



**Preparation of carious cavities of
Class IV according to Black.**

Rules for dissecting cavities of class IV according to Black.

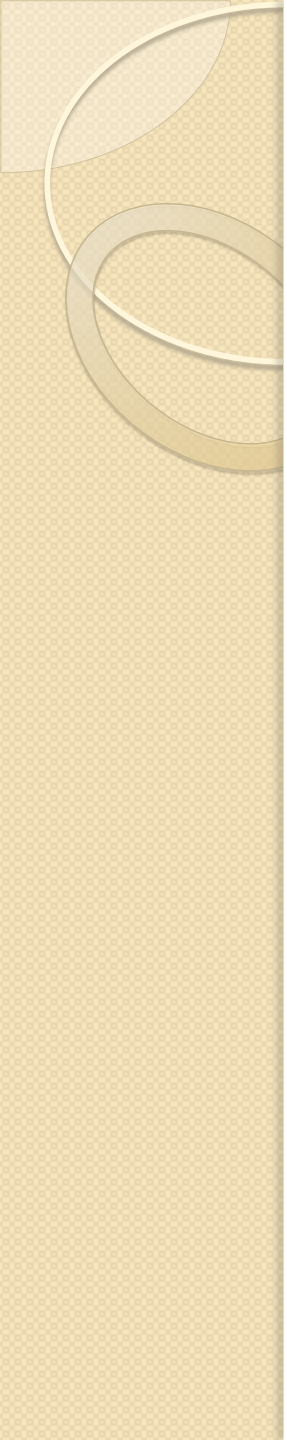
Class IV, according to the Black classification, includes cavities on the contact surfaces of incisors and canines with damage to the cutting edge.



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- Usually they are formed from class III cavities with a wide spread of the carious process on the contact surface, and the loss of the crown angle as a result. Another cause of class IV cavities may be lesions of tooth tissues of non-carious origin: acute or chronic trauma, destructive forms of hypoplasia, etc.

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- Class IV cavities present the greatest difficulty in preparation and filling. This is explained by the fact that in this case the doctor has to look for a "golden mean", solving a number of sometimes contradictory tasks:
 - it is necessary to treat the disease of the tooth and surrounding tissues, as well as take measures to prevent complications (primarily recurrent caries). The solution of this problem ensures the medical effectiveness of treatment;
 - considering the fact that in the vast majority of cases with class IV cavities, a significant volume of hard tooth tissues is lost, including enamel from the vestibular surface of the crown, restoration or improvement of the aesthetic parameters of the tooth is required. The solution of this problem provides an aesthetic result of restoration;

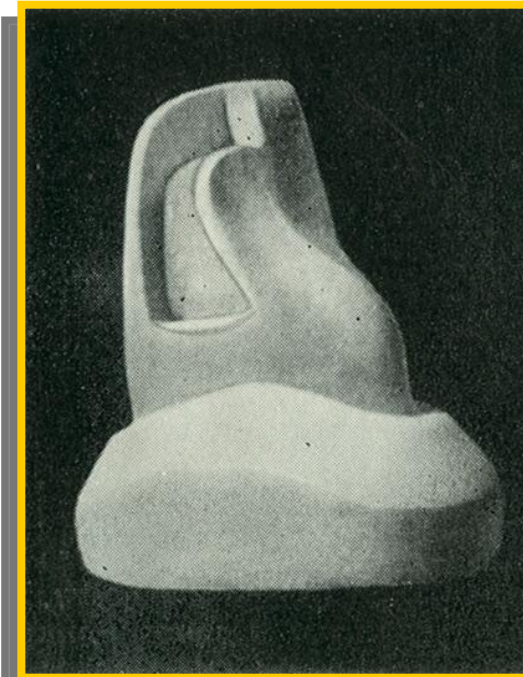
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- based on the fact that the filling in the class IV cavity is subjected to quite significant mechanical loads, it is necessary to carry out preparation and filling in such a way as to ensure the strength and reliable fixation of the seal, while at the same time preserving the strength of the remaining tooth tissues. The solution of this problem allows you to restore the strength characteristics and functional value of the tooth;
 - it should be taken into account that the enamel and dentin of the tooth, as well as filling materials have different strength characteristics (modulus of elasticity, flexural strength, compression, tensile, coefficient of thermal expansion, etc.).

