LESSON 28

Microbiological diagnostics of dental, periodontal and dentoalveolar infections

ORAL DISEASES

- **Stomatitis**
- **Gingivitis**
- **Periodontitis**
- **Periodontal disease**

STOMATITIS

- This is a group of diseases characterized by inflammation of the oral mucosa with hyperemia, edema, and an increase in the amount of mucus in the oral cavity. Depending on the severity and depth of the lesion, even sores or foci of necrosis can form in the oral cavity, which sharply disrupt the general condition - fever, weakness, anxiety, refusal to eat.
- There are many causes of the disease: mechanical, chemical, thermal, infectious agents. Often stomatitis develops in infectious diseases (measles, scarlet fever, influenza, whooping cough, etc.)
- The mucous membrane of the oral cavity acquires a bright red color, becomes edematous, teeth marks are visible on the mucous membrane of the cheeks and tongue. Saliva becomes viscous, viscous. The mucous membrane is covered with a whitish coating. The tongue is dry, swollen, often with a brown tinge, chewing is painful The duration of the disease is from 1 to 3 weeks, the prognosis is favorable.

GINGIVITIS

- Inflammatory process, in which there is swelling and soreness of soft tissues. The main causes of gingivitis:
- inadequate oral hygiene;
- thermal or chemical burns;
- the use of certain drugs;
- unbalanced diet (not enough vitamins in food)
- smoking;
- some infectious diseases;
- gastritis;
- ulcerative processes in the digestive system;
- caries.


Healthy Gums
Gingivitis

DEPENDING ON THE CLINICAL SITUATION AND THE NATURE OF THE DEVELOPMENT OF THE DISEASE, ACUTE AND CHRONIC GINGIVITIS ARE DISTINGUISHED.

ACUTE GINGIVITIS

- manifests itself in the form of classic signs of the disease: redness, swelling and bleeding of the gums.

CHRONIC GINGIVITIS

- develops more calmly, without pronounced signs, however, gradually leads to the growth of gum tissue (hyperplasia), which entails partial and complete coverage of the surface of the tooth crown by the gum.

PERIODONTITIS

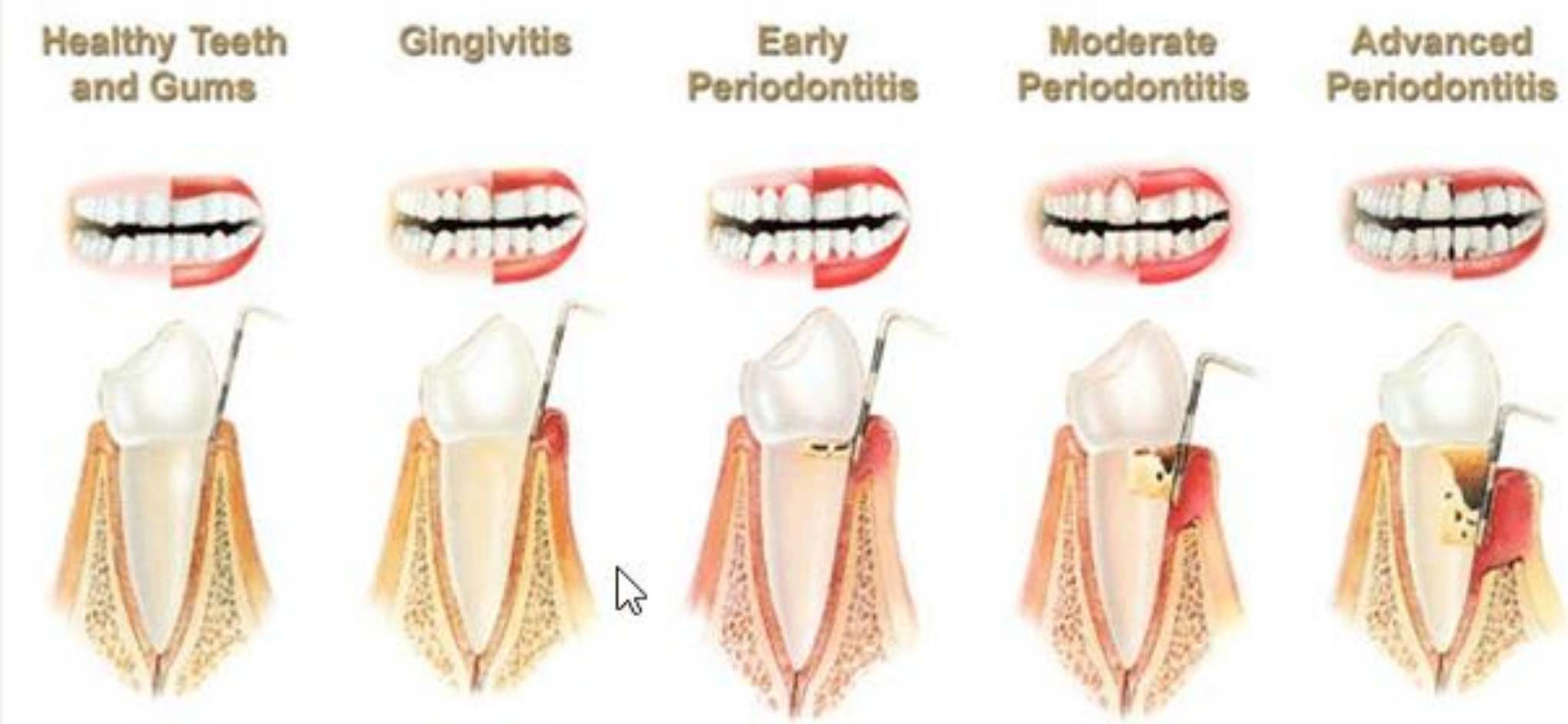
- **Periodontitis is an inflammation of periodontal tissues. Periodontitis as a disease is a consequence of gingivitis - a slight inflammation of the gums, the main cause of which is the neglect of oral hygiene. If with gingivitis inflammation spreads exclusively to soft mucous membranes, then with periodontitis, the ligaments that hold the teeth in the holes suffer. That is why in 90% of cases, when diagnosing this disease, tooth mobility is observed, which eventually leads to their loss.**

