FUNDAMENTALS IN TOOTH PREPARATION FOR SILVER AMALGAM RESTORATIONS
OUTLINE

• Definition of tooth preparation
• Objectives of tooth preparation
• Terminologies
• Classification of tooth preparation
• Stages of tooth preparation
  1. Initial stages of tooth preparation
     Outline form and initial depth
     Primary resistance form
     Primary retention form
     Convenience form
2. Final tooth preparation stages

- Removal of any remaining infected dentin or old restorative material (or both), if indicated
- Pulp protection, if indicated
- Secondary resistance and retention forms
- Final procedures - cleaning, inspecting, and sealing

• Conclusion
• References
DEFINITION OF TOOTH PREPARATION

Tooth preparation is the mechanical alteration of a defective, injured or diseased tooth to receive a restorative material that re-establishes a healthy state for the tooth, including esthetic corrections where indicated and normal form and function.

OBJECTIVES OF TOOTH PREPARATION

1. Remove all defects and provide necessary protection to the pulp
2. Extend the restoration as conservatively as possible
3. Form the tooth preparation so that under the force of mastication the tooth or the restoration or both will not fracture and the restoration will not be displaced
4. Allow for the esthetic and functional placement of the restorative material.
TERMINOLOGIES

1. TOOTH PREPARATION WALLS

- **INTERNAL WALL** - An internal wall is a prepared surface that does not extend to the external tooth surface.
- **AXIAL WALL** - An axial wall is an internal wall parallel with the long axis of the tooth.
- **PULPAL WALL** - A pulpal wall is an internal wall that is perpendicular to the long axis of the tooth and occlusal of the pulp.
- **EXTERNAL WALL** - An external wall is a prepared surface that extends to the external tooth surface.
• **FLOOR (SEAT)**- A floor is a prepared wall that is reasonably flat and perpendicular to the occlusal forces that are directed occlusogingivally.

• **ENAMEL WALL**- The enamel wall is that portion of a prepared external wall consisting of enamel.

• **DENTINAL WALL**- The dentinal wall is that portion of a prepared external wall consisting of dentin, in which mechanical retention features may be located.

2. **TOOTH PREPARATION ANGLES**

• **LINE ANGLE**- A line angle is the junction of two planal surfaces of different orientation along a line. An **INTERNAL LINE ANGLE** is a line angle whose apex points into the tooth. An **EXTERNAL LINE ANGLE** is a line angle whose apex points away from the tooth.
• **POINT ANGLE** - A point angle is the junction of three planal surfaces of different orientation.

• **CAVOSURFACE ANGLE AND CAVOSUFACE MARGIN** - The cavosurface angle is the angle of tooth surface formed by the junction of a prepared wall and the external surface of the tooth. The actual junction is referred to as the cavosurface margin.

3. **DENTINOENAMEL JUNCTION** - The DEJ is the junction of the enamel and dentin.

4. **CEMENTOENAMEL JUNCTION** - The cementoenamel junction is the junction of the enamel and cementum. It is also referred to as the *cervical line*.
5. ENAMEL MARGIN STRENGTH- One of the most important principles in tooth preparation is the concept of the strongest enamel margin. 2 significant features:
- formed by full-length enamel rods whose inner ends are on sound dentin.
They are buttressed on the preparation side by progressively shorter rods whose outer ends have been cut off, but whose inner ends are on sound dentin.
Because enamel rods are perpendicular to the enamel surface, the strongest enamel margin results in a cavosurface angle greater than 90 degrees.
-An enamel margin composed of full-length rods that are on sound dentin but are not buttressed tooth-side by shorter rods also on sound dentin is termed **strong**. Generally, this margin results in a 90 degree cavosurface angle.

An enamel margin composed of rods that do not run uninterrupted from the surface to sound dentin is termed **unsupported**, and this marginal enamel tends to split or fracture off, leaving a V-shaped ditch along the margin of a restoration. Usually, this weak enamel margin either has a cavosurface angle less than 90 degrees or has no dentinal support.

6. **ANATOMIC TOOTH CROWN**
The anatomic tooth crown is the portion of the tooth covered by enamel.

7. **CLINICAL TOOTH CROWN**
The clinical tooth crown is the portion of the tooth exposed to the oral cavity.
CLASSIFICATION OF TOOTH PREPARATION

1. G.V.BLACK’S CLASSIFICATION (Based on treatment and restoration design i.e. it is a therapeutic classification)

CLASS I Restorations: All pit and fissure restorations are Class I and they are assigned to three groups.
- Restorations on occlusal surface of premolars and molars.
- Restorations on occlusal two thirds of the facial and lingual surfaces of molars.
- Restorations on lingual surface of maxillary incisors.