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- Therefore, preparation and filling should be carried out in such a way that the biomechanical characteristics of the tooth are maximally restored, so that the restoration corresponds to the surrounding tissues in terms of strength characteristics, so that the stresses arising at the border of the seal with the tooth tissues are minimized.

Caries damage to the contact surface and cutting edge of the frontal tooth

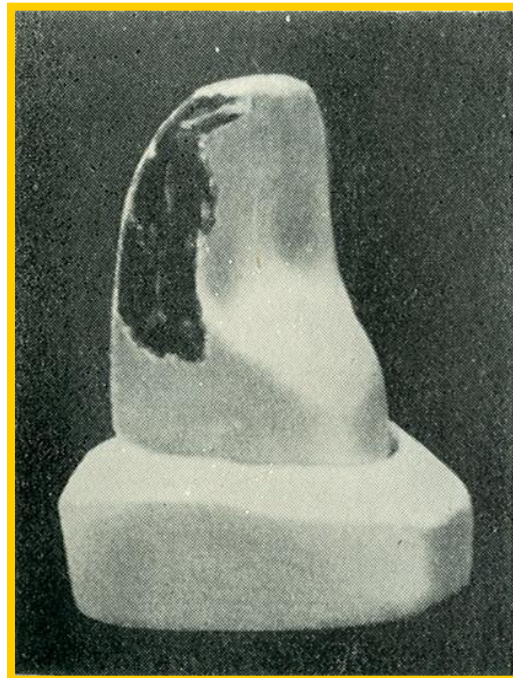


before preparation

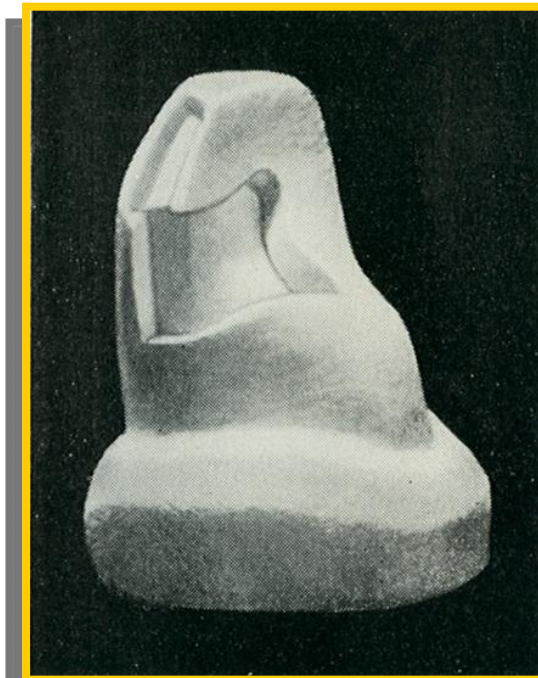


after preparation

**Caries damage of the contact surface and the cutting edge of the frontal tooth
with the destruction of the angle**



before preparation



after preparation

Stages of treatment of carious cavities on the contact surfaces of the frontal group of teeth with damage to the cutting edge.

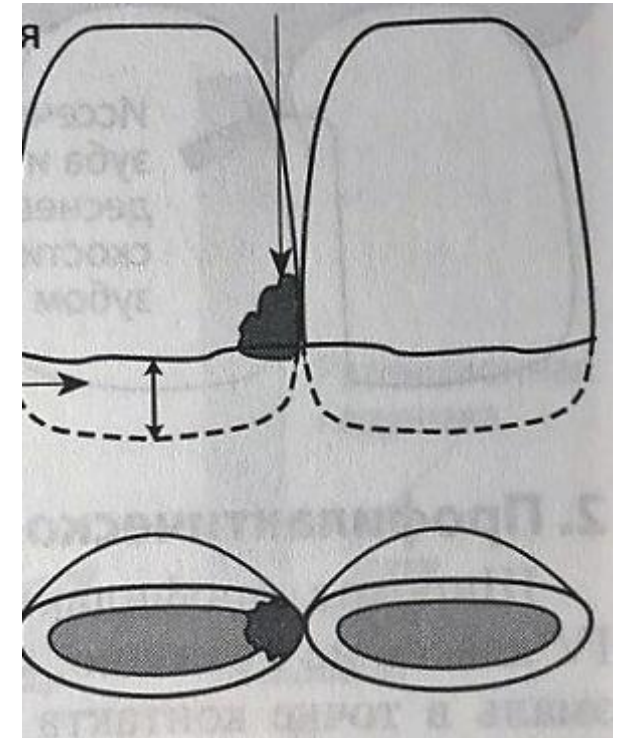
- **I. Opening of the cavity.**
- ~Direct access (carried out in the absence of a neighboring tooth, as well as in the presence of gaps between the teeth). Diamond or carbide spherical drills of small size are used.
- ~Lingual access (used when it is possible to preserve a significant amount of unaffected enamel on the vestibular surface of the tooth crown).
- ~Vestibular access (in the presence of an extensive contact surface). The disclosure is carried out with diamond spherical or pear-shaped drills of small size.

