

Crown and bridge Prosthodontics

Lecture: 11

Prof .Dr. Adel F. Ibraheem

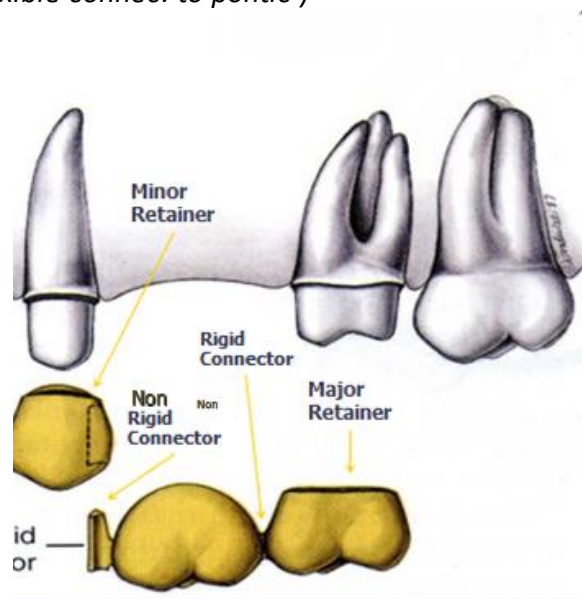
Fixed Partial Denture (Bridge)

Components of Bridge

Bridge Retainer:

That component of an FPD which takes support from the abutment tooth and provides retention to the prosthesis. It could be seat over (on or in) the abutment tooth, connecting the pontic to the abutment, **which could be (divided into);**

- 1. Major retainer:** Which are all these used in fixed-fixed, spring, and cantilever bridge. Fixed-mobile Bridge has one major retainer at one end of the pontic. Major retainer preparation must be retentive & with conventional bridge must cover the whole occluding surface of the tooth. (rigid connec.to pontic)
- 2. Minor retainer:** Represent the lesser retainer of fixed-mobile bridge into which a movable connector from a pontic seated or attach. It doesn't need full occlusal coverage. (flexible connec. to pontic)



Types of retainers:

Major or Minor Retainer Designs;

1. Based on preparation design

- 1) Extra coronal retainer (complete crown, partial crown)
- 2) Intra coronal (Inlay, onlay).
- 3) Intra radicular (Post & cor).

2. Based on material used

- 1) All metal retainers.
- 2) Metal ceramic retainers.
- 3) All ceramic retainer.
- 4) Zirconium retainers.
- 5) Acrylic retainers.

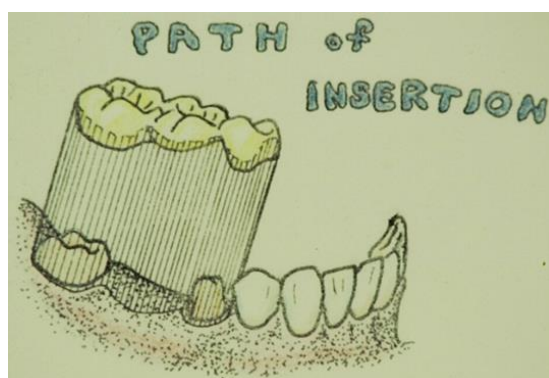
All metal retainers are most conservative, the simplest, & the least expensive to produce. Most of the time they used in posterior region when the esthetic is not critical or patient does not mind about appearance. Metal ceramic, All Ceramic and Zirconium are used for replacement of anterior teeth where esthetic is critical. Acrylic retainer used with temporary bridge

Criteria for choosing suitable retainer (assessment factors):

1. *Alignment of abutment teeth*
2. *Retention required*
3. *Appearance (esthetic)*
4. *Condition of abutment teeth*
5. *Periodontal condition*
6. *Conservation of tooth structure*
7. *Cost*
8. *Caries susceptibility*

1. Alignment of abutment teeth:

When abutment teeth are more or less parallel to each other, either complete or partial crown retainer can be used .If abutments are not parallel, complete crown retainer with common path of insertion can not obtain without a destructive reduction of the abutment.