CLASS II Restorations: Restorations on the proximal surfaces of posterior teeth are Class II.
**CLASS II Restorations:** Restorations on the proximal surfaces of posterior teeth are Class II.

**CLASS III Restorations:** Restorations on the proximal surfaces of anterior teeth that do not involve the incisal angle are Class III.
CLASS IV Restorations: Restoration on the proximal surface of anterior teeth that do involve the incisal edge are Class IV.

CLASS V Restorations: Restorations on the gingival third of the facial or lingual surfaces of all teeth are Class V.

CLASS VI Restoration: (Were not originally included in Black’s classification) Restorations on the incisal edge of anterior teeth or the occlusal cusp heights of posterior teeth are Class VI.
## 2. G J Mount’s Classification

<table>
<thead>
<tr>
<th>SIZE AND SITE</th>
<th>MINIMAL (1)</th>
<th>MODERATE (2)</th>
<th>ENLARGED (3)</th>
<th>EXTENSIVE (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIT AND FISSURE (1)</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>CONTACT AREA (2)</td>
<td>2.1</td>
<td>2.2</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>CERVICAL (3)</td>
<td>3.1</td>
<td>3.2</td>
<td>3.3</td>
<td>3.4</td>
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</tbody>
</table>
SITE 1: PIT AND FISSURE, OCCLUSAL SURFACE OF POSTERIORS AND SMOOTH SURFACE OF ANTERIORS

SIZE:

MINIMAL 1.1

MODERATE 1.2

ENLARGED 1.3

EXTENSIVE 1.4
SITE 2: BELOW THE CONTACT POINT

SIZE:

- MINIMAL 2.1
- MODERATE 2.2
- ENLARGED 2.3
- EXTENSIVE 2.4
SITE 3: CERVICAL

SIZE:

MINIMAL   MODERATE   ENLARGED   EXTENSIVE
3.1        3.2        3.3        3.4
STAGES OF TOOTH PREPARATION

1. INITIAL TOOTH PREPARATION STAGE
Initial tooth preparation is the extension and initial design of the external walls of the preparation at a specified limited depth so as to provide access to the caries or defect, reach sound tooth structure, resist fracture of the tooth or restorative material from masticatory forces principally directed with the long axis of the tooth and retain the restorative material in the tooth.

STEPS IN INITIAL TOOTH PREPARATION
• Outline form and initial depth
• Primary resistance form
• Primary retention form
• Convenience form
OUTLINE FORM AND INITIAL DEPTH

DEFINITION:
Establishing the outline form means (1) Placing the preparation margins in the positions they will occupy in the final preparation except for finishing enamel walls and margins and (2) Preparing an initial depth of 0.2 to 0.8 mm pulpally of the DEJ position or normal root-surface position.

PRINCIPLES:

1. All friable or weakened enamel should be removed.
2. All faults should be included.
3. All margins should be placed in a position to afford good finishing of the margins of the restoration.
FACTORS

- Extent of the carious lesion, defect or faulty old restoration
- Esthetic and occlusal conditions
- Adjacent tooth contour
- Desired cavosurface marginal configuration of the proposed restoration
FEATURES:

1. Preserving cuspal strength.
2. Preserving marginal ridge strength.
5. Connecting two close (less than 0.5 mm apart) faults or tooth preparations.
6. Restricting the depth of the preparation into dentin to a maximum of 0.2mm for pit and fissure caries and 0.2-0.8mm for the axial wall of smooth surface caries (the greater depth is indicated for an extension gingivally onto the root surface).
OUTLINE FORM AND INITIAL DEPTH FOR PIT AND FISSURE LESIONS

Controlled by 3 factors:
1. The extent to which the enamel has been involved by the carious process.
2. The extensions that must be made along the fissures to achieve sound and smooth margins.
3. The limited bur depth related to the tooth’s original surface.

RULES:
1. Extend the preparation margin until sound tooth structure is obtained and no unsupported or weakened enamel remains.
2. Avoid terminating the margin on extreme eminences such as cusp heights or ridge crests.
3. If the extension from a primary groove includes one half or more of the cusp incline, consideration should be given to capping the cusp.
RULES FOR CUSP CAPPING

Although the cusp size and occlusal considerations may affect the decision, a basic rule guides the reduction of cusps during initial tooth preparation.

