KAZAN STATE MEDICAL UNIVERSITY
Faculty of Dentistry
Department of Therapeutic Dentistry

The concept of caries. Classification. Operative dentistry.

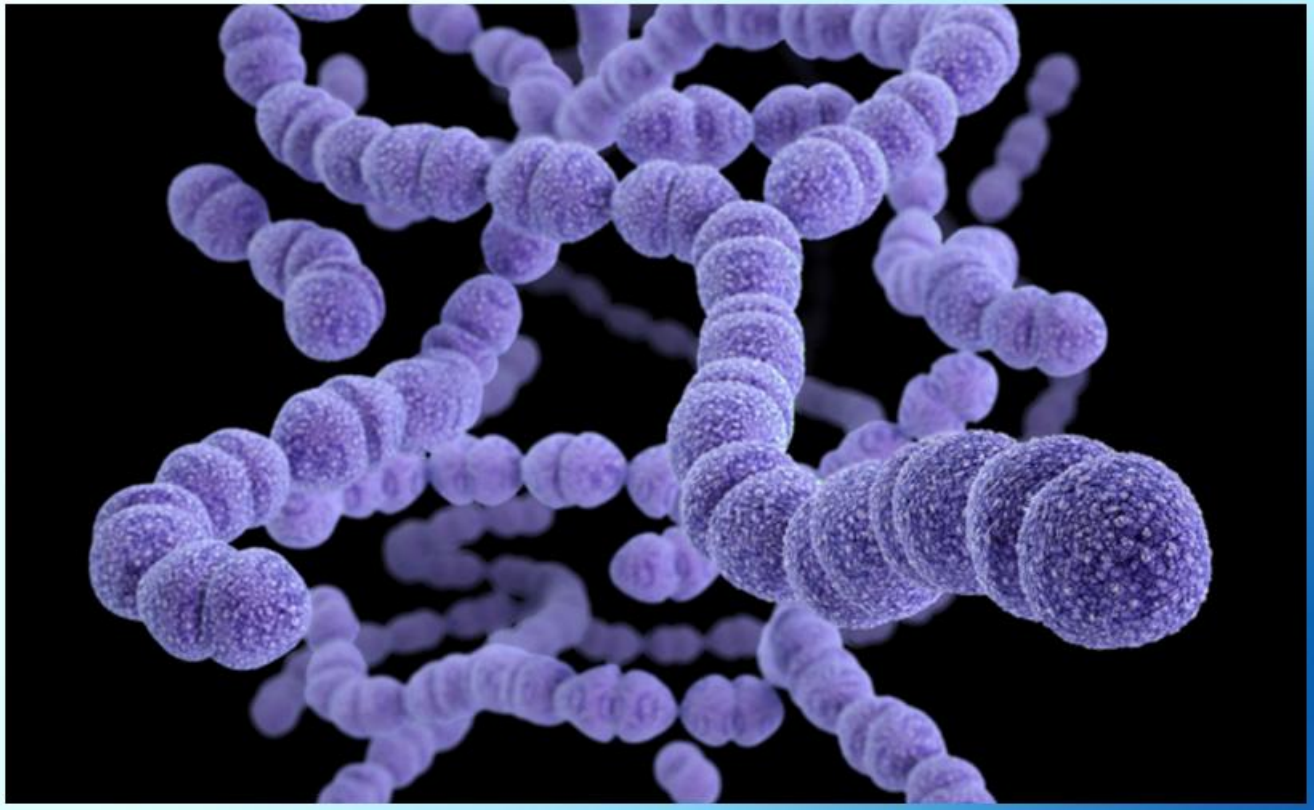
PREPARATION OF CARIOUS CAVITIES

Caries -

an infectious pathological process that occurs after teething, in which there is demineralization and softening of the hard tissues of the tooth, followed by the formation of a cavity

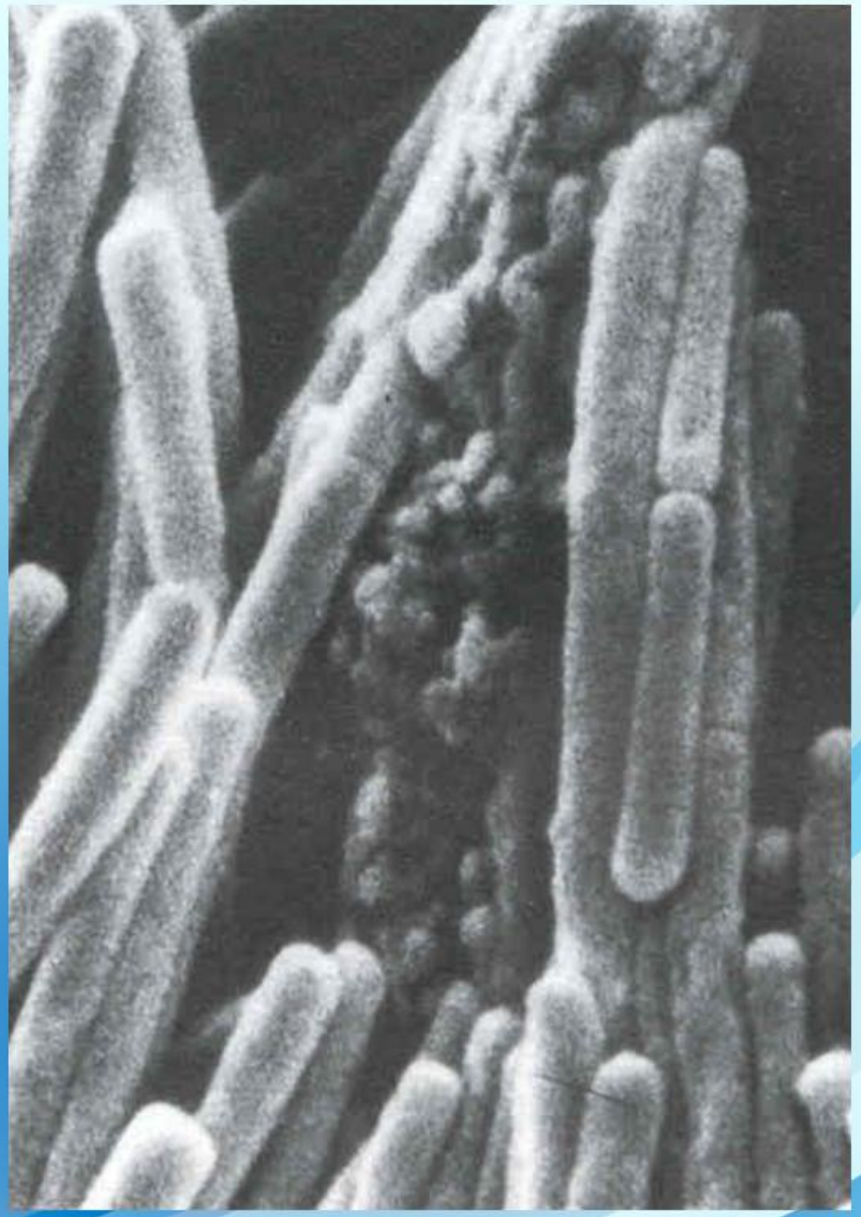

Caries
Cariogenic plaque microflora
Duration of exposure
Reduction of dental caries-intensity

Cariogenic microflora:



Streptococcus mutans, mitis and sanguis;
Lactobacilla;
Actinomyces;
Peptostreptococcus