- **Vestibular access** during the opening of class IV cavities is the most common. The cavity is opened through an enamel defect on the vestibular surface. Excise not only the affected, demineralized enamel, but also tissues that complicate the subsequent aesthetic restoration of the tooth. For example, in order to subsequently make a full-fledged, "aesthetic" bevel of enamel, at this stage, externally unchanged enamel, which does not have dentin under it, is excised from the vestibular wall.
- If the "old" seal located on the side of the vestibular surface is replaced, the cavity is also prepared through the vestibular access. All the old filling material must be removed.
- The cavity is opened with a diamond spherical or pear-shaped drills of small size. If the defect of hard tissues is localized mainly from the lingual surface and the vestibular enamel in the area of the cutting edge can be preserved, direct or lingual accesses are used.

- **Direct access**, as well as with Class III cavities, is carried out in the absence of an adjacent tooth, if there is a prepared cavity on the contact surface of the adjacent tooth, or if there are three and diastems between the teeth that make this type of access technically possible. At the same time, the affected, demineralized enamel is removed, trying not to expand the cavity in the vestibular direction.
- **Lingual access** is used when it is possible to preserve a significant amount of unaffected enamel on the vestibular surface of the tooth crown. However, it should be remembered that in some cases, the abandonment of vestibular enamel, which does not have dentin under it, worsens the final aesthetic result of restoration. Therefore, the decision on the expediency of lingual access is made by the doctor individually, taking into account the clinical situation, his washing and the possibility of further aesthetic restoration of the tooth.

- **Incisal access** (through the cutting edge) becomes possible when, as a result of erasing the cutting edge of the tooth, access to the contact carious cavity is cut off (physiological or pathological erasability). In this case, the class III cavity "passes" into class IV not due to the spread of the carious process, but due to a decrease in the height of the tooth crown, the enamel from the vestibular and lingual surfaces, as a rule, remains intact. The opening of the cavity in this case is carried out with a thin fissure drill through a wide, erased cutting edge, trying to preserve the enamel from the vestibular and lingual surfaces as much as possible.

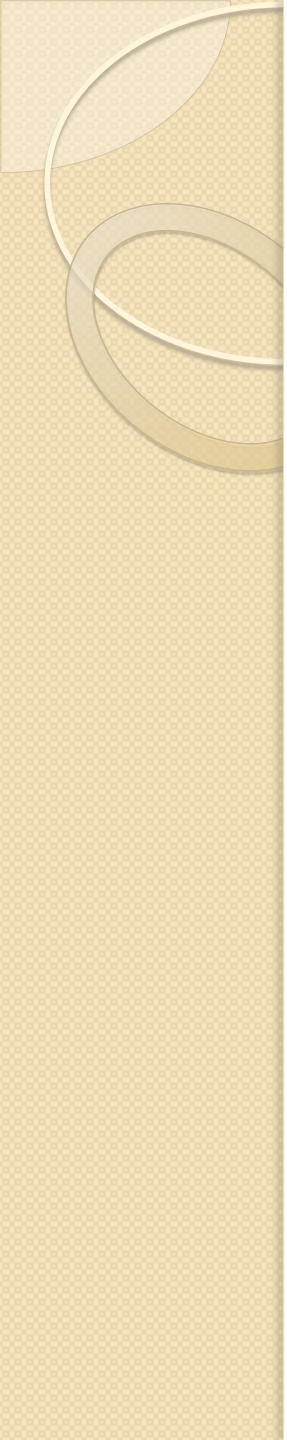
~ Incisial access (through the cutting edge, becomes possible when, as a result of physiological or pathological erasure of the cutting edge of the tooth, access to the contact carious cavity opens). The opening of the cavity is carried out with a thin drill through a wide erased cutting edge, trying to preserve the enamel on the vestibular and lingual surfaces of the tooth crown as much as possible.