1. Cusp reduction should be considered when the outline form has extended half the distance from a primary groove to a cusp tip.

2. Cusp reduction usually is mandatory when the outline form has extended two thirds the distance from a primary groove to a cusp tip.
4. Extend the preparation margin to include all of the fissure that cannot be eliminated by appropriate ENAMELOPLASTY.

1. Cusp is unusually large, and the operator judges that adequate cuspal strength remains.

2. When bonded restoration is being used, and the operator judges the bonding to provide for adequate remaining cuspal strength.
ENAMELOPLASTY

Sometimes a pit or groove does not penetrate to any great depth into enamel and does not allow proper preparation of tooth margins except by undesirable extension.

If such a shallow feature is removed, and the convolution of the enamel is rounded or “saucered”, the area becomes cleanable and finishable and allows conservative placement of the preparation margins. This procedure of reshaping the enamel surface with suitable rotary cutting instruments is termed ENAMELOPLASTY.

Usually a fissure should be removed by normal preparation procedures if it penetrates to more than one third the thickness of the enamel in the area. If one third or less of the enamel depth is involved the fissure is removed by enameloplasty.
-applicable also to **supplemental grooves** extending up cusp inclines. If the ends of these grooves were included in the tooth preparation the cusp could be weakened to the extent that it would need to be capped. Provided that these areas are ‘sauceried’ by enameloplasty the cusp strength can be retained.

-indicated on a **shallow fissure** that approaches or crosses a lingual or facial ridge. This fissure, if extended under tooth extension principles, would involve two surfaces of the tooth. Use of the enameloplasty procedure often can confine the tooth preparation to one surface.

**FIGURE 6-28** A, Enameloplasty on area of imperfect coalescence of enamel. B, No more than one third of the enamel thickness should be removed.
5. **Restrict the pulpal depth** of the preparation to a maximum of **0.2mm into dentin**. The preparation for an occlusal surface pit and fissure lesion to be restored with amalgam is first prepared to a depth of **1.5mm**, as measured at the central fissure. Depending on the cuspal steepness angles, the facial and lingual prepared walls are greater than **1.5mm**.

6. If the amount of **pit or fissure** remaining is greater than **50%** of the pulpal floor, the entire pulpal floor is deepened to a maximum initial depth of **0.2mm into dentin**.
7. When two pit and fissure preparations have less than 0.5mm of sound tooth structure between them, they should be joined to eliminate a weak enamel wall between them.

8. Extend the outline form to provide sufficient access for proper tooth preparation, restoration, placement and finishing procedures.

OUTLINE FORM AND INITIAL DEPTH FOR SMOOTH SURFACE LESIONS.

- Proximal surfaces (Class II, III and IV)
- Gingival portions of facial and lingual surfaces (Class V)
RULES FOR ESTABLISHING OUTLINE FORMS FOR PROXIMAL SURFACE TOOTH PREPARATIONS.

1. Extend the preparation margins until sound tooth structure is obtained and no unsupported or weakened enamel remains.

2. Avoid terminating the margin on extreme eminences, such as cusp heights or ridge crests.

3. Extend the margins to allow sufficient access for proper manipulative procedures.

4. Restrict the axial wall pulpal depth of the proximal preparation to a maximum of 0.2 to 0.8mm into dentin.
5. **Gingival margins** of tooth preparation are extended **apically** of the **proximal contact** to provide a minimum clearance of **0.5mm** between the gingival margin and the adjacent tooth.

6. The facial and lingual **margins** in **proximal** tooth preparations usually are **extended** into the respective embrasures to provide specified **clearance** between the prepared margins and the adjacent tooth.
RULES FOR ESTABLISHING OUTLINE FORMS FOR GINGIVAL PORTION OF FACIAL AND LINGUAL SURFACES (CLASS V)

1. The outline form of class V tooth preparations is governed ordinarily only by the extent of the lesion, except pulpally.

2. Extension mesially, gingivally, distally and occlusally is limited to reaching sound tooth structure; during this initial tooth preparation, the bur depth is usually no deeper than 0.8 to 1.25mm pulpally from the original tooth surface.

3. The lesser axial wall depth (0.8mm) is at a gingival wall without an enamel portion (i.e. the margin is on the root surface)
4. The correct axial wall depth at the occlusal wall is that which provides a 0.5mm extension into dentin (the remainder being enamel).

