Porcelain fused to metal crown (PFM)

Lecture 5

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Third stage

A porcelain fused to metal (PFM) crown

- It is a full metal crown having a facial surface (or all surfaces) covered by ceramic material.
- It combines the strength and accurate fit of cast metal with the esthetic of ceramic.
- So, this type combines the advantages of the strength of a full metal crown and the esthetic of all ceramic crowns.







Disadvantages of PFM crown

1. Removal of an extensive amount of tooth structure.
2. Subject to fracture because of the brittle nature of porcelain.
3. Shade selection can be difficult.
4. Inferior esthetic compared to the porcelain crown.
5. Discoloration of the gingival margin may occur with time.
6. More expensive.







Indications of PFM crown

1. Teeth need to be completely covered for esthetic demand.

2. As a retainer for a fixed partial denture.

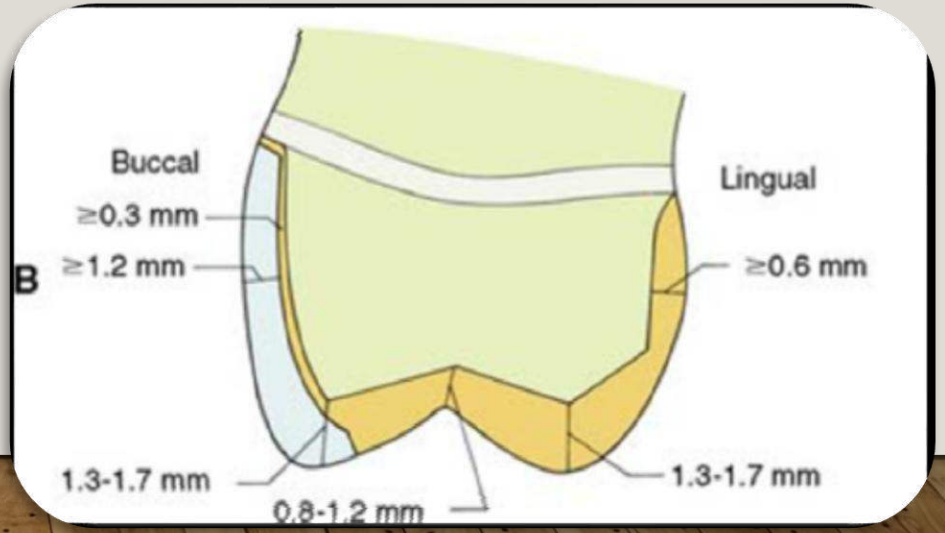
3. Similar to those of full metal crown.

Contra-indications of PFM crown

1. Teeth with large pulp (because of the possibility of pulp exposure during preparation).
2. Intact buccal wall where a more conservative retainer can be used.
3. Teeth with short crowns.
4. Patient with bad oral hygiene.

Preparation requirements:

- **A shoulder, radial shoulder, or heavy chamfer** can be used for the facial finishing line. In contrast, a **chamfer or knife-edge finishing line** is used for the **remaining surfaces** covered with metal only.



Tooth preparation of PFM crown (for anterior teeth)

Fabrication of silicone index

- The silicone index acts as a guide to check the amount of tooth structure removal.

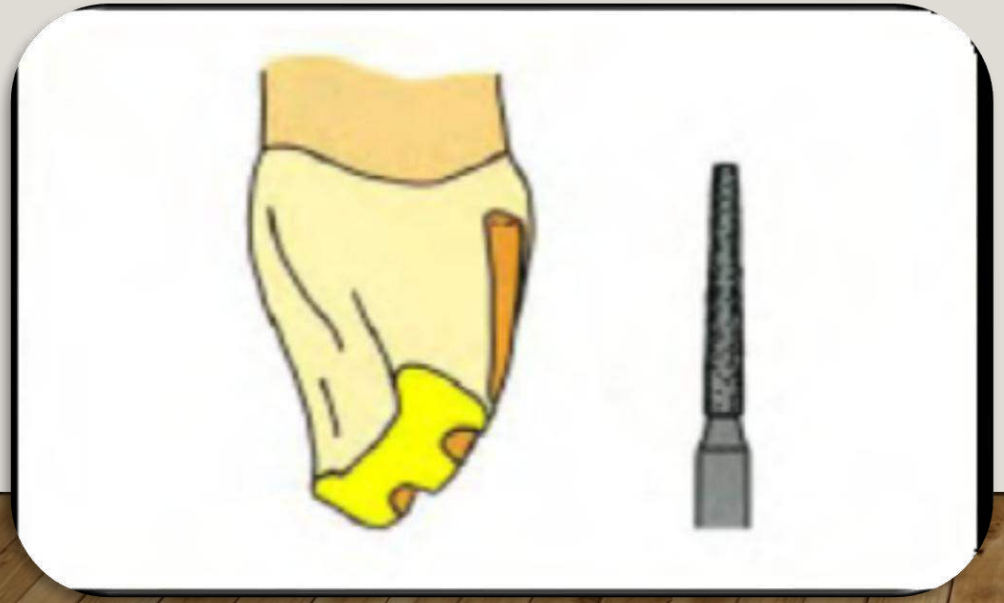




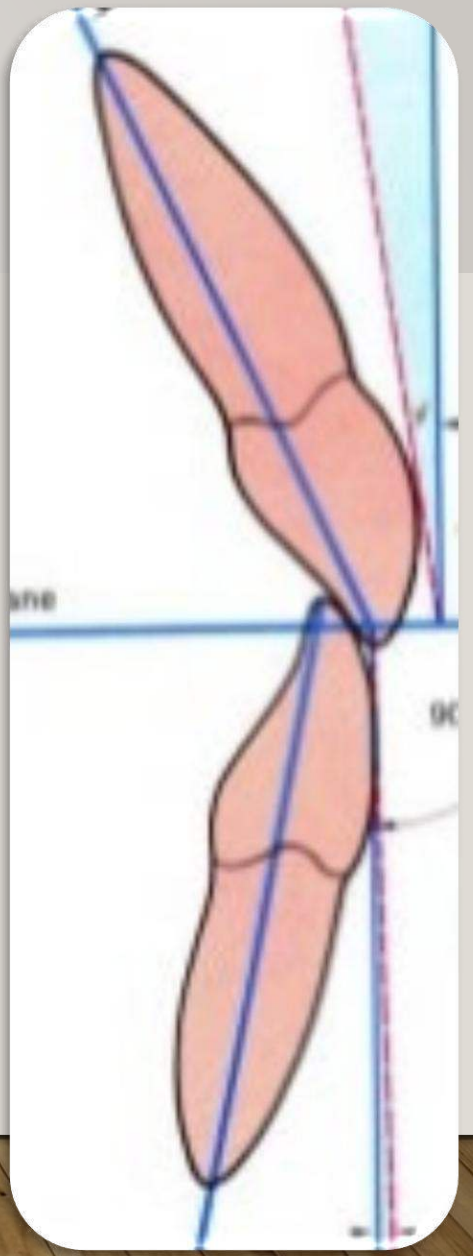


Incisal reduction

- A **2 mm** should be removed from the incisal edge for adequate restoration translucency.
- **Flat-end tapered diamond bur** is used and placed parallel to the incisal inclination (with a slight palatal inclination in the upper incisors and labial inclination in the lower incisors).

