

Black's classification of cavities, nomenclature, general rules and steps of cavity preparation

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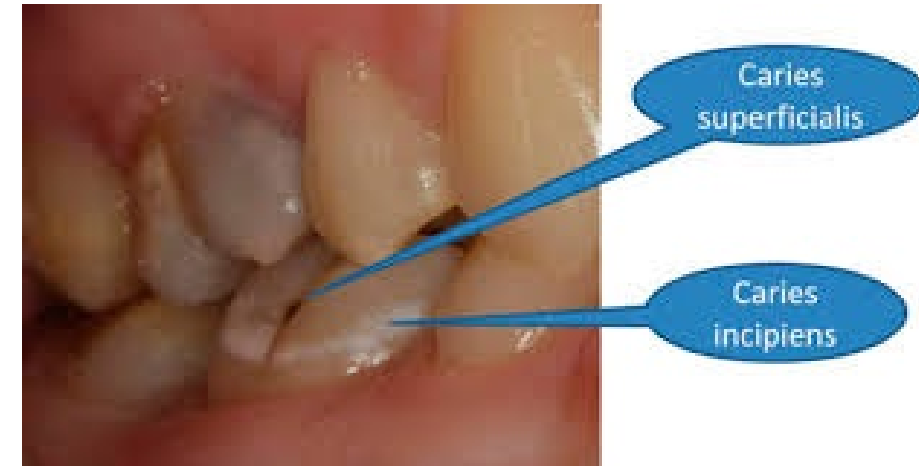
SEMMELWEIS EGYETEM

Department of Conservative Dentistry
<http://semmelweis.hu>

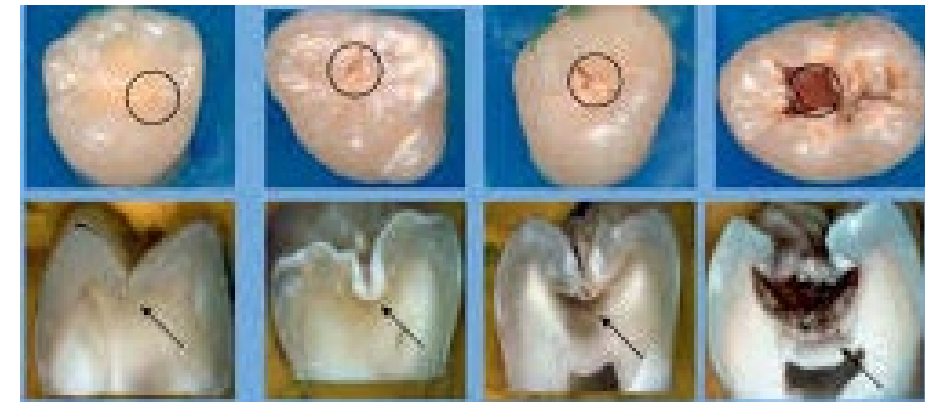


Caries

- REVERSIBLE
 - Caries incipiens
- IRREVERSIBLE
 - Caries superficialis
 - Caries media
 - Caries profunda
- Secondary prevention:
 - Remineralization
- Tertiary prevention: making restauration
 - Filling
 - Inlay/onlay
 - crown



https://regi.tankonyvtar.hu/hu/tartalom/tamop412A/2011-0095_fogaszat_magyar/ch02s02.html



<https://www.karger.com/Article/PDF/224210>

The aim of filling restoration beside removing the caries

- Preparing the tooth for filling are called ***TOOTH (CAVITY) PREPARATION***
- retention
- resistance
- shape
- function
- aesthetic



<https://www.nycdentist.com/more/teaching-private-practice/photomicrographs-sem-of-dental-histology/>

Influencing factors of the preparation

- Diagnosis, extension of the caries
- Characteristic of the enamel and the dentin
- Articulation, axis deviation, anatomy
- Retention of tooth structures
- Properties of filling materials
- Oral hygiene



NOMENCLATURE

Surface: unprepared part

Wall: prepared part

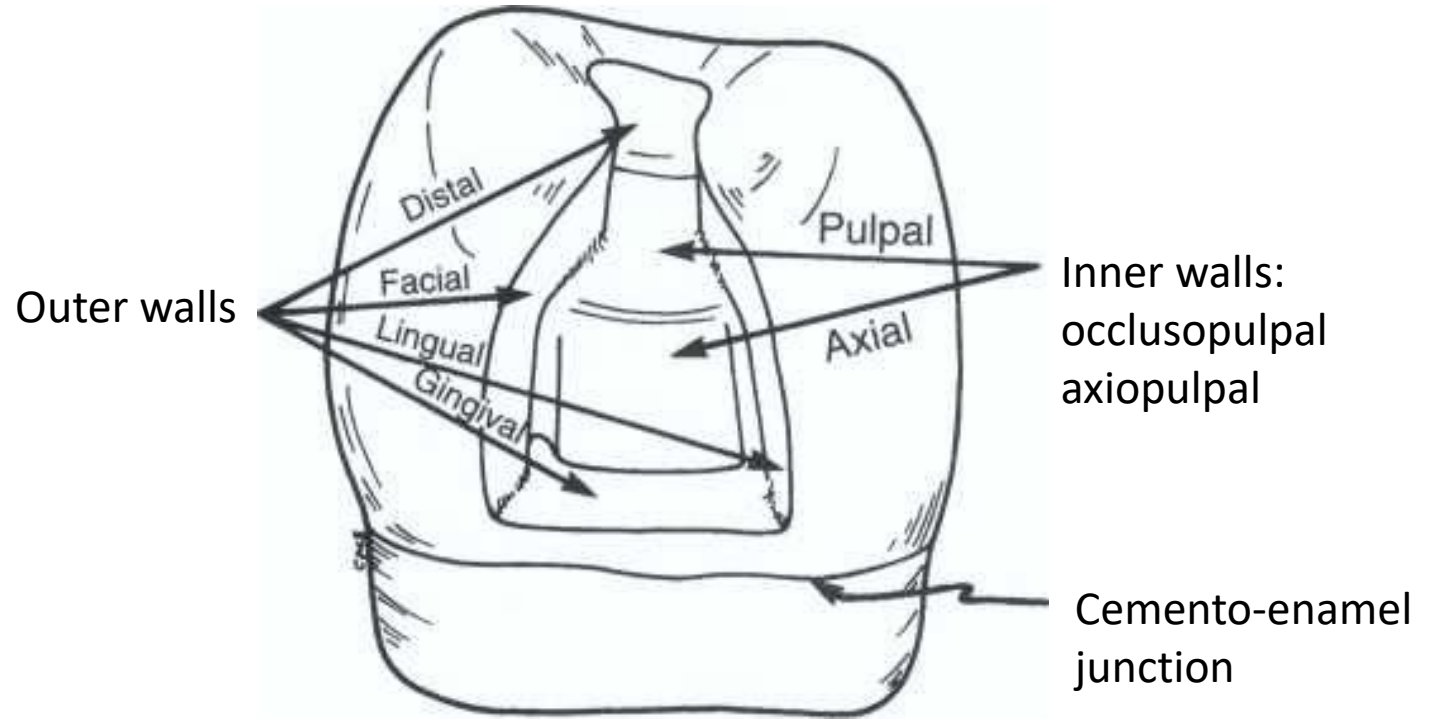
Cavosurface angle or margin: the junction of the surface and the wall

Line angle: the junction of two walls

Point angle: the junction of three walls

Nomenclature: the nearest anatomical structure

Occlusal, approximal (mesial, distal), axial, pulpal, gingival, vestibular (labial, buccal), oral (lingual, palatinal), apical

