

General considerations in Composite restoration

Learning outcomes

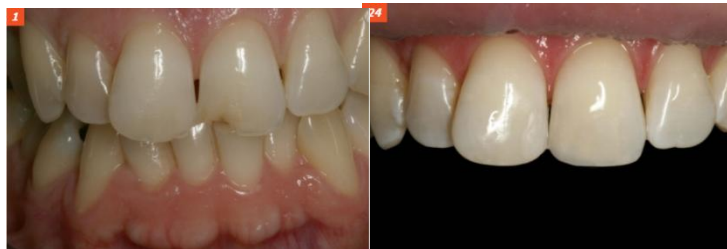
- List the indications and contraindications of composite restorations
- List the advantages and disadvantages of composite

Introduction

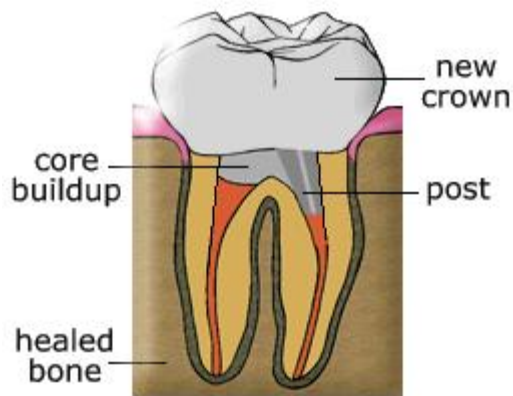
- Composites are presently the most popular tooth-colored materials, having completely replaced silicate cement and acrylic resin
- Composites are currently used in almost all types and sizes of restorations.
- Composites primarily retained by micromechanical adhesion

General Indications / Uses

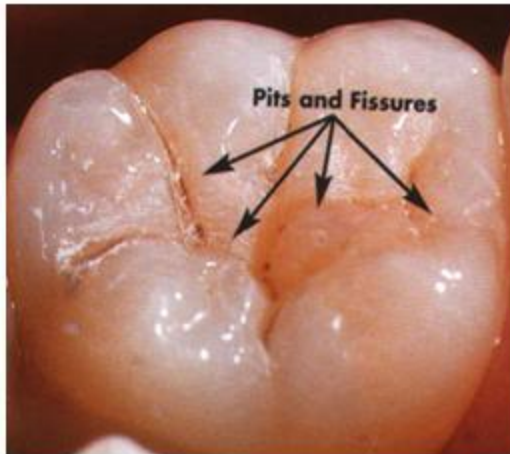
1. Class I, II, III, IV, V, restorations



2. Foundations or core buildups



3. Sealants and preventive resin restorations (conservative composite restorations)



4. Esthetic enhancement procedures

✓ Full veneers



✓ Diastema closures



5. Periodontal splinting



6. Non carious lesions



7. Composite inlays and onlays – Indirect restorations



General Contraindications

- The primary contraindications for use of composite as a restorative material relate to these factors

1.Isolation- For a composite restoration to be successful ,it must be bonded appropriately to the tooth structure (enamel and dentin).

Bonding to tooth structure requires an environment isolated from contamination by oral fluids (No salivary /other oral fluids contamination)

If the operating site cannot be isolated from contamination by oral fluids, composite should not be used.

Use of Rubber dam is mandatory for all composite restoration procedures

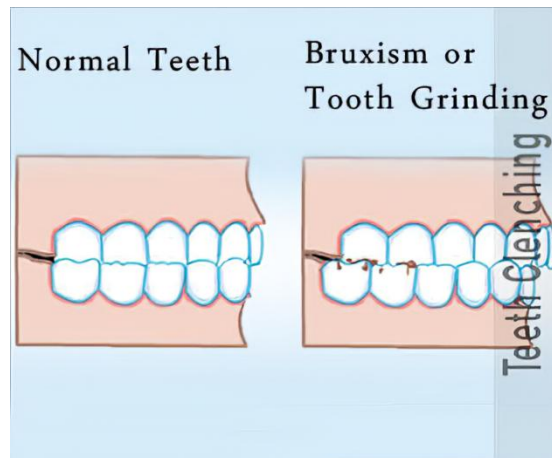


- If the operating area cannot be totally protected from contamination by use of rubber dam, amalgam restoration may be the material of choice.

2.Occlusion - If all of the occlusion is on the restorative material – high occlusal loading, composite may not be the choice for use because of **less wear resistance**

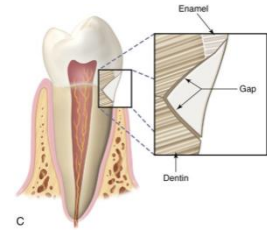


- For **patients with heavy occlusion, bruxism,** or restorations that provide all of a tooth's occlusal contacts, amalgam, rather than composite, is usually the material of choice.



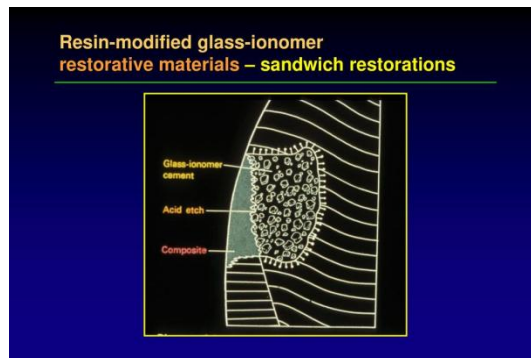
3. Material related - Any composite restoration that extends onto the root surface may result in less than ideal marginal integrity. – Polymerization shrinkage





- Composite restoration extensions on the root surface may exhibit gap formation at the junction of the composite and root.

