FUNDAMENTALS IN TOOTH PREPARATION
Definition of 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.
Definition of tooth preparation

Healthy state of a tooth:

- Esthetic correction.
- Normal form and function.
- Removal of defective/ friable tooth structure.
Factors affecting tooth preparation

1. General factors:
   - Diagnosis.
   - Knowledge of dental anatomy.
   - Patient factors.
   - Conservation of tooth structure.

2. Restorative material factors.
Fundamentals in tooth preparation

- **Conventional preparation**, preparation for amalgam, gold and ceramics.
- **Modified preparation**, preparation for bonded direct restoration (composite, glass-ionomer).
Modifications for a bonded restorative material:

- Non uniform depths, more shallow depths.
- Preparation walls of varying heights/widths.
- Marginal angels of 90 degrees or greater.
- Less or no need for retention and resistance form preparation features.
Fundamental concepts relating to conventional and modified preparation

- No friable tooth structure left.
- Fault, defect, or caries is removed.
- Remaining tooth structure is left as strong as possible.
- Protection of underlying pulpal tissue.
- Restorative material is retained in strong, esthetic and functional manner.
Nomenclature:

- **Caries terminology:**
  - Rate (speed) of caries.
  - Location of caries.
  - Extent of caries.
Caries terminology:

- Dental caries classified according to the severity or rapidity of the attack, different teeth and surfaces are involved depending on the severity:
  1) Rampant caries
  2) Arrested caries
Rampant Caries

A sudden rapid destruction, involving surfaces that are ordinarily caries-free.

- Primary dentition of infants (suck a bottle or comforter containing, or dipped into, a sugar).

- Permanent dentition of teenagers (frequent cariogenic snacks and sweet drinks between meals.
  
  - Xerostomia.
  - Radiation,
  - Therapeutic drugs.
Arrested Caries

Carious lesions which do not progress.

- When oral environment changed from conditions predisposing to caries to that slow lesion down e.g. after extraction of neighboring tooth, the environment becoming
  - Less plaque retentive,
  - Easier to clean,
  - Accessible to saliva.
Dental caries classified according to the sites where caries is most frequently encountered:

1) Pit and fissure caries
2) Smooth surface caries
3) Root surface caries
Pit-and-fissure caries

- Provide mechanical shelter for cariogenic organisms.
- Has highest prevalence of all dental caries.
- Sealing pits and fissures just after tooth eruption.
Progression of caries in pits and fissures
Smooth surface caries

- Second susceptible areas.

- Protected physically and free from effects of mastication, tongue movement, and salivary flow.
Progression of caries in **proximal** surfaces
Root surface caries

- Root, near cervical line, unaffected by hygiene procedures (concave surface contours and roughness at termination of enamel).

- Gingival recession, favor formation, caries-producing plaque and proximal root-surface caries.
Secondary or recurrent caries

- At margin of a restoration.
Residual caries

- Parts of carious lesion remain after tooth preparation.
Simple, Compound, and Complex Tooth Preparations.

- Simple, one tooth surface involved,
- Compound, two surfaces involved,
- Complex, involving three surfaces.
Abbreviated Descriptions of Tooth Preparations.

For brevity in records and communication, tooth

(1) An occlusal tooth preparation is an O.
(2) A preparation involving mesial and occlusal surfaces is an MO.
(3) A preparation involving mesial, occlusal, and distal surfaces is an MOD.
Tooth Preparation Walls:

**Internal Wall:** a prepared surface that does not extend to the external tooth surface.
- Axial wall.
- Pulpal wall.

**External Wall:** a prepared surface that extends to the external tooth surface.
External and internal walls.
Floor (or Seat)

- A prepared wall that is reasonably flat and perpendicular to long axis of the tooth, e.g. pulpal and gingival walls.
Tooth preparation terminology

**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, mechanical retention features may be located.
Tooth Preparation Angles.

- The junction of two or more prepared surfaces is referred to as an angle.
Tooth preparation terminology

**Line Angle.** Is junction of two panel surfaces.

- 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 junction of three panel surfaces of different orientation.
Cavosurface Angle/ Cavosurface Margin.

- Angle formed by junction of a prepared wall and the external surface of the tooth.
  - actual junction is referred to as the cavosurface margin.

- anatomic crown is portion of the tooth covered by enamel.
- clinical crown is portion of the tooth exposed to the oral cavity.
Tooth preparation line angles and point angles.

*Line angles* are faciopulpal (fp), distofacial (df), distopulpal (dp), distolingual (dl), linguopulpal (lp), mesiolingual (ml), mesiopulpal (mp), and mesiofacial (mf).

*Point angles* are distofaciopulpal (dfp), distolinguopulpal (dlp), mesiolinguopulpal (mlp), and mesiofaciopulpal (mfp).
Classification of tooth preparation

 Missing parts of the tooth structure classified in various ways according to:
   Anatomical areas involved.
   Black’s classification.
Anatomic classification of tooth preparations

- Pits and fissures.
- Smooth surface restorations, buccal and labial surfaces, inter proximal regions below the contact point.
GV Black Classification of Restorations
Class I Restorations

All pits-and-fissure restoration, assigned to three groups:

1. Occlusal surface of premolars and molars.
2. Occlusal two thirds of the facial and lingual surfaces of molars.
3. Lingual surfaces of maxillary incisors.