Microbial plaque



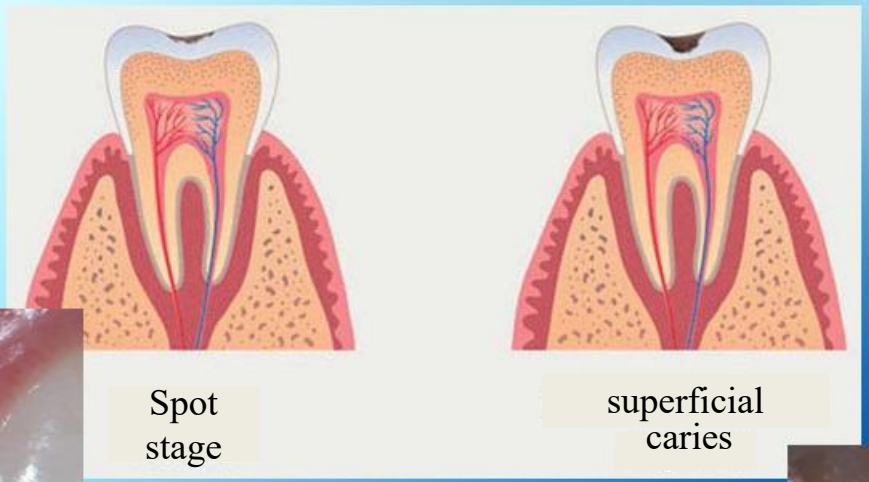
Composition:

- Saliva components.
- Food scraps.
- Microbial cells.
- Products of metabolism of microorganisms.

There are two stages in the clinical course of caries:

The first is characterized *by demineralization of enamel* and changes in color or roughness of enamel

The second is the formation of *a carious cavity with dentin damage*.



Spot stage

superficial caries

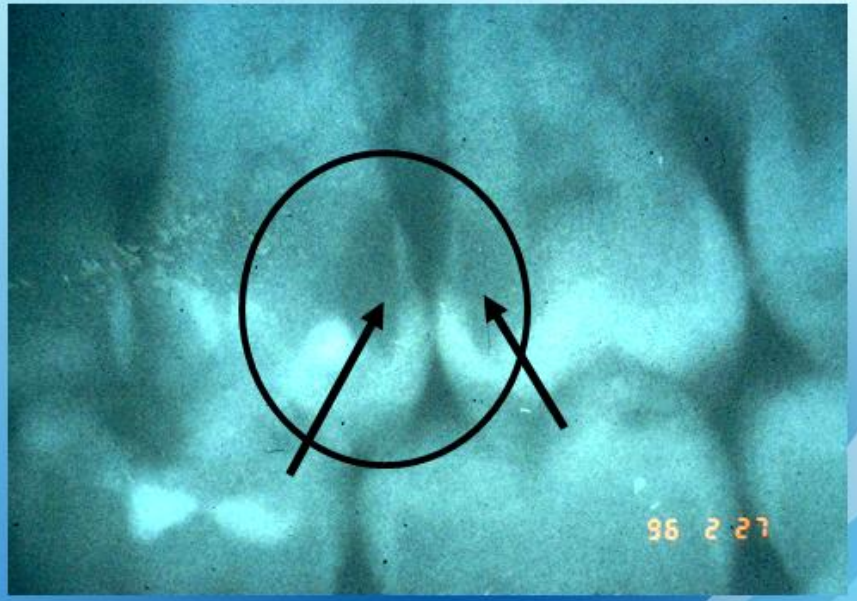
Occurrence of caries

Stained plaque

Caries in the white spot stage

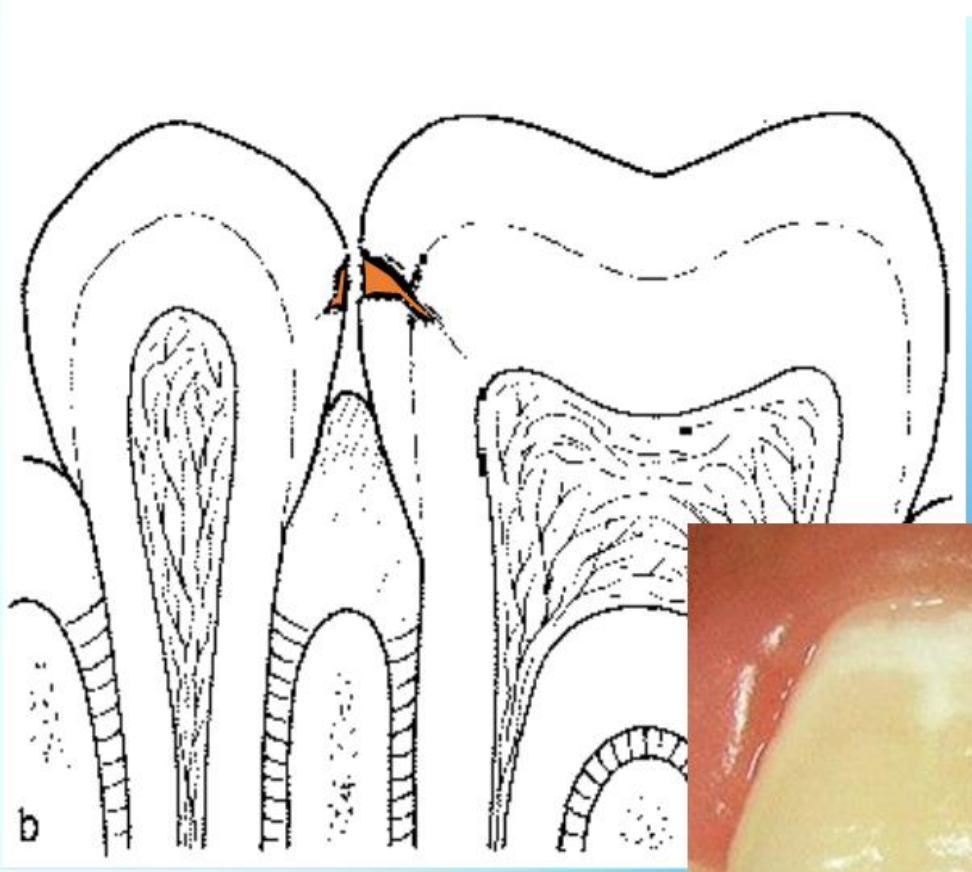
Development of caries:

