebound of pain that may occur.

**Pathohistological features.** It is determined marked dilation of vessels leads to slowing of erythrocytes and the margination of leukocytes along the walls. In all pulp (coronal and radicular) there are hemorrhages into pulp tissue, which is saturated with serous exudate. There are accumulations of erythrocytes and leukocytes in the pulp near the caries cavity. With increasing

of vascular wall permeability the inflammatory infiltration increased. As a result the odontoblast layer altered or destroyed.



**Pic.5.** Microscopical image of acute diffuse pulpitis



**Pic.6.** Inflammatory infiltrate in pulp tissues

**IV. Control questions for the class topic:**

1. Pathological anatomical picture of acute diffuse pulpitis.
2. Clinical signs of acute diffuse pulpitis.
3. Differential diagnostics of acute diffuse pulpitis.
4. Etiology of acute diffuse pulpitis.
5. Indicators of pulp electrical irritability of acute diffuse pulpitis.

**V. Control test tasks and/or case tasks:**

1. A 39-year-old patient complained of short-term soreness in a mandibular tooth caused by cold food, disappearing immediately after the irritant was removed. Objectively: on the chewing surface of the 35th tooth, the cavity is filled with softened dentin, probing the cavity is slightly painful, the thermo test is positive, percussion is negative. Make a diagnosis:
  - a. Pulp hyperaemia
  - b. Chronic fibrous pulpitis
  - c. Acute limited pulpitis
  - d. Acute chronic pulpitis
  - e. Acute diffuse pulpitis
2. The patient complains of spontaneous, attack-like pain radiating into the ear. The pain worsens with cold and at night. The pain appeared 3 days ago; its intensity gradually increased, the tooth was not bothering before. What is the most likely diagnosis?
  - a. Acute diffuse pulpitis
  - b. Acute limited pulpitis
  - c. Hyperemia of the pulp
  - d. Acute purulent pulpitis
  - e. Exacerbation of chronic pulpitis
3. How to correctly interpret the results of a cold test when the tooth has signs of acute inflammation in the pulp (diffuse pulpitis)?
  - a. Painful feelings occur immediately after the application of the cold factor, after the termination of its action, they increase
  - b. Painful sensations occur in the tooth 3-5 seconds after the application of the cold factor and disappear in a few seconds after its termination
  - c. The tooth does not react in any way to the application of a cold stimulus
  - d. Painful sensations appear 30 seconds after the application of the cold factor, disappear after its termination
  - e. Painful sensations appear 30 seconds after the application of the cold factor, disappear after the termination of its action, then increase again
4. An 11-year-old child came to the dentist with complaints of spontaneous attack-like pain in the left upper jaw, which worsens at night. Anamnesis: tooth 26 was treated for deep caries 3 months ago. Objective: tooth 26 has a large filling on the masticatory-medial surface. Cold test is sharply positive, percussion is negative. Radiograph: no pathological changes were found on the root apices of tooth 26. Establish the diagnosis:
  - a. Acute diffuse pulpitis
  - b. Acute periodontitis
  - c. Gangrenous pulpitis
  - d. Acute periostitis
  - e. Acute serous pulpitis
5. A 14-year-old child visited a dentist with complaints of short-term pain (5-10 minutes) in the teeth of the lower and upper jaws on the left, which occurred spontaneously or after drinking cold drinks, repeated several times during the day yesterday, and radiated to the left temple. Today the pain has increased, the tooth bothered at night. Examination: tooth 25 has a carious cavity distally. The cold test is sharply positive. X-ray: the carious cavity on the distal surface of tooth 25 directly extends into the pulp cavity of the tooth, no destructive changes were found on the apexes of the roots of 25. Make a diagnosis:
  - a. Acute serous pulpitis
  - b. Acute diffuse pulpitis
  - c. Chronic gangrenous pulpitis complicated by periodontitis



- d. Chronic fibrous pulpitis
- e. Chronic periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
6. Cohen's Pathways of the Pulp 12th Edition by Louis H. Berman, Kenneth M. Hargreaves. Publisher: Elsevier; 12th edition, 2020. –992 p.

## METHODOLOGICAL RESEARCH №4

### TOPIC: ACUTE PURULENT PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** If the inflammation is accompanied by the appearance of purulent exudate, there are almost no intermissions, there are only some periods of pain relief. Sometimes patients with such a development of pulp inflammation relieve their condition by applying cool compresses. Pain of patients with acute pulpitis is more often diffuse and non-localised. The patient cannot always identify the causative tooth, sometimes only by the carious cavity, which can be felt to the touch, they can guess which tooth is hurting. Sometimes, if the inflammation spreads to the periodontium, pain occurs during tooth percussion

#### **II. Study goal:**

##### **2.1. Student has to know:**

- Pathomorphological picture of acute purulent pulpitis;
- classification of pulpitis;
- pathogenesis of acute purulent pulpitis;
- etiology of acute purulent pulpitis.

##### **2.2 Be able to:**

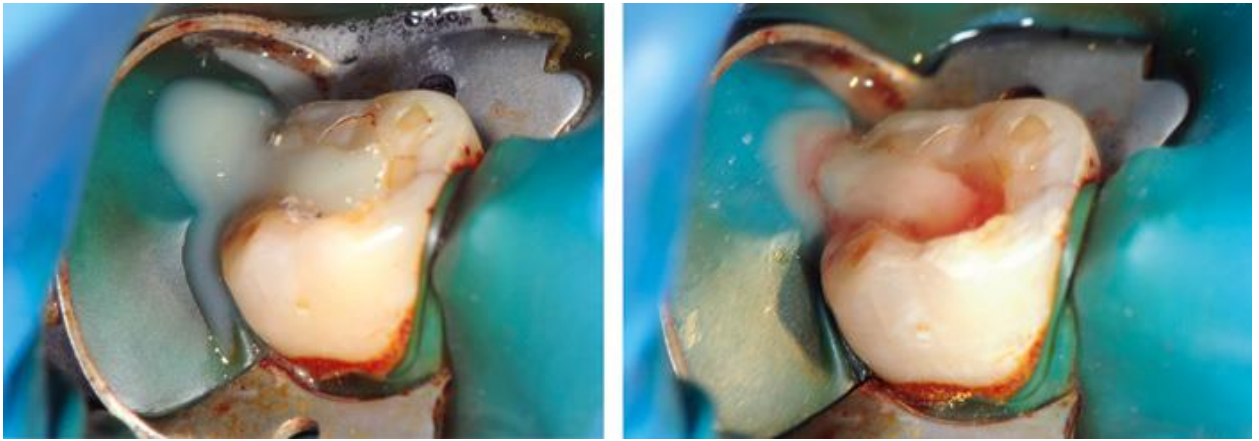
- diagnose acute purulent pulpitis;
- correctly classify acute purulent pulpitis;
- clearly differentiate acute purulent pulpitis from other forms of pulpitis;

#### **III. Content of the topic**

**Acute purulent (suppurative) pulpitis.** Pulpitis acuta purulenta, advanced acute pulpalgia): Acute purulent pulpitis usually is a result of further development of diffuse pulp inflammation. It is characterized by the spontaneous pain and development of acute pain attack, referred from one arch to the other and along the branches of n. trigeminus. The pain may start spontaneously or from a simple act such as ying down. Pain attack increases, pain become pulatile, continuous with remission only some minutes. At night pain attack becomes more intensive. The pain arises and increases as a result thermal irritants (the hot meals, temperature more than 37° C). The cold irritant relieves the pain. Examination revealed the tooth with caries cavity, frequently deep, rarer middle caries.

The walls and floor of cavity covered with soft demineralized dentin; in some cases it can be more dense and pigmented. Testing with heat 1 gives an immediate explosive response! Vertical percussion is painful. During probing the cavity floor is painful, the pulp chamber may easily be perforated with drop of pus or pus with blood appears. As usually such perforation relieves the pain attack. This is irreversible pulpitis!

**Pathohistological features.** It is determined marked dilation of vessels leads to slowing of erythrocytes and the margination of leukocytes along the walls. In all pulp (coronal and radicular) there are hemorrhages into pulp tissue, which is saturated with serous exudate. Histologically, one finds necrosis of the coronal pulp with vital remnants left. In the coronal pulp there are forming abscesses. There are accumulations of erythrocytes and leukocytes in the pulp near the caries cavity. With increasing of vascular wall permeability the inflammatory infiltration increased. As a result the odontoblast layer altered or destroyed.



**Pic.7.** Purulent exudate.

#### **IV. Control questions for the class topic:**

1. Objective signs and complaints of the patient with acute purulent pulpitis.
2. Factors of purulent exudate formation in the tooth cavity.
3. Difference of subjective symptoms in acute purulent pulpitis and maxillary sinusitis.
4. Microscopic picture of acute purulent pulpitis.
5. Microbiological component in acute purulent pulpitis and its role in the etiology of the disease.

#### **V. Control test tasks and/or case tasks:**

1. An 18-year-old patient who had a month ago underwent treatment of tooth 17 for chronic deep caries was diagnosed with acute purulent pulpitis of tooth 17. What complaints did the patient have?
  - a. Pain that stops immediately after stopping the stimuli, increased pain at night
  - b. Increased pain from cold, pain when biting on the tooth
  - c. Increasing pulsating pain, irradiation of pain into the ear, pain increases with hot food
  - d. Bleeding gums, pain from cold, increased pain during the day
  - e. Reduction of pain from hot, feeling of an overgrown tooth
2. What forms of pulpitis are characterised by pain from hot?
  - a. Focal serous
  - b. Acute serous
  - c. Chronic fibrous
  - d. Chronic calculous
  - e. Acute purulent, gangrenous
3. A 28-year-old patient who underwent treatment of tooth 47 4 weeks ago complains of constant pulsating pain in 47, which appeared a day ago. The preliminary diagnosis is acute purulent pulpitis of tooth 47. What is the treatment tactic?
  - a. Prescribe antibiotics
  - b. Vital amputation
  - c. Vital extirpation
  - d. Devitalising amputation
  - e. Physiotherapy
4. A girl of 8.5 years old was diagnosed with acute purulent pulpitis of tooth 54 after clinical examination. Choose the method of treatment:
  - a. Tooth extraction

- b. Vital extirpation
  - c. Vital amputation
  - d. Devitalisation
  - e. Devitalising amputation
5. The patient complained of severe spontaneous pain, the pain attack gradually increases, the pain irradiates to the temple, the interval between pain attacks is short. According to the patient, pain from cold decreases. Make a diagnosis:
- a. Acute traumatic pulpitis
  - b. Acute purulent periodontitis
  - c. Acute traumatic pulpitis
  - d. Hyperemia of the pulp
  - e. Acute purulent pulpitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
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5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
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## METHODOLOGICAL RESEARCH №5

### TOPIC: CHRONIC SIMPLE PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Chronic pulpitis can occur without an acute form. It depends on the virulence of the infectious agent, compensatory and adaptive mechanisms of the pulp, general immune status, etc. The most benign consequence of an acute pulp inflammatory reaction is chronic fibrous pulpitis. It is characterised by active processes of sclerosis, as a result of which the pulp undergoes fibrosis and hyalinosis. Partially, this form of inflammation occurs when the exudate finds an outflow. The number of cellular elements in such tissue decreases.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- etiology of chronic simple pulpitis;
- pathomorphological picture of chronic simple pulpitis;
- the main differences between acute and chronic forms of pulpitis;
- mechanisms of development of chronic simple pulpitis;

##### **2.2 Be able to:**

- diagnose chronic simple pulpitis;
- inform the patient about the development of the disease and its possible consequences;
- clearly differentiate chronic simple pulpitis from other forms of pulpitis.

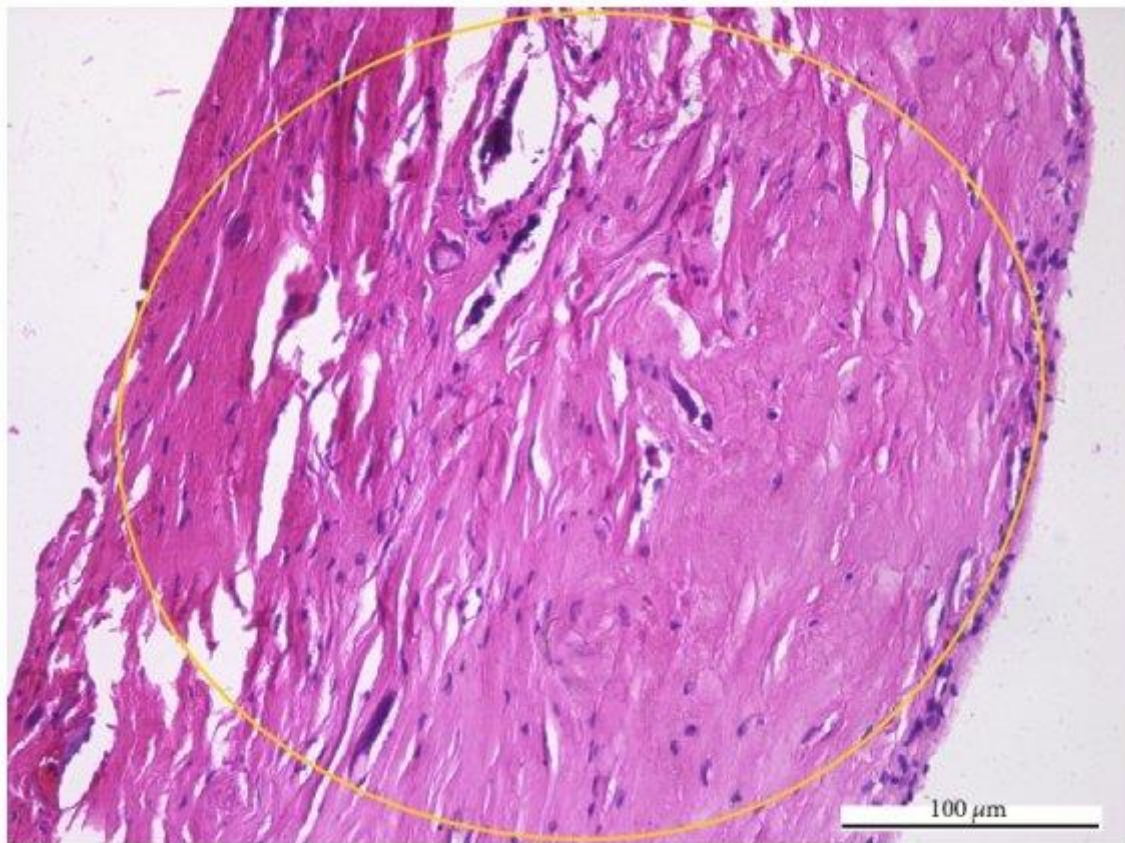
#### **III. Content of the topic**

**Chronic fibrous pulpitis** (Pulpitis chronica fibrosa, chronic pulpalgia): Unlike the acute form of pulpitis at chronic fibrous pulpitis the patient feels heaviness in a tooth. Pain appears in reply to action of thermal, chemical and mechanical irri-tants, intensity of which is usually depend of location of caries cavity. At the opened pulp chamber of the tooth and central location of caries cavity «sucking» from a tooth can cause quickly passing aching pain. Unlike caries the pain at chronic fibrous pulpitis lasted 30-90 minutes after cessation irritant action. At chronic pulpitis the acute pain is absent (it may revealed during anamne-sis in past) and now patient felt heavy dull pain. It is often described as a «grum-ble», not severe but consistent discomfort. Patients have admitted withstanding the discomfort for weeks or even years, suppressing the pain with analgesics. On the other hand, they may not have had any overt symptoms that would alert them to seek a dentist. Finally, when the pulp starts to ache all night or flare up during an airplane flight, they come in for treatment.

The pain is mild enough and diffuses enough to complicate its location. Moreover, chronic pulpalgia often refers to other teeth or the opposing arch. Pain may be precipitated by biting down on an open cavity. Cold has little effect, but heat may increase the discomfort. The examination of tooth with caries cavity or fractured filling may be revealed. Cavity covered with soft demineralized dentin, which may be pigmented. The probing revealed perforation with gray-brown pulp tissue, which is painful during probing.

The patient usually reports no significant pain, 2 and tests reveal little or no pain on percussion. Pathohistological features. The prominent feature is the excrescence of fibrous connective tissue. The fibres of pulp are thickened. There is hyalinosis of collagen fibres of pulp of ground substance. The cell reaction manifested odonto-blasts layer vacuolization, intensification of cells proliferation. In root pulp there are fibrous and petrification of ground

substance.



**Pic.8.** Microscopical image of chronic fibrous pulpitis.

**IV. Control questions for the class topic:**

1. Causes of occurrence of chronic forms of pulpitis.
2. Diagnostics of chronic simple pulpitis.
3. Etiological factors that affect the transition of acute forms of pulpitis to chronic.
4. Clinical signs of chronic simple pulpitis.
5. Pathological changes in the pulp in the presence of chronic fibrous inflammation.

**V. Control test tasks and/or case tasks:**

1. The patient complains of pain in the tooth 15. The pain occurs after eating ice cream, slowly increases and slowly disappears. Percussion is painless. There is pain during deep probing. X-ray shows deformation of the periodontal gap. The carious cavity and the tooth cavity are connected. Determine the diagnosis:
  - a. Chronic granulating periodontitis
  - b. Chronic granulomatous periodontitis
  - c. Chronic fibrous pulpitis
  - d. Chronic fibrous periodontitis
  - e. Radicular cyst
2. A 9-year-old child complains of aching pain when food gets into the tooth on the upper jaw. Objectively: 55 tooth carious cavity connected to the tooth cavity, probing is painful, cold stimulus causes prolonged aching pain. What is the most likely diagnosis?
  - a. Chronic gangrenous pulpitis
  - b. Chronic fibrous pulpitis
  - c. Chronic hypertrophic pulpitis

d.Chronic deep caries

e.Acute limited pulpitis.

3.A 19-year-old man was diagnosed with chronic fibrous pulpitis of tooth 46. On the basis of what symptoms was the diagnosis made?

a.A deep carious cavity connected to the tooth cavity, probing the bottom of the carious cavity is sharply painful, accompanied by bleeding, percussion is painless

b.Probing the bottom of the carious cavity is painless, the tooth is discoloured

c.Percussion is painful, cold test is negative

d.The carious cavity does not connect with the tooth cavity, probing the bottom of the carious cavity is painful

e.Sharp pain from thermal stimuli, worsening at night.

4.A 38-year-old patient complains of pain that occurs when drinking cold drinks in the area of the upper frontal teeth on the left, which has been going on for more than a month. The patient has a history of trauma to tooth 21 with a third of the crown chipped off about 3 months ago. After the injury, the tooth was restored using a composite material and did not bother. Examination: tooth 21 - cold test slightly positive, percussion 21 slightly positive, radiographically: widening of the periodontal gap along the perimeter of the apex of the root 21. Make a diagnosis:

a.Chronic fibrous periodontitis

b.Chronic gangrenous pulpitis complicated by periodontitis

c.Chronic fibrous pulpitis complicated by chronic periodontitis

d.Chronic periodontitis of the upper jaw

e.Chronic hypertrophic pulpitis complicated by periodontitis

5.The patient consulted a dentist with complaints of periodic aching pain in the left lower jaw, which intensifies after eating cold food, while brushing her teeth. The pain had started about 3 weeks ago. According to the patient, the pain is tolerable but unpleasant. Objective: pain after using a cold stimulus, which continues after its termination for about 1 minute in tooth 36. The tooth has a filling. Percussion is negative, radiographically no pathological changes were found on the apexes of the roots of 36. Establish the diagnosis:

a.Acute diffuse pulpitis

b.Chronic gangrenous pulpitis

c.Chronic hypertrophic pulpitis

d.Chronic fibrous pulpitis

e.Acute periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.

2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.

3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
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## METHODOLOGICAL RESEARCH №6

### TOPIC: CHRONIC HYPERTROPHIC PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Chronic hypertrophic pulpitis is also a sign of proliferative processes in the pulp, with a predominant proliferation of granulation and new connective tissue. One of the most important protective mechanisms of the pulp in response to carious lesions of hard tissues is the formation of reparative (replacement) dentin.

#### II. Study goal:

##### 2.1. Student has to know:

- the main differences between acute and chronic forms of pulpitis;
- etiology of chronic hypertrophic pulpitis;
- pathomorphological picture of chronic hypertrophic pulpitis;
- differences between chronic hypertrophic and other types of pulpitis;

##### 2.2 Be able to:

- identify the clinical characteristics of chronic hypertrophic pulpitis;
- evaluate the main characteristics of chronic hypertrophic pulpitis;
- perform differential diagnostics of chronic hypertrophic pulpitis with other diseases.

#### III. Content of the topic

**Chronic hypertrophic pulpitis** (Pulpitis chron-ica hypertrophica, Hyperplastic pulpitis). Hyperplastic pulpitis (pulp polyp) is a form of irreversible pulpitis, which results from growth of chronically inflamed young pulp into occlusal surfaces. It is usually found in carious crowns of young patients. Ample vascularity of young pulp, adequate exposure for drainage, and tissue proliferation are associated with formation of hyperplastic pulpitis. This form of pulpitis often develops in children and persons of young age. From anamnesis the presence in the past the acute pain is revealed. Patient's complaint of pain and the appearance of blood from a carious cavity during chewing are as a result of the trauma of a food lump or at «sucking» from a tooth. Hyperplastic pulpitis is usually asymptomatic. It appears as a reddish cauliflower-like outgrowth of connective tissue into caries that has resulted in a large occlusal exposure.

**Objectively** in affected tooth there is a large carious cavity filled by fleshy like colour tumor like formation. This overgrowing pulp is bleed and little sensitive at its probing, but is painful in area of entrance of root channels. Outlining round a «polyp» by a probe (determination of «area of growth»), it is possible to make sure in its connection with pulp. There is dull pain a result of cold irritants. Rising out of the carious shell of the crown is a «mushroom» of living pulp tissue that is often firm and insensitive to the touch.

A redish, cauliflower-like growth of pulp tissue through and around a carious exposure is one variation of asymptomatic irreversible pulpitis. The proliferative nature of this pulpal' reaction, sometimes known as a spulp polyp», is attributed to a low-grade, chronic irritation of the pul and the generous vascularity characteristically found in young people. Occasional is condition may cause mild, transient pain during mastication. The chronically inflamed young pulp, widely exposed by caries on its occlusal aspect, is the forerunner of this unique growth. Proliferative growth of inflamed connective tissue resembles a pyogenic granuloma of the gingiva.

**Pathohistological features.** The considerable changes developed in vessels: from one side, there is violation of anatomo-topographical architectonics of blood and lymphatic vessels, with other — clear features of morphological changes characteristic for a chronic inflammatory process. The changed pulp is usually presented by young granulation tissue. Microscopically, the pulp polyp is a complex of new capillaries, proliferating fibroblasts, and inflammatory cells. Among

tender connective tissue fibres there is a plenty of the young thin-walled capillaries. Support for the protruding mass is supplied by collagenous fibres rooted in the deeper pulp tissue of the chamber.

Sensory nerve elements are almost totally absent near the surface, in contrast to the rich innervations and exquisite sensitivity of an exposed pulp that is not hyperplastic. Before the lesion has grown to any extent, its surface layer consists of massed necrotic cells and leukocytes with chronic inflammatory cells (leucocytes) beneath forming a zone of variable width. As the tissue expands, it may acquire a stratified squamous epithelial cover that may form by a true cell graft. Cells of the oral mucosa floating free in the saliva may grow over the surface of the highly vascularized young connective tissue, or a direct migration of epithelial cells may occur from the gingi-va. Hyperplastic pulpitis is irreversible and therefore requires pulpectomy and root canal treatment or extraction.



**Pic. 9-10.** Chronic hypertrophic pulpitis.

#### IV. Control questions for the class topic:

1. Etiology of chronic hypertrophic pulpitis.
2. Forms of chronic hypertrophic pulpitis.
3. Differential diagnostics of chronic hypertrophic pulpitis.
4. Factors of occurrence of chronic hypertrophic pulpitis.
5. Pathological picture of chronic hypertrophic pulpitis.

#### V. Control test tasks and/or case tasks:

1. The patient came with complaints of aching pain in the tooth on the lower jaw on the left when eating, bleeding from the tooth. Diagnosis was made: chronic hypertrophic pulpitis of the 36th tooth. What is the tissue that fills the carious cavity?
  - a. The growth of loose connective tissue with a small number of cells
  - b. Growth of rough fibrous connective tissue
  - c. Formation of decay sites with microorganisms
  - d. Overgrowth of elastic fibres
  - e. Growth of new granulation tissue
2. An 18-year-old female patient complains of bleeding while chewing in the area of the lower right corner teeth. Examination: on the chewing surface of tooth 47, there is a large carious cavity filled with a pinkish mass and food debris. During probing of the cavity, there is slight pain and bleeding. What is the most possible diagnosis?
  - a. Acute limited pulpitis
  - b. Chronic gangrenous pulpitis
  - c. Acute purulent pulpitis
  - d. Chronic hypertrophic pulpitis
  - e. Chronic fibrous pulpitis
3. An 18-year-old female patient visited a dentist with complaints of pain and bleeding when eating in the right lower jaw tooth. From the anamnesis it was found that in the past there was a severe night pain. Objectively: carious cavity in tooth 36, Black class II, filled with soft tissue, probing is painful. On teeth 46, 45, 44 there is a significant deposition of soft white plaque. Diagnosis: chronic hypertrophic pulpitis of tooth 36. What diseases should be differentially diagnosed in this case?
  - a. Granulations that have sprouted through the opening of root canals or perforation in the area of bifurcations
  - b. Chronic granulating periodontitis
  - c. Hyperemia of the pulp
  - d. Acute limited pulpitis
  - e. Chronic fibrous pulpitis.
4. A 54-year-old patient complains of pain that occurs when eating solid food in the left mandible. Objectively: on the chewing surface of the 47th tooth there is a large carious cavity filled with food debris. After their removal, a hypertrophied dense pulp was found, which was slightly painful during probing. Percussion is painless. What is the most possible diagnosis?
  - a. Chronic fibrous pulpitis
  - b. Hypertrophic papillitis
  - c. Chronic gangrenous pulpitis
  - d. Chronic hypertrophic pulpitis
  - e. Chronic granulating periodontitis
5. What indicators of EOD are typical for chronic hypertrophic pulpitis?
  - a. 2-6 microA

- b.6-12 microA
- c.12-20 microA
- d.20-40 microA
- e.40-60 microA

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
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5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
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## METHODOLOGICAL RESEARCH №7

### TOPIC: CHRONIC GANGRENOUS PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS. PULP NECROSIS AND ATROPHY

**I. Topic relevance:** Chronic gangrenous pulpitis is a consequence of acute purulent and chronic fibrous pulpitis of a temporary tooth and develops in the case of anaerobic microflora, which leads to gradual necrosis of the pulp.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- basic principles of classification of chronic pulpitis;
- etiopathology of chronic gangrenous pulpitis;
- possible mechanisms of development of complications from chronic gangrenous pulpitis;
- differences between chronic gangrenous pulpitis and other types of pulpitis;

##### **2.2 Be able to:**

- correctly diagnose chronic gangrenous pulpitis;
- evaluate the main characteristics of chronic gangrenous pulpitis;
- clearly identify a specific clinical situation as chronic gangrenous pulpitis.

#### **III. Content of the topic**

**Chronic gangrenous pulpitis (Pulpitis chronica gangraenosa, Pulp necrosis):** This develops from acute purulent or chronic fibrous pulpitis as a result of penetration into pulp of putrid bacteria. Necrosis, the death of the pulp, actually refers to a histological condition resulting from an untreated irreversible pulpitis, a traumatic injury, or any event that causes long-term interruption of the blood supply to the pulp. As inflammation progresses, tissue continues to disintegrate in the center to form an increasing region of liquefaction necrosis.

