Lec. 7 **Restorative dentistry**

Direct posterior composite restorations

Esthetic dentistry has shown much advancement in materials and technology since the last century. Earlier composites were recommended only as a restorative material for anterior restorations, but now they become one of the most commonly used direct restorative materials for both anterior and posterior teeth. Principal reasons for shifting from dental amalgam to composites are the attraction for esthetic, and reduced need for complex and extensive cavity preparation.

Advantages of posterior composite restorations:

1. Esthetics (Tooth colored materials are esthetically preferred by patients over metallic restorations.
2. Conservative tooth structure removal: Less complex tooth preparation.
3. Bondable restoration: Restorations are bonded with enamel and dentin, hence show good retention. Composite restorations can bond directly to the tooth, making the tooth stronger than it would be with an amalgam filling.
4. Extended working time: Extended working time of composites makes their manipulation easier.
5. Decreased microleakage (Composite restoration establish an almost total hermetic seal of the cavity, if done properly.
6. Low thermal conductivity**:** Composites have low thermal conductivity, thus no insulation base is required to protect underlying pulp.
7. No galvanism: because composite resins do not contain any metals.
8. Mercury free: Alternatives to dental amalgam.
9. It can be repaired rather than replaced.

Disadvantages of direct posterior composite restorations:

1. Polymerization shrinkage effect: Gap formation on margins may occur; this can result in staining and secondary caries.
2. Time consuming: Composites restorations require good isolation and number of steps for their placement.
3. More technique-sensitive than amalgam restorations (all steps need to be done at exact time according to manufacturer instructions).
4. Low wear resistance: Composites have low wear resistance.
5. Post operative sensitivity.
6. Composite is more expensive than amalgam.

To decrease some of these disadvantages of direct composite restorations:

Using advanced type of composite material, such as packable (condensable) posterior composite materials, which consist of resin and ceramic component, inclusion of ceramic fillers resulting in increase in viscosity of the material and ease in handling, improvement in wear resistance. This system will improve the clinical manipulation to be very similar to that of freshly triturated mass of amalgam.

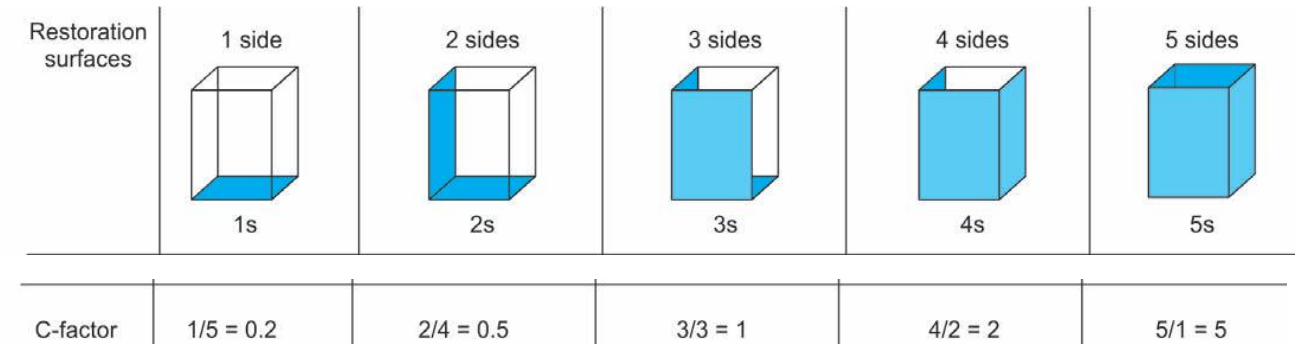
Polymerization shrinkage:

During polymerization, resin composite shrinks while hardening and may pull away from the least retentive cavity margins (usually those with little or no enamel on them), resulting in gap formation. Shrinkage stresses can result in cuspal deformation, enamel cracks and decreased fracture resistance of the cusps.