Fissural caries

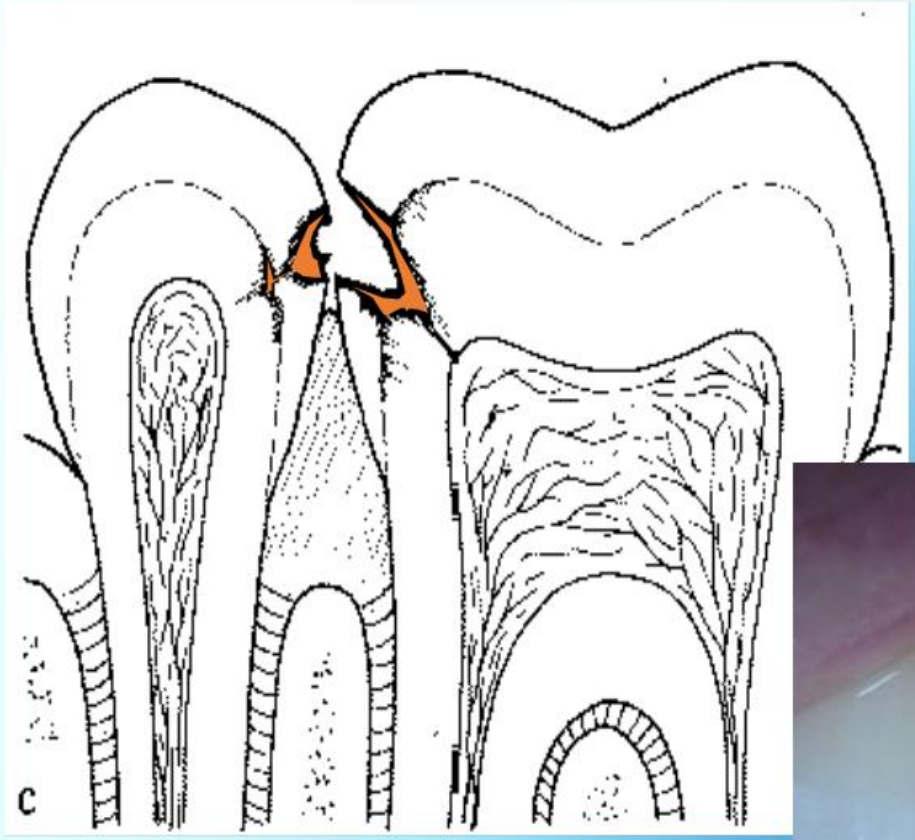


Caries of aproximal surfaces

Enamel caries



Dentin caries



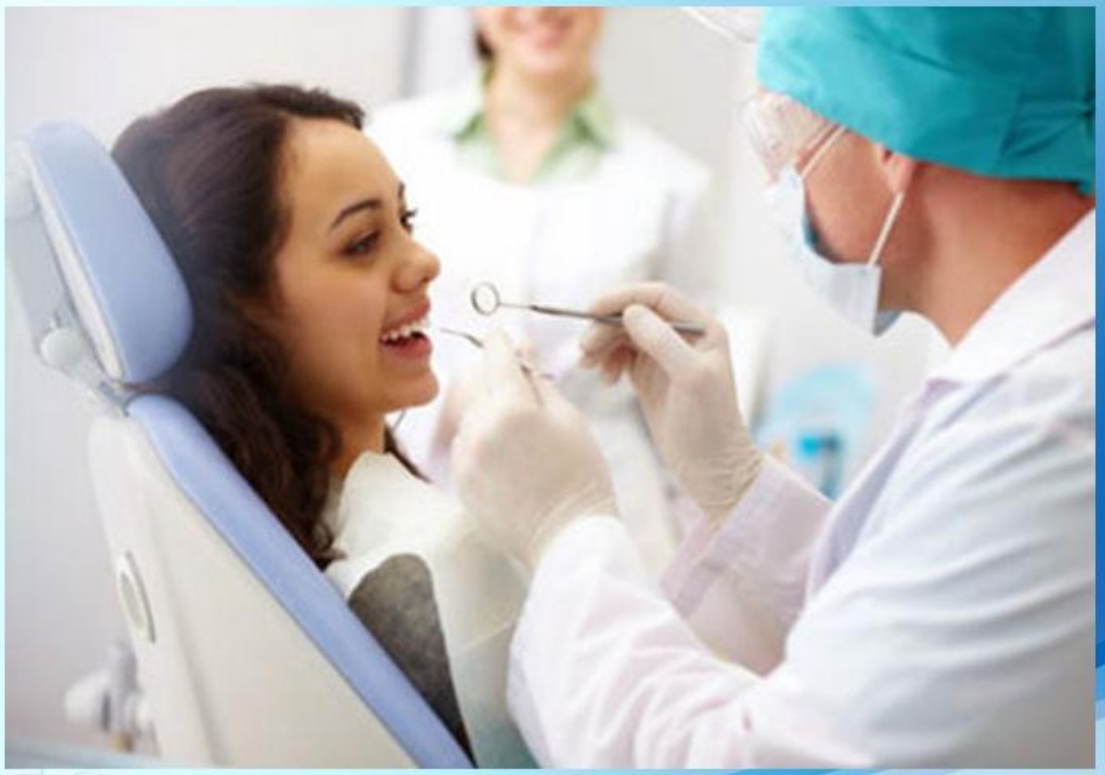
Root caries

Modern features of the course of dental caries

DEVELOPMENT OF DENTAL CARIES IN CASE OF FLUORIDE DEFICIENCY

DEVELOPMENT OF CARIES AGAINST THE BACKGROUND OF THE USE OF FLUORIDE TOOTHPASTES

When visually examining the teeth with a dental mirror and probe, even an experienced dentist fails to identify about 40% of cavities located on the contact surfaces!



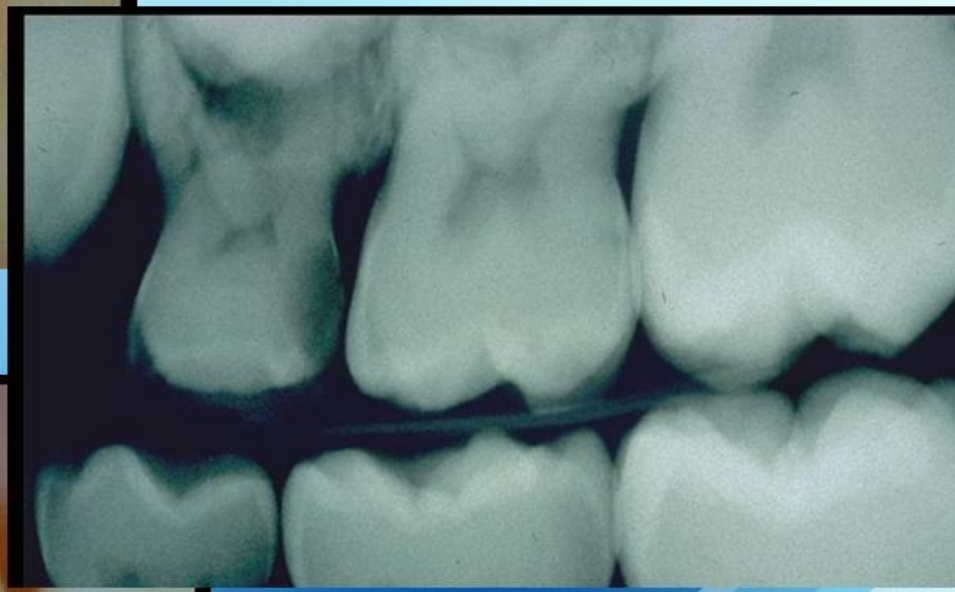
Bleck Classification

- Class1 - Cavities in the area of fissures and natural recesses
- Class2 - Cavities on the contact surfaces of molars and premolars
- Class 3 - on the contact surfaces of incisors and canines without disturbing the incisal edge