The use of a resin modified glass ionomer liner beneath the composite in the root-surface area may reduce the potential microleakage, gap formation, and recurrent caries



Advantages

- 1. Esthetics (Most Common Advantage)
- 2. Conservative of tooth structure removal
 - ✓ Less extension
 - ✓ Uniform depth not necessary
 - ✓ Mechanical retention usually not necessary.
- 3. Less complex when preparing the cavity.

- 4. Low thermal conductivity.
- 5. Used almost universally.
- 6. Bonded to tooth structure, resulting in good retention, less microleakage, minimal interfacial staining, and increased strength of remaining tooth structure.
- 7. Repairable.

Material	Thermal Conductivity (kcal/sec/°C/cm)
Enamel	2.2
Dentin	1.5
Ceramic (porcelain)	2.5
Dental cement	1-3
Amalgam	55
Gold	710
Composite	1-3
Wax	1

Disadvantages

- 1. The primary disadvantage of composite restoration resulting in a gap formation, usually occurring on root surfaces as a result of the forces of polymerization shrinkage of the composite





2. Costly (compared with amalgam restorations) because restoration for bonding usually requires multiple steps.

Etching, bonding, insertion of composite, finishing and polishing

3. Are more technique sensitive because the operating site must be appropriately isolated.

Rubber dam mandatory

4. Lack of anticariogenic property

5. May exhibit greater occlusal wear in areas of high occlusal stress or when all of the tooth's occlusal contacts are on the composite material. –
Less occlusal wear resistance



References

- Art and science Sturdevant's operative dentistry
5 th edition Page no .506 - 508

Restorative Technique for Dental Composite

Learning outcomes

- Outline the classification of adhesive system used in composite.
- Explain the basic concepts in restorative technique of composite.

Classification of Adhesive systems for Composite

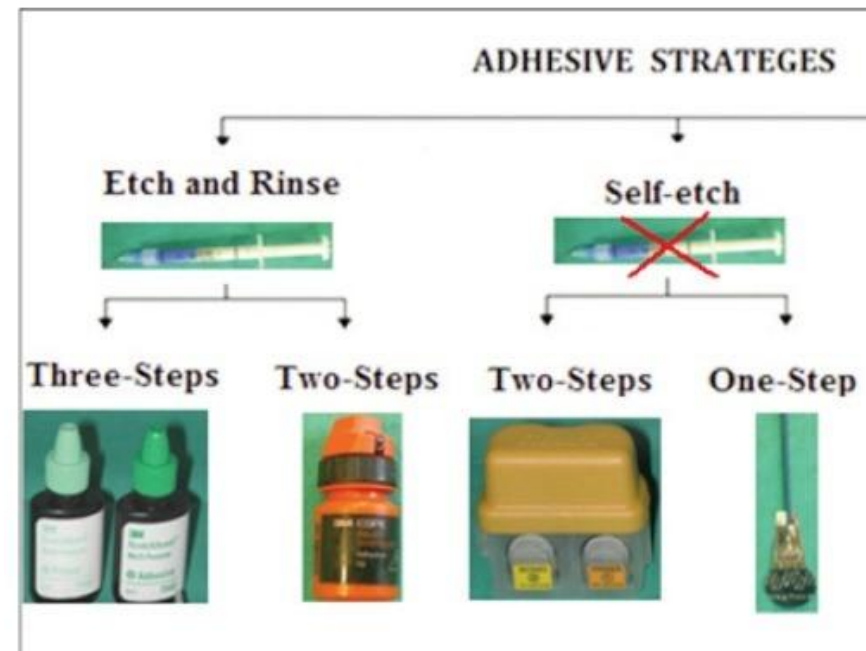
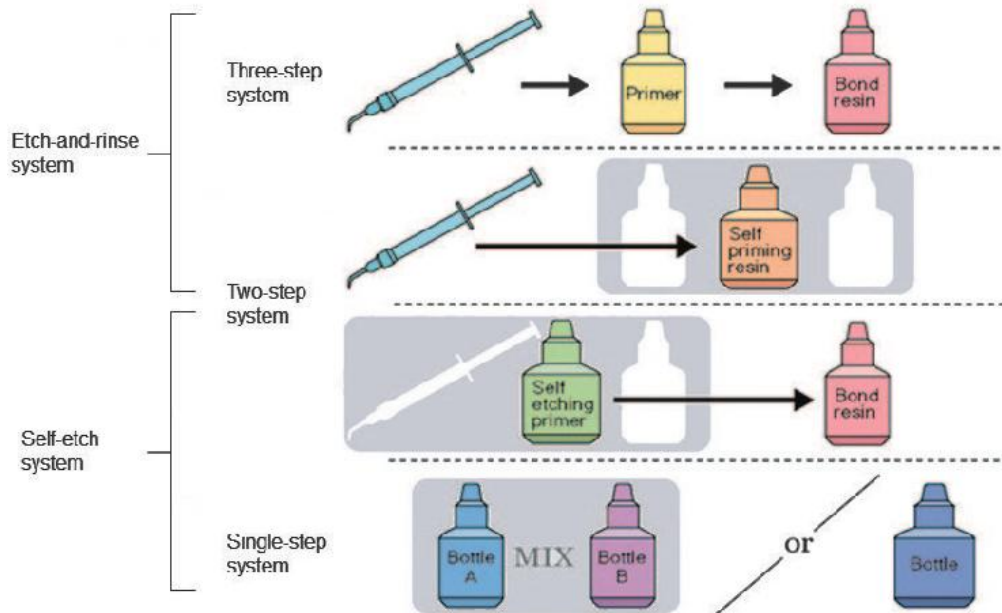


Fig. 1 Classification of contemporary adhesive systems.

