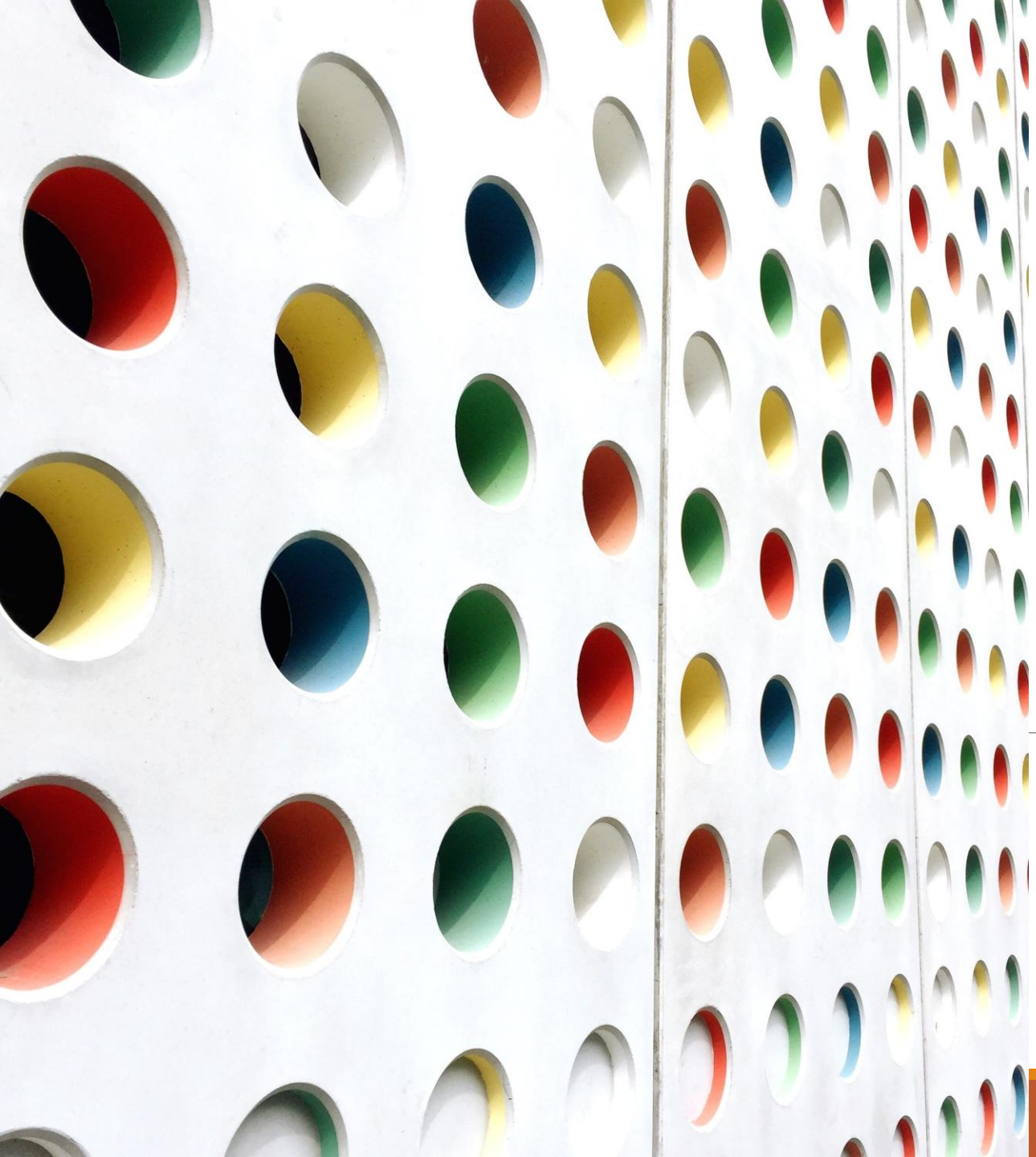


THE UNIVERSITY OF WESTERN AUSTRALIA | Oral Health Centre of Western Australia

Removable partial denture

SURVEY AND DESIGN

DR/ MARRWA IBRAHIM

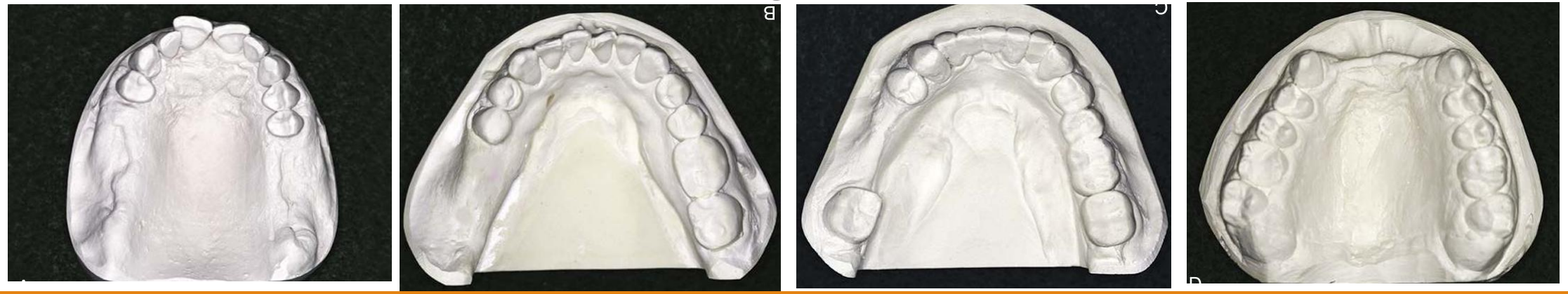
KENNEDY CLASSIFICATION + MODIFICATIONS

Class I - bilateral edentulous areas located posterior to all remaining teeth.

Class II - unilateral edentulous area located posterior to all remaining teeth.

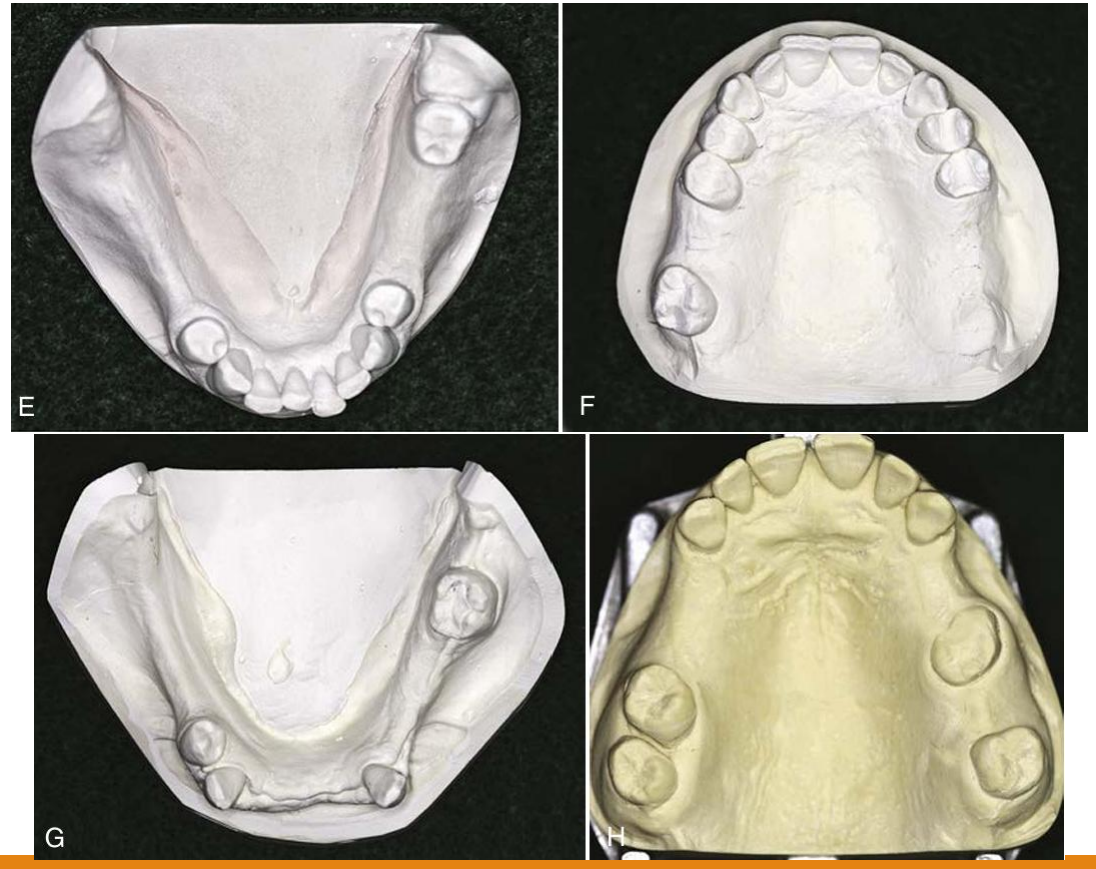
Class III - Unilateral edentulous area bounded by anterior and posterior natural teeth.