2. Appearance (Esthetic):

The esthetic of retainer must be acceptable to the patient. If esthetic is critical, P.F.M, All Ceramic, Zirconium or $\frac{3}{4}$ crown may be used also some patient may worry about metal display on occlusal surface of posterior teeth , this need to have porcelain extend to cover occlusal surface of metal. This lead to destruction preparation which is not always possible or desirable.

3. The condition of the abutment:

Partial crown can not be used because of presence of a caries or large restoration involving the buccal surface or because of loss of buccal surface due to fracture, in such cases a complete crown is used. Pulp condition play a vital role in the selection of retainer design, incisal relationship has great effect especially when clinical length of the crown is short for both anterior & posterior teeth (worn teeth).

4. conservation of tooth structure:

Inlays, Onlays are more conservative than Partial coverage which is more conservative than Complete coverage, Full Metal more conservative than P.F.M. which more conservative than All Ceramic crown. So when we have sound buccal enamel and dentine, Partial coverage is indicated to more conservative preparation. This will not only reduce the affect of cutting procedure on the pulp & periodontium, also will not destroy the natural appearance. However if there is sound indication for complete crown, this should be done.

5. Cost:

Partial Crown & Complete Crown (Retainer) may be less expensive than P.F.M., which is less expensive than All Ceramic or Zirconium Crown (retainer) . Metal Retainer are least expensive. When there is no other factor affecting choice, this is obviously of considerable importance.

6. Size and position of the abutment:

Partial crown need sufficient large and long tooth. Position may affect esthetic.

7. Caries susceptibility:

Patient with poor oral hygiene is indicated for complete crown.

8. Retention required:

The retention of a bridge retainer should be at least as great as for similar restoration made as single unit. Retention of crown vary according to preparation feature, Crown material properties and type of luting cement

Factors affecting the amount of required retention:

1) Length of span & rigidity:

The longer the span the greater the stresses on the retainer & the more will become un cemented. Further more the casting will be more liable to flex, so you must a certain they are sufficiently rigid (The longer, the span, the stronger must be all the component bridge).

2) Type of bridge:

Certain types of bridges induce greater stresses on the cementing media of bridge retainer than other.

Thus strong retainers are required fixed-fixed than fixed-mobile bridge. In deed, little retention is needed for the minor retainer of fixed-mobile bridge design. Thus when it is desirable to preserve tooth tissue, the fixed-mobile design is normally indicated as for lighter retainer can be used. For example ; replacement of upper 4 by fixed-mobile bridge using 3/4 crown or fully coverage on upper 5 as major retainer & a class III inlay on the distal of canine as the minor retainer. Such design will be:

1. Conservative
2. Esthetic
3. Incisal edge not included.

3) Strength of the bite:

The strength of the bite determines to large extent the degree of retention required to resist it, this will vary with age, sex, & muscular development of the patient concerned. The heavier the bite the stronger & thicker the retainer material needed to prevent failure of the retainer or pontic

4) Tooth or teeth to be replaced:

The size & position of the pontic have direct effect on the type of retainer required (stress amount). Thus the replacement of a molar cause greater stress to the abutment than lower incisor. Also forces acting on canine are more likely than that acting on an incisor.

5) Occlusal coverage:

There are several reasons for full. occlusal coverage, It is always (nearly) indicated because :

- a)** *It gives abutment complete protection during mastication.*
- b)** *There is no fear of cusp fracture (M O D inlay, or endo. Treated teeth).*

Full occlusal coverage always indicated in fixed-fixed bridge. Occlusal reduction must be sufficient to provide enough thickness for material to be rigid.

6) Habits of patient:

Various habits might induce stress on the bridge retainer such as pipe smoking, clenching; most important is grinding in (Bruxism). So if large number of patient natural teeth is severely worn, then any metal occluding surface that use in retainer construction will similarly worn unless the habit can be corrected. There for retainer must be thicker & stronger than normal (very hard alloy lead to wear off does not proceed at the same level as natural teeth do).