PERIODONTITIS

THE MOST COMMON CAUSES OF PERIODONTITIS ARE:

- 1. Improper or irregular oral care. Plaque, which is present on the surface of the teeth and in the interdental spaces, is not as safe a substance as it might seem at first glance. Soft and easily removed at the beginning, it goes through certain cycles of "development". The result is the mineralization of plaque and its transformation into hard tartar. This process in most cases is observed in those who neglect their daily oral care or use the wrong toothbrush, toothpaste and rinse.
- 2. Poor blood supply to the gums. Periodontitis is one of the most common problems among smokers. Substances contained in tobacco smoke lead to narrowing of the vessels of the oral mucosa and their fragility, which impairs the blood supply to the tissues of the gums and the supporting apparatus of the teeth. The slowdown in blood circulation and, as a result, the development of periodontitis is also facilitated by the lack of chewing load caused by eating habits (for example, the predominance of soft foods in the diet).
- 3. Nutrient deficiency. The lack of fresh vegetables, fruits, greens in the diet, a sufficient amount of fish, meat and dairy products quickly leads to a lack of essential substances in the gum tissues. If malnutrition is in the nature of a permanent habit, then over time, metabolic processes in the gums are disturbed, which creates the basis for inflammation and periodontitis. Deficiency of vitamins A, C and group B can lead to negative consequences.

Progression of Gum Disease



PATHOGENESIS OF OPPORTUNISTIC (ODONTOGENIC) INFECTIONS OF THE MAXILLOFACIAL REGION

- Trauma to the maxillofacial region, tooth extraction, local anesthesia or surgery
- Initial tissue damage and microcirculation disturbance
- The departure of resident flora beyond the ecological niche. The development of facultative anaerobic flora, contributing to a decrease in the redox potential of tissues
- Dominance in the focus of inflammation obligate-anaerobic species
- Lymphogenic and hematogenic dissemination
- Secondary blood circulation disorders
- Septic vascular thrombosis
- Secondary purulent foci, intravascular hemolysis, toxemia, disseminated intravascular coagulation, drop in blood pressure and toxic shock