Because of the lack of collateral circulation and the unyielding walls of the dentin, there is insufficient drainage of inflammatory fluids. These results in localized increases in tissue pressures, causing the destruction to progress unchecked until the entire pulp is necrotic. The rate of progress of liquefaction necrosis varies. Spontaneous pain is absent, when there is perforation of the caries cavity floor. The unpleasant feeling of expansion in a tooth is the permanent sign of gangrenous pulpitis. The pain usually slowly arises up under influence of thermal (hot) irritants and lasted short time. Spontaneous pain arises up and is observed then, when the pulp chamber is closed and the exudates cannot flow from the inflamed

*Objectively* in affected tooth there is a large carious cavity filled by softened dentin. The pulp chamber at most patients is opened and filled by the products of pulp disintegration with an unpleasant smell. The reaction on the superficial probing is absent. The deep probing is painful. The leathery dentin covering these lesions may be removed with a spoon excavator, often without anaesthesia unface ne no sis a dise comfort. The pulp lies revealed, covered with a ray sum of surface necross. crown discolouration may accompany pulp necrosis in anterior teeth, but this diagnostic sign is not reliable. Pathohistological features. Once bacteria have invaded the necrotic pulp, they release enzymes to break down the necrotic tissue for assimilation of the available nutrients; by the process of heterolysis, liquefaction (also called «wet gangrene») occurs. The coronal pulp is necrotic with plenty of anaerobic microorganism. Adjacent to the liquefaction necrosis is a zone of chronic inflammation. Although the width of this zone may vary, generally it is rather narrow. This activity produces an abundance of by-products, which eventually leak

into periradicular tissues, causing inflammatory and immunologic reactions. Odontoblasts had dystrophic changes; cellular composition of root pulp is poor with areas of hyalinosis. Periradicular inflammation would not be expected to develop until the pulp is nearly totally necrotic



**Pic.11.** Chronic gangrenous pulpitis.



**Рис.12.** Chronic gangrenous pulpitis of temporary teeth.

#### **IV. Control questions for the class topic:**

1. Main characteristics of chronic gangrenous pulpitis.
2. Etiopathology of chronic gangrenous pulpitis.
3. Differential diagnosis of chronic gangrenous pulpitis.
4. Microscopic state of the pulp in chronic gangrenous pulpitis.
5. Mechanisms of development of complications of chronic gangrenous pulpitis.

#### **V. Control test tasks and/or case tasks:**

1. Which symptoms correspond to the clinical picture of gangrenous pulpitis:
  - a. Pain of aching nature from hot stimuli, tooth discoloration
  - b. Swelling and hyperaemia of the mucous membrane of the alveolar ridge in the projection of the apices of the roots of the affected tooth
  - c. Positive percussion, pain from cold stimuli and its reduction from hot stimuli
  - d. Pain from cold stimuli and its reduction from hot stimuli, paresthesia of the inferior alveolar nerve

e. Sharp pain during chewing

2. A 12-year-old child complains of pain in the lower jaw on the right side, which occurs when drinking hot drinks. The pain appeared about a month ago and is slightly increasing. Physical examination: tooth 46 is greyish in colour, has a large carious cavity on the distal surface, after a test with hot water, aching pain occurs. X-ray: there is no layer of dense dentin between the carious and pulp cavity, no destructive changes at the root apices. Make a diagnosis:

- a. Chronic fibrous pulpitis
- b. Acute diffuse pulpitis
- c. Chronic gangrenous pulpitis
- d. Chronic hypertrophic pulpitis
- e. Hyperemia of the pulp.

3. A 36-year-old patient complains of darkening of the crown of tooth 11, prescribed painful reaction when drinking hot drinks. Anamnesis: trauma to tooth 11 with a slight chip within the dentin without exposing the pulp about six months ago. After the injury, the tooth reacted intensely to temperature stimuli for some time, but stopped bothering about 2-3 weeks after the injury. The chipped part of the tooth was not restored. At the moment, tooth 11 does not respond to cold stimuli, it is greyish in colour, and no destructive changes are observed on the apex of the root 11. Establish the diagnosis:

- a. Acute purulent pulpitis
- b. Chronic fibrous pulpitis
- c. Hyperemia of the pulp
- d. Chronic gangrenous pulpitis
- e. Chronic hypertrophic pulpitis.

4. During a preventive examination of a 17-year-old boy in tooth 45, a deep carious cavity communicating with the tooth cavity was found. Objectively: the crown of tooth 45 is grey. The carious cavity of the tooth is filled with a brown mass, surface probing of the cavity is painless, deep probing is painful. Percussion of tooth 45 is slightly painful, the mucous membrane of the alveolar ridge in the area of root projection is without pathological changes. What is the most likely diagnosis?

- a. Chronic granulating periodontitis
- b. Exacerbation of chronic periodontitis
- c. Chronic gangrenous pulpitis
- d. Chronic concretionary pulpitis
- e. Chronic fibrous pulpitis

5. A 15-year-old girl complains of a carious cavity in tooth 44 and bad breath. During the examination, a carious cavity was found in tooth 44, filled with a brown mass with an unpleasant, putrid smell. The crown of the tooth is grey in colour, and percussion of tooth 44 reveals a 'boxy' sound. What is the most likely diagnosis?

- a. Chronic hypertrophic pulpitis
- b. Chronic gangrenous pulpitis
- c. Hypertrophic papillitis
- d. Exacerbation of chronic pulpitis
- e. Chronic fibrous pulpitis

## VI. References

### 6.1. Main literature

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
6. Cohen's Pathways of the Pulp 12th Edition by Louis H. Berman, Kenneth M. Hargreaves. Publisher: Elsevier; 12th edition, 2020. –992 p.



## METHODOLOGICAL RESEARCH №8

### TOPIC: CALCULOUS AND ROOT PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Chronic calculous pulpitis is a form of pulpitis in which ectopic lesions of dentin replacement or calculi form in the neurovascular bundle (pulp). The cause of this disease is a denticle - a stone that arises as a result of the work of pulp cells and is located in it. There are three types of denticles: free-standing, parietal, and interstitial. Denticles can reach quite large sizes. As a rule, the formation and development of such deposits (denticles) is not accompanied by any symptoms.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- causes of calculi in the tooth cavity;
- classification of denticles;
- possible mechanisms of development of complications from chronic calculus pulpitis;
- differences between root and crown pulpitis;

##### **2.2 Be able to:**

- correctly diagnose calculous pulpitis;
- evaluate the radiograph of a patient with calculous pulpitis;
- correctly differentiate between crown and root pulpitis.

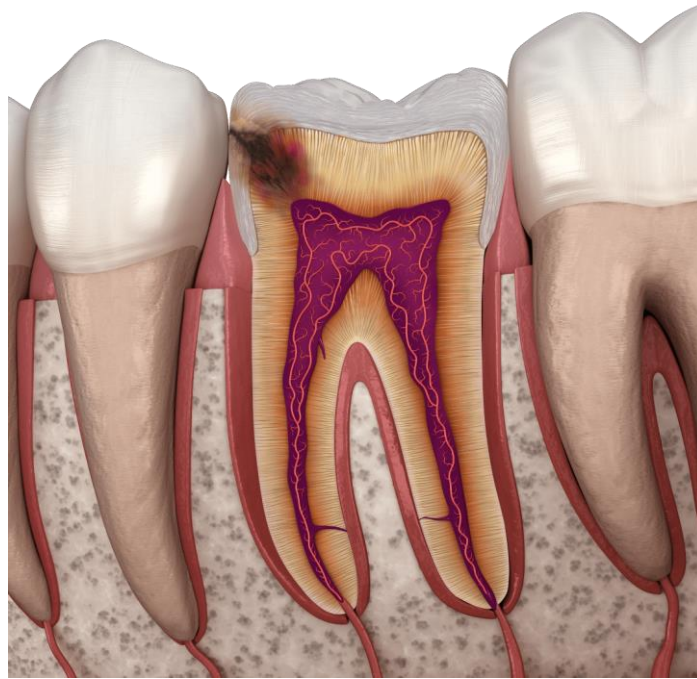
#### **III. Content of the topic**

**Chronic concremental pulpitis** (Pulpitis chronica concrementosa): The causative factor of this form of pulpitis there are denticles - a calcified deposits in the dental pulp. Usually they are located in pulp chamber or root canals. It may be composed either of irregular dentine (true denticle) or an ectopic calcification of pulp tissue. Denticle most often formed in back located teeth (molars, premolars) at persons in age more 40 years. These formations cause the permanent irritation of nervous endings of pulp, resulting in chronic inflammation. Patients' complains of spontaneous pain and development of acute pain attack, referred from one arch to the other and along the branches of n. trigeminus.

The character of pain attack is like of neuralgic attacks. Pain attacks increase and become more frequent at night and during vibration. Clinical features resembled trigeminal neuralgia. Pain attack lasted 15-30 minutes. *Vertical percussion* is painful and may provoke the pain attack. Examination revealed the tooth with abrasion of occlusal surfaces, frequently in patients with periodontal diseases (in rarely case the tooth may be intact). In the main diagnostic procedure is radiographic examination which allow to revealed den-ticles in pulp chamber.

*Pathohistological features.* In pulp tissue denticles and petrifications are revealed.

Their localization, quantity, form and size, are various. In pulp tissue there are some sign of dystrophia: odontoblasts vacuolization, hyalinosis and areas of petrificac- tion with signs of chronic inflammation



**Pic.13, 14.** Schematic image of pulpitis.

#### **IV. Control questions for the class topic:**

1. Origin of calculi in the tooth cavity.
2. Causes of occurrence of calculi in the tooth cavity.
3. The concept of denticles and the causes of their occurrence.
4. Differential diagnostics of chronic calculous pulpitis.
5. Difference between crown and root pulpitis.

#### **V. Control test tasks and/or case tasks:**

1. A 16-year-old patient was diagnosed with chronic fibrous pulpitis of tooth 46. On the basis of what symptoms was the diagnosis made?
  - a. . Probing the bottom of the carious cavity is painless, the tooth is discoloured
  - b. Deep carious cavity connected to the tooth cavity, probing the bottom of the carious cavity is sharply painful, accompanied by bleeding, percussion is painless

- c. Percussion is painful, cold test is negative
  - d. The carious cavity is not connected to the tooth cavity, probing the bottom of the carious cavity is painful
  - e. Sharp pain from thermal stimuli, aggravated at night
2. A 7.5-year-old child consulted a dentist with complaints of periodic aching pain in the left lower jaw, which worsens after eating cold food and while brushing teeth. The pain appeared about 3 weeks ago. According to the child, the pain is tolerable, but unpleasant. Observed: pain after using a cold stimulus, which continues after its termination for about 1 minute in tooth 36. The tooth has a filling. Percussion is negative, radiographically no pathological changes were found on the apexes of the roots of 36. Establish the diagnosis:
- a. Chronic calculous pulpitis
  - b. Chronic fibrous pulpitis
  - c. Chronic gangrenous pulpitis
  - d. Chronic hypertrophic pulpitis
  - e. Chronic pulpitis in the acute stage
3. An 18-year-old patient who had a month ago underwent treatment of tooth 17 for chronic deep caries was diagnosed with acute purulent pulpitis of tooth 17. What complaints did the patient have?
- a. Increased pain from cold, pain when biting on the tooth
  - b. Increasing pulsating pain, irradiation of pain into the ear, increased pain from hot
  - c. Reduction of pain from hot, sensation of an overgrown tooth
  - d. Pain that stops immediately after cessation of irritants, increased pain at night
  - e. Bleeding gums, pain from cold, increased pain during the day.
4. What forms of pulpitis are characterised by pain from hot?
- a. Focal serous
  - b. Acute purulent, gangrenous
  - c. Acute serous diffuse
  - d. Chronic fibrous
  - e. Chronic calculous.
5. A 20-year-old patient complains of pain that occurs when drinking cold drinks in the upper frontal teeth on the left, which has been going on for more than a month. The patient has a history of trauma to tooth 21 with a third of the crown chipped off about 3 months ago. After the injury, the tooth was restored using a composite material and did not bother. Examination: tooth 21 - cold test slightly positive, percussion 21 slightly positive, radiographically: widening of the periodontal gap along the perimeter of the root apex #21. Make a diagnosis:
- a. Chronic gangrenous pulpitis complicated by periodontitis
  - b. Chronic fibrous pulpitis complicated by chronic periodontitis
  - c. Chronic fibrous periodontitis
  - d. Chronic hypertrophic pulpitis complicated by periodontitis
  - e. Chronic periodontitis of the upper jaw

## VI. References

### 6.1. Main literature

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.
6. Cohen's Pathways of the Pulp 12th Edition by Louis H. Berman, Kenneth M. Hargreaves. Publisher: Elsevier; 12th edition, 2020. –992 p.

## METHODOLOGICAL RESEARCH №9

### TOPIC: EXACERBATION OF CHRONIC PULPITIS: PATHOMORPHOLOGY, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Exacerbation is the last stage of the disease, when the patient experiences signs of acute and chronic pulpitis at the same time. If pulpitis is not treated in the acute stage, the disease turns into periodontitis and continues to gain strength.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- the main causes of exacerbation of chronic pulpitis;
- characteristics of exacerbation of chronic pulpitis;
- possible mechanisms of exacerbation of chronic pulpitis;
- consequences of exacerbation of chronic pulpitis;

##### **2.2 Be able to:**

- correctly diagnose exacerbation of chronic pulpitis;
- clearly differentiate between chronic pulpitis in the acute stage and acute pulpitis;
- explain the causes, mechanisms and consequences of chronic pulpitis in the acute stage.

#### **III. Content of the topic**

**Exacerbated chronic pulpitis (Pulpitis chronica exacerbata):** Every form of chronic pulpitis can exacerbate. The frequently it is fibrous pulpitis more rarely - chronic gangrenous pulpitis. Exacerbated chronic pulpitis is characterized by the spontaneous pain and development of acute pain attack, referred from one arch to the other and along the branches of n. trigeminus. Pain attacks increase and become more frequent at night and at horizontal position of patient. The pain attack can provoke different irritants, frequently the cold.

Duration of pain attack may be different: pain attack at first lasted 15-30 minutes, but with development of the inflammatory process in pulp its duration increase to 1-2 hours. When inflammation develops in root pulp then the vertical percussion becomes painful.

*Examination* revealed the tooth with caries cavity, frequently deep, rarer middle caries. The state of caries cavity correspond some form of chronic pulpitis. For example, in case of exacerbated chronic fibrous pulpitis cavity covered with soft demineralized dentin, which may be pigmented. The probing revealed perforation with gray-brown pulp tissue, which is painful during probing. The patient usually reports no significant pain, and tests reveal little or no pain on percussion. But thermal (cold, hot) irritants may provoke pain attack.

**Pathohistological features** usually correspond with some forms of chronic pulpitis and with some sign of acute inflammation. It is determined marked dilation of vessels leads to slowing of erythrocytes and the margination of leukocytes along the walls. In all pulp (coronal and radicular) there are haemorrhages into pulp tissue, which is saturated with serous or purulent exudate. The odontoblast layer altered or destroyed.

**Pulpitis complicated with apical periodontitis (Pulpitis complicatus periodontitis).** Pulpitis on the definite stage of the inflammation development can be complicated by different forms of periodontitis. More frequent complicated acute diffuse pulpitis. The clinical features combined the clinical signs of pulpitis and apical periodontitis. For example there may be the signs of acute diffuse or purulent pulpitis and signs of periodontitis. The durability of pain attack was 10-30 minutes and attacks are lasting an hour. The durability of painless intervals decreases up to 10-30 minutes. Pain attacks increase and become more frequent at night and at horizontal position of patient. Usually patients indicate on a causal caries tooth, but in some cases the pain may be

referred from one arch to the other. These signs of pulpitis combined with signs of periodontitis. This may be aedema of the soft tissues of the face (lips, cheek), especially on the site of affected tooth. There is hyper-emia and edema in the area of tooth apex, sometimes hyperemia is present in the adjoining areas of gums. In some cases the periosteal abscess may develop. Horizontal and vertical percussion of tooth is very sensitive. There is tooth mobility in mesial, distal and vertical directions.

Examination revealed the tooth with caries cavity, frequently deep, rarer middle caries. The walls and floor of cavity covered with soft demineralized dentin; in some cases it can be more dense and pigmented. During probing the cavity floor is pain-ful, vertical percussion is painful. When chronic pulpitis complicated during probing the pulp chamber revealed perforation with gray-brown pulp tissue, which is painful during probing Pathohistological features usually correspond with some forms of acute or chronic pulpitis with some sign of acute inflammation in periodontal ligament.

#### **IV. Control questions for the class topic:**

1. Causes of exacerbation of chronic pulpitis.
2. Methods of diagnosing exacerbation of chronic pulpitis.
3. Differential diagnosis of exacerbation of chronic pulpitis.
4. Consequences of exacerbation of chronic pulpitis.
5. Pathological picture of exacerbation of chronic pulpitis.

#### **V. Control test tasks and/or case tasks:**

1. A 16-year-old patient complains of spontaneous tooth pain in the lower jaw, worsening when biting and from cold for 2 days. Objectively, the 25th tooth has a deep carious cavity filled with softened dentin, probing along the bottom is painful, prolonged acute pain on cold stimulus, percussion is painful, palpation along the transitional fold in the area of the 25th tooth is painful. What is the most possible diagnosis?
  - a. Acute pulpitis complicated by periodontitis
  - b. Acute serous periodontitis
  - c. Acute limited pulpitis
  - d. Acute chronic pulpitis
  - e. Acute diffuse pulpitis
2. A 20-year-old patient complains of acute spontaneous pain lasting 10-20 minutes. The attacks occur 1-3 times a day, intensify at night. The tooth has been aching for 2 days. Objectively: on the chewing surface of tooth 35 there is a deep carious cavity filled with pigmented dentin. Probing the bottom is painful at the point of projection of the pulp horn, percussion is painless. Determine the diagnosis:
  - a. Acute limited pulpitis
  - b. Acute diffuse pulpitis
  - c. Acute purulent pulpitis
  - d. Acute deep caries
  - e. Hyperemia of the pulp.
3. A 22-year-old woman complained of acute attacks of spontaneous pain lasting 15-20 minutes, which occurred several hours ago in the 25th tooth. Objectively: on the chewing surface of the 25th tooth there is a deep carious cavity that does not connect with the tooth cavity, cold stimulus causes an attack of pain. Determine the diagnosis:
  - a. Acute purulent pulpitis
  - b. Acute deep caries

c.Pulp hyperaemia

d.Acute limited pulpitis

e.Acute diffuse pulpitis.

4.A 30-year-old patient complained of short-term pain in the upper jaw tooth due to cold stimulus, which disappears immediately after its elimination. Objectively: on the chewing surface of the 47th tooth there is a deep carious cavity within the periapical dentin, filled with softened dentin, probing the bottom of the cavity causes slight pain, the thermal test is positive.

Make a diagnosis:

a.Acute deep caries

b.Chronic fibrous pulpitis

c.Acute chronic pulpitis

d.Acute medium caries

e.Hyperemia of the pulp.

5.Patient A., 47 years old, has had attacks of acute spontaneous pain for two days. The pain is aggravated by eating. Objectively: on the chewing surface of the 17th tooth there is a deep cavity that does not connect with the tooth cavity, probing is painful in the area of the projection of the pulp horn, the pain attack from a cold stimulus lasts about 15 minutes, percussion is painful.

What is the most possible diagnosis?

a.Acute deep caries

b.Acute limited pulpitis

c.Pulp hyperaemia

d.Acute diffuse pulpitis

e.Exacerbation of chronic pulpitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.

## METHODOLOGICAL RESEARCH №10

### TOPIC: METHODS AND MEANS OF ANAESTHESIA IN PULPITIS. MEDICINAL PRODUCTS AND METHODS OF APPLICATION. PREMEDICATION

**I. Topic relevance:** Anaesthesia during the treatment of pulp inflammation is a quite complex problem and has a number of features related to both the general condition of the patient and the peculiarities of the inflammatory process in the tooth cavity. Before choosing a particular type of anaesthesia, it is necessary to ask the patient about the presence of general diseases, especially such as hypertension, diabetes mellitus, cardiovascular diseases, bronchial asthma, etc. It is imperative to ask about the presence of hypersensitivity to certain medications and allergic reactions.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- the main methods of anaesthesia in dentistry;
- classification of anaesthetics;
- possible reactions of the human body to anaesthetics;
- drugs used for premedication;

##### **2.2 Be able to:**

- choose the right anaesthetic solution;
- prescribe the dosage and time of administration of premedication drugs;
- provide first aid in case of reactions to anaesthetic drugs quickly and effectively.

#### **III. Content of the topic**

In no other area of dentistry is the management of pain of greater importance than in endodontics. All too often the patient in need of endodontic therapy has endured a prolonged period of ever-increasing discomfort before seeking dental care. The reasons for this discomfort are manifold; however, there is one simple explanation in the overwhelming majority of these patients. It is possible to achieve clinically elictive pulpal anaesthesia on all teeth, infected or not, in any area of the oral cavi-ty, with a very high degree of success and without inflicting any additional pain on the patient in the process.

The administration of inhalation sedation with nitrous oxide and oxygen carefully titrated, alleviates any fears of injections in the majority of needle-pho-bic dental patients. Continued administration during the endodontic procedure is entirely appropriate if the patient is at all apprehensive. When inhalation sedation is contraindicated (e.g., patient is a mouth breather, patient has a «cold» or upper respiratory infection, or sedation has proved ineffective in the past in eliminating the patient's fears), other techniques of conscious sedation should be considered. The safest and most effective, when used properly, is intravenous conscious sedation. Clinically effective pain control can be achieved in the vast majority of patients requiring endodontic therapy. When problems achieving pain control occur, it is usually at the initial visit, when a frightened patient, who has been hurting for some period of time, finally seeks relief from pain yet often times they are unable to manage the fears of dentistry. Through a combination of thoughtful caring for the patient, the use of conscious sedation, when indicated, and the effective administration of local anaesthesia, endodontic treatment can proceed in a more relaxed and pleasant environment for both the patient and dental staff.

##### **Local anaesthetic techniques.**

*Mandibular Anaesthesia:* To provide effective pulpal anaesthesia in the mandi-ble, one must administer the local anaesthetic drug at a site where the nerve is still accessible (e.g., before



the nerve enters the mandibular foramen and into the man-dibular canal). Thus, one is limited to two injection sites. One site is the lingual aspect of the mandibular ramus, where three techniques may be used: the inferior alveolar (IA) nerve block (the traditional «mandibular block»); the Gow-Gates man-dibular nerve block (GGMNB), and the Akinosi-Vazirani closed-mouth mandibular nerve block.

A second site of access to the mandibular nerve is available on the mandible, the mental foramen, located (usually) between the two premolars. Local anaesthetic administered at this site will provide profound pulpal anaesthesia of the premolar, canine and incisor teeth virtually 100% of the time, even when infection is present. On those occasions when these three mandibular nerve block injections fail to provide successful pulpal anaesthesia, one of several supplemental techniques may be considered. These include the periodontal ligament (PDL) injection, intraosseous (IO) anaesthesia, and intrapulpal injection. The IO technique has proved to be of tremendous benefit in endodontics, particularly as a means of providing anaesthesia to the «hot» mandibular molar.

**Maxillary Anaesthesia:** Although profound anaesthesia of maxillary teeth is normally easier to obtain, problems, if they occur, usually do so following the administration of an infiltration injection to a central incisor, canine, or molar. The apex of the central incisor may lie under the cartilage of the nose, making infiltration less effective (as well as more uncomfortable). Canines that have longer than usual roots may not be anesthetized when the anaesthetic is deposited below the apex (needle is not inserted far enough).

Infiltration anaesthesia of maxillary molars will fail in situations where the palatal root flares greatly toward the midline of the palate. Most local anesthetics infiltrated into the buccal fold will not diffuse far enough toward the midline to provide adequate pulpal anaesthesia in this situation. Additionally, where periapical infection is present, the success rate of injected local anaesthetics is diminished, sometimes considerably. Fortunately, maxillary anaesthesia can readily be achieved through the administration of nerve blocks. Three nerve blocks, the posterior superior alveolar (PSA), middle superior alveolar (MSA), and anterior superior alveolar (ASA, «infraorbital»), successfully provide pulpal anaesthesia to maxillary teeth, even in the presence of infection.

**Supplemental Injection Techniques:** Periodontal Ligament (PDL) Injection and Intraligamentary Injection (ILI). When pulpal anaesthesia of a single tooth is required, the PDL injection should be considered. This is of special importance in the mandible, where nerve block anaesthesia is the norm. In the maxilla, supraperiosteal injection infiltrated above the apex of any tooth will provide successful pulpal anaesthesia with a success rate of > 95%. Because of the thickness of the mandibular cortical plate of bone (in adults), infiltration techniques are doomed to failure. Therefore, although the PDL may be successfully administered to any tooth, its use is most often reserved for mandibular teeth, specifically mandibular molars.

**Intraosseous (IO) Anaesthesia:** In true IO anaesthesia, local anaesthetic is injected directly into the bone surrounding the root of a tooth. Intrapulpal Anaesthesia. When the pulp chamber has been exposed and, because of exquisite sensitivity, treatment cannot proceed, intrapulpal anaesthesia should be considered. A small needle is inserted into the pulp chamber until resistance is encountered. The local anaesthetic must be injected under pressure. There will be a brief moment of intense discomfort as the injection is started, but anaesthesia usually supervenes almost immediately, and instrumentation can proceed painlessly. Clinically effective pain control can be achieved in the vast majority of patients requiring endodontic therapy. Through a combination of thoughtful caring for patient, the use of conscious sedation, when indicated, and the effective administration of local anaesthesia, endodontic treatment can proceed in a more relaxed and pleasant environment for both the patient and dental staff.

Table 1. Injectable Local Anesthetic Agents*			
Anesthetic Agent	Agent/Formulation	Duration of Pulpal Anesthesia	Pregnancy Category**
<b>Articaine</b> <i>Brand Names:</i> Articadent Septocaine Ultracaine Zorcaine	4% articaine/1:100,000 epinephrine	Medium	C
	4% articaine/1:200,000 epinephrine	Medium	C
<b>Bupivacaine</b> <i>Brand Names:</i> Marcaine Sensorcaine Vivacaine	0.5% bupivacaine/1:200,000 epinephrine	Long	C
<b>Lidocaine</b> <i>Brand Names:</i> Xylocaine Lignospan Alphacaine Octocaine	2% lidocaine/1:100,000 epinephrine	Medium	B
	2% lidocaine/1:50,000 epinephrine	Medium	B
<b>Mepivacaine</b> <i>Brand Names:</i> Carbocaine Polocaine Scandonest	3% mepivacaine plain	Short	C
	2% mepivacaine/1:20,000 levonordefrin	Medium	C
<b>Prilocaine</b> <i>Brand Name:</i> Citanest	4% prilocaine plain	Short	B
	4% prilocaine/1:200,000 epinephrine	Medium	B

**Pic.15.** Local anesthetics in dentistry

#### IV. Control questions for the class topic:

1. Classification of anaesthetic solutions in dentistry.
2. Dosage for different anaesthetic solutions.
3. Drugs used for premedication in dentistry.
4. Possible reactions of human body to anaesthetics.
5. The main methods of anaesthesia in dentistry.