Requirements of ideal retainer:

- 1) Provide maximum retention.
- 2) Give maximum esthetic.
- 3) Preserve vitality of preparation tooth.
- 4) Need conservative preparation (less amount of traumatic reduction).
- 5) Biological accepted to the surrounding tissue.
- 6) With stand masticatory forces.
- 7) Easily constructed.

Specific Retainer design;

Major retainer	Minor retainer
Full Crown. Post Crown & 3/4 Crown MOD inlay with full occlusal coverage. pinlay & pinledge. 7/8 partial crown.	Full Crown. 3/4 Crown Class III incisal withdrawal inlay.

All the restorations above that used as major retainer can be used as minor retainer but the reverse is not possible.

Major or Minor Retainer Designs;

- 1) Extra coronal retainer (complete crown, partial crown)
- 2) Intra coronal (Inlay, onlay).
- 3) Intra radicular (Post & core).

Specific Retainer design;

■ **Standard**

Full Metal Crown , 3/4 Crown , 7/8 Crown , Post Crown, PFM , full Zirconium, Combination

■ **Non Standard**

Implant, Inlay, Onlay , All Ceramic, Resin Bonded ("Maryland Bridge")

Requirements of ideal retainer:

- 1) Provide maximum retention.
- 2) Give maximum esthetic.
- 3) Preserve vitality of preparation tooth.
- 4) Need conservative preparation (less amount of traumatic reduction).
- 5) Biological accepted to the surrounding tissue.
- 6) With stand masticatory forces.
- 7) Easily constructed.

General factors in tooth preparation:

In order to obtain these ideal retainer requirements as far as related to tooth preparation, if the case permit, the design of the preparation of abutment tooth for a metal or porcelain crown restorations are limited by five principles:-

1. **Preservation of tooth structure.**
2. **Retention and resistance from.**
3. **Structural durability of the restoration.**
4. **Preservation of periodontium.**
5. **Marginal integrity.**

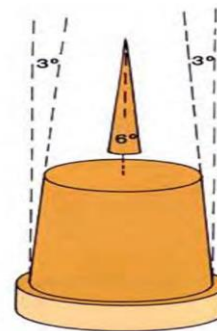
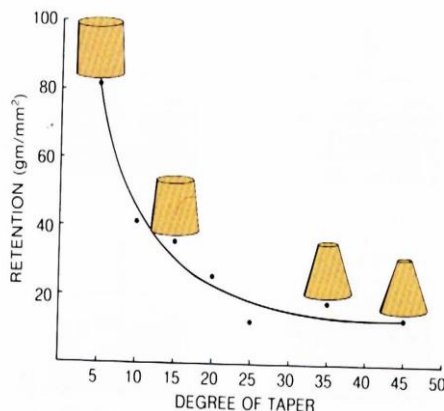
■ Factors affecting retention and resistance of crown restorations;

1) Taper of the preparation.

The more nearly parallel the opposing walls of preparation the greater will be the retention.(leaving undercut&seating problems)

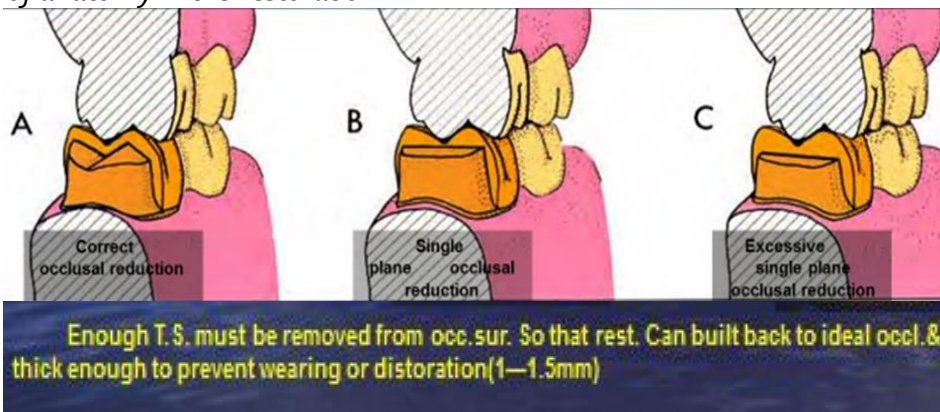
*(5-6) degree convergence angle is mostly used to provide the needed retention.