Class IV - a single edentulous area , but bilateral bounded by natural teeth, (crossing the midline) located anterior to remaining teeth.



KENNEDY CLASSIFICATION + MODIFICATIONS

Each additional edentulous area (not each missing teeth) is referred as a modification space.



APPLEGATE'S RULES APPLIED TO THE KENNEDY CLASSIFICATION

1. The classification should be determined after all extractions (if applicable)
2. If the third molar is missing and not to be replaced, it is not considered in the classification
3. If the third molar is present and is an abutment, it is considered in the classification
4. If the second molar is missing and is not to be replaced, it is not considered in the classification
5. The most posterior edentulous area(s) always determines the classification
6. Edentulous areas other than those determining the classification are referred as 'modification' and are designated by their number
7. The extent of the modification is not considered, only the number of additional edentulous areas
8. There is no modification in Class IV

Surveying the Diagnostic Cast

1-To determine the most desirable path of placement

2- To identify proximal tooth surfaces that are or need to be made parallel so that they act as guiding planes

3- To locate and measure areas of the teeth that may be used for retention

4- To determine whether teeth and bony areas are area of interference

5- To determine the most suitable path of placement that provide the best esthetic advantage

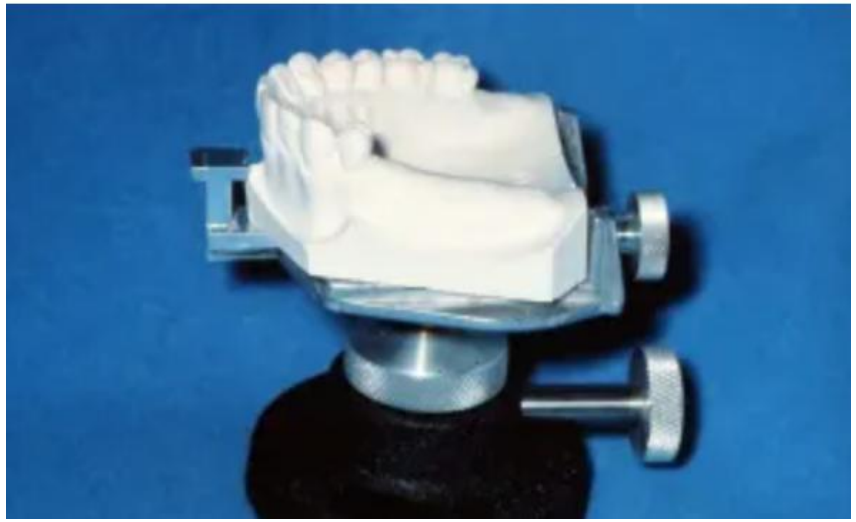
6- To permit accurate charting of the mouth preparations to be made

7- To record the cast position in relation to the selected path of placement for future reference:

PARTS OF A DENTAL SURVEYOR

1. Surveying Table (Cast holder):

it allows the cast to be oriented at various tilts and to be fixed along one of these planes through a ball and socket joint.



PARTS OF A DENTAL SURVEYOR

2. Surveying Arm:

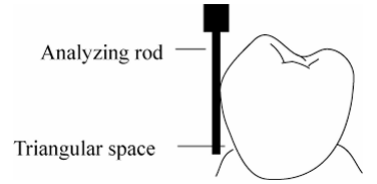
a vertical arm used to analyse the parallelism of various axial cast surfaces. The height of the arm can be adjusted, and it contains a holder so that several surveying tools may be attached and used.

PARTS OF A DENTAL SURVEYOR

3. Surveying Tools:

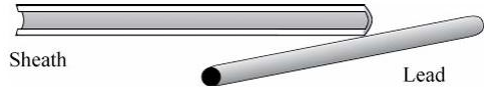
a. Analyzing Rod

A thin straight metal rod used to analyze contours and undercuts in the cast. It determines relative parallelism of axial surfaces.



b. Carbon Marker

Rod like pencil lead that is used to mark the location of the height of contour on a dental cast.



c. Undercut gauges

Identify the position of desired undercuts on casts

Size 1: 0.25 mm/ 0.01" - CoCr alloys

Size 2: 0.50 mm/ 0.02" - Gold alloy

Size 3: 0.75 mm/ 0.03"- Wrought wire

d. Surveyor blade:

Trim stone tooth to adjust the height of contour to the desirable position.

DENTAL SURVEY

1 - Preliminary assessment of the cast

2 - Selecting the path of insertion (POI) of the RPD

3 – Initial assessment of undercuts

4 – Drawing the height of contour

5 - Survey lines of soft tissues

6 - Tripodization of the diagnostic cast

7 - Identification of retentive undercuts

8 - Drawing the metal framework

9 - Adjusting the height of contour

10 - Creating guiding planes

11– Redraw the lines erased after changes on tooth contour

Initiate dental survey of maxillary model

Task	Initiate dental survey of maxillary model

Preliminary assessment

1) Kennedy Classification (modifications): _____

2) Identify the fulcrum lines (tooth number): _____

3) Potential rest seat locations (tooth number, surface M/D/L): _____
_____

4) Indirect retention (tooth number, surface M/D/L): _____
_____

5) Find the initial POI (Perpendicular to the occlusal plane)