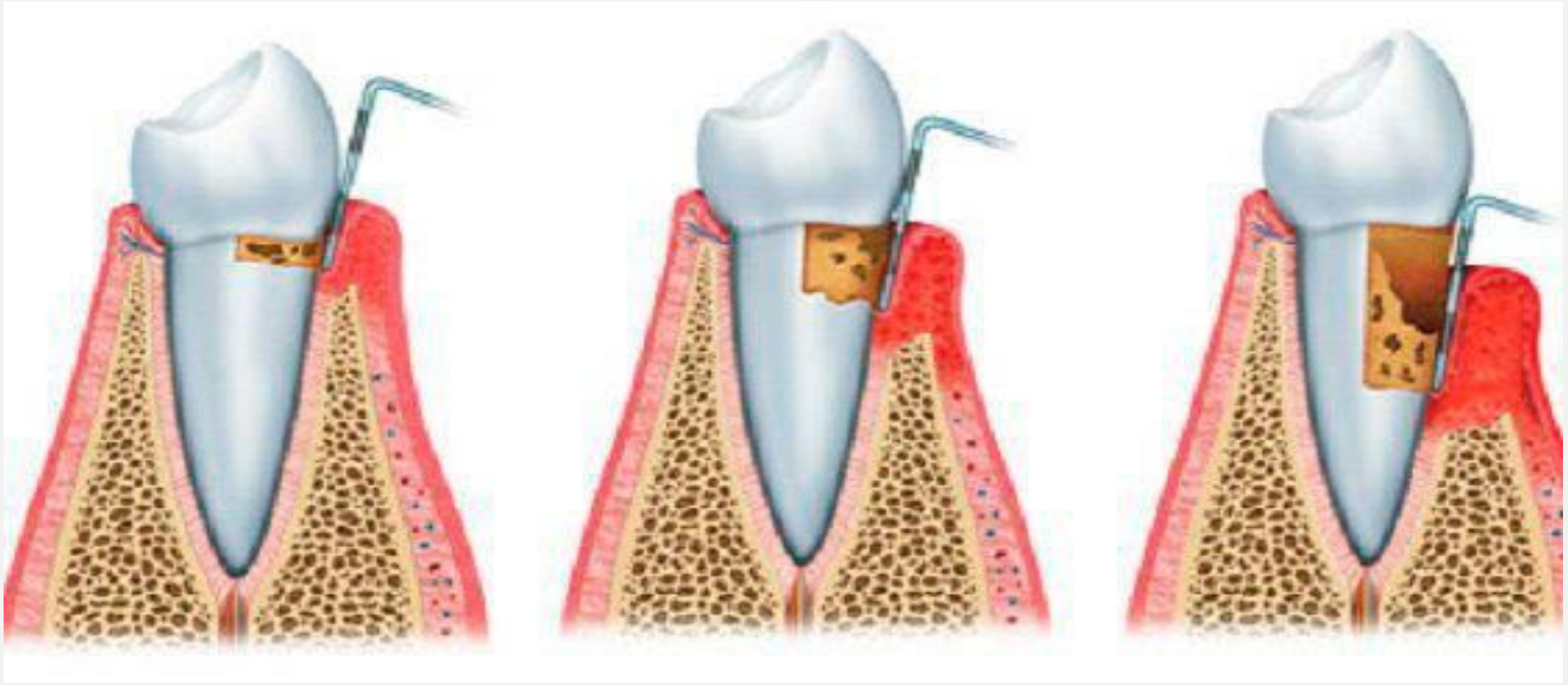
PERIODONTAL DISEASE

- Periodontitis of the teeth is a serious disease in which the last stage of gum inflammation occurs. Often this is the cause of the development of infectious diseases, gastritis, stomach ulcers or cirrhosis of the liver. Even more often, the patient's teeth simply fall out, and he cannot lead his usual way of life, eat food.

THERE ARE 3 STAGES OF PERIODONTAL DISEASE:

- **Light.** The patient has no complaints, very rarely there is a reaction to cold or hot food. The presence of periodontal disease can be established during the examination at the dentist. The mild stage of the disease is best treated.
- **Average**. The roots of the teeth are exposed on average by 4-6 mm. The patient begins to worry about burning in the mouth, there is an acute reaction to the intake of hot, cold or sour foods.
- **Heavy**. The roots of the teeth are exposed by 8-10 mm. Chewing food causes severe pain.