- 2) Surface area of the preparation,
- 3) Length and height of the preparation.
- 4) Diameter of the tooth (tooth width).
- 5) Texture of the preparation.
- 6) Accessory mean.



■ Structural Durability:

The preparation must be designed so that it provide S.D. to the restoration i.e. the crown rest. Must be rigid enough to not flex, perforate or even fracture. For rest. To be rigid it need bulk....to provide enough bulk to the crown restoration Sufficient T.S. must be removed from the prep. Tooth to create enough space. By doing so the restoration allowed to withstand the forces of occlusion, prevent wearing holes in the gold and allow proper contouring and carving of anatomy in the restoration.



■ **Preservation of periodontal tissue;**

- 1-Whenever possible the margin of the preparation should be supragingivally.
- 2-The casting should have proper contact, Embrasure form, Occlusion and a healthy occluso-gingival contour.

Margin(F.L.) placement:

Finishing line can be placed either:

1. Supragingival:

Placing the margin above the gingival tissue for these reasons:-

- a- can easily prepared and finished.
- b- To provide good vision for the dentist during preparation.
- c- impression can be easily made.
- d- the patient can keep the area clean easily.
- e-most of the time such position is situated on hard enamel.
- f-Less destructive

The factors that influence such position of finish line are :-

- a- When the esthetic is a factor.
- b- When we need extra retention.
- c- When we have carries or filling at the area of finish line.

2. Subgingival:

Placing the margin below the gingival tissue.

3. Placing the margin with in the level of the gingiva.

■ **Marginal Integrity:-**

The restoration can survive in the biological environment of the oral cavity only if the margins are closely adapted to the CSL OF the prep. The configuration Of the F.L. determine the shape and the bulk of the rest. Margin that affect both marginal adaptation and the degree of seating of the restoration. The restoration margins should:

- a-They must fit as closely as possible against the finishing line of preparation.
- b-They must have sufficient strength.
- c-Whenever possible they should be placed in an area where the dentist can finish and clean them properly.

Finishing line of the preparation (f.l):

Requirement of F.L. :-

1. It must be clear ,smooth and well defined.
2. It must be continuous from one surface to the other.
3. It must lie on sound tooth structure

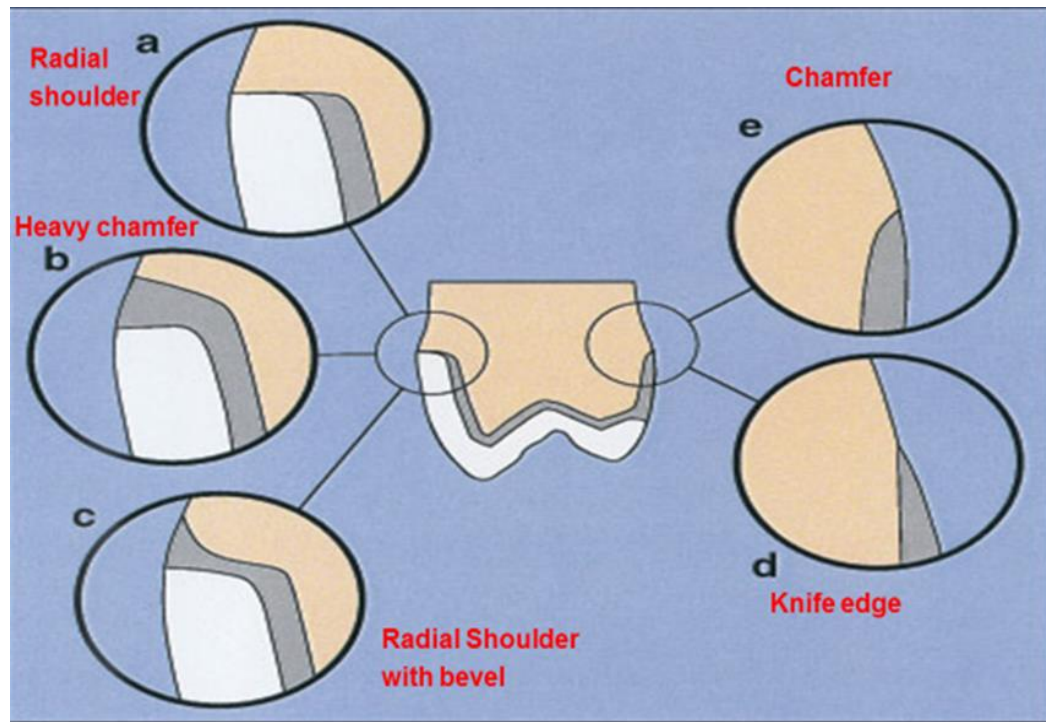
Factors affecting selection of F.L. Design;

