Resin Composite Restorations
MANIPULATION OF RESIN COMPOSITE

Selection of resin composite type

- Hybrids light activated composite ---- universal (anteriorly and posteriorly)
- microfilled ---best employed in cervical lesions
- ---esthetic is of prime concern

- Macrofilled composites are discontinued owing to their disadvantages in spite of the fact that they possess high mechanical properties
1- Selection of shade and type

Esthetic concern

Microfilled/ Hybrid

Occlusal concern

Hybrid brands
SHADE SELECTION

- Resin composite supplied in different shade to match tooth color

- Shade guide used for selection of suitable shade
-Under good (normal white day light and operatory light)

-under wet condition before isolation
Moisture contamination of adhesive system lowers its bond strength.

Moisture contamination during insertion of resin composite—deterioration of physical properties.
- Bonding systems seal dentinal tubules and protect the pulp.
- In very deep cavities, calcium hydroxide and glass ionomer are used.
- Varnishes and zinc-oxide and Eugonol under composite resin rest...
- Wedging is essential to gain tooth separation, avoid overhanging margins, and stabilize matrices.
- Light-transmitting wedges which are plastic in nature are designed to direct light into interproximal. They also encourage shrinkage towards gingival margin and minimize leakage at this site. Guided polymerization
5- Matricing & wedging
1 - Etching:

Tooth surface is treated with 37% phosphoric acid for 15 to 20 seconds. Etching is carried out in order to:

a) Removal of smear layer.
b) Create microporosities.
c) Increase surface energy of the tooth.
Pretreatment of the Substrate

Rinsing:
Acid should be rinsed with copious amount of water for 5–10 seconds to remove acid etchant byproducts.

Drying:
- Air drying leads to decrease in volume of collagen by 65% that could be regained by wetting.
- Over drying leads to collagen collapse.
- Drying using mini-sponge or cotton pellet is done in case of wet bonding technique.
Etched enamel appears clinically as a chalky white appearance and microscopically as honeycomb appearance.
2– Priming:

Primers are adhesive-promoting monomers applied to increase surface wettability to facilitate spread of bonding agent on tooth surface.

For successful priming:

- Application time is at least 15 seconds.
- Multiple coats should be applied.
- Dentin surface must not over dried or over wet.
- Tooth surface must appear glossy and wet after priming.
Pretreatment of the Substrate

3– Resin impregnation (adhesive resin application):

The main goal of resin impregnation is to totally seal all the micro-porous spaces to achieve a biologic tissue that is formed of resin encapsulating hydroxyapatite crystals and collagen to act as an elastic intermediary joint (hybrid layer) linking the composite resin to tooth tissue.
Clinical considerations during adhesive resin application:

1– Applied uniformly to create a uniform hybridization.

2– Brush thinning rather than air thinning to provide thick layer of adhesive (elastic intermediary joint).

3– A time lapse for 30 – 40 seconds should be provided to allow resin to sufficiently flow in created micro-porosities.

4– Adhesive cured sufficiently before composite application.
Packing is performed using gold-plated or Teflon-tipped plastic instruments:
- As it tend to stick to applicators and condensing instrument.

**Techniques of placement**
- Bulk placement
- Incremental placement
The depth of cure of resin composite will depend on:

1. The thickness of restoration
2. Time of exposure
3. Filler loading
4. Shade of resin composite
5. Restoration – light tip distance
Finishing:
- 12 bladed Carbide bur.
  Diamond stones of descending grits.

