

Fundamentals of cavity preparation

Road map

Now What?!!



Definitions

Objectives of cavity preparation

GV Black's principles in cavity preparations

Steps of cavity preparation

Definitions

- **What is a cavity?**

It is a defect in the hard tooth structure resulting from an insult as caries and trauma.



- **What is tooth preparation?**

It is mechanical alteration of a defective, injured or diseased tooth to receive a restorative material that re-establish the health state for the tooth including its esthetics, normal form and function



Definitions

- Tooth preparation that relates to **amalgam, gold or ceramic** restoration might be considered **conventional preparation** that require specific form, depth and marginal form



Definitions

- Tooth preparation **for bonded direct restorations as composite or glass ionomer** has less need for specific depth, wall and marginal form and is considered to be **modified preparations.**



Indications for restorative intervention:

1. Repair destroyed tooth
2. Repair fractured tooth either complete or incomplete [green stick fracture].
3. Restore teeth with congenital malformations.
4. Replace defective restoration.
5. Replacement of missing teeth.
6. Need for improved form or esthetic.



Why do we prepare carious cavities?

To remove caries and to create a compatible foundation to the restoration

Cavity preparation determinants



**Material
specific**



**Lesion
specific**



**Dental tissue
[site specific]**



What are the basic principles on which cavities are prepared?



Principles of cavity preparation according to GV Black

Biologic principles

Mechanical principles

Esthetic principles

What are the basic steps in cavity preparation?



Steps of cavity preparation

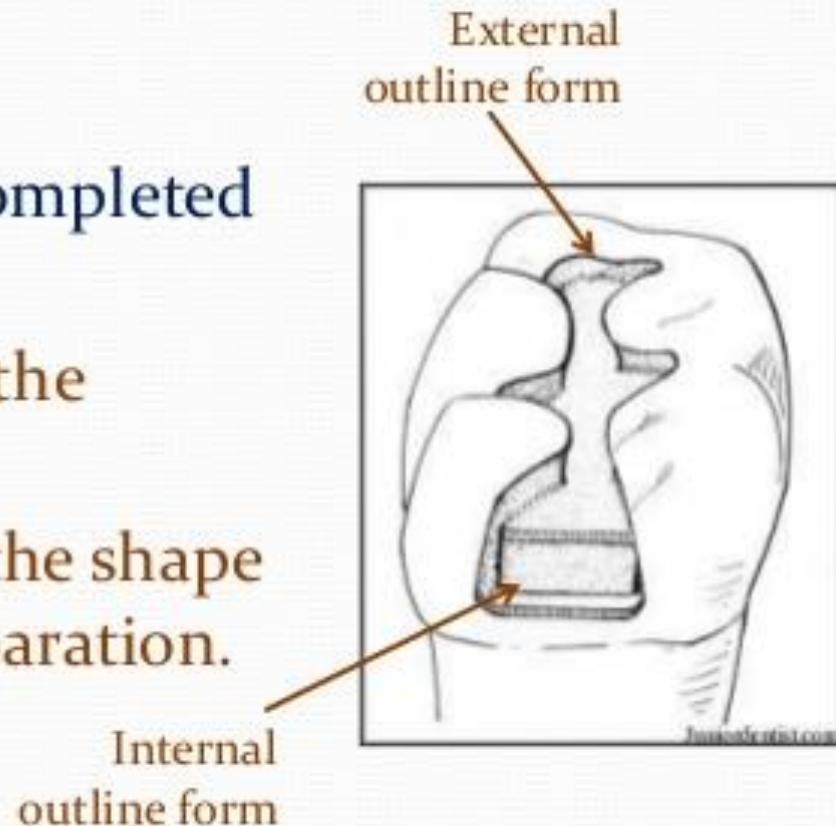


1-The outline form

- It is defined as

Shape of the boundaries of the completed cavity

- **External outline form** refers to the marginal boundaries
- **Internal outline form** refers to the shape of the internal form of the preparation.



Principles of outline form

- All fault or caries should be removed
- All friable or weakened enamel should be removed to avoid marginal ditching.
- All margins should be placed in a position to afford good finishing of the margins of the restoration.
- Giving the cavosurface angle [CSA] the correct angulations according to the restorative material [90° CSA for amalgam and obtuse for cast gold restorations].



Rules for outline form

1. Extend to sound tooth structure.
2. Avoid terminating the margins on extreme eminence such as cusp height or ridge crest.
3. If extension include $2/3$ of cusp incline, cusp capping is done for non adhesive restorations.

Rules for outline form

4- Extend the preparation margin to include all fissures that cannot be eliminated by enameloplasty.

Enameloplasty; is reshaping of enamel fissures to be non retentive.

It is made in pits or fissures that does not penetrate more than $1/3$ of enamel especially at end of fissure.

Rules for outline form

- **Restrict initial depth of penetration**
- **Depth** penetration into dentin should be kept to minimum [0.2-0.5 mm beyond DEJ; Total 1.5-2 mm] dictated by
 - Strength requirement of the restoration
 - Establishment of retention
 - Removal of caries.



Rules for outline form

6- In case of **two separate carious lesion**, as in upper molars, cavities are joined if the intervening tooth structure is

- Carious
- Undermined
- Weak i.e.; Less than 0.5 mm.