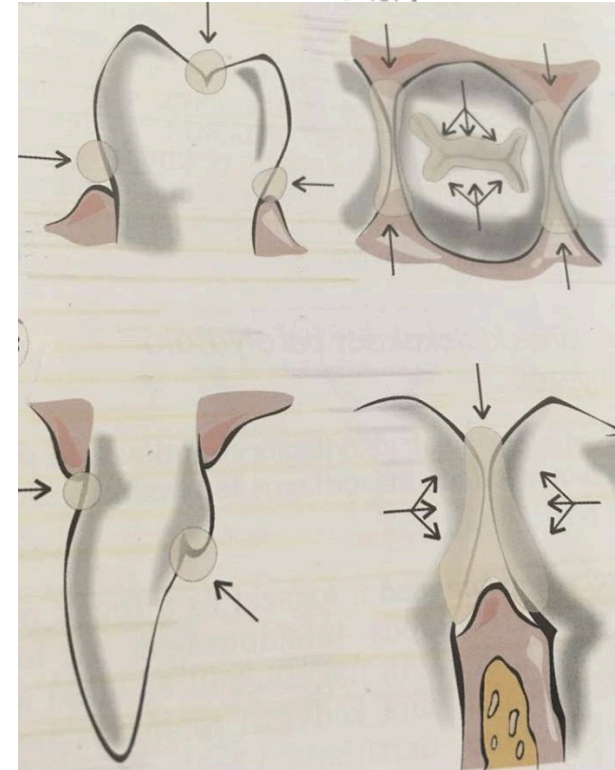
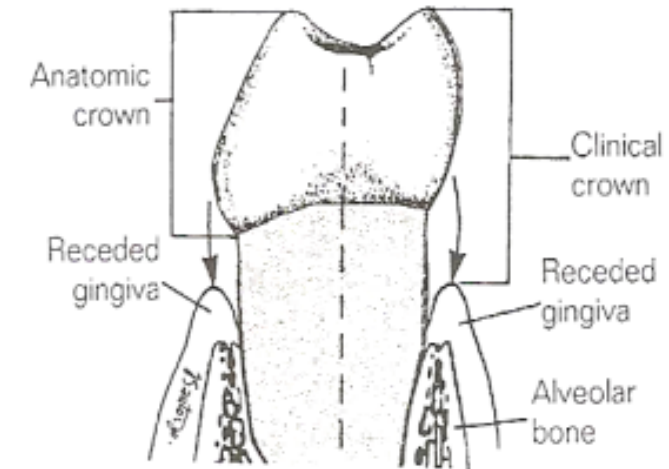


Classification of cavity

1914. G.V. Black

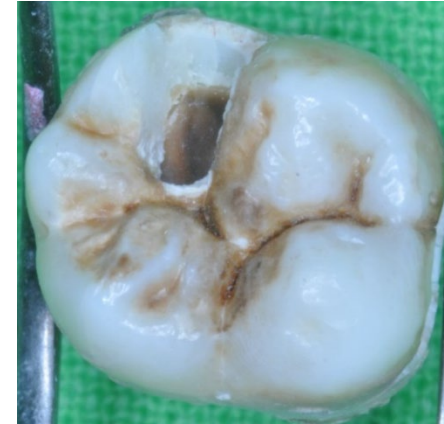


- Base: „the predilection places of caries” on the anatomical crown: I.-V. classes
- Later will be added :
 - Not predilection place: VI. class
 - Not on the anatomical crown: Root surface caries
- **Predilection areas:** These places have no self-cleaning!
 1. fissures, pits
 2. approximally, under the contact point
 3. in between the equator and the gingiva
 4. root surface

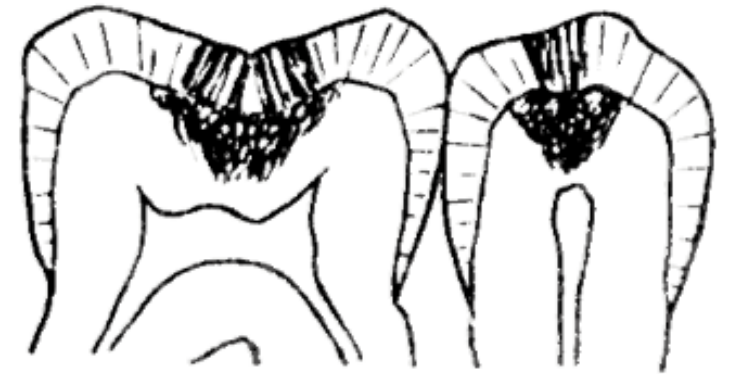
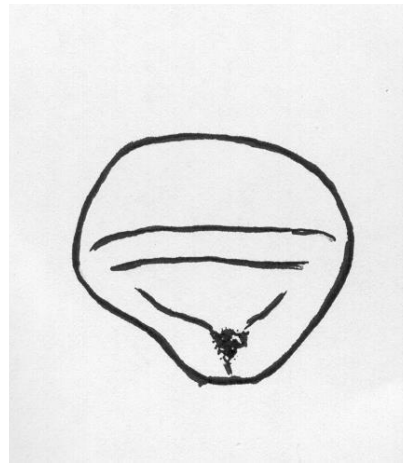
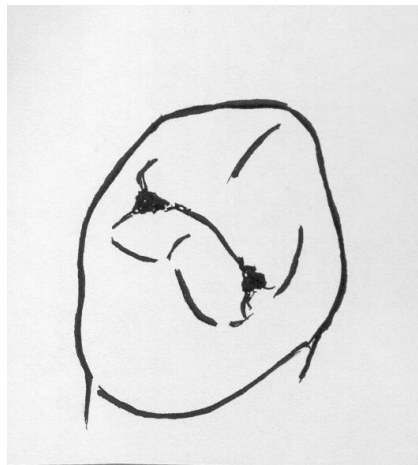
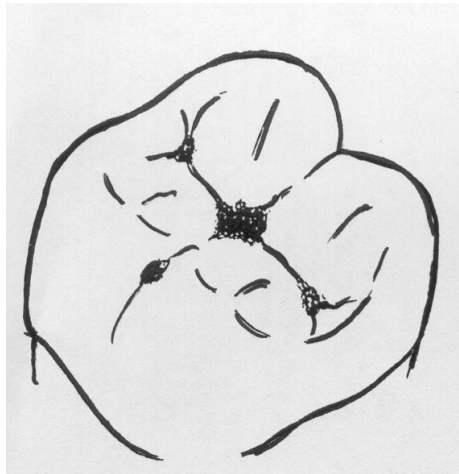


Class I.

- Cavity preparation from all pit and fissure caries
 - fissures of premolars and molars
 - Pits- foramen coecum
 - Upper first molars on the palatinal surface
 - Lower first molars on the buccal surface
 - Upper lateral incisor on the oral surface

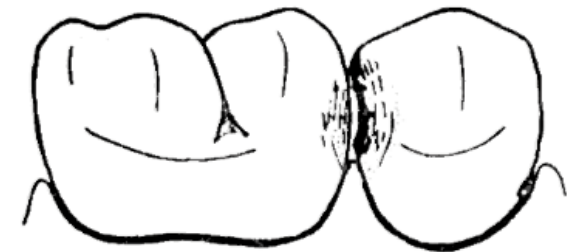
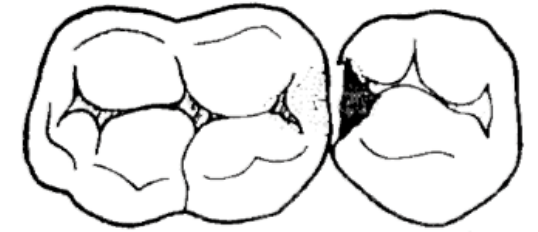
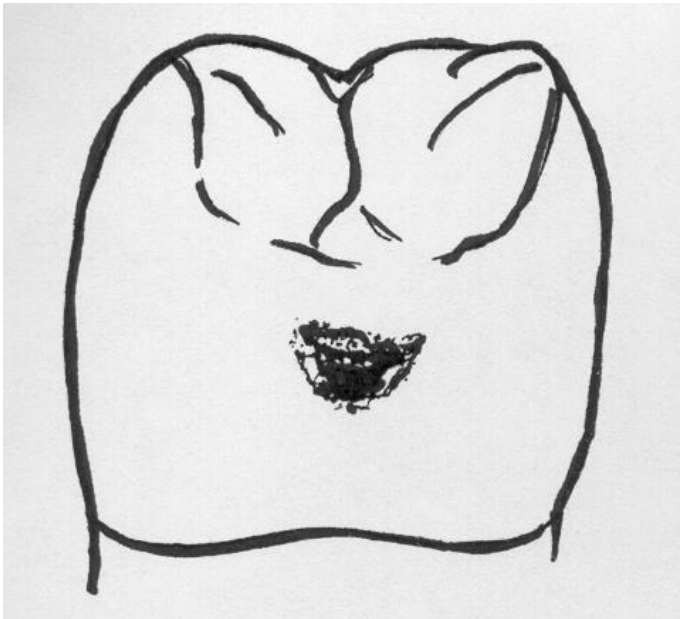