- 1) Type of the restoration
- 2) Materials used in construction
- 3) The amount of occlusal force (stress) the restoration will bear

Types (design or configuration) of finish line:

The following designs for finish line(margin of preparation) could be used: depending on the type of the crown restoration:

1. Knife edge
2. Shoulder
3. Shoulder with bevel
4. Radial shoulder
5. Chamfer
6. Heavy chamfer



Complete Cast Crown (FMC)

It is one of the most commonly used retainer for the posterior teeth. Because it is made of metal, it should be used when the patient doesn't mind the appearance of metal or when esthetics are not a factor. *This type of retainer provides better retention and resistance because all the axial surfaces of the teeth are included in the preparation.*

Indications

- 1) *It is indicated when the bridge is located posteriorly .*
- 2) *The abutment teeth with extensive tooth destruction as a result of caries or trauma.*
- 3) *As a retainer on teeth that receive a clasp.*
- 4) *Existing previous restoration that precludes the use of a more conservative restoration*
- 5) *Need for superior retention and strength*
- 6) *Endodontically treated tooth*
- 7) *Patient with high caries index.*

Contra-Indications

- 1) *When the abutment teeth are located in the appearance zone.*
- 2) *Patient with low caries index.*
- 3) *Whenever a more conservative retainer is feasible*

Advantages;

- 1) *Provide greater retention and resistance*
- 2) *high resistance to deformation (Strong)*
- 3) *Less tooth structure is removed and easy to prepare (conservative).*
- 4) *Strong even in thin sections*

Disadvantages

- 1) *Poor esthetic.*
- 2) *Difficulty to test the vitality of the abutment tooth especially by electrical pulp tester*
- 3) *Interfere with taste*
- 4) *Tarnish and corrosion so it needs prophylactic measures.*

Porcelain Fused to Metal ;

The most widely used retainer when esthetic is a factor .This type has the strength of F.M.C. and esthetic of All ceramic crown.

Indications

- 1) Use when the abutment teeth located in the appearance zone.
- 2) Excessive retention and resistance is needed.
- 3) Similar to these of PFM.

Contra-Indications

- 1) Large pulp chamber.
- 2) Intact buccal wall.
- 3) More conservative retainer can be used.

Advantages;

This type has the strength of F.M.C. and esthetic of All ceramic crown.

Disadvantages

- 1) Removal of substantial tooth structure.
- 2) Subject to fracture because of brittle nature of porcelain.
- 3) Shade selection can be difficult.
- 4) Inferior esthetic compared to All Ceramic Crown.
- 5) More expensive.