2- Resistance and Retention Form

They are two faces for the same coin



2- Resistance and Retention Form

Resistance form refers to **design features** in the cavity preparation which allows **tooth and restoration** to **resist the masticatory stresses without fracture.**



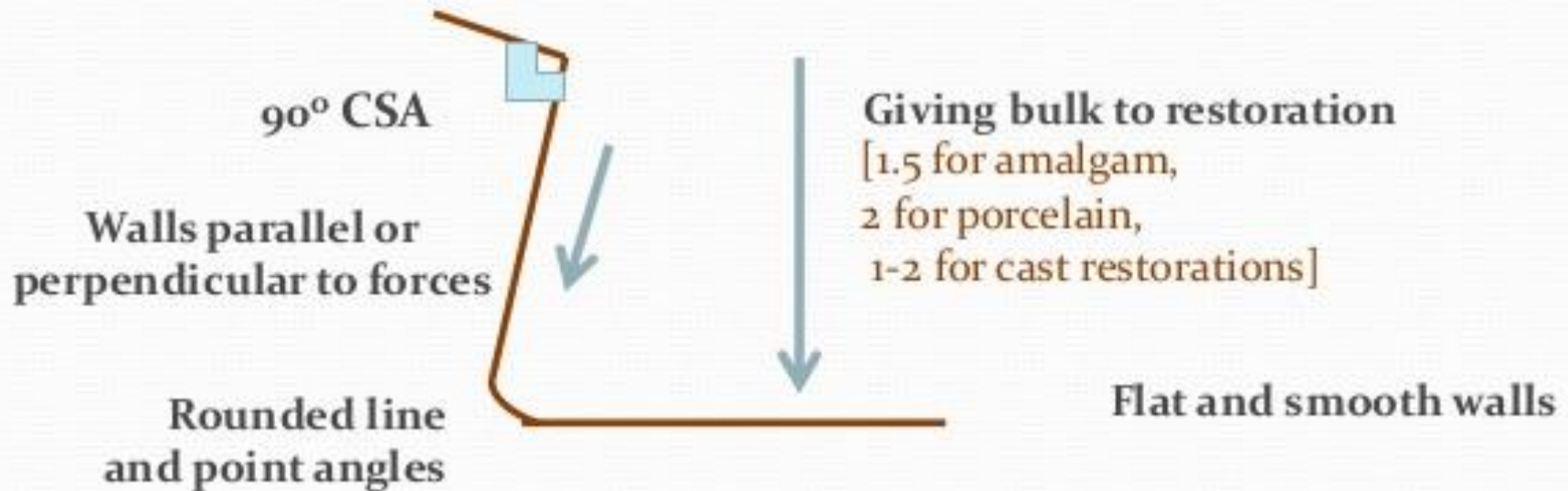


**What are the factors that
affect tooth or
restoration fracture?**

2- Resistance Form

How cavity design reduce fracture of tooth or restoration?

2- Resistance and Retention Form



2- Resistance and Retention form

What is the name of this shape?

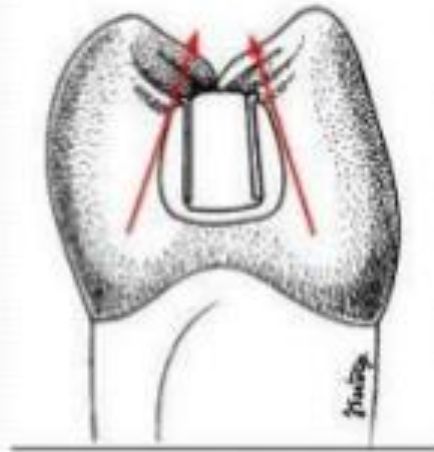
Box [mortise]