5. Infected caries deeper than these described depths should not be removed by the cutting instrument during this initial preparation stage.

RESTRICTED EXTENSIONS:

Conditions that warrant consideration of restricted extensions for smooth-surface tooth preparations are:
1. Proximal contours and root proximity
2. Esthetic requirements
3. The use of some tooth preparations for composite restorations.
INCREASED EXTENSIONS:

Some conditions that may necessitate increased extensions for smooth-surface tooth preparations are

1. Mental or physical handicaps.
3. Restoration of teeth as partial denture abutments or as units of a splint.
4. Need for additional measures for retention and resistance form.
5. Need to adjust tooth contours.
Primary resistance form may be defined as the shape and placement of the preparation walls that best enable the restoration and the tooth to withstand, without fracture, masticatory forces delivered principally in the long axis of the tooth.

**PRINCIPLES:**

6 principles
1. To use the box shape with relatively flat floor, which helps the tooth resist occlusal loading by virtue of being at right angles to the forces of mastication that are directed in the long axis of the tooth.

A. FLAT PULPAL FLOOR- helps prevent movement of the restoration.
B. ROUNDED PULPAL FLOOR- may allow a non bonded restoration rocking action, producing a wedging force, which may result in shearing of tooth structure
To restrict the extension of the external walls to allow strong cusp and ridge areas to remain with sufficient dentin support.

To have a slight rounding of internal line angles to reduce stress concentration in tooth structure.

To cap weak cups and envelope or include enough of a weakened tooth within the restoration in extensive tooth preparations to prevent or resist fracture of the tooth by forces in the long axis and obliquely directed forces.
To provide enough thickness of the restorative material to prevent its fracture under loading

To bond the material to tooth structure when appropriate
FACTORS

OCCLUSAL CONTACT ON THE RESTORATION AND THE REMAINING TOOTH STRUCTURE

TYPE OF RESTORATIVE MATERIAL

AMOUNT OF REMAINING TOOTH STRUCTURE

FACTORS
FEATURES

1. Relatively flat floors
2. Box shape
3. Inclusion of weakened tooth structure
4. Preservation of cusps and marginal ridges
5. Rounded internal line angles
6. Adequate thickness of restorative material
7. Reduction of cusps for capping when indicated
DEFINITION:
Primary retention form is the shape or form of the conventional preparation that resists displacement or removal of the restoration by tipping or lifting forces.
Occlusal convergence

Adhesive system

Occlusal dovetail

PRINCIPLES
PRINCIPLES:

1. In most class I and all class II conventional preparations the material is retained in the tooth by developing external tooth walls that converge occlusally.

2. For amalgams (eg. Class III and V), the external walls diverge outwardly to provide strong enamel margins and retention coves or grooves are prepared in the dentinal walls to provide the retention form.
Advantages of occlusal convergence of the proximal portion (in addition to retention)

1. Allows slight **extension** of the **proximal portion** of the preparation in the **gingival area**, while conserving the marginal ridge, reducing the forces of mastication on the critical areas of the restoration.

2. The **cavosurface angle** when the proximal facial and lingual walls meet the marginal ridge is **a desirable 90°** because of the **occlusal convergence** of the preparation.
3. In class II preparation involving only one of the two proximal surfaces, an occlusal dovetail may aid in preventing the tipping of the restoration by occlusal forces.

When an unusually large amount of retention form is required, the occlusal dovetail may be placed whether or not caries is on the occlusal surface.

The dovetail simulates a class I occlusal preparation in the area opposite the proximal involvement.

4. Adhesive systems provide some retention by micromechanically bonding amalgam to tooth structure and reducing or eliminating microleakage.
CONVENIENCE FORM

DEFINITION:
Convenience form is the shape or form of the preparation that provides for adequate observation, accessibility and ease of operation in preparing and restoring the tooth.

Ideally, a tooth preparation fulfilling all requirements for outline, resistance and retention forms will be convenient to instrumentation.