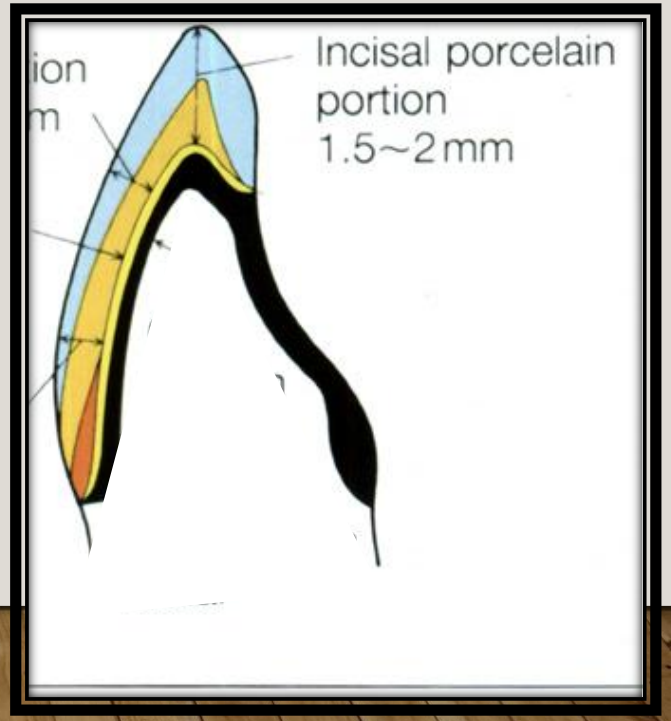






Labial reduction

- PFM crown preparation requires deep facial reduction to give enough space for metal and porcelain, thus avoiding over-contouring and poor esthetic which occur when no enough tooth structure is removed.
- The amount of labial reduction is 1.5-2 mm.



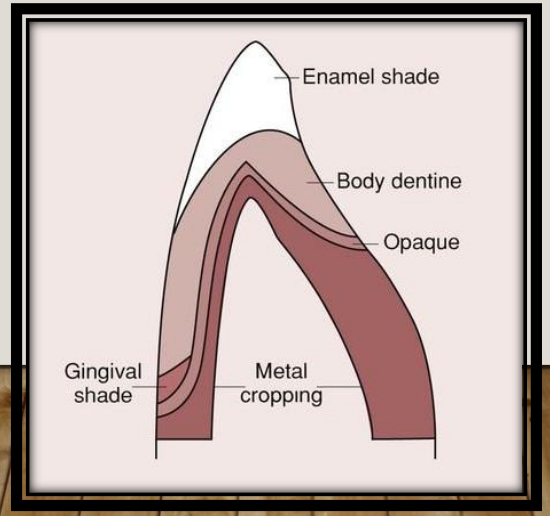
Advantages of adequate reduction (deep facial reduction)

1. The restoration will properly contour (effect on esthetic & gingival health).

2. The shade & translucency of the restoration will match that of the adjacent natural tooth.

- 0.5 mm for the metal coping.
- 1 mm for porcelain (0.2 mm opaque layer, 0.5 mm body “dentin” layer, and 0.3 mm incisal “enamel” layer).

- Because of the anatomy of the tooth labially, it should be reduced **in two planes** corresponding to the two geometric planes of the labial surface: a gingival plane and an incisal plane.