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- **2. Preventive expansion.**
 - Extensive prophylactic excision of tissues in class IV cavities is not indicated. It is recommended to excise only the enamel at the point of contact of the gingival edge of the cavity with the adjacent tooth.

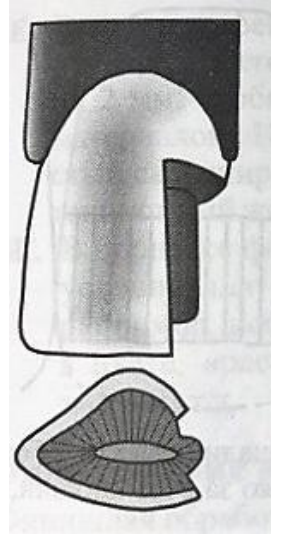
- **3. Necrectomy**

- This stage is performed in accordance with the principles of aesthetic restoration of frontal teeth with composite materials. Demineralized enamel and cariously altered dentin are removed, while not only softened, but also all pigmented dentin is removed. Necrectomy in the area of the pulp wall of the cavity should be carried out very carefully because of the proximity of the pulp of the tooth.

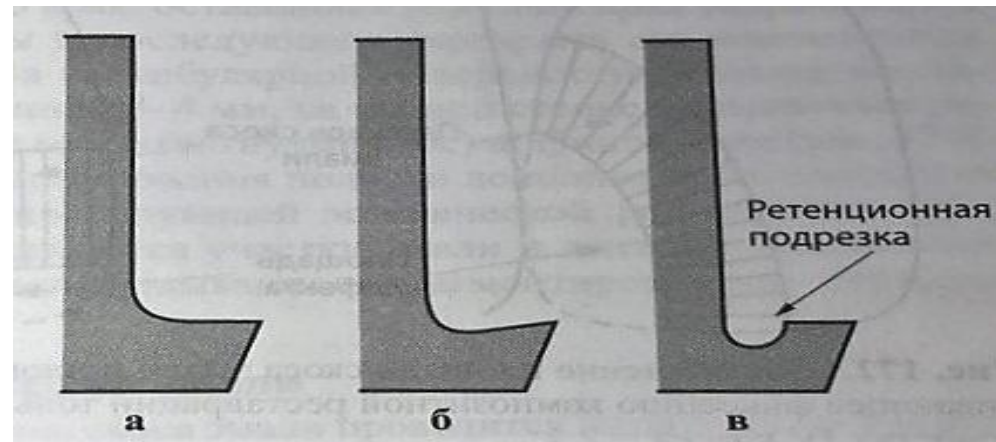
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- in some cases, guided by the tasks of subsequent aesthetic restoration of the tooth, the intact vestibular enamel, which does not have dentin under it, is removed;
 - necrectomy, especially in the area of the pulp wall (bottom) of the cavity, should be carried out very carefully, preferably with hand tools. This is due to the proximity of the pulp and the danger of accidental opening of the tooth cavity when working with too aggressive tools (for example, a turbine tip).

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- **4. Cavity formation.**
 - The features of this stage are the creation of conditions for aesthetic restoration of the tooth, as well as the formation of additional retention points and support platforms that provide macromechanical retention of the restoration (fillings).
 - A class IV cavity formed using vestibular access must meet a number of requirements.

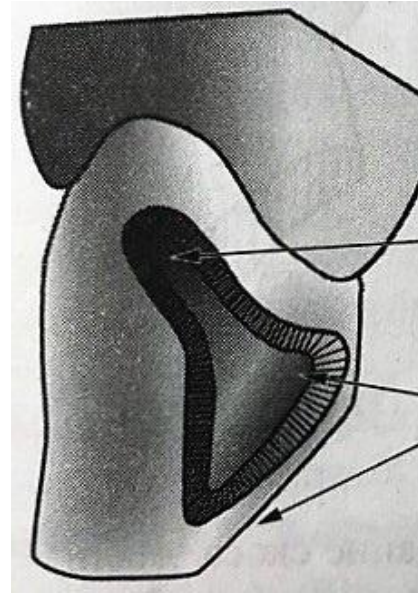
A) the pulp wall of the cavity is deepened into the dentin by no more than 0.5 mm. The bottom of the cavity is made roller-shaped.



B) the angle between the root and pulp walls of the weeding is made straight or slightly rounded (a, b). For an additional for macromechanical fixation of the seal, it is recommended to make a trim in the form of a groove running from the vestibular surface to the lingual at the border of the pulpary and posterior walls of the cavity (c).



