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FULL GOLD CROWNS

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CONTENTS

INTRODUCTION

Full metal crown is a full crown covering all axial surfaces of the tooth as well as the occlusal surface and made of metal. It is one of the most commonly indicated crown restorations for posterior teeth. Because it made of metal, it should be used when the patient doesn’t mind the appearance of metal or when esthetic is not a factor. It can be used as a single unit or as a retainer for a F.P.D, especially when we have a small abutment tooth with long span edentulous area to overcome the occlusal forces and prevent bridge displacement.

TYPES OF CROWNS

The choices of restoration can be described by;

- The dimensions and percentage coverage of the natural crown
  - Full crowns
  - ¾ and ⅞ crowns
- Material to be used
  - Metal
  - Metal- ceramic crowns
  - Full ceramic crowns
- Full metal crowns are entirely cast in a metal alloy. The American Dental Association categorises alloys in three groups
  - High noble alloys
  - Noble alloys
  - Base metal alloys

- Noble and high noble alloys used in casting crowns are generally based on alloys of gold . Gold is not used in its pure form as it is too soft and has poor mechanical strength.
- Other metal included in gold alloys are copper,platinum,palladium,zinc,indium and nickel.
- All types of gold casting alloys used in fabricating crowns are categorised by their percentage of gold and hardness,which are as follows
    - Type 1 - softest
    - Type 2-
    - Type 3- 62-78%
    - Type 4- 60-70%
- Generally type 3 and type 4 are used in casting of full gold crowns,as these are hard enough to withstand occlusal forces.

- Base metal alloys- cast base metal alloys are rarely used to make full metal crowns.they are more commonly used as a part of metal-ceramic crowns as bonding alloys. When compared to high noble and noble alloys ,they are stronger and harder,they can be used in thinner sections (0.3mm as opposed to 0.5mm) however they are harder to adjust and are more likely to cause excessive wear on opposing tooth. Furthermore there are most likely to cause nickel allergy.
- Common base metal alloys used are-
    - Silver palladium
    - Silver - palladium - cooper
    - Nickel- chromium
    - Nickel - chromium -beryllium
    - Cobalt - chromium
    - Titanium

Indications

- Teeth that exhibit extensive coronal destruction.
- On non - esthetic zone teeth with extensive coronal destruction. Short clinical crowns.
- Retainer for a long span fixed partial denture.
- On endodontically treated teeth.
- In case of generalized attrition where vertical dimension is reduced

Contraindications

- If treatment objectives can be met with a more conservative restoration.
- Extensively restored or vicariously involved teeth within the esthetic zone.