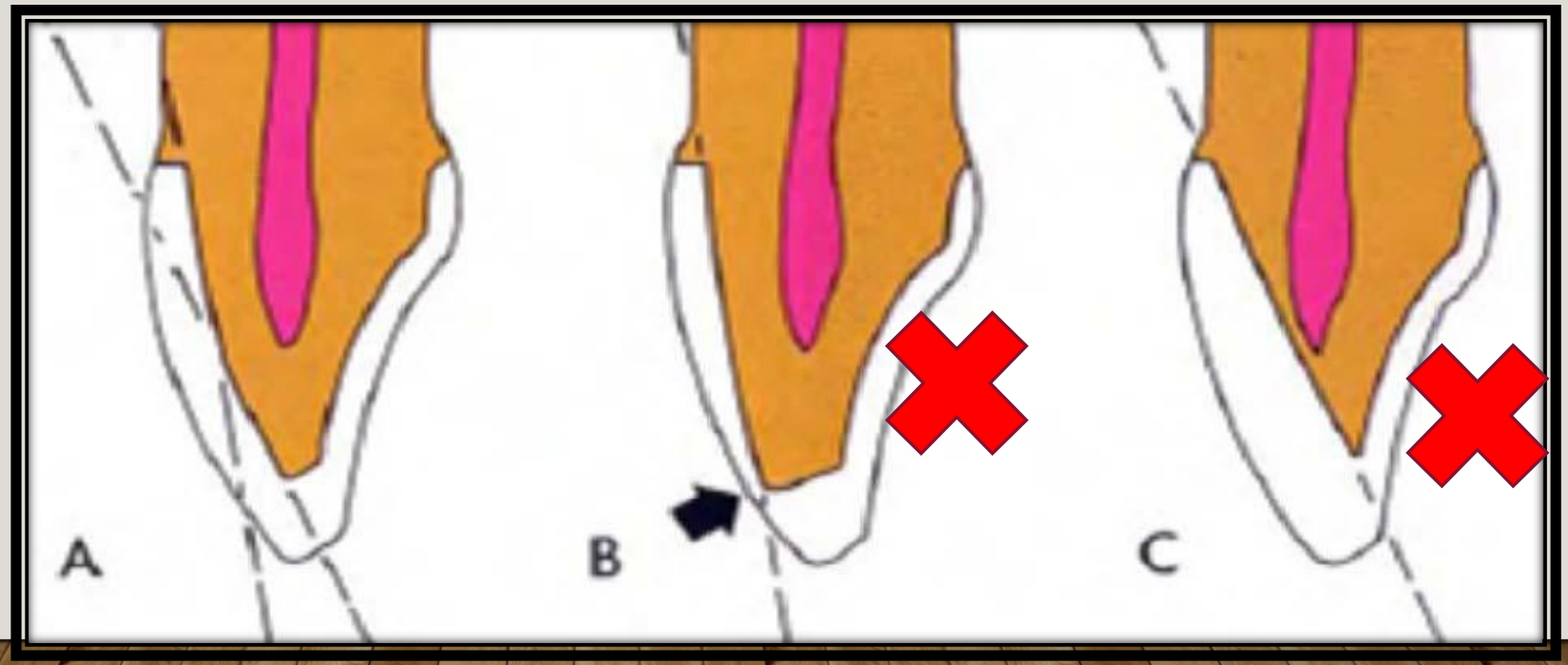


Advantages of two plane reduction

1. To follow the anatomy of the surface.

2. To avoid hitting the pulp.

3. To give enough space for the metal and porcelain layers, so that avoiding poor esthetic or over contour.

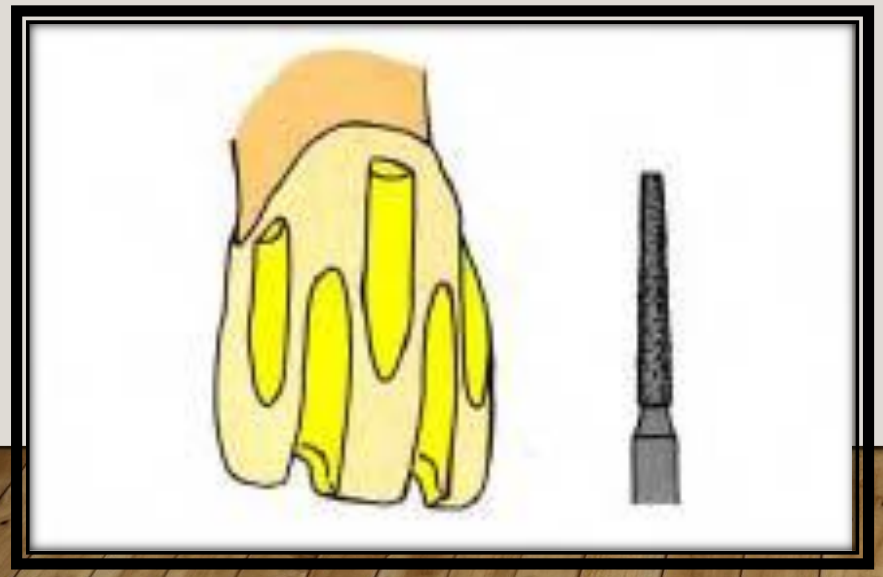


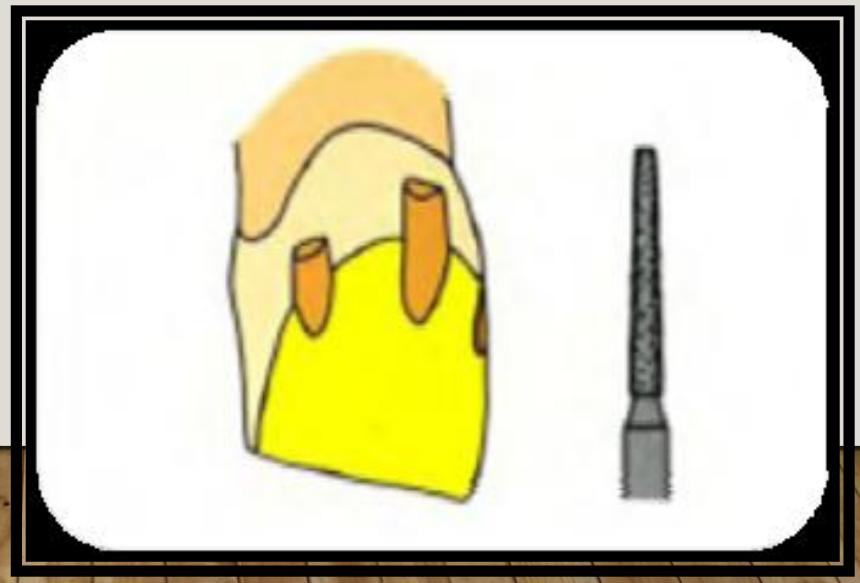
1. Incisal plane

- Three D.O.G (1.5 mm in depth) are prepared **parallel to the inclination of this area**.
- Flat-end tapered fissure bur creates a shoulder finishing line extended 1mm long to the contact.

2. Gingival plane

- Three D.O.G (1.5 mm in depth) are placed in the gingival third of the labial surface **parallel to the long axis of the tooth**.





Palatal (lingual) reduction

A. Cingulum area reduction

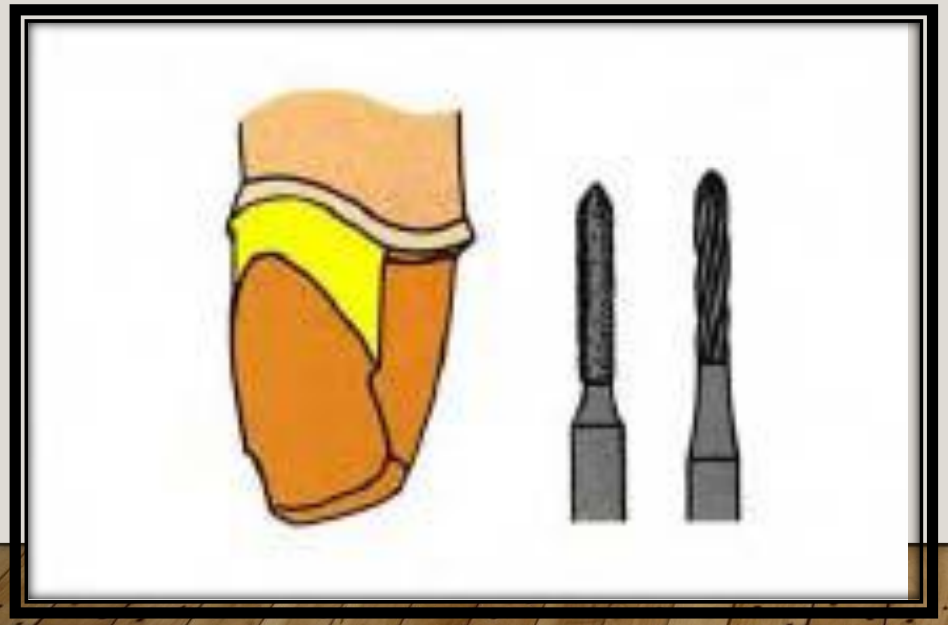
- D.O.G. with 1mm in depth is placed in the center using **a round bur 1 mm** in diameter.
- A **small wheel diamond bur** is then used to reduce this area following the concavity of this part of the tooth surface.





B. Lingual axial reduction

- D.O.G. of 1mm in depth is placed parallel to the long axis of the tooth.
- A round- end tapered fissure bur is then used to reduce this area parallel to the long axis of the tooth to create chamfer finishing line.