<https://www.dentalnotebook.com/caries-lesion-classification-g-v-black/>



Class II.

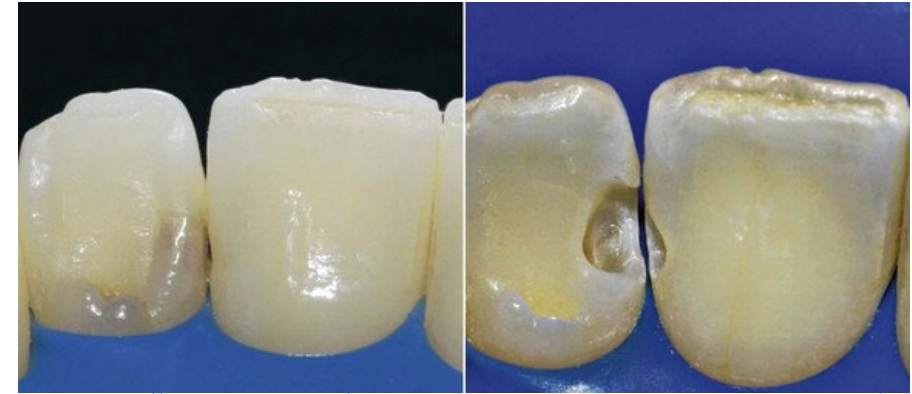
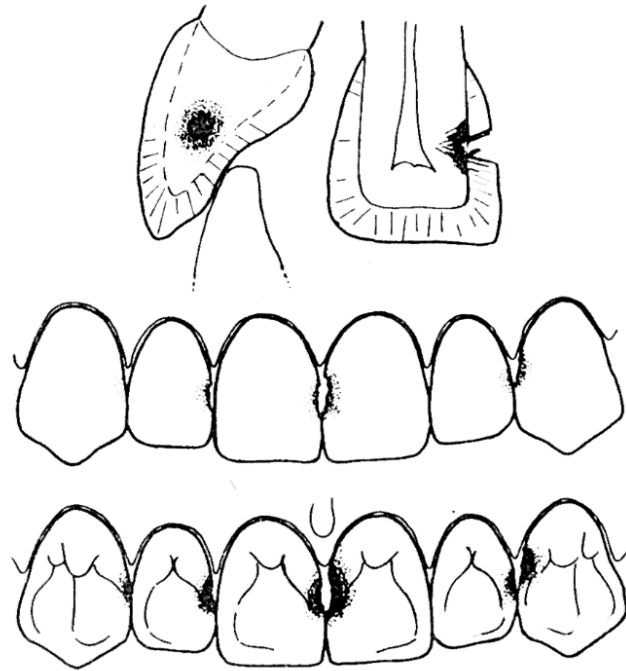
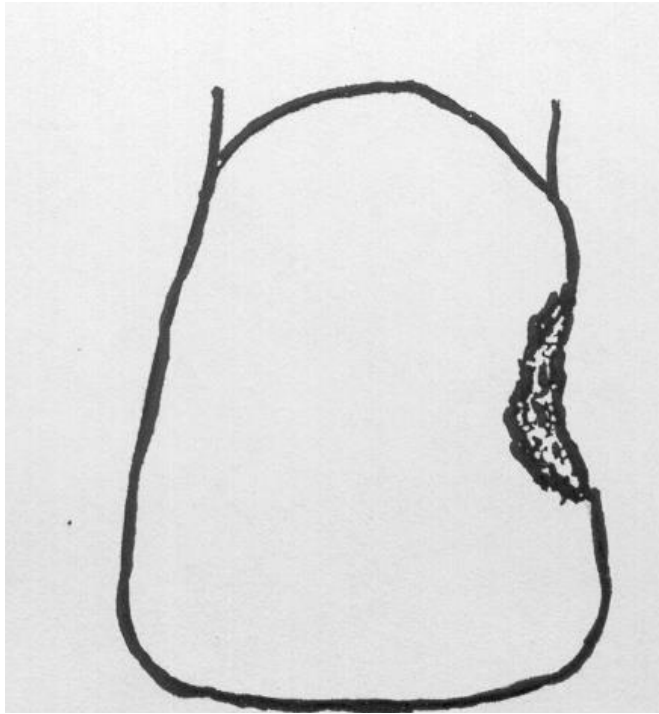
- Cavities on the proximal surface of posterior (premolar and molar) teeth
- Smooth surface caries
- M(O); (O)D; M(O)D; (toward or from the midline)



<https://nepaldentalspa.com/dental-caries-tooth-decay/>

Class III.

Cavities on the proximal surface of anterior teeth not **involving** the incisal angle