6) Initial assessment of undercuts: verify if the POI is adequate

7) Draw the height of contour on abutment teeth

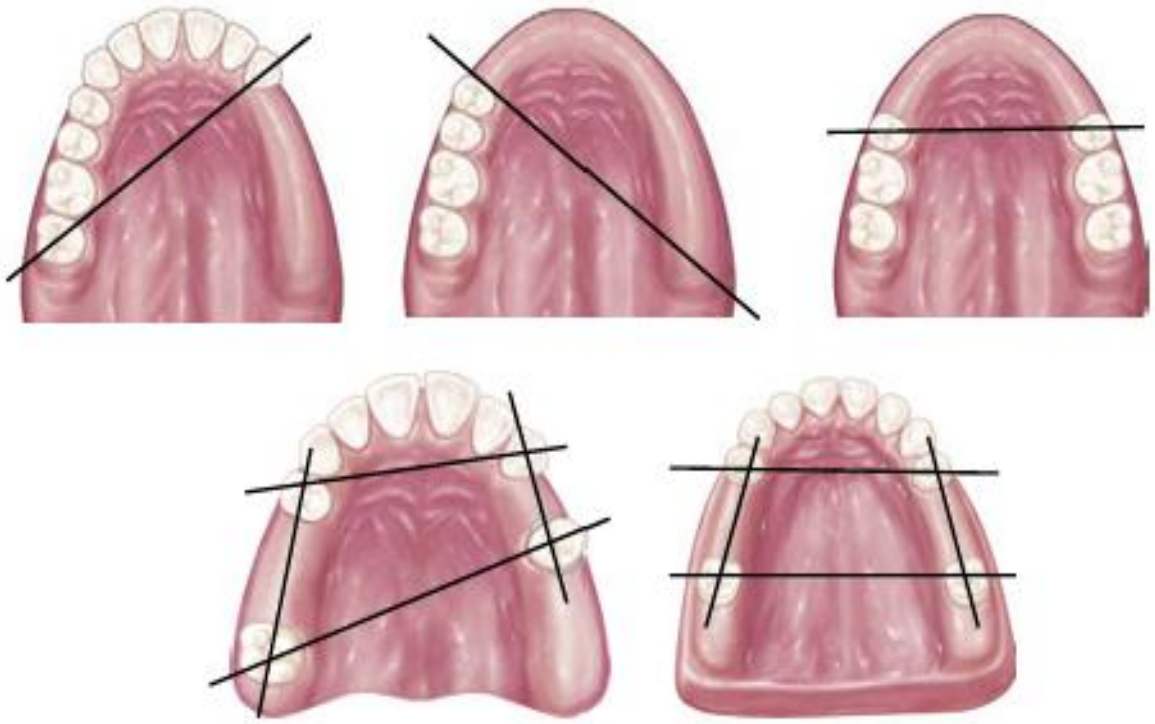
8) Tripodization of the diagnostic cast

8) Identification of retentive undercuts (retentive clasp position)

Self-assessment	2	1	0	Tutor grade
POI				
Height of contour				
Tripodization				
Retentive clasp tip position				

DENTAL SURVEY
1 - Preliminary assessment of the cast

- Classify the edentulous arch
- Identify fulcrum lines
- Define potential rest seat locations

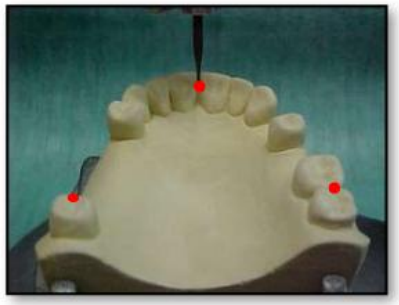


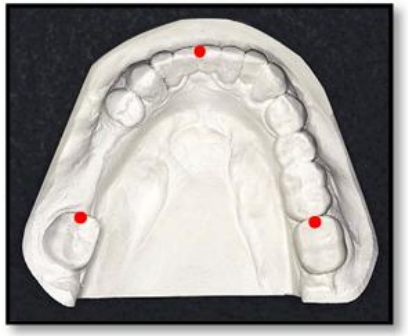
DENTAL SURVEY
2 - Selecting the path of insertion (POI) of the RPD

- The initial POI will be perpendicular to the occlusal plane.
- Select three points in the model that define the occlusal plane.

Maxilla: Two posterior points, mesial marginal ridge of 1st or 2nd molars in each quadrant. One anterior point: bellow the interproximal contact point between 11 and 21 (near the cingulum).

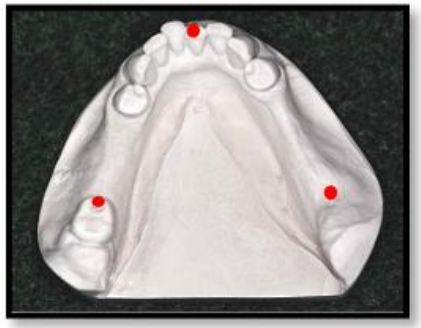
Mandible: Two posterior points, mesial marginal ridge of 1st or 2nd molars in each quadrant. One anterior point: incisal edge of 31 or 41.

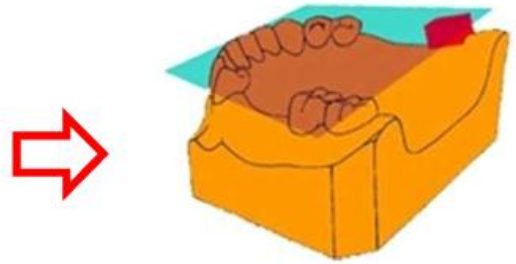




DENTAL SURVEY
2 - Selecting the path of insertion (POI) of the RPD

- Place the cast on the surveyor table and orient the plane of occlusion relatively horizontal.
- Using the Analysing Rod, adjust the inclination of the Surveying Table and the vertical position of the Surveying Arm until the three points coincide with the tip of the analysing rod without changing the vertical arm position.





Use wax rim to simulate the molar

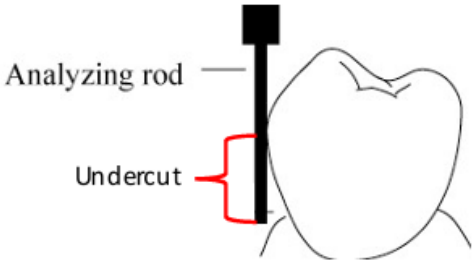
Dental Survey of maxillary cast

1 - Preliminary assessment of the cast

2 - Selecting the path of insertion (POI) of the RPD

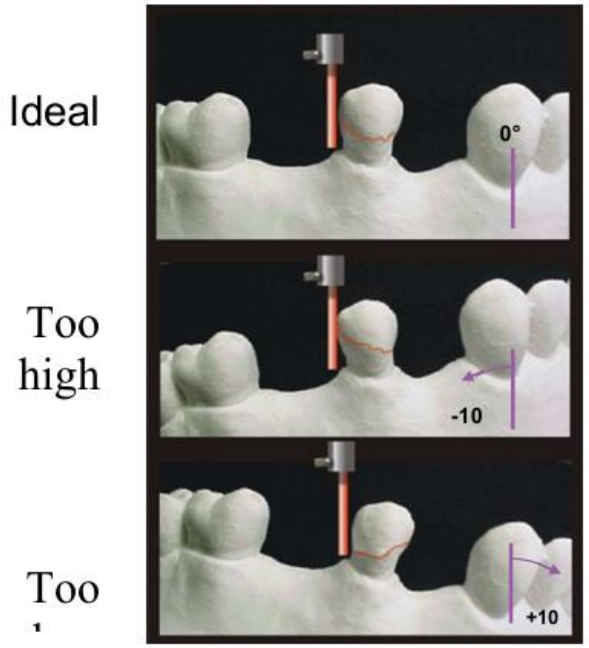
DENTAL SURVEY
3 – Initial assessment of undercuts

- Place the analysing rod against the axial surface of proposed abutment teeth.
- The tip of the rod should be at the level of the free gingival margin.
- If the height of contour is located in an unfavourable position (near the occlusal third or near the gingival margin) or if there is no undercut, the incline of the cast has to be changed to obtain a more favourable retention area.
- Soft tissues interferences (i.e., mandibular tori, residual ridge undercuts) also need to be avoided by modifying the path of insertion.