#### V. Control test tasks and/or case tasks:

1. 1 minute after torus anesthesia with 2% novocaine solution (4 ml) for the removal of 17, the patient began to complain of difficulty breathing. Objectively: the upper and lower lips are swollen, the mucous membrane of the larynx and oral cavity is also swollen and sharply hyperaemic. What complication did this patient have?
  - a. Quincke's edema
  - b. Anaesthetic intoxication
  - c. Anaphylactic shock

d.Collapse

e.Acute pulmonary insufficiency

2.A 30-year-old patient was treated for pulpitis 25 with a 2% lidocaine solution as an anaesthetic. A few minutes after the injection, he developed "numbness of the tongue", shortness of breath, heaviness behind the sternum, dry cough, cyanosis, general anxiety, convulsions. Blood pressure is 90/60 mmHg. Establish the most possible diagnosis:

a.Anaphylactic shock

b.Acute heart failure

c.Quincke's edema

d.Fainting

e.Epilepsy

3.A 62-year-old patient is undergoing extraction of 21, 22 teeth. Infiltration anaesthesia is used with the anaesthetic ultracaine DS. What is its composition?

a.4% articaine with epinephrine

b.2% mepivacaine with epinephrine

c.4% articaine without vasoconstrictor

d.3% mepivacaine without vasoconstrictor

e.2% articaine with epinephrine.

4.10 minutes after anaesthesia (15 ml of 2% lidocaine solution), a 26-year-old patient developed tachycardia, extrasystole, dyspnoea, dry cough, cyanosis, arterial hypotension, and loss of consciousness. Indicate the most likely diagnosis:

a.Anaphylactic shock

b.Aspiration asphyxia

c.Hypertensive crisis

d.Hyperglycaemic coma

e.Hypoglycaemic coma

5.A 20-year-old patient needs to undergo application anaesthesia on the upper jaw in the anterior region before conducting a conduction anaesthetic. What concentration of lidocaine solution is used for application anaesthesia?

a.10

b.50

c.20

d.30

e.15

## VI. References

### 6.1. Main literature

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.

2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.

3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### 6.2. Additional literature

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №11

**TOPIC: METHODS OF PULPITIS TREATMENT. REASONING FOR CHOOSING A METHOD OF TREATMENT OF PULPITIS DEPENDING ON THE FORM, PROGRESSION AND GENERAL CONDITION OF THE ORGANISM. METHOD OF PRESERVING THE PULP: INDICATIONS FOR USE. METHODS OF TREATMENT. MEDICINES, THEIR PRESCRIPTION. EFFECTIVENESS AND POSSIBLE COMPLICATIONS**

**I. Topic relevance:** A detailed study of the biology of pulp tissue has revealed its significant reparative and plastic capabilities. Pathogenetic therapy of pulpitis is based on these data. At the same time, the success of treatment and the completion of the inflammatory process in the pulp depend on the general condition of the organism, the patient's age, the localisation and development of the carious process, the virulence of carious cavity microorganisms, the ways of infection penetration into the pulp, the nature of the course, duration and form of inflammation, the topographic and anatomical features of the tooth cavity and root canals, the condition of the periodontium, etc. All of this should be taken into account when choosing a pulpitis treatment method

### **II. Study goal:**

#### **2.1. Student has to know:**

- basic methods of pulpitis treatment;
- materials for root canal filling;
- application of the pulp preservation method, indications for it;
- indications and contraindications to conservative and surgical methods of pulpitis treatment;

#### **2.2 Be able to:**

- correctly prescribe the method of treatment of pulpitis depending on its form;
- evaluate the main characteristics of materials and instruments used in the treatment of various forms of pulpitis;
- explain the choice of filling material for root canals.

### **III. Content of the topic**

**ENDODONTIC PRETREATMENT.** Root canal therapy does not necessarily begin with the placement of the rubber dam but with the restorative or periodontic procedures necessary to simplify its placement.

**Rubber dam application.** Rubber dam application is an essential prerequisite for providing nonsurgical endodontic treatment. For root canal treatment, rapid, simple, and effective methods of dam applications have been developed. In all but the most unusual circumstances, the rubber dam can be placed in less than 1 minute. Although the modern endodontic approach to the use of the dam has changed, the importance and purposes of the dam remain the same:

1. It provides a dry, clean, and disinfected field.
2. It protects the patient from the possible aspiration or swallowing of tooth and filling debris, bacteria, necrotic pulp remnants, and instruments or operating materials.
3. It protects the patient from rotary and hand instruments, drugs, irrigating solutions, and the trauma of repeated manual manipulation of the oral soft tissues.
4. It is faster, more convenient, and less frustrating than the repeated changing of cotton rolls and/or saliva ejectors.

The rubber dam also provides a fluid seal from saliva from the working field. It has been recently shown in vivo that intraoral and extraoral microorganisms contaminating the root canal system will lead to eventual failure.

#### **ENDODONTIC CAVITY PREPARATION.**

Endodontic cavity preparation may be separated into two anatomic divisions:

- (a) coronal preparation

(b) radicular preparation.

Actually, coronal preparation is merely a means to an end, but to accurately prepare and properly fill the radicular pulp space, intra-coronal preparation must be correct in size, shape, and inclination. Caries and defective restorations remaining in an endodontic cavity preparation must be removed for three reasons: (1) to eliminate mechanically as many bacteria as possible from the interior of the tooth, (2) to eliminate the discoloured Loth structure, that may ultimately lead to staining of the crown, and (3) to eliminate the possibility of any bacteria-laden saliva leaking into the prepared cavity.

The last point is especially true of proximal or buccal caries that extend into the prepared cavity. Black's principles of cavity preparation - Outline Convenience, Retention, and Resistance Forms - may be applied. The entire length of the preparation is the full outline form. In turn, this outline may have to be modified for the sake of convenience to accommodate canal anatomy or curvature and/or instruments. For initial entrance through the enamel surface or through a restoration, the ideal cutting instrument is the round-end carbide fissure bur. As soon as the bulk of the overhanging dentin is removed from the roof of the chamber, the slower operating round burs are put aside, and, once again, the high-speed fissure bur is used to finish and slope the side walls in the visible portions of the preparation. Size and shape of endodontic coronal preparations related to size and shape of the pulp chamber. The outline form of the endodontic cavity must be correctly shaped and positioned to establish complete access for instrumentation, from cavity margin to apical foramen. Moreover, external outline form evolves from the internal anatomy of the tooth established by the pulp.

To achieve optimal preparation, three factors of internal anatomy must be considered:

- (1) the size of the pulp chamber,
- (2) the shape of the pulp chamber,
- (3) the number of individual root canals, their curvature, and their position. The finished outline form should accurately reflect the shape of the pulp chamber. For example, the floor of the pulp chamber in a molar tooth is usually triangular in shape, owing to the triangular position of the orifices of the canals. As another example, the coronal pulp of a maxillary premolar is flat mesiodistally but is elongated buccolingual.

*Number, Position, and Curvature of Root Canals:* The third factor regulating outline form is the number, position, and curvature or direction of the root canals. To prepare each canal efficiently without interference, the cavity walls often have to be extended to allow an unstrained instrument approach to the apical foramen. When cavity walls are extended to improve instrumentation, the outline form is materially affected. This change is for convenience in preparation; hence, convenience form partly regulates the ultimate outline form.

In endodontic therapy convenience form makes more convenient (and accurate) the preparation and filling of the root canal. Four important benefits are gained through convenience form modifications:

- (1) unobstructed access to the canal orifice,
- (2) direct access to the apical foramen,
- (3) cavity expansion to accommodate filing techniques,
- (4) complete authority over the enlarging instrument.

*Unobstructed Access to the Canal Orifice:* In endodontic cavity preparations of all teeth, enough tooth structure must be removed to allow instruments to be placed easily into the orifice of each canal without interference from overhanging walls. The clinician must be able to see each orifice and easily reach much the instrument points. On the other hand it is most important that as much tooth structure be maintained as possible. MOD cavity preparations waste tooth structure by more than a little, as the «loss of marginal ridge integrity was the greatest contribution to loss of tooth strength».

*Direct Access to the Apical Foramen.* To provide direct access to the apical foramen, enough tooth structure must be removed to allow the endodontic instruments freedom within the coronal cavity so they can extend down the canal in an unstrained position. This is especially true

when the canal is severely curved or leaves the chamber at an obtuse angle. Infrequently, total de-cusgate is necessary.

*Extension to Accommodate Filling Techniques:* It is often necessary to expand the outline form to make certain filling techniques more convenient or practical. If a softened gutta-percha technique is used for filling, wherein rather rigid pluggers are used in a vertical thrust, then the outline form may have to be widely extended to accommodate these heavier instruments.

*Complete Authority over the Enlarging Instrument.* Direct access to the apical foramen It is imperative that the clinician maintain complete control over the root canal instrument. If the instrument is impinged at the canal orifice by tooth structure that should have been removed, the dentist will have lost control of the direction of the tip of the instrument, and the intervening tooth structure will dictate the control of the instrument. If, on the other hand, the tooth structure is removed around the orifice so that the instrument stands free in this area of the canal, the instrument will then be controlled by only two factors: the clinician's fingers on the handle of the instrument and the walls of the canal at the tip of the instrument. Nothing is to intervene between these two points

#### **IV. Control questions for the class topic:**

1. Methods of treatment of various forms of pulpitis.
2. The essence, indications and contraindications to the use of the pulp preservation method.
3. Classification of instruments for root canal treatment.
4. Main characteristics of different groups of root canal filling materials.
5. Difference between conservative and surgical methods of pulpitis treatment.

#### **V. Control test tasks and/or case tasks:**

1. An 18-year-old patient has acute limited pulpitis. Due to pain and fear, he did not sleep all night. In the morning he did not have breakfast. At the present moment: palms are moist, skin is pale. Dermatoglyphics are pronounced. He behaves restlessly. There are no signs of alcohol or drug intoxication. What is the tactic of the dentist:

- a. Feed the patient
- b. Apply local anaesthesia and send the patient home to eat, and continue treatment in an hour.
- c. Reschedule the treatment for another day
- d. Have a reassuring conversation with the patient
- e. Premedicate with gidazepam 0.02g once 30-60 minutes before treatment

2. In a 24-year-old patient, during the treatment of acute deep caries of the 36th tooth ( class 1 according to Black), the pulp was accidentally exposed during the preparation of the carious cavity.

What should be the doctor's tactics:

- a. Apply mummification paste
- b. Apply odontotropic paste
- c. Perform a vital pulp extraction
- d. Close the cavity with a glass-forming instrument
- e. Apply calcium hydroxide paste.

3. A 28-year-old patient, who had treatment of tooth 47 4 weeks ago, complains of constant throbbing pain in 47, which appeared a day ago. The preliminary diagnosis is acute purulent pulpitis of tooth 47. What is the treatment tactic?

- a. Prescribe antibiotics
- b. Vital amputation
- c. Vital extirpation
- d. Devitalising amputation
- e. Devitalisation.

4. A woman was treated for pulpitis by devitalisation. Arsenic paste was left in the 15th tooth. The patient came for a second appointment late. Toxic periodontitis developed. Which agent is optimal for root canal treatment:

- a. Crezofen
- b. Iodinol solution
- c. Trypsin
- d. Eugenol
- e. Chlorhexidine

5. Treatment of pulpitis by devitalising amputation is carried out at:

- a. Location of the carious cavity below the level of the cervix of teeth
- b. Taking antidepressants
- c. Taking non-steroidal anti-inflammatory drugs
- d. In case of incomplete opening of the oral cavity
- e. Patients under the age of 45

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.



## METHODOLOGICAL RESEARCH №12

**TOPIC:** VITAL AMPUTATION METHOD OF PULPITIS TREATMENT: INDICATIONS, TECHNIQUES, MEDICATIONS. EFFECTIVENESS AND POSSIBLE COMPLICATIONS

**I. Topic relevance:** Surgical methods of pulpitis treatment consist of partial (pulp amputation) or complete (pulpectomy or pulp extraction) removal of destructively altered pulp. Vital methods are understood as partial or complete removal of the pulp under a specific anaesthetic. The use of a one-session method not only saves time, but also prevents periodontal diseases.

### II. Study goal:

#### 2.1. *student has to know:*

- the concept of pulp vitality;
- the essence of vital pulp amputation;
- methods of vital amputation treatment of pulpitis;
- medicines used in the vital amputation treatment of pulpitis;

#### 2.2 *Be able to:*

- correctly diagnose various forms of pulpitis;
- correctly prescribe a treatment method for various forms of acute and chronic pulpitis;
- explain the method of treatment of pulpitis by vital amputation.

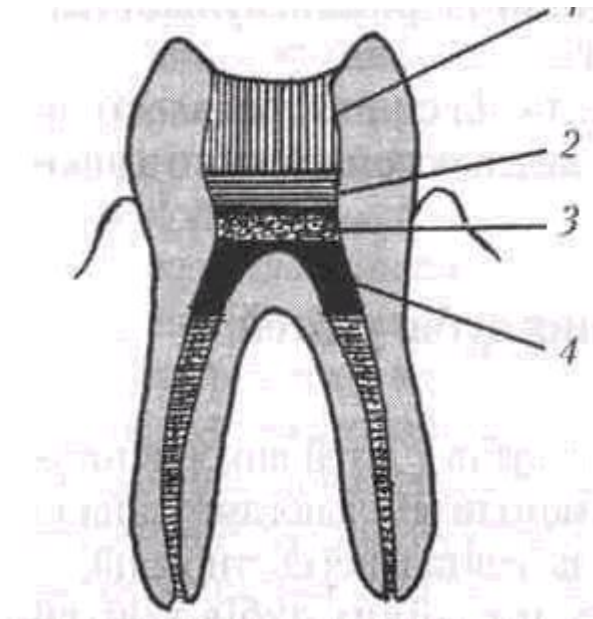
### III. Content of the topic

**PULP AMPUTATION (PULPOTOMY).** This method of pulpitis treatment consists of in removing part of pulp mainly coronal pulp. The vital pulp amputation is the partial pulp removing under anaesthesia. Indications: Pulpotomy is indicated in cases of irreversible pulpitis, mainly pulp hyperemia (in case of ineffective biological treatment), acute traumatic pulpitis (accidentally pulp wounded) and acute circumscription pulpitis in young patients. Also this method may be effective for treatment of chronic fibrous pulpitis, chronic hypertrophic pulpitis in young patients with incomplete root formation. Technique After careful antiseptic irrigation of oral cavity the dentist provide proper local anesthesia. The tooth isolate by cotton roll or rubber dam. The teeth surfaces wipe with 2% iodine solution, 1% chlorhexidine solution or 3 other antiseptics. The thorough preparation of caries cavity carried out.

During preparation the roof of the pulp chamber is best perforated with a round bur. This bur is 2 used to remove the roof of the pulp chamber from underneath to establish outline form. The outlines of caries preparation must coincide with outlines of pulp chamber. The pulp chamber should be frequently flushed with a sodium hypochlorite solution to remove debris. All of the tissue in the pulp chamber should be removed by the round bur or a sharp spoon excavator. The tissue is carefully curetted from the pulp horns and other ramifications of the chamber.

Failure to remove all tissue fragments from the pulp chamber may result in later discolouration of the tooth. At this point, the chamber should be irrigated well to remove blood and debris. It is very important to carefully control bleeding because the blood clot will hinder the dentin bridge formation. For the control of bleeding 3% hydrogen peroxide solution, 5% epsilon-amino-capric-acid (EACA) solution is used. After the control of bleeding and thorough irrigation of the cavity on the pulp stump medicament paste is placed. As usual the pastes with calcium hydroxide are used (see the pastes for the biological treatment of pulpitis). These pastes placed on the pulp stumps without any pressure and caries cavity hermetically sealed with temporary dressing. After 10-14 days when pain is absent the temporary dressing is changed on final restoration from composites or amalgam. Variant of vital pulpotomy in young patients with incompletely developed roots is called apexification. This procedure requires complete canal cleaning, shaping, removal of smear layer and disinfection before the apical placement of this material is accomplished using calcium hydroxide. The calcium hydroxide kills bacteria and creates an environment conducive for hard tissue formation. The material is left in place or

changed every 3 to 6 months in an attempt to enhance the tissue response. During this time period the root hard tissue develops and the root formation is ended.



**Pic.16.** Schematic image of pulpotomy

#### **IV. Control questions for the class topic:**

- 1.The concept of tooth pulp vitality.
- 2.The method of vital amputation of the tooth pulp, its essence and methodology.
- 3.Tools, materials and medicines used in the treatment of pulpitis by the method of vital amputation.
- 4.Indications for the treatment of pulpitis by vital amputation.
- 5.Contraindications to the treatment of pulpitis by the method of vital amputation.

#### **V. Control test tasks and/or case tasks:**

1.An 18-year-old female patient who had undergone treatment of tooth 11 using the vital pulpotomy method came to the clinic with complaints of darkening of the crown of tooth 11. The patient had no other complaints regarding tooth 11. Past medical history: tooth 11 was treated for deep caries approximately 3 months ago. It is known that during the treatment, MTA material was used for direct pulp coverage, as there was a contact with the pulp cavity during the preparation of the carious cavity. Objective: tooth 11 is greyish in colour, cold test is negative, EDP is within normal limits, no pathological changes at the root apex were detected during the radiological examination. What is the cause of discolouration of the crown of tooth 11 in this case?

- a.Trauma in the history of tooth 11
- b.Development of chronic gangrenous pulpitis
- c.Use of MTA in the crown part of the tooth
- d.Development of chronic periodontitis
- e.Failure to comply with the rules when placing a permanent filling

2.During a preventive examination in a 13-year-old patient, a deep carious cavity was found in tooth 35 on the chewing surface, the dentin was softened, slightly pigmented. Communication with the tooth cavity is determined, probing is painful, cold water causes pain that slowly disappears. Percussion is painless. What method of treatment is appropriate in this case?

- a.Devitalisation

- b. Vital amputation
  - c. Biological method
  - d. Vital extirpation
  - e. Devitalising amputation
3. What complication is most often observed in the treatment of temporary teeth by the method of vital pulpotomy?
- a. internal root resorption
  - b. root fracture in the long term
  - c. periapical abscess
  - d. external root resorption
  - e. appearance of mobility.
4. Treatment of pulpitis by devitalising amputation is carried out at:
- a. The location of the carious cavity below the level of the necks of the teeth
  - b. Taking antidepressants
  - c. Taking non-steroidal anti-inflammatory drugs
  - d. In case of incomplete opening of the oral cavity
  - e. Patients under the age of 45 years.
5. During the examination of a 15-year-old patient was diagnosed with acute diffuse pulpitis of the tooth 36. Which method of treatment is the most rational in this case?
- a. Vital extirpation
  - b. Devitalisation
  - c. Devitalising amputation
  - d. Biological method
  - e. Tooth extraction

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №13

**TOPIC: VITAL EXTIRPATION METHOD OF PULPITIS TREATMENT: INDICATIONS, TECHNIQUES, MEDICINES. EFFICACY AND POSSIBLE COMPLICATIONS. DIATHERMOCOAGULATION. INDICATIONS, TECHNIQUES**

**I. Topic relevance:** Tooth pulp extraction is the removal of tooth pulp with the usage of anaesthesia. Vital pulp extraction is a surgical method of treating pulpitis. At the same time, there is no toxic effect on the tissues, which is a great advantage. Nowadays, this procedure avoids the removal of a damaged tooth even in case of deep caries damage.

### **II. Study goal:**

#### **2.1. Student has to know:**

- difference between amputation and extirpation methods of pulpitis treatment;
- indications for the use of the method of vital pulp extraction;
- contraindications to the treatment of pulpitis by vital extirpation;
- the concept of diathermocoagulation;

#### **2.2 Be able to:**

- evaluate indications and contraindications to the method of vital pulp extraction;
- correctly prescribe treatment with the method of vital pulp extraction;
- explain to the patient the method of diathermocoagulation and its essence.

### **III. Content of the topic**

**PULPECTOMY.** The main treatment of pulp inflammation consists in removing a vital pulp from pulp chamber (pulp amputation) and root canal. This is termed pulp extirpation or pulpectomy. Total pulpectomy, extirpation of the pulp to or near the apical foramen, is indicated when the root apex is fully formed and the foramen sufficiently closed to permit obturation with conventional filling materials. If the pulp must be removed from a tooth with an incompletely formed root and an open apex, partial pulpectomy (pulp amputation) is preferred. This technique leaves the apical portion of pulp intact with the hope that the remaining stump will encourage completion of the apex. In a number of instances, restorative and fixed prosthetic procedures require intentional extirpation. Technique The following are the steps in the performance of a well-executed pulpectomy:

1. Obtain regional anaesthesia.
2. Prepare a minimal coronal opening and, with a sharp explorer, test the pulp for depth of anaesthesia.
3. If necessary, intrapulpal injection of anaesthetic.
4. Complete the access cavity.
5. Excavate the coronal pulp (amputation).
6. Extirpate the radicular pulp.
7. Control bleeding and de-bridge and shape the canal.
8. Place medication or the final filling.

Each of these steps must be completed carefully before the next is begun, and each requires some explanation.

The popular misconception that endodontic treatment invariably involves suffering will not be completely dispelled until all practitioners employ effective anaesthesia techniques while completing procedures as potentially painful as pulpectomy. It is wise to anticipate that, in spite of apparently profound anaesthesia, an intra-ligamentary or intrapulpal injection may be required to obtain total anaesthesia, particularly with an inflamed pulp. If the patient experiences pain during the inily, the anaesthetic can be forced into the pulp under pressure. Total anaesthesia follows

immediately. Completion of the Access Preparation Coronal access must be adequate and complete to allow thorough excavation of the tissue from the pulp chamber. Because intrapulpal injection with 2% lidocaine or articaine with 1:50,000 epinephrine promotes excellent hemostasis, it can be used during the completion of the access cavity to prevent interference from haemorrhaging tissue. Excavation of the coronal pulp All of the tissue in the pulp chamber should be removed before extirpation of the radicular pulp is begun. All pulp tissue that has not been removed by the round bur should be eliminated with a sharp spoon excavator. The tissue is carefully curetted from the pulp horns and other ramifications of the chamber. Failure to remove all tissue fragments from the pulp chamber may result in later discoloration of the tooth. At this point, the chamber should be irrigated well to remove blood and debris.

**Extirpation of Radicular Pulp.** The instrument used for this procedure is determined by the size of the canal and/or the level at which the pulp is to be excised. Large Canal, Total Pulpectomy If the canal is large enough to admit a barbed broach and a total pulpectomy is desired, the approach is as follows:

1. A pathway for the broach to follow is created by sliding a reamer, file, or pathfinder along the wall of the canal to the apical third. If the pulp is sensitive or bleeding, the anaesthetic syringe needle may be used as the «pathfinder». A drop of anaesthetic deposited near the apical foramen will stop the flow of blood and all pain sensations. At the same time, the needle displaces the pulp tissue and creates the desired pathway for a broach.

2. A broach, small enough not to bind in the canal, is passed to a point just short of the apex. The instrument is rotated slowly, to engage the fibrous tissue in the barbs of the broach, and then slowly withdrawn. Hopefully, the entire pulp will be removed with the broach. If not, the process is repeated. If the canal is large, it may be necessary to insert two or three broaches simultaneously to entwine the pulp on a sufficient number of barbs to ensure its intact removal.

3. If the pulp is not removed intact, small broaches are used to «scrub» the canal walls from the apex outward to remove adherent fragments. A word of caution: The barbed broach is a friable instrument and must never be locked into the canal. Handle with care!

**Control of Bleeding and Debridement of Canal Incomplete pulpectomy** will leave in the canal fragments of tissue that may remain vital if their blood supply is maintained through accessory foramina or along deep fissures in the canal walls. These remnants of the pulp may be a source of severe pain to the patient, who will return seeking relief as soon as the anaesthesia wears off. This is a desperately painful condition and requires immediate re-anaesthetization and extirpation of all tissue shreds. Any overlooked tissue will also interfere with proper obturation during immediate filling procedures.

Persistent bleeding following extirpation is usually a sign that «tags» of pulp tissue remain. If the flow of blood is not stopped by scrubbing the canal walls with a broach, as described above, it may originate in the periradicular area. In these cases, it is best to dry the canal as much as possible after irrigating with anaesthetic. A dry cotton pellet is then sealed in until a subsequent appointment.

**Placement of Medication or Root Canal Filling.** If pulpectomy was necessitated by pulpitis resulting from operative or accidental trauma, or planned extirpation of a normal pulp for restorative purposes was done, cleaning and shaping and obturation of the canal can be completed immediately. If a delay is necessary, a drug of choice or dry cotton should be sealed in the chamber. The final canal filling should never be placed, however, unless all pulpal shreds are removed and haemorrhage has stopped. Immediate filling is contraindicated if the possibility of pulpal infection exists. Intracanal Medication Antibacterial agents such as calcium hydroxide are recommended for use in the root canal between appointments. While recognizing the fact that most irrigating

agents destroy significant numbers of bacteria during canal debridement, it is still thought good form to further attempt canal sterilization between appointments.



**Fig.17.** Hand files.



**Fig.18.** Mechanical files.



**Рис.19.** Schematical image of diathermocoagulation.

**IV. Control questions for the class topic:**

- 1.The difference between tooth pulp extraction and amputation.
- 2.Methods of treatment of pulpitis by the vital extirpation method.
- 3.Medicines used in the treatment of pulpitis by the vital extirpation method.
- 4.The concept of diathermocoagulation.
- 5.Conducting of diathermocoagulation, instruments and drugs.

**V. Control test tasks and/or case tasks:**

- 1.In what cases is the extirpation method of endodontic treatment of temporary teeth used?
  - a. during the period of root stabilization
  - b. during the period of root growth
  - c. during the period of root resorption
  - d. 1.5 years before tooth replacement
  - e. this method is used regardless of the period of root development
- 2.A 28-year-old patient, who had treatment of tooth 47 4 weeks ago, complains of a constant throbbing pain in 47, which appeared a day ago. The preliminary diagnosis is acute purulent pulpitis of tooth 47. What is the treatment tactic?
  - a.Prescribe antibiotics
  - b.Vital amputation
  - c.Vital extirpation
  - d.Devitalization amputation
  - e.Physiotherapy
- 3.Which of the following solutions will stop bleeding from the root canal of the tooth in the treatment of pulpitis by vital extirpation:
  - a.Albucid
  - b.Capramine
  - c.Resorcinol - formalin liquid
  - d.Phosphate cement liquid
  - e.C<sub>2</sub>H<sub>5</sub>OH (ethanol).
- 4.What is the purpose of diagnostic tests with anesthesia:
  - a.To select the optimal anesthetic
  - b.To prevent allergic reactions
  - c.To find the tooth that provokes pain
  - d.To identify the allergen
  - e.To prevent side effects
- 5.During endodontic treatment, the patient began to lose consciousness. What medical tactics will be rational in this case:

- a. Call an ambulance
- b. Inject an antibiotic
- c. Continue manipulation
- d. Stop manipulation and empty the oral cavity
- e. Inject anesthetic

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.



## METHODOLOGICAL RESEARCH №14

**TOPIC: DEVITALISATION OF THE PULP: INDICATIONS, METHODS, MEDICINES.  
DEVITALISATION OF PULP. INDICATIONS, STAGES OF TREATMENT, MODERN  
TECHNOLOGIES. POSSIBLE COMPLICATIONS AND THEIR ELIMINATION.  
EFFECTIVENESS OF THE METHOD.**

**I. Topic relevance:** In the absence of conditions for anaesthesia or in patients with allergy to anaesthetics, pulpitis treatment with complete or partial pulp removal is performed by the devitalisation method. Devitalisation is the destruction of a number of anatomical structures of the pulp with impaired pulp function, including sensitivity, under the influence of various devitalising agents.

### **II. Study goal:**

#### **2.1. Student has to know:**

- basic principles of pulp devitalisation;
- methods of pulp devitalisation;
- complications from the treatment of pulpitis by the devitalisation method;
- indications and contraindications for the treatment of pulpitis by the method of devitalisation of pulp;

#### **2.2 Be able to:**

- classify pulp devitalisation medications and know the indications for their use;
- explain the method of applying devitalising pastes;
- choose the right medicine for pulp devitalisation.