1. Etch & Rinse System

I A. Three steps

Acid

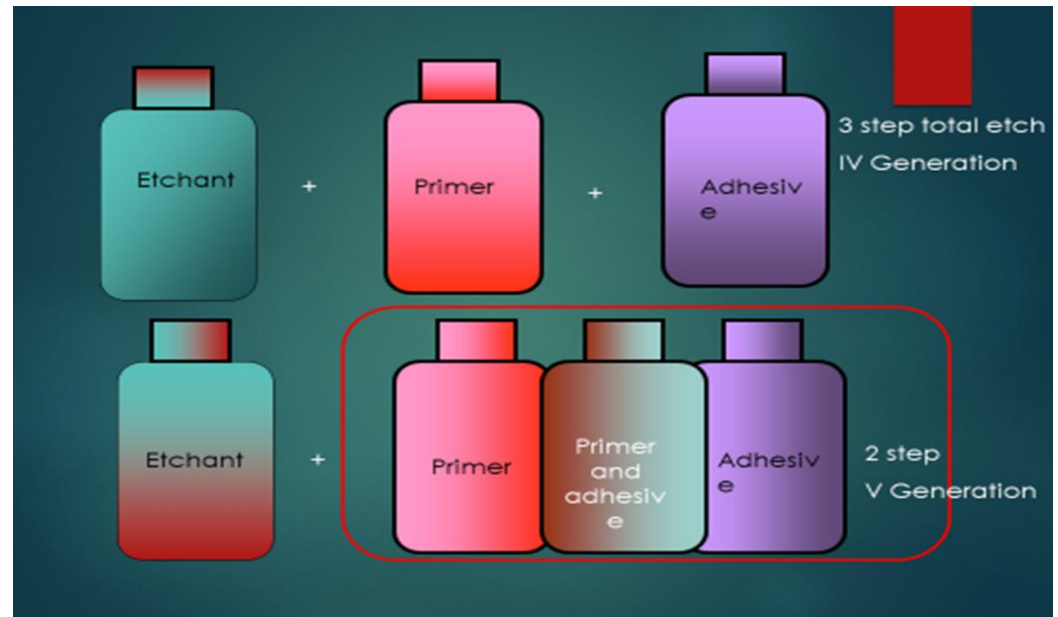
Primer

Bonding agent

B. Two steps

Acid

Primers+ Bonding

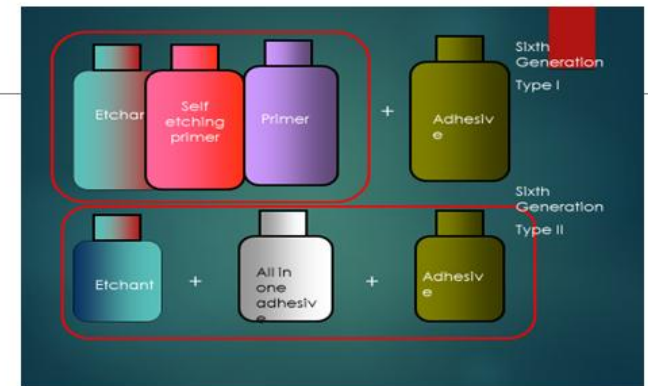


2. Self Etch System (Non Rinse)

A. Two steps self etch system (SEP-Self etch primer)

Acid + Primer

Bonding agent



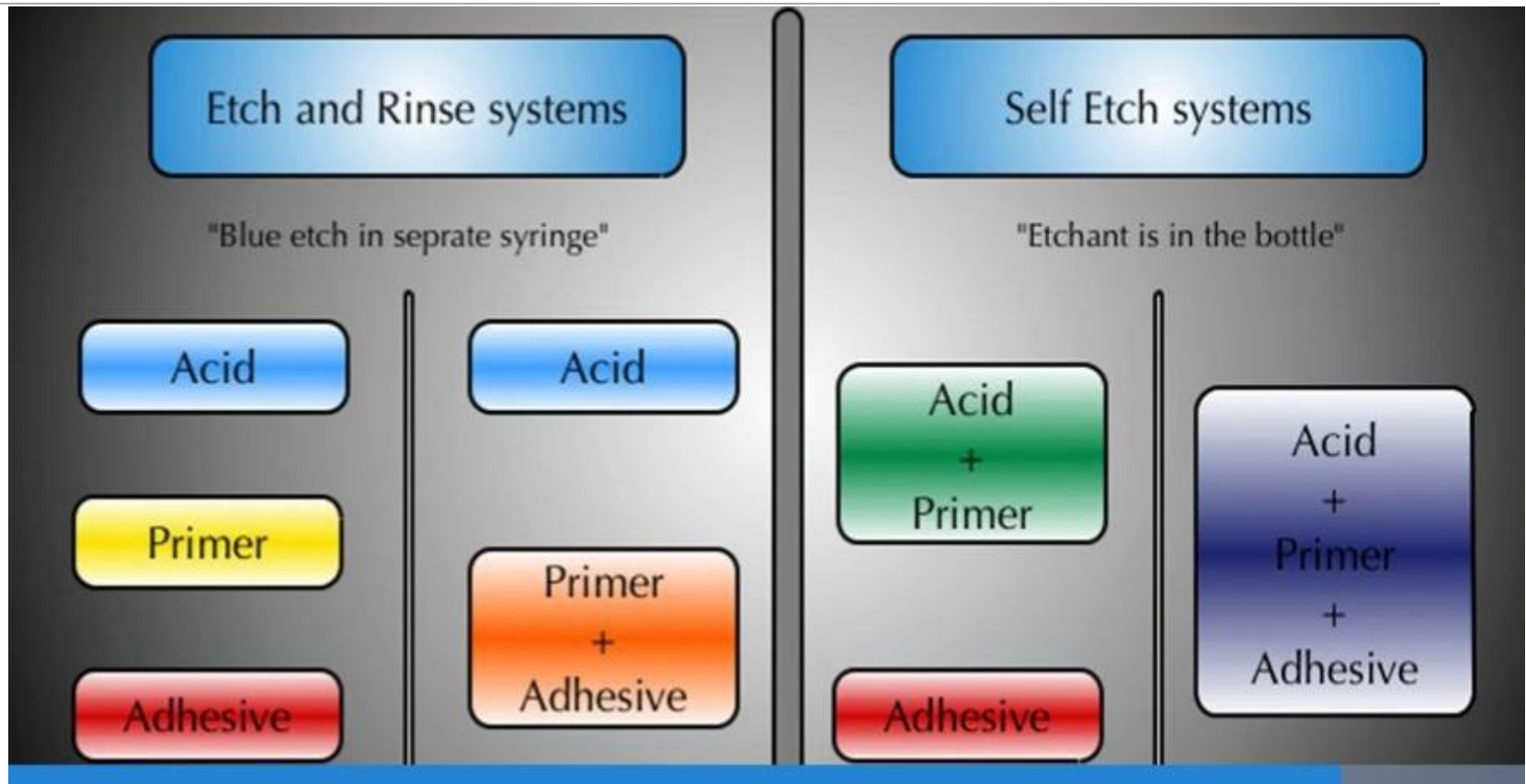
B. One step self etch adhesive

Acid+ Primer+ Bonding agent = All in one

Art and science operative 5th Edn. 250,254-256: 6th Edn.124-125

Classification of Adhesive systems for Composite

(Same as previous slides with different picture)



Restorative technique of composite for Two step Etch and Rinse technique

- 1) Shade selection
- 2) Isolation of the operating site by rubber dam
- 3) Tooth/Cavity preparation
- 4) Acid etching and wash
- 5) Adhesive application and light curing
- 6) Inserting the composite by incremental layering and light curing
- 7) Finishing & polishing of the composite.

1. Shade selection

- This is the first step in composite restoration