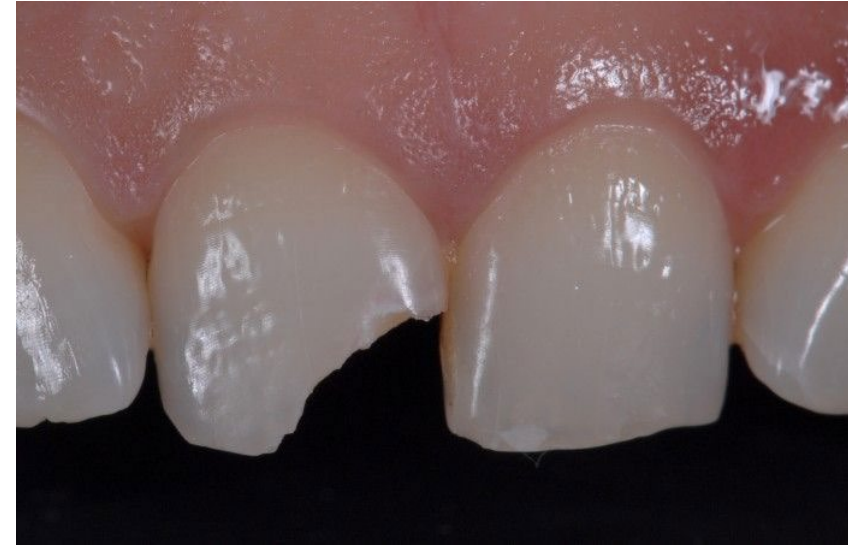
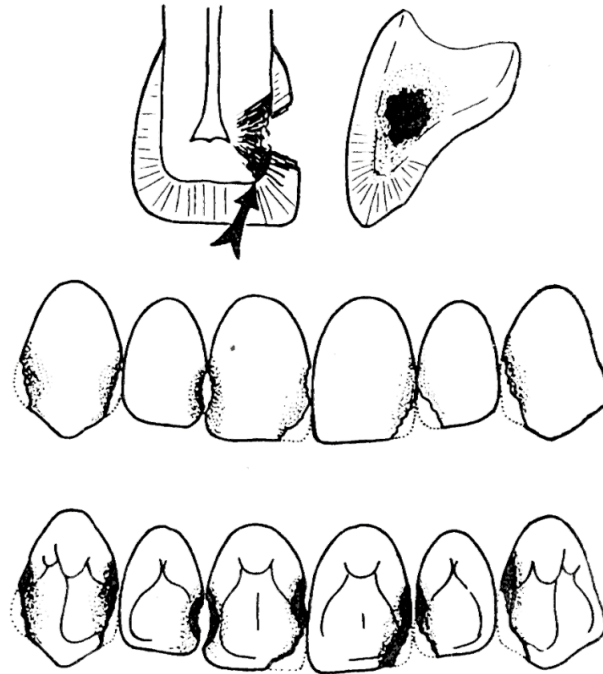
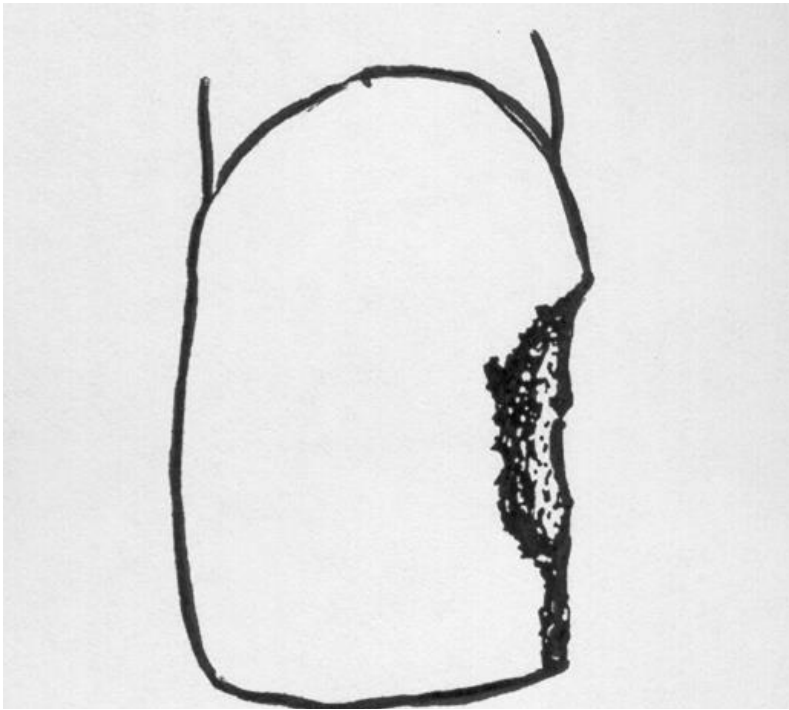
<https://pocketdentistry.com/1-diagnosis-and-treatment-planning-in-restorative-dentistry/>



<https://www.casemasters.com/posts/59c0aa65b365c77e9c10b5a2>

Class IV.

- Cavities on the proximal surfaces of anterior teeth **involving** the incisal angle



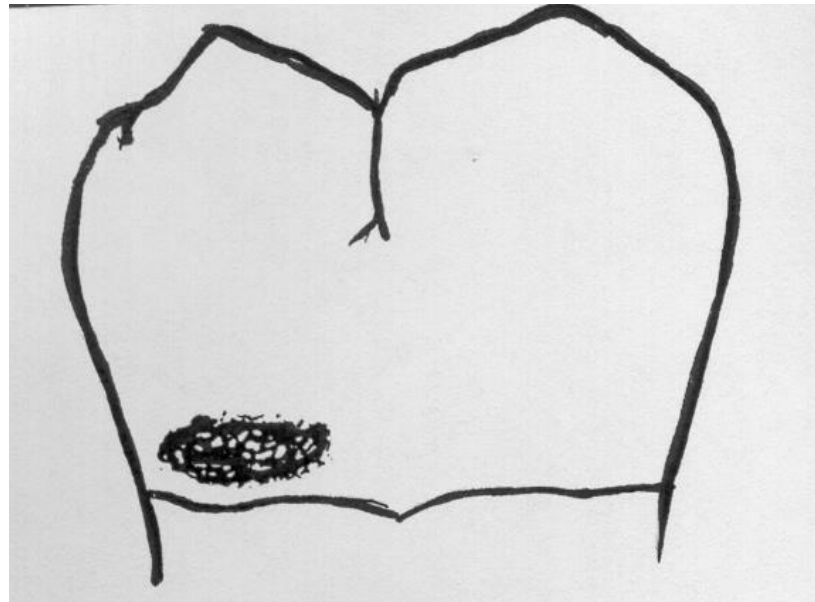
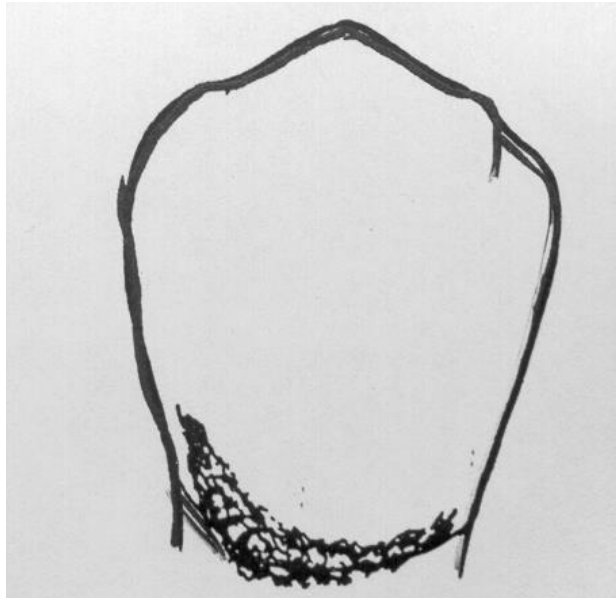
<https://www.styleitaliano.org/invisible-margins-in-anterior-composites-tips-tricks/>



<https://www.styleitaliano.org/step-by-step-for-class-iv-restorations/>

Class V.

Cavities on the **gingival third of the anatomical crown**.
These can be on the **facial or lingual surfaces of all teeth**.
Not pit and fissure cavities!



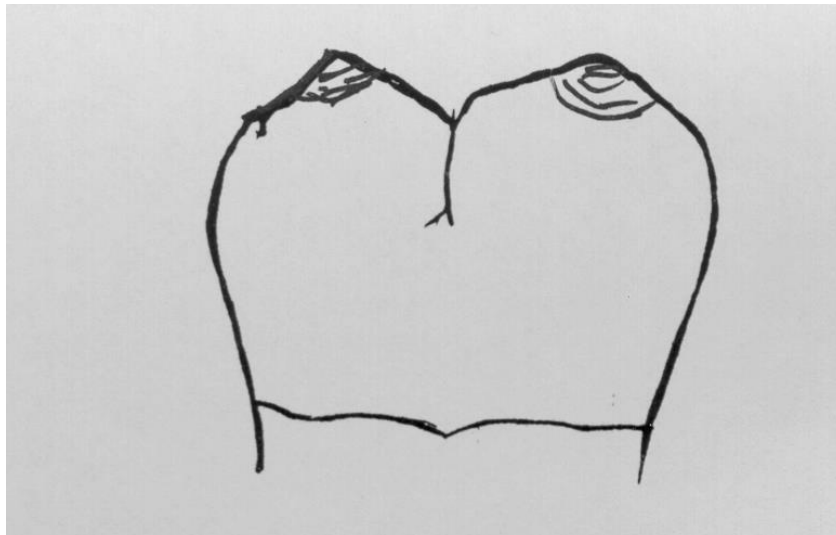
<https://www.dentalnotebook.com/caries-lesion-classification-g-v-black/>



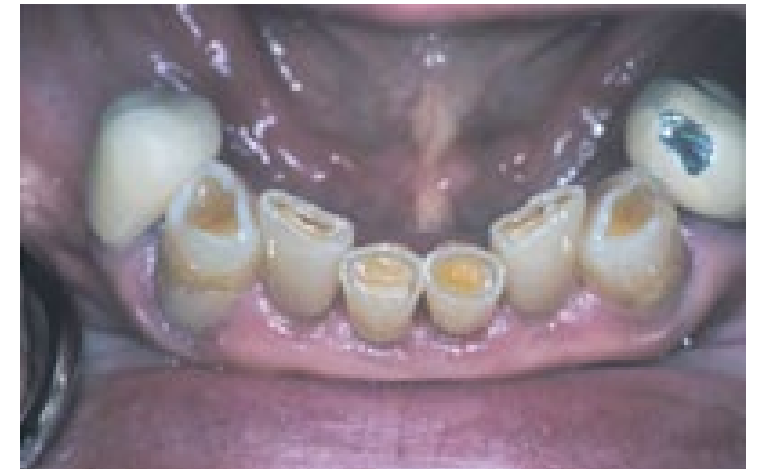
Class VI.