Situations do arise

Modes to obtain convenience form

1. Modification in tooth preparation
2. Instrument modification
3. Separation
1. MODIFICATION IN TOOTH PREPARATION

Extending proximal preparations beyond proximal contacts is another convenience form procedure. Although exceptions may be made to such an extension, preparing the proximal walls to obtain clearance with an adjacent proximal surface affords better access to finish the preparation walls and the restorative material and to place a matrix.
2. INSTRUMENT MODIFICATION

a. Contra-angling
b. Bayonetting
c. Addition of several angles to the shank of an instrument

Facilitates access and enables force application in the proper directions
3. SEPARATION

Wedging teeth away from each other can be the most radical way to make interproximal instrumentation convenient. However, the use of wedges interproximally during proximal surface instrumentation is the most indicated convenience form to be used.
2. FINAL TOOTH PREPARATION STAGE

When the extension and wall designs have fulfilled the objectives of initial tooth preparation, the preparation should be inspected carefully for other needs. With conservative amalgam restorations, the preparation may be complete after initial tooth preparation except for sealing the prepared walls for amalgam.

STEPS IN FINAL TOOTH PREPARATION

5. Removal of any remaining enamel pit or fissure, infected dentin, or old restorative material, if indicated
6. Pulp protection, if indicated
7. Secondary resistance and retention form
8. Procedures for finishing the external walls of the tooth preparation
9. Final procedures: cleaning, inspecting and sealing
5. REMOVAL OF ANY REMAINING ENAMEL PIT OR FISSURE, INFECTED DENTIN, OR OLD RESTORATIVE MATERIAL, IF INDICATED

DEFINITION:

Removal of any remaining enamel pit or fissure, infected dentin, or old restorative material is the elimination of any infected carious tooth structure or faulty restorative material left in the tooth after initial tooth preparation.
Removal of remaining enamel pit or fissure

Removal of remaining enamel pit or fissure occurs as a small, minimally extended excavation on isolated faulty areas on the pulpal floor.

Lasers, microabrasion units and other technologically advanced systems all have been proposed but none has shown complete reliability.

This technology should not be used as the primary diagnostic method but:
1. To help with questionable diagnosis
2. Indicate potential preventive interventions
3. Monitor suspicious areas
REMOVAL OF INFECTED DENTIN

FUSAYAMA (1979)

Carious dentin (2 Layers)

OUTER LAYER INFECTED DENTIN
- Bacteria present
- Collagen is irreversibly denatured
- Not remineralizable
- Should be removed

INNER LAYER AFFECTED DENTIN
- No bacteria
- Collagen is reversibly denatured
- Remineralizable
- Does not require removal in acute caries.
In tooth preparation,
It is desirable that only infected dentin be removed, leaving the affected dentin, which may be remineralized in a vital tooth after the completion of restorative treatment.
- Fusayama et al (1966)

How to distinguish clinically?

Observe the degree of discolouration (extrinsic staining)

Test the area for hardness by the feel of an explorer tine or a slowly revolving bur

The softening front of the lesion always precedes the discolouration front, which always precedes the bacterial front.
Difficulties with this approach…

1. Discolouration may be slight and gradually changeable in acute caries.

2. The hardness felt by the hand through an instrument may be an inexact guide.

The outer layer can be selectively stained \textit{in vivo} by caries detection solutions, such as 1\% acid red 52 (acid rhodamine B or food red 106) in propylene glycol.
TECHNIQUES

Large areas of soft caries are best removed with spoon excavators by flaking up the caries around the periphery of the infected mass and peeling it off in layers. Leaving carious dentin at the DEJ area is unacceptable.

The bulk of this material is removed easily in a few large pieces.

Regarding the removal of the harder, heavily discoloured dentin:

- Use of spoon excavators
- Round steel burs at very low speed
- Round carbide burs rotating at high speeds
Remove old restorative material:

1. Affect negatively the esthetic result of the new restoration
2. Compromises the amount of anticipated needed retention
3. Radiographic evidence indicates caries under the old material
4. The tooth pulp was symptomatic preoperatively
5. The periphery of the remaining old restorative material is not intact

TECHNIQUE
Accomplished with use of a round carbide bur, at slow speed with air or air-water coolant. The water spray (along with high-volume evacuation) is used when removing old amalgam material to reduce the amount of mercury vapor.
6. PULP PROTECTION

The reason for using traditional liners and bases is to protect the pulp or to aid pulpal recovery or both.

Clinical judgement about the need for specific liners and bases are linked to

1. Amount of remaining dentin thickness
2. Considerations of adhesive materials
3. Type of restorative material being used

Dentin sealers are being used more frequently instead of dentin bonding systems or varnishes to seal amalgam tooth preparations.
LINERS
- electrical insulation
- Thermal protection

NEED: pulpally extended metallic restorations that are not well bonded to the tooth and are not insulating.