DENTAL SURVEY
4 – Drawing the height of contour

Place the carbon marker against the axial surface of proposed abutment teeth. The tip of the carbon should be placed near the level of the free gingival margin. Mark the height of contour around each abutment teeth.

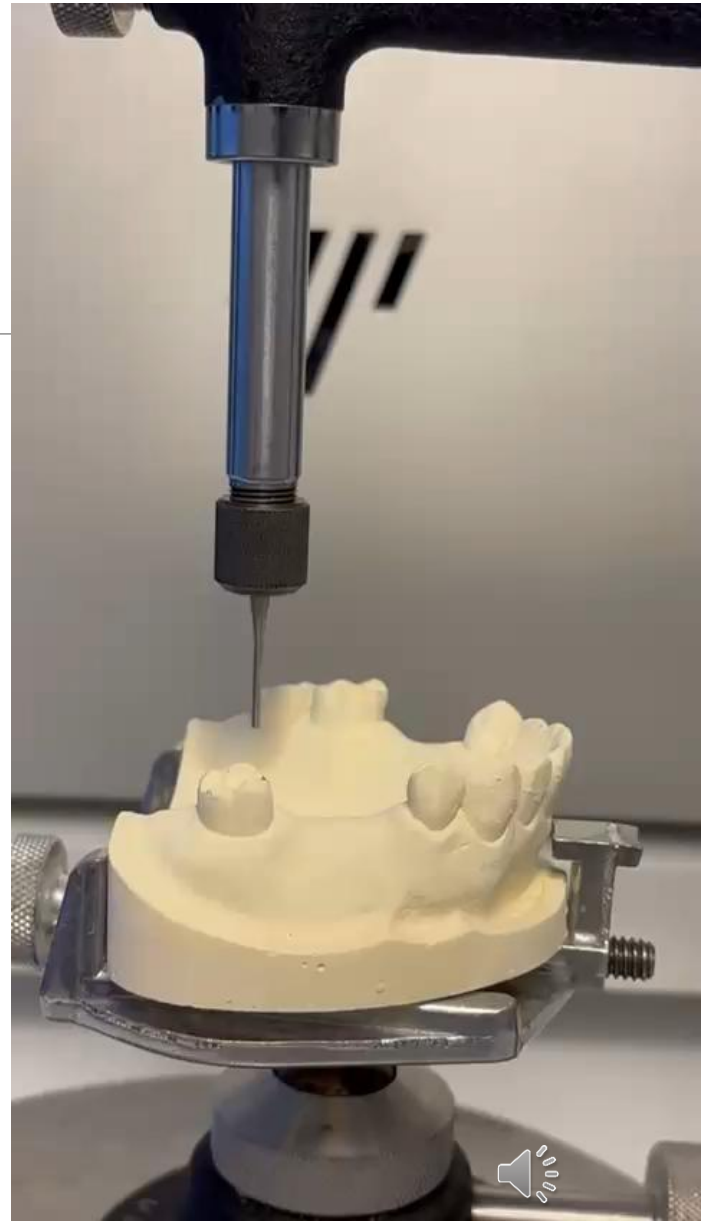


The position of the height of contour can be changed again by tilting the cast if necessary.

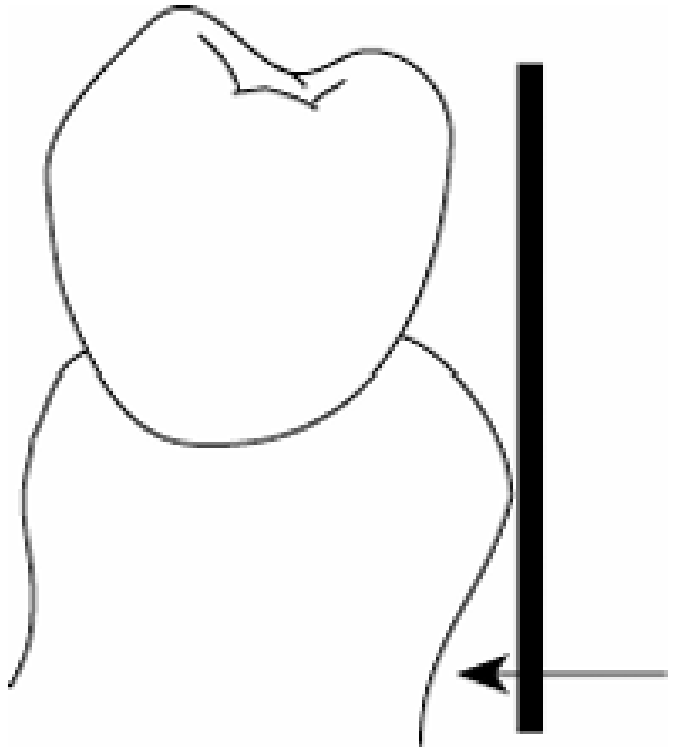
Dental Survey of maxillary cast

3 – Initial assessment of undercuts

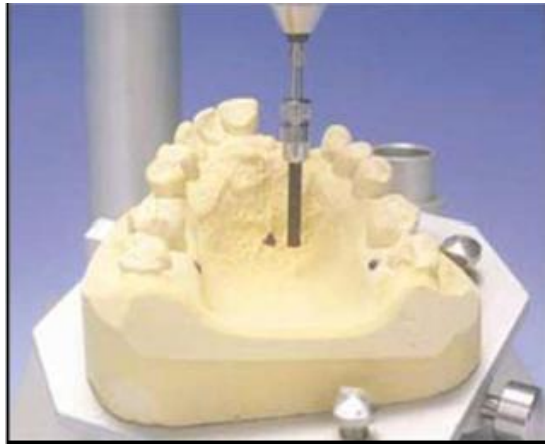
4 – Drawing the height of contour



DENTAL SURVEY
5 - Survey lines of soft tissues



DENTAL SURVEY
6 - Tripodization of the diagnostic cast



Tripodization is completed after the ideal path of insertion has been established.

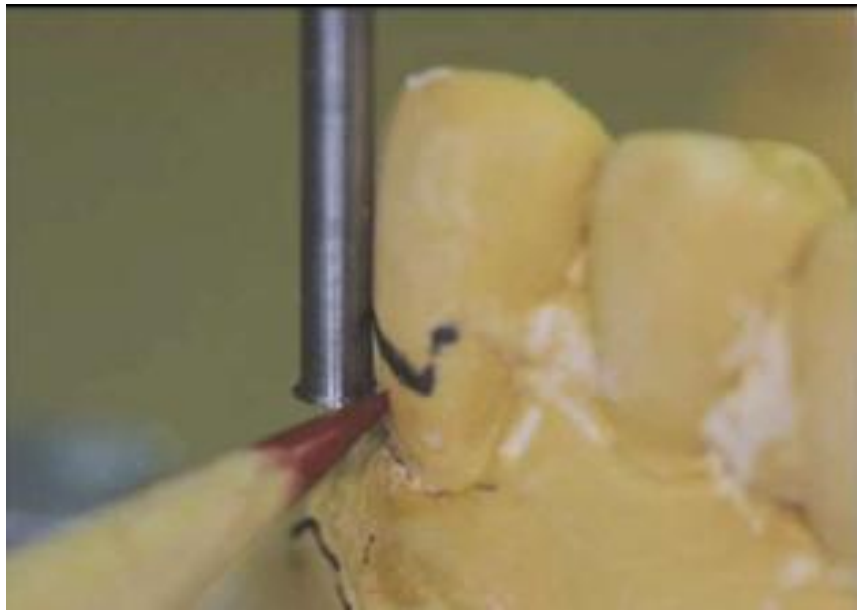
With the vertical arm of the surveyor **locked,** three widespread tissue points (two posterior and one anterior) are selected in relatively noncritical areas.

