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***Sheet no. :14***

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 **Class IV Cavity Preparation**

Class IV cavity preparation is similar to III but also involve the incisal edge.

***Clinical technique*** :

1**.** **Anesthesia.**

2**. Occlusal assessment** should be made to help in properly adjusting the restoration's function and in determining the tooth preparation design. It is more important in class IV than in class III because most of the tooth structure is lost.

The preoperative assessment of the occlusion is more important for class IV restoration extensions because it may influence the tooth preparation extension (placing margins in noncontact areas) and retention and resistance form features (heavy occlusion requires increased retention and resistance form).

Occlusal factors may dictate a more conventional tooth preparation form , with more resistance form features (boxlike , flat floors , and walls and floors parallel to the long axis and perpendicular to the occlusal forces ) and secondary retention form features (grooves and wider bevels).

3**. Shade selection** may be difficult for large class IV restorations that do not have normal dentin colorations (translucent incisal edge). Use of separate translucent or opaque shades of composite as a veneer over a hybrid composite core may provide improved esthetic results.

At the incisal edge of the incisors the enamel is thick and without underlying dentin, which makes this area translucent. To obtain natural appearance, it is helpful to make the cervical third of the tooth one shade darker than the incisal area.

4**. Isolation** (visibility, effective bonding).

Rubber dam isolation is the best for composite restoration.

The area must be isolated to permit effective bonding . Use of the rubber dam allows for operating efficiency and increased productivity. The rubber dam retainer helps to provide a moderate amount of mouth opening during the procedure.

5**. Tooth preparation** :

Three types :

1- Conventional.

2-Beveled conventional.

3-Modified conventional.

1. *Conventional class IV tooth preparation*.

* The conventional tooth preparation design has minimal clinical class IV application. However, except in areas that have margins located on root surfaces.
* Lesion, fault , or defective restoration located on the root surface of a tooth 🡪conventional class III .

 Lesion , fault , or defective restoration located on the root surface of a tooth + the proximal surface + the incisal edge🡪conventional class IV.

* Boxlike form may provide greater resistance to fracture of the restoration.
* The external walls are prepared perpendicular to the long axis of the tooth.
* Uniform depth.
* The cavosurface margins exhibit a 90-degree cavosurface angle and provide butt joints between the tooth and the composite material.

\*\* F and L cavosurface margin =90˚ and Gingival floor perpendicular to the long axis of the tooth. ( Resistance form )

2. *Beveled conventional class IV tooth preparation.*

* The beveled conventional tooth preparation is indicated for restoring large proximal areas that also include the incisal surface of an anterior tooth.
* Why? More retention / resistance are needed.
* Design: some beveled enamel margins with conventional wall design.
* Cavosurface margin =45˚ on beveled, 90˚ on non beveled margin.
* The External walls are prepared perpendicular to the enamel surface.
* Retention : In addition to the etched enamel margin, retention of the composite restorative material in beveled conventional class IV tooth preparation may be obtained by groove or other shaped undercuts, dovetail extensions, threaded pin, or a combination of these.

A. Enamel bevel or flare: (most common) Deep bevel for more retention with a width of (0.25-2 mm).

B. Retention grooves are made in the same way as in class III beveled conventional preparation. Retentive groove can be prepared along gingivoaxial line angle incisoaxial line angle.

C. Undercuts :

Gingival and incisal retentive undercuts may be indicated in large class IV preparations and are similar to the undercuts used in the class III preparation, in which rounded undercuts are placed in the dentin along line angles and into point angles wherever possible, without undermining the enamel.

\*\* Undercut 🡪2 walls converge occlusally.

D. Dovetail extension onto the lingual surface of the tooth.

-Similar to the occlusal extension in class II cavity preparation. It appears like narrow isthmus then wide cavity "Central Pit".

-It is less conservative and not used often.

E. Pins:[it looks like a small pin! :p]

-The use of pins in composite restorations is discouraged for several reasons:

1. The placement of pins in anterior teeth involves the risk of perforation either into the pulp or through the external surface.

2. Pins do not enhance the strength of the restorative material.

3. Some pins may corrode because of microleakage of the restoration, resulting in significant discoloration of the tooth and restoration.

- Despite these disadvantages, when a large amount of tooth structure is missing, pin retention may be necessary to retain the composite restoration.

3. *Modified class IV Tooth preparation*.

* Indications: Small and moderate class IV lesions or traumatic defects.
* Why? All enamel margins.
* No specific shape.
* The axial depth depends on the extent of the lesion.