Or modified box form

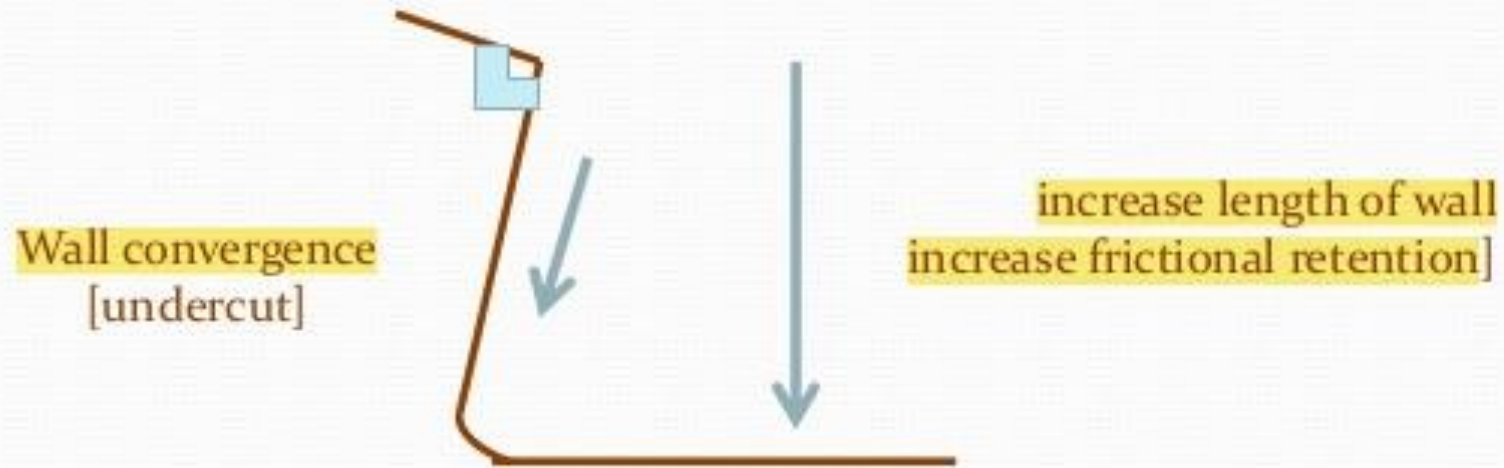


2- Retention Form

Retention form refers to **design features** in the cavity preparation which **allows** it to **retain restoration** securely during function