Polishing:
Sand paper discs.
Soflex discs.
CHAPTER 2: Resin Composite Restorations

Chapter outline

- Definitions
- Composition of resin composite
- Properties of resin composite
- Advantages and disadvantages of resin composite
- Indications and contraindications of resin composite
- Classifications of resin composite
- Types of resin composite
- Class III, IV and V cavity preparations
- Manipulation of resin composite
  ✓ Selection of resin composite shade and type
  ✓ Isolation of operative field
  ✓ Pulp protection
  ✓ Pretreatment of the substrate surface
  ✓ Matricing and wedging
  ✓ Packing, contouring and shaping
  ✓ Polymerization
  ✓ Finishing and polishing
  ✓ Maintenance
In the end of this chapter, the student will be able to recognize:

1) Definition and composition of resin composite.
2) Properties of resin composite.
3) Advantages and disadvantages of resin composite.
4) Indications and contraindications of resin composite.
5) Classifications and types of resin composite.
6) Cavity preparation for class III, IV and V.
7) Manipulation of resin composite.
Definitions:

**Composite material:**
It is a compound of two or more distinctly different materials with properties that are superior or intermediate to those of the individual constituents. These constituents cannot dissolve in each other.

**Dental composite**
It is a mixture of silica glass particles with an acrylic monomer that is polymerized during its application.

**Composition of Resin Composite**
Resin composite consists of a continuous polymeric or resin matrix (matrix phase or dispersion medium) in which inorganic fillers are dispersed (dispersed phase) and bonded to resin matrix using silane coupling agent.

**Inorganic fillers (dispersed phase)**
It is responsible for significantly enhanced physical properties of composite: 1- Increases strength properties 2- Decreases co-efficient of liner expansion bringing it nearer to the tooth structure. Fillers are usually silica. Lithium, aluminum, barium and zinc ions are added to modify the filler composition.

**Matrix phase (dispersion medium)**
It consists of polymeric monomers like BIS-GMA or UDMA which are diluted with TEGDMA to decrease its viscosity. Interfacial bonding between the matrix phase and the filler phase is provided by coating the filler particles with **silane coupling agent**. This bonding increases the
strength of the resin composite and reduces its solubility. The size of the filler particles and their relative percentage controls the properties of composites.

![Fig. 1](untreated.png) ![Fig. 1](silane_treated.png)

**Fig. 1:** A figure showing filler particles untreated and treated with silane coupling agent

**Properties of Resin Composite Restoratives**

1. **Linear co-efficient of thermal expansion (LCTE):**
   LCTE of improved composite is approximately *three times* that of tooth structure. Bonding of resin composite to etched tooth surface reduces the potential negative effects due to difference in LCTE between tooth and resin composite.

2. **Water absorption:**
   Resin composite with higher filler loading exhibits lower water absorption and therefore, exhibits better physical properties than resin composites with lower filler loading.

3. **Wear resistance:**
   Wear resistance is a property of filler particles depending on their size, shape and content.
4. **Surface texture:**

The size and composition of filler particles determine the smoothness of the surface of a restoration. Microfilled composites offer the smoothest restorative surface.

![Fig. 2: SEM micrography of surface texture of 2 types of composite](image)

5. **Radiopacity:**

Most resin composites contain radiopaque fillers like barium glass. The restorations should be radiopaque in order to detect any radiolucency indicating the presence of recurrent caries around or under the restorations.

![Fig. 3: A radiographic image showing recurrent caries under restoration](image)

6. **Modulus of elasticity:**

Rigidity or stiffness of any material is directly proportional to its modulus of elasticity. Microfill composites have greater flexibility than hybrid composite. In restoring Class V cavities, composites with lower
modulus of elasticity (flexible) should be used. Class V cavities are subjected to heavy occlusal forces or bending forces occurs in cervical area and hence, a more flexible composite material is indicated to absorb stresses without depending.

7. **Solubility:**

Resin composite materials do not show any clinically significant solubility in oral fluids.

8. **Polymerization shrinkage:**

Resin composite materials shrink during polymerization. This can lead to failure of interfacial bonding. It is usually more significant when the cavity margins extends to the root surface results in a V shaped gap formation between the composite and root surface due to polymerization shrinkage.