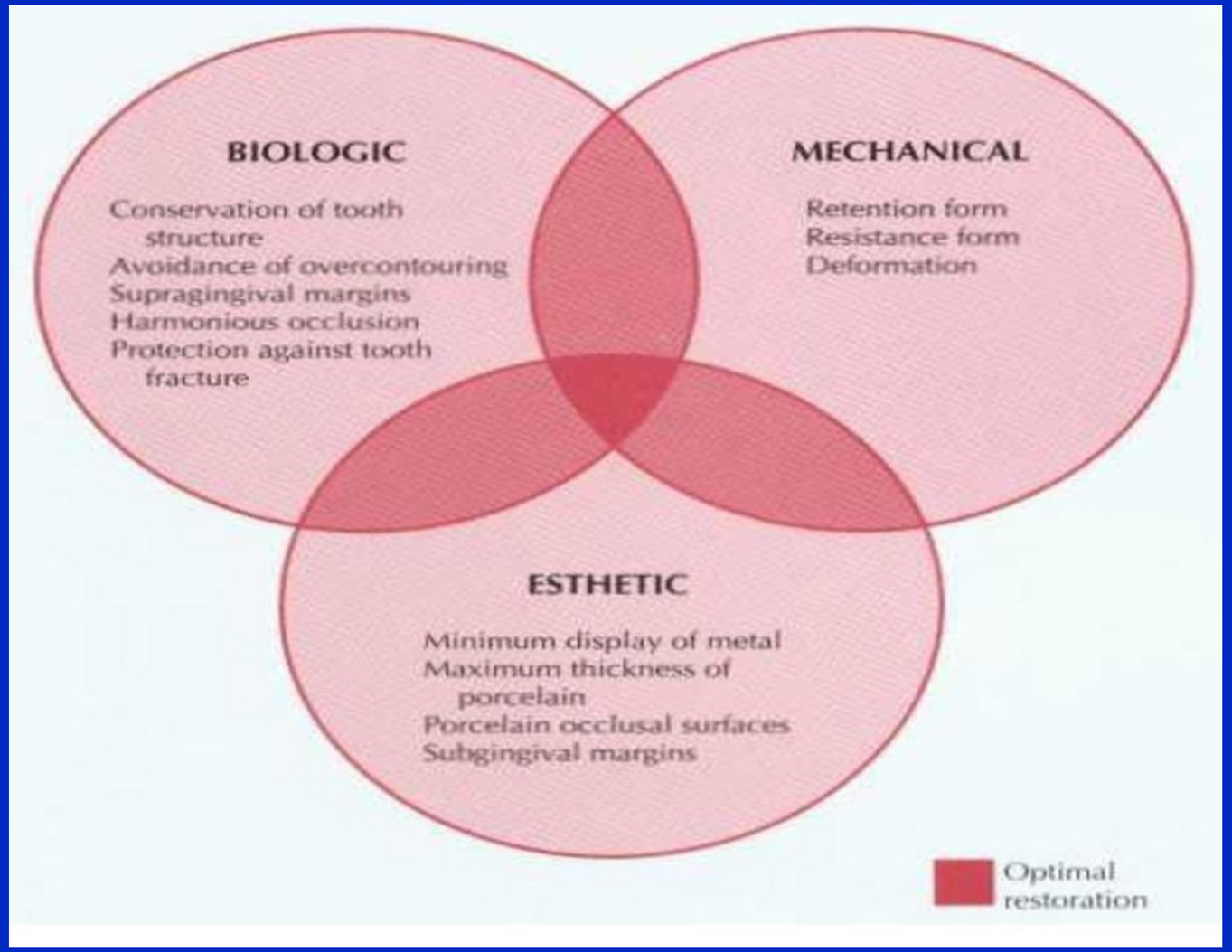
Advantages

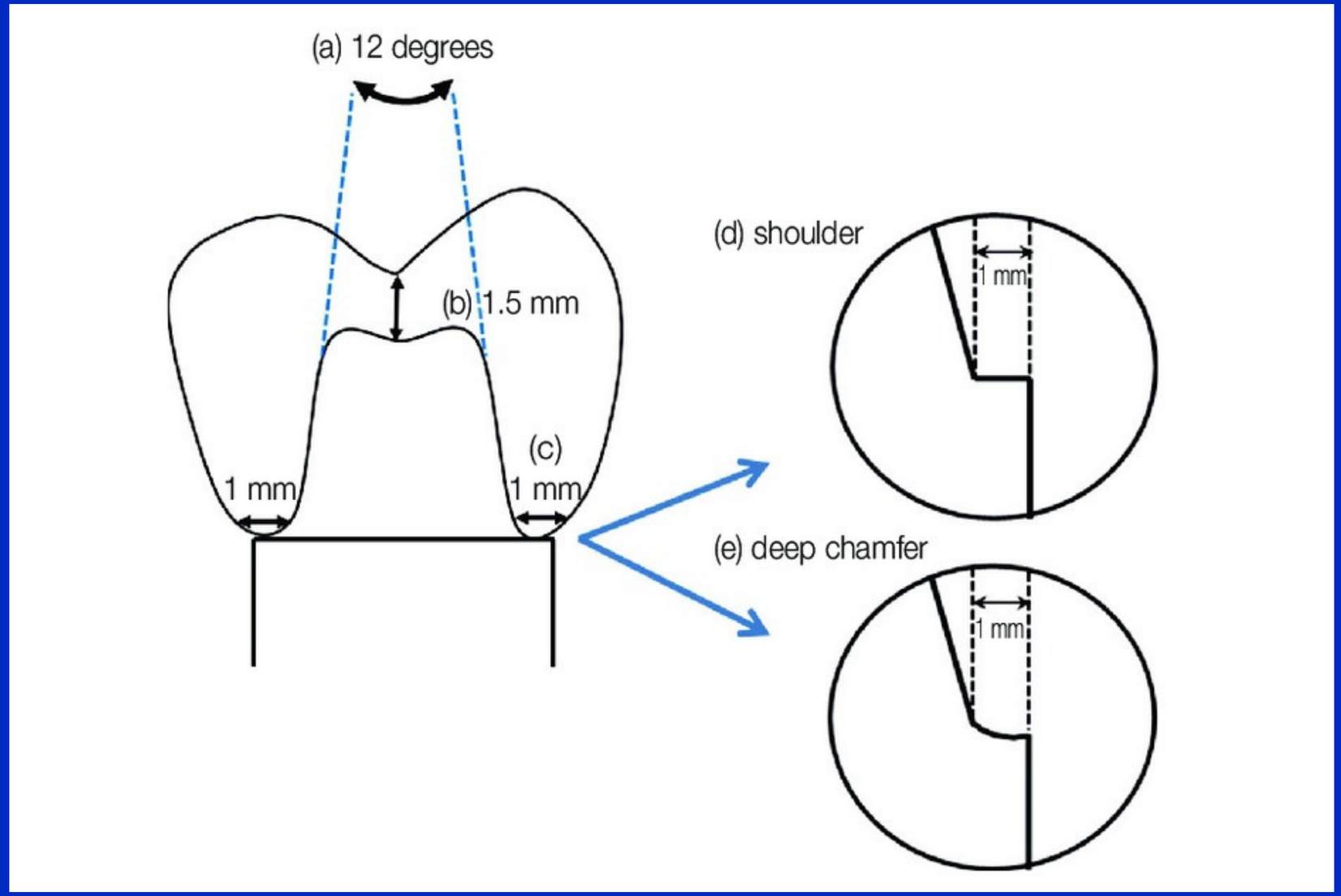
- Greater retention and resistance than a more conservative restoration. Strength is superior to that of other restoration.
- Permits easy modification of the occlusion.
- Protects the coronal integrity of a natural tooth which is compromised by restorations.
- They (FGC) also have similar wear properties to enamel ,so they are not likely cause excessive wear to the opposing tooth.
- They have good dimensional accuracy which minimises chair side/ appointment time and can be relatively easy to polish if any changes are required.

Disadvantages

- It is no longer feasible to perform electric vitality testing of the abutment tooth.