- Composite shade is selected on moist tooth prior to placement of a rubber dam.

Shade selection should be done prior to prolonged drying of teeth because dehydrated tooth becomes lighter in shade as result of decrease in translucency.

Procedure for shade selection

1. Operator should hold shade tab near the tooth to determine natural colour.
2. Shade tab should be partially covered with operators thumb or patients lip – natural effect of shadows
3. The selection of shade should be done in natural light
4. The selection should be made rapidly
5. Final shade can be verified by patient with a mirror



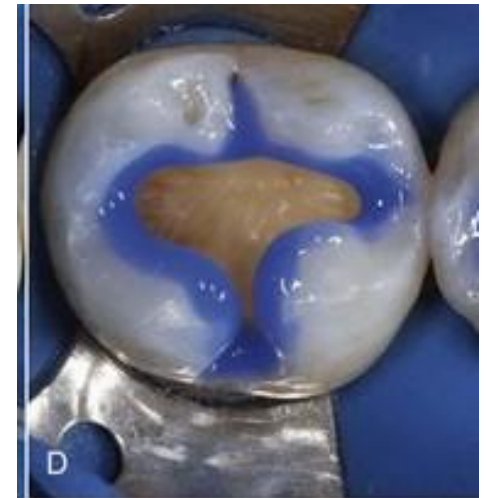
2. Isolation of operating field with Rubber dam

3. Cavity /Tooth preparation



4. Acid Etching

- DEVELOPED BY BUNOCORE IN 1955
- Most commonly used Agent used –
37 % PHOSPHORIC ACID
- Available in **Gel** or Liquid form



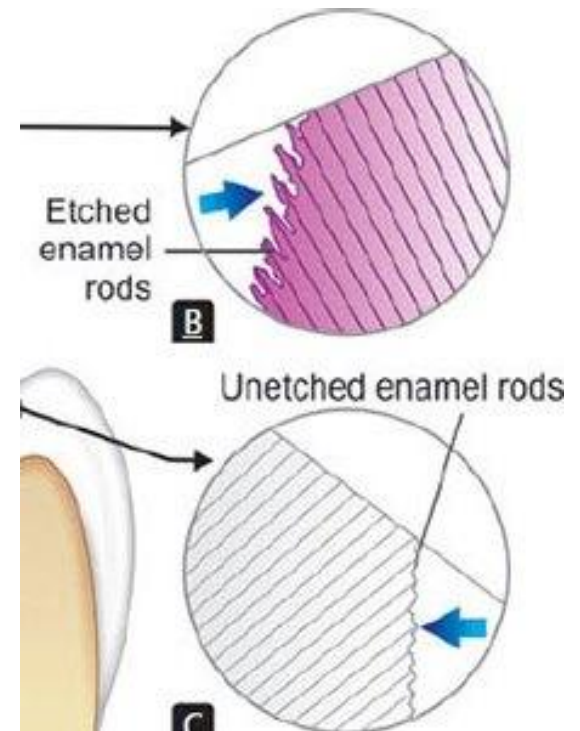
- Effects of acid etching on Enamel

- Dissolution of interprismatic enamel (Create micro porosities)