**Advantages of Resin Composites:**

1. Maximum conservation of tooth structure is possible.
2. Esthetically acceptable.
3. Less complex cavity preparation is required.
4. Insulating; have low thermal conductivity hence no insulation base is required.
5. Restorations are bonded to enamel and dentin and hence have good retention.
6. Can be finished immediately after curing.
7. It is repairable.
8. Has low microleakage.
9. Can be used almost universally.
Disadvantages of Resin Composites

1. Gap formation on margins may occur because the forces induced by polymerization shrinkage are greater than the initial bond strength of composite to dentin.
2. More difficult, time consuming and have higher cost than amalgam.
3. Technique sensitive.
4. Greater occlusal wear in areas of high occlusal stress.
5. High LCTE may result in marginal percolation around composite restorations.

Indications:

I) Carious defects:
Carious lesions that require esthetic and non invasive restorative dentistry as:

- Class I and II cavities that can be isolated properly and where some centric contacts are present on the tooth structure.
- Class III, IV & V defects.

II) Non-carious lesions including:
1) Hypoplasia and hypocalcification.
2) Abrasion and erosive lesions.
3) Abfraction lesions
4) Veneers.
5) Fractures of teeth and repair of restorations.
6) Cores under crowns.
7) Cementation of orthodontic brackets.
8) Indirect restorations.
9) Splints.
**Contraindications of Resin Composites:**

Resin composite restorations are contraindicated in the following conditions:

1. When moisture isolation is difficult.
2. When there are very high occlusal forces (especially in case of class I, class II and class VI).
3. Some class V restorations that are not esthetically critical.
4. When proper technique cannot be applied.
5. The restorations that extend up to the root surface.
6. Patients with high caries susceptibility and poor oral hygiene.

**Classification of resin composite based on:**

- Matrix composition (*BIS-GMA or UDMA*).
- Polymerization method (*self-curing, ultraviolet light curing, visible light curing, or dual curing*).
- Size, amount and composition of fillers (*macrofilled, microfilled, hybrid, flowable and packable*).

**Types of resin composite**

Resin composite resin can be divided into different types based on the size, amount and composition of fillers:

1. Macrofilled resin composite
2. Microfilled resin composite
3. Hybrid resin composite
4. Flowable resin composite
5. Packable (condensable) resin composite
1. **Conventional resin composite:** *(Macrofilled)*

   Average particle size of conventional composite resins is 8 microns (from 5-25 micron) approximately. It contains approximately 75 to 80 % inorganic fillers by weight. It exhibits a rough surface texture because of the relatively large size and extreme hardness of the filler particles. The surface becomes rougher because the resin matrix wears at faster rate than the inorganic fillers. Due to roughness, discoloration and wearing of occlusal contact areas and plaque accumulation take place quickly than other types of resin composites.

2. **Microfilled resin composite:**

   It can be described as polishable composites. Average particle size of microfilled resins ranges from 0.01 to 0.04 microns. This small particle size results in smooth polished surface which is resistant to stains, debris and plaque retention. Microfilled resins have inorganic filler content of approximately 35 to 60% by weight.

3. **Hybrid resin composite:**

   In order to combine the advantages of macro and microfilled composites, hybrid composites have been developed. The average inorganic particle size is 0.4 to 1 micron. These materials have an inorganic filler content of approximately 75 to 85% by weight. The physical properties of hybrid composite are similar to those of macrofilled composites in addition to the high surface polishability as microfilled composite.

   Considering all factors, the hybrid composites are the most commonly used because of their high mechanical
properties and smoothness. They are especially indicated in anterior restorations, and also in posterior restorations.

4. **Flowable resin composite:**

   It is characterized by its high flowability which indicates its use as: a) Pit and fissure sealant; b) very small class I, III, V and VI cavities; c) Repair of marginal defects and d) Base under hybrid or condensable composites.

   **Their features are as follow:**
   - Filler content is low about 30 % by weight. This results in inferior mechanical properties as poor strength and wear resistance, reduced viscosity and high flowability.
   - It shows high stickiness to instruments, and hence difficult to obtain a smooth surface.
   - Contraindicated in high stress bearing areas as large class I, II, and IV cavities.