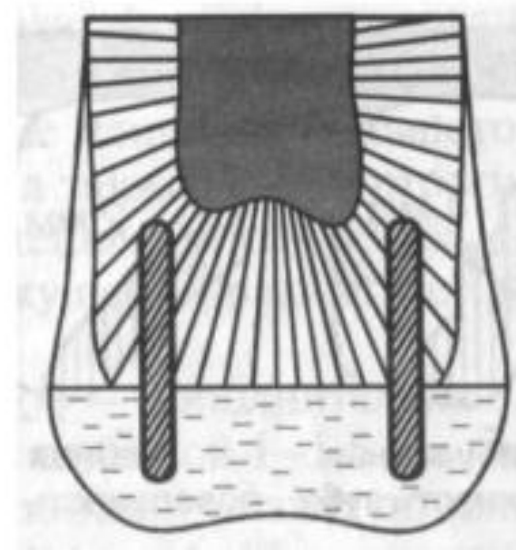
C) to improve the macromechanical retention of the seal, it is recommended to form an additional pad on the lingual surface of the tooth in the area of the blind fossa.



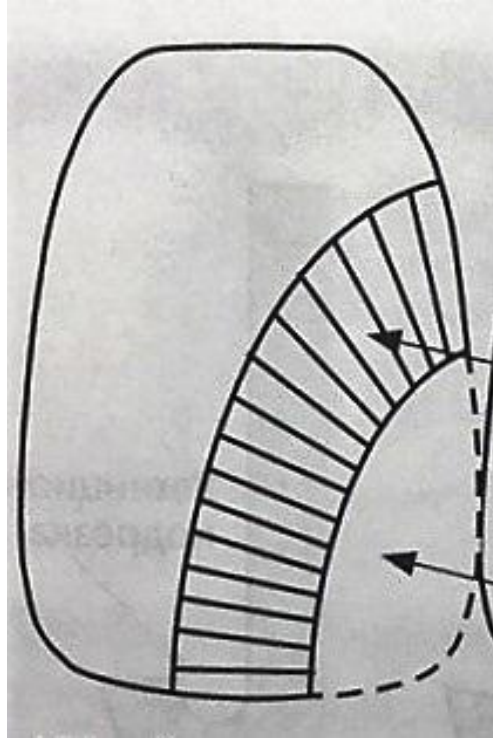
additional pad

The width of the additional platform is 1.5-2 mm. In order not to weaken the tooth tissue, it should be located as far as possible from the cutting edge. The bottom wall of the additional platform should pass into the bottom wall of the main cavity without ledges and steps. This wall is formed parallel to the gingival margin, at a distance of 1 - 1.5 mm from it. At the same time, the posterior enamel roller on the lingual surface of the tooth should be preserved as much as possible. The angle between the bottom of the main cavity and the bottom of the additional platform is smoothed. The optimal depth of the additional platform is 1 - 1.5 mm.

- to improve the macromechanical fixation of the restoration, parapulpar pins can be used. The picture shows a scheme for restoring the cutting edge of the central cutter;



- when creating a bevel on the vestibular surface of the tooth, guided by the tasks of subsequent aesthetic restoration, it is usually necessary to remove intact enamel that does not have dentin under it. The bevel of the enamel on the vestibular wall in the posterior region is made for the entire thickness of the enamel, the depth of the bevel decreases to the cutting edge. To achieve the best aesthetic result, the contours of the bevel are made wavy



D) the bevel of the enamel on the vestibular surface becomes wide and wavy. The area of the bevel should be 2 times larger than the area of the defect.

- in order to ensure micromechanical retention of the restoration due to the adhesive properties of the composite material, as well as to improve the aesthetic result of restoration with class IV cavities, a wide bevel of enamel is created on the vestibular surface of the tooth. As noted above, if the fixation of the restoration is planned to be provided only due to the adhesive properties of the composite, the area of the bevel should be at least 2 times larger than the area of the defect of the hard tissues of the tooth;
- in the case of a defect 1/4 of the tooth crown with preservation of more than half of the cutting edge (see Fig. 164), a bevel of enamel with a width of 4 mm with smooth, wavy contours is made on the vestibular surface, and a retention groove (concave bevel) with a width of 2 mm is prepared from the palatine surface along the entire wall (Salovaa.V., Rekhachev V.M, 2003).
- in the case of a defect of 1/3 of the tooth crown with less than half of the cutting edge preserved (see Fig. 165), the remaining cutting edge is shortened by 2 mm in order to subsequently cover it with composite material. A wavy bevel with a width of 4 mm is made on the vestibular surface, a retention groove (concave bevel) with a width of 2 mm is formed on the palatine wall