3 STAGES OF PERIODONTAL DISEASE



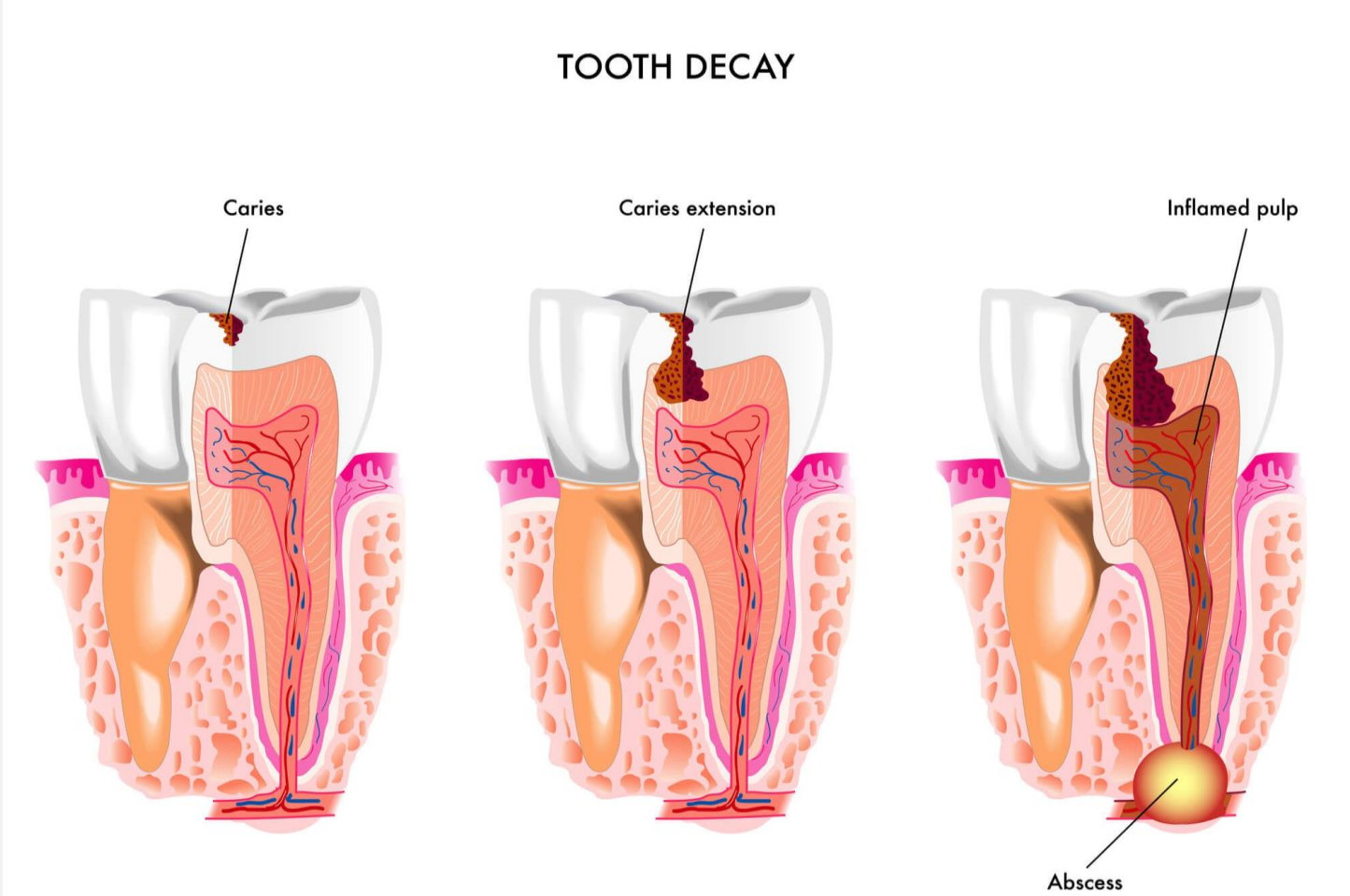
TOOTH ABSCESS

- Tooth abscess is an acute infectious disease that develops in the area of dental roots. Often, this disease is faced by people who do not carry out sufficient oral hygiene. When there are defects on the teeth, expressed by cracks and chips, carious lesions, bacteria penetrate into their soft parts and settle there, which is why an inflammatory process occurs, pus forms and the gums swell.
- There are nerve endings in the pulp area, so any inflammation is accompanied by a strong pain syndrome. The development of an abscess occurs quite quickly, if urgent measures are not taken, the bone tissue will be affected, and the integrity of the tooth becomes jeopardized.

TYPES OF TOOTH ABSCESS

- **Periapical** tooth abscess is located in the dental cavity as a result of pulp necrosis. Its main difference is that pus accumulates directly under the root of the tooth.
- **Gingival** abscess, its localization falls on soft tissues. The gum abscess does not move to the root of the tooth or to the periodontal ligament.
- **Periodontal abscess,** located between the gum and the root of the tooth.

OFTEN, A TOOTH ABSCESS BEGINS WITH AN EXACERBATION OF A CHRONIC INFLAMMATORY PROCESS. WITH THE PENETRATION OF AN INFECTION, THE INFLAMMATION PROCESS SPREADS. THIS LEADS TO THICKENING OF TISSUES, SWELLING OF THE FACE AND NECK. THE PAIN FROM ACHING AND LOCALIZED DEVELOPS INTO A THROBBING AND WIDESPREAD, GOING BEYOND THE JAW. IN THIS REGARD, IT BECOMES DIFFICULT FOR THE PATIENT TO CHEW AND FULLY OPEN HIS MOUTH, THERE MAY BE PAIN WHEN BITING, TOOTH MOBILITY, ENLARGEMENT AND SORENESS OF THE LYMPH NODES IN THE AFFECTED AREA.