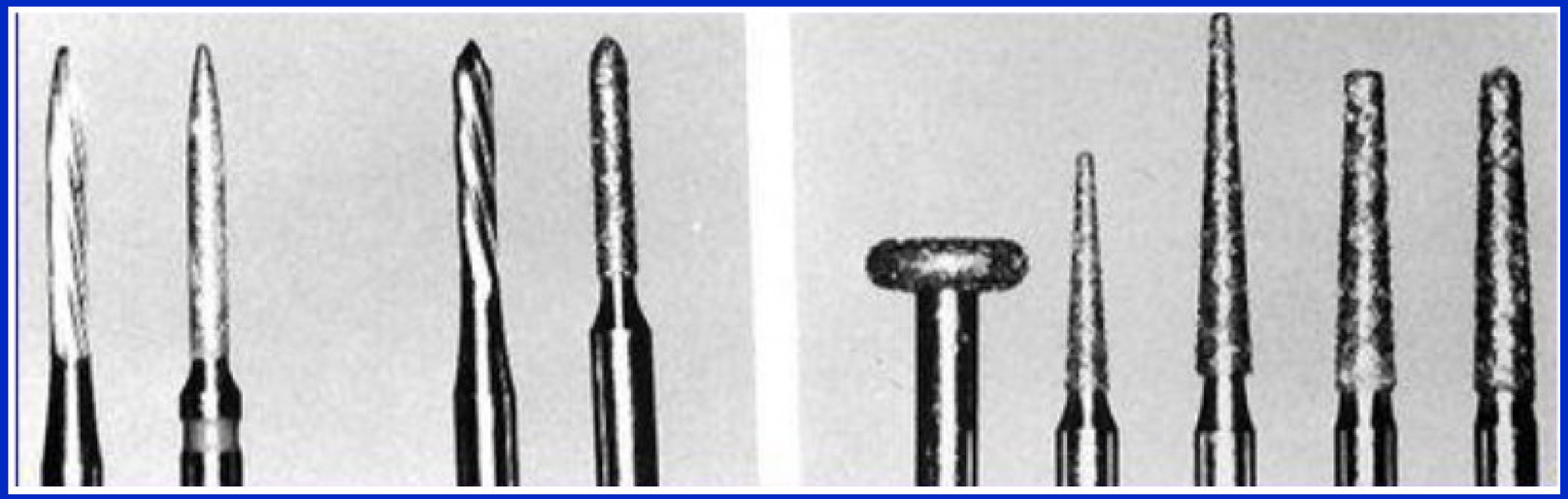
PRINCIPLES OF TOOTH PREPARATION




(a) 12 degrees
(b) 1.5 mm
(c)
1 mm
1 mm
(d) shoulder
1 mm
(e) deep chamfer
1 mm

ARMAMENTARIUM

- Airotor handpiece
- Round-end tapered diamond
- Short thin tapering/needle diamond Chamfer diamond/torpedo diamond/bur Baseplate wax sheet - 2mm thick



CRITERIA	DESCRIPTIONS	CORRECT ANSWER
Finish Line	If the finish line even throughout?	Yes
	Lingual: Would you classify the finish line as Chamfer?	Yes
	Buccal: Would you classify the finish line as Shoulder?	No
	Facial: Depth of finish line (Axial Reduction)	0.5-1mm
	Lingual: Depth of finish line (Axial Reduction)	0.5-1mm
Margin	Is the margin supragingival?	Yes
	Is your margin parallel to the marginal gingiva?	Yes
Occlusal reduction	Is the occlusal surface anatomically reduced?	Yes
	Is the occlusal surface flat?	No
	Is the occlusal surface under-reduced?	No
Functional cusp bevel	Is there a bevel on the functional cusp?	Yes

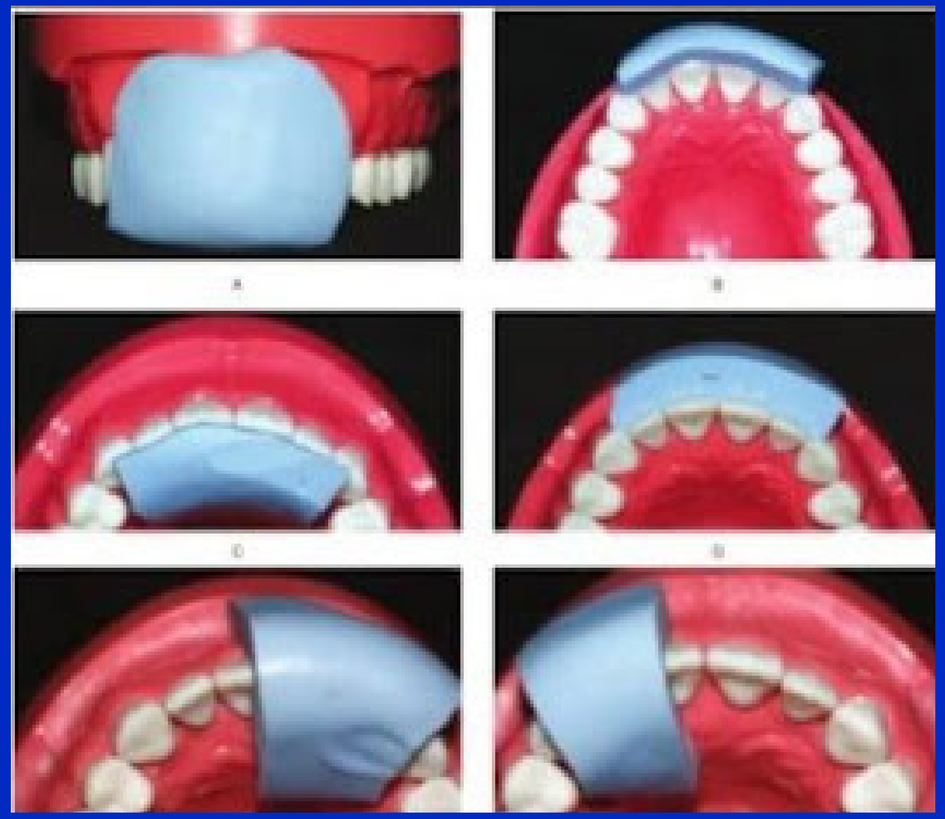
CRITERIA	DESCRIPTIONS	CORRECT ANSWER
Occlusal Clearance	Is the occlusal clearance adequate?	1-1.5mm
Taper	Facial View: How much is the taper of the crown?	6-12 degree
	Proximal View: How much is the taper of the crown?	6-12 degree
Proximal Clearance	Is proximal clearance present both mesially and distally?	Yes, 0.5-1mm
Path of insertion	Can you see a uniform outline around the tooth?/ Undercuts are absent?	Yes
Finish	Rounded angles/edges	Yes
	J-shaped margins	No
	Adjacent tooth damage	No
	Adjacent soft tissue damage	No
	Burn marks	No

PREPARATION OF PUTTY INDEX

- Elastomeric putty impression material is kneaded with its catalyst paste/activator and adapted over the tooth to be prepared, covering the entire tooth structure and at least one adjacent tooth.
- Then, index is removed once set, and cut into a labial and lingual half with a BP blade.
- Each of this is again divided into an occlusal and gingival half.
- Once tooth preparation is completed, the index is used to verify the amount of reduction.