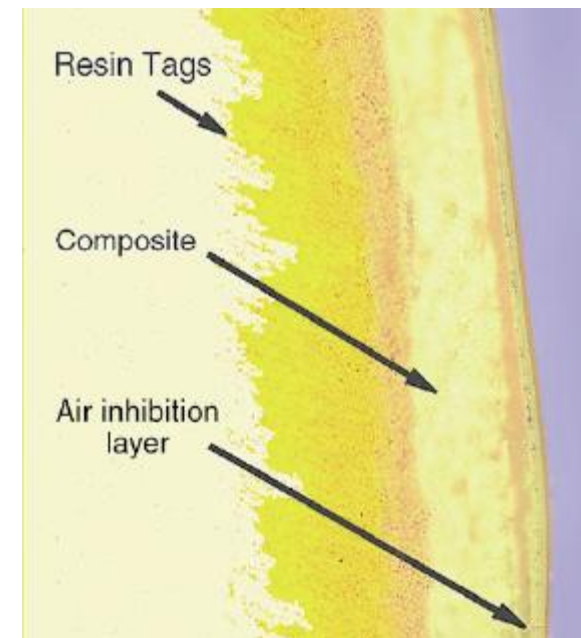
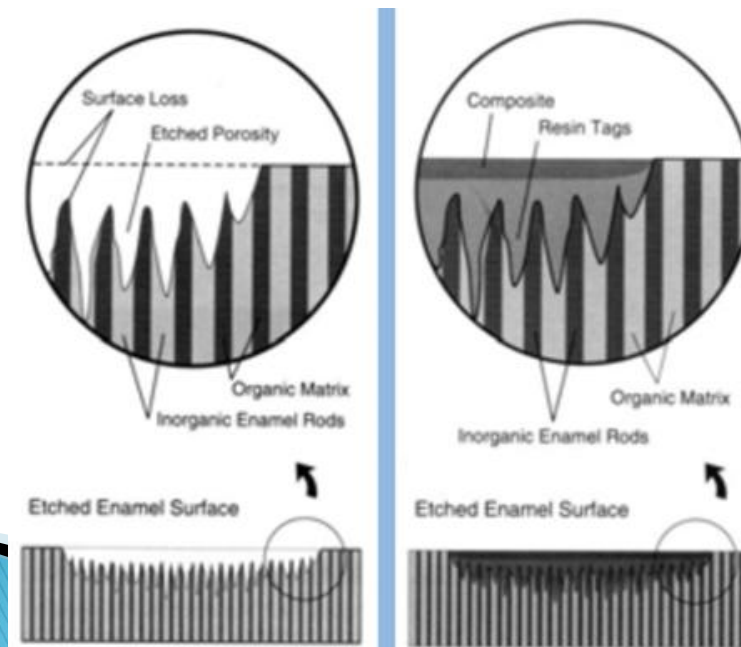
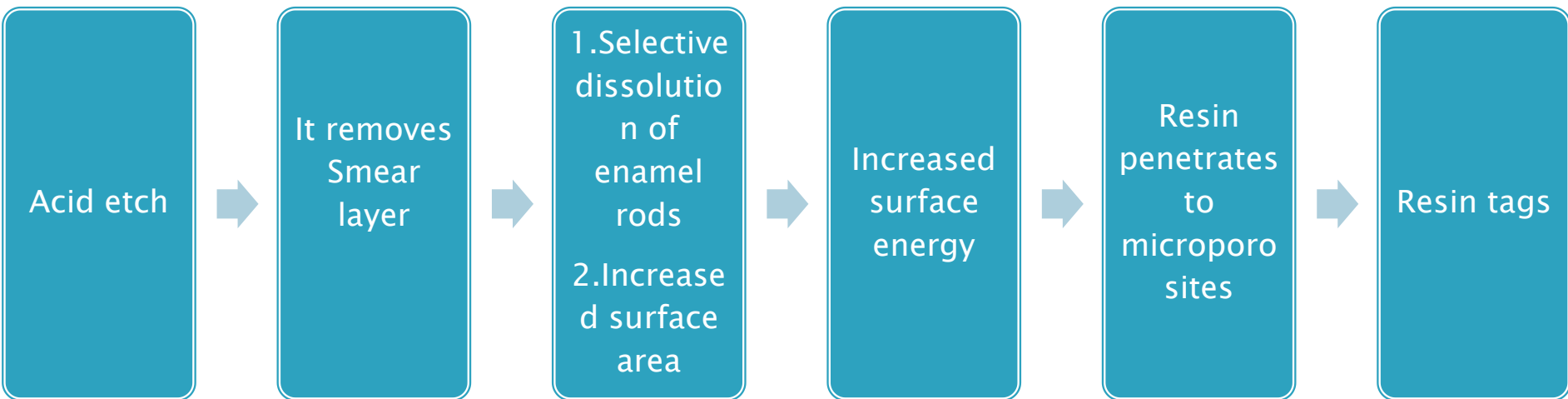
- Increase in surface area