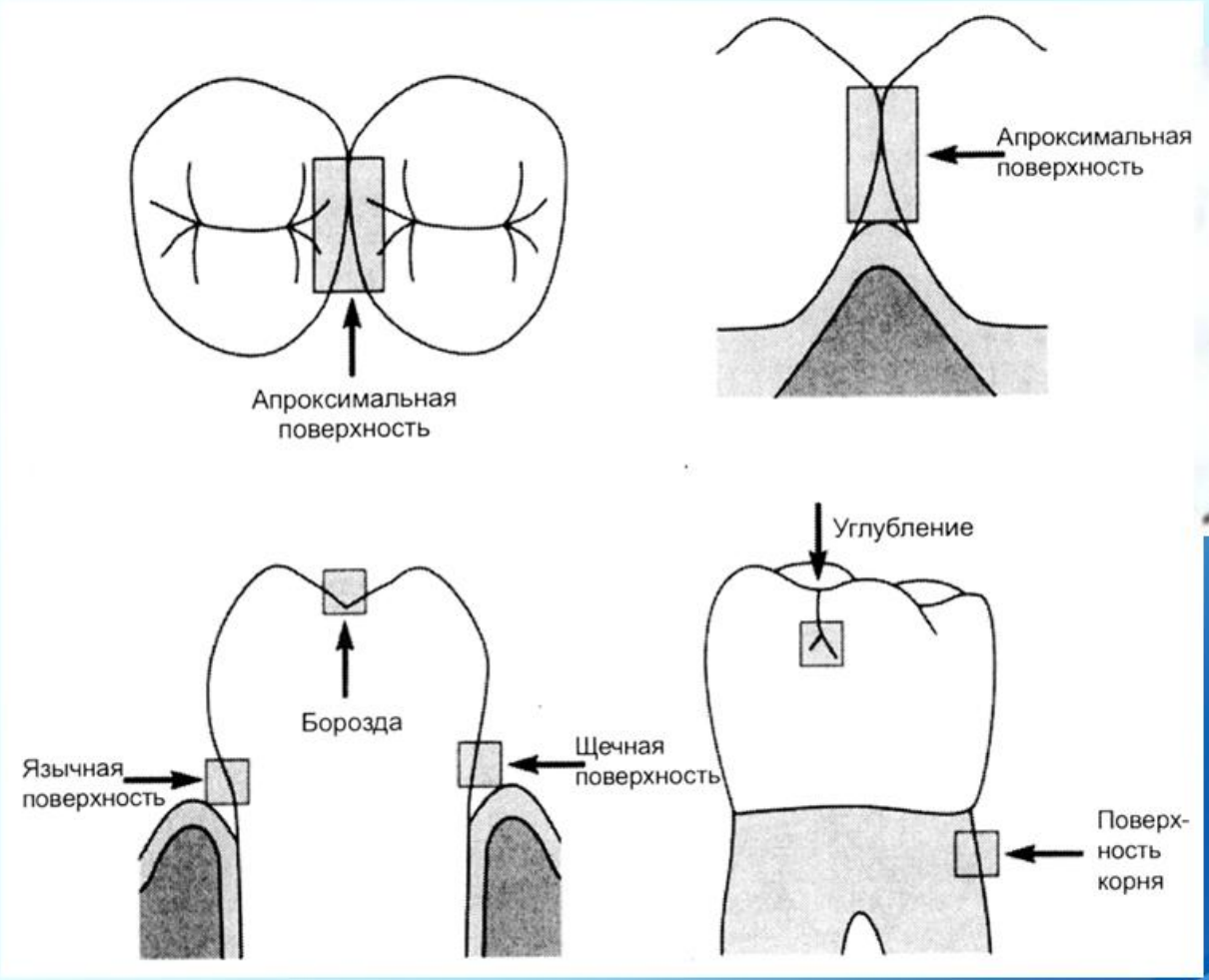
- Class 4 - Cavities on the contact surfaces of incisors and canines with

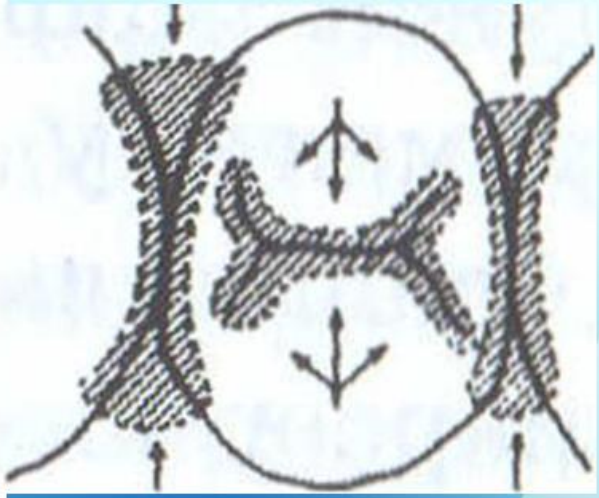
Disturbance of the cutting edge and corners of the crown

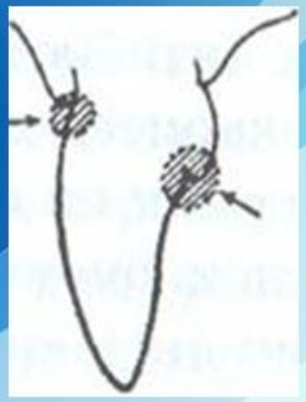
- Class 5 - cavities on the lip, cheek, and lingual surfaces, located in the anterior part of the crown of the tooth.
- Class6 - cavities located on the tips of the cusps of molars and premolars, as well as on the cutting edges of incisors and canines

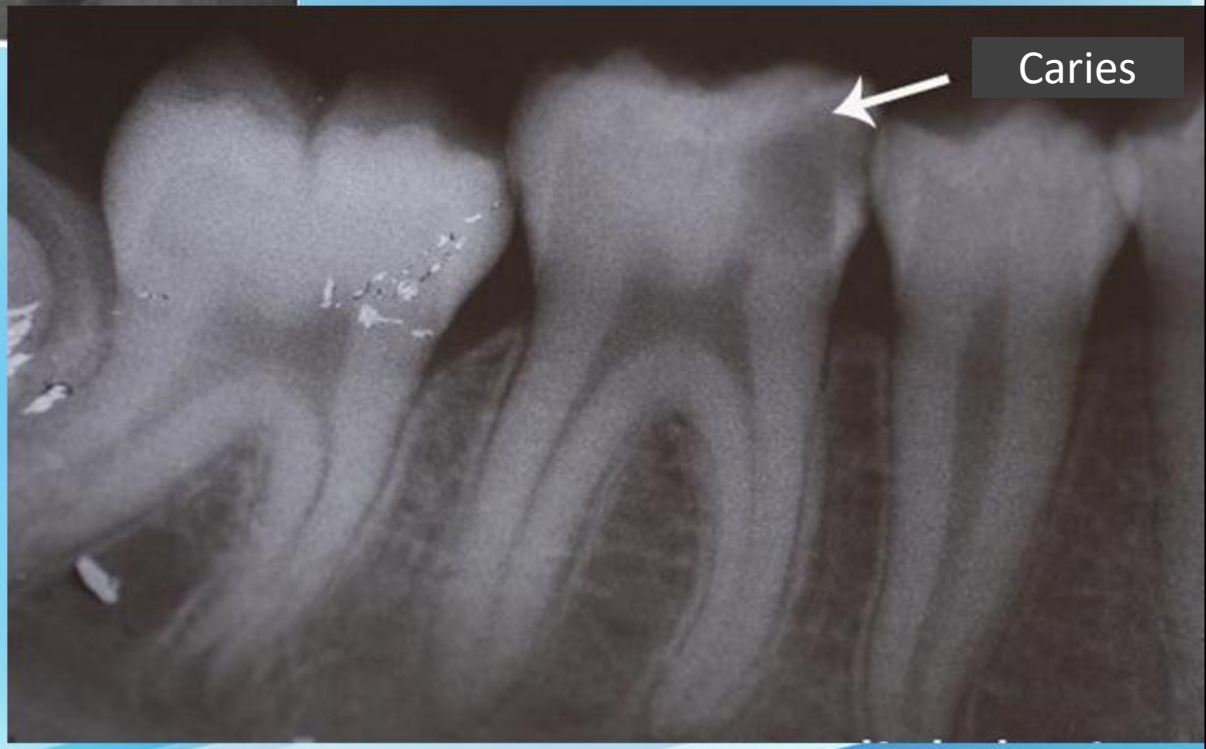


"Caries susceptible" zones.
(E. Hellwig, J. Klimek, T. Attin, 1995)