CLINICAL RELEVANCE

As with any fixed prosthodontic procedure, you should always have a diagnostic cast to visualize your planned procedure. The silicone matrix will guide us during preparation as well as help us determine the adequacy of tooth reduction. Take note that in some instances, silicone matrix may not be the best technique to use to evaluate the preparation. Other techniques, like using a vacuum-formed matrix may be more practical especially on teeth that are tilted, rotated or deviated from normal position.



TOOTH PREPARATION FOR MANDIBULAR MOLAR

Steps

- Occlusal reduction
- Axial reduction
- Proximal reduction
- Finishing
- Buccal seating groove

RESIN MATRIX

A. **Occlusal Surface Reduction**

The goal of occlusal reduction is to provide 1.0-1.5 mm uniform reduction of occlusal surface and following the contour of the tooth. This can be accomplished with the help of depth grooves.

1. With the round-end tapered diamond bur, place the depth grooves in the following areas:

a. primary development grooves .

b. crest of the triangular ridges.

2. Orient the bur parallel to the inner inclines.

3. With the sweeping movement, proceed to remove occlusal tooth structure to the predetermined depth by removing the islands of tooth structure between depth grooves.

4. Follow the up and down contours of the ridge and cusps inclines a. Occlusal morphology is never flat. b. Achieve Occlusal Planar Reduction-occlusal reduction following the planar contours of the tooth as they are presented pre-operatively.

5. Verify the uniformity & the amount of occlusal reduction .This can be done either by:

a. The silicone putty matrix.

b. Articulating the maxillary and the mandibular arch.

c. A softened piece of wax .

Clinical relevance

The amount of tooth structure removal including the amount of occlusal reduction depends on the type of restoration. For FGC, 1.0 mm on non-functional, and 1.5mm on functional cusps reduction should be adequate to provide adequate space for the metal thickness without interfering with occlusion.

- A buccal seating groove is finally placed in the buccal surface of the lower molar.
  - The advantages of placing a seating groove are;
  - It acts as a guide during the placement of the crown.
  - It prevents the rotation of the crown by increasing the resistance.
  - It improves the retention.
  - Depth of preparation: 1 mm

Rotary instrument: 171L bur / flat-end Tapering diamond is used

Procedure:Placed in the centre of the facial surface parallel to the

B. **Buccal and Lingual Surfaces Reductions** (axial reduction)

The goals of Buccal and Lingual reductions are to remove adequate amount of teeth structures to

(1) remove the natural undercut contour of the tooth and

(2) achieve 6 degrees total occlusal convergence.

With round-end tapered diamond bur, place the depth grooves in the following areas of the Buccal surface and extend apically upto 1.0 mm to the margin of the gingiva (The tapering diamond half sunk in will reduce 1 mm occlusally and 0.5 mm cervically)

a. development groove(s)

b. line angle(s)

- Orient the bur at 3 degrees from the long axis of the tooth.
- With the sweeping movement, proceed to remove the buccal tooth structures at a predetermined depth by removing the islands of tooth structure between depth grooves.

- Make sure you remove all the natural undercut on unprepared tooth
- Re-orient your bur angulation to reduce the second plane of the buccal surface.
- Follow the outline of the unprepared buccal contours. Verify the uniformity and the amount of buccal reduction (Fig. with the silicone putty matrix.

- Repeat the same procedure on the lingual surface making sure that the orientation of bur is at 3 degrees and extending the reduction apically upto 1.0 mm to the margin of the gingiva. There is, however, no second plane for the lingual surface.

Verify the removal of undercut and the amount of lingual reduction by:

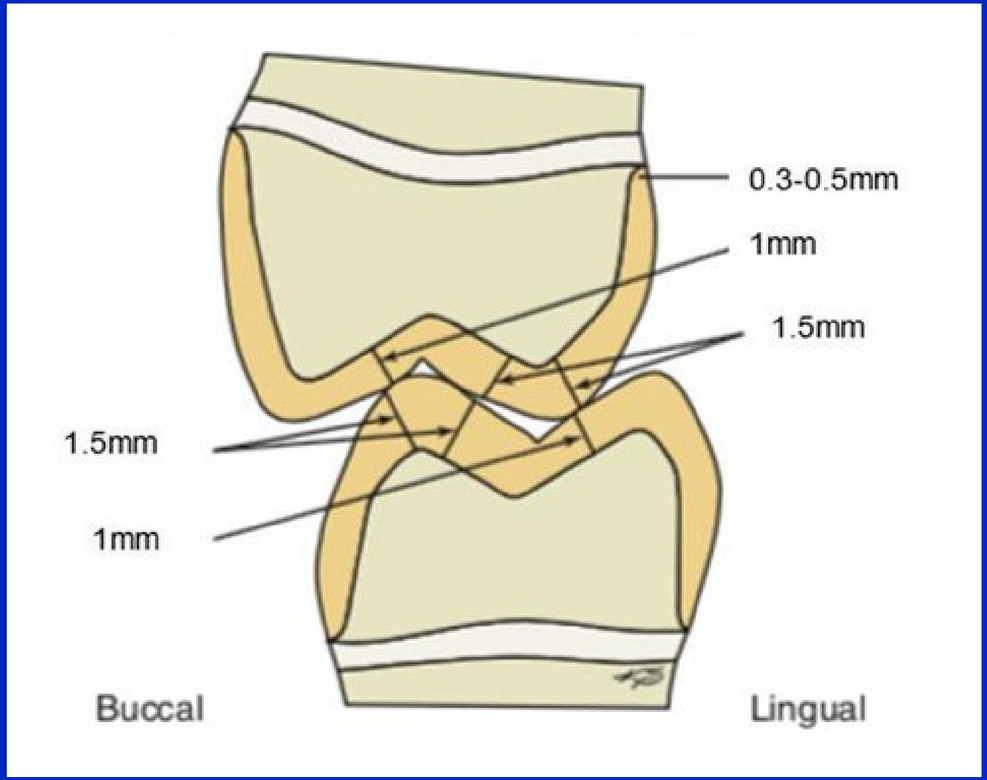
a. The silicone putty matrix.