(Maxilla: palate; Mandible: lingual side of alveolar ridge)

Reason: to facilitate the repositioning of the same cast or a different one in the established ideal path of insertion.

DENTAL SURVEY
7 - Identification of retentive undercuts:

- where the tip of the retentive arm will be placed.
- Use 0.25 mm gauge (0.01’’)
- Bring the vertical shaft of the gauge in contact with the tooth and then moving the surveying arm up or down until the terminal lip touches the tooth surface.
- Repeat the steps for all retentive arms.

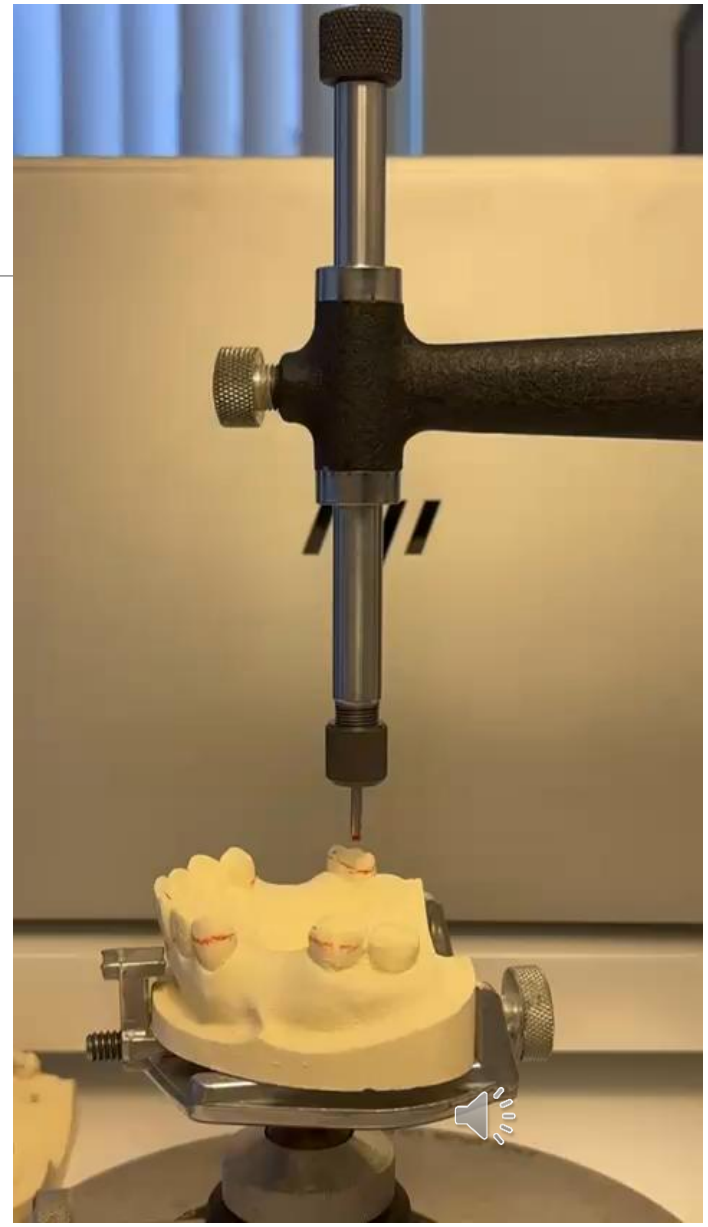


Dental Survey of maxillary cast

5 - Survey lines of soft tissues

6 - Tripodization of the diagnostic cast

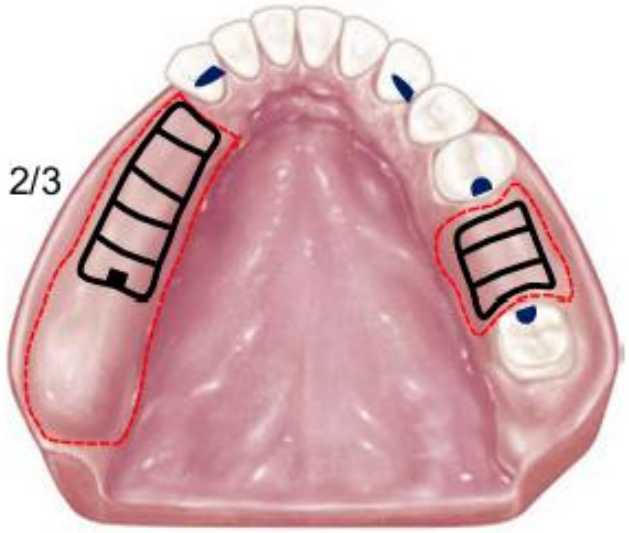
7 - Identification of retentive undercuts:



DENTAL SURVEY
8 - Drawing the metal framework

1) REST SEATS:

- **Intercalated edentulous area**: adjacent to the edentulous area
- **Free-end edentulous area:** not immediately adjacent to the saddle
- Include indirect retainers



2) GRIDS:

- Free-end saddle—2/3 of the bearing area

DENTAL SURVEY

8 - Drawing the metal framework

3) CLASPS: retention arm and reciprocal arm

Simple circumferential: rest adjacent to edentulous area

Reverse circumferential: rest opposing to edentulous area. It needs a proximal plate.

Ring clasp: rest on both sides of the abutment

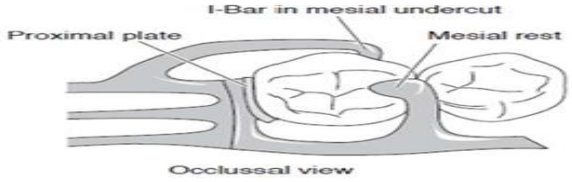
Embrasure clasp: between abutments, indirect retainer

T-clasp: Retention arm cross gingival margin at 90°

Modified T-clasp: to avoid significant undercuts

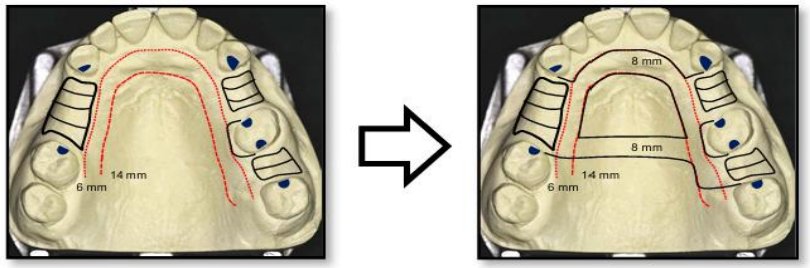
I-clasp: cross perpendicular the gingival margin.