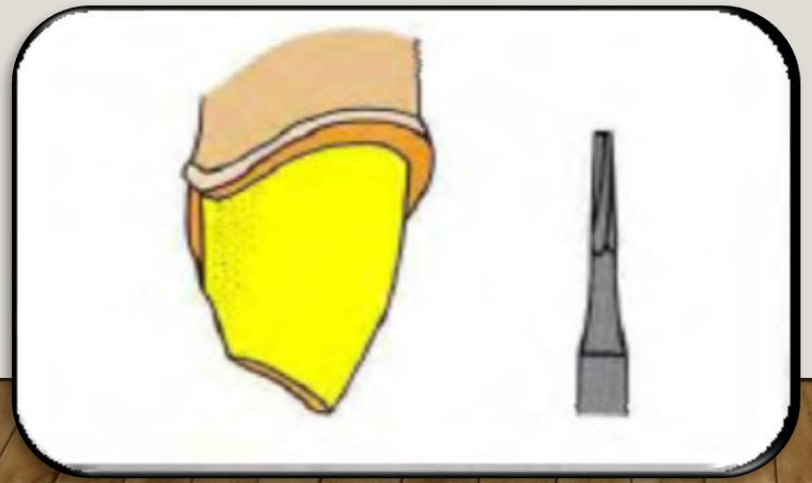




Proximal reduction

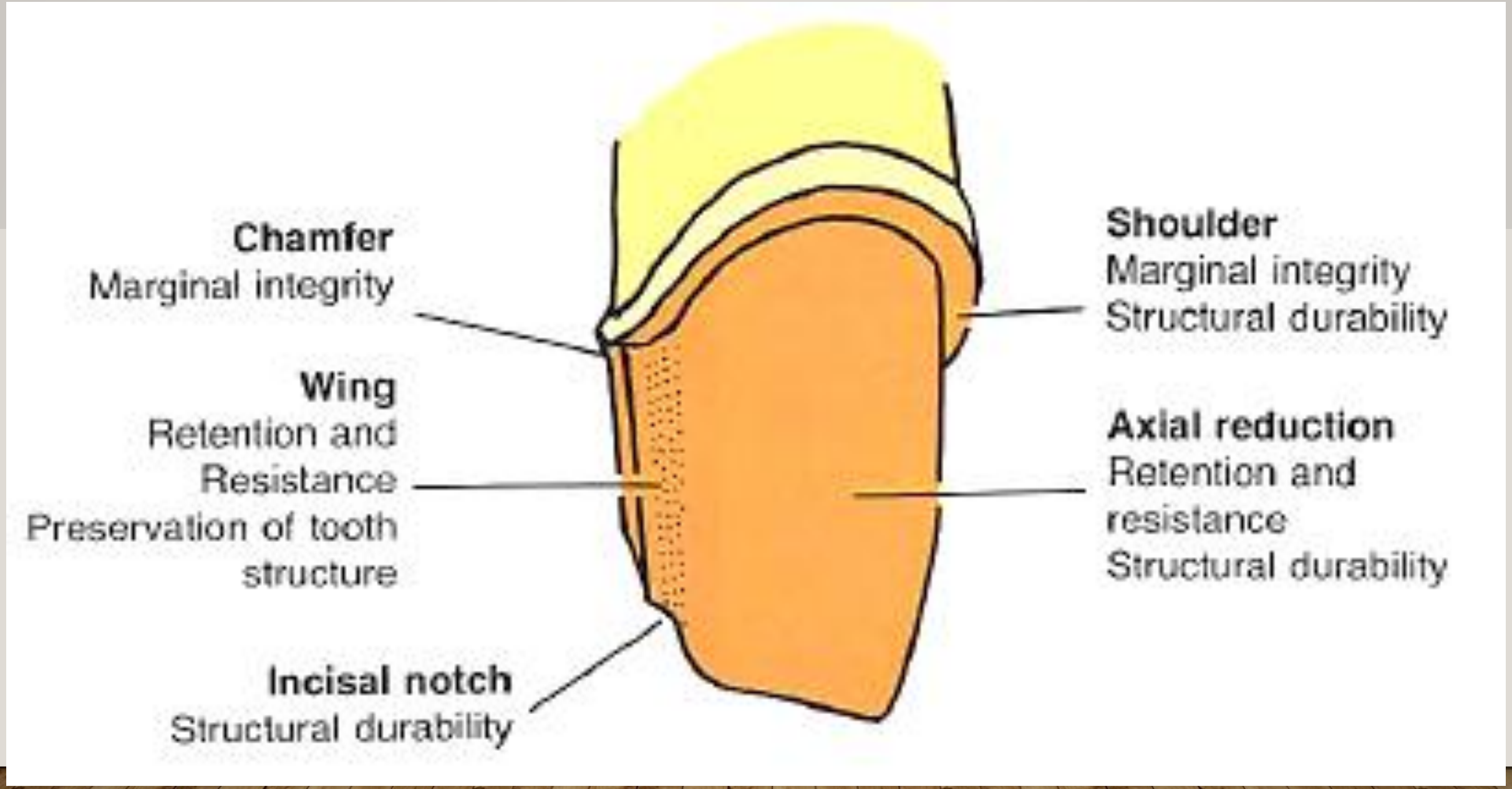
- A **pointed tapered fissure bur** (long needle) is used to open the contact with the adjacent tooth by moving the bur up and down from the palatal to the labial.
- **A round-end tapered fissure bur** is then used to create a chamfer finishing line continuous with the chamfer finishing line of the palatal surface and joining the shoulder finishing line of the labial surface at a line angle called "wing".







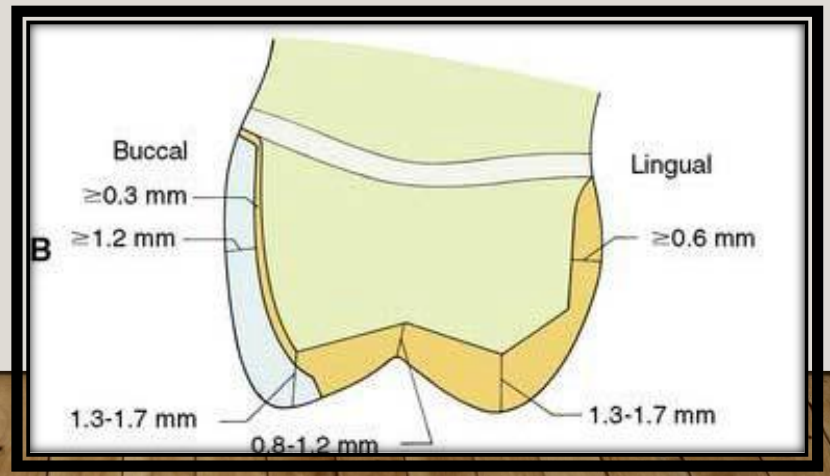



Chamfer
Marginal integrity
Wing
Retention and
Resistance
Preservation of tooth
structure
Incisal notch
Structural durability
Shoulder
Marginal integrity
Structural durability
Axial reduction
Retention and
resistance
Structural durability

Tooth preparation of PFM crown for posterior teeth

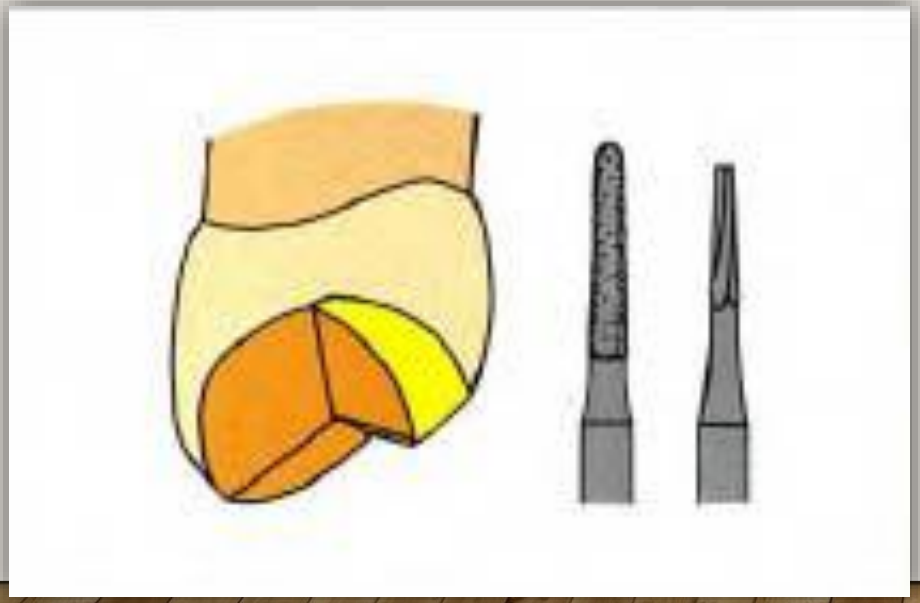
- The same principles of full metal crown preparation are used with exception of providing a deep reduction in the area that is to be covered with both metal and porcelain.
- 1.5 mm for the non-functional cusps.
- 2 mm for the functional cusps.
- 1.5-2 mm for the facial reduction.
- The same steps of PFM crown preparation for the anterior teeth are used for the posterior teeth starting with fabrication of a silicone index.