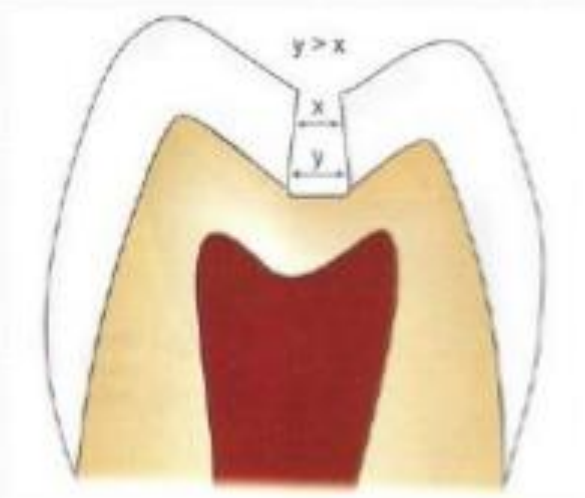
2- Resistance and Retention Form



2- Retention Form

Retentive features

A- axial retentive design features

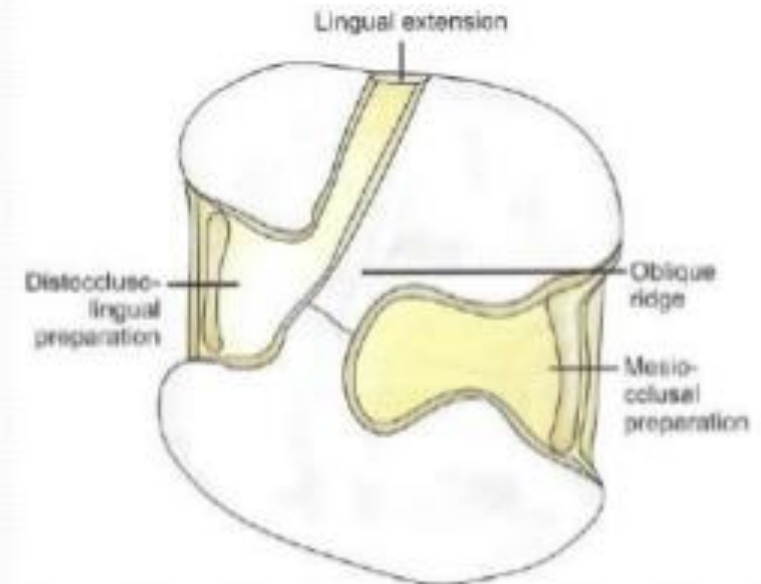


2- Resistance and Retention Form

Retentive features

Parallel to the axial wall

- Buccal or lingual extensions



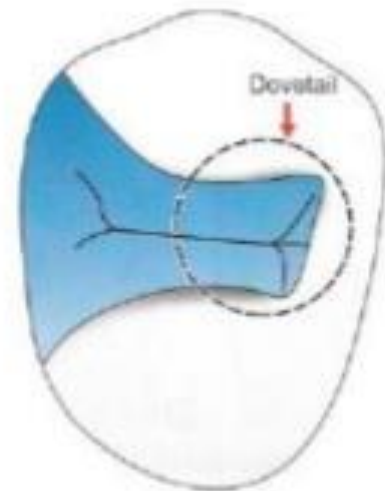
2- Retention Form

Retentive features

Given near the marginal
ridges

- Dove tail lock

Mechanically locks



**round off sharp corner at
D triangular ridge without
encroaching on cusp**



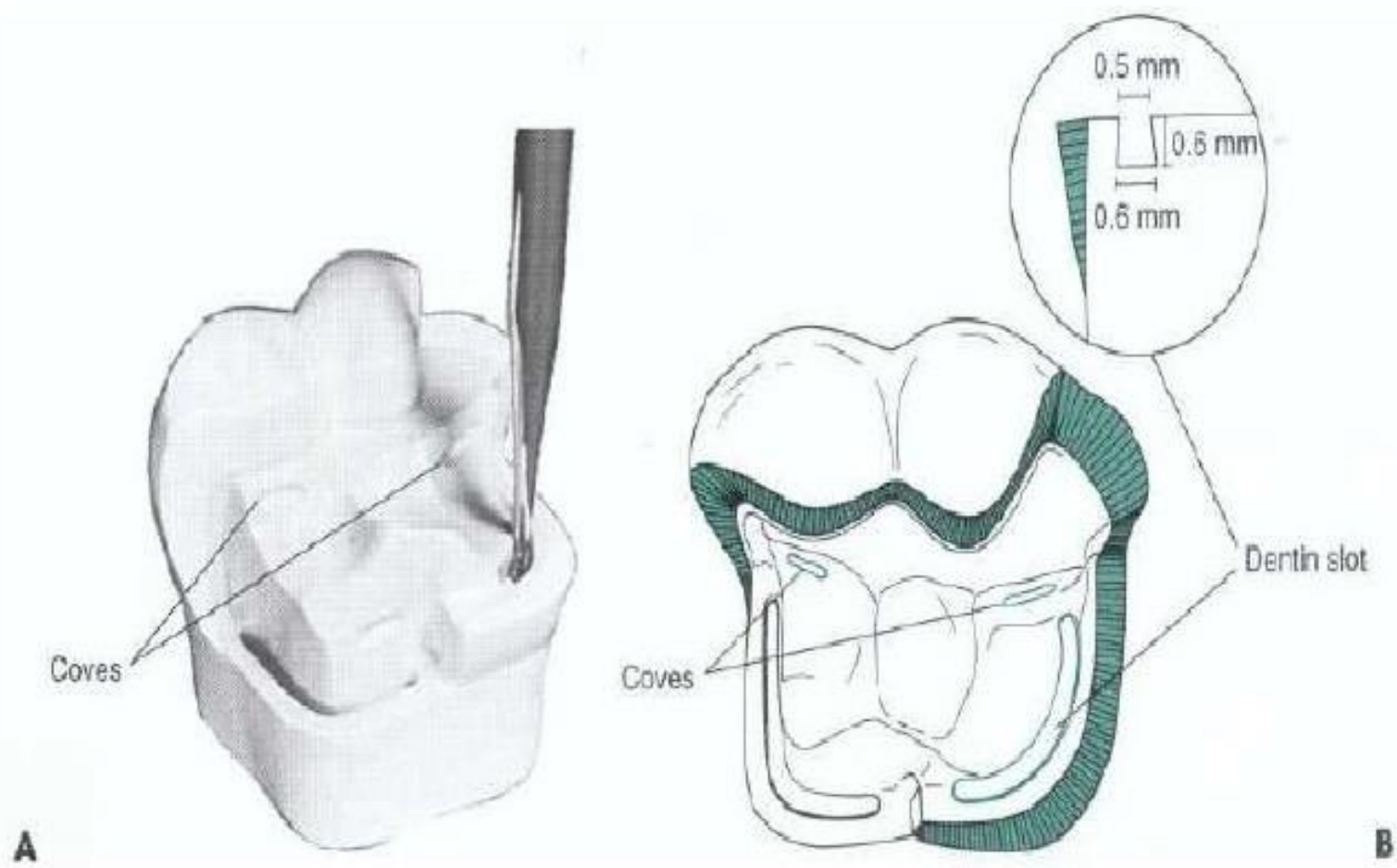


FIG. 19-4 Slots. A and B, With a No. 33½ bur, prepare dentinal slots approximately 0.6 mm deep and 0.5 to 1 mm inside dentinoenamel junction.

3- **Obtaining the convenience form**

- **Definition**

It describes those **features in the prepared cavity** which **improves visibility** and **accessibility** during preparation and restoration

N.B.: Advent of recent methods of instrumentation *limited* the application of this step

4- Removal of remaining caries

- **Definition**

It is the **removal** of any **remaining infected** caries left in the tooth **after initial** preparation.

In dentin as caries progress, **area of decalcification precedes penetration of microorganisms.** It is called **affected dentin.**

Infected carious dentin is removed alone leaving a rounded concave area in the wall.

4- Removal of remaining caries



**Manual
excavation**

**Mechanical
excavation by
burs**



**Air abrasion
debridement**

**Laser
debridement**



**Chemico-
mechanical**
[e.g. Carisolv]

4- Removal of remaining caries

- Sometimes during caries removal, you might find **hard discolored dentin** that is **stained from pigments produced by chromogenic bacteria** and **not demineralized.**
- **How to differentiate this dentin from caries?**
- **Is it removed or not?**

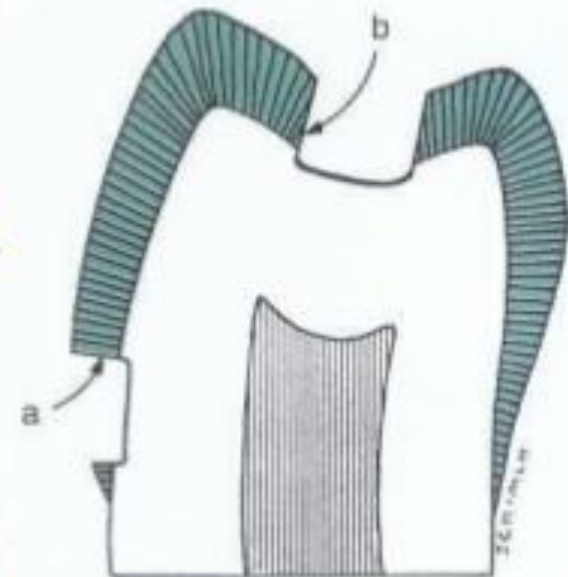
5- Finishing of cavity walls

- Definition

It is the development of a specific surface design and degree of smoothness that produce maximum effectiveness of the restoration.