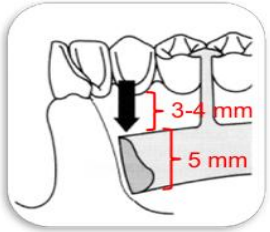
RPI-clasp: rest, proximal plate and I bar (no reciprocal arm)



DENTAL SURVEY
8 - Drawing the metal framework
4) MAJOR CONNECTOR:

Mandible : 3-4 mm from the gingival margin and 5 mm of width
Maxilla : 5-6 mm from the gingival margin and 8 mm of width





TYPES:

Maxilla	Mandible
Single palatal strap	Lingual bar
Anterior-posterior palatal strap	Lingual plate
U-shaped palatal connector	Cingulum bar
Broad palatal strap or Palatal plate	Double lingual bar (Kennedy bar)
Single palatal bar	Sublingual bar
Anterior-posterior palatal bar	

DENTAL SURVEY
8 - Drawing the metal framework

5) MINOR CONNECTORS:

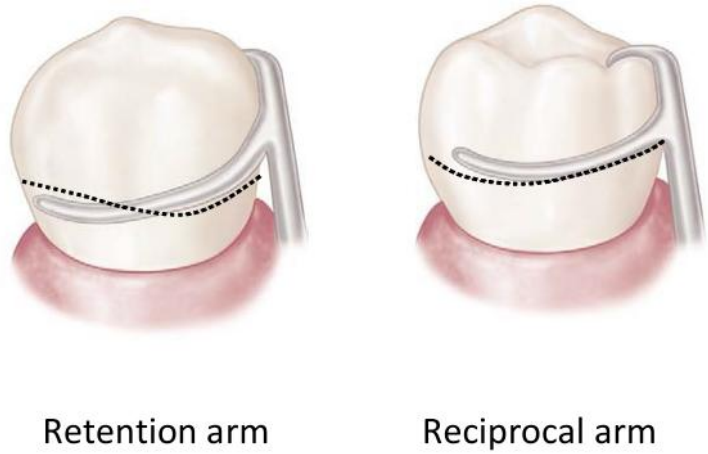
Join the remaining components of a RPD to the major connector

Dental Survey of maxillary cast

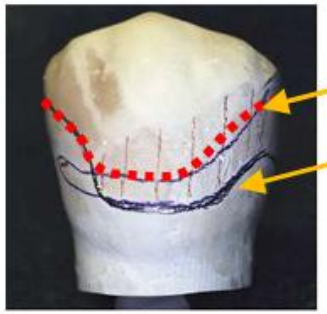
8 - Drawing the metal framework

DENTAL SURVEY
9 - Adjusting the height of contour:

- All reciprocal arms need to be above the height of contour
- 1/3 of the retention arm should be in undercut
- Use surveyor blade to trim the plaster tooth surface

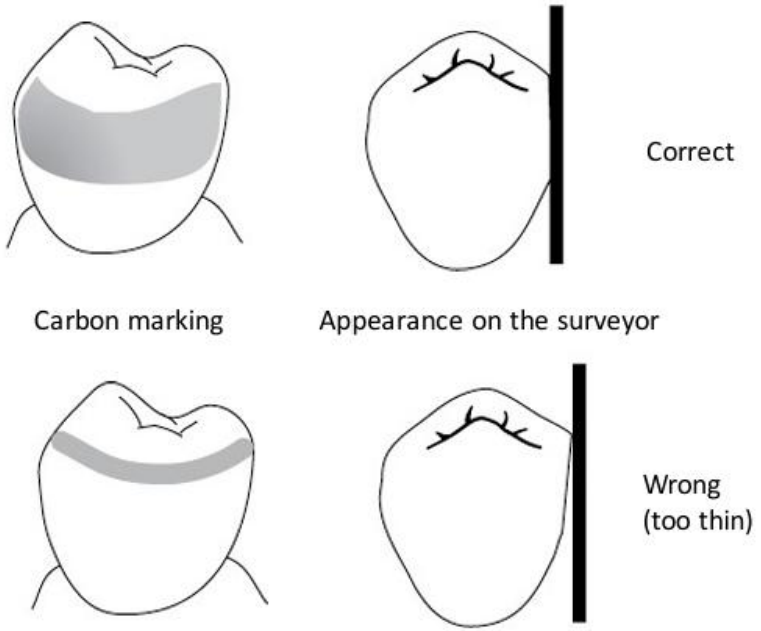


Retention arm Reciprocal arm



DENTAL SURVEY
10 - Creating guiding planes

Use surveyor blade



DENTAL SURVEY

11 – Redraw the lines erased after changes on tooth contour

Dental Survey of maxillary cast

9 - Adjusting the height of contour

10 - Creating guiding planes

11 – Redraw the lines erased after changes on tooth contour

Rests and Rest Seats:

Rest:

A rigid component of a removable partial denture which rests in a recessed preparation on the occlusal, lingual or incisal surface of a tooth to provide vertical support for the denture. Although a rest is a component of a direct retainer (retentive unit, clasp assembly), the rest itself is classified as a supporting element due to the nature of its function.

Rests and Rest Seats:

Rest Seat:

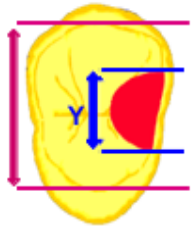
A portion of a tooth selected and prepared to receive an occlusal, incisal or lingual rest.

Armamentarium:

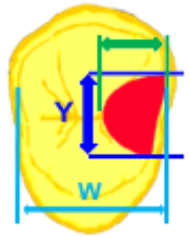
- Spherical diamond bur (large diameter)
- tapered round end bur
- Material for composite restorations

Occlusal rest seat

Prepared on the occlusal surface of a bicuspid or molar.
preparations are entirely in enamel.
Preparation should have a smooth flowing outline form (no sharp line angles).



- Rounded triangular shape, base facing the proximal surface at the marginal ridge, and the apex toward the center of the occlusal surface



- Bucco-lingually: ½ inter-cusp distance (approximately one third the bucco-lingual width of the tooth.

- Mesio-distally: equal or slightly larger than B/L size

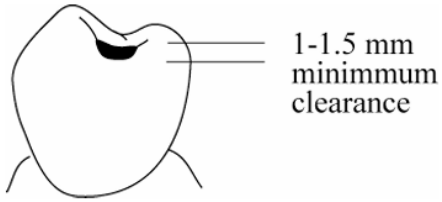
Occlusal rest seat

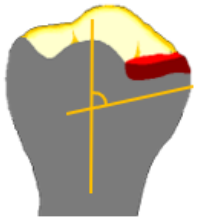
The marginal ridge must be lowered and rounded to permit a sufficient bulk of metal to prevent fracture of the rest from the minor connector (1 to 1.5 mm)

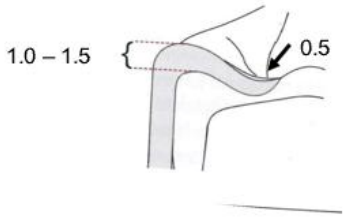
Concaved floor, rounded (spoon like shape)

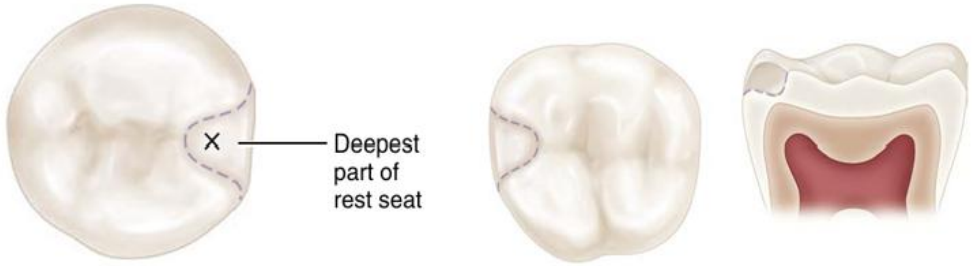
Slightly inclined apically (less than 90°)