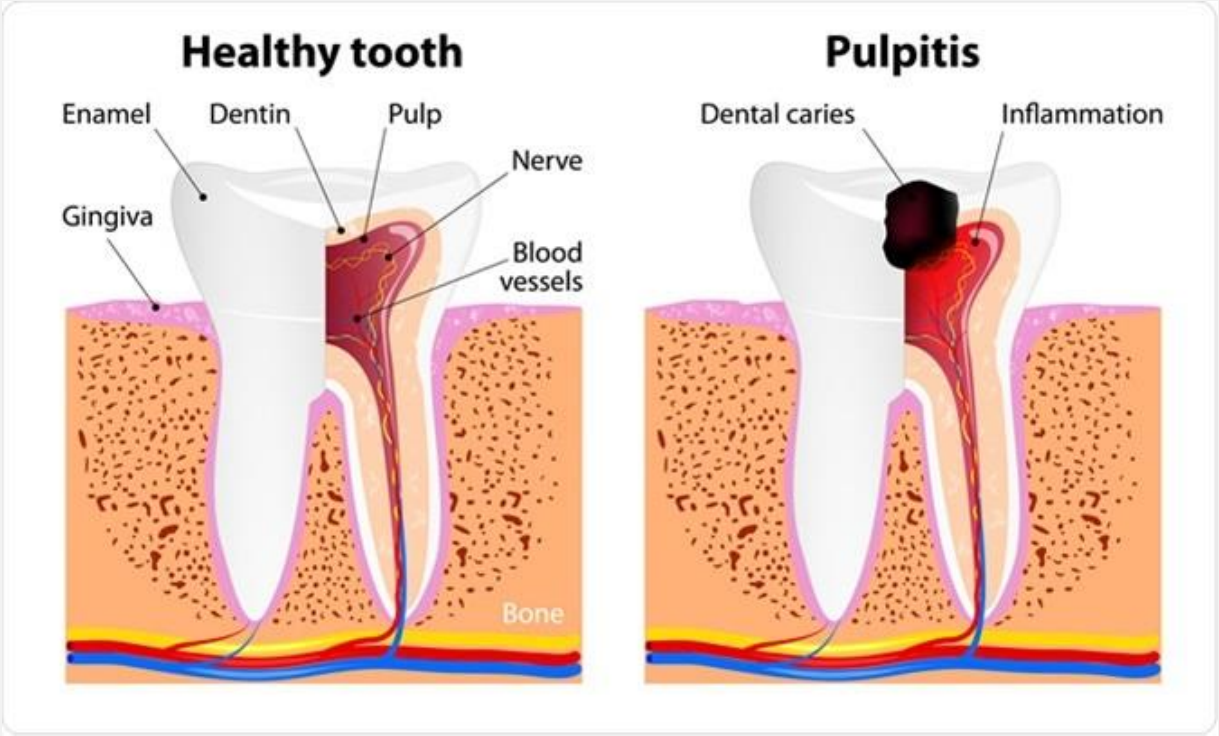


PATHOGENESIS OF A TOOTH ABSCESS

- Odontogenic (tooth) infections develop when a mixed bacterial flora penetrates the surrounding tissues. Facultative anaerobic bacteria (eg, streptococci) dominate in the early stages. They can exist both in the presence of oxygen and in its absence. If no treatment is carried out at the time of infection, then the soft edema becomes dense. During this process, the redox potential of the affected tissues changes, and the environment becomes acidic and hypoxic (anoxic). This leads to the growth of obligate anaerobic bacteria, which exist only in the absence of oxygen, and retards the growth of facultative anaerobes. This change of bacteria, along with an increased reaction of the body to infection, leads to the formation of an abscess.
- In the course of their life, bacteria release toxins. They are involved in the formation of biologically active products that enhance vascular permeability. Inflammation of the periodontium continues to progress, which is why antigens accumulate in it. Their accumulation is the primary focus of infection. In response to these antigens, the body secretes antibodies that fight foreign substances.
- A connective capsule separates the focus of infection from healthy tissues. Thanks to it, a balance is maintained between pathogenic flora and healthy tissues. But, despite the body's fight against infection, bacteria continue to penetrate into the periodontium through the root canal of the tooth. Their number increases, and with it more toxins and tissue breakdown products are released.

PULPITIS

Pulpitis is an inflammation of the inner tissue of the tooth, called the pulp. It contains blood vessels and nerves, provides nutrition to the tissues of the teeth. Therefore, pulpitis can lead to a loss of tooth viability, and in the worst case, to switching the inflammatory process to the surrounding tissues. As a rule, the disease is accompanied by severe pain and it is extremely difficult to miss the development of this disease. Pathology develops most often against the background of the carious process of the tooth itself or from neighboring infected teeth, and very rarely as a result of incorrect treatment.



PULPITIS

There are three stages of pulpitis:

- spicy,
- Chronic
- exacerbated chronic pulpitis.