- Removes the smear layer

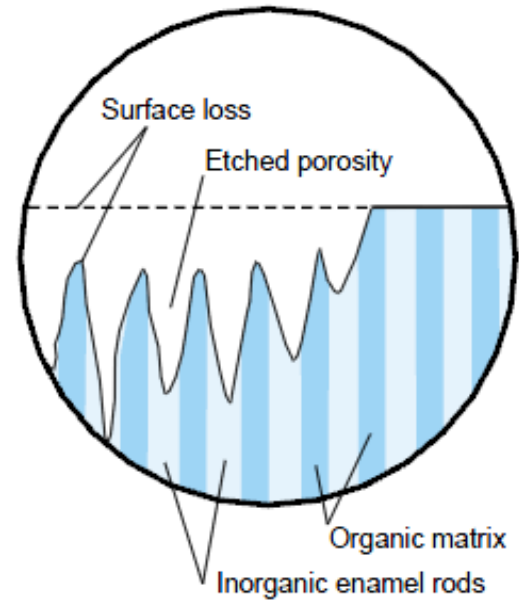
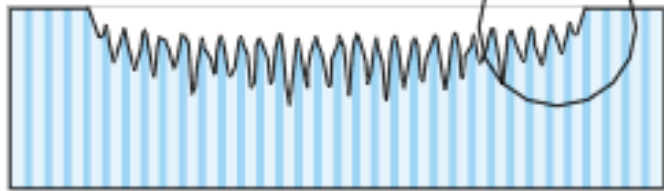
- Increases the surface energy



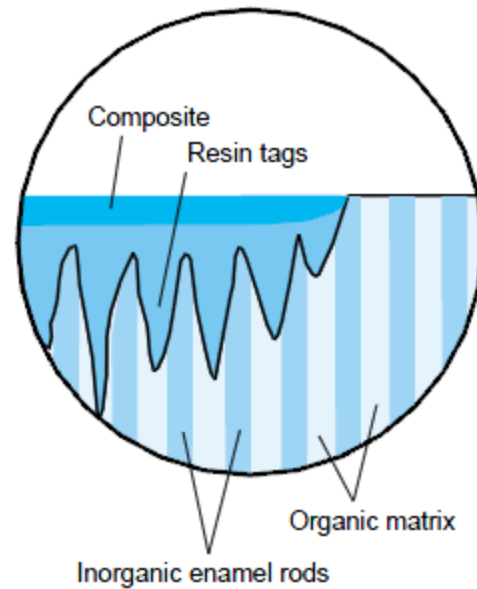
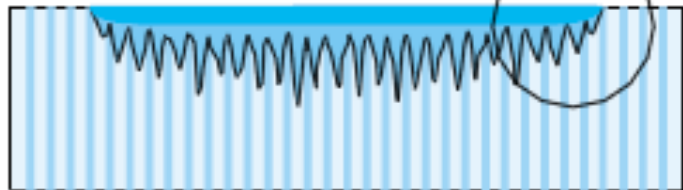
Mode of action in enamel



Etched enamel surface



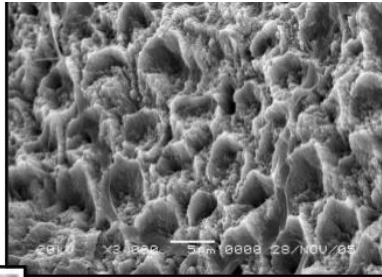
Etched enamel surface



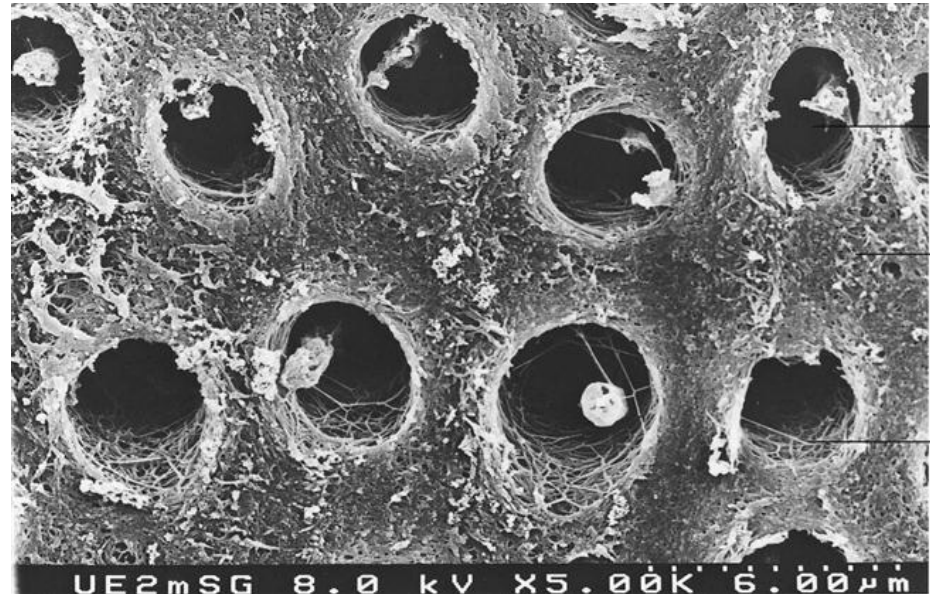
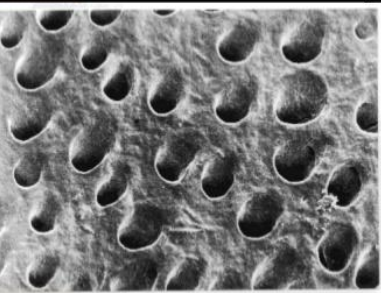
Mode of action in dentin