Tooth reduction: 1-1.5mm occ-gingival, taper to the center till only 0.5mm reduction



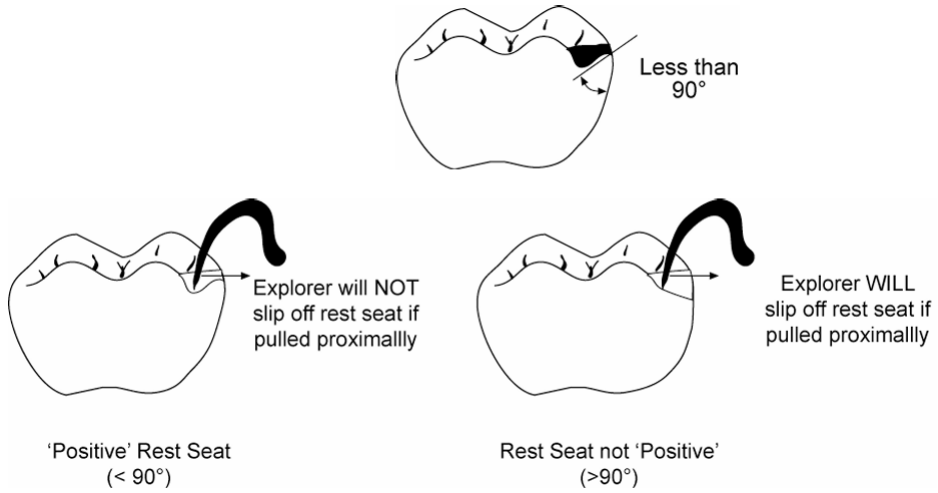






Occlusal rest seat

- ✓ The floor of the rest seat should be inclined towards the centre of the tooth, so that the angle formed by the rest and the minor connector should be less than 90°. This helps to direct the occlusal forces along the long axis of the tooth.
- ✓ You can test to see if a rest seat is ‘positive’ (less than 90° by trying to slide an explorer tip off the rest seat.
- ✓ An angle of more than 90° fails to transmit the occlusal forces along the long axis of the tooth and permits movement of the clasp assembly away from the abutment and orthodontic movement of the tooth.



Lingual rest seat

Can be done by cutting tooth structure or Adding composite

Cingulum of anterior teeth especially canine, due to its well-developed cingulum.

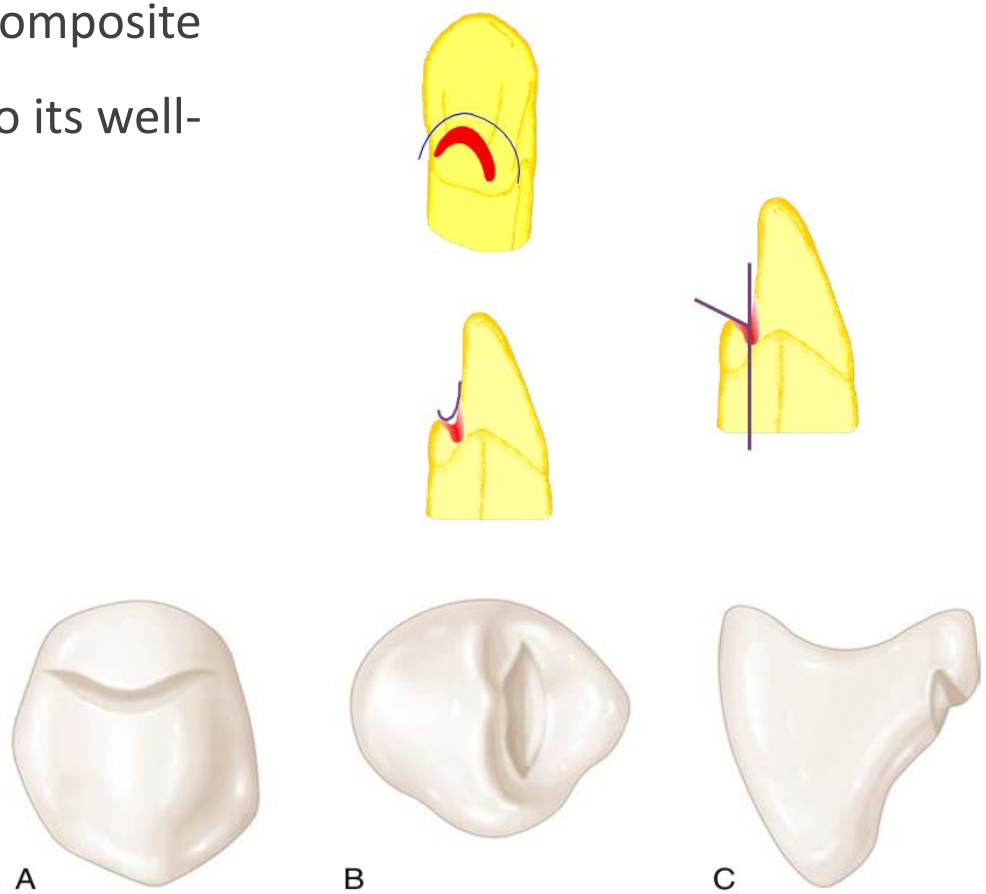
Convex M/D

Concave B-L: V shaped

Floor less than 90°

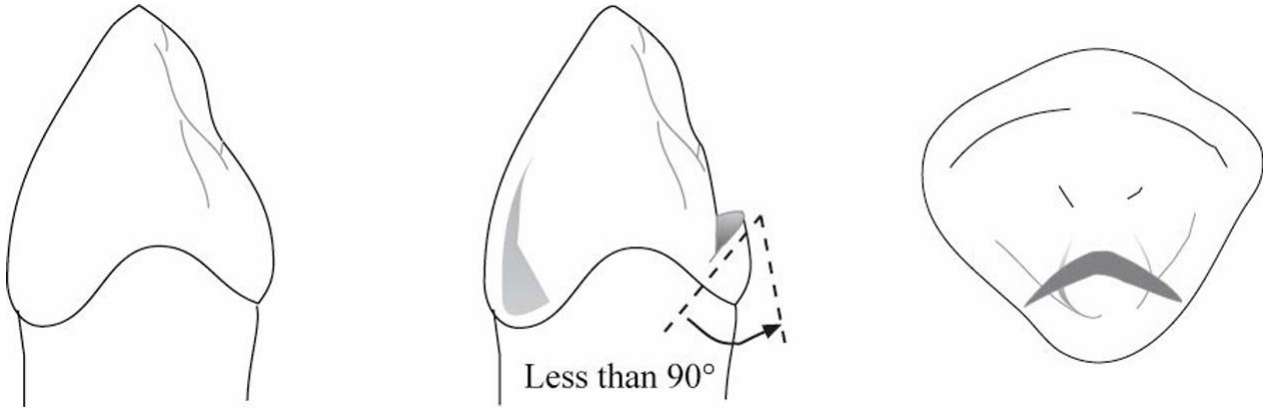
Rounded, no sharp line angles

Minimum reduction 0.8 mm



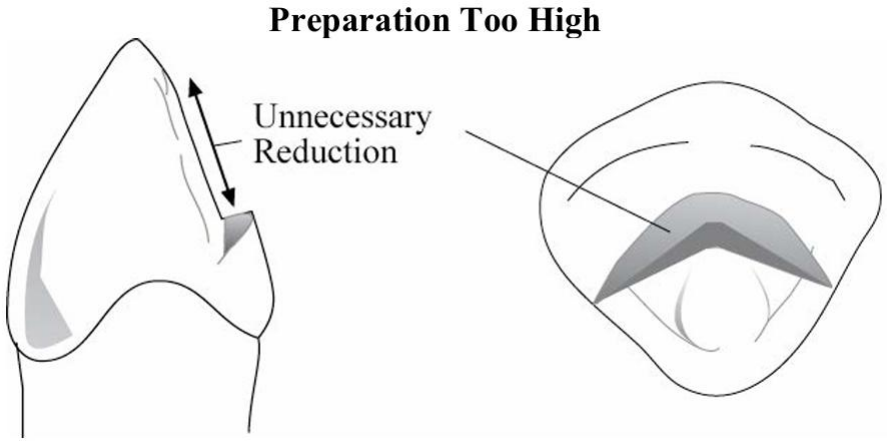
Lingual rest seat

Correct Preparation: The cingulum rest seat should be prepared in the bulk of the cingulum to minimize tooth reduction. The cavosurface should be less than 90° to prevent orthodontic movements of the tooth.