What can happen if pulpitis is not treated?

- **Flux -** periostitis, a pathological inflammatory process that develops from the periosteum.
- **Periodontitis** is an inflammation of the tissue around the root of the tooth with the possible formation of purulent pockets and destruction of the periapical bone tissue.
- **Pulp gangrene** (necrosis) is the death of cells in the inner tissue of the tooth.
- **Sepsis** is a blood infection that develops when microorganisms enter the general bloodstream (usually occurs with reduced immunity).

ODONTOGENIC INFLAMMATION

- Odontogenic inflammation is called such an inflammatory process, which is associated directly with the tissues located inside and around the tooth. It begins as a result of the destruction of the hard tissues of the tooth (carious process), which leads to the possibility of microflora entering the pulp and the appearance of first coronal and then root pulpitis. The penetration of microbes through the apical opening of the root canal into the periodontal tissue is the cause of periodontitis. Further spread of inflammation into the periosteum leads to periostitis, and when the bone marrow is involved, osteomyelitis occurs. The inclusion of the soft tissues of the jaw in this process contributes to the occurrence of perimaxillary abscesses and phlegmon.
- As a rule, the causative agents of odontogenic inflammatory processes are representatives of the normal microflora of the oral cavity: staphylococci, streptococci, gram-positive and gram-negative non-spore-forming bacteria. More often they occur in the form of microbial associations that cause mixed infections. The leading role in these associations is played by pathogenic staphylococci, which are characterized by multiple resistance to antibiotics.

ODONTOGENIC INFLAMMATIONS CAN OCCUR IN VARIOUS TYPES, ON WHICH THE COMPOSITION OF THE MICROBIAL FLORA WILL DEPEND.

Exudative inflammation can be serous, purulent, putrefactive. The following bacteria are most often found in the microflora:

1. green and non-hemolytic streptococci, enterococci with serous inflammation;
2. Staphylococcus aureus (coagulase-positive), β-hemolytic streptococci in case of purulent inflammation;
3. microbes with pronounced proteolytic properties (petostreptococci, veillonella, bacteroids, some clostridia, sometimes Proteus) in the putrefactive process.

PULPITIS IS AN INFLAMMATORY PROCESS THAT OCCURS BOTH IN THE CORONAL PULP AND IN THE ENTIRE PULP.

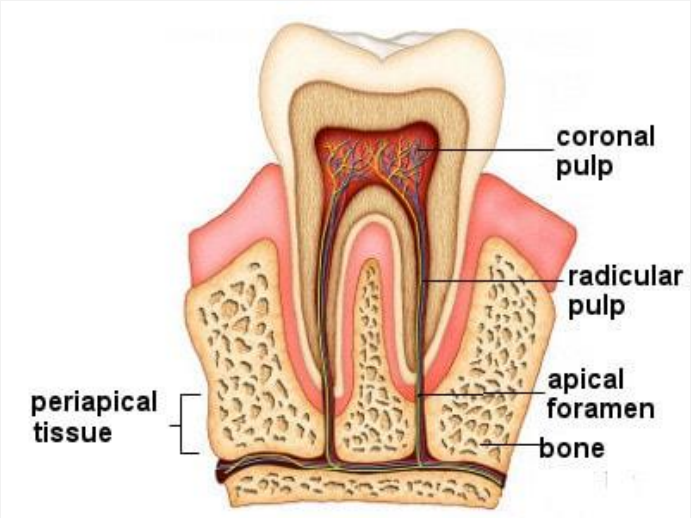
A healthy pulp is a biological barrier that prevents the penetration of various harmful factors into the periodontium.

It is a loose connective tissue, consisting of the main (intercellular) substance, cellular and fibrous elements, with vessels and nerves included in them (Fig. 6). The pulp performs the main functions of connective tissue: trophic, protective, plastic.

The protective, or barrier, function is carried out in the pulp by the cells of the reticuloendothelial system.

The main substance of the pulp consists of mucoprotein,

glycoprotein and mucopolysaccharides



PATHOGENESIS OF PULPITIS

- Acute pulpitis is initially focal in nature and proceeds as a serous inflammation. In acute serous pulpitis, green and non-hemolytic streptococci can be detected. Usually after 6-8 hours the serous nature of the inflammation becomes purulent. This transition is primarily observed in the area of inflammation, which is adjacent to the carious cavity. Here there is an intensive migration of leukocytes from the vessels. The accumulation of exudate leads to hypoxia, which further disrupts the metabolism in the pulp, increasing anaerobic glycolysis, the consequence of this is acidosis, which contributes to the inhibition of the phagocytic activity of pulp cells, pulp decay is observed in this focus, i.e. a pulp abscess is formed.
- There comes a state of acute diffuse pulpitis. With purulent pulpitis, Staphylococcus aureus and β-hemolytic streptococci are of great importance.
- If the abscess opens into the carious cavity, then the inflammation passes into the stage of chronic inflammation: acute pulpitis becomes chronic, which at this stage is characterized by significant tissue necrosis.