5. **Packable (condensable) resin composite:**

   Packable composites have been developed to improve the compressive, tensile, edge strength and handling characteristics. They are characterized by their high viscosity. Their components are resin and ceramic inorganic fillers which are incorporated in network of ceramic fibers. Each increment is condensed similar to silver amalgam.

   **Advantages of condensable composites over the conventional composites are as follows:**
   - Higher wear resistance.
   - Better depth of cure.
✓ Lower polymerization shrinkage: Polymerization shrinkage is inversely proportional to the number of ceramic fibers present.
✓ Reduced stickiness.

**Cavity preparation for Class III, IV and V**

**Class III Cavity Preparation:**
Class III cavity preparations, by definition, are located on the proximal surfaces of anterior teeth without involvement of incisal edge.

**Access cavity:**
- **Lingual approach**
A small carious lesion is preferable to be treated from lingual approach unless:
  1. It would necessitate excessive cutting of tooth structure.
  2. The lesion including the facial enamel.

The advantages of restoring the proximal lesion from the lingual approach include:
1. The facial enamel is conserved for enhanced esthetics.
2. Color matching of composite is not so critical.
3. Discoloration of the restoration is less visible.

- **Facial approach**
The indications for a facial approach include:
  1. The carious lesion involving facial enamel.
  2. The teeth are irregularly aligned, making lingual access undesirable.
  3. A faulty restoration that was originally placed from facial approach needs to be replaced or repaired.
Fig. 4: A graphical illustration of Class III cavity preparation

**Modified Class III cavity preparation:**
A modified tooth preparation is the most used type of Class III cavity preparations. It is indicated for small and moderate lesions and is designed to be as conservative as possible.

- The preparation design is dictated by the extent of the lesion and is prepared from a lingual approach when possible, with an appropriate sized round bur or diamond instrument.
- No effort is made to produce preparation walls that have specific shapes or forms other than external angles of 90 degrees or greater.
- Beveled enamel margins are prepared using flame-shaped diamond instrument during which any weakened or friable enamel could be removed.

*Function of enamel beveling is:*
- Increase surface area available for bonding.
- Color degradation from tooth to composite.
• Usually no macromechanical means of retention are indicated as grooves or coves because the retention is mainly micromechanical (bond achieved between composite and etched enamel surface).

• **If possible,** the outline form should be: (1) Not include the entire proximal contact area, (2) Not extended onto the facial surface, or (3) Not extended subgingivally.

  **N.B.:** Final tooth preparation steps for a modified tooth preparation are, when indicated: (1) removal of infected dentin, (2) pulp protection, (3) beveling of accessible enamel margins, and (4) final procedures of cleaning and inspecting.

**Conventional Class III cavity preparation:**
The primary indication for this type of Class III cavity preparation is for the restoration of root surfaces. When preparing the conventional portion of a preparation (on the root surface), the form of the preparation walls are the same as that for amalgam restoration.

• The cavosurface margins exhibit a 90-degree cavosurface angle and provide butt joints between the tooth and the composite restoration.

• The external walls are prepared perpendicular to the root surface.

• Sufficient depth is indicated to provide for the following: (1) Adequate removal of the caries or old restorative material. (2) The placement of retention grooves, if necessary. Cavity depth (depth of axial line angles) will be approximately 0.75 mm into dentin, assuming no additional caries excavation is required.
• Groove retention form may be necessary in non-enamel, root-surface preparations to both increase the retention of the material.
• The box like design may be considered a part of retention form; however, at this stage in tooth preparation the external walls may be retentive because of opposing wall parallelism or slight undercuts, or non-retentive because of slight divergence outwardly.

**Class IV cavity preparation:**
Class IV cavity preparations, by definition, are located on the proximal surfaces of anterior teeth involving the incisal edge.