### **III. Content of the topic**

*The necrotic or «mummified» tissue remaining in the pulp cavity of a pulpless tooth has lost its identity as an organ; hence, its removal is called pulp cavity debridement. Indications Pulp «mummification» with either arsenic trioxide, formaldehyde, or other destructive compounds was at one time preferable to extirpation. With the advent of effective local anaesthetics, pulpectomy has become a relatively painless process and superseded «mummification», with its attendant hazards of bone necrosis and prolonged postoperative pain.*

The necessary quantity of devitalizing paste with a probe (without pressure) to enter into a pre-cleaned from carious dentin and an open cavity. The amount of paste is determined individually. In the treatment of pulpitis of temporary teeth, as well as single rooted teeth in adults is enough to put the paste in an amount equal to the size of a millet grain.

For pulp devitalization of multi rooted teeth amount of paste must be doubled. After applying the paste it's necessary to close hermetically the cavity by temporary filling material. The complete devitalization of the pulp takes place in 3-5 days. If the patient does not feel pain, permanent filling can be carried out within 24-48 hours after application of the paste.

If there is no direct contact with the pulp devitalization should be carried out in two stages. Direct contact may be achieved only after the second stage reducing the viability of the pulp. After devitalization and extirpation of the pulp needed instrumental and pharmacological root treatment. With increasing of pulpitis pain after the imposition devitalizing paste (not opened pulp horn or paste imposed very tight) it is necessary to make infiltration anesthesia with lidocaine or another anesthetics.

### **IV. Control questions for the class topic:**

1. Indications for pulp devitalisation.
2. Composition and mechanism of action of devitalising pastes.
3. Method of applying devitalising pastes.
4. Conducting the method of devitalising pulp extraction.

5. Complications from the treatment of pulpitis by the method of devitalisation.

**V. Control test tasks and/or case tasks:**

1. A woman was treated for pulpitis by devitalising extirpation. Arsenic paste was left in the 15th tooth. The patient came for a second appointment late. Toxic periodontitis developed. Which agent is optimal for root canal treatment:

- a. Crezofen
- b. Iodinol solution
- c. Trypsin
- d. Eugenol
- e. Chlorhexidine

2. The composition of arsenic devitalising paste includes:

- a. Arsenic anhydride, antiseptics, local anaesthetics, binders
- b. Collagen fibres, dyes, paraformaldehyde
- c. Antidotes, antiseptics, arsenic acid
- d. Mixture of arsenic anhydride and arsenic acid
- e. Arsenic, anaesthetics, dyes.

3. During a preventive examination of a 19-year-old patient, a deep carious cavity in tooth 35 was found to be connected to the tooth cavity. Probing is painful, cold water causes pain that passes slowly. Percussion is painless. The doctor decided to perform a devitalising amputation. What therapeutic paste should be applied to the root canal cells in this case?

- a. Mummification paste
- b. Antiseptic
- c. Paste containing enzymes
- d. Odontotropic
- e. Anti-inflammatory.

4. During a routine examination of a 7.5-year-old girl in tooth 65, a coronal part destroyed by a third was found to be pink in colour. Percussion of tooth 65 is painless, palpation on the transitional fold is somewhat painful, and there is a fistula opening on the alveolar gingiva in the area of the apices of the roots of tooth 65. The radiograph shows destruction of bone tissue in the area of the apices and bifurcation of the roots, the cortical plate of the follicle of tooth 25 is destroyed. Indicate the therapeutic tactics?

- a. Tooth extraction
- b. Devitalisation
- c. Devitalisation
- d. Physiotherapeutic method
- e. Vital extirpation

5. The examination of a 16-year-old patient was diagnosed with acute general pulpitis of the 36th tooth. Which method of treatment is the most rational in this case?

- a. Biological method
- b. Vital amputation
- c. Extirpation of the pulp
- d. Devitalising amputation
- e. Tooth extraction

**VI. References**

**6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.

2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №15

**TOPIC:** DEVITALISED AMPUTATION AND COMBINED METHODS OF PULPITIS TREATMENT. INDICATIONS FOR USE. METHODOLOGY: STAGES, MEDICINES. DISADVANTAGES AND POSSIBLE COMPLICATIONS

**I. Topic relevance:** Devital amputation is a method of surgical excision of the crown and root pulp, which, unlike the vital procedure, involves the complete removal of the neurovascular bundle after preliminary death.

### II. Study goal:

#### 2.1. Student has to know:

- the concept of devitalised pulp amputation;
- indications for the use of devitalised pulp amputation;
- medicines used in the treatment of pulpitis by devitalised amputation;
- the essence of the combined method of treatment of pulpitis;

#### 2.2 Be able to:

- clearly differentiate between amputation and extirpation methods of pulpitis treatment;
- choose treatment methods depending on the form of pulpitis and its course;
- explain the methodology of devitalised amputation and combined methods.

### III. Content of the topic

**Placement of Medication or Root Canal Filling.** If pulpectomy was necessitated by pulpitis resulting from operative or accidental trauma, or planned extirpation of a normal pulp for restorative purposes was done, cleaning and shaping and obturation of the canal can be completed immediately. If a delay is necessary, a drug of choice or dry cotton should be sealed in the chamber. The final canal filling should never be placed, however, unless all pulpal shreds are removed and haemorrhage has stopped. Immediate filling is contraindicated if the possibility of pulpal infection exists.

*Intracanal Medication Antibacterial* agents such as calcium hydroxide are recommended for use in the root canal between appointments. While recognizing the fact that most irrigating agents destroy significant numbers of bacteria during canal debridement, it is still thought good form to further attempt canal sterilization between appointments. Root canal preparation With the completion of the coronal access cavity, preparation of the radicular cavity may be started. Root canal preparation has two objectives: thorough debride-ment of the root canal system and the specific shaping of the root canal preparation to receive a specific type of filling. The first objective is achieved by skilful instrumentation coupled with liber-a irrigation. This double-pronged attack will eliminate most of the bacterial contaminants of the canal as well as the necrotic debris and dentin.

Cleaning and sanitizing the root canal have been likened to the removal of carious dentin in a restorative preparation - that is, enough of the dentin wall of the canal must be removed to eliminate the attached necrotic debris and, insofar as possible, the bacteria and debris found in the dentinal tubuli. Along with repeated irrigation, the instruments for debridement must be constantly cleaned. Sterile gauze square soaked in alcohol is used to wipe the instruments.

Over the years, two different approaches to root canal cleaning and shaping have emerged: the «step-back» and the «step-down» preparations.

The step-back preparation is based upon the traditional approach: beginning the preparation at the apex and working back up the coronal canal with larger and larger instruments.

The step-down preparation, often called «the crown-down approach», begins at the coronal and the preparation is advanced apically, using smaller and smaller instruments, finally terminating at the apical stop. Chemomechanical Debridement: The pulp chamber and root canals of untreated non-vital teeth are filled with a gelatinous mass of necrotic pulp remnants and tissue fluid.

Essential to endodontic success is the careful removal of these remnants, microbes, and dentinal filings from the root canal system. The apical portion of the root canal is especially important because of its relationship to the periradicular tissue. Although instrumentation of the root canal is the primary method of canal debridement, irrigation is a critical adjunct. Irregularities in canal systems such as narrow isthmi and apical deltas prevent complete debridement by mechanical instrumentation alone. Irrigation serves as a physical flush to remove debris as well as serving as a bactericidal agent, tissue solvent, and lubricant. Furthermore, some irrigants are effective in eliminating the smear layer.

*Root Canal Irrigants:* A wide variety of irrigating agents are available. Sodium hypochlorite is one of the most widely used irrigating solutions. Household bleach such as Clorox contains 5.25% sodium hypochlorite. Some suggest that it be used at that concentration, whereas others suggest diluting it with water, and still others alternate it with other agents, such as ethylenediaminetetraacetic acid with cen-trimide (EDTAC) or chlorhexidine. By combining 5.0% sodium hypochlorite with EDTA, however, the bactericidal effect was considerably enhanced. Sodium hypochlorite is an effective antimicrobial agent, serves as a lubricant during instrumentation, and dissolves vital and non-vital tissue.

Chlorhexidine gluconate is an effective antimicrobial agent, and its use as an endodontic irrigant has been well documented. It possesses a broad-spectrum anti-microbial substantive action and a relative absence of toxicity. The alternate use of sodium hypochlorite and chlorhexidine gluconate irrigants resulted in a greater reduction of microbial flora (84.6%) when compared with the individual use of sodium hypochlorite (59.4%) or chlorhexidine gluconate (70 %) alone. Regardless of the delivery system, the solution must be introduced slowly and the needle never wedged in the canal. Several types of plastic disposable syringes are available. The syringe is filled by immersing the hub into the solution while withdrawing the plunger. It is strongly recommended that the needle lie passively in the canal and not engage the walls. However, the closer the needle tip is placed to the apex, the greater the potential for damage to the periradicular tissues.

The determination of an accurate working length is one of the most critical steps of endodontic therapy. The cleaning, 0.5-1.0mm shaping, and obturation of the root canal system cannot be accomplished accurately unless the working length is determined precisely.

*Working lengths* defined in the endodontic Glossary as «the distance from a coronal reference point to the point at which canal preparation and obturation should terminate». Before cleaning and shaping are undertaken, the length of each canal must be established. This can be done radiographically or electronically.

One must first establish in one's own mind just where the preparation and obturation of the canal should terminate. It has long been suggested that the minor diameter at the cement dentinal junction is often the narrowest site of the apical foramen, the apical constriction, and that this is where the apical stop should be established. Measurements have shown this site to be from 0.5 to 10 mm from the major diameter, the radiographic apex. So, if the full length of the canal is determined, 0.5 to 1.0 mm should be subtracted to stay within the confines of the canal and terminate at its narrowest point. This should be the working length. Some would argue that preparation and obturation should be ended at apical stop.

*Determination of Working Length by Radiographic Methods:* To establish the length of the tooth, a stainless steel reamer or file with an instrument stop on the shaft is needed. The exploring instrument size must be small enough to negotiate the total length of the canal but large enough not to be loose in the canal. Measure the tooth on the preoperative radiograph. Place the instrument in the canal until the stop is at the plane of reference unless pain is felt (if anesthesia has not been used). Expose, develop, and clear the radiograph. On the radiograph, measure the difference between the end of the instrument and the end of the root and add this amount to the original measured length the instrument extended into the tooth. If, through some oversight, the exploring instrument has gone beyond the apex, subtract this difference. From this adjusted length of tooth, subtract a 1.0 mm «safety factor» to conform to the apical termination of the root canal at the apical constriction.

**Determination of Working Length by Electronics:** The appliance «apex locator» is commonly used. It is a simple direct current ohmmeter to measure a constant resistance of 6.5 kilo ohms between oral mucous membrane and the periodontium regardless of the size or shape of the teeth. One side of the apex locator's circuitry is connected to an endodontic instrument. The other side is connected to the patient's body, either by a contact to the patient's lip or by an electrode held in the patient's hand. The electrical circuit is complete when the endodontic instrument is advanced apically inside the root canal until it touches periodontal tissue. The display on the apex locator indicates that the apical area has been reached. Techniques of radicular cavity preparation:

Over the years, there has been a gradual change in the ideal configuration of a prepared root canal. After Schilder's classic description of «cleaning and shaping», the more accepted shape for the finished canal has become a gradually increasing taper, with the smallest diameter at the apical constriction, terminating larger at the coronal orifice. Two approaches to debriding and shaping the canal have finally emerged: either starting at the apex with fine instruments and working one's way back up (or down) the canal with progressively larger instruments - the «step-back» or serial technique — or the opposite, starting at the cervical orifice with larger instruments and gradually progressing toward the apex with smaller and smaller instruments - the «step-down» technique, also called «crown-down» filing.

**Step-Back Preparation:** This preparation divided into two phases.

Phase I is the apical preparation starting at the apical constriction. Phase II is the preparation of the remainder of the canal, gradually stepping back while increasing in size. The completion of the preparation is the Refining Phase IIA and IIB to produce the con-inuing taper from apex to cervical. Prior to the introduction of nickel-titanium files, one of the first axioms of end-odontics has been to «always use a curved instrument in a curved canal».

The degree and direction of the curve are determined by the canal shadow in the radiograph. Phase 1: To start Phase I instrumentation, it must be assumed that the canal has been explored with a fine pathfinder or instrument and that the working length has been established - that is, the apical constriction identified. The first active instrument to be inserted should be a fine (No. 08, 10, or 15) 0.02, tapered, stainless steel file, curved and coated with a lubricant, such as Gly-Oxide, R.C. Prep, File-Eze, Glyde, K-Y Jelly, or liquid soap.

The motion of the instrument is «watch winding», two or three quarter-turns clockwise-counter clockwise and then retraction. On removal, the instrument is wiped clean, recurved, re-lubricated and repositioned. «Watch winding, is then repeated. Remember that the instrument must be to full depth when the cutting action is made. This procedure is repeated until the instrument is loose in position. Then the next size file is used — length established, pre-curved, lubricated, and portion ing strokes an a rinding action and retraction are repeated.

Very short (10 mm filime a size 25ak also be used at the apex. By the time a size 25 K file has been used to full working length, Phase I is complete. The s his area on space back from the apical coking lens, put itcan o debris unless this astruments canal was large to begin with, as in a youngster. Theon, of course, larger instruments are used to start with. Using a num apical rese here as an example is not to imply that all canals should be shaped at the apical restriction only to size 23. Many, in fact most, canais should be enlarged beyont and 25 at the apical constriction in order to round, out the prepa-riion at this point and remove as much of the extraneous tissue, debris, and lateral canals as possible.

A size 25 file is used here as an example and as a danger point for beyond No. 25 lies danger! Phase II. In a fine canal (and in this example), the step-back process begins with a No. 30 K-style file. Its working length is set I mm short of the full working length. It is pre-curved, lubricated, carried down the canal to the new shortened depth, watch wound, and retracted. The same process is repeated until the No. 30 is loose at this adjusted length. Recapitulation to full length with a No. 25 file follows to ensure patency to the constriction. This is followed by copious irrigation before the next curved instrument is introduced. In this case, it is a No. 35, again shortened by 1.0 mm from the No. 30 (2.0 mm from the apical No. 25). It is curved, lubricated, inserted, watch wound, and retracted followed by recapitulation and irrigation. Thus, the

preparation steps back up the canal 1mm and one larger instrument at a time. When that portion of the canal is reached, usually the straight mid canal, where the instruments no longer fit tightly, then perimeter filing may begin, along with plenty of irrigation. It is at this point that Hedstroem files are most effective.

They are much more aggressive rasps than the K-files. The canal is shaped into the continuous taper so conducive to optimum obturation. Care must be taken to recapitulate between each instrument with the original No. 25 file along with ample irrigation. This mid canal area is the region where reshaping can also be done with power-driven instruments: Gates-Glidden drills, starting with the smaller drills and gradually increasing in size to No. 4, 5, or 6. Proper continuing taper is developed to finish Phase IIA preparation. Refining Phase IIB is a return to a size No. 25 (or the last apical instrument used, smoothing all around the walls with vertical push-pull strokes, to perfect the taper from the apical constriction to the cervical canal orifice. In this case, a Sale-ended, non-cutting-tip Hedstroem file is the most efficient. It produces a good deal of dentin chips, however, that must be broken up at the apex with a cutting-tip K file and then flushed out with abundant sodium hypochlorite. This completes the chemomechanical step-back preparation of the continuing taper canal. It is now ready to be filled or medicated and sealed at the corone cavity until the next appointment. If it is to be filled, the smear layer should first be remove.

**Step-Down Technique** - «Crown-Down Less Pressure Preparation» in which Gates-Glidden drills and larger files are first used in the coronal two-thirds of the canals and then progressively smaller files are used from the «crown down» until the desired length is reached. This has become known as the step-down or crown-down technique of cleaning and shaping. A primary purpose of this technique is to minimize or eliminate the amount of necrotic debris that could be extruded through the apical foramen during instru-mentation. This would help prevent post-treatment discomfort, incomplete cleans-ing, and difficulty in achieving a biocompatible seal at the apical constriction. Also emphasized the importance of removing all pulp remnants before shaping begins to ensure that this tissue does not «pile up» at the constriction and impede full cleaning and shaping to that point. In this method, the access cavity is filled with sodium hypochlorite, and the first instrument is introduced into the canal. One should start with a wider (0.04 or 0.06 taper) instrument or a Gates-Glidden drill to free up the canal so that a fine instrument may reach the mid- and apical canal.

This would be the beginning of step-down preparation. The initial penetrating instrument is a small, curved, stainless steel K file, exploring to the apical constriction and establishing working length. To ensure this pen-etration, one may have to enlarge the coronal third of the canal with progressively smaller Gates- Glidden drills or with instruments of larger taper such as the.04 or the. 06 instruments. At this point, and in the presence of sodium hypochlorite and/or a lubricant such as Glyde, step-down cleaning and shaping begins with K-Flex, Tri-ple-Flex, or Safety Hedstrum (Sybron Endo/Kerr; Orange, Calif.) instruments in 0.02, 0.04, or 0.06 taper configurations depending on the canal size to begin with. Starting with a No. 50 instrument (for example) and working down the canal to, say, a size No. 15, and the instruments are used in a watch-winding motion until the apical constriction (or working length) is reached. When resistance is met to further penetration, the next smallest size is used.

Irrigation should follow the use of each instrument and recapitulation after every other instrument. To properly enlarge the apical third, and to round out ovoid shape and lateral canal orifices, a reverse order of instruments may be used starting with a No. 20 (for example) and enlarging this region to a No. 40 or 50 (for example). The tapered shape can be improved by stepping back up the canal with ever larger instruments, bearing in mind all the time the importance of lubrica-tion, irrigation, and recapitulation. At this point, the canal should be ready for smear layer removal, drying, and either medication or obturation. Over the past few years, the movement toward using rotary nickel-titani-um instruments for root canal preparation has resulted in a

multitude of instrumentation systems in the marketplace. The manufacture of variably tapered and «Gates-Glidden-like», flexible nickel-titanium instruments, for use in gear-reduction, slow-speed handpieces, either air driven or electric, has enabled the skilled clinician to deliver predictable canal shapes with enhanced speed and increased efficiency.

Root canal preparation is considered finished, if a root canal corresponds with such requirements: - it is fully free from an infectious dentin; - has a tapered shape from cervical orifice of the root canal to apex; - it is enough enlarged; - has the formed apically support; - dry, clean, sterile. Obturation of root canal Nearly 60% of the failures in the endodontic treatment were apparently caused by incomplete obliteration of the radicular space. Periradicular inflammation is presumed to persist under the influence of any oxious substance. Bacteria certainly play a major role in the production of toxic products in the root canal.

However, in the absence of bacteria, degraded serum per se may well assume the role of the primary tissue irritant. The persistence of periradicular inflammation, in the absence of bacterial infection, might thus be attributed to the continuing apical percolation of serum and its breakdown products. It is apparent that the preliminary objectives of operative endodontics are total debridement of the pulpal space, development of a fluid-tight seal at the apical foramen, and total obliteration of the root canal. The anatomic limits of the pulp space are the dentinocemental junction apically, and the pulp chamber coronal. The root canal is ready to be filled when the canal is cleaned and shaped to an optimum size and dryness. Dry canals may be obtained with absorbent points except in cases of apical periodontitis or apical cyst, in which «weeping» into the canal persists. The materials used to fill root canals have been legion, running the gamut from gold to feathers.

Grossman grouped acceptable filling materials into plastics, solids, cements, and pastes. He also delineated 10 requirements for an ideal root canal filling material that apply equally to metals, plastics, and cements: (see chapter 10 «Apical Periodontitis» - «Obturation of root canal»). Cements, plastics, and pastes The cements, which have a wide dentist's acceptance, are primarily zinc oxide-eugenol (ZOE) cements, the polyketones, and epoxy. The pastes currently in worldwide vogue are chlorapercha and eucapercha, as well as the iodoform pastes, which include both the rapidly absorbable and the slowly absorbable types. Despite their disadvantages, pastes are applicable in certain cases. The plastics show promise, as do the calcium phosphate products. At present the methods most frequently used in filling root canals involve the use of solid-core points that are inserted in conjunction with cementing materials. Gutta-percha and silver per se are not considered adequate filling material unless they are cemented in place in the canal.

#### **IV. Control questions for the class topic:**

- 1.The essence of the devitalised amputation method of pulpitis treatment.
- 2.Techniques for the treatment of pulpitis by devitalised amputation.
- 3.Combined treatment of pulpitis, indications, contraindications.
- 4.Advantages and disadvantages of treatment of pulpitis by the combined method.
- 5.Complications from the treatment of pulpitis by devitalised amputation and combined methods.

#### **V. Control test tasks and/or case tasks:**

- 1.A 10-year-old child complained of a broken crown of the 11th tooth. The injury occurred 4 hours ago as a result of a fall from a height. Objectively: fracture of the crown of the 11th tooth, pulp is pointwise exposed, sharply painful. Which method of treatment is optimal?
  - a.Biological.
  - b.Vital extirpation.
  - c.Vital amputation.
  - d.Devitalising amputation.



e.Devitalisation.

2.The child is 8.5 years old, practically healthy. Complains of pain in the anterior upper left tooth due to traumatic injury three hours ago. Objectively: the crown part of 21 is missing by 1/2, the pulp is significantly exposed, red in colour, sharply painful and bleeding during probing.

Percussion of 21 is sharply painful. Choose the optimal method of treatment of 21.

a.Vital amputation.

b.Devitalisation.

c.Vital extirpation.

d.Biological method.

e.Devitalising amputation.

3.A patient aged 28 years during the treatment of deep caries of the 26th tooth was exposed tooth pulp. Assign the necessary method of further treatment.

a.Conservative (biological)

b.Vital amputation

c.Vital extirpation

d.Devitalising amputation

e.Devitalising extirpation.

4.A 46-year-old patient was diagnosed with chronic calculous pulpitis of the 27th tooth after examination. The radiograph revealed that the calculus is located in the crown part of the tooth cavity, occupying about 1/4 of its volume. Choose a method of treatment.

a.Vital amputation of the pulp

b.Biological method

c.Devitalised pulp extraction

d.Vital pulp extraction

e.Devitalised pulp amputation

5.A 27-year-old patient complains of prolonged pain in the 22nd tooth from cold, hot, causeless pain for 30 minutes occurs 3-4 times a day, worsens at night. The pain appeared 3 days ago after preparation of the tooth for a plastic crown. Objectively: 22 tooth - temperature test is sharply positive, provokes an attack of pain, percussion is painless. What is the treatment tactic in this clinical case?

a.Coating the tooth with fluoride varnish

b.Biological method of pulpitis treatment

c.Devitalisation of the pulp

d.Vital pulp extraction

e.Vital pulp amputation

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.

2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.

3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## 6.2. Additional literature

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №16

**TOPIC:** SEALANTS AND FILLERS FOR ROOT CANAL FILLING IN CASE OF PULPITIS: GROUPS, PROPERTIES, INDICATIONS FOR USE, FILLING TECHNIQUES. METHODS OF ROOT CANAL FILLING: METHODS OF CENTRAL PIN, VERTICAL CONDENSATION OF GUTTA-PERCHA, COLD AND WARM LATERAL CONDENSATION OF GUTTA-PERCHA. MISTAKES AND COMPLICATIONS

**I. Topic relevance:** A wide variety of filling materials are used to fill canals. They must meet the following requirements: easy to insert and, if necessary, to remove from the root canal; have high adhesive properties, not reduce their volume after hardening; not be absorbed by tissue fluid; not irritate the periodontium; have antiseptic properties; be radiocontrast and not stain tooth tissue. Depending on their main properties, they are divided into plastic non-hardening, plastic hardening materials and pins. Depending on the nature of the application, they are also divided into hard - pins (fillers) and flexible - sealants.

### II. Study goal:

#### 2.1. Student has to know:

- the main groups of filling materials for root canal treatment;
- the difference between sealants and fillers for filling root canals;
- methods of root canal filling with the main methods;
- possible errors in root canal filling and their consequences.

#### 2.2 Be able to:

- choose the right method and materials for root canal filling;
- evaluate the advantages and disadvantages of different methods of root canal filling;
- classify sealants and fillers for root canal filling according to their group affiliation.

### III. Content of the topic

**The sealers** are to form a fluid-tight seal at the apex by filling the minor interstices between the solid material and the wall of the canal, and also by filling patent accessory canals and multiple foramina. Dye-immersion studies have shown the necessity of cementation, without which dye penetrates back into the canal after compaction; this occurs with all known solid-core root canal-filling techniques.

**Gutta-percha** is by far the most universally used solid-core root canal filling material and may be classified as a plastic. To date, modern plastics have been disappointing as solid-core endodontic filling materials. Chemically pure gutta-percha (or balata) exists in two distinctly different crystalline forms (alpha and beta) that can be converted into each other.

The alpha form comes directly from the tree. Most commercial gutta-percha, however, is the beta crystalline form. There are few differences in physical properties between the two forms, merely a difference in the crystalline lattice depending on the annealing and/ or drawing process used when manufacturing the final product. Traditionally, the beta form of gutta-percha was used to manufacture endodontic gutta-per-cha points to achieve an improved stability and hardness and reduce stickiness. Although techniques of gutta-percha placement involving heating in the root canal caused reversible physical changes, no apparent changes in chemical composition take place. For endodontic usage the gutta-percha supplied by manufacturers in form of gutta-percha filling points which contain about 20% of its chemical composition of gutta-percha, whereas the 60 to 75% of the composition is zinc oxide filler.

The remaining constituents are wax or resin to make the point more pliable and/ or compactable and metal salts to lend radiopacity. Gutta-percha points (or cones) are supplied in two shapes. The traditional form is cone shaped to conform to the perceived shape of the root canal. The other shape of gutta-percha points is standardized to the same size and shape as the standardized (ISO) endodontic instruments. These points are available in the standardized.02 taper

as well as in increased taper sizes (.04,.06, etc) to correspond to the newer tapered instrument sizes. Colour coding the numbered points to match ISO instrument colour has become routine. Methods of obturating the root canal space Today, most root canals are being filled with gutta-percha and sealers. The methods vary by the direction of the compaction (lateral or vertical) and/or the temperature of the gutta-percha; either cold or warm (plasticized). These are the two basic procedures: lateral compaction of cold gutta-percha or vertical compaction of warmed gutta-percha.

Other methods are variations of warmed gutta-percha. The main methods are listed as follows:

- I. Solid Core Gutta-Percha with Sealants
  - A. Cold gutta-percha points
    1. Lateral compaction
    2. Variations of lateral compaction
  - B. Canal-warmed gutta-percha
    1. Vertical compaction
  - C. Thermoplasticized gutta-percha
    1. Solid-core carrier insertion
  - a. Thermafil

#### **IV. Control questions for the class topic:**

- 1.The concept of sealants and fillers for root canal filling.
- 2.Classification of sealants and fillers.
- 3.Methods of root canal filling with gutta-percha.
- 4.Disadvantages of endo-seals.
- 5.Mistakes and complications in root canal treatment.

#### **V. Control test tasks and/or case tasks:**

- 1.The advantage of gutta-percha over other fillers is that it:
  - a.It is bioinert and does not irritate periodontal tissues
  - b.Insoluble in water and tissue fluid
  - c.Penetration into the deltoid branches of the root canal
  - d.Affordable price
  - e.All answers are correct
- 2.Name the horizontal gutta-percha seal:
  - a.Plugger
  - b.Spreader
  - c.Rimmer
  - d.Protaper
  - e.Lentulo
- 3.Name a vertical gutta-percha seal:
  - a.Plugger
  - b.Spreader
  - c.Rimmer
  - d.Protaper
  - e.Lentulo
- 4.The centre pin or single cone method is used when:
  - a.The patient has limited time and the shape of the canal is not important
  - b.The root canal is obliterated in the lower third of the root
  - c.The root canal is straight, wide and short with relatively parallel walls
  - d.The root canal is straight and wide with relatively parallel walls
  - e.The root canal is curved

5. What are the disadvantages of root canal filling using the cold lateral condensation method?
- High cost
  - Complicated technique
  - Small branches of root canals are filled only with sealant
  - Gutta-percha is toxic to periodontal cells
  - Additional equipment is required to perform the technique

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

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1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
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4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №17

### TOPIC: PERIODONTITIS: ETIOLOGY, PATHOGENESIS, CLASSIFICATION (I.G. LUKOMSKYI, M.A. GROSHYKOV, S.A. WEINDRUKH, ICD-10). PATHOLOGICAL ANATOMY OF ACUTE AND CHRONIC PERIODONTITIS

**I. Topic relevance:** Periodontium is a connective tissue formation that fills the space between the root and the inner wall of the alveoli and connects the teeth to the jaw bones. The main structure of periodontium is bundles of dense fibrous tissue consisting of closely intertwined collagen fibres.