At this point we can begin developing our cervical margin by extending apically the margin from 1.0 mm to 0.5mm above the margin of the gingiva. The margin configuration is chamfer. However, completion of the cervical margin preparation can be done after reduction of all axial surfaces of the tooth.

Proximal surface reduction -The goals of proximal reduction are to
(1) eliminate proximal contact with the adjacent teeth, and
(2) create sufficient convergence to the occlusal surface.

- Initial proximal cuts can be made with a smaller diameter round-end tapered diamond bur/short thin needle bur.
- In a ‘sawing motion’ the thin diameter diamond bur is worked through the proximal area in occluso-gingival and bucco lingual direction it can be done on both mesial and distal surafces.
- Avoid contact with the adjacent teeth.
- Once sufficient maneuvering room has been obtained, use the larger diameter round-end diamond bur to plane the walls and extending apically forming the chamfer margin at 0.5mm above the margin of the gingiva.

- Maintain the taper of each surface at 3 degrees.
- Verify the uniformity and the amount of proximal reduction by visually examining the 3 degrees taper, the 0.5mm chamfer margin and absence of tooth contact on the adjacent teeth.

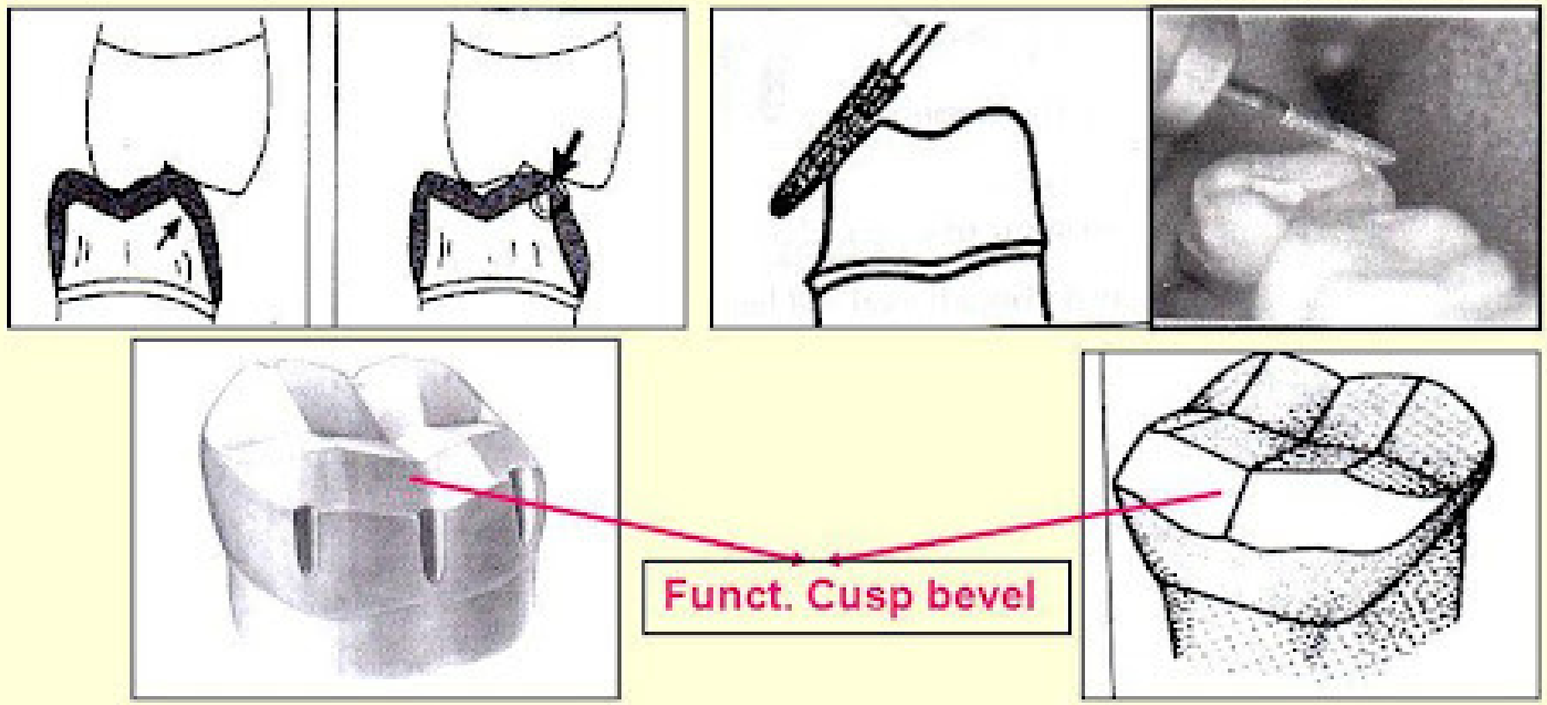


Functional cusp bevel- The goal of functional cusp bevel is to reduce further the cuspal height by 0.5 mm on the functional cusp to provide adequate thickness of the restorative material on the area of significant functional loading.

- Using the round-end tapered bur, depth grooves are placed at 45 degrees to the long axis of the tooth at the line angle created between the second plane of the buccal surface & occlusal surface.
- With the sweeping movement, proceed to remove tooth structure to the predetermined depth by removing the islands of tooth structure between depth grooves.
- Follow the up and down contours of the cusp heights.
- A wide bevel should have been created on the area.

Functional cusp bevel in the mandibular molars → buccal cusps

Functional cusp bevel in the maxillary molars → palatal cusps



Margin Preparation The goal of margin preparation is to establish a visible termination of the preparation that provides a definite finish line configuration. A chamfer configuration is required for FGC. The dimension is 0.5 mm and is placed 0.5mm supragingival all around the cervical area of the prepared tooth.

- With a depth of 0.5mm, placed the round-end tapered bur 0.5 mm above the margin of the gingiva and define the rough removal of teeth structure previously performed along the cervical margin of the tooth.
- Follow the contour of the margin of the gingiva.
- Remove any rough and uneven surface along the margin.
- Assure a smooth, even, definite chamfer margin

Finishing The Preparation The goals of finishing the preparation are to

1.establish a smooth preparation devoid of irregularities.