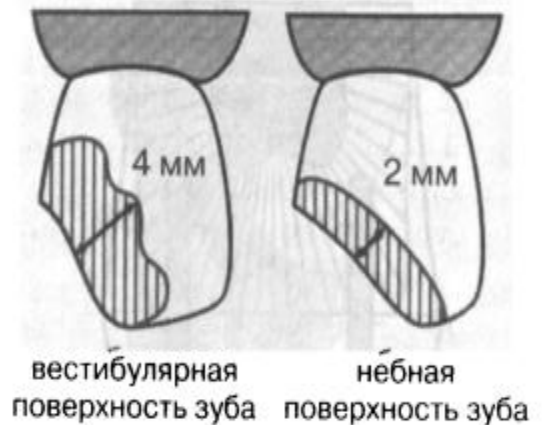


Рис. 164. Создание скоса эмали при дефекте 1/4 коронки зуба с сохранением более половины режущего края (Салова А.В., Рехачев В.М, 2003).

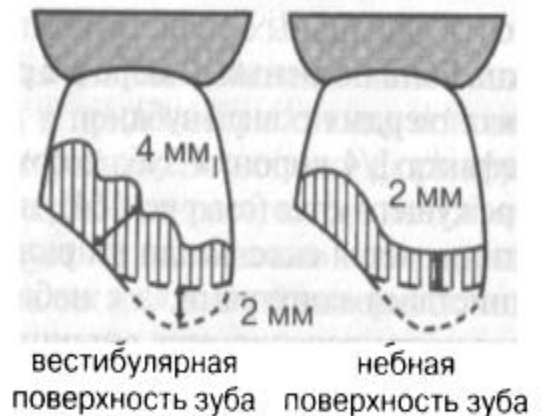
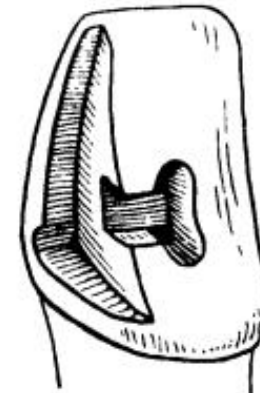
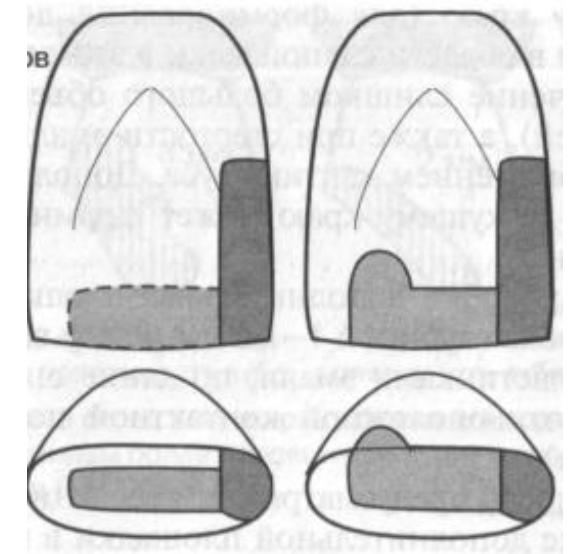


Рис. 165. Создание скоса эмали при дефекте 1/3 коронки зуба с сохранением менее половины режущего края (Салова А.В., Рехачев В.М, 2003).

- **The second option.**
- If the vestibular enamel is preserved, the dimensions of the cavity are small, and the opening was carried out using lingual access, then the formed cavity has the following parameters:
- the main cavity resembles a triangle in shape, the base facing the gingival edge;
- during the formation of the cavity, the tooth tissues on the vestibular surface are preserved as much as possible. Vestibular enamel, even without the underlying dentin, is preserved in this case;
- the pulp wall of the cavity deepens into the dentin by no more than 0.5 mm. To remove the softened dentin, a local deepening of the bottom is performed in certain areas;
- the angle between the gingival and pulp walls of the cavity is made straight or sharp and slightly rounded;
- an additional platform is formed either on the lingual surface or along the cutting edge of the tooth. When forming an additional pad on the lingual surface, it is placed in the area of the blind fossa in accordance with the principles described above;



