Fundamental Principles of Tooth Preparation in Operative Dentistry

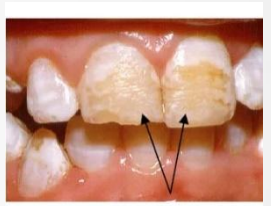
Learning Outcomes

- By end of the lesson, student should know

- List the Steps of tooth preparation
- Explain the fundamental steps required in tooth preparation
- Compare the difference between infected and affected dentin

OBJECTIVES OF TOOTH PREPARATION

- Remove all defects.



- Provide necessary protection to the pulp.

- Form the tooth preparation, so that it will withstand masticatory forces without fracture.

- Esthetic and functional placement of a restorative material.

- G.V BLACK

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STEPS IN TOOTH PREPARATION

Tooth preparation is divided into two stages

Initial tooth Preparation stage:

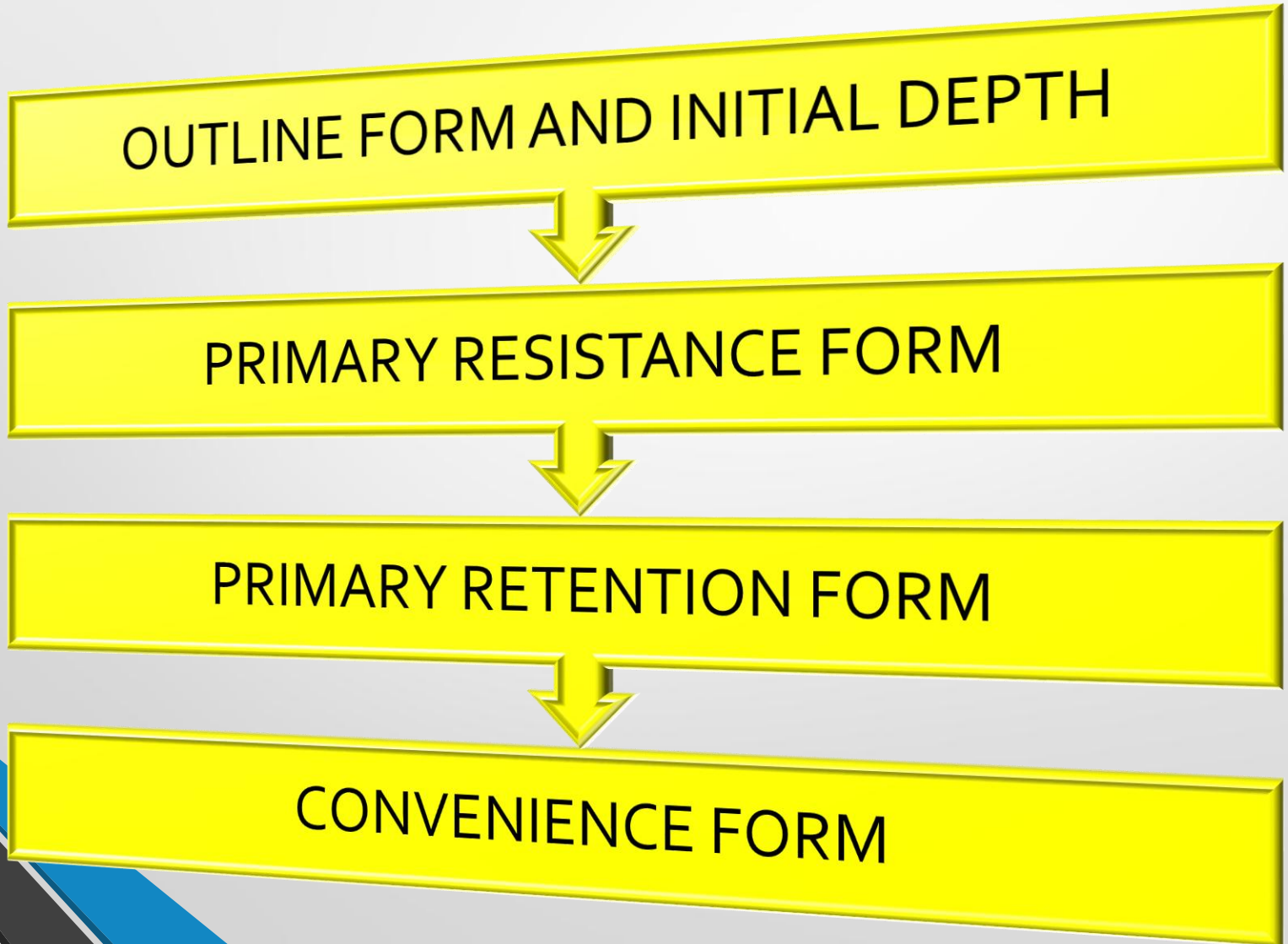
- Step 1: Outline form & initial depth
- Step 2: Primary Resistance form
- Step 3: Primary Retention form
- Step 4: Convenience form