5-Finishing of cavity walls

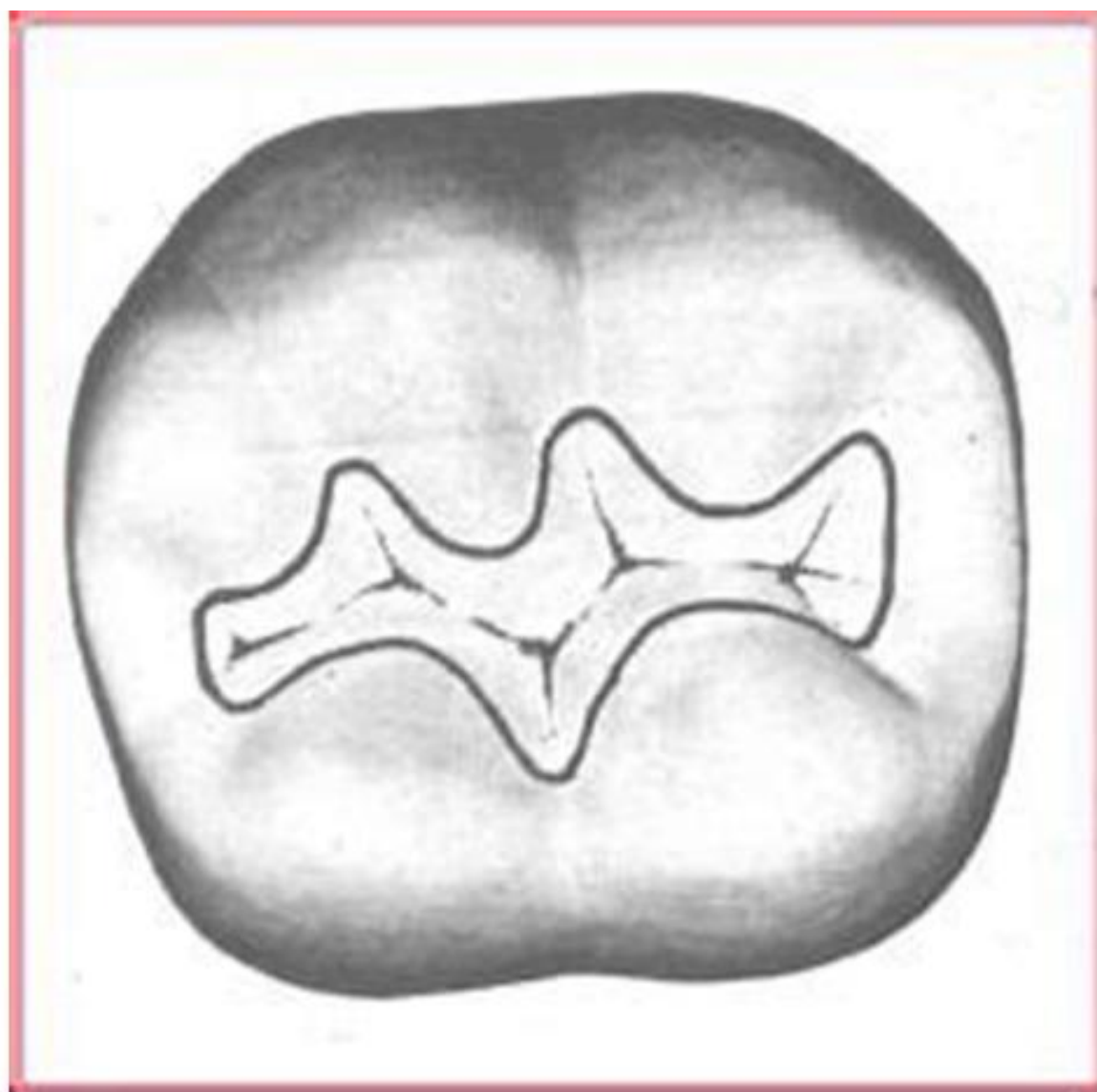
- According to **Noy's principles**, the maintenance of a **stronger enamel wall** at the cavosurface angles
 1. **Enamel** should **rest on sound dentin**.
 2. **Enamel rods** forming the cavosurface angle must have their **inner ends resting on sound dentin**.
 3. The **cavosurface angle** is **beveled** and **covered by strong restoration**.