All Ceramic Crown :

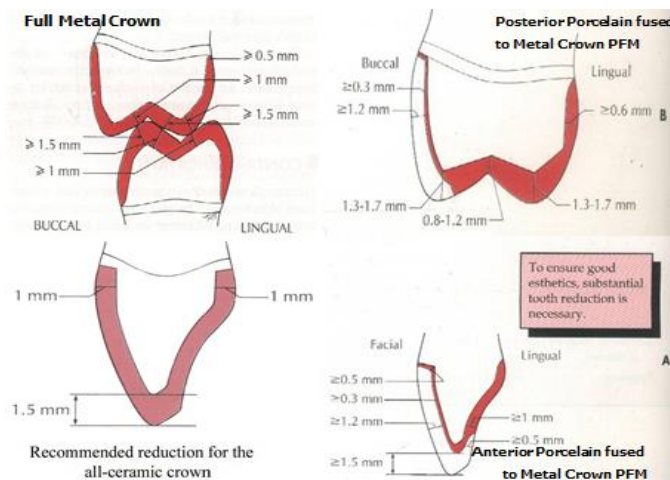
Since it made entirely from ceramic substance the most esthetically pleasing retainer . Because, there is no metal understructure to block light transmission, it can resemble natural tooth in term of color and translucency than can any other restoration .

Indications

1. High esthetic requirement.
2. Considerable proximal caries
3. Endodontically treated teeth with post & core.
4. Incial edge reasonably intact.
5. Favorable distribution of occlusal load.

Contra-Indications

- 1) Superior strength requirment.
- 2) Thin teeth faciolingually .
- 3) Unfavorable distribution of occlusal load
- 4) Insufficient coronal tooth structure
- 5) Bruxism



Partial veneer crown (three quarter crown):

It's a cast restoration which cover 3/4 of the clinical crown (occlusal, incisal, lingua and proximal surfaces) leaving the buccal or labial surface untouched. It has less retention and resistance to displacement compared to full metal, full veneer with facing.

Indication:

- 1) Short span bridge.
- 2) On teeth with clinical crown of good (average) length and thickness labio-lingually.
- 3) Patient with good oral hygiene and low caries index.
- 4) When the abutment tooth in good axial relationship to facilitate the path of insertion.

Contra-indication:

- 1) Short teeth.
- 2) Poor O.H, grossly caries teeth.
- 3) Long span bridge.
- 4) Poorly align abutment (poor axial relationship).
- 5) Endodontically treated teeth.

Advantages:

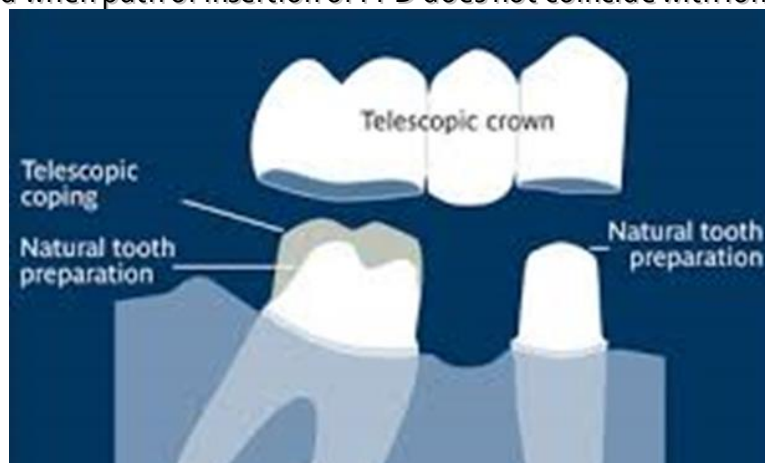
- 1) Conservation of tooth structure (Tooth structure is saved)(.
- 2) Better esthetic than other types.
- 3) Reduced pulpal and periodontal insult during tooth prep.
- 4) Less chance of periodontal irritation because all the margins of the crown is supergingival.
- 5) Vitality tests can be done on the exposed labial or buccal surface of the tooth.
- 6) Improved access for finishing by dentist & oral hygiene by patient

Disadvantages:

- 1) Possibility of recurrent caries along to cavosurface line angle.
- 2) Possibility of showing gold especially in the lower anterior and posterior teeth.
- 3) Difficulty in preparation compared to other types of crowns (limited adjustment can be made in the path of placement).

