Conservative dentistry

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Direct posterior composite restorations

The use of direct composite resin as material for restoring posterior teeth has increased greatly in recent years, because the patients are attracted to a restoration that matches the colour of natural teeth.

Advantages of posterior composite restorations:

1-Bondable restoration requires a much conservative tooth preparation and establish an almost total hermetic seal of the cavity, if done properly.

2-Tooth colored materials are esthetically preferred by patient more than metallic restorations.

3-Radiopacity that allow the dentist to evaluate the contours and marginal adaptation of the restoration as well as to distinguish caries lesions below and among the restoration.

4-Low thermal conductivity and eliminate the Galvanic current.

Direct composite restorations:

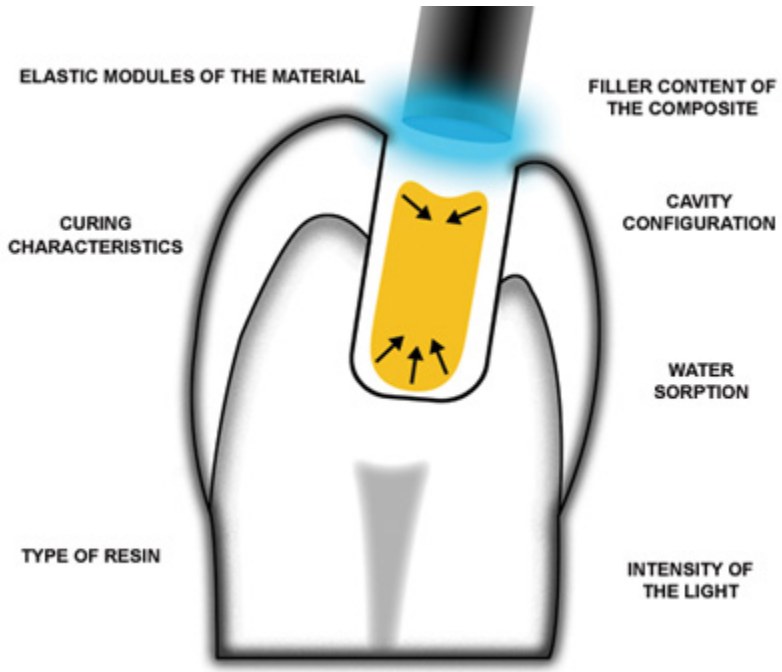
This composite restoration is applied directly into prepared cavity with no need for impression and cast preparation.

Disadvantages of direct posterior composite restorations:

1- The polymerization shrinkage result in less marginal adaptation.
2- Microleakage and secondary caries at tooth restoration interfaces
3- In class II difficult to get convex and appropriate proximal contact.
4- Low wear resistance and the wear rate increase with increase size of restorations and occlusal contact.
5- Highly technique sensitive (it need to keep area dry and all steps need to be done at exact time according to manufacturer instructions).
6- Need more time for placement of the restoration.
7- More expensive than amalgam.
8- Post operative sensitivity.

Polymerization shrinkage of composite resin during light curing remains the main

problem for practitioners. While in the past this problem was approached by optimizing filler particle sizes, researchers are currently working to improve the resin matrix. A new material group, called ormocers which is a three dimensionally cross-linked copolymer that contain larger monomers in the methacrylate resin which undergoes 1.97% volume shrinkage but not solve the problem altogether. The latest approach is the “silorane” composite with a new resin using cationic ring-opening polymerization. These composites are recommended for posterior use only because of low opacity, limited shade selection, and incompatibility with methacrylate - based composites and bonding systems. The manufacturer claims less than 1% shrinkage with silorane, which would help to reduce marginal gap formation, microleakage, and secondary caries.