The preoperative assessment of occlusion is very important for Class IV restorations because it may influence the tooth preparation extensions as placing margins in non-contact areas. Heavy occlusion requires increased retention and resistance forms either primary features as box like preparation, flat floors, parallel or perpendicular walls and floors to the long axis of the tooth or secondary features as grooves, dovetails, undercuts, pins and wider bevels.

![Fig. 5: Class IV cavity preparation](image_url)
Modified Class IV cavity preparation:
The modified Class IV cavity preparation for composite is indicated for small or moderate carious lesions or traumatic defects. The objective of tooth preparation is: a) removal of defective tooth structure according to the size of the lesion using a suitable sized round bur or diamond instrument; b) providing appropriate retention and resistance forms. Retention usually depends on bond strength of composite to enamel and dentin (micromechanical). Usually little or no initial tooth preparation is indicated for fractured incisal corners, other than roughening the fractured tooth structure. The cavosurface margins are prepared with a bevel as previously described which enhances the retention of the restoration.

Conventional Class IV Tooth Preparation:
As previously mentioned, conventional class IV is indicated when the restoration is extended onto the root surface. The typical conventional preparation design is 90-degree cavosurface margins on root surface regardless of whether either a beveled conventional or modified preparation design is used for the crown portion of the preparation. In case of large Class IV cavities, the walls should be as much as possible parallel and perpendicular to the long axis of the tooth. Secondary retentive features may be obtained as grooves, undercuts, dovetail extensions or pins to improve retention. Beveling also increases surface area available for bonding in addition to color degradation for esthetic purposes. The width of the bevel should be 0.25 to 2 mm, depending on the amount of lost tooth structure.
**Class V cavity preparation:**

Class V tooth preparations, by definition, are located in the gingival one third of the facial and lingual surfaces of all teeth.

**Modified Class V cavity preparation:**

The modified Class V cavity preparation is indicated for the restoration of small and moderate lesions. The objective is to restore the lesion as conservatively as possible. Therefore, there is no effort to prepare the walls as butt joints and usually no groove retention is incorporated. The lesion is just removed using round bur, resulting in a preparation form that may have a divergent wall configuration and non-uniform depth.

**Conventional Class V cavity preparation**

The conventional Class V cavity preparation for composite is indicated when the carious lesion is totally or partially on the root surface of the tooth. The preparation form would be similar to that for Class V amalgam. The features of the preparation include a 90-degree cavosurface margins in the root surface, uniform depth of the axial walls usually 0.75 mm and sometimes retentive grooves (placed in the gingivoaxial and incisoaxial line angles). The enamel marginal areas in the coronal portion are prepared with a bevel of approximately 0.25 to 0.5 mm width.

**The steps of Class V cavity preparation briefly are:**

1. Removal of any remaining infected dentin or old restoration;
2. Apply calcium hydroxide liner if needed;
3. Prepare gingival retention grooves if either the gingival margins are located on the root surface or the preparation is large enough to warrant groove retention;
4. Bevel the
enamel margins using a flame-shaped or round diamond instrument.

![Image](image.png)

Fig. 6: A figure showing conventional Class V cavity preparation

**Manipulation of resin composite**

1- **Selection of resin composite type and shade**

a- **Selection of type:**

Determination of the properties required to restore each cavity is essential to select the material in terms of the resin matrix composition; filler size, type and loading.

Stress-bearing areas require heavily loaded composite while an area subjected to flexural forces requires a less rigid type of composite. Hybrid composite is commonly used to restore various sites anteriorly and posteriorly due to high mechanical properties and high polishability while microfilled used only in areas indicated for esthetics with limited rigidity (best employed in cervical lesions). Macrofilled composites are no more used in spite of their high mechanical properties, due to poor surface polish.

b- **Selection of shade:**

It's of primary concern to allow simulation of natural tooth tissues and render the restoration invisible. Selection is
done with the help of shade buttons in the form of shade guide provided by the manufacturer.