Final tooth Preparation stage:

- Step 5 :Removal of any remaining infected dentin &/or old restorative material
- Step 6: Pulp protection, if needed
- Step 7: Secondary resistance & retention form
- Step 8: Procedures for finishing external walls
- Step 9: Final procedures, cleaning, inspecting, sealing

Stages of Cavity Preparation

❑ INITIAL STEPS OF CAVITY PREPARATION



❑ FINAL STEPS OF PREPARATION

REMOVAL OF ANY REMAINING INFECTED DENTIN OR OLD RESTORATION

PULP PROTECTION

SECONDARY RESISTANCE AND RETENTION FORM

FINISHING THE EXTERNAL WALLS

CLEANING, INSPECTING ,SEALING

Step I: Outline form and initial depth:

This is the first step in cavity preparation

- Establishing the outline form means:

Placing the preparation margins in the positions they will occupy in the final preparation, except for finishing enamel walls and margins.

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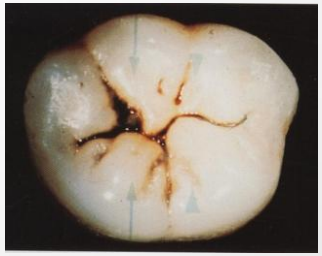
Principles of Outline form

Three general principles should be followed

- All weakened enamel should be removed.



- All caries should be included.
- All margins should be placed in a position to afford good finishing of the margins of the restoration.

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General Features of outline form

These six criteria's of outline form to be fulfilled

1. Preserving cuspal strength
2. Preserving marginal ridge strength
3. Minimizing Buccolingual Width
4. Use enameloplasty when indicated
5. Connect two close tooth preparation
6. Restrict the pulpal depth

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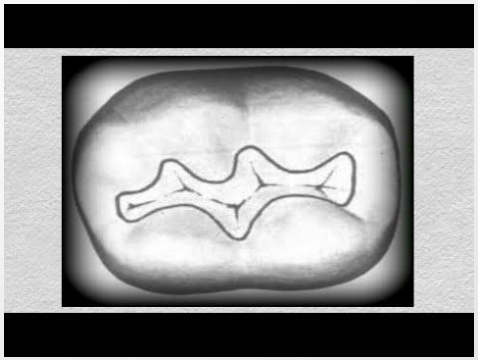
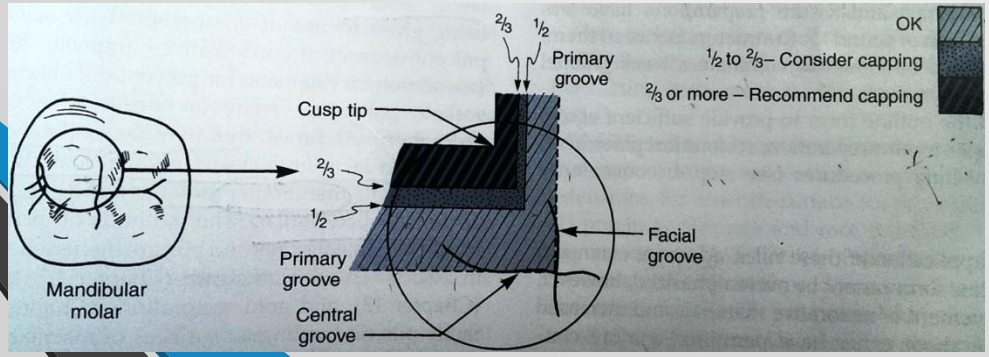
1. Preserving cuspal strength

