Lecture № 3

CARIES: clinic and morphological changes on various stages of carious process

for 3-rd year students of stomatological department

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Lecture plan

- Caries of a tooth. Classification.
- Morphological changes of tissues of a tooth on various stages of carious process on the given radial, electron and polarizing microscopy.
- Clinic, diagnostics and differential diagnostics of caries.
- Use of physical methods in diagnostics of caries.

Classification of caries (worker)

1. Clinical (topographical).
   - Initial (white, pigmented stain) (macula cariosa)
   - Superficial (c. superficialis)
   - Middle (c. media)
   - Deep (c. profunda)

2. The anatomic
   - Caries of enamel (c. enameli)
   - Caries of dentine (c. dentini)
   - Caries of cement (c. cementi)

3. On localization
   - fissure (c. fissuralis)
   - aproximal (c. aproximalis, c. contactus)
   - in area of neck (c. cervicalis) Circulating (ring)

4. On a current
   - Acute (c. acuta)
   - Chronic (c. chronica)
   - Plural (blooming, system) (c. florida)
   - Secondary (c. secundaria)
   - Stationary (stopped) (c. stationaria)

5. On intensity of defeat
   - The compensated
   - The subcompensated
   - The decompensated

6. On presence of complications
   - Simple (not complicated) (c. simplex, c. incomplicata)
   - Complicated (c. complicata)
Acute initial caries (macula cariosa)

is a pathological process which is characterized by demineralization of
subsuperficial layer of enamel without formation of defect in the form of a cavity.

Pathomorphologic of acute initial caries

In the basis of pathological process is demineralization of an enamel layers,
which begins on so-called lines by Retzius (regions the least degree of a
mineralization of enamel). But feature consists that subsuperficial and the central
layers of enamel are exposed to demineralization to the greatest degree. And the
outside layer remains enough mineralization that explains saliva activity.

S.P.Onishchenko and V.P.Zenovsky have secured 5 layers of a lesion:

1. The superficial region, is characterized by the greatest stability;
2. The subsuperficial, in which reduction of the content of calcium in
   comparison with norm is observed; the volume of microspaces is enlarged to
   14 % at norm of 1 %. Permeability of an enamel sharply increases;
3. The central region (lesion body) – region of maximum changes. The volume
   of microspaces is enlarged to 20-25 %;
4. The intermediate region;
5. The intrinsic (region a lustrous enamel) - region the relative well-being.

Clinic of acute initial caries

Complaints: on cosmetic defect in a view whitish maculae various shades,
inappreciable sensitivity from chemical irritates (acidic, sweet, bitter).

Anamnesis of diseases: causal tooth earlier it is not treated, complaints have
occurred several weeks ago

Objective examination of a place of disease:

At survey - whitish, opaque macula small dimension with accurate borders.
This maculae can be defined on any, accessible to survey surfaces, except for a
place of the most frequent localization of caries lesions - at the bottom of sulcus
and proximal surfaces of teeth.

At probing the smooth surface of these maculae, painlessness is defined.
A vertical and horizontal percussion and a mucosa palpation in range of projection apexes of a root of tooth are painless.

A thermo diagnostic painless or inappreciable short-time painful sensitivity.

EOD: 2-6 mkA.

Maculae are imbued by 2 % solution of the methylene dark blue.

Clinic of chronic initial caries

Difference:

Complaints at presence dark stain, if it is localized on places accessible to its survey. Complaints often are absent, as the pain or sensitivity from irritants does not arise. Caries often find out at routine inspection.

Long current. Development of this caries can stop.

At survey the dark stain of various shades - from light brown to black in typical places for localization of caries defeats is defined.

The acute superficial caries

is a pathological process which is characterized by demineralization of all layer of enamel with formation of defect in the form of a cavity within enamel. In situ whitish macula destruction of an outside layer of enamel is. Disorientation of crystals in frame hydroxiapatite, change of their shape and the dimensions are occurred. Defect (affection) the enamel-dentin border and changes in a pulp is not observed.

Clinic of acute superficial caries

Complaints: short-time pain from chemical (acidic, sweet, bitter) and less often from temperature irritant. It is more often observed at localization of defect in the field of nick of teeth, where sides are the thinnest.

Anamnesis of diseases: causal tooth earlier it is not treated, complaints have occurred 1 month ago.

Objective examination of a disease place:

At survey – on the centre of whitish maculae defect of enamel is defined.

At probing the rough surface of enamel and painfulness are defined.
A vertical and horizontal percussion and palpation a mucosa in range of apexes projection of tooth root are painless.

At thermo diagnostic: inappreciable short-time painful sensitivity. EOD: 2-6 mkA.

Clinic of chronic superficial caries

Difference:
- Absence of painful sensitivity.
- Long current.
- Colouring of defect of enamel in dark colour

The middle caries

is a pathological process which is characterized by demineralization of enamel and a cloak layer of a dentine with formation of defect within a cloak dentine in the form of a cavity.

Pathomorphologic of chronic middle caries

In light microscope 4 regions are defined:
1. Decay and demineralization enamel and cloak dentine;
2. The transparent dentine;
3. Intact dentine;
4. Replaceable (tertiary, substitute) dentine and changes in a pulp.