Cavities on the incisal edge of anterior teeth or on the occlusal cusp heights of posterior teeth.

Not predilection place!



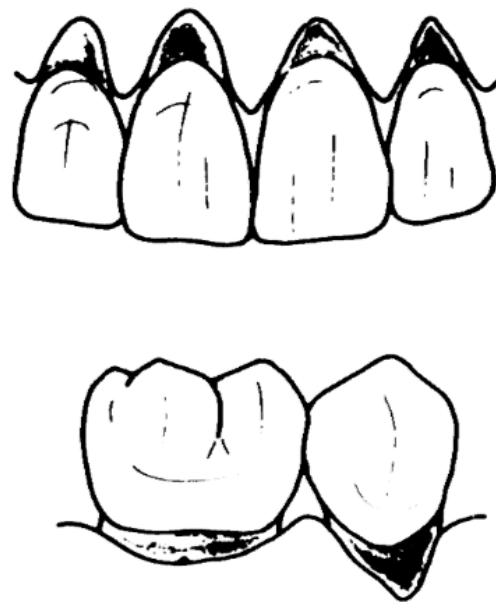
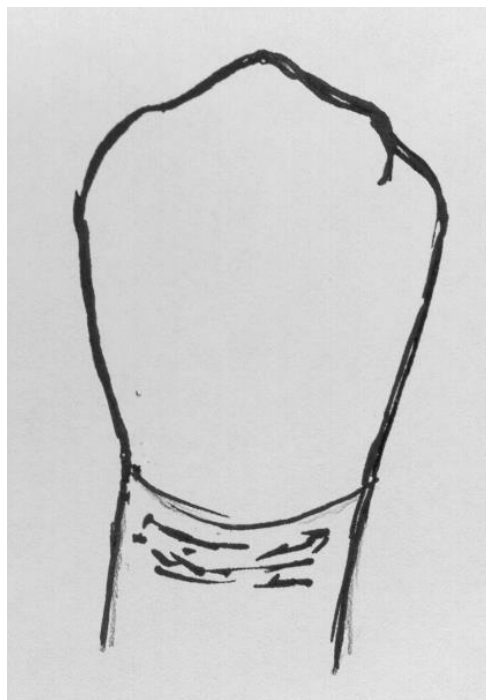
<https://dentodontics.com/2015/02/26/g-v-blacks-classification-of-carious-lesions/>



<http://www.dentistrytoday.com/ce-articles/272-conservative-treatment-of-the-worn-dentition-with-adhesive-composite-resin>

Root surface caries

- Caries begins on the root surface (clinical crown)
 - cement (not with enamel covered surface)!
 - Predilection place!



<https://www.quora.com/What-are-root-caries-and-how-are-they-different-from-regular-cavities-caries>

BASIC PREPARATION DESIGN

Depends on the filling material and the extension of caries

- **CONVENTIONAL:**

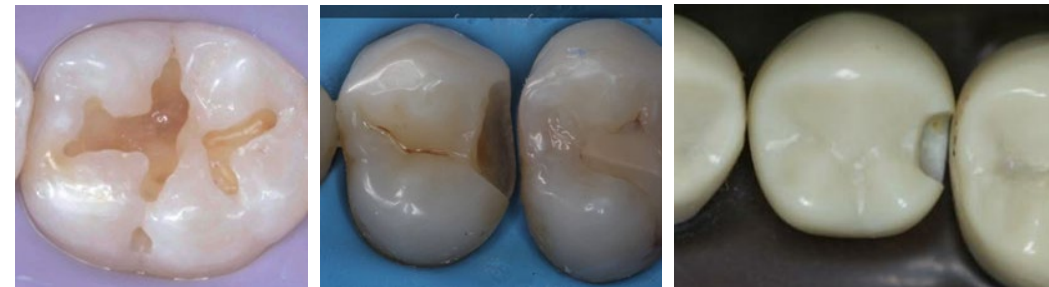
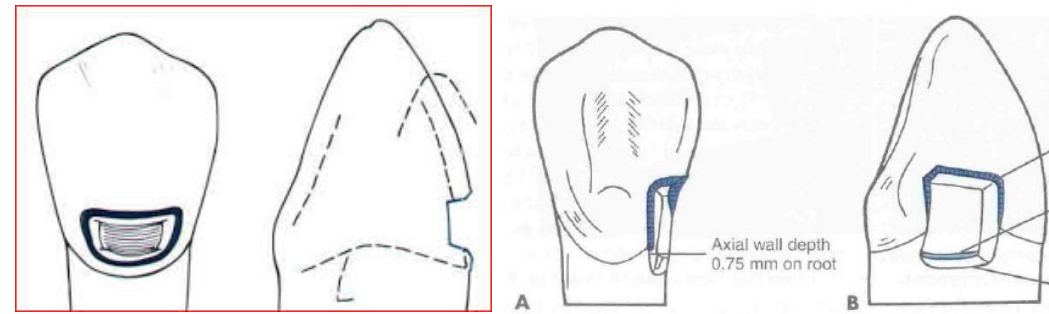
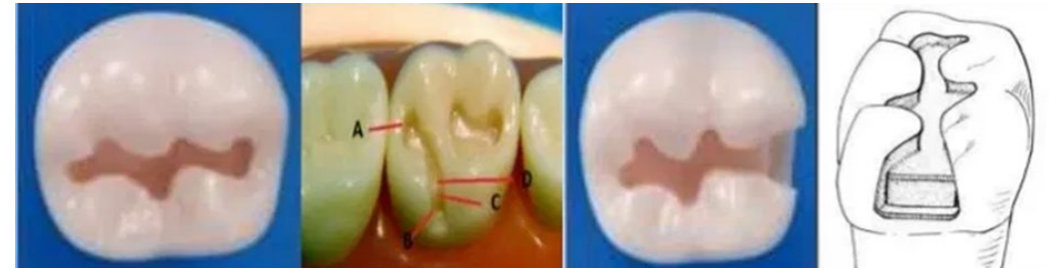
- For amalgam, metal inlay, rootsurface caries (planning composite filling)
- Macroretention
- Box-like cavity, special enamel margin, secondary retention are used very often

- **BEVELED CONVENTIONAL:**

- Earlier amalgam was the filling material and now we are going to change that for composite
- Macro- and microretention (box shape and bevel prep.)

- **MODIFIED, or ADHESIVE or MINIMAL-INVASIV:**

- No special walls, line angles and point angles!
- Only carious tooth structure is going to be removed, and cavosurface margin gonna be prepared beveling (composite)
- Microretention



GENERAL RULES OF CAVITY PREPARATION

I. INITIAL STAGE (primer steps)

1. outline form and initial depth
2. primary resistance form
3. primary retention form
4. convenience form

II. FINAL STAGE (secunder steps)

1. removal of infected dentin and old filling
2. pulp protection
3. secondary resistance and retention form
4. finishing the prepared walls
5. cleaning, inspecting...