*It's performed as follow:*

1- Wetting of the tooth surface and shade button.
2- Using day light during selection at a proper distance from the patient
3- Avoid looking for a long time in the operation field to avoid eye fatigue.

![Vitapan 3D master shade guide](image)

*Fig. 7: Vitapan 3D master shade guide*

### 2- Isolation of the operative field

It is important to isolate the field of operation using rubber dam, cotton rolls or retraction cords. Contamination of the tooth surface by saliva or any other material will affect the adhesive potential of the bonding system and will result in degradation of the resin composite material.

### 3- Pulp protection

Protection of the dental pulp from irritating materials is a primary objective in maintaining tooth vitality. This includes:

1) Proper isolation of the operating field.
2) Removal of infected dentin.
3) Placement of a protective liner or base in deep cavities.
This is done using calcium hydroxide and glass-ionomer materials and their modifications (resin-modified ionomer and polyacid modified composite resins). *Copal varnishes and eugenol-containing preparations* should not be used in conjunction with resin composites as they adversely affect the polymerization reaction. The depth of the cavity dictates the kind of pulp protection required (liner or base).

**4-Pretreatment of the substrate surface**

It's an essential step for the preparation of the foundation upon which the restoration will be placed. The aim of pretreatment of the tooth substrate is to achieve proper bonding to tooth structure. The achieved bond should be stronger than the polymerization shrinkage stresses developed at the tooth-restoration interface to minimize formation of interfacial gaps that are responsible for microleakage.

*Types of adhesion:*

1- Mechanical adhesion:

   a) Macro-mechanical (undercuts and grooves)

   b) Micro-mechanical (etching, priming and bonding)

2- Chemical adhesion

**Clinical steps to achieve bonding:**

**1-Etching:**

Tooth surface is treated with 37% phosphoric acid for 30 seconds for enamel and 15 seconds for dentin. Etching is carried out in order to: a) remove smear layer; b) create
microporosities and c) increase surface energy of the tooth surface.

**Rinsing:**

Acid should be rinsed with copious amount of water for 10 – 20 seconds to remove acid etchant byproducts.

**Drying:**

- Air drying leads to decrease in volume of collagen by 65% that could be regained by wetting.
- Over drying leads to collagen collapse.
- Drying using mini-sponge or cotton pellet is done in case of wet bonding technique.

**N.B.:** *Etched enamel* appears clinically as a chalky white appearance and microscopically as honeycomb appearance.

**Fig. 8:** Chalky white appearance (A) Honeycomb appearance (B)

**Fig. 9:** A figure showing opened dentinal tubules after etching and removal of smear layer
2- Priming:

Primers are adhesive-promoting monomers applied to increase surface wettability to facilitate spread of bonding agent on tooth surface.

For successful priming:

- Application time is at least 15 seconds.
- Multiple coats should be applied to ensure total coverage of the tooth substrate.
- Dentin surface must not over dried or over wet.
- Enamel and dentin surface must appear glossy and wet after priming.

3- Resin impregnation (adhesive resin application):

The main goal of resin impregnation is to totally seal all the micro-porous spaces to achieve a biologic tissue that is formed of resin encapsulating hydroxyapatite crystals and collagen to act as an elastic intermediary joint (hybrid layer) linking the composite resin to tooth tissue.

Fig. 10: A figure showing cured adhesive resin after infiltration into opened dentinal tubules
Clinical considerations during adhesive resin application:

1- It should be applied uniformly to create a uniform hybridization.

2- Brush thinning rather than air thinning is preferred to avoid extremely thin resin layer and formation of air-inhibited layer which decreases bond strength.

3- A time lapse for 30 – 40 seconds should be provided to allow resin to sufficiently flow in created micro-porosities.

4- Adhesive layer should be cured sufficiently before composite application.

5- Matricing and wedging

a- Matricing:

Different matrices can be used as circumferential or sectional, metal or translucent. It's desirable to use translucent matrices to allow passage of curing light. Those translucent matrices are either precontoured or modified to fit the required circumstances.