Telescopic retainers

- Design involves fabrication of two copings one over the other
- Internal or primary coping function to modify the morphology of tooth – path insertion changed
- Secondary or external coping designed to fit over primary
- Used when path of insertion of FPD does not coincide with long axis of abutment



Post crown:

It is a fixed artificial restoration which replaced the coronal portion of the natural tooth completely. It retained itself by a means of post (dowel) that extended and cemented to the root canal space of endodontically treated tooth

The post crown will reinforce the remaining tooth structure against forces by distributing the forces to the supporting tissue.

Indication:

- 1) It commonly indicated for endodontically abutment tooth.
- 2) Abutment tooth with short clinical crown.
- 3) Re-alignment of malposed abutment. When the preparation of full metal and full veneer will cause exposure of the pulp.

The retention of the post crown depends on:

- 1) Taper of the root canal.
parallel sided prep. Is more retentive than tapered (divergence occlusally)
- 2) Post length.
Longer length more retention (2/3 length of root, Equal to length of clinical crown, 4-5 mm from apex, 8 mm deep from CEJ)
- 3) Post diameter.
one third the root diameter at C.E.J. and should be at least 2mm less than root diameter at mid root area)
- 4) Post surface texture.

For multi-rooted posterior teeth, the post should be placed in the largest canal.

*For the maxillary molar use the **palatal canal** and for the mandibular molar use the **distal canal**.*

*For the maxillary premolar, the post should be placed in the **buccal canal**.*

Factors affect the selection of a tooth for post crown retainer:

- 1- *The root of the abutment should be of sufficient length, width and without sharp angulations in the middle third.*
- 2- *The root should be without internal or external resorption.*
- 3- *Quality of the root-filling: the canal should be filled with well-condensed gutta-percha especially in the apical 3rd of the canal.*

Resin bonded retainers

- *Require minimal tooth preparation*
- *Acid etched*
- *Esthetically appealing*
- *Economical, conservative, functional & do not irritate soft or hard tissues*

Indication

- 1) As retainers of FPD for abutment with sufficient enamel to etch
- 2) Splinting of periodontally compromised teeth
- 3) Stabilizing dentition after orthodontic treatment.

Contraindication

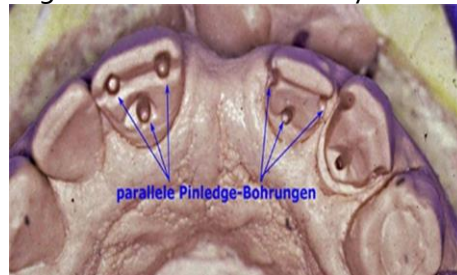
- 1) In patients with sensitivity to base metal alloys
- 2) When facial esthetic of abutment require improvement
- 3) Inadequate enamel surface to bond eg; caries, existing restoration, attrition
- 4) Incisor with extremely thin facio-lingual dimension

Pinledge

A partial veneer retainer preparation incorporating pins holes to provide retention.

Indications

- 1) High esthetic requirement
- 2) Undamaged anterior teeth
- 3) When proximal grooves are impossible to prepare
- 4) To alter lingual contour of maxillary anterior teeth



INLAY

A fixed intracoronal restoration; a dental restoration made outside of a tooth to correspond to the form of the prepared cavity, which is then luted into the tooth. Inlay may be used as

- a single tooth restorations for proximo-occlusal or gingival lesions with minimal to moderate extensions.
- Minor retainer for fixed partial denture

They may be made up of gold alloy or ceramic material.

Contraindications

- 1) high caries index
- 2) Poor plaque control
- 3) MODs
- 4) Poor dentinal support require wide preparation

ONLAY

A restoration that restores one or more cusps and adjoining occlusal surfaces or the entire occlusal surface and is retained by mechanical or adhesive mean. It is used for restoring more extensively damaged posterior teeth needing wide mesio-occluso-distal restorations.

It can be used as a retainer for fixed partial denture

Contraindications

- 1) High caries risk
- 2) poor plaque control
- 3) Short clinical crown/extruded tooth
- 4) Bruxism