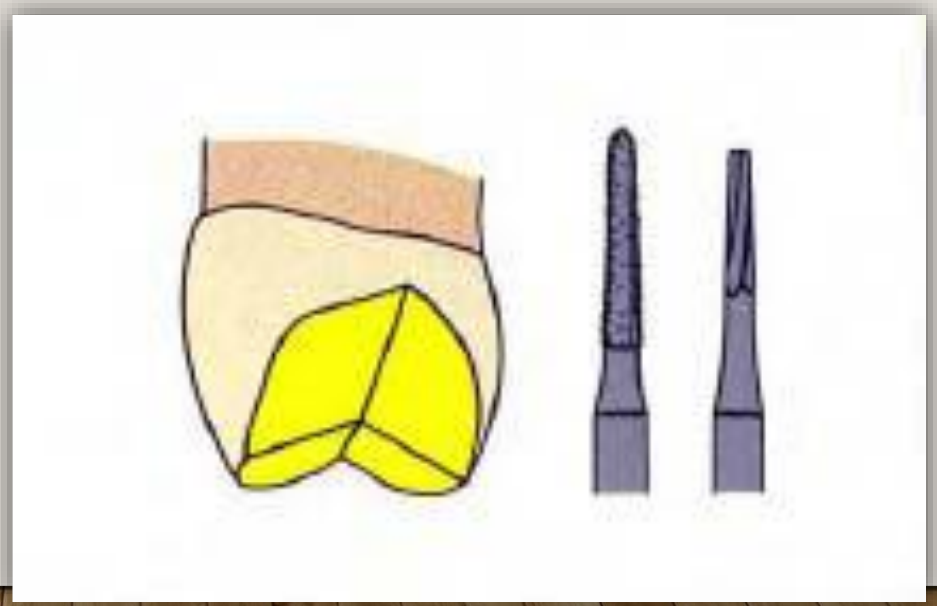


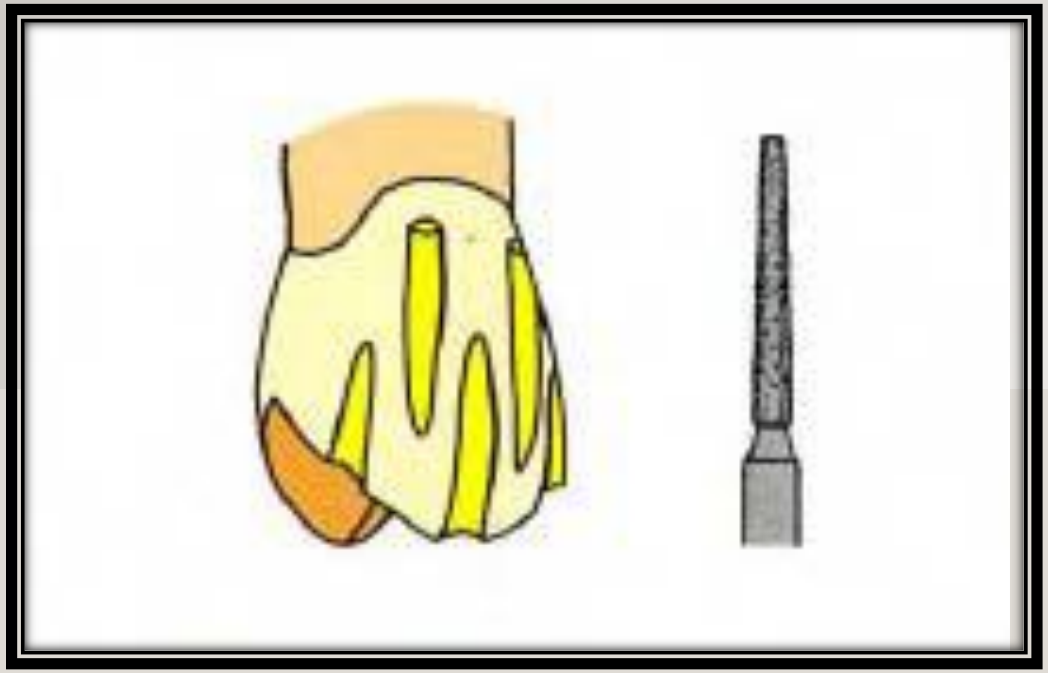


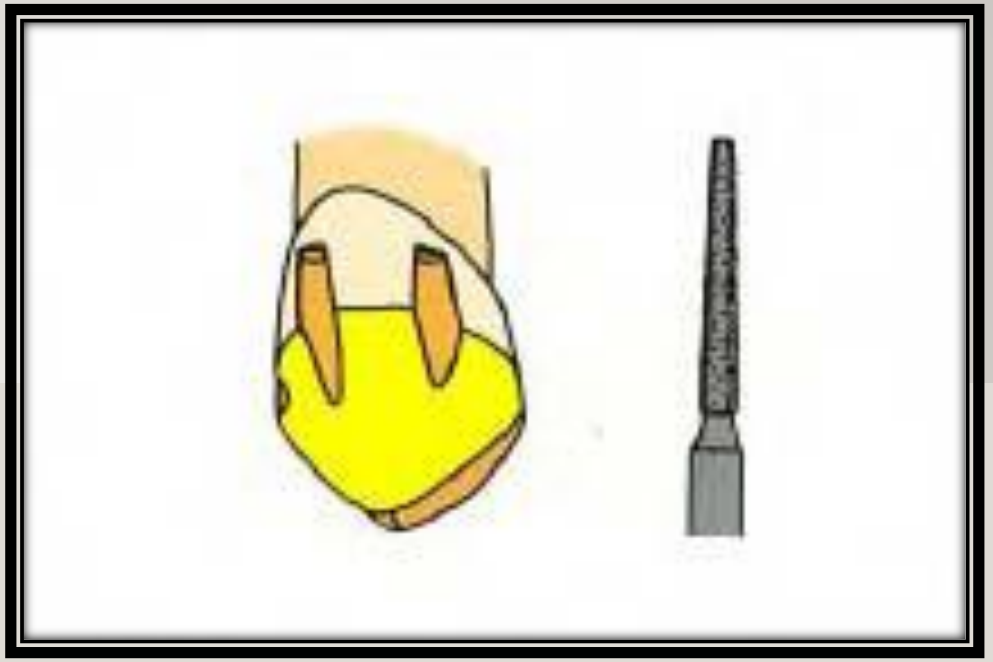


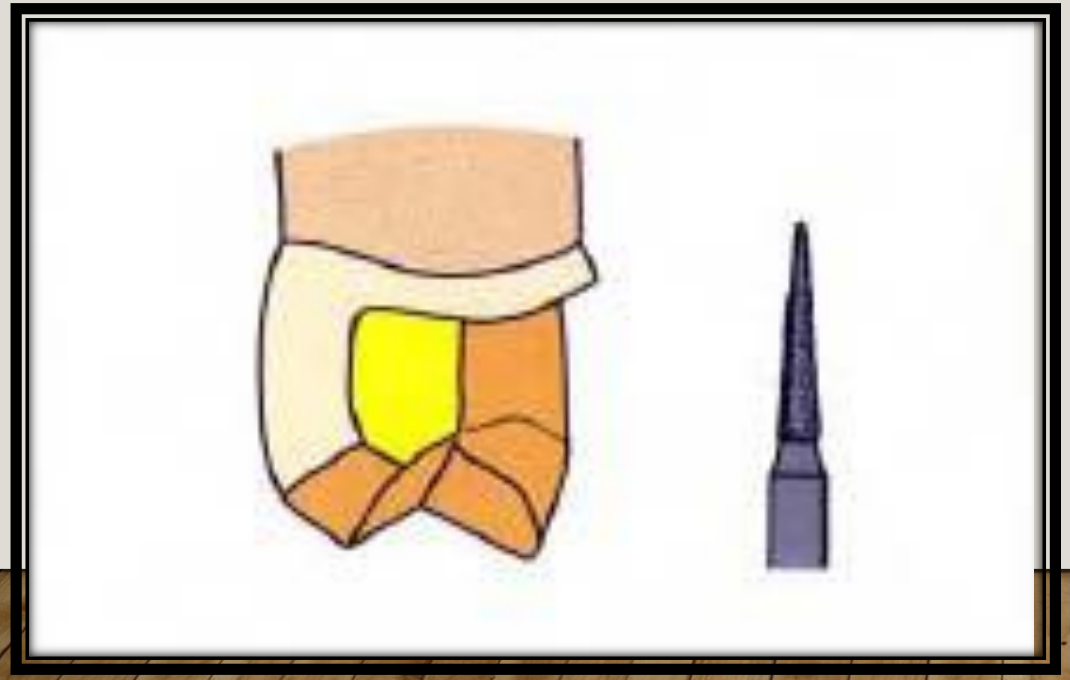


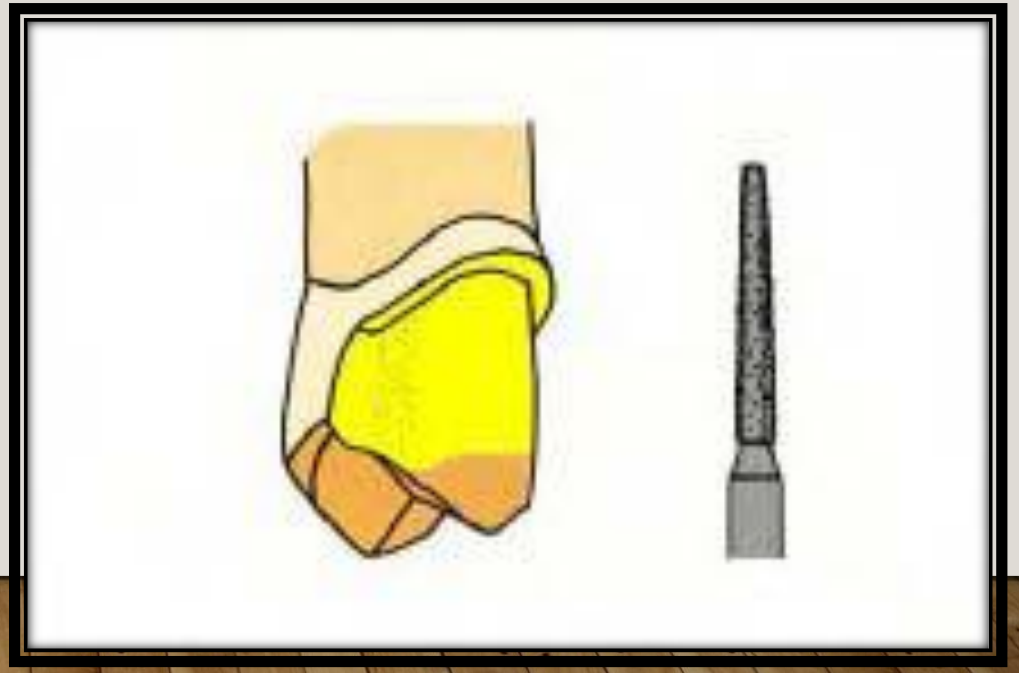


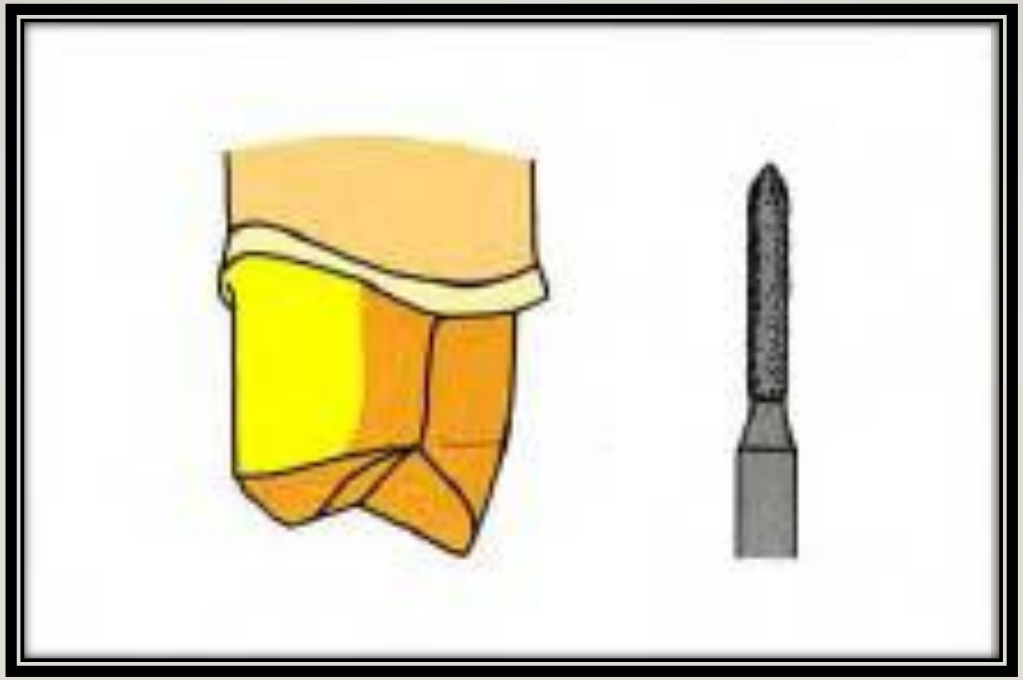






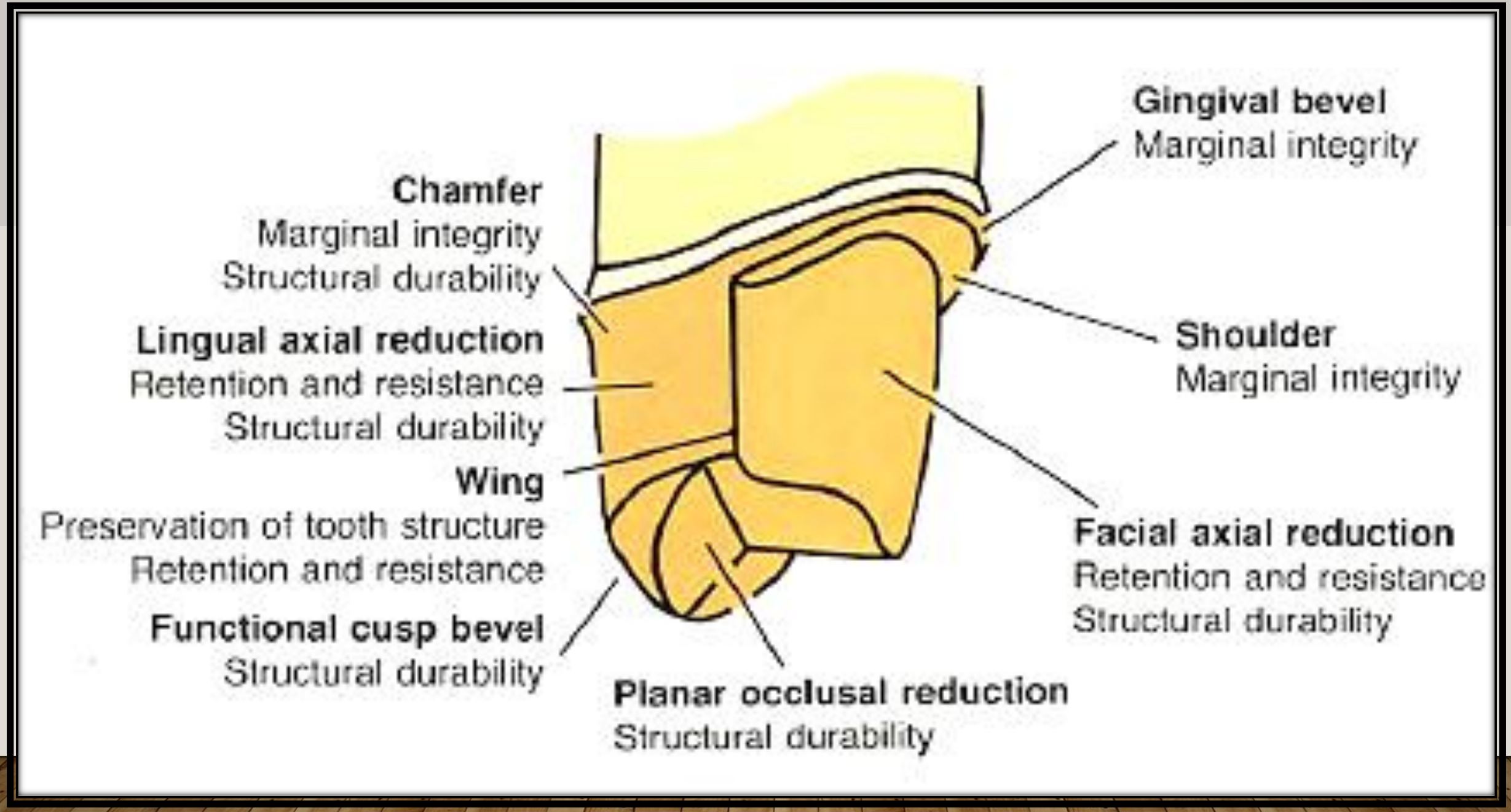











Gingival bevel
Marginal integrity
Chamfer
Marginal integrity
Structural durability
Lingual axial reduction
Retention and resistance
Structural durability
Shoulder
Marginal integrity
Wing
Preservation of tooth structure
Retention and resistance
Facial axial reduction
Retention and resistance
Structural durability
Functional cusp bevel
Structural durability
Planar occlusal reduction
Structural durability

Full metal crown with acrylic facing

- It is a full metal crown whose labial or buccal surface is covered with tooth colored acrylic resin. It has been widely used previously before the use of porcelain as a facing material, but still used nowadays due to its lower cost as compared to PFM.
- It combines the strength and accuracy of full metal crown with the esthetics of tooth-colored acrylic resin.
- It is less expensive than PFM crown.
- The preparation involves deep facial reduction to provide enough space for both metal and facing material.
- The finishing line is shoulder with bevel facially (labially or buccally) and chamfer or knife edge for the other surfaces.