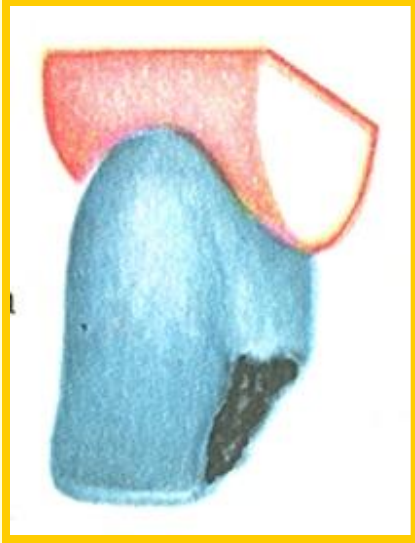
- an additional platform in the area of the cutting edge of the tooth is formed if there is a vertical erasure of the tooth, and its cutting edge becomes flat and wide.
- This option is preferred with a small size of the carious cavity, its location closer to the cutting edge (for the formation of an additional site in the area of the blind fossa, in this case, excision of too large a volume of unaffected tissues will be required), as well as when the enamel is erased along the cutting edge with the exposure of the dentin of the tooth. An additional platform along the cutting edge can be formed in two ways.
- The first method — an additional platform is made in the form of a groove with a depth of 1 - 1.5 mm between the vestibular and palatine enamel plates, along the length it is brought to the enamel of the opposite contact surface.



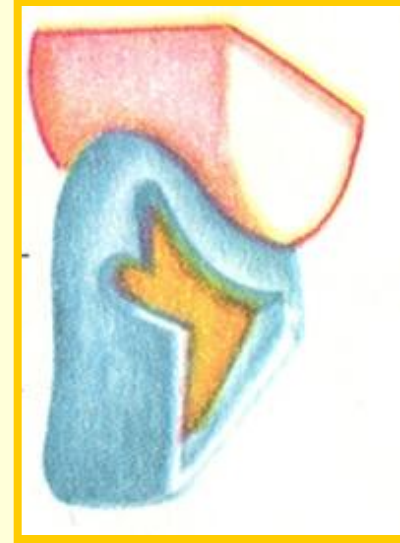
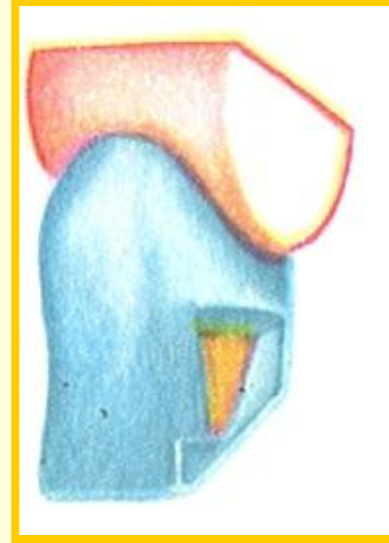
- The second method involves excision of the palatine enamel and the creation of an additional platform in the form of a step with a height of 1-2 mm, along the length reaching the enamel of the opposite contact surface. In this case, at the end of the additional site, it is recommended to make an additional retention point in the form of a recess (the clamp form of the retention point).
- it is not recommended to create additional sites with excision of the vestibular enamel. In addition, if the cutting edge is thin (less than 2 mm), it should not be used to create an additional platform, as this will significantly weaken the strength characteristics of the tooth.;
- to enhance the macromechanical fixation of the seal with a small spherical or fissure drill, it is possible to additionally perform retention trimming at the boundary of the pulp and back walls. It has the shape of a groove running from the vestibular surface to the lingual;
- on the lingual walls of the cavity, a uniform bevel of the enamel is made at an angle of 40-45 °. The width of the bevel is 0.2-0.5 mm. The bevel of the enamel walls of the additional platform located on the cutting edge is made within 10-15 °. The enamel on the contact and vestibular surfaces is slightly mowed by processing with fine-grained diamond drills, strips or enamel knives.

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- **5. Finishing the edges of the enamel.**
 - The finishing treatment of the enamel bevel is carried out according to the type of polishing. This manipulation is performed with fine-grained diamond drills or hard-alloy 20-32-sided finiers.

Options for the preparation of the carious cavity of class IV



before preparation



types of additional cavities