It's essential to apply a matrix in order to:

1- Establish proper contour.
2- Prevent marginal overhangs.
3- Increase density and adaptation of the restoration by applying pressure on the composite material.
4- Prevent air-inhibited polymerization of the resin composite surface by protecting it during polymerization.
5- Provide a smooth surfaced restoration.

The matrices used should be resin compatible, thin, light-transmittable, contourable, smooth and rigid. These could be celluloid matrix strips, mylar matrix strips, dead-
soft metal matrices, contoured circumferential matrices and light-transmittable crown formers. O-rings are advocated as they provide slight separation and hence adequate contact.

b- Wedging:

A strong wedge is essential to gain tooth separation, avoid overhang margins, and stabilize matrix. The use of light-transmitting wedges which are plastic in nature can allow light transmission to interproximal areas. This can provide sufficient curing of composite in these inaccessible areas in addition to guiding shrinkage to happen towards gingival margin (guided polymerization) and so improve adaptation and minimize microleakage at this site.

![Fig. 11: Garrison ring used with sectional matrices (A), Omni matrix system which is a disposable matrix system used with circumferential transparent and metal matrices (B) and Transparent wedge (C)](image)

6- Packing

Packing is performed using gold-plated or Teflon-tipped plastic instruments or syringeable compules as the resinous materials are characterized by its stickiness.

Techniques of placement:

1-Bulk packing technique
2-Incremental packing technique
Advantages:
- It improves the depth of cure.
- It minimizes polymerization shrinkage.
- Directs shrinkage towards tooth structure (guided polymerization).
- Chemically cured composites are placed in bulk.
- Photochemically-cured composites are placed either:
  a- In bulk if the increment is 2mm in thickness or less.
  b- Incrementally placed, if the thickness exceeds 2mm.
This is to ensure full penetration of the light and provision of adequate polymerization.

7- Contouring and shaping

It allows restoration of tooth anatomy, contact and contour in order to mimic natural tooth appearance.

8- Polymerization (curing)

The depth of cure of resin composite will depend on:

1- The thickness of restoration:
   The degree of cure decreases with increasing thickness.
2- Time of exposure:
   A 40 seconds exposure will penetrate deeper than 20 seconds time period.
3- Filler loading:
   Heavily filled resins require more exposure time to light.
4- Resin composite shade:
   Lighter shades are cured to greater depths and hence require lower exposure time.
5- Restoration – light tip distance:
   It should be as close as possible and should never exceed 4 mm. It is feasible to use special cones that penetrate inside the restoration during polymerization which allow light to
reach deeper areas. The volume shrinkage could range from 2.9 – 7.1% and should be controlled to minimize its sequel.

9- Finishing and polishing
- Resin composites should be finished to reach a smooth texture and polished to reach a satin gloss.

- Finishing is attempted using 12-bladed carbide burs of different sizes and shapes also, diamond stones could be utilized with descending grits and different shapes to accommodate with the different surfaces.

- Polishing is done using sand paper discs mounted on a Moore mandrel or Sof-lex discs or Pop-on discs and mandrels or Super-snap discs. They are all used in descending order from the more abrasive to the lesser one to achieve excellent surface properties. Finishing strips, aluminum oxide polishing pastes in conjunction with rubber cups could also be adjunctive in the finishing and polishing procedures.

- Highly polished surfaces will provide a biocompatible restoration as it will eliminate all potentials for irritation as sharp restoration surface or margins and overhangs which lead to food impaction and plaque accumulation.

10- Maintenance
It allows the correction of minor or limited discrepancies that will not affect the integrity of the restorative system such as marginal crevicing less than 0.5 mm deep, surface discolorations or minor chipping of materials. Fluoridation is also essential due to the fact that most resin composites are non fluoride releasing. A few of them only incorporate Ytterbium- fluoride fillers and can release limited amounts of fluorides and hence are considered anticariogenic.