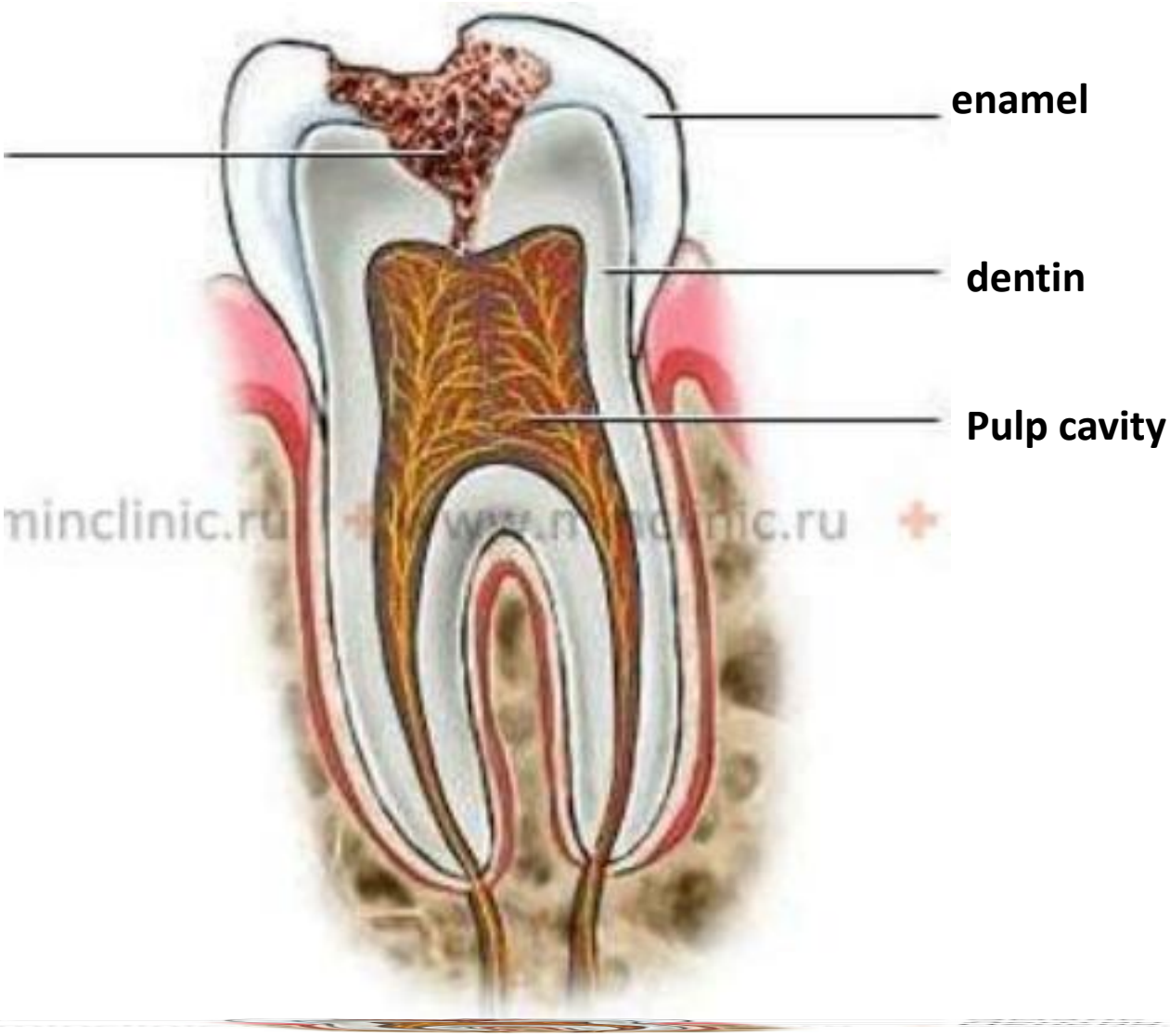





Caries

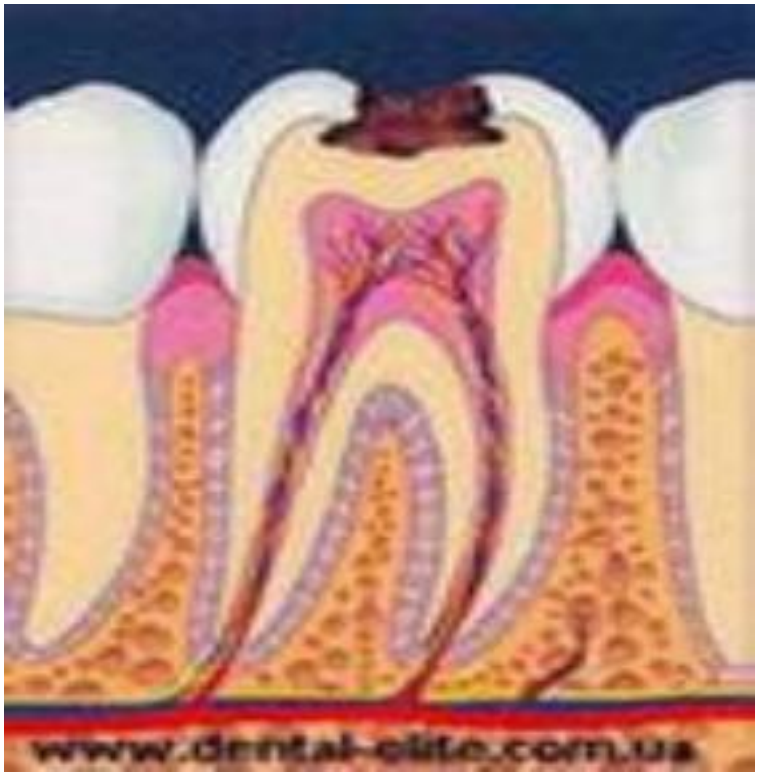

caries
Caries under filling

CARIOUS CAVITY - CONTAINS DECAYED(destroyed) TOOTH TISSUE.



ELEMENTS OF THE CARIOUS CAVITY:

- the entrance hole, bounded by the edges of the carious cavity,
- the wall,
- the wall facing the pulp, is called the bottom of the carious cavity,
- the corners of the carious cavity are formed the walls and bottom of the carious cavity.



Elements of the carious cavity

- The concept of a formed cavity includes the following elements: edges, walls, corners, bottom.

- The walls of the cavity have names depending on the surface of the crown to which they are attached.

- The angles between parallel vertically standing walls are the main elements of fixing the filling material.

- The bottom of the cavity is considered to be the surface facing the pulp of the tooth, regardless of the localization of the carious cavity

CLASSIFICATION OF CARIOUS CAVITIES BY BLEC

-anatomical classification, depending on the localization of the carious process

There are 5 classes of caries localization.

•Class I - area of natural fissures of molars and premolars, blind fossae of incisors and molars.

•Class II - contact (lateral) surfaces of molars and premolars.

•Class III - contact surfaces of incisors and canines without disturbance of the incisal edge and crown angle.

•Class IV - contact surfaces of incisors and canines with damage to the integrity of the angle of the crown and the incisal edge

•Class V - cervical areas of all teeth on vestibular and oral surfaces.

Modern dentistry also considers

•Grade VI - in the area of cusps, equator, incisal edge, i.e. in the area of atypical surfaces for caries.

Stages of treatment(therapy) of simple (uncomplicated) caries

1. Anesthesia (according to indications);
2. Preparation of the carious cavity;
3. Medical treatment of the carious cavity;
4. Restoration of the anatomical shape and function of the tooth by filling the carious cavity

Preparation of the carious cavity

Preparation is the effect(impact, exposure) on the hard tissues of the tooth in order to remove pathologically altered tissues and create a cavity shape that provides convenient and technological filling, preservation of the strength characteristics of the tooth, as well as reliable fixation, aesthetics and medical effectiveness of the filling.