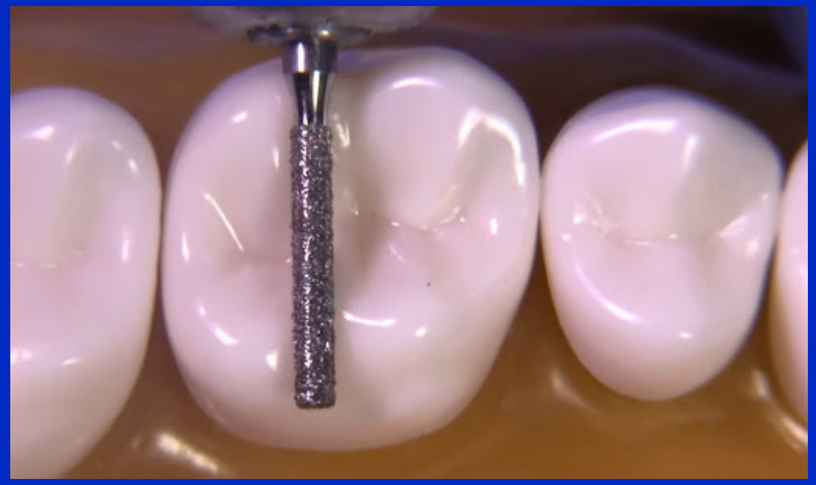
2.establish a well-defined and smooth margin configuration.

- With the round-end tapered bur, smoothen all the axial surfaces of the preparation particularly removing all irregularities
- Round off all the sharp corners and areas.
- For the margins, use the round-end tapered finishing bur (fine-grit), to remove surface irregularities and provide smooth and well-defined margin finish .

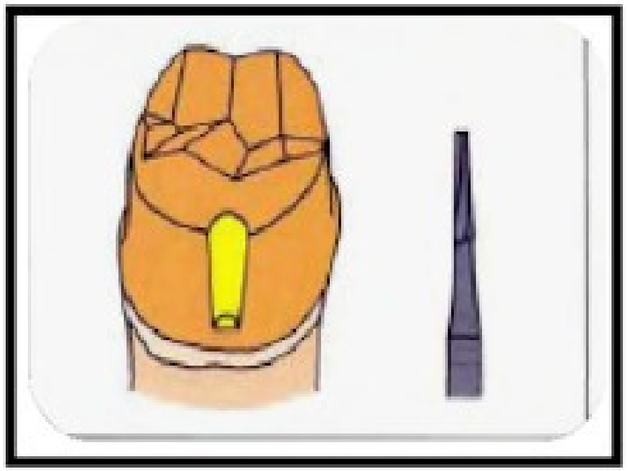
Tooth Preparation on Tooth #30 to receive Full Gold Crown

TOOTH PREPARATION FOR MAXILLARY MOLAR

- **Occlusal reduction**
- 838-012 cylinder diamond is used for uniform reduction of the occlusal surface.
- 1.5 mm reduction of the occlusal surface required.
- Follow the original occlusal planes.
- Reduction parallels opposing occlusal surfaces.
- Include functional cusp bevel.
- Cusps tips line up with the rest of the arch buccolingually.

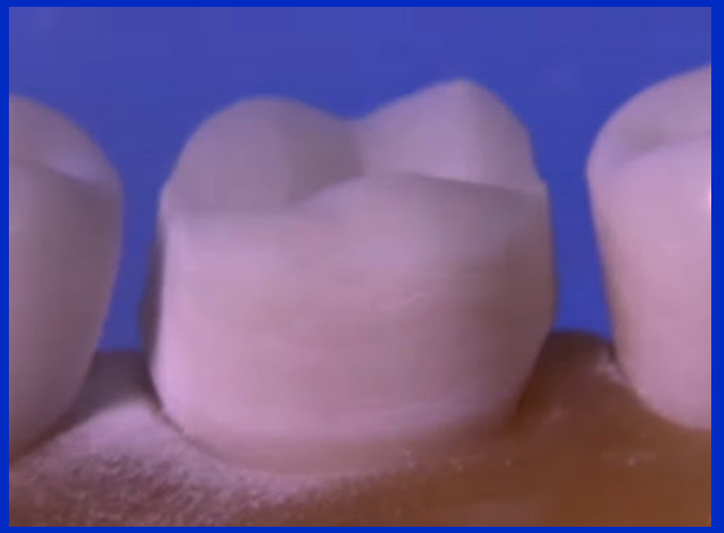


- A seating groove is finally placed in the palatal surface of the upper molar. The advantages of placing a seating groove are;
  - It acts as a guide during the placement of the crown.
  - It prevents the rotation of the crown by increasing the resistance.
  - It improves the retention.



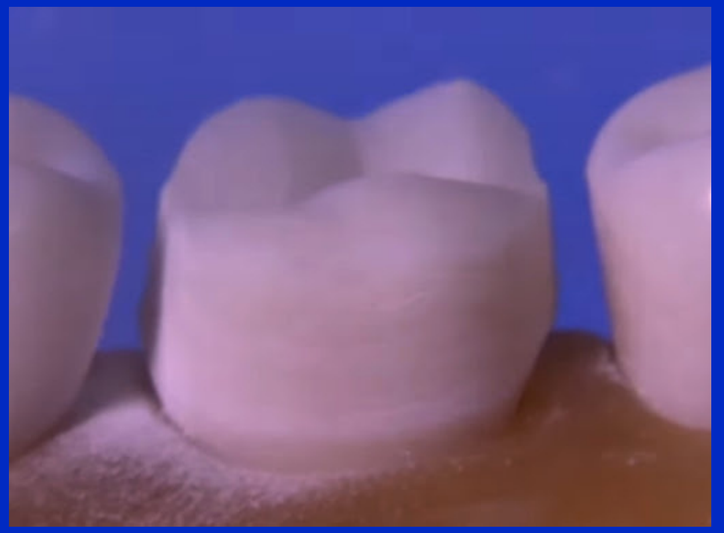
- Axial reduction
  - 878k-012 tapered diamond is used.
  - Should be 0.5 mm at the margins.
  - 6-10 degree of TOC.
  - Create uniform taper.
  - Keep the margins 0.5 mm - 1.0 mm supragingival.
  - Create uniform chamfer finish line.