1. THIN FILM LINERS (1-50 MICRO METERS)
   - solution liners (varnishes, 2-5 micrometers)
   - suspension liners (20-25 micrometers)

2. THICK LINERS (200-1000 MICRO METERS)

BASES
(1-2 MICROMETERS)
Provide thermal protection for the pulp
Distribute local stresses from the restoration across the underlying dentin.
In a shallow tooth excavation, there is no need for pulpal protection other than in terms of chemical protection. For an amalgam restoration, the preparation is coated with two coats of a varnish, a single coat of dentin or a dentin bonding system, and then restored.

In most cases, a dentin sealer is the material of choice.

In a moderately deep tooth excavation for amalgam that includes some amount of preparation toward the pulp so that a region includes less than ideal dentin protection, it is judicious to apply a liner only at that site using ZOE or calcium hydroxide. A sealer is then applied before placing a final amalgam restoration.

Under these circumstances for an amalgam restoration, a spherical amalgam type is recommended for use because less condensation pressure is required.
SHALLOW EXCAVATION - Sealer
(RDT greater than 2mm)
MODERATE EXCAVATION - Base/Sealer
(RDT 0.5-2mm)
DEEP EXCAVATION - CH/Base/Sealer
(RDT less than 0.5mm)
7. SECONDARY RESISTANCE AND RETENTION FORMS

2 TYPES:

1. MECHANICAL PREPARATION FEATURES

2. TREATMENT OF THE PREPARATION WALLS WITH ETCHING, PRIMING AND ADHESIVE MATERIALS
1. **RETENTION LOCKS, GROOVES AND COVES**

- **Vertically oriented retention locks and retention grooves** for proximal portions of some conventional tooth preparations (locks for amalgams)

- **Horizontally oriented retention grooves** for class III and V preparations for amalgam

- **Retention coves (appropriately placed undercuts)** - incisal retention of class III amalgams - occlusal portion of amalgam restorations - class V amalgams
2. PINS, SLOTS, STEPS AND AMALGAM PINS

- increases retention and resistance forms

- Amalgam pins and properly positioned steps also improve retention form.

PLACEMENT OF ETCHANT, PRIMER OR ADHESIVE ON THE PREPARED WALLS

1. Enamel wall etching:

   For bonded restorations that use porcelain, composite or amalgam materials, etch the enamel by an appropriate acid, which causes a microscopically roughened surface to which the bonding material is mechanically bonded.
8. PROCEDURES FOR FINISHING THE EXTERNAL WALLS OF THE TOOTH PREPARATION

DEFINITION:
Finishing the preparation walls is the further development, when indicated, of a specific cavosurface design and degree of smoothness or roughness that produces the maximum effectiveness of the restorative material being used.

OBJECTIVES:
1. Create the best marginal seal possible between the restorative material and the tooth structure.
2. Afford a smooth marginal junction
3. Provide maximal strength of the tooth and the restorative at and near the margin
FACTORS:
1. The direction of the enamel rods
2. The support of the enamel rods at the DEJ and laterally (preparation side)
3. The type of restorative material to be placed in the preparation
4. The location of the margin
5. The degree of smoothness or roughness desired

All enamel walls should be created in such a way that all rods forming the prepared enamel wall have their inner ends resting on sound dentin. The strongest enamel margin is one that is composed of full-length enamel rods supported on the preparation side by shorter enamel rods, all of which extend to sound dentin. The shorter enamel rods buttress the full-length enamel rods that form the margin, increasing the strength of the enamel margin.
FEATURES:

Degree of smoothness or roughness of the walls
The restorative material is the primary factor dictating the desired smoothness or roughness of an enamel wall. For amalgam restorative materials, a more rough surface prepared wall markedly improves resistance to marginal leakage.

Design of the cavosurface angle
Cavosurface angle of 90° produces maximal strength for the amalgam and the tooth. Beveling is contraindicated except on the gingival floor of a class II preparation when enamel is still present.
9. FINAL PROCEDURES: CLEANING, INSPECTING AND SEALING

1. Removing all chips and loose debris that have accumulated, drying the preparation
   Procedure: free the preparation of visible debris with warm water from the syringe and then to remove the visible moisture with a few light surges of air from the air syringe.

2. The routine use of specific disinfection medicaments is no longer a strong consideration.

3. Since the elimination of bacterial penetration is important, the use of dentin bonding agents or sealers is likely to become universal.
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