MICROBIAL FLORA IN PULPITIS

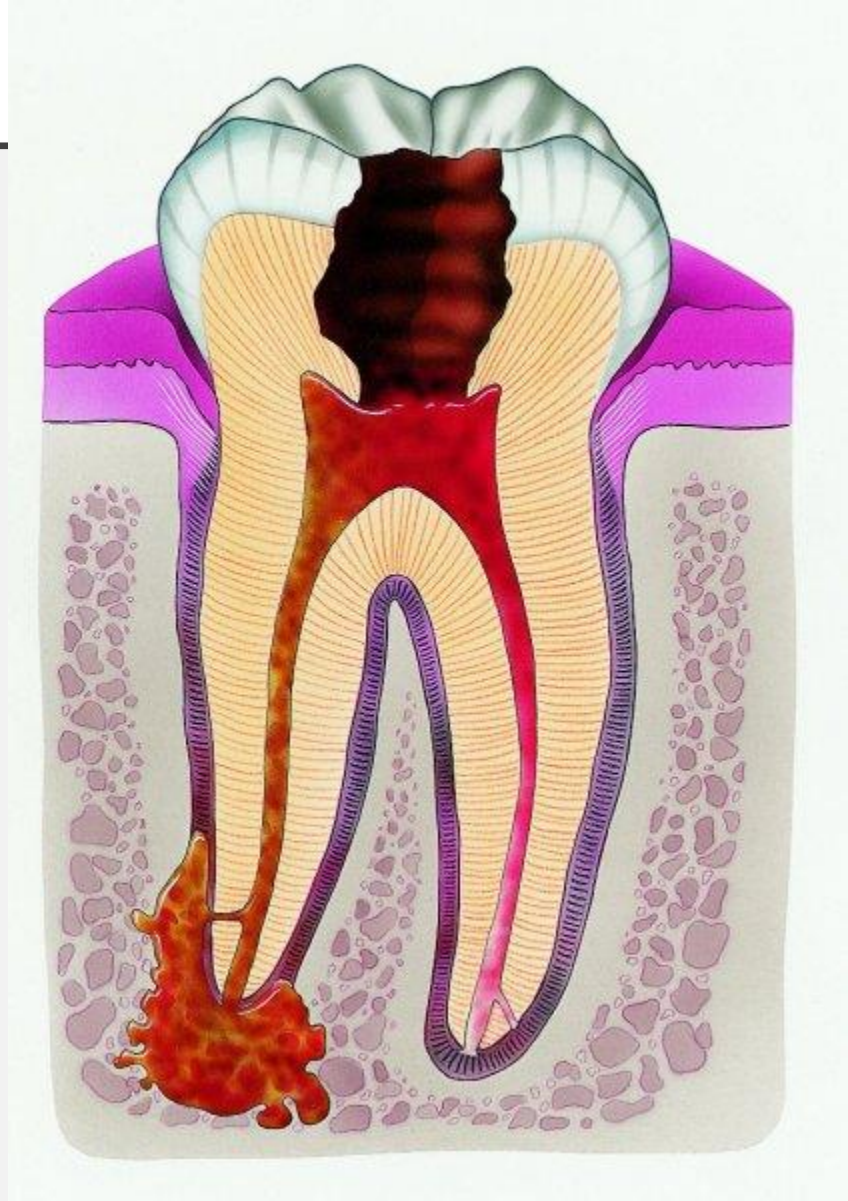
- Anaerobic representatives (Peptostreptococci, Bacteroids, Spirochetes, Actinomycetes, Pathogenic Staphylococci) are found in large numbers in the necrotic pulp, but putrefactive bacteria (Proteus, Clostridia) can also be detected.
- The outcome of chronic gangrenous pulpitis may be pulp gangrene, clinically manifested as periodontitis, as well as exacerbation of chronic pulpitis.

PERIODONTITIS

- Periodontium is a complex anatomical formation of connective tissue origin, located between the compact plate of the tooth cell and the cementum of the tooth root.
- Throughout the periodontium is in direct connection with the jaw bone, through the apical opening - with the pulp of the tooth, and at the edges of the cell - with the gums and periosteum of the jaw. On average, the periodontal thickness is 0.20-0.25 mm, but this value changes with age, tooth development, its function, and, finally, as a result of the pathological process.