- Proximal clearance
  - 859-010 needle diamond is used.
  - Remove the little portion of remaining tooth structure interproximally.
  - Avoid damage to adjacent tooth structure.



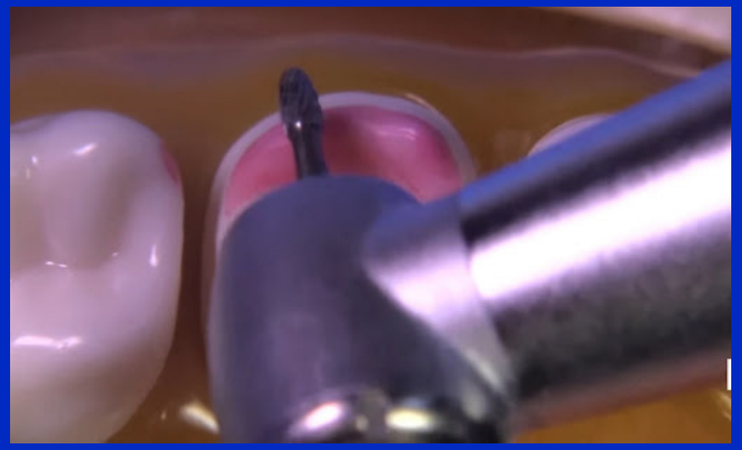
- Axial refinement
- 878-012 tapered diamond is used.
- Follow the secondary planes and create enough axial reduction to have the structural durability in the final crown.
- Avoid creating undercuts.

- Chamfer definition
- 878k-010 parallel chamfer diamond and 8877-010 parallel chamfer diamond is used to create uniform chamfer margin.

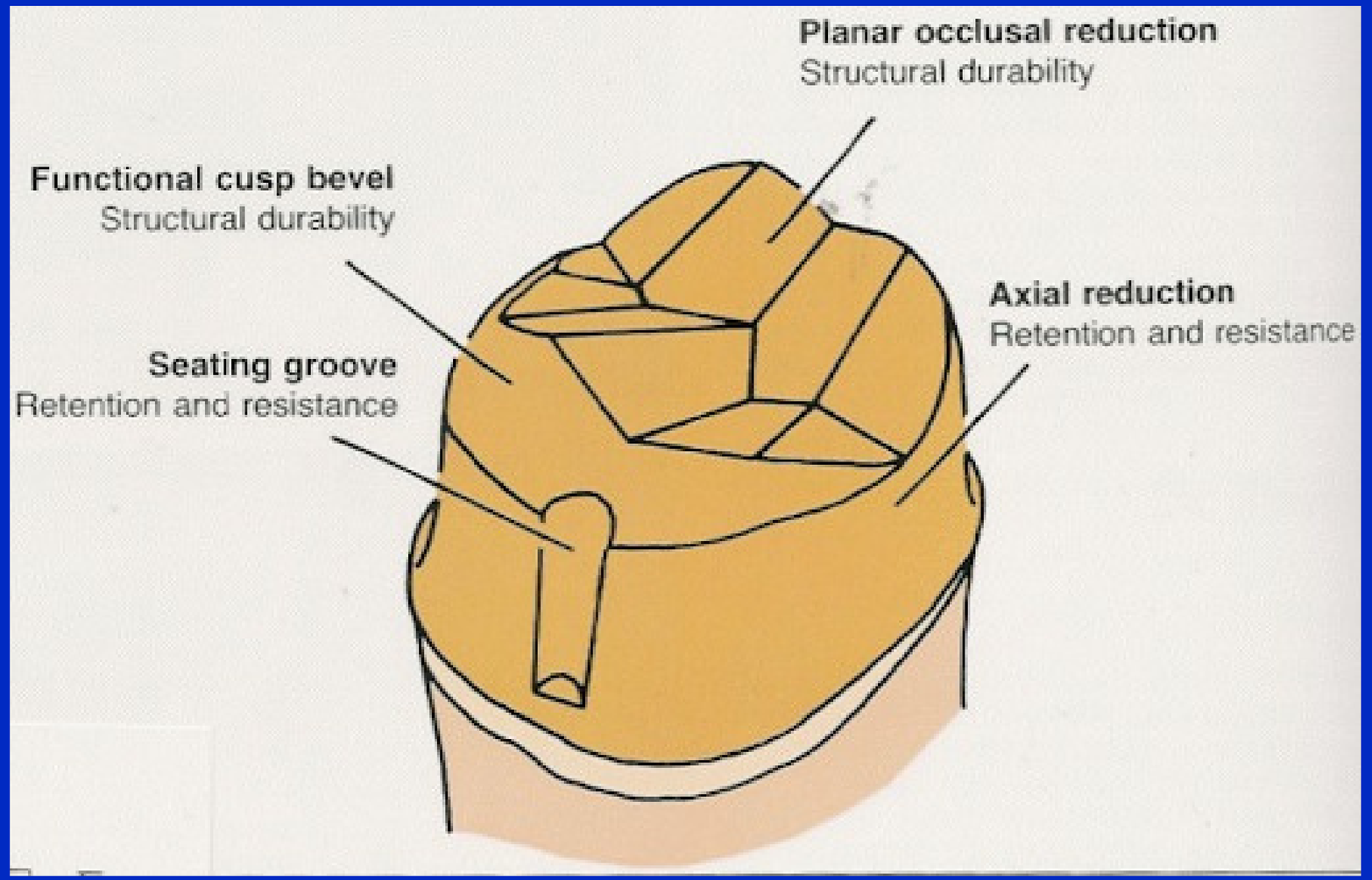


- Final finishing
- 8877-010 parallel chamfer diamond is used to smoothen the preparation.
- 1.5 mm = occlusal clearence
- Clean gingiva.
- Occluso-buccal bevel=0.5mm