Enamel Etching



Dentin Etching



Dentinal tubule

Etched dentin

Exposed collagen fibrils

Etching techniques 2 Types

1. **Total acid etching** – Complete enamel and dentin etching – 15 seconds



2. **Selective acid etching**- First enamel is etched for followed by dentin etching

Enamel etching time – 30 seconds

Dentin etching time – 15 seconds



Total etching technique



- Acid etching for 15 seconds
- Followed by thoroughly rinsing of etchant with water for 15 seconds
- Later the surface should be dry with dry cotton pellets
- Clinically the most important parameter of proper etched tooth is presence of a **frosty white appearance** on tooth



- Over drying must be avoided if especially dentin is involved ,as it may result in collapse of collagen network mesh which results in forming a dense film and prevents adhesive agent to penetrate.



5. Adhesive application



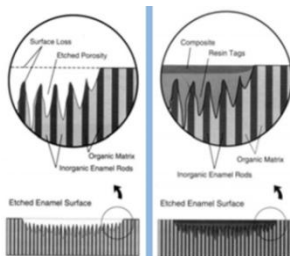
Use low viscosity resin which will flow into etched enamel pores & dentinal tubules to form resin tags.

The bonding or adhesive is applied using a microbrush

Usually 2 coats are applied

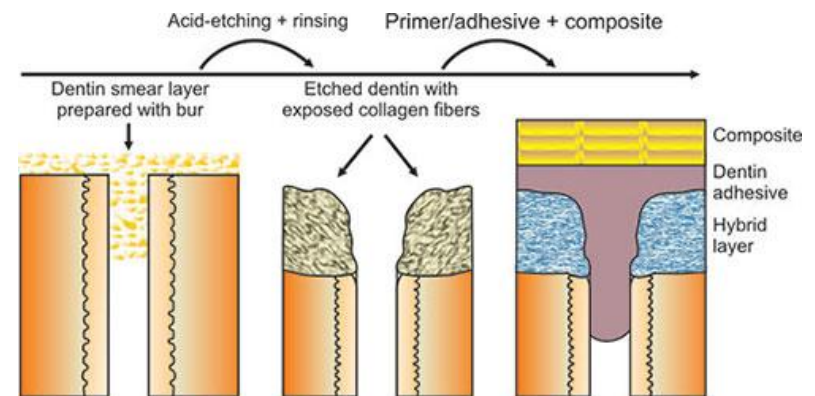
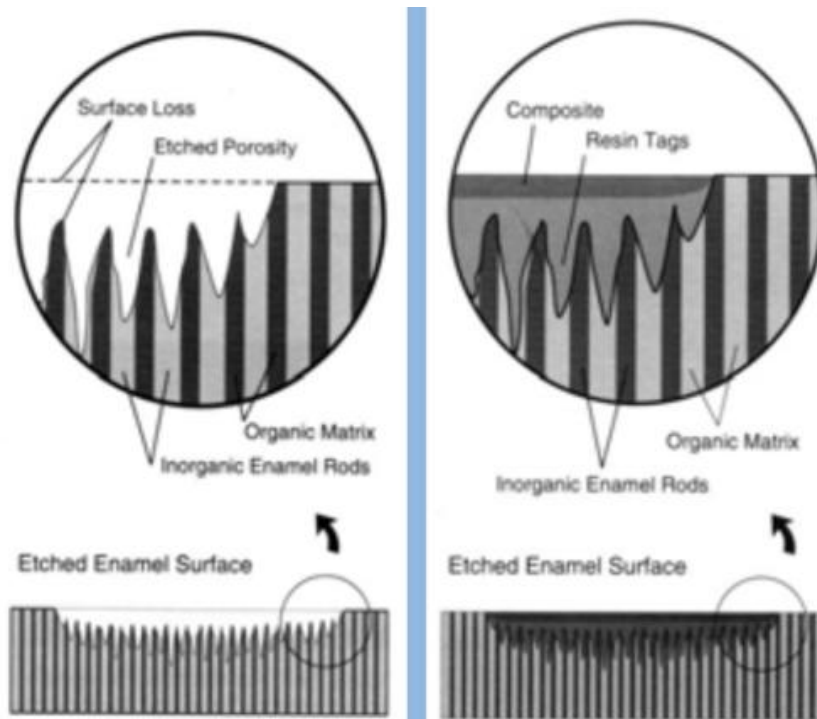
When applied, the adhesive is lightly dried with the air syringe to evaporate any solvent

Then the adhesive is polymerized with light cure for 20 seconds.



It penetrates the irregularities on enamel and bonds micromechanically by formation of resin tags

On dentin, it penetrates into the collagen network and dentinal tubules.