PERIODONTITIS

- Periodontitis is an acute or chronic inflammation of the periodontium, i.e. tissues adjacent to the tooth root. The main reason for the occurrence of this pathology is the penetration of infection from the canal of the tooth through the hole in the root apex with a running carious process or with untreated acute pulpitis.
- Due to the fact that periodontitis can clinically occur both in an acute form and in a chronic one, its symptoms can have very different degrees of severity..



MICROBIAL FLORA IN PERIODONTITIS

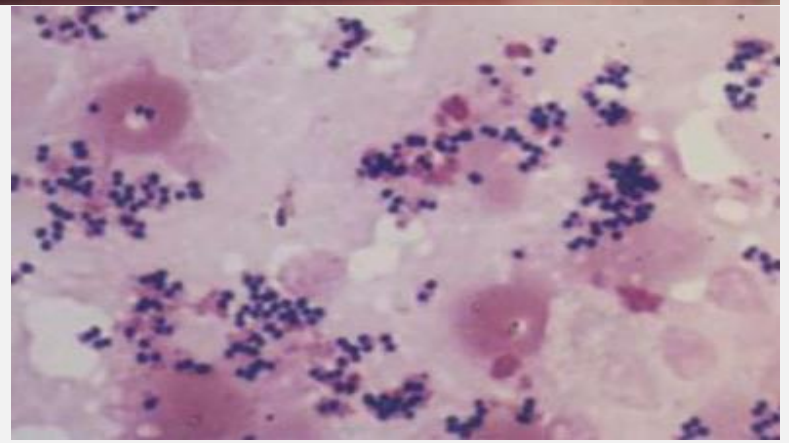
- **Acute purulent periodontitis**, as a rule, is caused by microbial associations, including staphylococci, streptococci, gram-positive and gram-negative rods, including putrefactive bacteria. In some cases, a characteristic feature of serous periodontitis is a sharp predominance of streptococcal flora over staphylococcal**.**
- In the initial stages of inflammation, green and non-hemolytic streptococci are usually found. If the infection has penetrated through the opening of the root canal, then the flora characteristic of purulent and gangrenous pulpitis is determined.
- In the transition of acute periodontitis to **chronic**, the main role is played by streptococcal anaerobic flora, i.e. peptostreptococci. In apical granulomas, actinomycetes, bacteroids, spirochetes, vibrios are found. As the pathological process develops in the periodontium and the form of the disease changes **(acute serous apical periodontitis, acute purulent apical periodontitis, chronic granulomatous periodontitis),** changes occur in microbial associations and / or replacement of some bacteria with other

ODONTOGENIC INFLAMMATORY PROCESSES (PERIOSTITIS, OSTEOMYELITIS, ABSCESS, PHLEGMON)

- Acute purulent periostitis is a mixed infection. Inflammation of the periosteum is the most common complication of periodontitis. in acute purulent periostitis, it most often detects microbial associations, including staphylococci (golden, plasma-positive) and β-hemolytic streptococci, in some cases gram-positive and gram-negative rods, putrefactive bacteria.

Odontogenic inflammatory processes (periostitis, osteomyelitis, abscess, phlegmon).

- **Odontogenic osteomyelitis** of the jaw is a purulent-necrotic infectious inflammatory process in the bone tissue of the jaws. The source of infection is the causative agents of previous diseases of hard and soft tissues of the tooth, as well as periodontal tissues. Osteomyelitis occurs as a result of the penetration of microflora into the bone from the focus of periodontitis. Like other odontogenic inflammatory diseases, it is an example of a mixed infection, with staphylococci playing the leading role, much less often a combination of staphylococci and streptococci. With osteomyelitis, a microbial association can be detected, including staphylococci, streptococci, gram-positive and gram-negative microorganisms, including putrefactive bacteria.
- In severe forms, anaerobic streptococci and plasma-positive staphylococci are detected.



ODONTOGENIC INFLAMMATORY PROCESSES (PERIOSTITIS, OSTEOMYELITIS, ABSCESS, PHLEGMON).

- In acute osteomyelitis of the jaw, the purulent process can spread through the periosteum to the adjacent tissue, causing a maxillary abscess or phlegmon.
- Odontogenic abscesses are caused by microbial associations, which are dominated by staphylococci, streptococci, gram-positive and gram-negative rods.
- Antibiotic-resistant staphylococci are considered the leading pathogens.
- Determination of the generic and species composition of the rod-shaped flora in bacteriological studies is sometimes difficult.
- Phlegmon (cellulite) is called acute diffuse purulent inflammation of the fiber.
- Unlike abscess, phlegmon is prone to spread.
- With phlegmon, β-hemolytic streptococci are isolated, then clostridia, bacteroids can join.