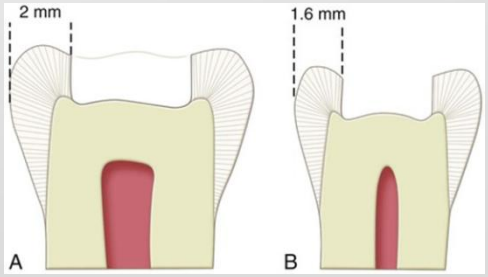
Avoiding termination of the cavity margin on extreme eminence, such as cusp height





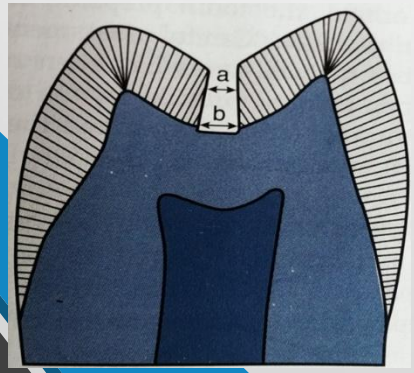
2. Preserving marginal ridge strength

- Remaining Marginal ridge should be greater than 1.6 mm for premolar & 2 mm for molar
- If Remaining Marginal ridge less than 1.6 mm there may be the chances of fracture due to undermining the marginal ridge.



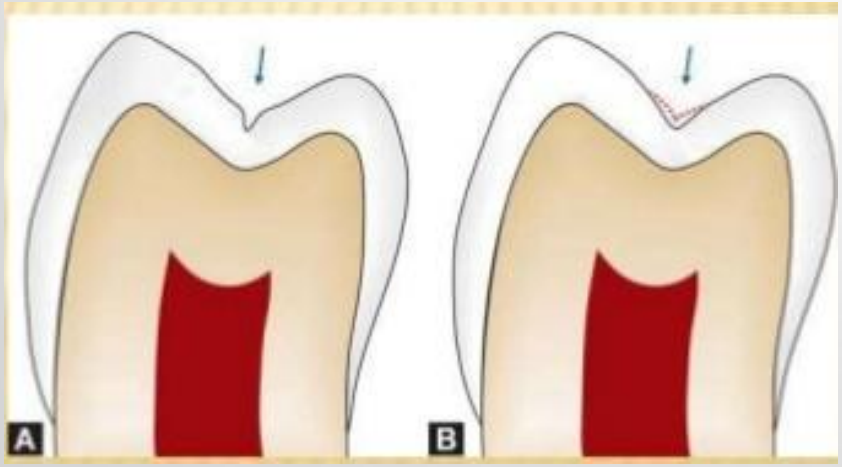
3. Minimizing Buccolingual width

- Minimizing buccolingual width prevents the weakening of cusp.
- Buccolingual width should be not more than ¼ th of the intercuspal distance.
- As minimum tooth structure is removed, it increases the resistance of tooth.



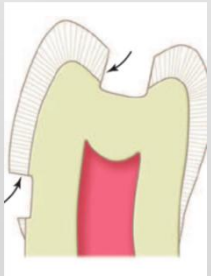
4. Using enameloplasty,whenever it is required

"The procedure of reshaping the enamel surface with suitable rotary cutting instruments is termed as enameloplsty"



5. Connecting two close (less than 0.5 mm apart) tooth preparation.

6. Restricting the depth of the preparation into dentin to maximum of 0.2 mm for pit & fissure caries (Overall depth 2 mm)



Step 2: PRIMARY RESISTANCE FORM:

"Primary Resistance form means as that shape & placement of the preparation, that best enables both the restoration & the tooth to withstand masticatory forces without fracture.

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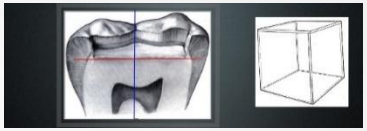
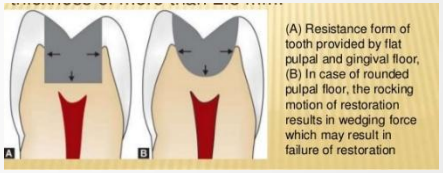


Primary Resistance Form

Six Features (Criteria's to be fulfilled)



1. Relatively flat floors
2. Box shape design of the cavity
3. Inclusion of weakened tooth structure
4. Preservation of cusps and marginal ridges
5. Rounded internal line angles
6. Adequate thickness of restorative materials

Restorative material thickness affects the ability of a material to resist fracture.