The main disadvantages of this type of crown are related to the acrylic facing material, including discoloration with time, wearing, and poor compatibility of the acrylic resin with the gingival tissue.

Complete ceramic crown

(all ceramic crown)

Lecture 6

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Third stage

- The most esthetically pleasing fixed restoration.
- Because, there is no metal understructure to block light transmission, it can resemble natural tooth due to color and translucency more than any other restoration.
- Since it made entirely from ceramic substance, it is the weakest type of crown restorations (more susceptible to fracture).
- It isn't conservative type of crowns.
- it used as single restoration on upper or lower incisors.

Advantages

1. Superior esthetic.
2. Good tissue response for subgingival margins. Why?
3. Slightly more conservative of facial wall.

Disadvantages

1- Reduced strength compared to MC (PFMC).

2- Preparation is extremely critical.

3- Considered the least conservative preparation.

4- Brittle nature of the material.

5- Can be used as single restoration only

INDICATIONS

1. High aesthetic requirements.
2. Considerable proximal caries.
3. Endodontically treated teeth (endocrown)
4. Intact incisal edge. (partial veneer)
5. Favourable distribution of occlusal load

CONTRA-INDICATIONS

1- When superior strength is required; the PFMC is more appropriate.

2- Thin teeth facio-lingually.

3- Unfavorable distribution of occlusal load.

4- Insufficient coronal tooth structure for support. (Very short teeth)

5- Edge to edge occlusion.

6- Bruxism

PREPARATION REQUIREMENTS:

1. The preparation must be as long as possible to give support to porcelain.

Short prep ---- stress concentration in the lingual area ----- fracture in this area.

2. A **shoulder FL** of uniform width (**1mm**) is used gingivally to provide a flat seat to resist force directed from the incisal.

3. Incisal edge is flat and should prepare with a slight inclination toward the lingual. , for the lower labial inclination.

4. All sharp angles of preparation should be rounded to reduce the danger of fracture by point of stress concentration.

5. It should be avoided on teeth with edge-to-edge occlusal relation.

6. The occlusion on all-ceramic crowns is critical for avoiding fracture. Centric contacts are best confined to the middle third of the lingual surface.

Preparation steps

Before tooth reduction, a silicon index is constructed.

A. Incisal Reduction

- Complete reduction of the incisal edge should provide 1.5 - 2mm of clearance for porcelain in all mandibular movements.
- **Flat-end taper diamond bur** is used, placed parallel to the incisal inclination. (For post. Teeth 2mm. occl clearance is needed ion all cusps).