#### II. Study goal:

##### 2.1. Student has to know:

- definition of periodontitis;
- etiopathology of various forms of periodontitis;
- classification of periodontitis according to I.G. Lukomsky, M.A. Groszykov, S.A. Weindruch, ICD-10;
- pathomorphology of acute and chronic periodontitis;

##### 2.2 Be able to:

- clearly differentiate between pulpitis and periodontitis;
- correctly diagnose periodontitis;
- distinguish acute periodontitis from chronic periodontitis based on anamnesis.

#### III. Content of the topic

*Table 18 etiology of periodontitis*

infectious	uninfectious
1. Mixed anaerobic and aerobic microflora 2. Aerobes in a- Streptococcus- Streptococcus Neisseria Staphilococcus albus Candida 3. Anaerobes B.perfingens V. V. mesentericus subtitis Str. putridus 4. Bacteroids Veilonella Fuzobakteries	1. Acute Traumatic household trauma. Deep extirpation of the pulp. Injury endodontic instruments. Chronic trauma (fillings, crowns). 2. Chemical Application of toxic arsenic preparations. Application paraformu. The use of antiseptics. The use of endodontic materials. 3. Allergic medications (iodine, formalin, antibiotics, etc.). Filling materials
Pathways of infection 1. A root canal 2. Marginal way 3. through hematogenous way 4. Contact way (in case of osteomyelitis, sinusitis)	

2. Marginal way. Often it is implemented in patients with periodontal disease. In the case of generalized or localized periodontitis broadcast broken tooth plate cortical alveolus, periodontal

pocket is formed, from which the infection enters the periodontal space and it causes inflammation of tissues.

3. Contact way. In patients with osteomyelitis or sinusitis infection with pathological focus moves to the contact teeth are located.

4. Hematogenous or lymphogenous way. In this way the infection gets in periodontal patients with infectious for sickness.

To be infectious and so-called periods of perifocal dentistry, which was described IG Lukomski yet in 1955 he develops in patients with acute and chronic pulpitis, pulp gangrene and other diseases when infection is at the root canal tooth and there is focus of the pathological process. With this focus in the periapical space penetrated individual bacteria and their toxins, causing an inflammatory reaction of periodontal tissues. After removal of the fire (eg removing infected pulp canal sterilization) inflammation periodically disappears. This inflammatory reaction periodontal tissues in the tooth root apex area serves as a barrier that obstacles further penetration of the infection.

*Noninfectious periodontitis caused by the influence of periodic various local and general factors.*

1. The most common cause of periodontitis is a traumatic factors, mainly mechanical trauma - acute or chronic.

2. The second large group is chemical-toxic periodontitis.

3. Inflammation of Periodontal may cause allergic factors.

As noted, the traumatic factors that cause periodontitis include various injuries. Thus, acute trauma (shock, drop, etc..) Causing an acute traumatic injury. In such cases often suffer front teeth. Pathological changes vary depending on the strength and direction of the traumatic factor. In the case of small injuries may be breaks apical periodontal tissues, causing inflammatory reaction, and later it can pass and the pulp is alive.

Severe periodontal damage may result in not only the development of periodontitis, but also damage the pulp. Wang infected pulp complicates inflammation in periodontal.

Chronic trauma. With a weak, but the Permanent injury (eg, patients with abnormality of the bite, an artificial crown, denture or mostopodibnym seal that overstates the bite) forces traumatic focus in the area of the root apex. This injury causes gradual resorption of alveolar bone and the body also gradually compensates by its produkuvan - tion of granulation or fibrous tissue in the region of injury.

In addition, periodontitis may occur in smokers, smoking his pipe, in the musicians that played on wind instruments, in individuals who have bad habits teeth bite off the end, biting a pencil and generally in all cases, when you create a constant pressure on land top of the tooth root. In this case the crown of the tooth can remain intact, although for a long in the process can lead to periodontal destruction pulpal tissue.

An individual case of periodontitis should be further characterised using a simple matrix of four steps (see: Periodontitis: clinical decision tree for staging and grading, part of this toolkit) that describes the stage and grade of the disease. There are four stages and three grades. Staging relies on the standard dimensions of the severity and extent of periodontitis at presentation but adds the complexity of managing the individual patient. The information derived from assessing the stage of periodontitis should be supplemented by information on the inherent biological grade of the disease.

This relies on three sets of parameters:

1. The rate of periodontitis progression;
2. Recognised risk factors for periodontitis progression;
3. The risk of an individual's case affecting their systemic health. Within this classification framework, staging is largely dependent upon the severity of disease at presentation and on the

complexity of disease management, while grading provides supplemental information about biological features of the disease. These features include a history-based analysis of the rate of periodontitis progression, assessment of the risk for further progression, analysis of possible poor outcomes of treatment, and assessment of the risk that the disease or its treatment may negatively affect the patient's general health.

There are two dimensions in the process of assessing the stage of periodontitis in a patient: severity and complexity.

**Severity:** The primary goal is to classify the severity and extent of destroyed and damaged tissue caused by periodontitis. This is done by measuring CAL by clinical probing and bone loss by radiographic examination. These measurements must include the number of teeth whose loss can be attributed to periodontitis.

**Complexity:** The secondary goal is to determine the complexity involved in controlling the disease and managing the long-term function and aesthetics of the patient's dentition. Scoring the stages: The severity score is based primarily on interdental attachment loss attributable to periodontitis (CAL) and marginal bone loss. It is assigned based on the worst-affected tooth. The complexity score is based on the complexity of treating the case. It considers factors including the presence of deep probing depths, vertical defects, furcation involvement, tooth hypermobility, drifting and/or flaring of teeth, tooth loss, ridge deficiency, and loss of masticatory function.

Grading a periodontitis patient involves estimating the future risk of periodontitis progression and the likely responsiveness to standard therapeutic principles. This estimate guides the intensity of therapy and secondary prevention after therapy. Grading adds another dimension and allows the rate of progression to be considered, using direct and indirect evidence. Direct evidence is based on the available longitudinal observation: for example, in the form of older diagnostic-quality radiographs. Indirect evidence is based on the assessment of bone loss at the worst-affected tooth in the dentition as a function of age (measured as radiographic bone loss in percentage of root length divided by the age of the subject). The periodontitis grade can then be modified by the presence of risk factors.

Clinicians should approach grading by assuming a moderate rate of progression (grade B) and look for direct and indirect measures of whether there is a higher disease progression that would justify the application of grade C. Grade A is applied once the disease is arrested. If the patient has risk factors that have been associated with greater disease progression or lesser responsiveness to bacterial-reduction therapies, the grade score should be raised independently of the primary criterion represented by the rate of progression. For example, a case could be characterised by moderate attachment loss (stage II), where the assumption of a moderate rate of progression (grade B) is modified by the presence of poorly controlled Type-2 diabetes, which is a risk factor that could shift the grade definition to rapid progression (grade C).

#### **IV. Control questions for the class topic:**

1. Etiology of periodontitis.
2. The difference between acute and chronic periodontitis.
3. Classification of periodontitis.
4. Pathogenesis of periodontitis.
5. Pathological and anatomical picture of periodontitis.

#### **V. Control test tasks and/or case tasks:**

1. A 50-year-old woman complained to the dentist that food was stuck in the mandibular tooth. Objectively: on the distal contact surface of the 45th tooth, a carious cavity was found within the periapical dentin, filled with dense pigmented dentin. The diagnosis was made: "Chronic deep caries". On the basis of which examination the doctor can make a differential diagnosis with chronic periodontitis:
  - a. Percussion



b. Probing

c. Palpation of the projection area of the root apex

d. EOD

e. Cold test

2. Name the timing of acute apical periodontitis progression:

a. From 2-3 days to 2 weeks

b. Several months

c. A few days

d. A few hours

e. No more than 1 hour.

3. A 10-year-old child complains of pain that occurs when drinking cold drinks in the upper frontal teeth on the left, which has been going on for more than a month. There is a history of trauma to tooth 21 with a chipped third of the crown about 3 months ago. After the injury, the tooth was restored using a composite material and did not bother. Examination: tooth 21 - cold test slightly positive, percussion 21 slightly positive, radiographically: widening of the periodontal gap along the perimeter of the apex of the root 21. Make a diagnosis:

a. Chronic fibrous pulpitis complicated by chronic periodontitis

b. Chronic gangrenous pulpitis complicated by periodontitis

c. Chronic fibrous periodontitis

d. Chronic hypertrophic pulpitis complicated by periodontitis

e. Chronic periodontitis of the upper jaw.

4. An 11-year-old boy complains of a carious cavity in a tooth on the right lower jaw. Objective: In tooth 46 there is a carious cavity within the dentin, dense, pigmented dentin. Reaction to cold stimulus, probing of the cavity floor, percussion is painless. The preliminary diagnosis is chronic medium caries. What diseases should be differentially diagnosed?

a. Chronic gangrenous pulpitis, acute infectious periodontitis

b. Chronic deep caries, chronic periodontitis, acute medium caries

c. Acute periodontitis, acute pulpitis

d. Chronic superficial caries, chronic pulpitis

e. Chronic hypertrophic pulpitis, chronic gangrenous pulpitis

5. What complications can occur after leakage of the restoration on a tooth treated for deep caries in the long term?

a. spotted form of fluorosis, chronic pulpitis

b. Stanton-Cappdepon syndrome

c. imperfect amelogenesis, imperfect dentinogenesis

d. local enamel hypoplasia

e. secondary caries, acute or chronic pulpitis, chronic periodontitis

## VI. References

### 6.1. Main literature

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.

2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.

3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### 6.2. Additional literature

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4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №18

**TOPIC: ACUTE DRUG-INDUCED AND TRAUMATIC APICAL PERIODONTITIS: ETIOLOGY, PATHOGENESIS, CLINIC, DIAGNOSIS. ACUTE SEROUS PERIODONTITIS OF INFECTIOUS GENESIS: ETIOLOGY, PATHOGENESIS, CLINIC, DIAGNOSTICS**

**I. Topic relevance:** Drug-induced and traumatic periodontitis are forms of non-infectious periodontitis and can be caused by both dental error and patient negligence. In turn, serous periodontitis belongs to periodontitis of infectious origin and is the first phase of acute periodontal inflammation.

### **II. Study goal:**

#### **2.1. Student has to know:**

- causes of acute drug-induced periodontitis;
- possible traumas that provoke the development of acute traumatic periodontitis;
- mechanisms of development of acute serous periodontitis of infectious genesis;
- clinical signs of acute serous periodontitis;

#### **2.2 Be able to:**

- correctly diagnose acute serous periodontitis;
- provide first aid for injuries that may lead to acute traumatic periodontitis;
- prevent the formation of acute drug-induced periodontitis.

### **III. Content of the topic**

**Traumatic factors** that cause periodontitis include various traumas. For example, an acute trauma (blow, fall, heavy object, etc.) causes acute traumatic injury. In such cases, the front teeth are most often affected. Pathological changes vary depending on the strength and direction of the traumatic factor. In the case of minor injuries, there may be tears in the apical periodontal tissue, which causes an inflammatory reaction, which may later resolve and the pulp remains alive.

Severe damage to the periodontium can cause not only the development of periodontitis, but also damage to the pulp. Infected pulp complicates the inflammatory process in the periodontium.

**Chronic trauma.** In case of a mild but permanent trauma (for example, in patients with an abnormal bite, artificial crown, bridge or overbite filling), the forces of traumatic action are concentrated in the area of the root apex. Such an injury causes gradual resorption of the alveolar bone, and the body also gradually compensates for it by producing granulation or fibrous tissue in the area of injury.

In addition, periodontitis can occur in pipe smokers, musicians playing wind instruments, people with bad habits of biting off the ends of threads with their teeth, chewing on pencils and in general in all cases when constant pressure is applied to the area of the apex of the tooth root. In this case, the crown of the tooth may remain intact, although a prolonged inflammatory process in the periodontium can lead to the death of the pulp tissue.

Traumatic periodontitis can be caused by the actions of the dentist who treated the inflamed pulp or by medical and instrumental treatment of the root canal. For example, during deep pulp extraction, periodontal tissue can be torn off, and over time, the periodontium can be damaged; in case of incorrect determination of the length of the canal, working with a file or a rimer can also lead to periodontal damage.

In the event of acute traumatic periodontitis, the patient experiences pain at the site of the knocked-down tooth, it becomes mobile, and may have bleeding gums, acute or aching pain.

The course of traumatic periodontitis is accompanied by the following symptoms:

- *Severe pain*

The cause of pain is a short impact of high force. This includes a blow or a fall, but in addition, discomfort can be caused by improperly prescribed and performed dental treatment. The pain occurs and intensifies during eating - biting and chewing, as well as when applying strong pressure to the tooth. It causes discomfort to the patient, but disappears for a while, which makes them postpone going to the doctor.

*- Redness and swelling of the mucous membrane*

Redness and swelling of the mucous membrane occurs for several reasons, they are accompanied by pain in the throat, gums, lips and tongue. The most common causes of redness and swelling are injuries or trauma to the oral cavity, such as eating too hot or hard food, poor dental treatment, and infectious inflammation. Periodontitis is characterised by swelling in the gum area, the patient notices a deterioration in well-being and a feeling that the affected tooth has become higher than the others.

*- Mobility of the causative tooth*

The following classification was developed to determine the degree of tooth mobility:

1st degree. The tooth is unstable in relation to the adjacent teeth. The amplitude of swinging is no more than 1 mm

2nd degree. The mobility of the teeth increases. It is slightly more than 1 mm. The teeth wobble in different directions.

3rd degree. The teeth are loose in any direction. The patient can even lift one of them up.

4th degree. The tooth rotates around its axis.

*- Bleeding gums*

Bleeding gums are observed in various diseases of the oral cavity. In periodontitis, the ligaments that surround and hold the tooth are destroyed. Now the dental ligament is involved in the inflammatory process, and it is filled with blood vessels. Over time, the ligament begins to break down, and the teeth become loose and fall out.

*- Tooth discolouration in pink colour*

The rupture of the neurovascular bundle is accompanied by haemorrhage into the pulp tissue, so the enamel turns pink. In some cases, the crown of the tooth darkens.

**Toxicochemical (drug-induced) periodontitis** occurs mainly after dental manipulations. In most cases, this is due to the use of arsenic paste, the effect of which extends to the periapical tissues in case of violation of its terms of use or dose.

Strong antiseptic agents (formalin, phenol, feresol, etc.) used to treat root canals can also cause irritation and inflammation of the periodontium.

**Allergic periodontitis** develops in patients with hypersensitivity to medications used for root canal treatment and filling. Quite often, allergic reactions occur after the use of iodine and iodide compounds (iodoform), especially when they are included in root canal filling pastes.



**Pic.21.** *Acute tooth trauma that leads to acute traumatic periodontitis.*

**Acute serous periodontitis (periodontitis acuta serosa).** In clinical practice, periodontitis is most commonly encountered under the influence of infection and develops mainly as a complication of pulp inflammation or as a result of errors made during endodontic therapy.

**Symptoms.** The patient's complaints are so characteristic that they are often enough to establish an almost unmistakable diagnosis. At first, the patient feels heaviness and tension in the tooth, which seems to be larger and longer than the others. Gradually, a rather severe pain of a spontaneous nature occurs. The pain is constant, localised, does not irradiate, worsens at night and is almost not suppressed by common painkillers. As the process is constantly evolving, the intensity of the pain increases.

In addition, characteristic provoked pain may occur. Anything that can increase the blood flow in the tooth area and change its mobility provokes pain attacks. Thus, severe pain appears while eating. In the initial stage, however, deliberate, slow, long-term pressure relieves pain due to the outflow of exudate from the periodontium, reduced hyperaemia and compression of nerve endings. That is why, by pressing the tooth in the alveolus, patients temporarily improve their condition. Pain when pressing on the tooth can occur under the influence of heat if periodontitis is a complication of pulp gangrene with a closed tooth cavity. Temperature differences can cause pain if the change occurs suddenly. In the case of a gradual increase in temperature and prolonged exposure to heat, a calming effect is achieved due to sustained vasodilation, which promotes blood flow from the area of inflammation.

**Objective.** A diseased tooth may be intact, which does not exclude the presence of trauma (for example, when using an orthodontic appliance). Most often, however, it is carious, devitalised, with an open tooth cavity or filled with a large filling. The enamel loses its characteristic shine and becomes dark grey in colour. The gingiva in the apex area is often hyperaemic and swollen, sometimes hyperaemia is also present in the adjacent areas of the gingiva. Vertical percussion is painful. The reason for this reaction is an increase in the sensitivity of nerve receptors in the area of periapical inflammation. Palpation of the gums in the area of the tooth apex (especially the anterior ones) is painful, which is explained by the proximity of the root to the periosteum. Regional lymph nodes are enlarged and become painful during palpation. Depending on which lymph nodes are inflamed, in diagnostically difficult cases, a diseased tooth can be differentiated.

Thus, periodontitis of the lower front teeth is accompanied by inflammation of the submental lymph nodes, periodontitis of the upper incisors, as well as the upper and lower canines and premolars - by the anterior submandibular lymph node of the corresponding side, and periodontitis of the molars of both jaws - by the middle and posterior submandibular lymph nodes. Electrical excitability is above 100 microA, except in cases of traumatic periodontal injury, when the pulp is still alive and the response to direct current is related to its response.

Radiographic changes are usually undetectable, and only in the later stages of development may there be a slight widening of the periodontal gap. Depending on the etiology, the clinical picture of acute serous periodontitis may have its own specificity, which should be taken into account during the differential diagnosis. In patients with traumatic periodontitis, the clinical picture largely depends on the condition of the pulp that has been exposed to acute trauma. If the pulp is alive, the course of the process is milder and the prognosis is favourable. In the case of septic pulp necrosis, periodontal infection is always associated with a clinical picture of infectious periodontitis.

The differential diagnosis of acute serous periodontitis should be made with acute diffuse pulpitis. Pulpitis is characterised by pain radiation, acute onset, remissions and intermittent periodontitis. The pain in patients with periodontitis is duller, not as acute as in pulpitis. Lymph nodes are not affected in patients with pulpitis. The differential diagnosis between serous and

purulent periodontitis is based on the severity of the patient's condition and the nature of the pain, as well as the overall clinical picture. In patients with serous periodontitis, the pain is less pronounced, not as intense, and strictly localised. Changes in the mucous membrane in the area of the root apex are minor, most often in the form of mild hyperaemia. The tooth is only slightly mobile in the transverse direction. The patient's general condition is not affected.

#### **IV. Control questions for the class topic:**

1. Etiological factors of occurrence of acute drug-induced periodontitis.
2. Types of injuries that can provoke the occurrence of acute traumatic periodontitis.
3. Diagnosis of acute drug periodontitis.
4. Factors of acute serous periodontitis.
5. Pathological and anatomical picture of acute serous periodontitis.

#### **V. Control test tasks and/or case tasks:**

1. A 30-year-old patient complains of pain in the 12th tooth, which increases during biting. Past medical history: trauma. Objective: The 12th tooth is intact, discoloured, percussion is painful. Indicate additional research methods to clarify the diagnosis:

- a. Biopsy
- b. Vital staining
- c. EOS
- d. Radiography
- e. Blood tests

2. Name the typical complaints of a patient with acute serous periodontitis:

- a. Constant localised pulsating pain, gradually increasing in intensity, intensifying when biting and touching the tooth
- b. Constant pulsating pain, taking non-steroidal anti-inflammatory drugs completely eliminates the pain
- c. Constant pulsating pain, taking non-steroidal anti-inflammatory drugs reduces the intensity of the pain
- d. Expressed facial asymmetry. Constant localised pain that worsens at night. Changes in general condition
- e. Pain provoked by chilled water when moving from a cold room to a warm one.

3. Which method of examination is the most informative in case of tooth trauma:

- a. Intraoral contact radiography
- b. Extraoral radiography
- c. Targeted radiography
- d. Intraoral radiography in the bite
- e. Computer tomography.

4. Penetration of infection into the pulp is more common:

- a. Through a carious cavity
- b. Due to mechanical trauma
- c. Due to chronic trauma
- d. By haematogenous route
- e. By lymphatic route

5. A 24-year-old patient complains of a constant growing pain in the tooth on the lower jaw on the right, which increases when biting. Objectively: Tooth 46 has a carious cavity that does not communicate with the tooth cavity, percussion is mildly painful, probing of the walls and bottom of the cavity is painless. No changes are found on the radiograph. Give the most possible diagnosis:

- a. Acute diffuse pulpitis
- b. Acute purulent periodontitis

- c. Acute serous periodontitis
- d. Acute limited pulpitis
- e. Exacerbation of chronic periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №19

### TOPIC: ACUTE PURULENT APICAL PERIODONTITIS: ETIOLOGY, PATHOGENESIS, CLINIC, DIAGNOSTICS

**I. Topic relevance:** Acute purulent periodontitis develops if the infection that has entered the periodontium is highly virulent, the damaging factor is quite aggressive, and the body's defence reactions are low. Due to the increased permeability of blood vessels as a result of activation of enzymes such as leukotoxin, trypsin, large numbers of leukocytes, lymphocytes and monocytes penetrate the vascular wall.

#### II. Study goal:

##### 2.1. Student has to know:

- pathogenesis of acute purulent periodontitis;
- causes and composition of purulent exudate;
- pathomorphological picture of acute purulent periodontitis;
- clinical signs of acute purulent periodontitis;

##### 2.2 Be able to:

- correctly diagnose acute purulent periodontitis;
- evaluate the main characteristics of acute purulent periodontitis;
- determine the causes of acute purulent periodontitis.

#### III. Content of the topic

*Determining the phase of purulent periodontitis* is important for the choice of treatment methods, as each of these phases requires specific measures. With the equalisation of the forces of the damaging factor and the body's defences, proliferation processes begin to manifest themselves. Granulation tissue, which develops directly after the processes of alteration and exudation, restores the damaged periodontium and alveolar bone. In the future, it can act as a protective barrier that neutralises bacteria, toxins and other irritants.

**Acute purulent periodontitis (periodontitis acuta purulenta)** usually develops after serous periodontitis. However, it can often start spontaneously in case of massive penetration of virulent infection into the periodontium and a decrease in the reactivity of the patient's body. The clinical picture of such periodontitis is quite typical. Compared to the serous form, its course is more violent, and general manifestations are pronounced. Purulent exudate formed in the periodontal space, which is looking for a way out, most often breaks through, destroying periodontal tissue.

**Patients complain** of spontaneous acute continuous throbbing pain. At the beginning of the process, the pain is localised. However, it soon becomes diffuse, irradiating from the teeth of the lower jaw to the ear, and from the upper teeth to the temporal region. The patient always points to the diseased tooth, which they feel as "higher", very painful when pressing, contacting antagonists or even touching with the tongue during conversation. The pain is aggravated by heat, while cold, on the contrary, has a calming effect. Any physical effort leads to increased pain.

**Objectively.** A diseased tooth may be intact, although its colour may be discoloured, sometimes there is a significant carious defect or filling. The pulp cavity is closed in most cases, but may be open. Electrical excitability is 120-150  $\mu$ A, which determines pulp necrosis. During probing, gangrenous decay is observed in the canals, and pus often comes out under pressure. Horizontal and vertical percussion of the tooth is very painful. The tooth is mobile in the mesiodistal direction and in the direction of the longitudinal axis. The mobility is especially significant if the pus reaches the circular ligament and seeks an exit in the gingival pocket. In this



case, the tooth seems to be floating in the accumulation of pus. The tooth seems to have grown, which is not only subjectively felt by the patient, but is determined during the examination, as it is indeed somewhat displaced from the alveolus by the inflammatory exudate accumulated deep inside. The mucous membrane in the area of the apex is hyperemic and swollen. The transitional fold is smoothed due to the accumulation of inflammatory infiltrate, very painful during palpation. Depending on the stage of development of purulent periodontitis, palpation may reveal extremely painful hardening of the periosteum in the case of subperiosteal abscess formation.

In the case of a submucosal abscess, palpation reveals not only painfulness but also the phenomenon of fluctuation, collateral changes in the form of edema of the soft tissues of the face, the size of which does not always correspond to the severity of the lesion. Edema can lead to significant asymmetry and deformation of the face, especially in the case of pasty tissues. The presence of collateral edema should always be differentiated from phlegmon, but phlegmon is characterised by severe pain, as well as tension, thinness and shine of the skin. The progression of purulent exudate and the location of the abscess depend on the location of the root that is the source of infection and the anatomical and histological features of the jaw area. In some cases, pus collected in the periodontium can be discharged through the tooth canal. This is the most favourable option for the evacuation of pus, but it is possible only if the canal is passable and open. Often, in the case of lower molar disease, pus flows marginally through the gingival pocket, which occurs after the circular periodontal ligament has melted. This pathway is unfavourable, as the cortical lamina is subsequently melted and a bone pocket is formed.

In addition to these pathways, purulent exudate can break through into the maxillary sinus or adjacent alveoli, penetrate the jawbone, and into the spongy substance. Under such conditions, limited osteomyelitis develops. This is a particularly unfavourable variant of pus spread, which leads to severe complications. In case of purulent periodontitis, the inflammatory reaction spreads to the regional and even cervical lymph nodes, which become painful and enlarged. Unlike serous periodontitis, purulent forms are most often accompanied by general symptoms. General disorders are observed in case of subperiosteal abscess formation, when unbearable pain, intoxication, general exhaustion, changes in complexion, and characteristic shadows under the eyes occur against the background of high body temperature (38-39 °C). Abuse of analgesics worsens the condition. Patients complain of headache, dizziness, and weakness.

Radiographic examination of purulent periodontitis in 24 to 48 hours reveals a darkening of the structure of the cancellous part of the bone due to bone marrow infiltration. The outlines of the compact lamina remain smooth and clear. In the case of severe collateral edema, the image of bone structures is superimposed by a light shadow of infiltrated, swollen soft tissue. The periodontal cleft is dilated. Radiography in patients with acute purulent periodontitis is advisable mainly for differential diagnosis with exacerbation of various forms of chronic periodontitis, when the image reveals changes characteristic of resorptive processes.

**Differential diagnostics.** The differential diagnosis between purulent and serous periodontitis is not difficult. Intense, unbearable pulsating pain with radiation is indicative of purulent periodontitis. The pain increases when pressing on the tooth or even touching it; tooth mobility is more pronounced, and mobility in the longitudinal axis is also characteristic; in case of circular ligament melting, the tooth seems to float in purulent exudate. The presence of abscess, pus discharge and general condition of the patient leave no doubt about the diagnosis. Acute purulent periodontitis, especially with severe general symptoms, must be differentiated from osteomyelitis. In the case of spontaneous osteomyelitis, the patient's general condition is quite severe. In patients with purulent periodontitis, the general intoxication is less pronounced, and local inflammatory changes affect only one or neighbouring teeth, and not a group of teeth or half

of the jaw, as is the case with osteomyelitis. An X-ray examination will help to establish the final diagnosis.