- For amalgam it should be minimum cavity preparation depth should be 1.5 – 2 mm

- Although no specific thickness dimension has been noted for strength of composite, most composite restorations are 1 to 2mm thick

Step 3 : PRIMARY RETENTION FORM:

"Primary retention form is that shape or form of the conventional preparation that resists displacement or removal of the restoration (restoration coming out of cavity preparation) by tipping or lifting forces."

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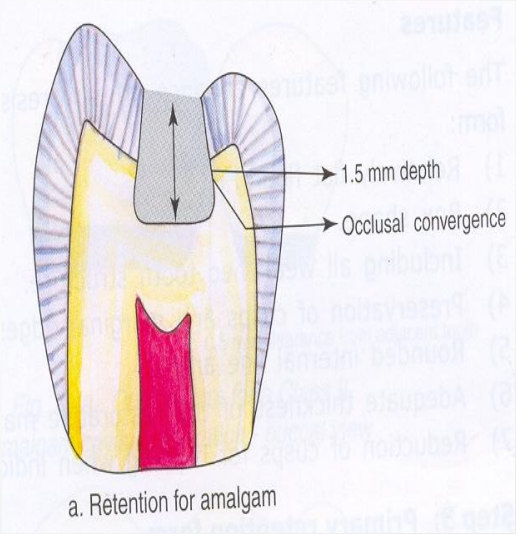
Principles of Retention form:

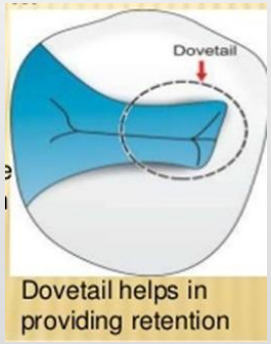
Primary retention features for Amalgam class 1 cavity preparation