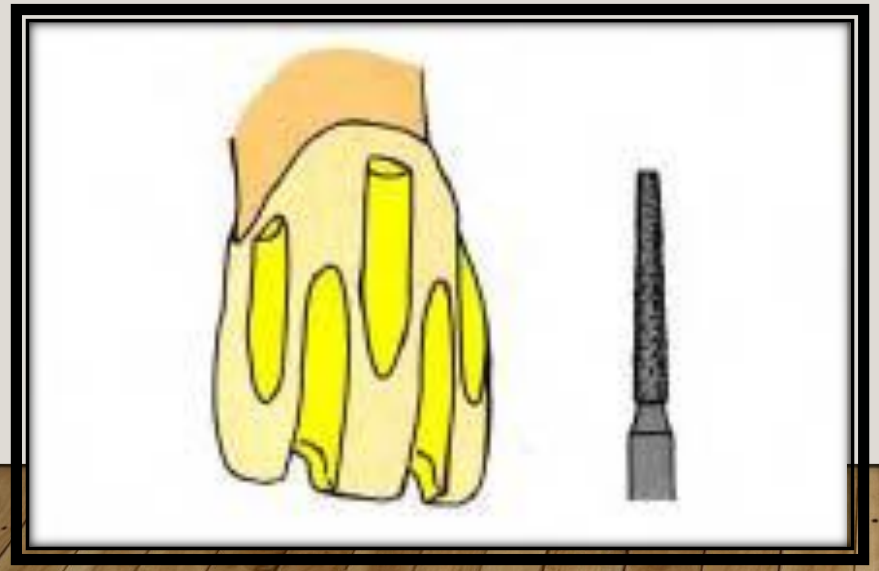
1. Depth orientation grooves (D.O.G.) 1.3 mm in depth are made on the incisal edge using a flat-end tapered fisher bur, parallel to the incisal inclination of the prepared incisal edge

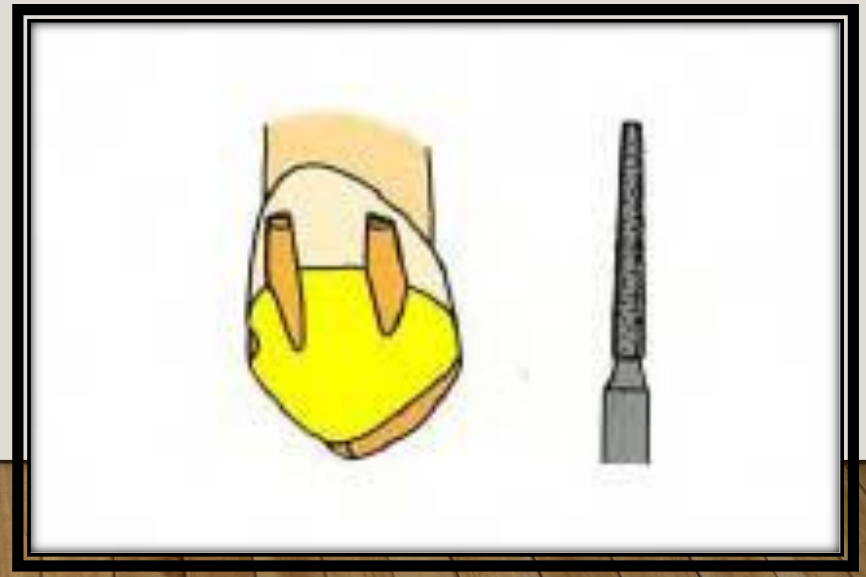
2. Any tooth structure between D.O.G should be removed using the same bur at the same angle. (1.5 mm)

3. Incisal clearance then checks in centric & eccentric occlusal relations

B. Labial (facial) reduction

- **Two planes** reduction; the anatomy of the tooth labially should be reduced into two planes corresponding to the two geometric planes of the labial surface gingival plane and the incisal plane.

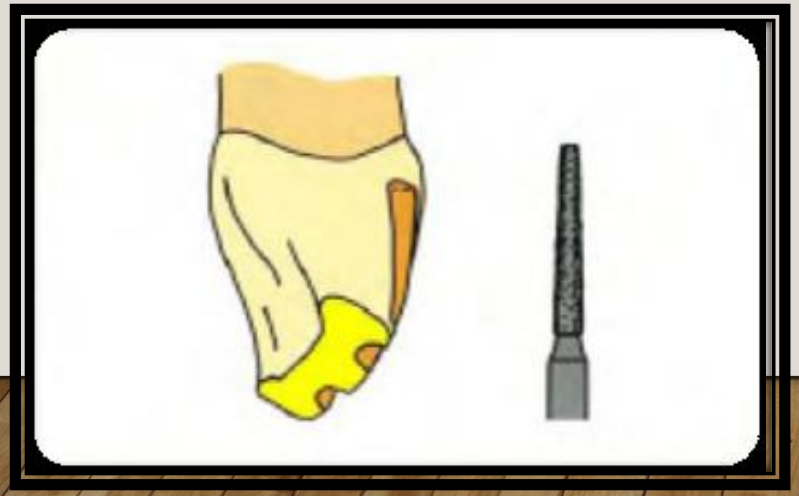




1. Incisal plan

1. Three D.O.G. (1mm.) are placed, the angle of these grooves should be parallel to the inclination of this area.

2. Any tooth structure between D.O.G were removed following the contour of the tooth (keep the bur at the same angle)





2. Gingival plan

1. D.O.G.(1mm) are placed in a gingival part of the lingual surface parallel to the long axis of the tooth.
2. Any tooth structure between D.O.G should be removed using flat end T.F.B to create shoulder F.L.

C. Lingual reduction:

Similar to PFM but with a deeper reduction (1mm)

1. Cingulum area reduction:

- D.O.G. of 0.8 mm placed in the center.
- **A small wheel diamond** is used to reduce this area.

2. Lingual axial reduction:

- D.O.G. of 0.8 mm placed parallel to the long axis of the tooth.
- Flat-end T.F.B. is used to reduce this area using the same angle (to create shoulder F.L.).

4. Proximal reduction.

- Preparation of the proximal surfaces is done **in the same manner as in the full metal crown preparation**.
- Silicon index can be used now to check tooth reduction.
- Smoothing of the preparation finally to remove any sharp angle.

Types of finishing lines used for PJC (all ceramic crown)

- **Shoulder or Radial Shoulder** has been advocated as a gingival finishing line to be used with PJC.
- The depth and contour of the shoulder are established with the tip of **flat end tapered fissure bur.**
- Sharp angles should be rounded to avoid the creation of a point of stress concentration.

Acrylic jacket crown (AJC)

- It is made from tooth-colored **acrylic resin**; it can be nearly perfect in appearance when fitted, but discoloration and loss of contour take place.
- **Poor adaptation** is a great disadvantage of acrylic crowns (Coefficient Thermal Expansion).
- It is used in the treatment of young patients for whom other types of crown restoration are planned, but delayed until the complete eruption of the tooth.
- It is used as a **temporary crown restoration.**
- The preparation of the tooth is the **same as that for PJC.**

Disadvantages;

1. Poor marginal fitness.
2. Poor tissue response.
3. Discoloration with time.
4. Loss of contour (wear easily).


THANK
YOU

Quiz

1. A _____ finishing line is the **most conservative** type.

2. **Shoulder finishing line** is prepared by ____ bur.