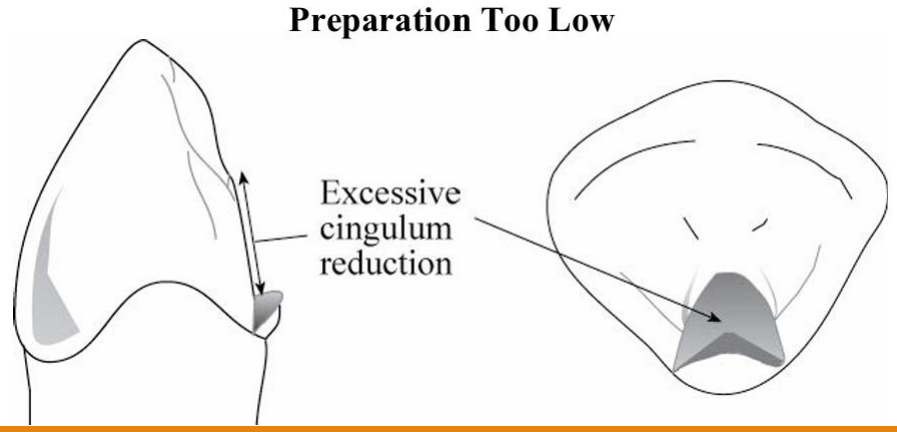
Lingual rest seat

Preparation Too High: If the preparation is started too high above the cingulum proper, much of the lingual surface of the tooth above the cingulum will need to be reduced, in order to obtain sufficient width for support. On maxillary anteriors, this may also cause the rest to interfere with the opposing tooth.



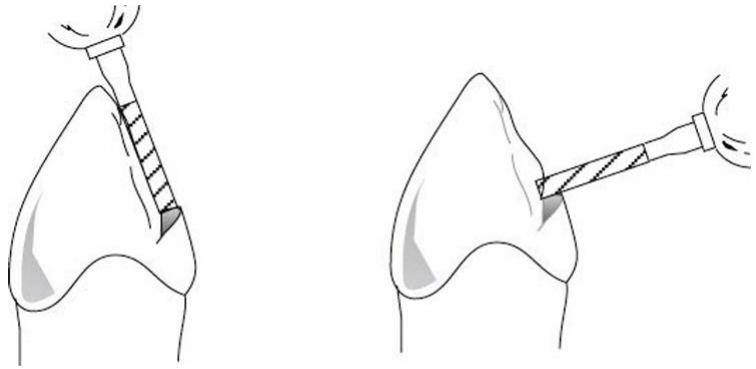
Lingual rest seat

Preparation Too Low : If the preparation is started too low, much of the cingulum will need to be reduced, in order to obtain sufficient width for support. Enamel is thinner in this area, and preparation could result in dentinal exposure, resulting in sensitivity. If correction of the outline form or depth is required, there will be little tooth structure remaining to make such changes.



Lingual rest seat

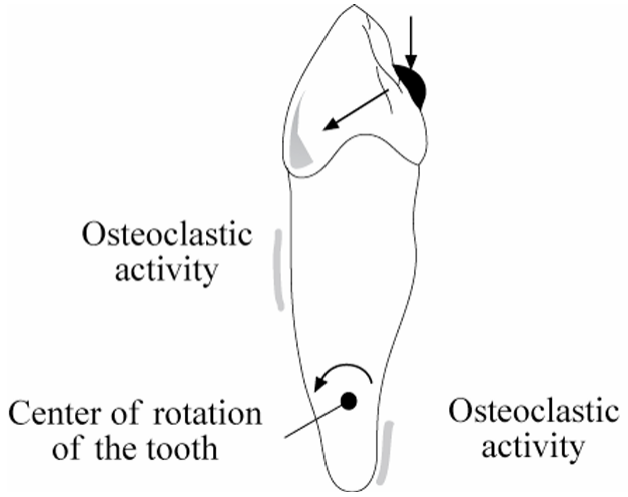
Care must be taken not to create an enamel undercut that would interfere with the placement of the denture. A medium or large diameter cylindrical fissure bur should be utilized approaching along the long axis of the tooth. Approach from a horizontal direction will often result in creation of an undercut incisal to the rest seat.



Correct Incorrect

Lingual rest seat

A rest placed on an unprepared cingulum results in force being applied in a labial direction. Orthodontic movement will occur with osteoclastic activity around the centre of rotation of the root. A rest seat prepared in the cingulum of the tooth results in the forces being directed along the long axis of the tooth.

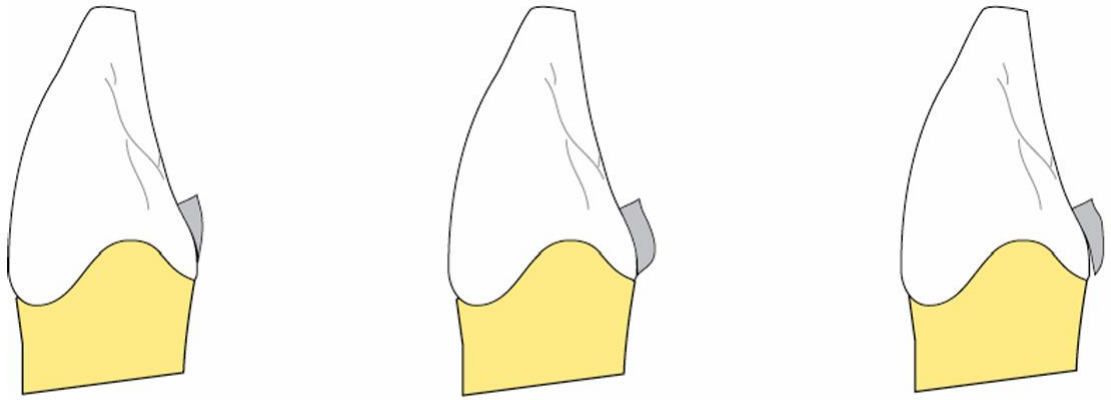


Composite Buildups for Cingulum Rests

When a cingulum is poorly developed, with insufficient bulk for preparation for a cingulum rest seat, a rest seat can be made using composite resin

The cervical portion of the buildup should have a flat emergence profile (not over contoured) with bulk increasing toward the incisal.

The bonded rest seat should be smooth and well polished, with no sharp line angles.



Thank You

Sources:

- Removable Partial Denture Manual Robert W. Loney, DMD, MS 2011
- McCracken’s REMOVABLE PARTIAL PROSTHODONTICS