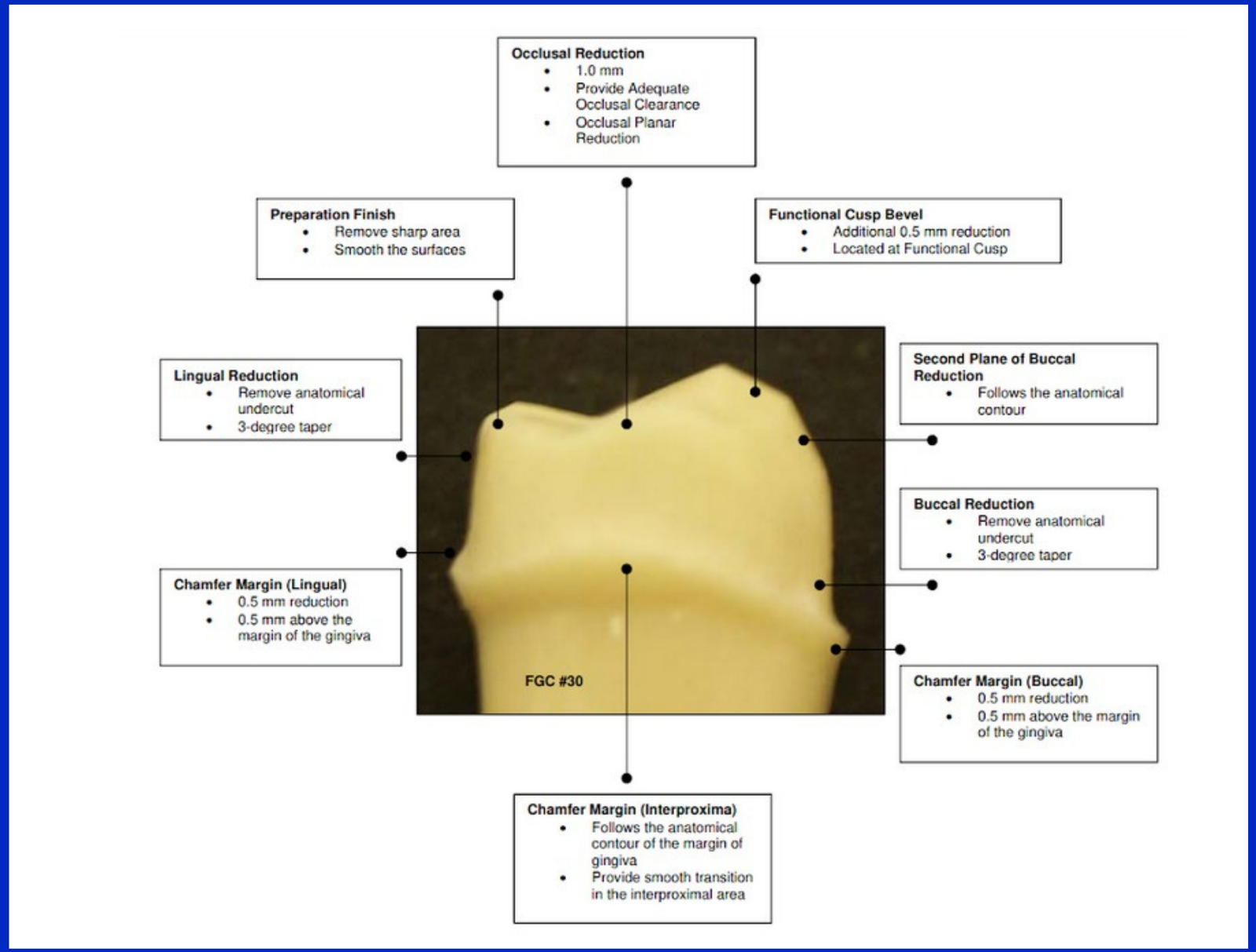
- Finishing bevels
  - 7404-014 football carbide and 7102-012 flame carbide is used.
  - Dry erase can be used to visualise and properly finish the bevels



FGC preparation in tooth #3


Planar occlusal reduction
Structural durability
Functional cusp bevel
Structural durability
Axial reduction
Retention and resistance
Seating groove
Retention and resistance

Click Here - To play this video


Occlusal Reduction
1.0 mm
Provide Adequate Occlusal Clearance
Occlusal Planar Reduction
Preparation Finish
Remove sharp area
Smooth the surfaces
Functional Cusp Bevel
Additional 0.5 mm reduction
Located at Functional Cusp
Lingual Reduction
Remove anatomical undercut
3-degree taper
Second Plane of Buccal Reduction
Follows the anatomical contour
Buccal Reduction
Remove anatomical undercut
3-degree taper
Chamfer Margin (Lingual)
0.5 mm reduction
0.5 mm above the margin of the gingiva
FGC #30
Chamfer Margin (Buccal)
0.5 mm reduction
0.5 mm above the margin of the gingiva
Chamfer Margin (Interproxima)
Follows the anatomical contour of the margin of gingiva
Provide smooth transition in the interproximal area

TIPS AND TRICKS

- Use cotton rolls to gain visibility, even during the FGC preparation.
- Keep your margins parallel to marginal gingiva.
- Measure reduction 2-3 times amidst the procedure.
- Give functional cusp bevel for sure.
- Use Carbide burs to prepare occlusal surface: replicates the anatomy.
- Practice each exercise in 1 hour.
- Polish with Jiffy White Cup, you can also use composite finishing and polishing strips to remove adjacent tooth damage (shhh!).

REFERENCES

- Shillingburg (1981) Fundamentals of Fixed Prosthodontics.
- Shillingburg (1987) Fundamentals of Tooth Preparation for Cast Metal. C.J Goodacre- designing tooth preparation for optimal success.

Thank You

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