*Acute purulent periodontitis* should also be differentiated from acute chronic periodontitis. Anamnestic data indicating the primary nature of the disease and relatively slow development of abscesses are in favour of purulent periodontitis. Whereas in patients with acute purulent periodontitis an abscess develops within 3-4 days, in the case of acute periodontitis, abscess formation occurs within one day or even several hours due to destructive changes in the bone tissue. During clinical examination of patients with inflammatory chronic periodontitis, especially granulating periodontitis, fistulas or scars are found. The absence of changes in the periapical area on X-rays confirms the diagnosis of acute purulent periodontitis. If the periodontitis is in the area of the upper 4, 5, 6 teeth, a differential diagnosis with maxillary sinusitis should be made. Patients with maxillary sinusitis complain of spontaneous pain in the maxillary sinus area, which radiates to the posterior regions; percussion of several teeth, the roots of which are close to the floor of the maxillary sinus, is painful. In addition, in the case of a comparative examination of both sinuses, pain is detected when pressing over the affected sinus. Purulent exudate is also characteristic of the nostril, which is usually closed on the side of the affected maxillary sinus. Acute purulent periodontitis becomes chronic after drainage and drainage of purulent exudate.

#### **IV. Control questions for the class topic:**

1. Composition of purulent exudate in case of acute purulent periodontitis.
2. Etiology of acute purulent periodontitis.
3. Pathogenesis of acute periodontitis, including purulent periodontitis.
4. Differential diagnosis of acute purulent periodontitis.
5. Radiological signs of acute purulent periodontitis.

#### **V. Control test tasks and/or case tasks:**

1. A 14-year-old girl has been complaining for 3 days of throbbing pain in the teeth on the upper jaw on the left, which increases sharply when biting. Objectively: the carious cavity does not connect with the tooth cavity. Probing the bottom is painless. Vertical and horizontal percussion is sharply painful. The mucous membrane in the area of tooth 16 is hyperaemic. What is the diagnosis?
  - a. Acute serous pulpitis
  - b. Acute purulent pulpitis.
  - c. Acute purulent periodontitis
  - d. Acute chronic pulpitis
  - e. Acute serous periodontitis
2. The patient complains of increasing pulsating pain in the 26th tooth. Objectively: 26 tooth - carious cavity filled with softened dentin, tooth cavity and carious cavity are not connected, bottom probing is painless, percussion is sharply painful. Tooth mobility is of the second degree. Palpation in the projection of the apices of the roots of tooth 26 is painful. What is the possible diagnosis?
  - a. Acute purulent periodontitis
  - b. Exacerbation of chronic pulpitis
  - c. Acute diffuse pulpitis
  - d. Exacerbation of chronic periodontitis
  - e. Acute purulent pulpitis.
3. Indicate the timing of acute purulent periodontitis progression:
  - a. About 20 days
  - b. 1-2 weeks
  - c. 1 month
  - d. 1-2 days

e. 1-2 hours.

4. A 25-year-old patient is referred for extraction of the 26th tooth after unsuccessful previous treatment. Diagnosis: acute purulent periodontitis of the 26th tooth. What instrument should be used for extraction?

- a. S-shaped right forceps
- b. Straight root forceps
- c. S-shaped left forceps
- d. Bayonet forceps (bayonet-shaped)
- e. Straight elevator

5. The patient complains of acute pain 16, a feeling of 'a grown tooth'. The pain appeared 3 days ago. Previously, the tooth did not bother. Objectively: the submandibular lymph nodes are enlarged, painless during palpation. The gingival crease in the area of the projection of the apexes of the roots of the 16th tooth is hyper-emphasised, painful. Vertical and horizontal percussion of the tooth is sharply painful, probing is painless. There is no reaction to temperature stimuli. EOD-150 microA. On the radiograph: periodontal gap without pronounced pathological changes. What is the most possible diagnosis?

- a. Acute purulent periodontitis
- b. Exacerbation of chronic periodontitis
- c. Exacerbation of chronic pulpitis
- d. Acute diffuse pulpitis
- e. Acute serous periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.; color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №20

### TOPIC: CHRONIC FIBROUS, GRANULATING, GRANULOMATOUS PERIODONTITIS: ETIOLOGY, PATHOGENESIS, CLINIC, DIAGNOSTICS, DIFFERENTIAL DIAGNOSIS

**I. Topic relevance:** Chronic periodontitis is a disease that has a varied clinical and radiological picture and is most common among people with periodontal pathology. Chronic periodontitis, as a rule, does not cause any special subjective sensations. It is often detected by chance on X-rays when the patient is not even aware of the presence of this disease. An accurate diagnosis can be made only after a thorough clinical and radiological examination.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- basic principles of classification of chronic periodontitis;
- pathogenesis of chronic periodontitis;
- possible mechanisms of development of complications from chronic periodontitis;
- differences between cystogranulomas, granulomas and cysts;

##### **2.2 Be able to:**

- clearly differentiate between fibrous, granulating and granulomatous forms of chronic periodontitis;
- evaluate the main clinical manifestations of chronic periodontitis;
- distinguish between granulating and granulomatous chronic periodontitis.

#### **III. Content of the topic**

##### **Chronic fibrous periodontitis** (periodontitis chronica fibrosa).

*Symptoms.* Chronic fibrous periodontitis is asymptomatic, only sometimes patients experience slight pain when chewing on rough food. The same can be determined in pulp gangrene if the carious cavity is filled with food debris. The disease is detected by radiography. From the anamnesis, it is established that earlier (1-2 years ago) the patient had spontaneous or causal pain and the tooth root was treated.

*Objectively.* A carious or filled devitalised tooth is detected. There is no pain from thermal stimuli and percussion. Palpation in the apex area is painless. If fibrous periodontitis has developed after treatment of acute purulent or chronic granulating periodontitis, an old scar may be detected. Sometimes fibrous periodontitis can occur in patients with intact teeth. In such cases, fibrous periodontitis is caused by chronic trauma or traumatic occlusion. Radiographically, the most commonly detected enlargement of the periodontal gap in the apical region is a sharp-edged cap. The compact alveolar lamina and root cementum are completely preserved.

In other cases, hypercementosis of the tooth root is detected, which causes its thickening in the apical part - the root looks like a drumstick. Hypercementosis is characterised by a positive immunological state of the body and a slow course of the chronic process. At the same time, hypercalcification of the alveolar bone can be observed, which looks like an osteosclerotic roller on the periphery of the periodontal fibrosis area on the radiograph.

*Chronic granulomatous periodontitis* occurs as a consequence of an acute inflammatory process, especially after acute purulent periodontitis, and can also develop in patients with chronic pulpitis, especially gangrenous pulpitis. The formation of granulation tissue rich in capillaries and fibroblasts indicates a higher level of the body's defences. Under the influence of stimuli from the root canal, the entire apical part of the periodontium is replaced by granulation tissue. As it grows, granulation tissue resorbs the adjacent layer of cement, on the one hand, and destroys the compact alveolar plate, on the other. Osteoblasts penetrate into the bone marrow cavities, resorbing the bone beams.

The granulation process can spread to soft tissues and create a gingival or skin fistula. The activation of the pathogenic factor causes an acute inflammatory process in the area of the root apex, and then the granulation tissue undergoes partial destruction. If at this stage the body's defences are superior, the granulation tissue restores the destroyed cells. It is this kind of periodontitis that is characterised in the clinic as unsealable or as periodontitis that is often exacerbated. This form of chronic periodontal inflammation is very difficult to treat.

*Chronic granulating periodontitis* (periodontitis chronica granulans) accounts for 65-70% of all cases of chronic periodontitis. Symptoms. Patients complain of tooth stiffness, some pain during eating and pressing. In the root area, the patient feels heaviness and some bulging. If there is a carious defect, filling it with food debris can cause exacerbation of the process and pain. The anamnesis reveals repeated exacerbations of the process with severe pain, swelling, abscess formation and the appearance of a fistula with pus discharge.

*Objectively.* A gangrenous or filled devitalised tooth with a discoloured tooth is detected. The tooth may also be externally intact or have a broken crown (in case of traumatic etiology of the lesion). Vertical percussion of the tooth is quite tangible or gives a mild painful reaction. During horizontal percussion, if the bone wall is perforated or thinned, after inserting the index finger into the vestibule of the mouth in the apex area, a tapping sound is felt, which is transmitted directly from the crown of the tooth to its root. This transmission of percussion sound is called the phenomenon of the diverted blow and is most pronounced in the area of single-rooted teeth. Tooth mobility may vary depending on the degree of alveolar bone destruction. Examination of the mucous membrane in the area of the apex reveals hyperaemia with a bluish tint. However, the hyperaemia is not very pronounced, so to detect it, the oral cavity should be examined from the vestibule.

I.G. Lukomsky (1955) described a symptom of *vasoparesis* characteristic of granulating periodontitis, which is observed when pressing on the swollen gums - they seem like a swollen pillow. This is due to the infiltrative growth of the granulation focus, which spreads not only to the bone but also to the soft tissues surrounding the alveolus. After pressing on such gums with a small instrument (corkscrew head or blunt side of an excavator), depressions and pallor of the mucous membrane remain, which quickly changes to a bright red streak that lasts for a long time, sometimes several minutes (due to paresis of the gingival vessels).

In the case of frequent exacerbation, a permanent gingival or skin fistula (fistula) may occur on the mucous membrane, from which a drop of pus spills out when pressed. The fistulous passage connects the infectious focus to the oral cavity, where it opens with a fistulous opening, which is often tamponaded with granulation tissue protruding from it, giving the opening the appearance of a navel. Sometimes one or more scars can be seen in the fistula area. Palpation in the area of the apex, depending on the stage of the process, is accompanied by more or less severe pain. Palpation can reveal resorption of the cortical layer of the bone; the regional lymph nodes are usually enlarged and painful to pressure.

*Chronic granulating periodontitis* outside of exacerbation is not accompanied by general symptoms. Radiographs in the area of the apex reveal a focal point of lucency of varying size, the contours of which resemble flames. There is a consistent transition from the area of bone destruction to healthy bone in the form of a slight darkening. This indicates demineralisation of the inflamed bone. In the case of a prolonged course of the process, resorption of cement and dentin of the tooth root is noted in some areas, which may look like an obliquely cut cone of more than 1/3 of the root length.

In case of successful treatment of periodontitis, the defect begins to shrink in 4-8 months, and new bone tissue forms on its periphery. Bone trabeculae may also form, which can be seen as a characteristic grey shadow on the radiograph. After a year, the area of lucency is completely

replaced by bone, sometimes denser than normal bone tissue. Differential diagnosis. Chronic granulomatous periodontitis can be easily differentiated from fibrous periodontitis by the nature of the signs detected by percussion and palpation, the presence of hyperaemia and swelling of the mucous membrane in the apex area, as well as a fistula or scar at the site of the latter. Diffuse, irregularly shaped lucency in certain areas of the apical alveolar region on X-rays allows for a more accurate diagnosis.

*Chronic granulomatous periodontitis.* This form of periodontal inflammation has 2 ways of formation.

1. The inflammatory process can occur spontaneously or after acute purulent periodontitis and is accompanied by the growth of granulation tissue, which takes the form of a local focus. This lesion does not tend to grow actively because the granulation of the outer layer is replaced by fibrous connective tissue that separates it from the adjacent tissues. This formation is called a granuloma. It has a spherical shape, an outer dense capsule and soft granulation tissue inside.

2. Granuloma can develop from granulating periodontitis. In the case of sufficiently high defences of the body, high resistance of periodontal tissues and a weak etiological factor (microbes and their toxins), the granulating focus may lose its aggressive character. Under such conditions, the infiltrative growth of granulations stops, and a fibrous connective tissue capsule surrounding the granulation is formed along its periphery. A layer of bone tissue resembling a compact plate is deposited at the border of the capsule. The fibres of the capsule are woven into the periodontium, binding the granuloma to the tooth root. Such a granuloma is called simple or fibrous.

*The granulation* tissue inside the granuloma has the same cellular composition as in granulating periodontitis.

*Granuloma* is a fairly persistent, stable form of chronic periodontitis that can exist for a long time - several years. In case of a decrease in the body's defences or under the influence of local factors, an exacerbation of the inflammatory process may occur. Purulent exudate breaks through the fibrous capsule and causes diffuse inflammation of the periodontium and adjacent tissues. After treatment, this form of periodontitis can turn into fibrous periodontitis. Depending on the nature of the capsule and cell composition, epithelial granulomas and cystic granulomas are also distinguished.

*Epithelial granulomas* are granulomas in which the granulation tissue is permeated with epithelial strands. In the early stages of development, the epithelial strands are single, and later they become more numerous - epithelial cells almost replace the granulation tissue, which can lead to the formation of cystic granulomas.

*A cystogranuloma* is a cavity lined with epithelium and filled with a cloudy fluid. In the case of frequent exacerbations of periodontitis, the blood supply to the periodontium is disrupted, cells degenerate, and as a result of their decay, cavities filled with fluid containing degenerative forms of leukocytes, erythrocytes, epithelial cells, etc. appear. Any form of chronic periodontitis can be exacerbated when the body's defences are reduced. Most often, chronic granulating periodontitis is exacerbated. Thus, each of the three forms of chronic apical periodontitis can occur spontaneously or can transition from one to another. This factor is very important in the treatment of periodontitis.

*Chronic granulomatous periodontitis* (periodontitis chronica granulomatosa) is manifested by limited inflammation of the periodontium around the apical foramen, usually asymptomatic. The dentist detects it, like fibrous disease, by chance during an X-ray examination. Anamnesis can establish that sometimes during colds or active chewing of solid food, patients feel heaviness, tension, even pain in the area of the apex of the tooth root.

*Objectively.* A discoloured tooth is detected, it may be intact or filled. Vertical percussion is often painless. However, the causative tooth may be more sensitive compared to the adjacent

teeth. Horizontal percussion in cases of large granulomas is used to determine the symptom of a reflected blow. The mucous membrane in the area of the apex is not altered; only in the acute stage is it hyperemic and swollen. Palpation reveals mild pain, and a hard protrusion without fluctuation of 3 to 5 mm in size can be detected, which is a reactive thickening of the periosteum. The diagnosis can only be confirmed by X-ray. In chronic periodontitis, radiography is the main examination, in fact, the only source that provides objective information about the condition of the periodontium. The radiograph reveals a limited lumen in the apex area, which is oval or round in shape, up to 5 mm in diameter. The contours of the granuloma clearly delimit it from the healthy bone and resemble a compact alveolar plate. Along with the granuloma, there is often an osteosclerotic roller.

Differential diagnosis is based on clinical symptoms (appearance of the tooth and surrounding mucosa, percussion findings, etc.), electrical excitability test, and radiography. Granulomatous periodontitis differs from fibrous periodontitis by milder pain during palpation and sometimes percussion. It differs from granulomatous periodontitis in the absence of gingival edema and periodically opening fistula in the apex area. The main thing in the differential diagnosis is a typical radiological picture with a clearly limited periapical lumen, which confirms the diagnosis of chronic granulomatous periodontitis and allows to exclude granulating periodontitis.

#### **IV. Control questions for the class topic:**

1. Etiology of chronic periodontitis.
2. The definition of cystogranulomas, granulomas and cysts in granulomatous periodontitis.
3. Pathological and anatomical picture of chronic fibrous periodontitis.
4. Clinical signs of chronic granulating periodontitis.
5. Differential diagnostics of chronic fibrous, granulating and granulomatous periodontitis.

#### **V. Control test tasks and/or case tasks:**

1. The patient visited the dentist for restoration. Objectively: a deep carious cavity was found in 37, communicating with the tooth chamber. The tooth does not respond to stimuli. Radiographs: enlargement and deformation of the periodontal gap in the apical region. What is the most possible diagnosis?
  - a. Chronic fibrous pulpitis
  - b. Chronic granulomatous periodontitis
  - c. Chronic gangrenous pulpitis
  - d. Chronic granulating periodontitis
  - e. Chronic fibrous periodontitis
2. A 5-year-old child came for oral cavity rehabilitation. At 65, chronic granulating periodontitis was detected. What radiological changes should be expected on the dental radiograph?
  - a. Destruction of bone tissue with clear contours
  - b. Destruction of bone tissue with clear contours
  - c. Osteoporosis of bone tissue
  - d. Destruction of bone tissue with fuzzy contours
  - e. Expansion of the periodontal gap.
3. A 20-year-old girl developed pain in a previously treated and filled 22 a week ago. Three days ago, the pain stopped, but a fistula with purulent discharge appeared in the projection of the apex of the root of 22. Radiographically, a focus of bone thinning near the apex of root 22 with a diameter of 0.5-0.6 cm without clear contours was found. What is the most possible diagnosis?
  - a. Chronic granulomatous periodontitis
  - b. Exacerbation of chronic periodontitis

- c.Chronic granulating periodontitis
  - d.Radicular cyst from 22 that has suppurated
  - e.Limited osteomyelitis of the maxilla.
- 4.The patient complains of a carious cavity in 11. The filling fell out a week ago. The crown of 11 is dark in colour, there are remnants of filling material at the bottom of the carious cavity. Vertical percussion is painless. The radiograph shows oval bone resorption with clear contours. The root canal is filled with defects in the filling. Choose the most possible diagnosis:
- a.Chronic granulomatous periodontitis
  - b.Chronic fibrous periodontitis
  - c.Chronic granulating periodontitis
  - d.Radicular cyst
  - e.Exacerbation of chronic periodontitis.
- 5.A patient S., 45 years old, during the sanitation of the oral cavity at 36, a carious cavity with the remains of a filling was found. The colour of the tooth is changed. The tooth cavity is open, probing and percussion are painless. The radiograph on the medial root shows bone destruction with clear margins of 0.3 - 0.3 cm. Make a diagnosis:
- a.Chronic granulating periodontitis
  - b.Chronic granulomatous periodontitis
  - c.Chronic fibrous periodontitis
  - d.Chronic gangrenous pulpitis
  - e.Exacerbation of chronic periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.



## METHODOLOGICAL RESEARCH №21

### TOPIC: EXACERBATION OF CHRONIC APICAL PERIODONTITIS: ETIOLOGY, PATHOGENESIS, CLINIC, DIAGNOSTICS. COMPLICATION OF PERIODONTITIS BY PERIOSTITIS

**I. Topic relevance:** Exacerbation of inflammation can occur regardless of the form of periodontitis, but most often granulating periodontitis is exacerbated, and less often it is fibrous periodontitis. Exacerbated periodontitis is much more common than acute periodontitis.

#### II. Study goal:

##### 2.1. Student has to know:

- the main causes of exacerbation of chronic apical periodontitis;
- clinical signs of exacerbation of chronic apical periodontitis;
- possible signs of complications of periodontitis with periostitis;
- differences between acute periodontitis and exacerbation of chronic periodontitis;

##### 2.2 Be able to:

- clearly distinguish acute periodontitis from chronic periodontitis in the exacerbating phase;
- evaluate the main features of exacerbation of chronic apical periodontitis;
- determine the presence of periodontitis complications with periostitis.

#### III. Content of the topic

*The clinical picture of acute chronic periodontitis* resembles the symptoms of acute periodontitis. The peculiarities of the clinic of acute chronic periodontitis are due to the presence of destruction in both the periodontium and the alveolar bone. Therefore, the history is characterised not only by repeated exacerbations with pain, swelling, general malaise, but also by a very rapid development of inflammation with the formation of fistulas. All symptoms - pain, collateral edema, lymph node reaction, etc. - appear in the same sequence as in the case of acute periodontitis. Its acuteness and severity, however, are significantly reduced due to the presence of a fistulous course. Pain during pressure and eating is less intense than in patients with acute purulent periodontitis.

Objectively. A carious or filled devitalised tooth is detected, the horizontal and especially vertical percussion of which is painful. Depending on the phase and stage of the disease, tooth mobility of the I-II degree is detected. The mucosa in the apex area is hyperemic and swollen. The transitional fold is smoothed and painful to palpate. There may be an abscess in one or another phase of development and collateral soft tissue edema. Lymph nodes can also be inflamed. The general condition may deteriorate.

The radiological picture corresponds to that of previous chronic periodontitis. Additional changes in it depend on the severity and duration of the inflammatory process. Thus, in the case of acute fibrous periodontitis, the periodontal space is more deformed - there is a clear widening of the periodontal gap in the apex area, and there are foci of bone softening.

In the case of exacerbation of granulomatous periodontitis, the clear contours of the compacted bone around the granulomas disappear, and the bone marrow spaces on its periphery become lucent.

The radiological picture of granulating periodontitis is generally blurred, but the contours of lucency are more pronounced. In the case of acute periodontitis, differential diagnosis with acute purulent periodontitis should be performed. Such anamnestic data as recurrence of acute symptoms and rapid development of inflammation up to fistula formation in a short time (within a few hours) indicate an exacerbation of chronic periodontitis. The diagnosis is confirmed by X-rays, which reveal periapical changes.

Sometimes, if periodontitis is not treated in a timely manner, a complication in the form of periostitis may occur.

Periodontitis is an inflammation of the periosteum (periosteum), the tissue that covers the jaw bones and alveolar branches in which the teeth are located. It usually occurs as a result of an infection that can occur due to tooth decay, trauma, gum disease or other causes. Localisation of the disease in the lower jaw occurs about 1.5-2 times more often than in the upper jaw. The course of jaw periostitis has a specific local and general clinical picture, and in case of timely treatment, the inflammatory process can be reversible. However, with the progression of the disease, the risk of severe purulent complications increases.

Tooth pain can be of a different nature: aching, dull, pulsating, constant, and can also radiate to the part of the head. This pain may be accompanied by complaints such as the inability to fully open the mouth, pain when chewing, swallowing, or moving the tongue. The localisation of swelling in periostitis on the gums is located in the area of the diseased tooth.

If you conduct an examination of the oral cavity, periostitis can be noticed due to its characteristic red colour, as well as elevation above the gum, swelling of the mucous membrane. Depending on the process of inflammation, a submucosal or subperiosteal abscess may form. In some cases, spontaneous release of the pathological process may occur - a breakthrough of pus from under the gingival areas. This can usually happen on the sixth or seventh day. However, it is also possible that the disease may need to be treated invasively.

Most patients also experience swollen, painful lymph nodes or some symptoms of intoxication in the form of weakness, poor appetite, malaise, and sleep disturbance. This can often be accompanied by elderly or senile people in the presence of characteristic diseases (diabetes mellitus, diseases of the cardiovascular system, gastrointestinal tract).

Periodontitis of the jaws can occur in different ways, but much depends on the location of the causative tooth. Thus, the pathology is characterised by an inflammatory process and swelling on the lip or wings of the nose. However, if the causative tooth is located on the upper jaw, the swelling can also spread to the area around the eyes, corners of the mouth, and buccal area. Sometimes even partial involvement of the facial nerve is possible, and it can reach the auricle. In case of development of periostitis on the lower jaw, swelling forms in the area of the lower lip and chin.

### **Diagnosis**

The diagnosis can be determined from laboratory tests of blood samples taken from a person. In particular, a slight increase in leukocytes ( $10-11 \cdot 10^9 / l$ ), an increase in neutrophils (75-78%) is noted for a characteristic inflammation. Radiographic analysis of the jaws can also be performed.

#### **I. Control questions for the class topic:**

1. Causes of exacerbation of chronic apical periodontitis.
2. The difference between exacerbated chronic apical and acute periodontitis.
3. Differential diagnosis of chronic apical periodontitis in the acute phase.
4. Factors contributing to the complication of chronic periodontitis with periostitis.
5. Clinic of apical periodontitis complicated by periostitis.

#### **V. Control test tasks and/or case tasks:**

1. A 52-year-old patient complains of pain, periodic appearance of a fistula on the gum in area 15. The tooth was treated 1.5 years ago for caries. Objectively: there is a filling in 15. There is a fistula in the projection of the root apex, purulent exudate is released when pressed. Percussion of the tooth is painful. On the X-ray, the root canal is not filled, near the root apex there is a focus of destruction with fuzzy contours. What is the most possible diagnosis?
  - a. Exacerbation of granulating periodontitis
  - b. Chronic granulating periodontitis.

- c.Exacerbation of granulomatous periodontitis
- d.Acute purulent periodontitis
- e.Radicular cyst

2.A 32-year-old patient visited a dentist with complaints of persistent pain in the 15th tooth. The diagnosis was made: exacerbation of chronic periodontitis 15. What type of anaesthesia is most appropriate for the removal of 15?

- a.Infraorbital, tuberal, palatal
- b.Tubal, plexus anaesthesia
- c.Tubal, palatine anaesthesia
- d.Plexus, incisal anaesthesia
- e.Infiltration anaesthesia around 15.

3.A 42-year-old patient sought the help of a dental surgeon for an exacerbation of chronic periodontitis 26. After examination, the surgeon decided to extract tooth 26. What anaesthesia should be used?

- a.Infraorbital, tuberal and palatal
- b.Tuberal and palatal
- c.Torusal and palatal
- d.Infiltration anaesthesia of the vestibular and palatal surfaces
- e.Incisal and palatal.

4.A girl of 18 years old started to have pain in the 22nd tooth a week ago, which was treated and filled several years ago. Over the past two days, the pain has increased. Objectively: The 22nd tooth is filled, percussion is sharply painful, the mucous membrane is hyperaemic and swollen. On the targeted radiograph: around the apex of the root of 22 - bone thinning 0.4 \* 0.5 cm without clear contours. Make a diagnosis:

- a.Suppuration of radicular cyst
- b.Exacerbation of chronic periodontitis
- c.Acute purulent periodontitis
- d.Acute purulent pulpitis
- e.Chronic fibrous periodontitis

5.A 47-year-old patient complains of persistent pain in the 27th tooth, which is aggravated when biting down. Objectively: the face is symmetrical, the skin is normal, the mouth opens freely, the mucous membrane of the alveolar ridge at the level of the 27th tooth is swollen, hyperemic. In tooth 27, a deep carious cavity connects to the pulp chamber. Percussion of tooth 27 is sharply painful. What is the preliminary diagnosis?

- a.Chronic odontogenic maxillary sinusitis on the left
- b.Acute general purulent pulpitis
- c.Acute purulent periodontitis
- d.Acute purulent periodontitis of the upper jaw
- e.Exacerbation of chronic periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.

3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

## **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №22

**TOPIC:** X-RAY DIAGNOSTICS OF PERIODONTITIS. CONCEPTS OF OSTEOPOROSIS, OSTEOSCLEROSIS, DESTRUCTION, DEFORMATION, HYPERCEMENTOSIS, ETC.

**I. Topic relevance:** X-ray diagnostics is one of the main and most effective diagnostic methods in dentistry, including for the identification of periodontitis. X-ray methods also allow for differential diagnostics of periodontitis in its various forms and phases. However, it is worth noting that not all forms of periodontitis are visible on X-rays, which is a significant disadvantage of this diagnostic method.

### II. Study goal:

#### 2.1. *Student has to know:*

- main types of X-ray examinations in dentistry;
- definition of osteoporosis, osteosclerosis, destruction, deformation, hypercementosis;
- radiological manifestations of various forms of periodontitis;
- differences between acute and chronic forms of periodontitis on radiographs;

#### 2.2 *Be able to:*

- use a variety of devices for radiological diagnostics in dentistry;
- examine radiographic images;
- identify signs of acute and chronic periodontitis on X-ray images.

### III. Content of the topic

In the acute process, pathological changes in the periodontium may not be detected on the radiograph or the periodontal gap may be widened. In the case of exacerbation of the chronic process, changes occur that are characteristic of granulating, granulomatous, and rarely fibrous periodontitis.

In apical granulating periodontitis, changes are noted in the form of an expansion of the periodontal line near the apex of the tooth as a result of resorption of the socket walls. There is also bone thinning with uneven contours. The outline of the root apex may be uneven due to resorption of the tooth cement and dentin. In the presence of odontogenic granulomas in the soft tissues, the destructive focus at the root apex is always small. In patients with marginal granulating periodontitis, similar changes are found in the marginal periodontium, where bone resorption occurs both horizontally and vertically.