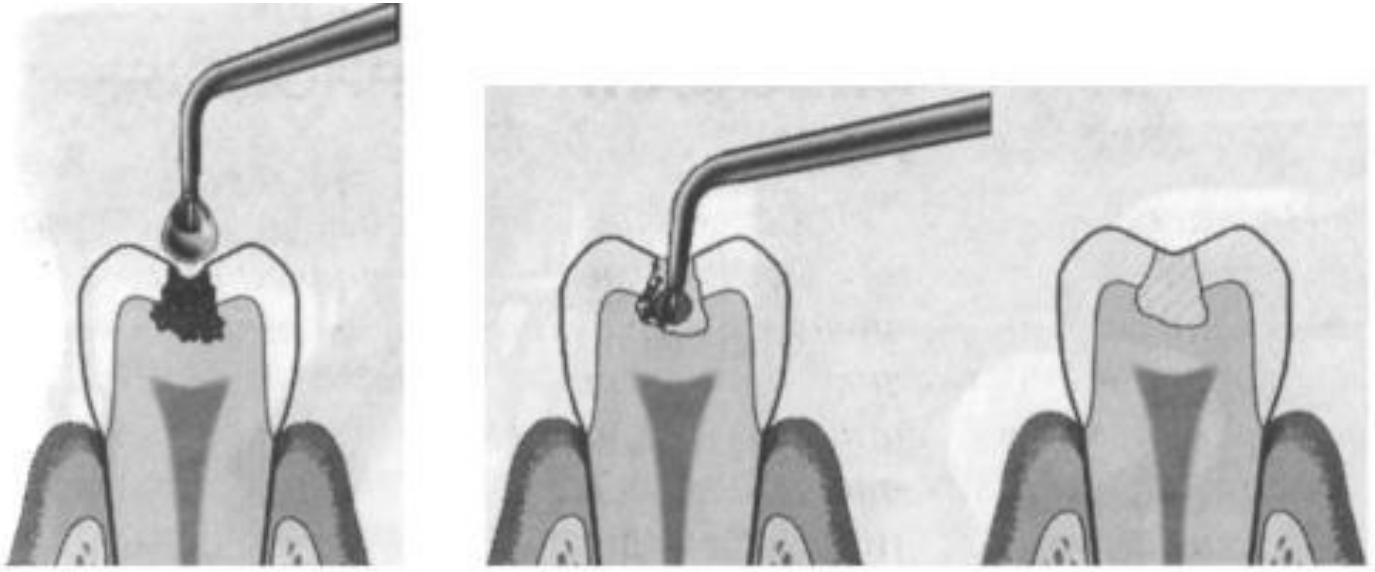
CURRENTLY, THERE ARE VARIOUS METHODS OF PREPARATION:

Mechanical — with the use of drills(burs) and hand tools. This method is currently the most common.

Chemical-mechanical — the use of systems that destroy the lesion of the tissue by the carious process, which are then removed with hand tools. An example of a system for chemical-mechanical preparation of a cavity can be "Carisolv".

Carisolv gel is made on the basis of 0.95% sodium hypochlorite and a mixture of amino acids (leucine, lysine, glutamic acid). The gel is introduced into the carious cavity, then the cavity is cleaned with special hand tools and sealed filling materials.

CHEMICAL-MECHANICAL METHOD OF PREPARATION USING THE"CARISOLV" SYSTEM



Activation of the "Carisolv" gel

Mechanical cleaning of the cavity with hand tools "Carisolv".

Filling

Clinical stages of application of the "Carisolv"system

The kinetic, or air-abrasive method implements in dentistry the method of sandblasting hard surfaces. This method consists in the directed supply of an aerosol containing water and an abrasive agent to the prepared tooth tissues through special tips of a jet jet. The active component of the aerosol used for the preparation of hard tooth tissues is an abrasive powder consisting of aluminum oxide particles of increased abrasiveness

The device for air-abrasive preparation of hard tooth tissues

AIR-ABRASIVE METHOD OF PREPARATION

- **is used for processing fissures before sealing, for eliminating deep enamel pigmentation, for preparing small carious cavities and for preparing adhesive surfaces for applying the adhesive system of the composite. Air-abrasive treatment makes it possible to achieve minimal excision of tissues, which is impossible to do even with the smallest burs(drills). In addition, the abrasive effect of the aerosol creates a rough surface free of contamination with a maximum contact area that does not require additional chemical etching.**

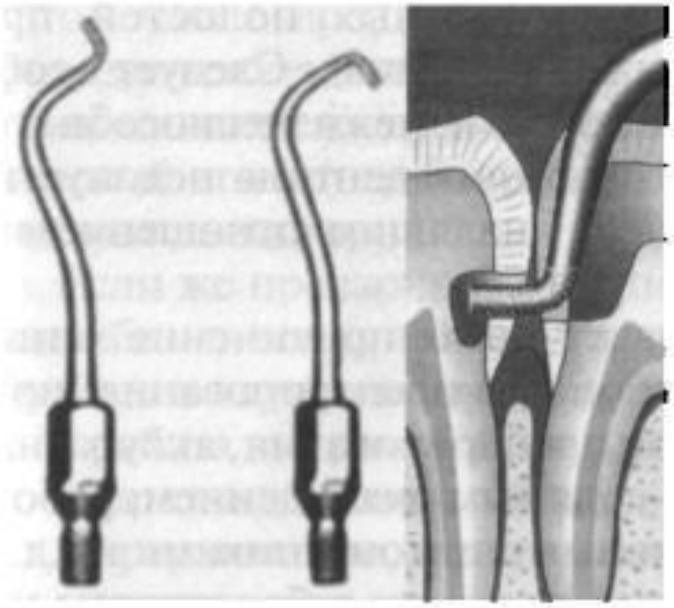
TIP FOR AIR-ABRASIVE PREPARATION OF TOOTH TISSUES

Methods of preparation

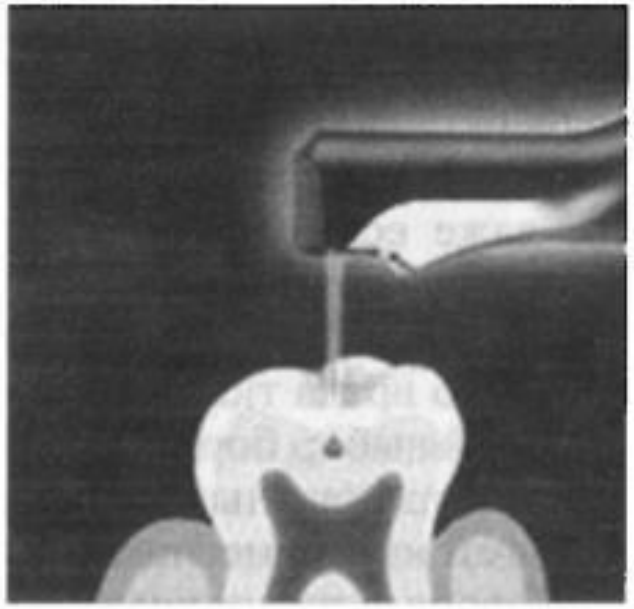
- **Ultrasonic - the use of ultrasonic tips and special attachments to them with a diamond coating of the working part. The tip of the nozzle when working makes microscopic vibrating movements along an oval trajectory, processing the walls of the cavity;**

- **Laser — the use of special lasers intended for the treatment of carious cavities and hard tissues of the tooth**

ULTRASONIC AND LASER METHODS PREPARATION OF THE CARIOUS CAVITY.



Ultrasonic method of preparation of the carious cavity with special diamond-coated nozzles of the working part "SONICflex" (*KaVo*)



Laser method of preparation of the carious cavity "KEY Laser 3" (*KaVo*)

BASIC PRINCIPLES OF PREPARATION.

THE PRINCIPLE OF "EXPANSION FOR THE SAKE OF WARNING".

The principle of "Preventive expansion“

This method was developed more than 100 years ago by the American dentist G. V. Black. The Black method provides for a wide excision of caries-susceptible areas to "immune" zones with the creation of an extensive box — shaped cavity - "expansion for the sake of prevention".