6. Insertion of composite

- Incremental layering(Layer by layer) of composite
- Increment should be only approximately 1 to 2 mm in thickness, maximum 2 mm, because it is the far away increment from the curing light and is most critical in establishing a proper seal.
- This first increment should be cured with a light exposure of 20 seconds



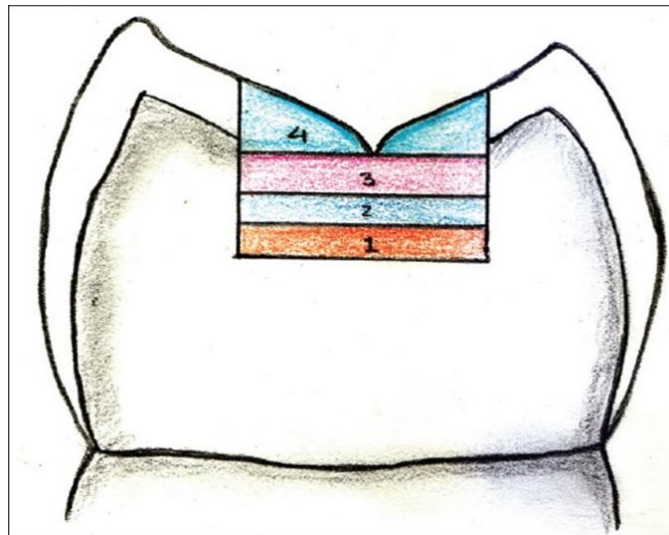


- Subsequent additions are made and cured (usually not exceeding 2mm in thickness at a time) until the preparation is completely filled with composite.
- With large restorations, it is better to add and cure the composite in several increments to reduce the effects of polymerization shrinkage and to ensure more complete curing in remote regions.

Incremental layering technique

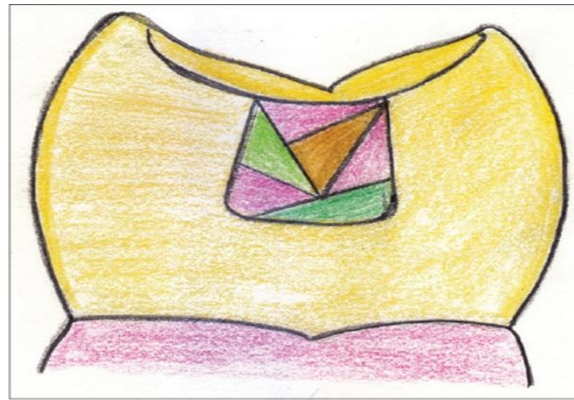
Horizontal layering technique :

The horizontal placement technique utilizes composite resin layers, each less than 2.0 mm thick . This technique increases the polymerization shrinkage



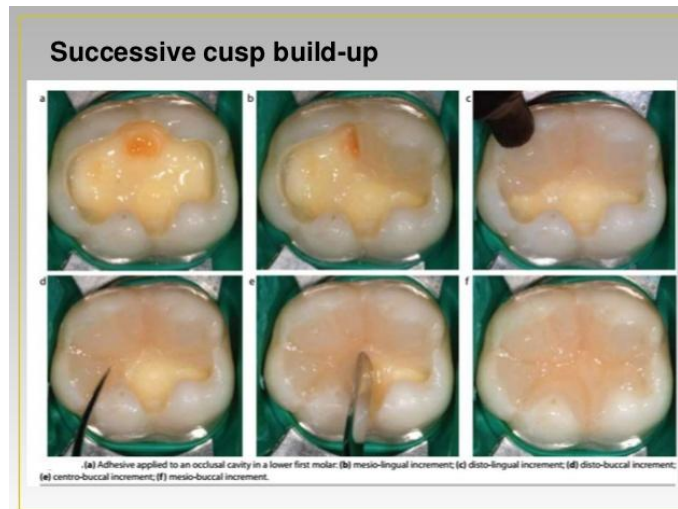
- Oblique layering technique

The oblique technique is accomplished by placing a series of wedge-shaped composite increments. This technique reduces polymerization shrinkage



- **Successive cusp buildup technique**

Here, individual cusps are restored one at a time up to the level of the occlusal enamel. Small sloping increments are applied to each corner of the cavity. This method, while initially time-consuming, can greatly reduce finishing time by precise attention to progressive reconstruction of natural morphology.



- **Polychromatic layering technique**

The fundamental principle of polychromatic layering technique is to use different composite shades to replicate the layers seen in natural teeth which can be described in layers as palatal enamel layer, dentine layer, special features, transulecent shade.

It is especially useful in anterior restorations.



Figure 2 An increment of white (B) shade T2) is used as a "translucent"



Finishing and polishing

- It is very important step in the completion of the restoration.
- Microfilled composite materials can undoubtedly be polished to the highest gloss and are considered to be esthetically best amongst all composites.
- Finishing can be immediately initiated after light curing of composites

- For gross contouring and finishing of the concave like occlusal surface oval 12 fluted carbide or finishing diamond can be used .



- Rotary instruments should always be used with a stream of water and little pressure.

Polishing of the composite

- Composite restorations are polished with appropriate polishing points, cups, disks .
- These are having “latch-type” mandrel for slow hand pieces.



Brief Procedure for composite restoration



**cavity
prepared**



**etching with
phosphoric acid**



**rinsing
with water**



drying



bonding



light-curing



**placing composite
increments**



**light-curing
each increment**



**polishing
and finishing**

References

- Art and science Operative dentistry 5 th edition
Page no.517 – 522
- Incremental layering technique, Journal of conservative dentistry, November 2017 Page 386 - 391