The principles of cavity preparation

Are some fundamental principles which must be realized in preparing cavities and must be intelligently applied and adhered to in all cases since failure of whole procedure might occur if one or any one is violated.

These principles of cavity preparation include

- Biological fundamentals
- Mechanical fundamentals
- Esthetic fundamentals

**Biological fundamentals**

(Concerned with Health and integrity of remaining tooth structure)

**Protection of dentine (vital) and pulp organ**

The pulp is the highly specialized and sensitive structure within the tooth and must be protected against irritation, irritation may be:

<table>
<thead>
<tr>
<th>Mechanical irritation</th>
<th>The following points should be avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Excessive cutting of enamel (width) (decrease cutting)</td>
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<tr>
<td>2-Over-cutting of dentin (depth) (decrease cutting)</td>
<td></td>
</tr>
<tr>
<td>3-Unnecesary application of excessive pressure on dentin (decrease pressure)</td>
<td></td>
</tr>
<tr>
<td>4-Cutting across (perpendicular) the recessional lines of pulp (weak) (Avoid cutting)</td>
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Resting of odontoblasts during formation of secondary dentin (decrease pulp size)

**Pulp is very sensitive to thermal changes so dentin preserve it in case of recession there is severe pain and destruction of pulp**

- So any thermal changes will affect pulp

Pulp has no co-lateral sensitive position

Enclosed pulp cavity increase its inflammation

**Thermal irritation during cavity preparation can be controlled by**

1-Minimizing the frictional heat during cavity preparation
2-Sharp tools
3-Small instrument
4-The use of coolant (air-water spray) the coolant must fulfill the following requirements:
   - A-It must be copious (more) in amount.
   - B-Should be multidirectional .
   - C-Should be of the same temperature of the mouth (37 c).

**Note**

- Air only → dry dentin → post-operative sensitivity
- Water only → not reach to field area
Chemical irritation

- Cavity cleaners proved to have insignificant role in preventing secondary caries thus their use was discontinued
  - Alcohol and flowable compound → irritation and evaporation of dentin water so we should avoid chemicals
- It's now widely accepted that the use of certified conditioners, primers and adhesives with full respect to its instructions will not damage the pulp
  - Chlorhexidine → accept to be used

Bacterial irritation

In case of very deep cavities, the use of rubber dam to isolate the field of operation is mandatory to prevent bacterial contamination from saliva or neighboring teeth if pulp exposure occurs.

Control of caries (Dentin)

Control of secondary caries requires

1. Removal of all primary caries
2. Removal of all weak undermined (friable) enamel.
3. Giving the cavo-surface angle the correct angulation.

Protection of investing tissues and adjacent teeth (Gingiva, tongue, ...etc)

This is achieved by

1. Rounding and smoothening ragged cavity margins
2. Avoid injudicious sub-gingival extensions whenever possible..
3. Proper guide and support of hand and rotary instruments to avoid slippage of instruments and injury to the gingiva. (Modified pen grasp) (rest by middle finger)

B. Mechanical fundamentals

These principles are primarily concerned with Preservation of the structural integrity of both the tooth and restoration.

C. Esthetic fundamentals

(In case of class III we use palatal approach to improve esthetic)

This includes

1. Provision of symmetrical cavity outlines with refined margins and smooth sweeping curves.
2. The margins must be free of opaque, discolored or pitted dentine.
3. Limiting the area-display of restoration by using conservative designs with minimum lateral extensions.
4. Elimination of discolored enamel or dentine.
Steps of cavity preparation

According to black, the procedure of cavity preparation is outlined in seven steps

1- Obtaining the **outline form** and initial depth
2- Obtaining required the **resistance forms** \(\rightarrow\) design feature \(\rightarrow\) avoid fracture of tooth and restoration or both
3- Obtaining the **retention forms** \(\rightarrow\) design feature \(\rightarrow\) retained restoration in its place
4- Obtaining the required **convenience form**.
5- **Removal of the remaining carious dentine**
6- **Finishing of the cavity walls and margins.**
7- **Performing the toilet of the cavity.**

**Obtaining the outline form**

- An outline form refers to the shape of boundaries of the completed cavity.
  
  The aim is to place the margins of cavities in sound enamel at areas which are not carious or defected and less stress-bearing.

- Remove small part of enamel for finishing

**General factors affecting the outline form**

*The factors are:*-

1- Extension of the carious defect in enamel
2- Removal of undermined enamel
3- Defective, non-remineralizable and retentive enamel
4- To achieve conservative approach (**very critical**)

**Tooth restoration interference is very critical so never ever put restoration in:**-

- Caries growing areas \(\rightarrow\) Do enameloplasty
- Extreme eminence (cusp tip and marginal ridge) \(\rightarrow\) Slanting bur technique
- Centric stop \(\rightarrow\)

**Enameloplasty**

- It's the reshaping of the fissures and angular grooves (no caries) to make them non-retentive and less prone to caries.
- The technique is performed by using flame shaped diamond stone.
- Remove 1/3 enamel but there is more caries so do slanting bur technique

**Slanting bur technique**

- (البير مائل لبرة عشان يقطع من فوق مش من تحت)
  
  Is done to include supplementary or defective fissures that approximate the outline of the cavity preparation in a conservative way.

- More conservative.

- The fissure bur is placed on the wall of the preparation and slanted (tilted) to 110 to include the fissure.

**Pit & Fissure sealant (The best)**

- It's primarily indicated in case of deep grooves liable to caries, it's used in conjunction with restorations where sealing of fissures provides a conservative choice instead of including them into the preparation.

- The later procedure is termed **preventing resin restoration (PRR)**.
5. All enamel which is weak or undermined by caries should be eliminated.

6. Adjacent cavities, closely approaching to each other, shouldn't be joined into a single cavity unless if the intervening enamel is carious, undermined or weak (less than 0.5 mm).

7. Cusps and ridges that are severely weakened and subjected to occlusal forces must be reduced and restored with appropriate restoration (cusp capping).

**Extension from the primary groove ½ or more of cusp incline indicates cusp capping.**

<table>
<thead>
<tr>
<th>From central groove to cusp tip: -</th>
<th></th>
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<tbody>
<tr>
<td>1/3</td>
<td>No cusp capping</td>
</tr>
<tr>
<td>1/3 – 2/3</td>
<td>May have according to patient condition</td>
</tr>
<tr>
<td>2/3</td>
<td>Must cusp capping</td>
</tr>
</tbody>
</table>

**According to patient condition**
- Males → Need cusp capping
- Females → No cusp capping
- Normal force → No need cusp capping
- Abnormal force (bruxism) → Need cusp capping

8. The outline form must be in the form of harmonious sweeping curves in order to avoid stress concentrations and provide better esthetics.

9. The pulp should be protected against inadvertent cutting of dentin, thermogenesis, pressure and desiccation. Depth penetration into dentin should be kept to a minimum (0.2 to 0.8 mm).

10. The cavo-surface angle should be given the correct angulation according to physical properties of the restorative material. Moreover, It should be located in sound dentin areas that are less liable to caries recurrence and less stress bearing.

**Amalgam needs (1.5 – 2) mm depth = 0.2 or 0.5 mm below AEJ except in case of attrition (cavity in dentin)**