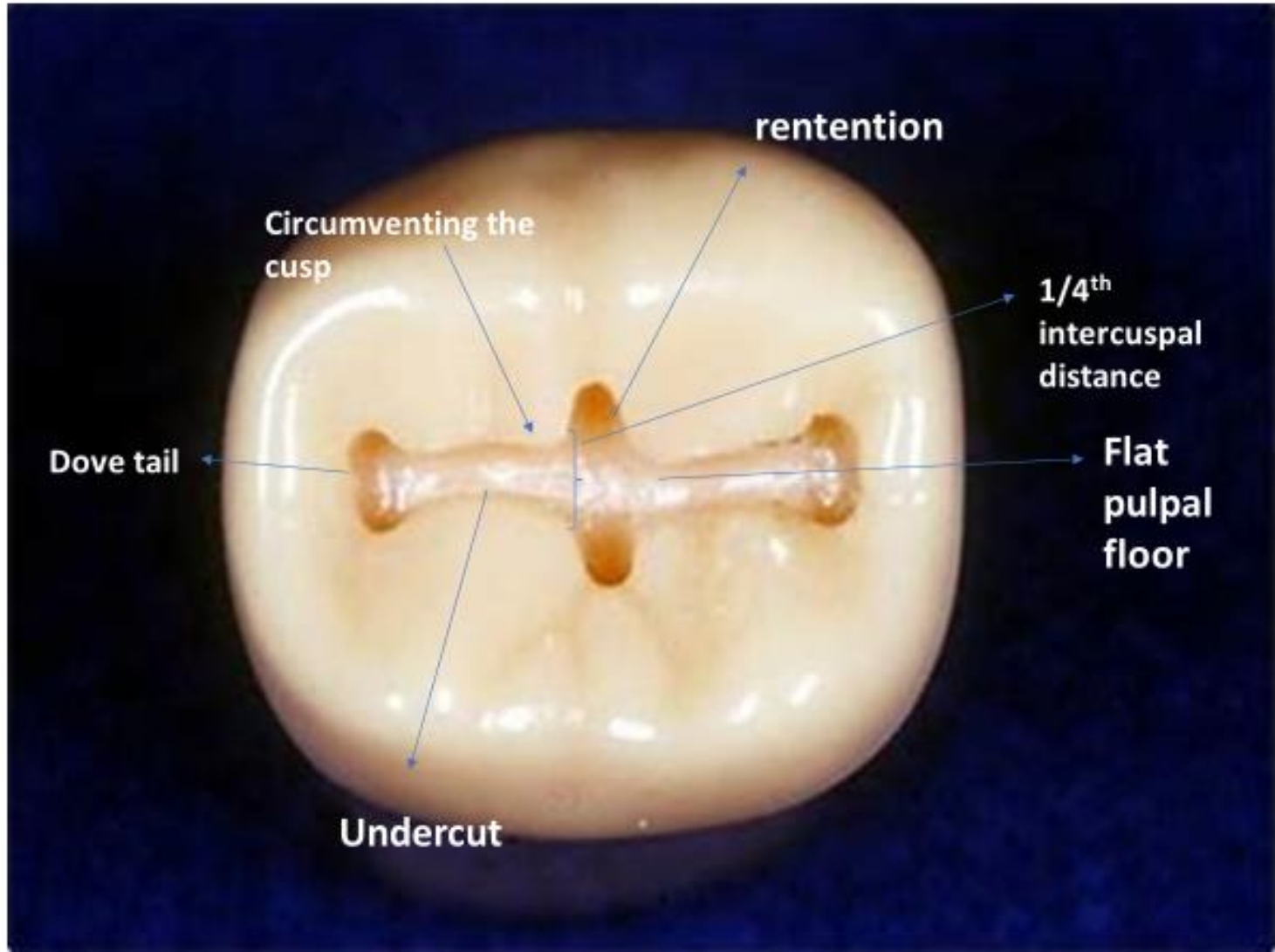
6- Toilet of the cavity

- The cavity should be **clean** and **dry** before insertion of the final restoration.
- It is aimed to
 - **Remove debris, dentin chips, saliva.**
 - **Improve adaptation** of final restoration.
 - **Hinder recurrence of decay**
- This is **done using air water spray.**