THE PRINCIPLE OF "EXTENSION FOR THE SAKE OF WARNING".

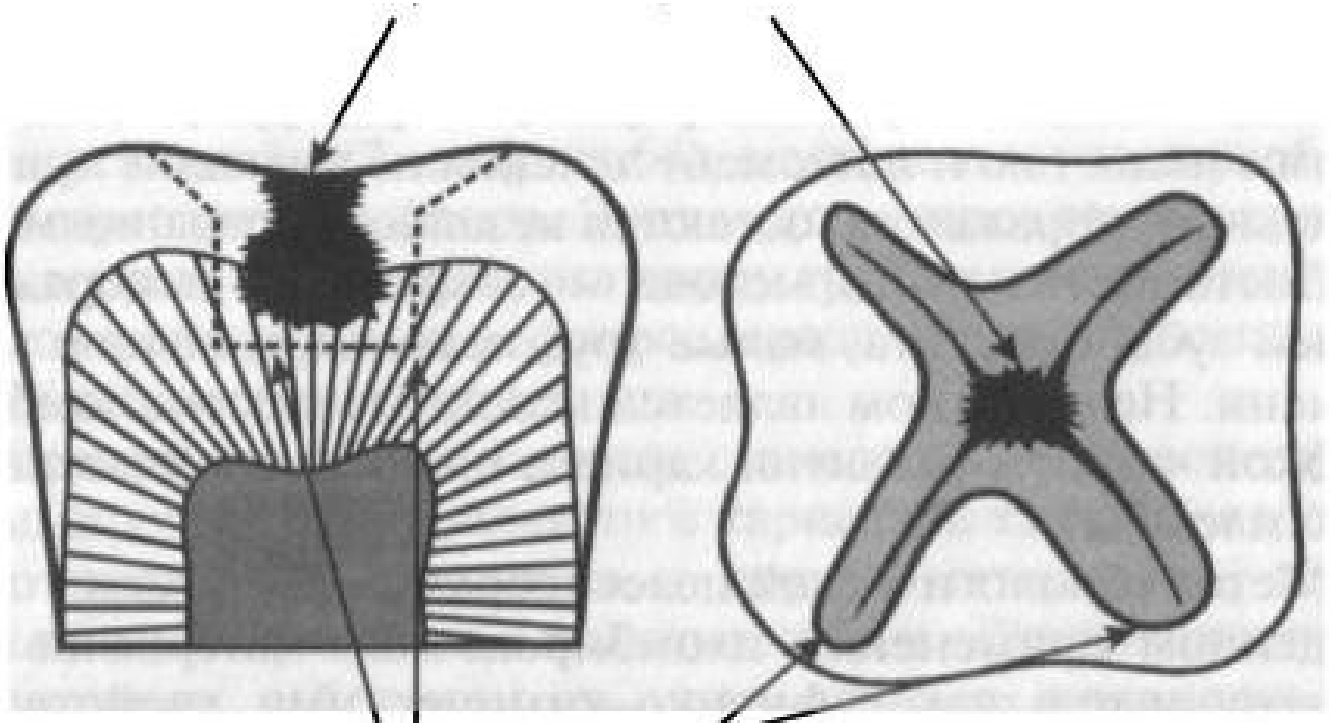
The principle is based on two main provisions — "Retention" and "Resistance", which ensure reliable fixation of the restorative material and prevent the development of a secondary carious process.

Principles of preparation of carious cavities according to Black:

1. **Thorough, complete removal of carious dentin.**
2. **"Expansion for the sake of prevention"— preventive expansion of the cavity to the immune zones of the tooth in order to prevent the development of caries recurrence. Immune zones are bumps and convex surfaces of the teeth.**
3. **The formation of a "box-shaped" cavity that ensures the stability of the filling to the tooth and the forces that arise during chewing.**
4. **Removal of overhanging, unsupported enamel edges in order to prevent their breakage and recurrence of caries.**
5. **Formation of a cavity that is convenient for applying a seal.**

"EXTENSION FOR THE SAKE OF WARNING".

carious lesion



contours of the formed cavity

Preventive expansion of the carious cavity of the 1st class according to Black

"Extension for the sake of warning".

The advantages of this principle are the durability(of fillings, the low frequency of recurrent caries, the simplicity of developing a standard approach to the preparation of the cavity.

Disadvantages - a large volume of excised healthy tooth tissues, a decrease in the strength of the crown, a large amount of time.

Currently, due to the appearance of new filling materials and the development of methods for the prevention of caries, the method of preventive expansion in the classic " version is used extremely rarely.

It is indicated when using high-strength, durable filling materials that do not have adhesion to tooth tissues - amalgams, metal and ceramic inlays

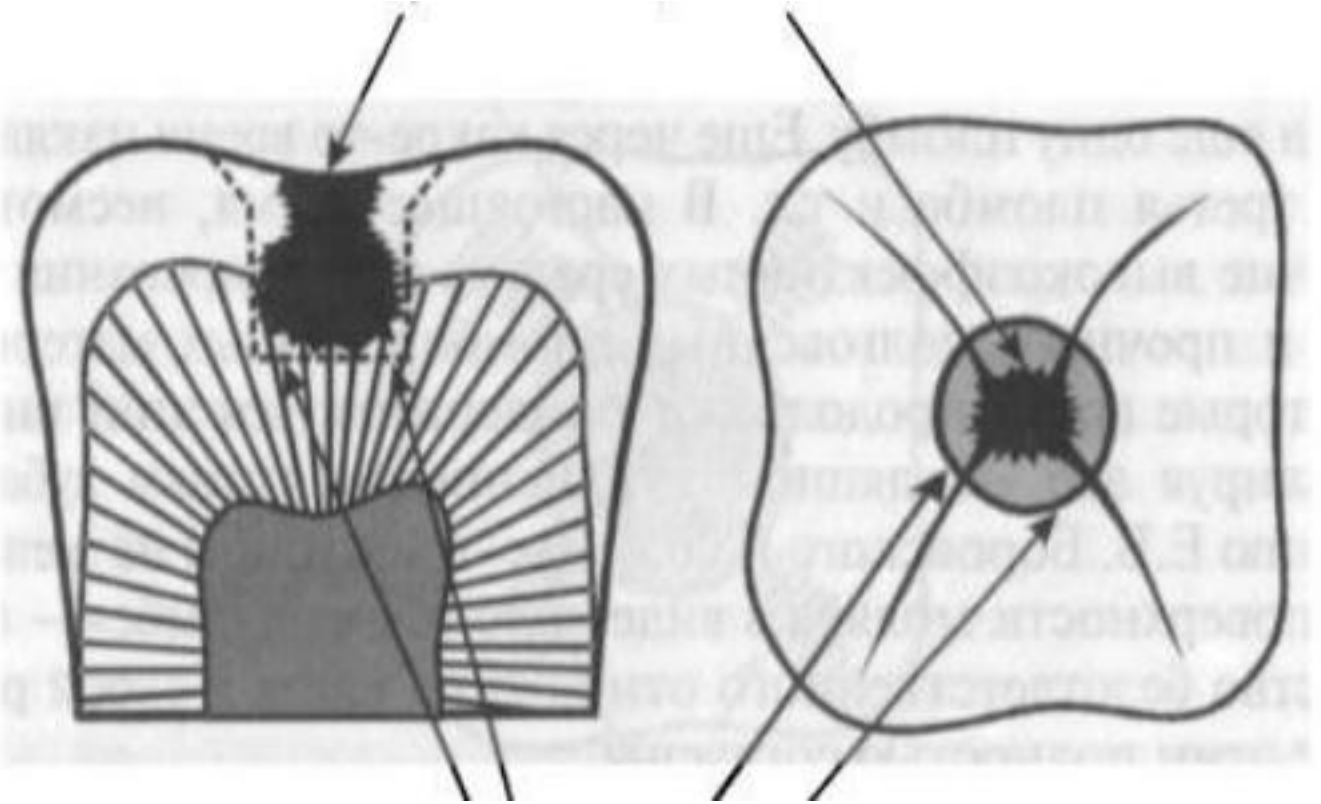
THE PRINCIPLE OF "BIOLOGICAL EXPEDIENCY(reasonability)"

Developed by I. G. Lukomsky. According to this principle, only tissues affected by the carious process are removed with a careful and sparing attitude to healthy tooth tissues.