Out of date: „extension for prevention ”

If we consider the principles and the filling materials, we can close up the steps.

INITIAL STAGE

Determination of the outline form, and initial depth

High speed (170-200.000 rpm) with water cooling, diamond or hard metal bur (FG). The shape of the bur depends on the caries!

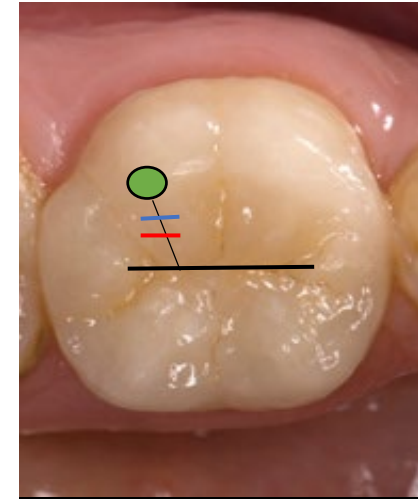
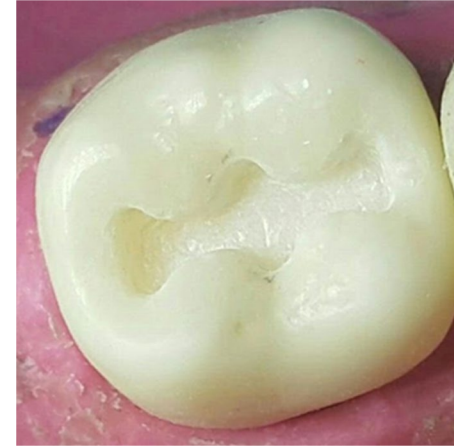
Main rules:

1. Healthy tooth structure should be preserved
2. All friable enamel should be removed
3. All faults should be include in cavity
4. The outline of the filling should be shortened
5. Maximum 0,2-0,8mm in the dentin



FACTORS INFLUENCING THE OUTLINE FORM

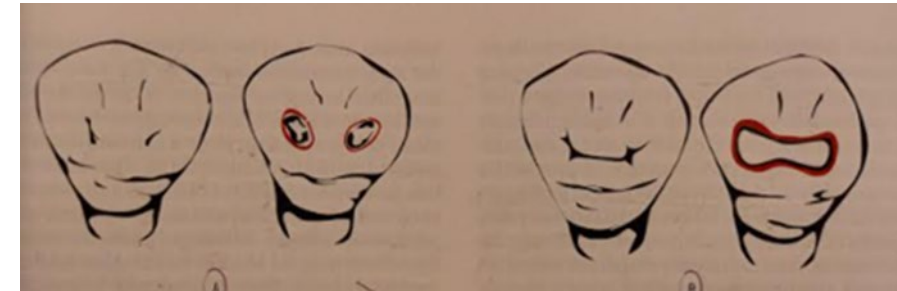
1. The extension of carious lesion
2. Aesthetic considerations
3. Occlusal relationship
4. Adjacent tooth position
5. Anatomical features of the tooth



http://www.dentalcetoday.com/courses/63/html/dt_section_4.htm

Preserve the strength of **marginal ridge** and the **strength of the cusps**.
Decision: about keeping or reduction of the cusps.

- **Keeping**: extension of caries is less than half of the distance (50 %) between the primer fissure and the height of the cusp .
- **Considerable**: if the distance is between 50% and 75%
- **Reduction**: extension of caries is bigger, than 2/3 (75%) of the distance.



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If the distance between two prepared cavities <0,5mm- connect it

PRIMARY RETENTION FORM

Definition: Preparation resists displacement or removal of the restoration from tipping or lifting forces.

Retention is influenced by the contact between the restorative material and tooth.

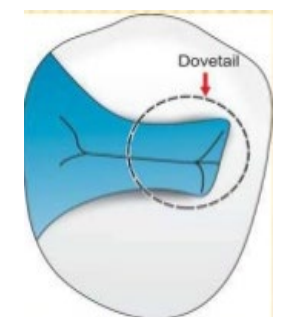
- **macromechanical:** amalgam
- **micromechanical:** composite
- **chemical:** glassionomer, polycarboxylate cement
- **electrical:** weak

Differences according to the restoration

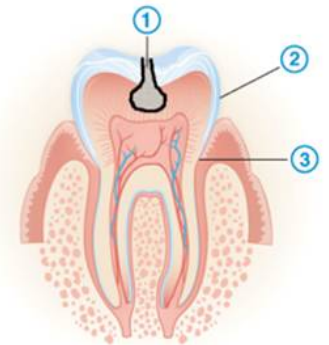
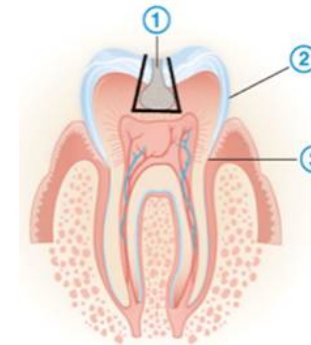
- inlay/onlay (indirect rest.): metal, esthetics
- filling (direct rest.): amalgam, composite



Amalgam



Composite



http://intranet.tdmu.edu.ua/data/kafedra/internal/stomat_ter_dit/classes_stud/en/stomat/ntn/Propaedeutics%20of%20child%20therapeutic%20dentistry/2/03.%20dissection%20cavities%20and%20%D1%96%20-v%20classes%20in%20temporary%20and%20permanent%20teeth%20.htm



Amalgam



Inlay(metal)

<https://www.slideshare.net/AdwitiVidushi/fundamentals-in-tooth-preparation-conservative-dentistry>

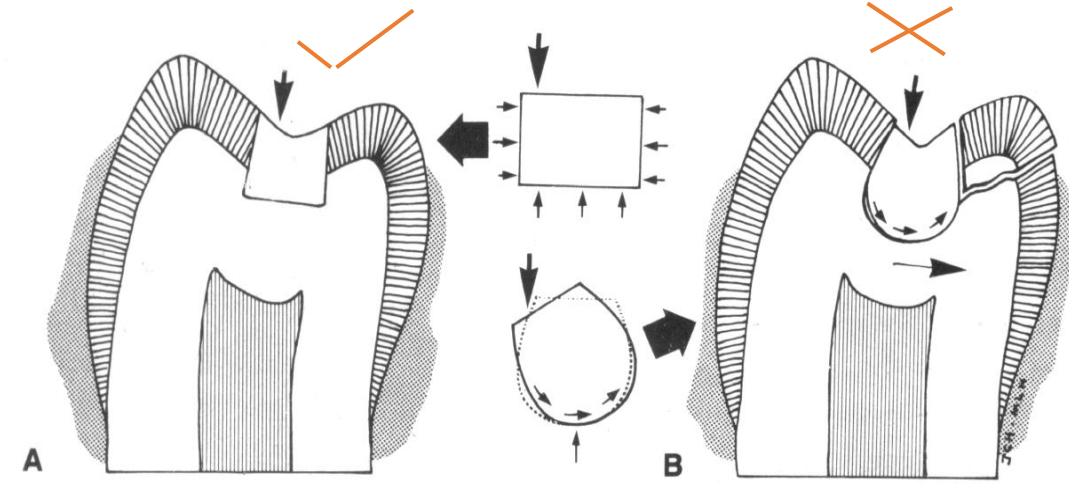
PRIMARY RESISTANCE FORM

Definition: both of the tooth and restoration can withstand without fracture the masticatory forces.