Layer of decay and demineralization

In first zone the rest of destruction of enamel and a dentine with a considerable quantity of microorganisms are visible. The cloak dentine is softened, dentinal tubules are dilated or are merged, forming microcavities (flaw), are filled with bacteria. Processes of odontoblasts are exposed fatty dystrophic.

Layer of transparent dentine

The (region hypermineralizations) - a layer of the compacted dentine with considerably reduced dentinal canaliculuses. This region is characteristic only for chronic caries since for its formation the long-term current and expressed enough properties of saliva and blood is necessary. This region is termed so because of optical effect: at the expense of an obliteration of dentinal canaliculuses there is
"wipeout" of borders between canaliculuses and a dentine. Rays of light, transiting through tissues with the homogeneous frame is not quenched, and yields the homogeneous light emission (on microsections these fields look homogeneously transparent).

Layers of intact and tertiary dentine

At chronic middle caries the layer of nearpulpul dentine is intact. In forth zone at arch of pulp chamber in projective of carious lesion the layer of replaceable (tertiary) dentine is formed. It differs from the secondary dentine less oriented locating of dentinal canaliculuses or their full lack. Region a replaceable dentine is characteristic only for **chronic current** of caries.

Clinic of chronic middle caries

- **Complaints:** pain is absence; patients complain at presence of a carious cavity, hit and hold back of nutrition.
- **The disease anamnesis:** tooth earlier was not treated, complaints have occurred about 6 months ago.
- At **survey** of tooth the middle depth caries cavity with a wide inlet opening is defined. A dentine of bottom and walls is dark, dense at probing.
- A **vertical and horizontal percussion** and a **palpation** of a mucosa in the field of apex projection of tooth root are painless.
- Response to probing and a thermodiagnostic are painless.
- EOD - 2-6 мкА.
- The test for preparation: at diagnostic preparing on a dentine-enamel border without previous anesthesia pain arises.

The acute middle caries

At this caries allocate following zones:

1. Decay and demineralization enamel and cloak dentine;
2. Intact nearpulpul dentine;
3. Changes in a pulp.

At an acute caries the process is distributed along dentin-enamel junction, in this connection the undermined (hanging) edges of enamel are formed. The cavity
has the form of a rhombus, which short diagonal settles down on dentin-enamel junction. Transparent and replaceable dentine has not time to be developed, therefore process quickly passes on nearpulpul dentine.

Clinic of acute middle caries

β Complaints: short-time pain from chemical and temperature irritant, hit and holdback of food;

β Anamnesis of diseases: causal tooth earlier was not treated, complaints have occurred 2-3 month ago.

β Objective examination:

At survey – caries cavity settles down in limits of cloak dentine, with narrow entrance aperture. The defect of enamel is insignificant, does not correspond to the sizes of a cavity in a dentine. The edges of defect in enamel sometimes are transparent, fragile (easily break off by an excavator). A dentine of bottom and walls are light and softened at probing.

β At probing painfulness at enamel-dentin border are defined.

β A vertical and horizontal percussion and palpation a mucosa in range of apexes projection of tooth root are painless.

β At thermo diagnostic: inappreciable short-time painful sensitivity. EOD: 2 - 12 mkA.

The acute deep caries

At this caries following zones are allocated:

a) Disintegration and demineralization;

b) The thin zone of an intact dentine (sometimes is absent);

c) Changes in a pulp.

In the third zone take place: quantity reduction of odontoblasts, their disorientation and fatty dystrophic. At a light microscopy at a deep caries the changes in vessels of a pulp externally similar to the basic inflammation are defined. The degenerative changes in some nervous fibers of a pulp, even to complete disintegration of their axial cylinder are visible.
Clinic of acute deep caries

- **Complaints:** on a short-term pain from mechanical (as a result of hit of firm particles of food which create pressure upon a bottom of caries cavity), chemical and temperature irritants, hit and holdback food, cosmetic defect (at defeat of a frontal teeth). Sometimes, if the cavity is settled down on proximal surfaces, acute caries proceeds without complaints.

- **The disease anamnesis:** a causal tooth earlier was not treated; complaints have appeared about 2-4 months ago.

- At **survey** the deep cavity with the rests of food is found out. Dentine of a bottom and walls is softened, weak pigmented. The entrance aperture narrows with hanging edges of enamel.

- **Probing** of bottom of caries cavity is poorly painful (sensitive). In some cases there can be characteristic signs for pulpit: aching pain in a tooth in case holdback of food, sensation of discomfort in a tooth.

- **Vertical and horizontal percussion** and a mucosa palpation in the field of apex projection of tooth root are painless.

- Thermodiagnostics can cause considerable, but short-term painful reaction.

EOD: 10-12 мкА.

The chronic deep caries

**Difference:**

- Absence of painful sensitivity from mechanical irritants;
- Long current;
- Wide entrance aperture with out hanging edges of enamel;
- Dentine of a bottom and walls of caries cavity is dense and pigmented;
- Painless probing.

**Additional method of diagnostics of caries**

**X-ray diagnostics** - concealed caries cavities

**The caries-marking**