Typical Class I tooth preparation for amalgam on maxillary premolar.
Class II Restorations

- Proximal surfaces of posterior teeth.
- Below the contact point.
- Can involve both mesial and distal surfaces: (MO), (DO) or an (MOD) preparation.

Typical Class II mesioocclusal conventional tooth preparation for amalgam on maxillary premolar.
Black’s Classification

**Class III restorations:**
On the proximal surface of anterior teeth, do not involve the incisal angle.

**Class IV restorations:**
On the proximal surface of anterior teeth that do involve the incisal angle.

Class III conventional tooth preparation on maxillary central incisor.
Black’s Classification

**Class V restorations:**

On the gingival third of the facial or lingual surfaces of all teeth (except pit-and-fissure lesions).

Class V conventional Tooth preparation.
Black’s Classification

**Class VI Restorations.**

On the incisal edge of anterior teeth or the occlusal cusp heights of posterior teeth.
Principles of tooth preparation

1. Initial tooth preparation stage:
2. Final Tooth Preparation Stage:
Initial tooth preparation stage:

- Step 1: Outline form and initial depth
- Step 2: Primary resistance form
- Step 3: Primary retention form
- Step 4: Convenience form
Final Tooth Preparation Stage

- **Step 5**: Removal of remaining infected dentin/restorative material.
- **Step 6**: Pulp protection.
- **Step 7**: Secondary resistance and retention forms.
- **Step 8**: Finishing external walls.
- **Step 9**: Cleaning, inspecting, sealing.
Outline form / initial depth.

- Placing preparation margins in positions they occupy in final preparation.
- Preparing an initial depth of 0.2 to 0.8 mm at DEJ position.
- Removal of caries.
Principles out line form:

- Weakened enamel removed.
- Faults included.
- Margins placed in a position to afford finishing of margins of the restoration.
Factors affect out line form:

1. Caries extension.
2. Esthetic consideration.
3. Occlusal relationship.
4. Adjacent tooth contour.
5. Cavosurface marginal configuration.
Features at establishing outline form and initial depth:

1. Preserve cuspal /marginal ridge strength.
4. Connecting two close faults or cavity preparations.
5. Restricting depth into dentine to 0.2 mm for pit and fissure caries and 0.2 to 0.8 mm for axial wall.
Primary resistance form:-

- Is the shape and placement of the preparation walls that best enable restoration/tooth withstand masticatory forces delivered in the long axis of the tooth.
Principles in obtaining primary resistance form:

1. Box shape with relatively flat floor.
2. Restrict extension at external wall to allow strong cusps and ridge areas to remain with dentine support.
3. Rounding at internal line angles.
4. Provide thickness of restorative material to prevent its fracture under load.
Factors affect the resistance form:

1. The assessment of the occlusal contact potential on restoration and remaining tooth structure.
2. The amount of remaining tooth structure impact the need and type of resistance form needed.
Features that enhance resistance form:

1. Relatively flat floors.
2. Box shape.
3. Inclusion at weakened tooth structure.
4. Preservation of cusps and marginal ridge.
5. Rounded internal line angles.
6. Adequate thickness of restorative material.
7. Seats in sound dentine peripheral to excavations of infected dentine.
8. Reduction of cusps for capping when indicated.
Primary retention forms:

- Defined as that shape of the prepared cavity that resist displacement of the restoration from tipping or lifting forces.
Principles

Depending on the material:

- Amalgam, class I and class II preparations, retained by developing external cavity wall converge occlusally.
- Adhesive systems, micromechanical bond (enamel etching).
Convenience form:

- Format that provides observation, accessibility and ease of operation in preparing and restoring tooth.
Final tooth preparation stage

- **Step 5:**
  - Removal of any remaining enamel pit/ fissure/ old restorative material left after initial preparation.

- It is an appropriate practice to allow affected dentine to remain in a prepared tooth.
Removal of old restorative material

- Affect negatively the esthetic of the new restoration.
- Compromise the anticipated needed retention.
- Radiographic evidence of caries under it.
- Pulp was symptomatic preoperatively.
- Periphery of the remaining material is not intact.
Final tooth preparation stage

- **Step 6: pulp protection:**
  - No cutting pulpally until preparation completed,
  - Placement of bases and liners.
  - Pulp caries removed with sharp excavators.
  - In deep caries lesion discolored dentine in pulpal floor or axial wall should be left
Final tooth preparation stage

- Step 7: secondary resistance and retention forms:
  
  Mechanical features:
  
  - Groove extensions.
  - Beveled enamel margins.
  - Pin, slots and steps.
  - Retention locks.
Dentin slot

Dentin pins
Step 8: procedure for finishing the external walls:

Objectives:

- Create best marginal seal possible between material/tooth.
- Afford a smooth marginal junction.
- Provide maximum strength of tooth and material near the margin.
Factors affecting finishing the external walls:

- Direction of enamel rods.
- Support of enamel rods both at DEJ and laterally.
- Type of material to be used in preparation.
- Location of margin.
- Degree of smoothness desired.
Step 9: final procedure:

- Cleaning, inspecting:
  - Removing all chips and loose debris.
  - Final inspection of the preparation for any remaining infected dentine.