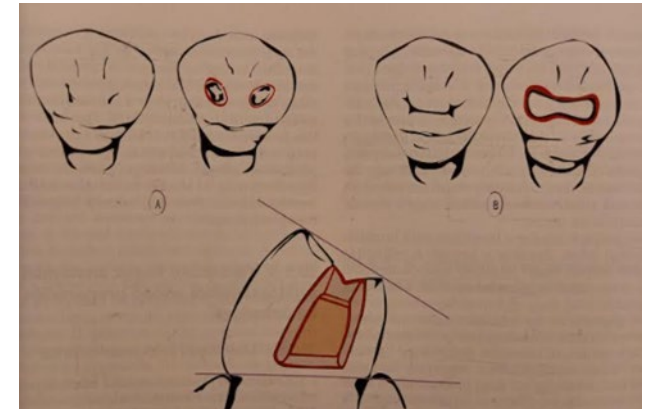
Preparation: primary retention and resistance form are prepared together.

Principles:

- shape, flat floor, slightly rounded line angles
- thickness of restorative material
- walls: parallel, divergent or convergent



<http://dentisty.org/--principles-of-cavity-preparation.html>



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CONVINIENCE FORM

FINAL STEPS OF CAVITY PREPARATION

- removal of infected dentin and old filling
- pulp protection if it's required (direct, indirect)
- secondary resistance and retention form
- finishing the prepared walls
- cavity cleaning, drying, inspection...

Removal of any remaining infected dentin and/or old restorative material

Carious dentin

Difference between carious and healthy dentin in practice

- in color (whitish, brown)
- Hardness (soft, hard)

Instruments:

- Caries indicator,
- sharp excavator,
- steel/ carbide round bur
- Micromotor (blue, green)
1.000-4.500-6.000 rpm



Old restoration should be removed, if:

- negatively affect the new one
- compromise the retention
- caries is under the filling
- the pulp was symptomatic preoperatively
- the periphery of remaining filling is not intact

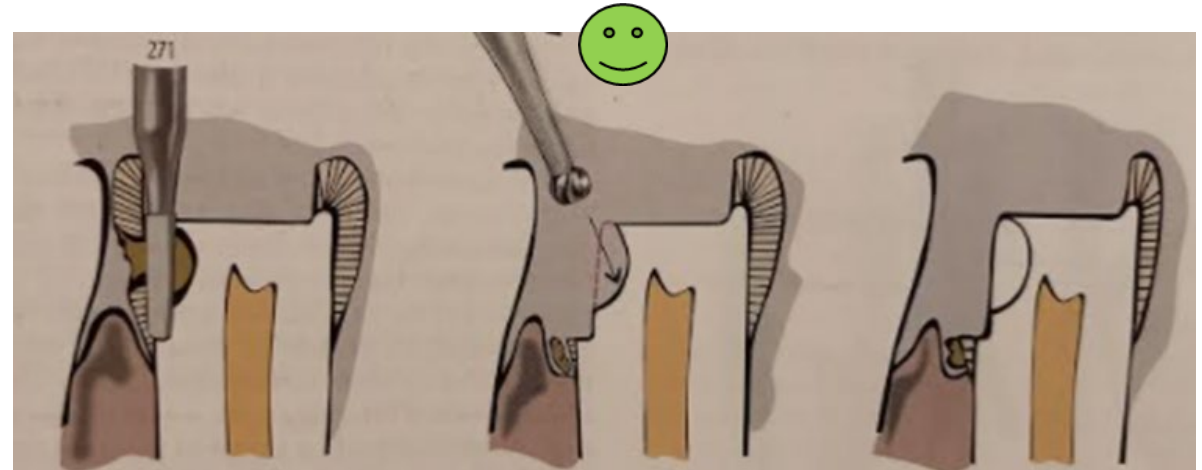
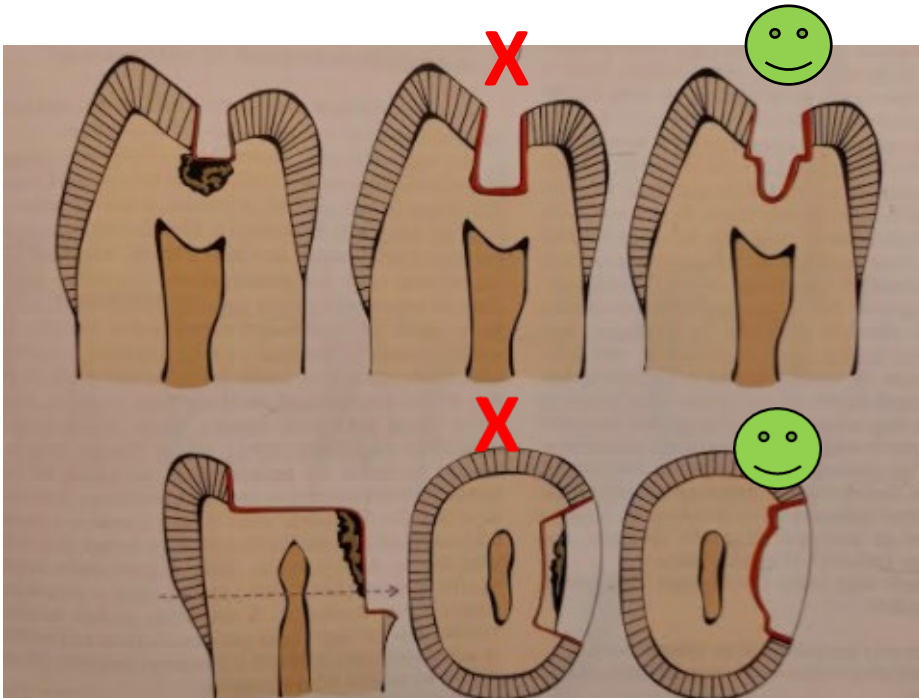
Amalgam removing: carbide bur
(rubberdam and/or exhaustor)

Composite removing: diamond
bur, carbide



Removal of any remaining infected dentin and/or old restorative material and pulp protection

- Concave prepared area
- DO NOT deepened the whole occlusopulpal / axiopulpal wall
- pulp protection if it is needed (direct/indirect pulp capping)



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Secondary resistance and retention forms

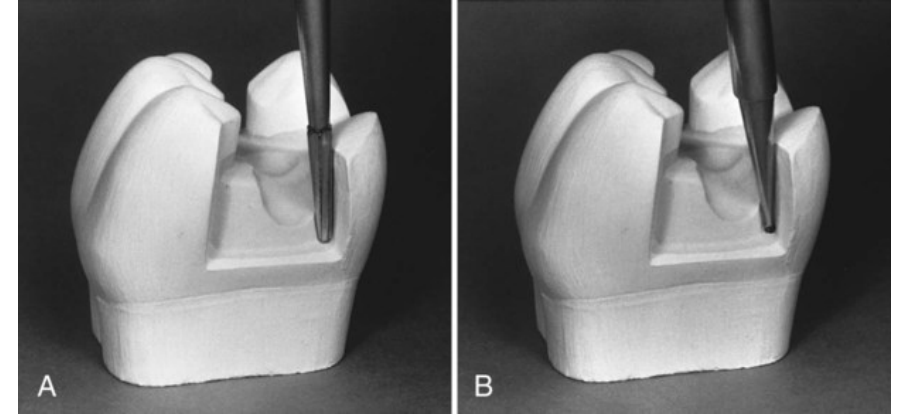
1. Mechanical features:

all require additional removal of tooth structure

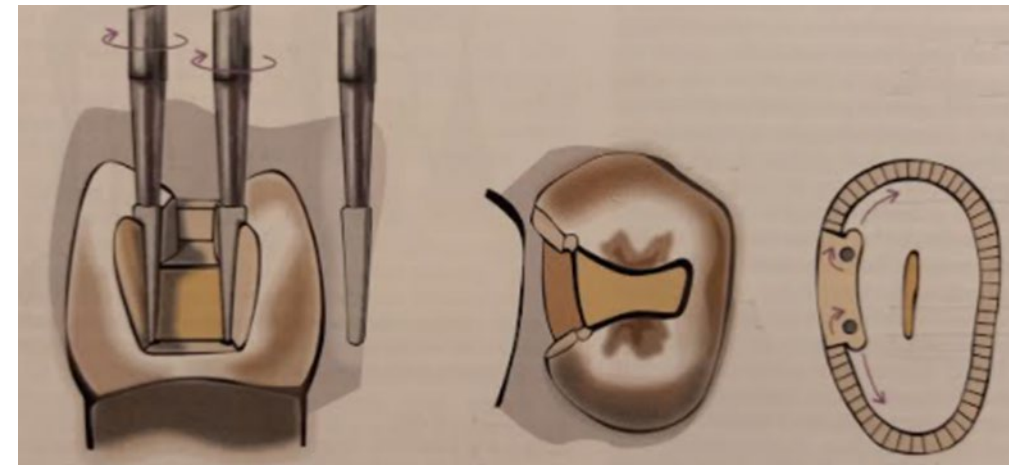
- Retention lock, grooves, coves, skirts, pins, slots
- Beveled enamel margins (metal inlay, composite filling)
- Preservation of dentin support of the enamel prisms on the margin of the cavity