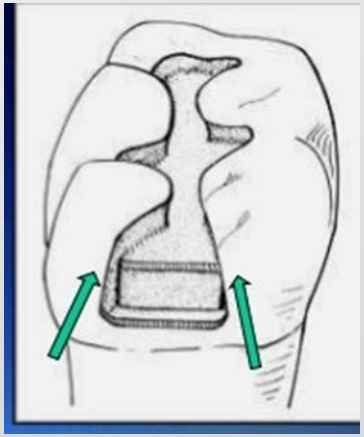
a. Retention for amalgam

1. Occlusal convergence of facial and lingual walls.

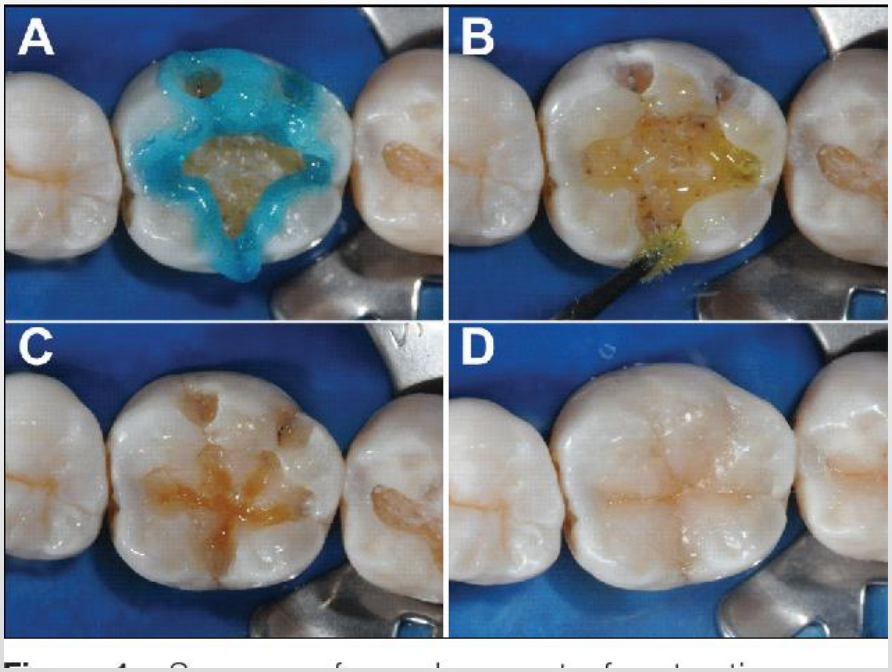
2. Dovetail



Dovetail helps in providing retention



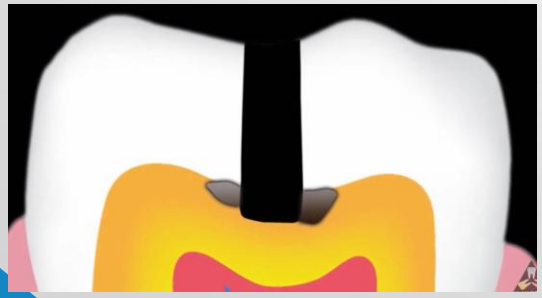
- Composite restorations primarily are retained in a tooth by a micromechanical bond that develops between the material & etched & primed prepared tooth structure.

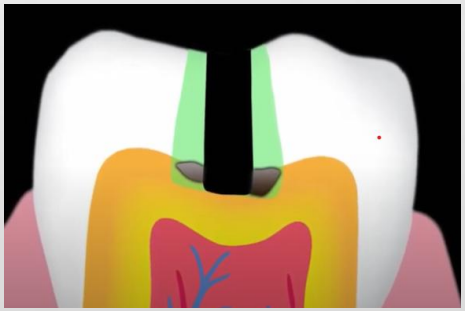


Step 4: CONVENIENCE FORM

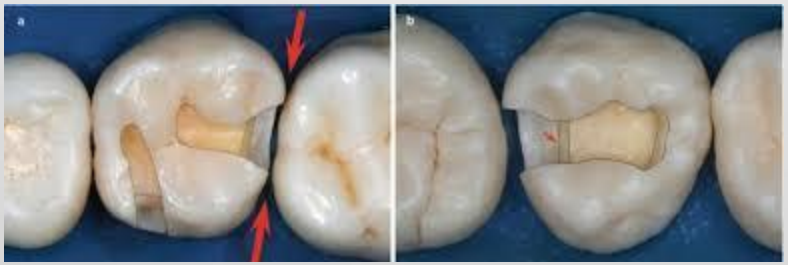
"Convenience form is that shape of form of the preparation that provides for adequate observation, accessibility & ease of operation in preparing & restoring the tooth."

We should be able to see the cavity clearly. Instrumentation should be easier.





- Extension of the proximal walls, so as to obtain clearance with an adjacent proximal surface, may afford better access for the finishing of preparation walls, the placement of the matrix, and the finishing of the restoration margins.



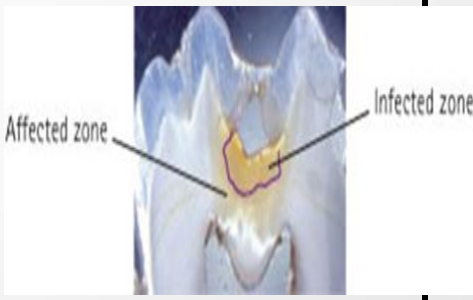
FINAL TOOTH PREPARATION

Step 5: REMOVAL OF ANY REMAINING INFECTED DENTIN, AND/OR RESTORATIVE MATERIAL IF INDICATED.

After initial depth of 1.5 - 2 mm cavity should be inspected for any remaining caries.

Infected Vs Affected dentin

Infected dentin(Soft Dentin)	Affected dentin(Firm Dentin)
▪ Superficial caries layer. ▪ Unremineralizable. ▪ Lacking sensation. ▪ Stained by Caries Detecting dye ▪ Should be excavated.	▪ Deeper caries layer. ▪ Remineralizable. ▪ Sensitive. ▪ Does not stain. ▪ Should be left to remineralizable.