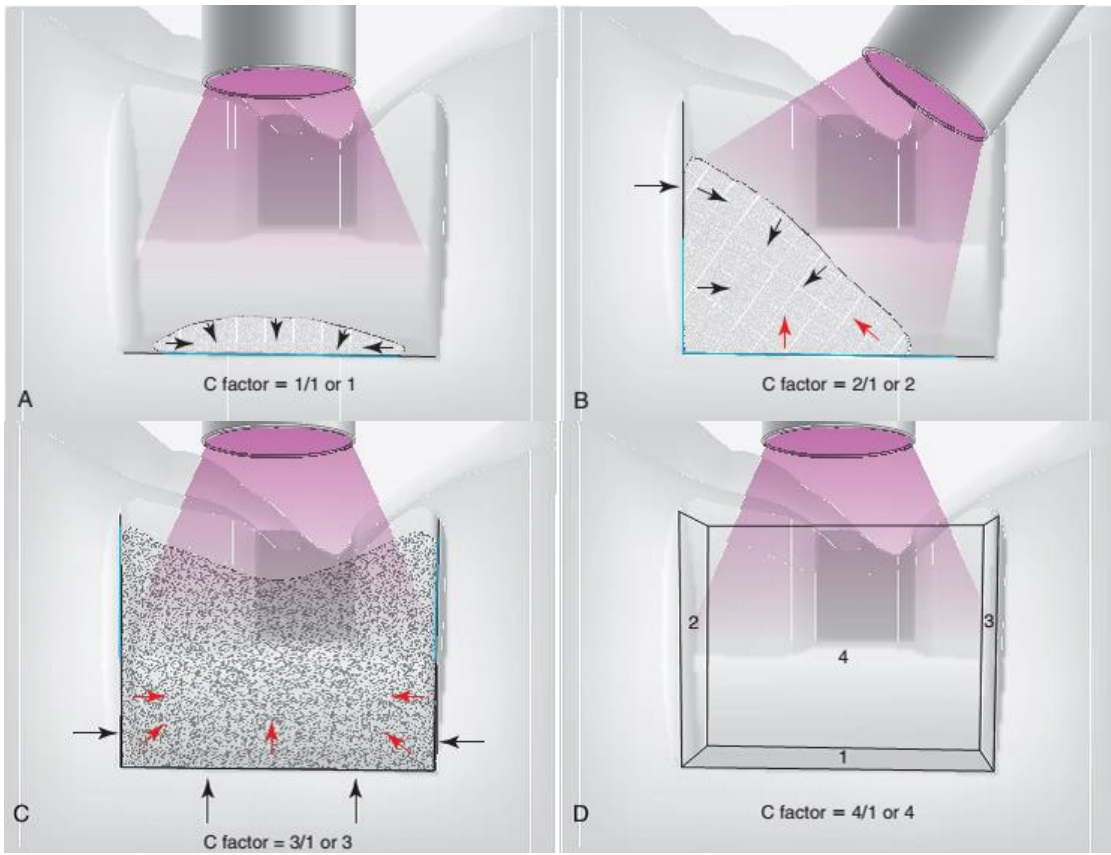


The C-Factor (configuration factor)

The C-factor is a concept that is discussed by many in the dental community. Although the concept has never been proven scientifically, it is the best guide to the management of polymerization shrinkage in various cavity preparations. C-factor stands for configuration factor and expresses the ratio of internal walls versus external surfaces. A second way to describe C-factor is internal surface area versus external surface area. C-factor is a fundamental flaw in traditional cavity preparations because the parallel walls for resistance and retention work against the dentist during polymerization shrinkage. As the curing light hits the composite, it will shrink toward the center. The shrinkage can be measured as either volume or linearly. On a linear basis, most direct composites shrink 2% to 5%. All composites shrink on polymerization at this point, but the way the composite shrinks is critical and is based

on the C-factor.

The shape of the cavity preparation, the number of opposing walls, how they oppose one another, and the angle at which they oppose one another are extremely critical to the behavior of composite shrinkage. **The C-factor is a ratio of the internal walls divided by the external walls,** or it can be expressed in terms of surface area of the external surface. For C-factor a high number is unfavorable. Realistically a number of 2 or above is a problem when it comes to performance of the composite. Stress that is put onto the tooth and or composite can compromise the bond, cause microfracturing of the enamel, and lead to lack of adhesion in certain areas of the composite. The higher the C-factor, the worse for the situation.



Indications of direct posterior composite restorations: The direct composite restoration can be used for:

A-Class I.
B-Class II.
C-Class V.
D- Core for crown restoration.
E- Class VI.

But the cavity should have the following criteria to increase the half-life of the restoration:

1-In class II if possible the gingival cavosurface margin best to located on intact enamel.

2-The patient should not exhibit excessive wear from clenching or grinding.

3- Cavity with cavity width less than one third intercuspal distance.

4-The tooth should be amenable to rubber dam isolation.

Cavity preparation:

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

1-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.

2-The preparation tends to have a narrower out line form which allows less occlusal contact on the restoration and reduce wear.

3-The preparation should has rounded, internal line angles to decrease stress concentration associated with sharp line angles and enhances resin adaptation during placement.

4-There is no extension for prevention so the occlusal fissure are included in the preparation only in the presence of the caries.

As general principle preparation should be limited to eliminating carious tooth structure and providing access for the restoration placement and finishing

In principle of class II cavity preparation for posterior composite, the proximal box preparation should be provided bevel placement buccally and lingually or palatelly in the cavosurface to provide more area for acid etching and bonding, while on occlusal cavity preparation the bevel placement should be avoided at the cavosurface line angle to prevent loss of sound tooth structure, decease surface area of final restoration, lessens the chance of occlusal contact on the restoration and eliminates a thin area of composite that would be more susceptible to fracture and presents a well demarcated marginal periphery to which the resin composite can be more precisely

finished.

Filling procedure:

Proper isolation of the operating field by means of rubber dam placement is very important for success of this restoration. In class II application of wedge before filling and immediately after rubber dam placement is important to get tighter composite contact to the approximating tooth, then proper matrix band is applied.

Total etch for 15 seconds with 37% phosphoric acid to get proper hybrid layer, then wash by water for 2 seconds and gently air dried (not fully desiccated). The bonding agent is placed with a brush according to the manufacturer instruction then the composite material is applied, in the class II, the material applied in incremental technique each increment should be no more than 2mm, first in the proximal box with condensation against the matrix band and cavity walls, followed be light application in all direction labially, lingually and occlusally, then the rest of cavity is filled in the incremental order followed by light application in different directions.

Finishing and polishing procedure:

The placement procedure that minimize the need for finishing and polishing should be used.