In case of granulomatous periodontitis, a rounded focus of bone thinning with clear, even borders is determined in the periapical area on the radiograph. In the inactive course of granulomatous periodontitis, the focus of liquefaction at the root apex is surrounded by a zone of sclerosed bone. If the treatment is carried out correctly, the granulomatous lesion should be destroyed and changes characteristic of fibrous periodontitis or the formation of a sclerosed bone area should be detected in its place.

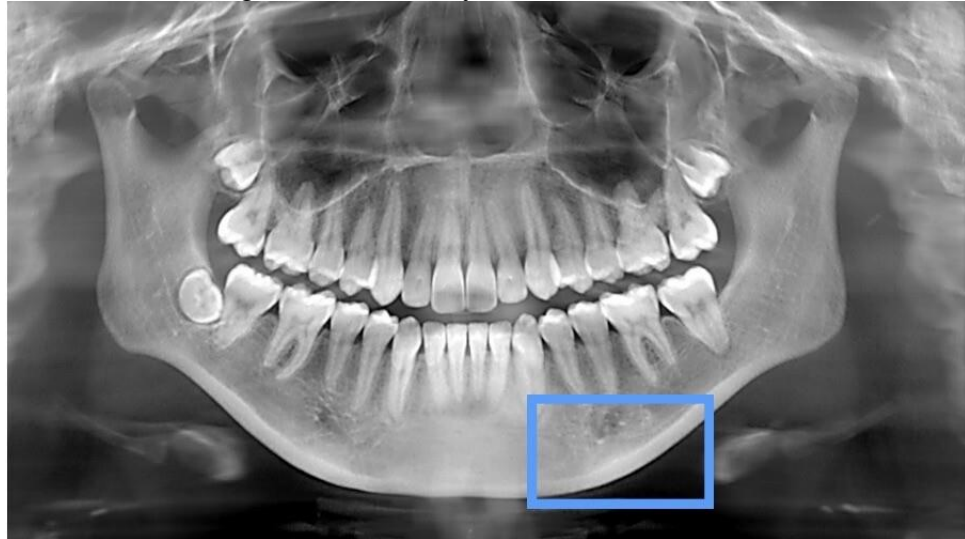
On the radiograph, fibrous periodontitis is characterised by widening of the periodontal line, mainly at the apex of the tooth root. Sometimes, as a result of hypercementosis, a significant thickening of the apical part of the root is detected. The bone plate bordering the enlarged periodontal line is often thickened and sclerosed.

Radiological signs of exacerbation of chronic periodontitis. The diagnosis of chronic periodontitis in the exacerbation stage is based on the clinical manifestations of acute periodontitis and the radiological picture of chronic periodontitis. Granulating and granulomatous periodontitis are more likely to exacerbate, and fibrous periodontitis is less likely to exacerbate. Subjective symptoms indicating exacerbation of chronic periodontitis include recurrence of acute periodontitis symptoms and formation of fistulas on the gums or facial skin.

Exacerbation of chronic fibrous periodontitis on radiographs is represented by foci of destruction and osteoporosis in the area of a new inflammatory focus against the background of phenomena characteristic of fibrous periodontitis on the part of the periodontal crevice and the compact lamina of the tooth socket. The radiological picture of granulomatous periodontitis in the acute stage is

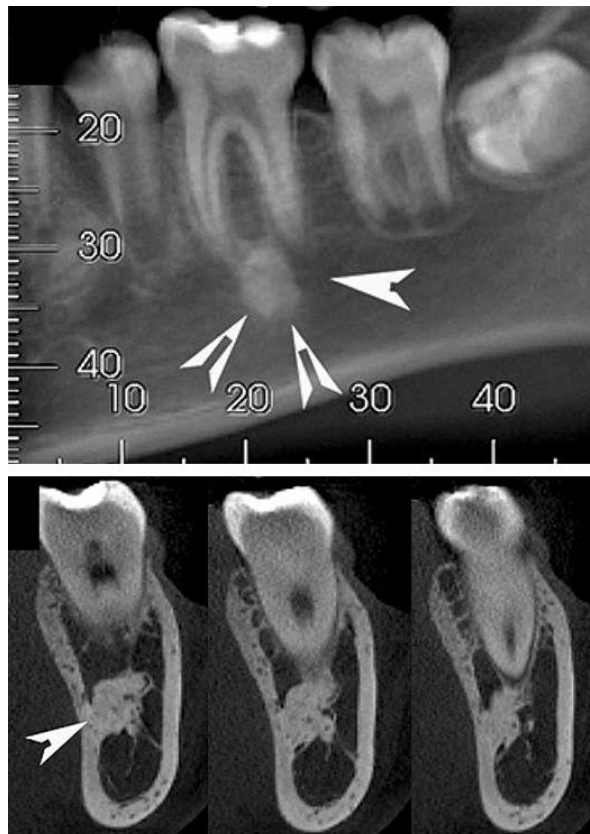
characterised by a loss of clarity of the bone destruction boundaries in the apical part of the tooth, indistinct periodontal line in the lateral parts of the periodontium, as well as the appearance of destruction and osteoporosis in the periphery of the granuloma. Exacerbated chronic granulomatous periodontitis is radiographically characterised by more pronounced blurring of the destruction focus contours against the background of an enlarged osteoporosis zone.

Osteoporosis is a condition that causes bone loss. As the tissue breaks down at the microscopic level, bones become more fragile and can easily fracture.



**Pic.22.** Osteoporosis found by an AI

Osteosclerosis is a pathological condition that increases bone density, manifested in the form of thickening of bone trabeculae and compact bone substance. Spongy bone with osteosclerosis acquires a narrow looped structure. Due to the fact that the compacted bone tissue becomes less transparent to X-rays, osteosclerosis can be diagnosed by X-ray examination methods.



**Pic. 23.** X-ray of osteosclerosis

Destruction is the gradual destruction of bone with its replacement by other pathological tissue (pus, granulation, tumour mass, etc.). Destruction can be focal, diffuse, osteolytic, and marginal. The degree of destruction is assessed by localisation, number of foci or areas, shape, contours, structure and size.

Bone deformity is a group of congenital and acquired pathological conditions that are accompanied by changes in the length, shape and axis of bones, including the jawbone. External signs of deformity are accompanied by dysfunction of a particular bone.

Hypercementosis is a process of excessive deposition of secondary cement, during which the tooth root undergoes deformation: it thickens and characteristic protrusions are formed on it.



**Рис.24.** Tooth hypercementosis

## II. Control questions for the class topic:

1. Definition of osteoporosis, osteosclerosis, destruction, deformation, hypercementosis.
2. Difference in X-ray between acute and chronic periodontitis.
3. Radiological signs of different forms of chronic periodontitis.
4. Methods of performing X-ray examinations in dentistry.
5. Methods of protecting the doctor, patient and assistant from the negative effects of X-rays.

## V. Control test tasks and/or case tasks:

1. A 45-year-old patient came to the dental clinic with complaints of pain when biting in the area of the 45th tooth. To confirm the diagnosis, the method of electro-odontodiagnostics was used. Which indicator of electro-odontodiagnostics will indicate pulp necrosis and apical periodontitis?
  - a. 2-6 microA
  - b. 20-40 microA
  - c. 50-60 microA
  - d. 100 microA and more
  - e. 10-12 microA
2. A 9.5-year-old child complains of the destruction of the lateral tooth of the upper jaw on the right. Objectively: the crown part of the 16th tooth is decayed, the tooth cavity is open. Root canal probing at the level of the lips is slightly painful, accompanied by intense bleeding. Percussion of the tooth is painless. A fistula is noted on the mucous membrane of the alveolar process in the projection of the roots of 16. Determine the diagnosis:
  - a. Chronic fibrous pulpitis
  - b. Chronic gangrenous pulpitis
  - c. Chronic fibrous periodontitis
  - d. Chronic granulating periodontitis
  - e. Chronic granulomatous periodontitis.
3. A 32-year-old patient was diagnosed with chronic granulomatous periodontitis of 21 teeth. The doctor decided to resect the apex of the tooth root. Choose the optimal filling material for hermetic isolation of the root canal:

- a.Zinc-eugenol material and gutta-percha
- b.MTA
- c.Resorcinol-formalin paste
- d.Epoxy resin and gutta-percha
- e.Glass ionomer cement.

4.A 27-year-old patient complains of recurrent pain in the front of the upper jaw. An X-ray of the upper jaw reveals a rounded bone destruction area near the apex of the root of the 12th tooth with a diameter of up to 0.5 cm. The root canal of the 12th tooth is filled to the apex. Diagnosis: chronic granulomatous periodontitis of the 12th tooth. What is the method of surgical treatment?

- a.Periostotomy
- b.Replantation of the 12th tooth
- c.Resection of the apex of the root of the 12th tooth
- d.Cystectomy
- e.Extraction of the 12th tooth

5.In the treatment of a patient with chronic granulomatous periodontitis of the 26th tooth, root canal irrigation was performed with an antiseptic that has the ability to penetrate the structure of biofilms, destroy them and cause dissolution of organic tissues. What antiseptic was used by the doctor?

- a.Saline solution
- b.Furacilin solution
- c.Sodium hypochlorite solution
- d.Chlorhexidine solution
- e.Hydrogen peroxide solution

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.



## METHODOLOGICAL RESEARCH №23

**TOPIC:** TREATMENT OF ACUTE SEROUS AND PURULENT APICAL PERIODONTITIS OF INFECTIOUS AND NON-INFECTIOUS (MEDICATION AND TRAUMA) ORIGIN. EMERGENCY CARE. SEQUENCE AND FEATURES OF THE TREATMENT STAGES. ANTIDOTE THERAPY. MODERN TECHNOLOGIES AND INSTRUMENTS FOR ROOT CANAL TREATMENT. FEATURES OF FILLING

**I. Topic relevance:** The choice of treatment tactics for periodontitis depends on the etiology and progression of the pathological process (acute, chronic, exacerbation of chronic), anatomical and topographic features of the roots of the teeth, the presence of a focus of periapical pathology, as well as the general condition of the patient.

### **II. Study goal:**

#### **2.1. Student has to know:**

- basic principles of periodontitis treatment;
- list and classification of instruments for root canal treatment;
- the essence and methods of antidote therapy;
- features of root canal filling in periodontitis;

#### **2.2 Be able to:**

- choose methods and materials for the treatment of various forms of periodontitis;
- provide emergency care to patients;
- use endodontic instruments in the treatment of periodontitis.

### **III. Content of the topic**

**The available methods of periodontitis treatment can be divided into 4 groups:**

- 1) conservative - aimed at preserving the anatomical and functional value of a diseased tooth;
- 2) conservative-surgical - aimed at preserving the basic functions of the tooth. It involves the removal of a part of the root or peri-root tissue destroyed by a pathological process that cannot be treated;
- 3) surgical - removal of the diseased tooth and pathologically altered alveolar bone;
- 4) physical.

Conservative treatment of periodontitis is carried out to eliminate the focus of periodontal infection (pathologically altered pulp tissues, dentin, root canal microflora and microtubules) by thorough instrumental and medicinal treatment of root canals and their obturation, which creates conditions for the regeneration of periodontal tissues and the periapical area.

Indications for surgical and conservative surgical methods are the ineffectiveness or impossibility of conservative treatment in full or the presence of contraindications to its implementation, namely: - a diseased tooth is the cause of an acute septic condition, chronic infection and intoxication of the body; - complete destruction of the tooth crown, if its restoration is impossible; - large perforations of the root wall or the bottom of the tooth cavity.

Conservative method of periodontitis treatment. Treatment of acute and exacerbated chronic periodontitis. One of the main tasks of treatment of acute and acute chronic periodontitis is the fastest possible elimination of the inflammatory process in periodontal tissues, pain relief and prevention of the spread of the inflammatory process. Treatment of periodontitis involves the treatment of the root canal, microtubules and periapical inflammation. The doctor's tactics depend on the etiology of periodontitis, the stage of the inflammatory process and the general condition of the patient.

Treatment of acute infectious periodontitis. Acute infectious periodontitis has a very short phase of intoxication, but a strongly pronounced exudation that develops quite quickly. The

exudate formed in the periapical space can move into the adjacent tissues in different ways: through the root canal, through the alveolar bone of the jaw under the periosteum on the vestibular or lingual (palatal) side and further under the mucous membrane, along the periodontal cleft to the circular ligament. The main tasks in the treatment of acute infectious periodontitis (both serous and purulent) are: pain relief, creation of conditions for exudate outflow, antimicrobial and anti-inflammatory treatment, cessation of the prevalence of inflammation of periodontal tissues, restoration of the anatomical shape and function of the tooth. The treatment of acute periodontitis consists of a number of stages and is carried out in several visits.

**The first visit includes the following stages of treatment:**

1. Anaesthesia. Taking into account inflammatory changes in the soft tissues around the diseased tooth, the presence of an abscess, and sometimes difficulty opening the mouth, it is advisable to perform a conduction anaesthesia.

2. Antiseptic treatment of the oral cavity. Patients with acute periodontitis, especially purulent periodontitis, due to their severe condition, cannot maintain oral hygiene, take only softened food, so the teeth are covered with plaque infected with various microorganisms. Before starting treatment, it is necessary to remove soft plaque with hydrogen peroxide and irrigation with furatsilin solution and herbal decoctions.

3. Preparation of the carious cavity taking into account the topographic and anatomical features of the diseased tooth. The tooth cavity should be opened so that there is free access to the root canal. In 2-3-rooted teeth, after opening and expanding the tooth cavity, the mouth of the root canal is opened using intra-root burs of the Gates Glidden type.

4. Removal of putrid masses from the root canal. The quality of further treatment depends on the thorough removal of infected pulp tissue decay, remnants of filling material, infected softened dentin and other irritants. Putrid masses are removed from the canal with the help of a pulp extractor gradually, layer by layer, very carefully, so as not to push infected tissues into the periapical opening, constantly treating the canal with antiseptic solutions. After removing all the putrid masses, a serous or purulent exudate with or without blood may be released. The exudate is sucked out with cotton pads or paper pins.

5. Medicinal treatment of the root canal. It is performed with one of the non-irritating and fast-acting medicinal solutions (1% chlorhexidine solution, 1% iodinol solution, 3% hydrogen peroxide solution, etc.) The treatment can be carried out using a syringe or cotton swabs until a clean swab is obtained.

6. Opening the apical foramen. If the exudate is not discharged into the canal, i.e. the apical foramen is not opened, then after thorough drug treatment and drying of the root canal, it is opened. For the outflow of exudate through the root canal, drainage of the apical foramen is mandatory. The apical foramen is opened with a root needle, file or rimer carefully, with rotational movements around the axis, pushing the instrument to the apical area. This manipulation should be carried out with great care to avoid injury and secondary infection of periodontal tissues.

Difficult to pass canals, as well as in case of obliteration of the apical foramen, its opening and dilation of the canals are performed using manual and machine reamers (reamers and files). After the exudate is drained, the canal is rinsed and a turunda abundantly moistened with enzymes (trypsin, chymotrypsin) and antibiotics (streptomycin, lincomycin) is left in it for 1-2 days under a loose or hermetic dressing.

In the presence of a subgingival or subperiosteal abscess, it is opened and drained. The type of dressing and the nature of the injected substance depend on the general condition of the patient, the severity of the inflammatory process, the amount and nature of exudate discharged through the root canal.

Acute purulent periodontitis, which is usually accompanied by a violation of the patient's general condition, severe collateral edema, and a large amount of purulent exudate, is treated by applying a loose dressing. Enzyme solutions with antibiotics in isotonic sodium chloride solution or 0.25% novocaine solution; sorbents, antiseptics are left in the root canal. The patient should be prescribed general treatment: detoxification therapy, plenty of warm vitamin drinks, analgesics, antipyretics, desensitising drugs. In addition, rinsing with 0.02% furatsilin solution, 1% sodium bicarbonate solution, and decoctions of medicinal plants is prescribed 6-8 times a day.

In the case of acute serous periodontitis, which is characterised by mild local pain, a small amount of exudate, and an unexpressed reaction of the oral mucosa, the root canal is treated with aqueous solutions of enzymes, antiseptics, etc., an emulsion of enzymes with nitrofurans or combined sorbent preparations is left in the root canal, and the tooth is covered with a sealed dressing. During the second visit, the choice of further treatment depends on the patient's complaints and the results of an objective examination: percussion, palpation, the condition of the root canal turunda, and the presence of exudate. It is also taken into account whether the dressing was applied hermetically or loosely. If there are no complaints after closing the tooth with an airtight dressing, the tooth has withstood the sealing well, the reaction to percussion is negative or slightly positive, the turunda is clean and dry, and there is no exudate in the canal, a thorough preparation of the carious cavity, medical and instrumental treatment of the canal, and filling of the canal and carious cavity are performed. These stages are carefully outlined in the treatment of chronic periodontitis.

Sometimes the patient has no complaints, but the examination reveals a positive reaction to percussion, and a small amount of purulent or serous exudate is found in the root canal. In such cases, after preparation of the carious cavity, tooth cavity and instrumental treatment of the root canal, the latter is thoroughly treated with an enzyme solution with an antibiotic or sorbent, a turunda with an emulsion of enzyme and antibiotic is left, a sealed dressing is reapplied for 2 days and the treatment is completed at the next visit.

The treatment of acute toxic (drug-induced) periodontitis does not fundamentally differ from the treatment of acute infectious periodontitis. The success of treatment depends on the prompt elimination of the cause of inflammation, removal of necrotic masses or toxic substances from the canal and the introduction of anti-inflammatory and antidote drugs into the periodontal tissues. **To treat periodontal inflammation caused by the use of devitalising pastes (arsenic), the following steps are performed:**

1. Removal of the devitalising paste.
2. Devitalisation of the pulp.
3. Treatment of the root canal with specific antidotes containing sulfhydryl groups - 5% solution of unithiol, sodium thiosulfate. These solutions are used to rinse the root canals abundantly and leave them on the socket for 1 to 2 days under a sealed dressing. In multi-rooted teeth and difficult root canals, iodine electrophoresis should be performed.
4. On the second visit after the disappearance of symptoms of exudation and exacerbation, further medical treatment of the canals with 5% iodine solution, 1% iodinol solution and instrumental treatment of the canals in full is carried out.
5. Filling of the canals up to the apical foramen with silers with prolonged antiseptic and anti-inflammatory effect.

Treatment of traumatic periodontitis. Acute periodontitis, which occurs as a result of errors and complications in the treatment of pulpitis, haematoma formation in case of pulp extirpation, removal of formalin-containing silers beyond the root apex, root perforation, etc., is treated mainly with physical methods: electrophoresis of 1% potassium iodide solution, 10% calcium chloride solution, ultraviolet light, laser therapy. If after 5-6 treatment sessions the pain does not decrease

and even increases, it is necessary to unseal the root canal and treat the tooth using the lithium-ion method. If, after 5-6 treatment sessions, the pain does not decrease and even increases, it is necessary to unseal the root canal and treat the tooth according to the method of treating acute infectious periodontitis.

#### **IV. Control questions for the class topic:**

1. Classification of endodontic instruments.
2. Methods of treatment of various forms of periodontitis.
3. Antidote therapy: indications, contraindications, technique.
4. Features of root canal filling in periodontitis.
5. Modern technologies of root canal treatment.

#### **V. Control test tasks and/or case tasks:**

1. A 24-year-old patient complains of a constant growing pain in the tooth on the lower jaw on the right, which increases when biting. Objectively: Tooth 46 has a carious cavity that does not connect with the tooth cavity, percussion is slightly painful, probing the walls and bottom of the cavity is painless. No changes are found on the radiograph. Give the most likely diagnosis:
  - a. Acute diffuse pulpitis
  - b. Acute purulent periodontitis
  - c. Acute serous periodontitis
  - d. Acute chronic pulpitis
  - e. Acute limited pulpitis
2. The patient complains of acute pain 16, a feeling of 'grown tooth'. The pain appeared 3 days ago. Previously, the tooth did not bother. Objectively: the submandibular lymph nodes are enlarged, painless during palpation. The gingival crease in the area of the projection of the apices of the roots of the 16th tooth is hyper-emphasised, painful. Vertical and horizontal percussion of the tooth is sharply painful, probing is painless. There is no reaction to temperature stimuli. EOD-150 microA. On the radiograph: periodontal gap without expressed pathological changes. What is the most likely diagnosis?
  - a. Acute limited pulpitis
  - b. Acute purulent periodontitis
  - c. Acute purulent pulpitis
  - d. Acute serous periodontitis
  - e. Hyperemia of the pulp.
3. The patient with the aim of removing 47 due to chronic periodontitis was blocked by the inferior colliculus nerve, which enters the mandibular foramen. At what distance from the anterior edge of the mandibular branch is this foramen located?
  - a. 15 mm
  - b. 20 mm
  - c. 25 mm
  - d. 30 mm
  - e. 35 mm
4. A dentist is treating a 52-year-old man for chronic periodontitis. Radiographically: the medial root canals are curved, in the area of the apex of the medial root there is a focus of bone destruction with uneven contours measuring 0.2x0.2 cm. Which of the following drugs is optimal for intracanal electrophoresis?
  - a. 1% novocaine solution
  - b. 1% solution of decamethoxine
  - c. 3% solution of copper sulphate

d.0.1% trypsin solution

e.10% potassium iodide solution

5.A 52-year-old patient complains of pain, periodic appearance of a fistula on the gum in area 15. The tooth was treated 1.5 years ago for caries. Objectively: there is a filling in 15. There is a fistula in the projection of the root apex, purulent exudate is released when pressed. Percussion of the tooth is painful. On the radiograph, the root canal is not filled, near the root apex there is a focus of destruction with fuzzy contours. What is the most possible diagnosis?

a.Exacerbation of granulating periodontitis

b.Chronic granulating periodontitis

c.Exacerbation of granulomatous periodontitis

d.Acute purulent periodontitis

e.Radicular cyst

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.

## METHODOLOGICAL RESEARCH №24

### TOPIC: TREATMENT OF APICAL PERIODONTITIS OF SINGLE-ROOTED AND MULTI-ROOTED TEETH. PRINCIPLES OF TREATMENT. METHODS OF INFLUENCING THE APICAL FOCUS OF INFECTION. SEQUENCE AND FEATURES OF TREATMENT METHODS. EFFECTIVENESS OF TREATMENT. INDICATIONS AND TREATMENT OF APICAL PERIODONTITIS IN A SHORT TIME. MISTAKES IN THE DIAGNOSTICS AND TREATMENT OF PERIODONTITIS. CAUSES, METHODS OF ELIMINATION AND PREVENTION

**I. Topic relevance:** Treatment of chronic periodontitis is a quite difficult task. Due to the complex and highly variable anatomical and topographical structure of the teeth, the presence of numerous dentinal tubules containing plasma processes, it is almost impossible to completely eliminate infected tissues.

#### II. Study goal:

##### 2.1. *Student has to know:*

- basic principles of treatment of apical periodontitis in single- and multi-rooted teeth;
- methods of influence on the apical focus and their effectiveness;
- possible techniques for the treatment of apical periodontitis in a short time;
- complications during treatment, mistakes and methods of their prevention and/or elimination;

##### 2.2 *Be able to:*

- correctly diagnose various forms of apical periodontitis;
- establish the sequence of stages in the treatment of apical periodontitis;
- provide patients with advice on the prevention of complications after the treatment of apical periodontitis.

#### III. Content of the topic

The main objectives of chronic periodontitis treatment are to eliminate the focus of periodontal infection and further influence the microflora of the root canals and their branches, eliminate the effects of toxins and biogenic amines - tissue protein breakdown products; eliminate or reduce inflammation in the periodontium; provide conditions for the regeneration of all periodontal components; and desensitise the patient's body.

*Chronic periodontitis can be treated* in one or several visits, but regardless of the number of visits, treatment consists of a number of stages. Only in case of conscientious implementation of each stage can success be achieved in the treatment of this complex dental pathology.

**Stage 1.** Preparation of the carious cavity and tooth cavity. The purpose of the first stage is to create free access to the root canal openings. For a successful preparation, it is necessary to clearly define the topographic and anatomical features of the diseased tooth, for which it is advisable to have a targeted radiograph. It is known that in a depulped tooth, replacement dentin cannot be formed or remineralised, so necrotomy of the carious cavity should be carried out especially carefully, otherwise the areas of softened dentin will become a focus of infection, which can lead to the destruction of the rest of the tooth crown.

**Stage 2.** Expansion of the root canal mouths for free access to them and their further processing. The mouth is expanded with special intracanal burs or small spherical burs.

**Stage 3.** Removal of putrid (infected) masses from the canal. Under a layer of antiseptic solution, the remnants of necrotic pulp tissue are removed with a pulp extractor to prepare the canal for instrumental treatment. For this purpose, a 0.5-1 % chloramine solution, a 0.02 % chlorhexidine bigluconate solution, which release atomic chlorine that denatures microbial cytoplasmic proteins, and a 1 % iodinol solution are used. The root canal mouths, especially their apical third, are the most infected, so it is necessary to remove the putrid masses in fractions, changing the antiseptic baths during the removal of each new portion of decay. Work very

carefully in the apical third of the root canal so as not to push the contents into the periapical tissues.

**Stage 4.** Instrumental root canal treatment is the most important stage of endodontic treatment. The purpose of this stage is to remove the infected dentin from the canal walls, provide access to the apical opening and, if necessary, open it and create conditions for further filling of the canal. Root canal treatment begins with determining its working length. The length of the root can be determined in one of three ways: radiographically, using calculation tables, and electronometrically using an apex locator. Root canal expansion and formation is carried out using special sets of endodontic instruments using different methods. The most common is the standard method, according to which the canal is expanded with K-reamers or K-files with a sequential increase in their diameter by 3-4 sizes, not reaching the radiological length by 1 mm. This technique is advisable for instrumental treatment of straight, well-passable canals, especially in anterior teeth.

Nowadays, the most popular technique for instrumental treatment of narrow canals is the "step-back" canal preparation technique (a "step back" is the expansion of the canal from the apical opening to the mouth). According to this technique, endodontic instruments are used from smaller to larger sizes. This technique is described in detail in the section "Pulpit". Start working in the canal with the smallest K-file (010), which freely passes to the marked depth of the canal, gradually use larger K-files; before the physiological narrowing, the root canal should be expanded to the file size 025. The instrument should be rotated only clockwise and constantly return to smaller instruments. After each instrument change, the canal is rinsed with an antiseptic to prevent blockage of the root canal tip with dental debris.

The next stage of this technique is to expand the canal with larger instruments (up to 040 - 045), but of shorter length to ensure the creation of a uniform conical shape of the canal in the direction of the mouth. Then the walls of the canal are levelled with a file (Hedström), rinsed after each instrument insertion, and the canal is ready for filling.

Recently, flexible endodontic instruments with a rounded tip made of nickel-titanium alloy have been developed and a technique for working with such instruments called "Crown down" ("step-down") has been proposed - the expansion of the canal from the mouth to the apex. This technique is based on the sequential replacement of endodontic instruments from large to smaller sizes. The canal is expanded from the oral part, gradually moving to the middle and then the apical part.

Root canal treatment using the *Balanced force method* has also become widespread. Methodology: the endodontic instrument is inserted 1/3 of the way into the canal and manually rotated counterclockwise. During its rotation, a slight pressure should be applied in the apical direction at the same time. The balance of these two forces will remove dentin without clamping the file. It is advisable to use flexible instruments made of nickel-titanium alloy with a rounded tip to perform this technique.

**Instrumental treatment of the root canal is considered complete if the root canal meets the following requirements:**

- is completely free of infected dentin;
- has a conical shape along the entire length from the apex to the mouth;
- is sufficiently dilated;
- has a formed apical stop;
- dry, clean, sterile.