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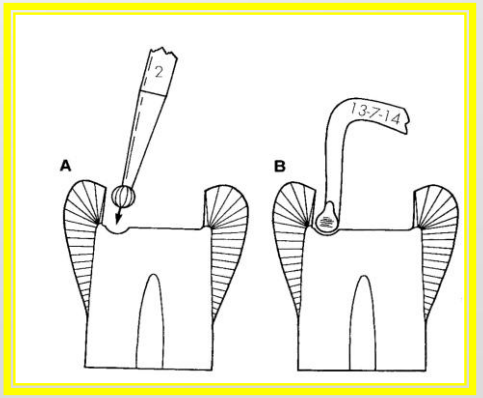
TECHNIQUES

- Removal of Infected dentin (Soft caries)

1. Large areas of soft caries usually are best removed with hand instruments like spoon excavator.

2. Soft caries can also be removed by rotary instrument like round steel burs at a very low speed.



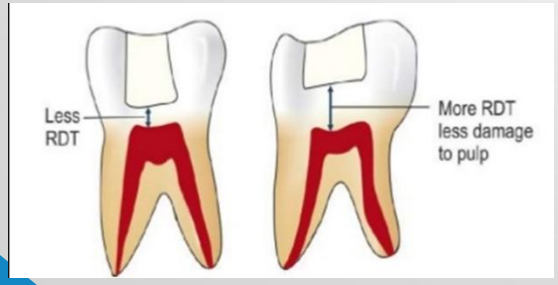
Step 6: PULP PROTECTION IF INDICATED

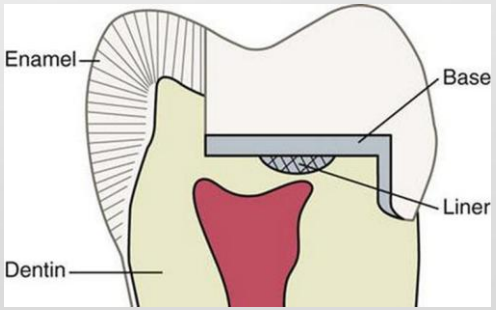
If remaining dentin thickness (RDT) overlying the pulp is 2 mm then no need of pulp protection

But if it is less than 2mm ,pulp protection is mandatory,

The thin remaining dentin provides little protection from heat generated by rotary instruments during subsequent steps, noxious ingredients of various restorative materials, thermal changes conducted through restorative materials, and the ingress of bacteria and/or noxious bacterial toxins through microleakage.

Pulp protection in the form of Liners & Bases for Deeper cavities

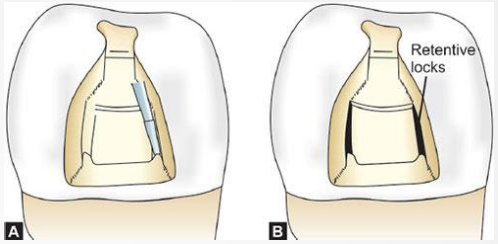




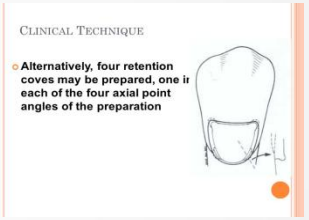
Step-7: SECONDARY RESISTANCE AND RETENTION FORM

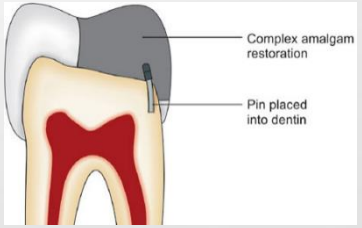
Many compound & complex tooth preparation require additional retentive mechanical features

Mechanical features



- Retention locks and groves
- Retentive Coves
- Skirts
- Slot preparation
- Pins

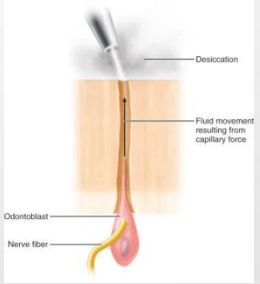




Step 8: Procedure for finishing the external walls of the tooth preparation

Eg: Beveling of enamel margins in composite preparations is indicated primarily for large restorations that have increased retention needs and insufficient amount of prepared enamel

- **Step 9:** Final procedure; Clean and inspect the cavity preparation
- ***Objectives:***
  - Debris removal.
  - Moisture elimination.
  - Disinfection.
- ***Methods:***
  - Air/water jets.
  - Dry cotton pellets.



References

- Sturdevant's,6th edition art and science of operative dentistry page no- 151-161

- Sturdevant's,5th edition art and science of operative dentistry page no- 297- 316