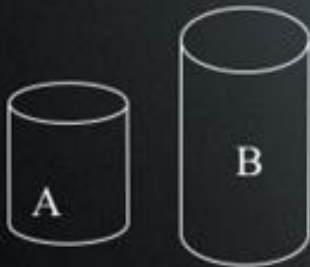




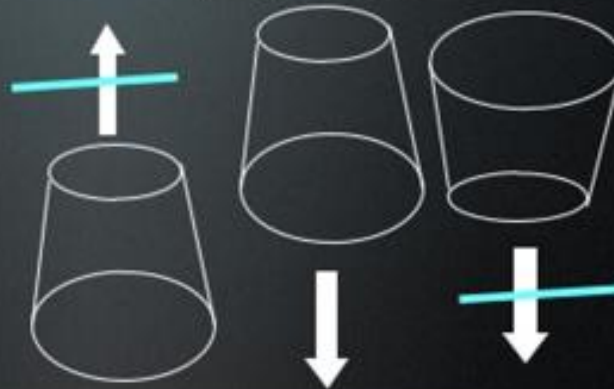


Retention Form

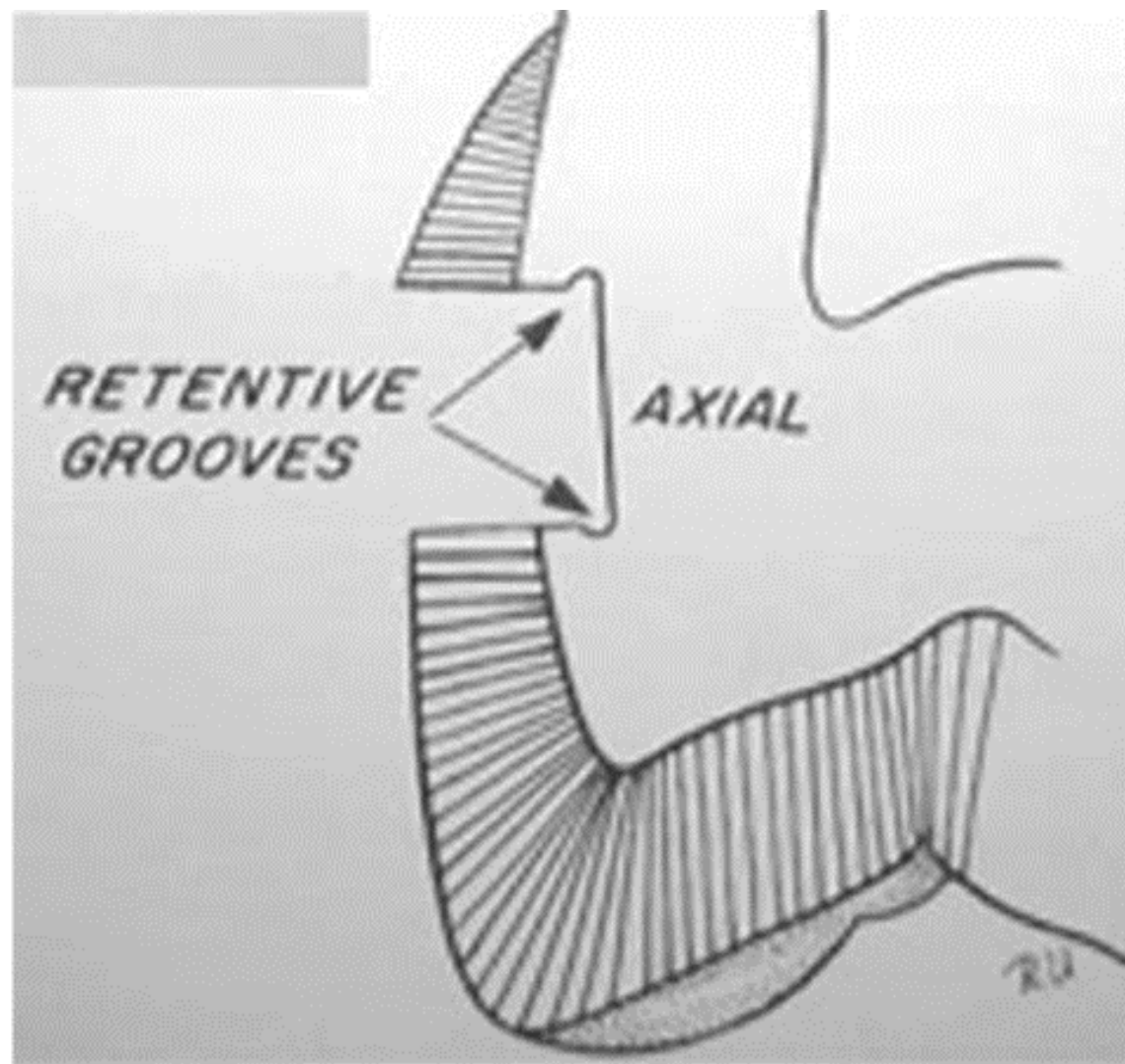
Box Form



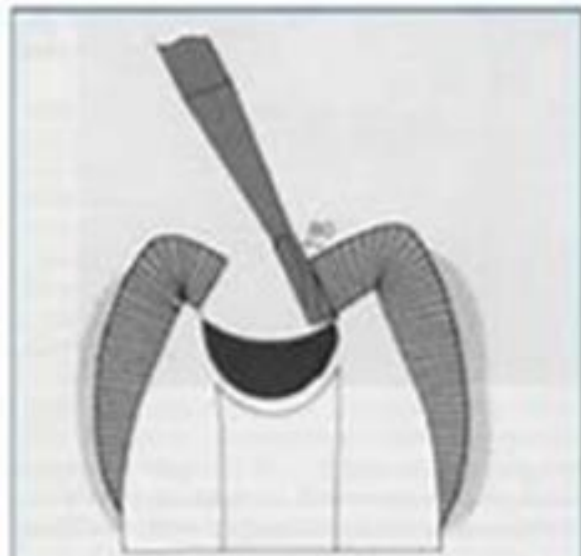
Modified box or mortise preparation

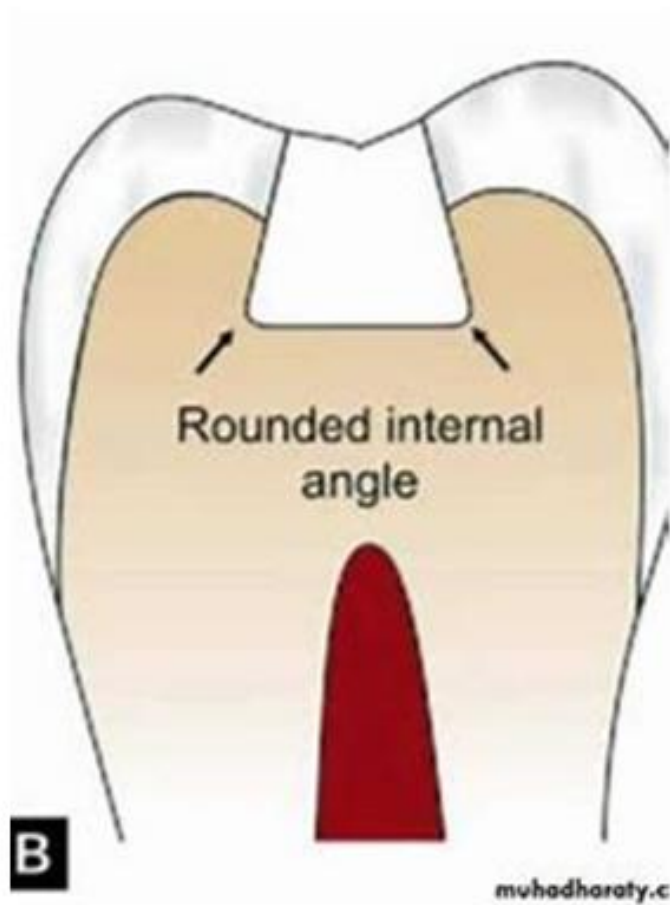


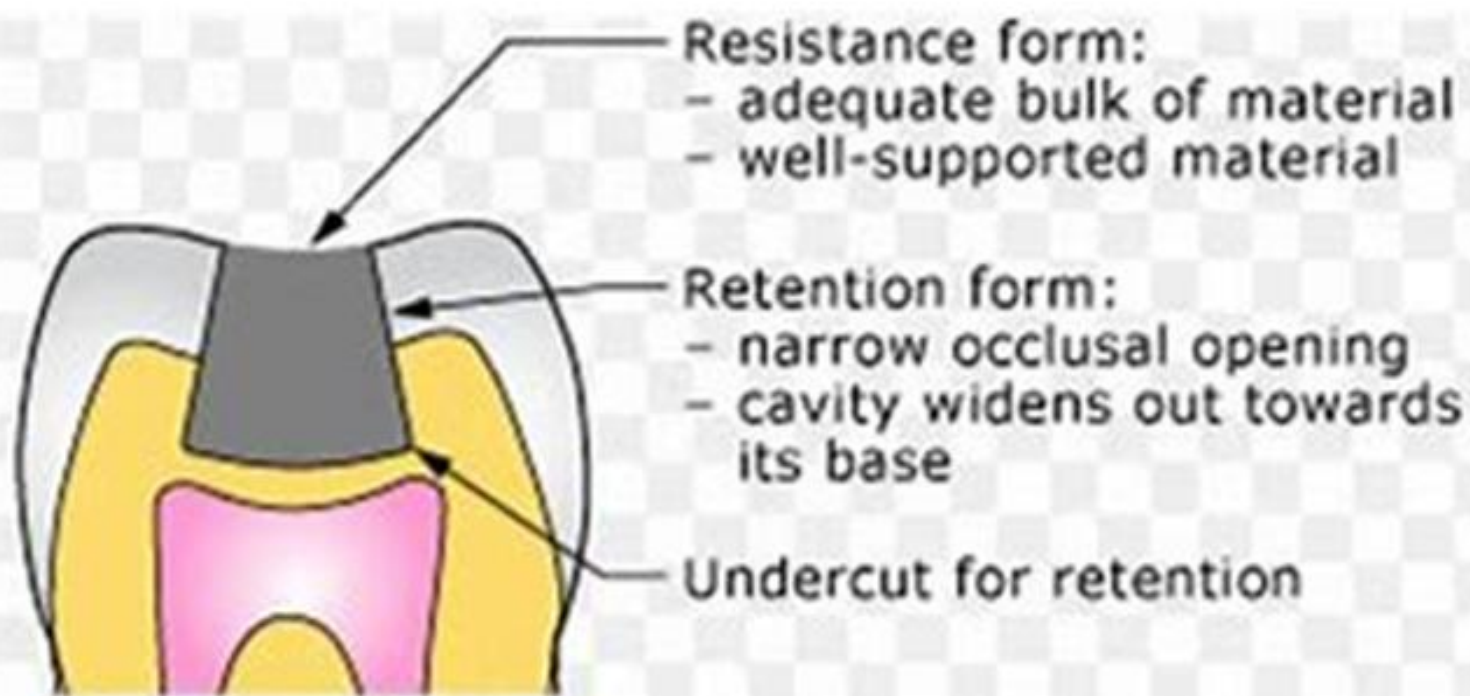
Convergence to occlusal surface
(small undercut to prevent occlusal displacement)



- An occlusal cavosurface bevel is **contraindicated** in an amalgam cavity preparation.
- Provide an approximate 90-100 degree cavosurface angle which should result in 80-90 degree amalgam at the margins.
- Amalgam is a brittle material with low edge strength and tends to chip under occlusal stress.







Resistance and retention is provided by the shape of the cavity and by rounded undercuts

Convenience Form



Conservative Approach

- **Cavity width** : $\frac{1}{4}$ intercuspal distance (1 – 1.5 mm).
- **Depth** : 1.5 – 2 mm