To decrease the adverse effects of polymerization shrinkage:

1. Incremental placement of resin composite (no more than 2mm), which decreases the effect of setting contraction by reducing the bulk of resin composite cured at a time. In addition, incremental insertion (wedge-shape) reduces the ratio of bonded to unbonded surface area **(C-factor)**, which helps to relieve the stress developed at the bond between tooth and resin composite.

Configuration or C-factor: is the ratio of bonded surface of restoration to unbonded surfaces. Higher the value of C-factor, greater is the polymerization shrinkage. (Class I and V) have the highest (most unfavorable) C-factor and thus are at more risk to the effects of polymerization shrinkage.



Configuration factor of different tooth preparations

2. Polymerization rate**:** "Soft-start" polymerization reduces polymerization shrinkage.
3. A stress-breaking liner: such as resin modified glass inomer, SDR (more elastic material) can be used under the composite restoration. When composite is placed

over an RMGI material, this technique is often referred to as a "sandwich" technique.

4. Another approach to reducing polymerization shrinkage stress with composites is to use a different polymer as the matrix. Typical hybrid composites using BIS-GMA as the matrix shrink approximately 2.4% to 2.8%. One product, Filtek (3M ESPE) uses a **silorane** polymer matrix and the linear shrinkage of this composite is approximately 0.7%.

CLINICAL STEPS FOR DIRECT COMPOSITE RESTORATION IN Cl I AND Cl II CAVITY PREPARATION:

1. Local anesthesia.
2. Composite selection: For the restoration, that requiring high mechanical performance, like large class I, II, choice of composite is that with the highest inorganic load.
3. Shade Selection: For posterior composite restorations, shade selection is not as critical as for anterior restorations.
4. Cavity Preparation:

The principle of the cavity for posterior composite similar to those used for amalgam restoration but with certain differences:

- A more conservative tooth reduction in both extension and depth, the preparation tend to be shallower because composite materials bond to tooth structure through chemical adhesion than mechanical undercut and better bond to enamel than dentin, thus there is no need to prepare cavity to dentin where decay has not penetrated or extended.
- The preparation tends to have a narrower out line form which allows less occlusal contact on the restoration and reduce wear.
- There is no extension for prevention so the occlusal fissure are included in the preparation only in the presence of the caries.
- In class II cavity preparation, the proximal box should provide bevel placement; bucally and lingually or palatelly in the cavosurface. Thus, to provide more area for acid etching and bonding, while on occlusal cavity preparation the bevel placement should be avoided, to prevent loss of sound tooth structure and eliminates a thin area of composite that would be more susceptible to fracture.

5. Filling procedure:

❖ Proper isolation of the operating field by means of rubber dam placement is very important for success of this restoration.

- ❖ Etching and bonding should be done according to manufacturer's instructions.
- ❖ One of the most important steps in restoring Class II preparations with direct composites is the selection and proper placement of the matrix. Generally, the matrix is applied before adhesive placement.
- ❖ In class II application of wedge before filling and immediately after rubber dam placement is important to get tighter composite contact to the adjacent tooth.
- ❖ The composite material is applied in incremental technique, each increment should be no more than 2mm, and followed by light application in all directions. In cl II fill proximal box separately and create proper contact areas, then filled the cavity as conventional cl I restoration.

6. Final Contouring, Finishing and Polishing of Composite Restorations

For composite restorations, the amount of contouring required after final curing can be minimized by careful placement technique. Decreased need of contouring of the cured composite ensures that margins and surface of composite restoration remain sealed and free of microcracks that can be formed while contouring. If contouring is needed, the occlusal surface is shaped with a round or oval finishing bur, excess composite is removed at the proximal margins and embrasures with a flame-shaped, abrasive discs. Narrow finishing strips may be used to smooth the gingival proximal surface. Restorations are finished with appropriate polishing points, cups, brushes, or discs.