Drug treatment of root canals during the treatment of periodontitis. The main objectives of the drug treatment are:

1. Influence on the etiological factor - infection, toxins, chemical toxic substances, etc. contained in the root canal and its branches, microtubules and periapical area.
2. Anti-inflammatory effect on damaged periodontal tissues.
3. Stimulation of regeneration processes of periodontal tissues and damaged alveolar bone.

*Depending on the duration of action on microorganisms and damaged periodontal tissues, all medicines can be divided into 2 groups:*

1. Drugs of instant or short-term action. their effect begins in 5-10 s and lasts 1-3-5 min. These are mainly drugs whose active ingredient is gases and gaseous substances (chlorine, iodine, oxygen, etc.).

2. Long-acting drugs (1-3 - 5 - 7 days). These drugs or their mixtures have not only antiseptic or antimicrobial effects, but also have both anti-inflammatory and regenerative effects - they affect the inflammatory process in periapical tissues.

The success of the treatment depends on the correct choice of the drug for the root canal treatment. Since both aerobes and anaerobes, non-proliferative microorganisms, play a significant role in the etiology and pathogenesis of inflammatory processes in the periodontium (acute and chronic), a positive treatment effect can be obtained by using medications that act on all types of microflora. To do this, you need to know the main clinical signs of a particular type of microorganism.

For example, clinical signs of anaerobic infection include a pungent putrid odour from the canal, thick yellowish-grey pus, moist gangrenous grey-black decay, and no or very low therapeutic effect from previous use of antibacterial drugs. Coccal microflora is characterised by a large amount of thin purulent light exudate without a noticeable odour. In order to influence anaerobes, it is advisable to use nitrofurans, 1-0.5 % dioxidin solution, bactrim suspension, as well as metronidazole, fusidine sodium, which in this case should be prescribed to patients according to the regimen.

Since patients with chronic periodontitis or its exacerbation have a significant contamination of the root canal with pathogenic staphylococcus aureus resistant to other antiseptics, the use of an ectericide or chlorophylliptic is justified.

When choosing a drug for root canal treatment, one should take into account not only the duration of its bactericidal and bacteriostatic action, solubility in water and biological fluids, but also the nature and stage of periodontal tissue inflammation and the patient's general condition.

Root canal filling in patients with periodontitis is an important stage of endodontic therapy. In case of its high-quality performance, two main tasks are solved. First of all, root canal filling aims to create a barrier between the external and internal environments of the body. The peculiarities of the tooth cavity morphology do not allow to completely remove the decayed organic substances and to achieve a state of sterility of the canal. Therefore, hermetic obturation of the canals is the only way to block and neutralise toxic decay products and microorganisms in the canal, apical delta and dentinal tubules. Secondly, the root canal filling material inevitably comes into contact with the periodontium, so it must be a biologically neutral substance that does not have an irritating effect on the tissues.

The root canal filling should protect the periodontium from external irritants. In addition, since there is an inflammatory process in the periapical tissues, the filling should play the role of a kind of therapeutic dressing that has a medicinal effect on inflammation and thus stimulates regeneration processes. This role of a root canal filling can be realised, first of all, if it is inserted into the root canal and filled tightly to the periodontium. Only in this case, conditions are created for a biological effect on the pathological focus in the periapical tissues.

Regardless of which filling material is chosen for root canal obturation, the filling will be considered to be correctly performed only if the canal is densely obturated along its entire length, especially in the apical part. The optimal level of filling is the level of the apical foramen. It is quite difficult to achieve a root canal filling exactly at the level of the apical foramen. A slight extension of the filling material beyond the apex is not a very serious complication, but it is not allowed to deliberately extend the filling material beyond the apex or fill the focal point of destruction of the collar bone with it. Particular care should be taken when working with materials that have high irritant properties and do not resorb from the periapical area.

Thus, the procedure for the treatment of periodontitis, regardless of clinical features, consists of the following sequential stages:



1. Preparation of the carious cavity and tooth cavity.
2. Antiseptic treatment and removal of putrid masses from the tooth cavity and canals.
3. Determination of the length of the root canal.
4. Instrumental treatment of the canal.
5. Medicinal treatment of the canal.
6. Zaapical therapy.
7. Root canal filling.
8. Filling or restoration of the crown part of the tooth.

The number of patient visits depends on the time required to complete all these stages. Some forms of periodontitis can be treated in one session, while other forms require 2-3-5 visits. It all depends on the success of each stage and the dynamics of the clinical condition.

#### **Complications arising after periodontitis treatment**

1. At different times after the treatment of periodontitis, asymptomatic progression of the pathological process in the periodontium is possible, which can lead to chronic osteomyelitis, odontogenic cysts, etc. Most often, this complication occurs in patients with reduced immunity, an individual reaction to the filling material or in case of resorption of the endocanal filling. This pathology is detected by X-ray. It requires immediate tooth retreatment. If it is not possible to treat the diseased tooth qualitatively, it should be extracted as a focus of chronioseptic condition.

2. Odontogenic maxillary sinusitis is a fairly common complication of chronic periodontitis. Its development can be caused by destruction of the spongy substance of the alveolar ridge by a pathological process, infection of the maxillary sinus, its trauma during instrumental root canal treatment of the non-root 5, 6, 7 teeth, removal of filling material into the sinus cavity. Exacerbation may occur in 1-2 months or in 1 - 2 years. In such cases, the causative tooth is removed and sinusitis is treated.

#### **IV. Control questions for the class topic:**

1. Principles of treatment of apical periodontitis.
2. Methods of influence on the apical focus, medications and their effectiveness.
3. Sequence of stages in the treatment of chronic apical periodontitis.
4. Indications and methods of treatment of periodontitis in a short time.
5. Mistakes in the diagnosis and treatment of periodontitis.

#### **V. Control test tasks and/or case tasks:**

1. An 11-year-old boy has no complaints. Objectively: there is a significant carious cavity in 46 connected to the tooth cavity. Percussion of the tooth is painless, the mucous membrane in the area of projection of the apices of the roots of 46 is unchanged. Probing of the root canal mouth is painless. What is the most possible diagnosis?

- a. Chronic deep caries
- b. Chronic medium caries
- c. Chronic pulpitis
- d. Acute periodontitis
- e. Chronic periodontitis

2. In an 11-year-old child, during oral cavity rehabilitation, a deep carious cavity with softened dentin was found in 14, a connection with the tooth cavity was determined; probing, reaction to thermal stimuli and percussion were painless. The gingiva in area 14 is paste-like, cyanotic. On X-ray: in the area of the unformed apex of root 14 - destruction of the alveolar cortical plate and small bone tissue with an indistinct contour (chronic granulating periodontitis). What should be the tactics?

- a. Tooth extraction surgery
- b. Endodontic treatment, the tooth is open
- c. Paraformaldehyde paste, dentin dressing
- d. Calcium-containing paste, permanent filling
- e. Endodontic treatment, antiseptic dressing.

3. A 14-year-old patient complained of a mild aching pain, without radiation, in the left mandible in area 37. On examination, a deep carious cavity connected to the tooth cavity is found on the chewing surface of 37, probing is painless, there is no reaction to thermal stimuli, vertical percussion is positive, and there are no changes in the radiograph in area of 37. What is the most possible diagnosis?

- a. Acute purulent pulpitis
- b. Acute purulent periodontitis
- c. Pulp hyperaemia
- d. Acute serous periodontitis
- e. Acute serous periodontitis.

4. The patient complained of constant acute pain, aggravated by touching the tooth on the lower jaw on the left, a feeling of an overgrown tooth. Previously, there was a spontaneous acute pain that was aggravated by cold. No radiological changes were detected. What is the most possible diagnosis?

- a. Exacerbation of chronic periodontitis
- b. Acute purulent periodontitis
- c. Acute purulent pulpitis
- d. Exacerbation of chronic pulpitis
- e. Acute serous periodontitis

5. A 42-year-old patient came to the clinic of prosthetic dentistry with a complaint of tooth pain in the left lower jaw. Objectively: 33 is covered with a metal crown, is a support for the clasp of a partial removable denture, intact. What is the reason for the painfulness of the abutment tooth?

- a. Traumatic periodontitis due to mechanical traction of the clamer
- b. Acute pulpitis
- c. Carious disease
- d. Chronic pulpitis
- e. Exacerbation of chronic pulpitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.: edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.

## METHODOLOGICAL RESEARCH №25

### TOPIC: USE OF PHYSICAL FACTORS IN THE COMPLEX THERAPY OF PULPITIS AND PERIODONTITIS. METHODS. EQUIPMENT

**I. Topic relevance:** The widespread introduction of physical methods into dental practice allows for the most accurate diagnostics of diseases and monitoring the effectiveness of treatment. Timely and correct prescription of physiotherapy makes it possible to quickly stop various signs of pathological processes in the maxillofacial area.

#### **II. Study goal:**

##### **2.1. Student has to know:**

- the concept of physical factors in the complex therapy of pulpitis and periodontitis;
- classification of physical methods of treatment of pulpitis and periodontitis;
- medicines used in the physical methods of treatment of pulpitis and periodontitis;
- methods of depophoresis, electrophoresis, diathermocoagulation;

##### **2.2 Be able to:**

- use various physical methods of treatment in the treatment of pulpitis and periodontitis;
- use equipment for complex therapy of pulpitis and periodontitis;
- choose the most appropriate method of treatment of pulpitis or periodontitis based on indications and contraindications for each method.

#### **III. Content of the topic**

Physical methods are used when it is necessary to influence the infection in the root canal and microtubules, as well as the inflammatory process in the periapical tissues. These methods affect the bacterial flora, which is difficult to access and eliminate due to the complex topographic and anatomical properties of the endodontic tissue. In addition to the effect on the bacterial flora, physical methods activate biochemical processes in the periapical tissues, which contributes to the reversal of the pathological process. As a result of their action, fibrosis of granulation tissue increases and the processes of alveolar bone regeneration are accelerated.

For the treatment of periodontitis, physical methods can be used both independently (e.g. diathermocoagulation, electrophoresis) and in complex therapy aimed at stimulating reparative processes in periapical tissues, as well as preventing complications. In some cases, when drug therapy is unsuccessful or cannot be used (for example, in patients with allergies to certain drugs), these methods become the means of choice.

#### **Indications for the use of physical methods:**

1. Treatment of periodontitis in teeth with obstructed root canals, with fragments of instruments in them.
2. Treatment of periodontitis that does not withstand hermetic closure or is very slow to respond to drug treatment.
3. Treatment of chronic granulating periodontitis with persistent fistulas.
4. In patients with allergies to drugs that are most often used in dental practice, as well as in patients with reduced body resistance.
5. For the prevention and treatment of complications after endodontic treatment.

The most common physical method of treating periodontitis is electrophoresis of medicinal substances. Depending on the electric charge carried by the ion of the drug substance injected into the canal and periapex, the active electrode can be an anode or a cathode. Since the anode made of noble metal (platinum) is inserted into the canal as an active electrode, chlorine, chloride and hypochlorous acids, and oxygen are produced in the canal as a result of electrolytic dissociation of tissue fluids. Chloride and hypochlorous acids are also dissociated, additionally releasing chlorine. In essence, the method is a kind of chlorotherapy that leads to sterilisation of obstructed canals and their branches. Anodic sterilisation with ions of various metals is also used. The most commonly used electrolytes are zinc chloride, zinc iodide, zinc sulphate and copper sulphate. Negatively charged microorganisms moving with metal ions can partially escape from the dentinal tubules and periapex into the macrochannel, creating additional conditions for the inhibition and elimination of bacterial flora. Zinc ions, in addition to having a bactericidal effect, are able to

coagulate proteins in the endodontium. For the treatment of teeth with obstructed root canals, silver nitrate electrophoresis is used, except for the anterior teeth (they may be stained).

For the treatment of periodontitis, iodine electrophoresis is very common. The active electrode is a cathode that is placed in the canal or fixed in the tooth cavity. The electrolyte can be of three types:

1) an alkaline solution prepared *ex tempore*: Iodi puri - 7.5, Kalii iodati - 5.0, Aq. destil. - 10 ml (diluted 10 times);

2) saturated solution of potassium iodide (dissolve potassium iodide powder in 2-3 drops of distilled water until saturated). Potassium iodide solution is used to treat periodontitis of the anterior teeth;

3) in the treatment of molars, if the darkening of the crown is not significant, a 5-10 % tincture of iodine is used (Fig. 125). The electrophoresis procedure lasts 20 minutes, the current strength is about Z mA. The procedures are performed daily or every other day, depending on the form of periodontitis. The course of treatment is 3 to 5 procedures.

The therapeutic effect is associated with the action of chlorine and iodine ions, which move to the apex and penetrate dentinal tubes and apical tissues. In addition, the reaction in the channel near the cathode releases potassium, which forms potassium alkali with water, which lyses all organic matter. Hydrogen is also released in the form of gas bubbles. It carries the substances lysed in the canal into the tooth cavity with foam. Iodine ions have a bactericidal effect. In addition, oxygen is released in the root canal, which enhances oxidative processes, and cellular decay products have a local stimulating effect.

In the treatment of apical periodontitis, electrophoresis of calcium, copper, and zinc is also used.

Electrophoresis of a 10% calcium chloride solution is indicated in the treatment of acute and exacerbated chronic periodontitis, as calcium ions have analgesic and dehydrating effects in inflamed tissues. Copper ions have a strong antiseptic effect on anaerobes, so copper hydroxide electrophoresis is most effective in chronic granulomatous periodontitis.

Zinc chloride electrophoresis provides anti-inflammatory and stimulating effects in patients with chronic granulomatous periodontitis, because zinc ions coagulate proteins and inhibit the growth of granulation tissue. The course of treatment is 3 to 5 procedures.

To accelerate the treatment of acute purulent and exacerbated chronic periodontitis, especially in teeth that do not withstand tightness, the use of electrophoresis of proteolytic enzymes and their compositions with antibiotics is effective. Antibiotic and enzyme solutions are prepared *ex tempore*: 2 mg of chymotrypsin (or trypsin) is dissolved in 2 ml of isotonic sodium chloride solution and ZO 000 U of penicillin (streptomycin) is added, or 3 mg of trypsin is dissolved in 3 ml of microcide. One of these solutions is injected into the root canal. The active electrode is the cathode, the current is 1 - 2 mA, the procedure lasts 15 minutes. The course of treatment is 3 - 4 procedures. In addition to endocanal electrophoresis, for the treatment of chronic periodontitis, 10% calcium chloride solution is used to influence the inflammatory process and accelerate bone regeneration.

**Ultraprophoresis** of medicinal substances is also used in the complex therapy of periodontitis. Ultrasound intensifies metabolism, enzyme activity, increases cell membrane permeability, resulting in the release of biologically active substances. In addition, ultrasound causes the dissociation of drugs and the accumulation of active ions in cells. This leads to the formation of a drug depot, which has a therapeutic effect at the subcellular level. Ultraprophoresis is prescribed in the following mode: intensity from 0.005 to 0.4 W/cm<sup>2</sup>, oscillation frequency 800 kHz - 2 MHz in continuous mode. The duration of the procedure is 10 minutes, and the course includes 5-7 procedures. Deprophoresis of copper-calcium hydroxide.

In order to increase the effectiveness of endodontic treatment, especially in the treatment of infected hard-to-reach canals, Professor A. Knappvost (1998) proposed the method of copper-calcium hydroxide deprophoresis. The essence of the technique is that the root canals are passed and extended to about 2/3 of their length. After that, an aqueous suspension of copper-calcium

hydroxide is injected into one of the canals, a needle electrode (-) is inserted, the electrical circuit is closed, and the procedure is performed. Then other channels are treated in the same way. At the end of the depophoresis course, the canals are sealed with a special alkaline cement containing copper.

**Mechanism of depophoresis action.** Under the influence of a constant electric current, hydroxyl ions (OH) and hydroxycuprate ions  $[\text{Cu}(\text{OH})_4]^{2-}$  penetrate the apical part of both the main canal and the deltaic branches. In the lumen of the canal, copper hydroxide accumulates, partially precipitates and corrodes the walls. In the area of the apical opening, in a neutral environment, hydroxycuprate ions decompose and turn into poorly soluble copper hydroxide  $[\text{Cu}(\text{OH})_2]$ , which also precipitates. As a result, "copper plugs" are formed, which reliably seal all the exits of the apical delta to the root surface, soft tissue decomposition occurs in the root canal lumen and adjacent tissues, while decomposition products are eliminated into the periapical tissues and resorbed by the body. At the same time, the lumen of the main canal and the apical delta are sterilised due to the bactericidal effect of the drugs used. In the unsealed part of the main canal, as well as in the deltaic branches, copper-calcium hydroxide lines the walls and creates a depot. The resulting "copper plugs", which encircle all the exits of the apical delta to the root surface, ensure the tightness, disinfection and long-term sterility of this part of the root canal. Due to the alkalisation of the environment and the therapeutic effect of copper-calcium hydroxide, the function of odontoblasts and bone regeneration in the periapical area are stimulated.

**Indications. Depophoresis** with copper-calcium hydroxide is indicated primarily in endodontic treatment of teeth with obstructed root canals, in addition, this method is recommended in cases of significant infection of the canal contents, breakage of the instrument in the lumen of the canal (without going beyond the apex), in case of unsuccessful treatment of the tooth with traditional methods in the presence of a wide apical opening.

**Contraindications** to depophoresis: malignant tumours, severe forms of autoimmune diseases, pregnancy, intolerance to electric current, allergic reaction to copper.

**Depophoresis** is a medical procedure performed by a dentist directly in the dental chair. **Method of copper-calcium hydroxide depophoresis.** During the first visit, the root canals are passed and expanded by about 2/3 of the length. The canals should be processed until it is necessary to use ISO instrument No. 35-50 (International Standard Organisation). The mouths of the canals are widened slightly more to create a sufficient depot of copper hydroxide. After machining, the canals are rinsed with distilled water, a 10% calcium hydroxide suspension or a dilute copper-calcium hydroxide suspension. After the root canal treatment, the tooth is isolated from saliva and dried. The patient should be positioned in such a way that the preparation does not leak out of the canal: when treating the teeth of the lower jaw - sitting, when treating the teeth of the upper jaw - lying in a chair with the head tilted back. The suspension of copper-calcium hydroxide is diluted with distilled water to a creamy consistency and injected with a root canal filling material into the treated part of the canal. When treating anterior teeth, to avoid staining the tooth crown, it is recommended to dilute the paste with water in a ratio of 1:10. Then a negative needle electrode (cathode) is inserted into the canal to a depth of 4-8 mm, leaving the tooth cavity open. It is necessary to ensure that during the procedure this electrode does not touch soft tissues, metal crowns and fillings of other teeth. In addition, saliva, blood or gum fluid should not enter the tooth cavity. All mistakes can lead to a decrease in the effectiveness of treatment and electrochemical burns of the oral tissues. The positive passive electrode (anode) is placed behind the cheek on the opposite side and make sure that it does not touch the teeth. To improve the electrical contact between the electrode and the cheek, a cotton roller moistened with tap water or isotonic sodium chloride solution is placed.

Electrophoresis is performed using the Original II, Comfort (Germany) or Endo EST (Russia) apparatus. During the procedure, the current strength is slowly increased until a slight sensation of warmth or tingling appears in the tooth area, then the current strength is reduced and slowly increased, reaching 1 - 2 mA. The duration of the procedure is calculated based on the fact that during one session, 5 mA/min should be received per channel. For example, if the current

strength is 1 mA, the procedure duration is 5 minutes, 1.2 mA - 4 minutes, 2 mA - 2.5 minutes, and if only 0.5 mA was achieved, the procedure duration is 10 minutes. In multi-rooted teeth, each canal is treated separately. After the procedure, the canals and the tooth cavity are rinsed again with distilled water, 10% calcium hydroxide suspension or diluted copper-calcium hydroxide suspension, and the tooth cavity is sealed with an artificial dentin dressing. In case of inflammation in the periodontium, the tooth can be left open after depopohoresis to allow the exudate to drain through the canal. Additional infection of the periodontium with oral microflora is excluded due to the high bactericidal activity of copper-calcium hydroxide. The patient is scheduled for a follow-up visit in 8 to 14 days.

On the second visit, copper-calcium hydroxide depopohoresis is again performed at the rate of 5 mA/min per channel. The patient should receive an "amount of electricity" equal to 15 mA/min during the course of treatment. After the last procedure, the treated part of the canal (2/3 of the length) is sealed with a special alkaline cement "Atacamit" containing copper, which is included in the depopohoresis kit, and a permanent filling is placed. Positive aspects of depopohoresis: possibility of successful endodontic treatment of teeth with obstructed root canals; high (up to 96%) clinical effectiveness; reduction of the risk of complications arising during instrumental treatment of the canal (perforation, breakage of instruments, etc.). there is no need to determine the working length - reducing the number of X-ray examinations and, as a result, the radiation exposure of the patient; minimal risk of removal of the filling material beyond the root apex; disinfection of the entire apical area.

**Disadvantages:** absence of objective diagnostic tests that would allow reliable assessment of the quality of obturation of the entire root canal, because its apical part looks unsealed on the radiograph; technical complexity of the procedure; after the course of depopohoresis, the tooth crown acquires a yellowish tint; in addition, it is impossible to completely exclude further discolouration due to chemical transformations of copper compounds in the canals and tooth cavity; long treatment time - 2-4 weeks - creates some discomfort for the patient; the need for significant material costs for the purchase of a "starter" kit, replenishment of domestic materials, and provision of the doctor with appropriate endodontic instruments. Despite these disadvantages, this method undoubtedly opens up new opportunities in endodontics.

**Diathermocoagulation.** For diathermocoagulation, a current of low voltage and high strength is used, which has a thermal effect. As a result, the structures of soft tissues and microorganisms are denatured.

**Methodology.** To sterilise root canals, the instrument (root needle) at the tip of the diathermocoagulator is inserted into the canal first 1/3, then 2/3 and then the entire length of the canal. The high temperature destroys microorganisms and denatures putrid masses. For zaapical therapy, the instrument is withdrawn beyond the root apex and the granulation tissue is coagulated. The coagulant gradually dissolves, stimulating regeneration. After the procedure, the root canal is treated with instruments and medications and filled.

**Laser therapy.** Recently, low-frequency helium-neon lasers with irradiation in the infrared part of the spectrum have been used. For the treatment of periodontitis in dental practice, the following parameters are prescribed: dose 50-100 mW/cm<sup>2</sup>, exposure 1 - 2 min per field, total 10-12 min. The therapeutic effect of the laser is associated with photosensitisation of the affected periodontal cells, which results in analgesic, anti-inflammatory and regeneration stimulation. In addition, the laser stimulates the body's general reactions (desensitisation) and improves the functioning of adaptive mechanisms.

Ultrashort waves (USW) are used to treat chronic periodontitis to sterilise the root canal, as well as to stimulate anti-inflammatory and general immunobiological functions. They are applied both intracanal and to the periapical tissue in the area of the diseased tooth.

**Dyadic current.** The method is based on the effect of diadynamic current on tissue metabolism, so its use helps to stimulate regeneration processes in periapical tissues. Diadynamic current is prescribed both during treatment and after root canal filling to prevent and treat complications.

Physical methods have a fairly quick and effective effect on the periapical inflammatory focus. They activate metabolic processes in the periapical tissues, stimulate trophism and regeneration of connective and bone tissue. The use of physical methods significantly speeds up the treatment of pulpitis and periodontitis and prevents complications.

**IV. Control questions for the class topic:**

1. Physical methods in the complex therapy of pulpitis and periodontitis, indications for use.
2. The difference between depophoresis, electrophoresis, ultraphonophoresis.
3. The use of laser, ultrashort waves, diadynamic current in the complex treatment of pulpitis and periodontitis.
4. Methods of diathermocoagulation.
5. Modern physical methods of treatment of pulpitis and periodontitis.

**V. Control test tasks and/or case tasks:**

1. The patient visited the dentist for rehabilitation. Objectively: a deep carious cavity was found in 37, connected to the tooth chamber. The tooth does not respond to stimuli. X-ray: enlargement and deformation of the periradicular gap in the apical region. What is the most possible diagnosis?
  - a. Chronic fibrous pulpitis
  - b. Chronic granulomatous periodontitis
  - c. Chronic gangrenous pulpitis
  - d. Acute chronic pulpitis
  - e. Chronic fibrous periodontitis
2. A 14-year-old child has a maxillary sinus perforation with penetration of the distal buccal root into the maxillary sinus during extraction of 16 for periodontitis. What are the doctor's further actions?
  - a. Form a clot, do not inform the patient
  - b. Try to remove the root on your own
  - c. Refer to the hospital for surgical intervention
  - d. Perform outpatient maxillary sinus surgery
  - e. Close the perforation with a muco-periosteal flap.
3. A 13-year-old child complained of discolouration of the upper front tooth. 4 years ago, there was an injury to the anterior region of the upper jaw. Objectively: 11 is intact, percussion is painless. The X-ray shows bone thinning at the apex of the root of 11 measuring 1.6x2.7 cm with clear rounded edges. What is the most likely diagnosis?
  - a. Exacerbation of granulomatous periodontitis
  - b. Chronic granulating periodontitis
  - c. Chronic fibrous periodontitis
  - d. Odontogenic cyst of the upper jaw
  - e. Chronic granulomatous periodontitis.
4. The patient complains of discomfort in the tooth 3.4. while eating. From the anamnesis: swelling periodically appears near the tooth. In tooth 3.4, the entrance to the carious cavity is wide open. Probing and percussion are painless. X-ray: bone destruction without clear contours in the area of the root apex, associated with periodontal disease. Make a diagnosis:
  - a. Chronic fibrous pulpitis
  - b. Chronic fibrous periodontitis
  - c. Chronic gangrenous pulpitis
  - d. Chronic granulomatous periodontitis
  - e. Chronic granulating periodontitis
5. Indicate in which form of complicated caries the Lukomsky triad occurs:
  - a. Chronic granulating periodontitis
  - b. Chronic gangrenous pulpitis
  - c. Chronic fibrous pulpitis
  - d. Chronic fibrous periodontitis
  - e. Chronic granulomatous periodontitis

## **VI. References**

### **6.1. Main literature**

1. Stomatology: textbook: in 2 books. Book I / M.M. Rozhko, Z.B. Popovych, V.D. Kuroiedova et al.; edited by M.M. Rozhko. – Kyiv: AUS Medicine Publishing, 2020. – 792 p.: color edition.
2. Periodontal and Oral Mucosa Diseases: textbook. Vol. 2 / A.V. Borysenko, L.V. Lynovytska, O.F. Nesyn et al.; edited by A.V. Borysenko. - Kyiv: AUS Medicine Publishing, 2018. – 624 p.; color edition.
3. Stomatology: textbook: in 2 books. Book 2 / M.M. Rozhko, I.I. Kyrylenko, O. H. Denysenko et al.; edited by M. M. Rozhko. – Kyiv: AUS Medicine Publishing, 2018. – 960 p.; color edition.

### **6.2. Additional literature**

1. Esthetic Dentistry: A Clinical Approach to Techniques and Materials 3rd Edition by Kenneth W. Aschheim. Publisher: Mosby; 3rd edition, 2014. – 600 p.
2. Esthetic and Restorative Dentistry: Material Selection and Technique 3rd Edition by Douglas A Terry, Willi Geller. Publisher: Quintessence Publishing Co Inc.; 3rd edition, 2017. – 776 p.
3. Dental Composite Materials for Direct Restorations Softcover reprint of the original 1st ed. by Vesna Miletic. Publisher: Springer; 1st edition, 2018. – 327 p.
4. Posterior Direct Restorations 1st Edition by Salvatore Scolavino, Gaetano Paolone. Publisher: Quintessence Pub Co; 1st edition, 2021. – 264 p.
5. Smile Design Integrating Esthetics and Function Essentials of Esthetic Dentistry Volume Two by Jonathan B. Levine. Elsevier Health Sciences, 2015. – 240 p.