The advantages of the method are the preservation of healthy tissues, saving time.

Disadvantages - the possibility of recurrent caries and the fragility of fillings.

carious lesion



contours of the formed cavity

Preparation of the carious cavity of the 1st class in accordance with the principle of "biological expediency"

PRINCIPLES OF PREPARATION OF CARIOUS CAVITIESFORMULATED LATER.

The principle of medical validity and expediency.

- **This principle provides for the rejection of the template approach to the choice of the method of preparation and filling of the cavity.**
- **Excision of tooth tissues should be carried out taking into account the degree of prevalence of the carious process, the state of individual caries resistance of the patient, the prognosis of the course of "carious disease".**
- **In accordance with this principle, all non-viable tooth tissues affected by the carious process should be excised. Tactics in relation to fissures, contact surfaces, etc. are chosen taking into account the individual characteristics of the patient on the basis of the concept of preventive filling.**
- **At the same time, the risk of developing recurrent caries and caries on adjacent, unaffected areas of the tooth at the time of treatment is taken into account.**

The principle of a sparing attitude to the tissues of the tooth.

This principle implies the choice of treatment tactics that allows you to preserve the tissues that are not affected by the carious process as much as possible.

First of all, this means the rejection of the formation of extensive box-shaped cavities with small carious lesions.

It should be emphasized that leaving non-viable, infected, demineralized dentin in the cavity is unacceptable, even if it is motivated by a "sparing attitude to the tooth tissues".

This principle also provides for causing minimal damage to the tooth tissues during the preparation process: the correct choice of drills(burs) and preparation modes, careful work with adequate air-water cooling, work with sharp tools, serviceable tips, etc.

The principle of painlessness of all therapeutic, diagnostic and preventive manipulations.

- Adequate anesthesia for all potentially painful manipulations.
- Work with sharp bores(drills) and serviceable tips;
- intermittent, "stroking" movements of the bor(drill);
- sufficient air-water cooling;
- use of high-speed tips;
- psychological, psychotherapeutic and drug preparation of the patient according to the indications.

The principle of compliance with the rules of asepsis and antiseptics.

It is necessary to ensure the prevention of nosocomial infection.

The use of such preparation technologies (turbine, ultrasonic device, air-abrasive method) leads to the formation of aerosols in the air of the office. During the operation of the turbine, an infected aerosol cloud is formed around the working field, exceeding several meters in diameter. When using technologies related to the formation of aerosols in the air of the office (turbine, ultrasonic device), additional measures of respiratory and eye protection should be provided. It is recommended to work in protective glasses and a respirator mask.

Compliance with the rules of asepsis and antiseptics.

To reduce the bacterial contamination of the patient's oral cavity, rinsing with antiseptic solutions is recommended before taking it: an aqueous solution of potassium permanganate 1:1000 (prepared ex tempore), a solution of furacilin 1:5000, a 0.5% solution of hydrogen peroxide or solutions of official preparations for antiseptic treatment of the oral cavity: "Octenicept", "Listerine", "Dentasol", etc.

In addition to protecting the patient from possible infection, measures should be taken during the preparation process to protect and preserve the health of the doctor and other medical staff.

Wear protective glasses, masks and gloves while working. It is recommended to change the masks every 2-4 hours. Gloves are replaced with new ones after each patient's admission.

The principle of visual control and ease of operation.

Visual control of the quality of each manipulation, the correctness of each stage. Application of various ergonomic techniques, tools and devices:

•- the use of an effective aspiration system (saliva pump, "vacuum cleaner")

•- sufficient illumination of the working field: the correct location and direction of the light of the installation lamp, work with illuminated tips, additional illumination of the working field with special devices;-

• use of magnifying lenses or dental equipment a microscope for quality control of preparation;

•- the use of special dyes (caries markers) for objective control of the condition of tooth tissues;

•- the use of gingival edge retractors, mouth expanders, cofferdam, lip, cheek and tongue holders to divert soft tissues to the required distance from the prepared cavity.

The principle of preserving the integrity of adjacent teeth, periodontal and oral tissues.

When preparing cavities, especially those located in the immediate vicinity of the gingival edge, it is necessary to carefully and accurately perform all manipulations, which allows avoiding mechanical or chemical injury to the mucous membrane and marginal periodontal.

In addition, when preparing, especially contact cavities, it is necessary to avoid damage to the enamel of neighboring teeth, using appropriate devices and techniques for this.

The principle of rationality and technological manipulations.

This principle provides for the selection of the most effective and rational methods, tools and techniques for preparing the carious cavity.

The preparation of the carious cavity is a technological process, the success of which is largely determined by how accurately the doctor fulfills the recommendations on the use of bors(drills), the choice of a tip, compliance with the preparation regimens, the implementation of each stage of treatment.

The principle of retention and resistance.

The most important conditions for effective and high-quality preparation is the creation of a retention and resistant form of the cavity.

Resistance is understood as the resistance of tooth tissues to mechanical loads and cariesogenic influences.

Mechanical resistance of the tooth is ensured by minimal excision of healthy tissues, and caries - resistance is ensured by preparation and filling to the "immune" zones.

Retention - ensuring a strong and reliable fixation of the seal in the cavity. It is provided by three factors.

Macromechanical retention — fixation of the seal due to retention,the" holding " shape of the cavity. To ensure the macromechanical retention of the cavity seal, an "irregular" shape is given, additional platforms are formed, retention cuts.

Micromechanical retention is provided by creating a micro-rough surface of the cavity walls, which increases the area of contact with them of the filling material, improving the fixation of the seal. To create micro-roughness on the surface of enamel and dentin, they are etched with 37% orthophosphoric acid, air-abrasive treatment, etc.

The chemical bond with the tooth tissues is provided by glass ionomer and polycarboxylate cements.

The principle of biomechanical compliance.

This principle provides for the compliance of the cavity design with the physical and mechanical properties of the filling materials used and the biomechanical characteristics of the tooth tissues surrounding the formed cavity.

For example, when filling with amalgam or tabs, the formed cavity should have a box-shaped form, parallel walls or walls slightly converging to the bottom, right angles. Weakened, thinned chewing bumps should be excised when using these materials.

- **The principle of creating conditions for the aestheticrestoration of the tooth.**

- **When preparing carious cavities, especially in the front teeth, it is necessary to additionally follow the requirements of aesthetics:**
- **completely excise the pigmented dentin;**
- **treat the enamel in such a way as to ensure adequate reflection and refraction of light at the border of the restoration material with the tooth tissues,**
- **excise areas that worsen the aesthetic result of restoration (for example, pigmented enamel cracks).**

- **To improve the aesthetic result of filling, it is allowed to leave unaffected enamel on the vestibular surface of the front teeth, which does not have a dentine base under it.**

PRHINCIPES PREPARATIONS CARIOUS CAVITY

The principle of ergonomics.

Compliance with the principles of ergonomics in the work of a dentist.

Ergonomics is a science that studies the functional capabilities of a person in labor processes in order to create optimal working conditions for him. The task of ergonomics, on the one hand , is to make work highly productive and efficient, on the other, to provide a person with convenience of work, preservation of his strength, health and efficiency.