2. (Treatments of the prepared walls:)

- Etching, priming and bonding.
- This is not really considered as part of the tooth preparation!



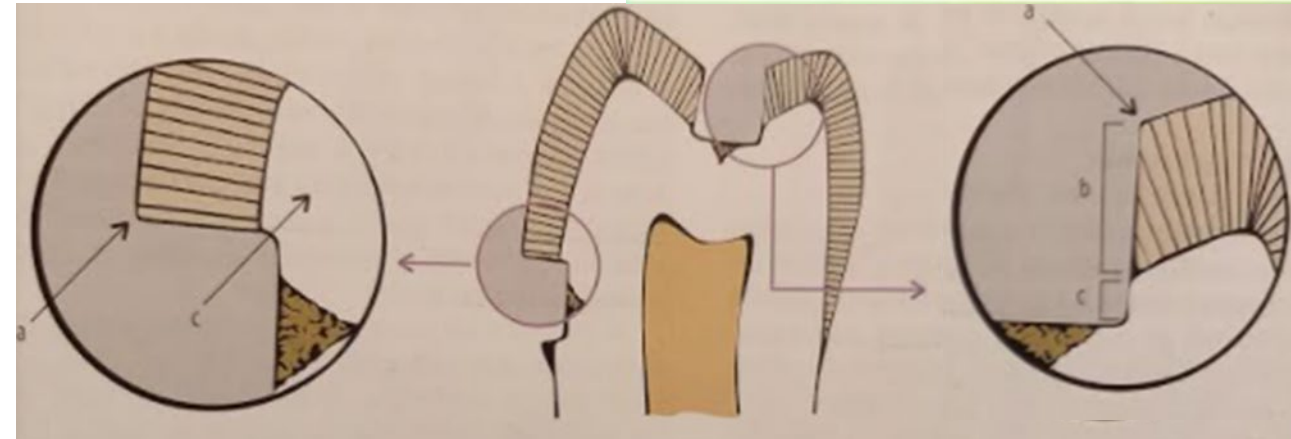
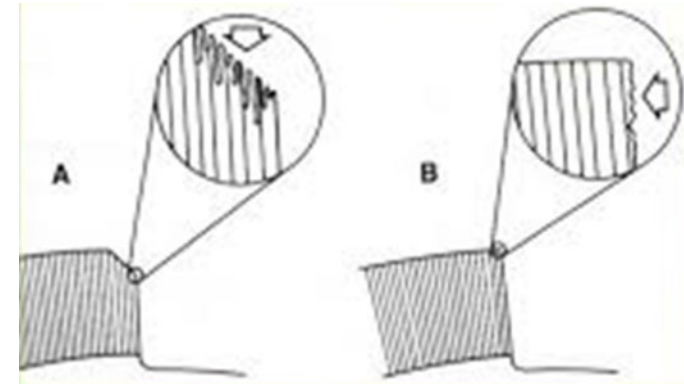
<https://pocketdentistry.com/16-complex-amalgam-restorations/>



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Beveled enamel margins (Secondary resistance and retention forms)

- **Metal inlay** (better adaptation between the inlay and tooth structure)
 - **Composite filling** (more enamel surface for adhesive technic)
 - Amalgam- NO BEVELING!!! 90 degrees cavosurface angle
-
- 0,5-1mm width
 - Healthy, supported enamel prisms!!!
 - Beveling occlusally is CONTRAINDICATED because of masticatory forces



Finishing the prepared walls

The aim of finishing:

- is to create the **best marginal seal** between the restorative material and tooth.
- afford a **smooth marginal junction**
- provide maximum strength of both the tooth and filling near the margin.

Finishing:

- Micromotor (accelerator) 10.000-40.000 rpm
- Materia: diamond, hardmetal
- Shank: FG
- Bur shape: depends on the shape of the cavity wall
- Grit size: fine, extra fine
- Hardmetal bur's edges: 16, 18



Cleaning, drying, inspection

Check out the cavity from every way:

- is there any opacity ?
- is there any unsupported enamel ?
- are the walls enough hard ?
- are the indirectly visualised areas enough clean ?
- are the orificies, pulp chamber closed ?
- are the walls prepared in a good angle?
- are the walls enough hard ?

Removing the debris from the cavity, cleaning and drying:

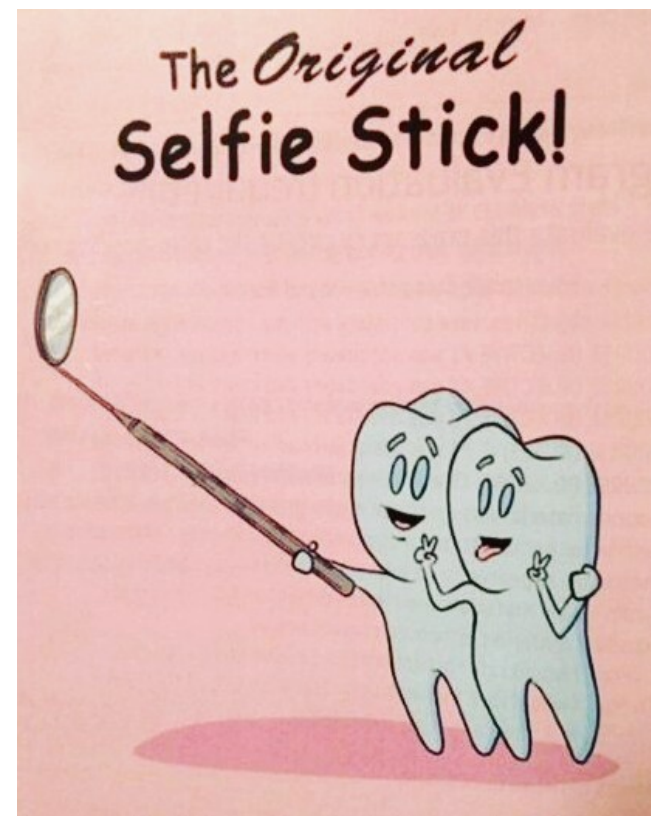
- Benzin
- Chlorhexidin gluconat 2% (inhibition of MMP)
- water



[J Dent Res. 2007 Jan; 86\(1\): 90–94.](#)

Chlorhexidine Preserves Dentin Bond *in vitro*
[M. R. O. Carrilho](#),^{1,4} [R. M. Carvalho](#),² [M. F. de Goes](#),¹ [V. di Hipólito](#),¹ [S. Geraldini](#),³ [F. R. Tay](#),⁴ [D. H. Pashley](#),⁴ and [L. Tjäderhane](#)^{5,*}

Thank you for your kind attention!



<http://report.semmelweis.hu/linkreport.php?qr=JUHOKSADCLKCYJNE>