-Remove any existing lesion or defective restoration 🡪 enamel bevel 🡪 restoration.

6**. Pulp protection.**

- Place calcium hydroxide in deep caries on the axial wall.

- Add Resin modified glass ionomer cement liner to protect the calcium hydroxide from being dissolved by Acid etch application.

RMGIC when applied on root surface:

\* Seal the dentinal tubules.

\* Minimize the effect of polymerization shrinkage.

7**. Restoration**:

Etching🡪Bonding agent + light cure🡪Composite restoration + light cure.

* Is it appropriate to etch the tooth before the application of RMGIC ?

-You can etch the tooth cavity before applying RMGIC, but you have to be careful not to affect the enamel margin.

 **But** conditioning is not a need when applying RMGIC and you can't etch the tooth cavity after applying calcium hydroxide.

* Is it appropriate to etch the tooth before the application of calcium hydroxide ?

-No! Calcium hydroxide usually placed in deep caries, so it's very close to the pulp and the "Acid" will cause pulp irritation.
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* The class IV composite restoration has provided the dental profession with a conservative treatment to restore fractured, defective, or cariously involved anterior teeth when previously a porcelain crown many have been the treatment of choice. Porcelain crowns are not as conservative as class IV composite restoration.

For young patient, teeth and jaws are not usually fully developed!

It is generally recommended that crowns not be placed on younger patients until they are 18 years old to avoid the added expense and time to completely remake the crown!

* use 7901/ 7802 finishing burs, round or flame shaped burs to place bevel.
* Use clear Mylar strip to provide "proximal wall" to restore against.
* Place wedge between the teeth gingivally to seal the cervical margin, and protect the adjacent teeth.
* Etching is accomplished with strict adherence to the manufacturer's instructions.
* The etchant is applied to all of the prepared tooth structure and left undisturbed for 15 to 30 seconds.
* The area is washed to remove the etchant.
* When dentin is exposed, rather than air dry the rinsed area, it may be better to use a damp cotton pellet to remove the excess water.
* The bonding agent is applied next. (The manufacturer's recommendations should be followed).
* when applied, the bonding agent is lightly dried with the air syringe to evaporate any solvent. Then it is polymerized with light curing for 10 to 20 seconds.
* The operator inserts the composite and cures in 1 to 2 mm increments to ensure complete polymerization and possibly to reduce the effects of polymerization shrinkage. (Beginning at the cervical third, the tip is moved towards the incisal area while applying the composite. Initially no composite is applied to the incisal third ).

Custom lingual matrix may be used for large class IV preparations.

When planning a class IV restoration, a diagnostic wax-up is helpful to determine the ideal anatomical contours and symmetry. It allows for the fabrication of lingual putty matrix.

At the first visit the operator takes an impression of the patients teeth, then the impression is poured with stone (in the laboratory) to obtain a cast. Wax is placed on the involved stone tooth to create the desired result.

The lingual matrix is prepared by using a putty-like polyvinylsiloxane impression material. The operator records the lingual and, if possible, incisal contours of the wax-up.

When obtained, the lingual matrix is set aside until it is time to insert the composite.

At the second visit (after preparing the tooth, etching and placing the adhesive) the operator repositions the lingual matrix and inserts the initial composite increment against the matrix in the lingual part of the preparation. This initial increment (*the lingual shell*) when cured, generally establishes the lingual, proximal, and incisal contours of the final restoration. The operator continues to place and cure additional increments until the desired from is obtained.

🡪 The lingual shell is made using the enamel shade (should be flowable so it can flow into the irregularities on the lingual surface!)

After the lingual shell has been cured, the operator replaces the natural dentin with the corresponding Dentin shade of composite (there is **no** dentin present in the incisal area!). Finally the enamel increment is placed and cured.

\* This technique is used for highly esthetic demanding cases.

\* Polyvinylsiloxane is an addition silicone.

**Finishing the class IV**: Use finishing burs, stones, hand instruments, discs, and/or scalped to finish.

\* Scalpel is a small and extremely sharp bladed instrument used for surgery. [ for making incisions!]

\* Finishing discs (flexible) are used primarily on the buccal and lingual surfaces.

\*finishing strips: Use strips in "s" motion, do not remove proximal contact.

**Assessment**:

1-The incisal edge length and thickness.

2-The occlusion with opposing teeth: The operator evaluates the occlusion by having the patient close lightly on a piece of articulating paper and slide the mandibular teeth over the restored area. If excess composite is present, the operator removes only a small amount at a time and rechecks with articulating paper.