



Introduction in prosthodontics

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Definitions

Prosthetic: The art and science of supplying artificial replacements for missing parts of the human body.

Prosthodontics (Prosthetic dentistry): It is the branch of dental art and science that deals with the replacement of missing teeth and oral tissues to restore and maintain oral form, function, appearance, and health.

Prosthesis: An artificial replacement of an absent part of the human body.



Definitions

Dental prosthesis: An artificial replacement of one or more teeth (up to the entire dentition in the arch) and associated dental and/or alveolar structures.



Prosthodontics



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graph TD; A[Prosthodontics] --> B[Fixed prosthodontics]; A --> C[Removable prosthodontics]; A --> D[Maxillofacial prosthodontics]; C --> E[Removable partial prosthodontics]; C --> F[Removable complete prosthodontics];
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A hierarchical flowchart showing the classification of Prosthodontics. The root node is 'Prosthodontics', which branches into three main categories: 'Fixed prosthodontics', 'Removable prosthodontics', and 'Maxillofacial prosthodontics'. The 'Removable prosthodontics' category further branches into 'Removable partial prosthodontics' and 'Removable complete prosthodontics'. Each node is represented by a blue box with a white shadow, connected by black lines.

Fixed
prosthodontics

Removable
prosthodontics

Maxillofacial
prosthodontics

Removable partial
prosthodontics

Removable complete
prosthodontics



Definitions

Fixed prosthodontics: is the area of prosthodontics focused on permanently attached (fixed) dental restoration, Such as indirect dental .restorations, crowns, bridges (fixed dentures), inlays , Onlays, and veneers



Definitions

Maxillofacial prosthodontics: Maxillofacial prosthodontics is a specialty of dentistry which deals with the rehabilitation of patients with acquired and congenital defects of the head and neck region



Definitions



Removable dental prosthesis: Any dental prosthesis that replaces some or all teeth in a partially dentate arch (removable partial dental prosthesis) or edentate arch (removable complete dental prosthesis), and can be removed from the mouth and replaced at will

A removable partial denture (RPD): is a denture for a partially edentulous patient who desires to have replacement teeth for functional or aesthetic reasons and who cannot have a bridge (a fixed partial denture) for any reason, such as a lack of required teeth to serve as support for a bridge (i.e. distal abutments) or financial limitations

Complete denture: A removable dental prosthesis which replaces the entire dentition and associated structures of the maxilla and mandible



Complete denture

:Objective of complete denture

- 1 Preservation of the remaining tissues in health (1 .state
- 2 .Restoration of the function of mastication (2
- 3 Restoration of the disturbed facial dimension (3 .and contour (esthetic)
- 4 Correction of speech due to the loss of natural (4 .teeth
- 5 Satisfaction, pleasing and comfort of the (5 .patient





:Complete denture is composed of

Basal surface (impression surface or tissue surface): the part of a denture that rests on the foundation tissues (*the oral structures available to support a denture*) and to which the teeth are attached

Denture occlusal surface: the portion of the surface of a denture that makes contact with its antagonist

Denture polished surface: the portion of the surface of a denture that extends in an occlusal direction from the border of the denture and includes the palatal surface. It is the part of the denture base that is usually polished, and it includes the buccal and lingual surfaces of the teeth



:Complete denture is composed of

Denture border: the margin of the denture base at the junction of the .polished surface and the basal surface

Denture flange: the part of the denture base that extends from the .cervical ends of the teeth to the denture border

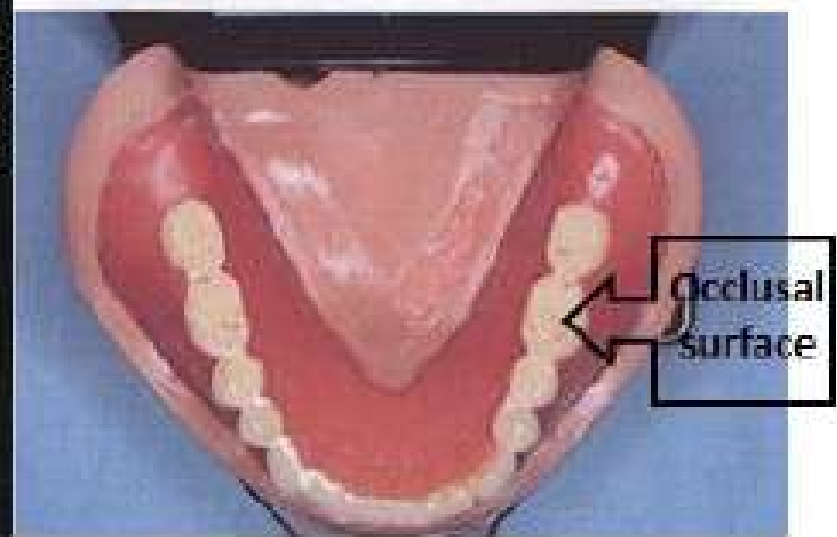
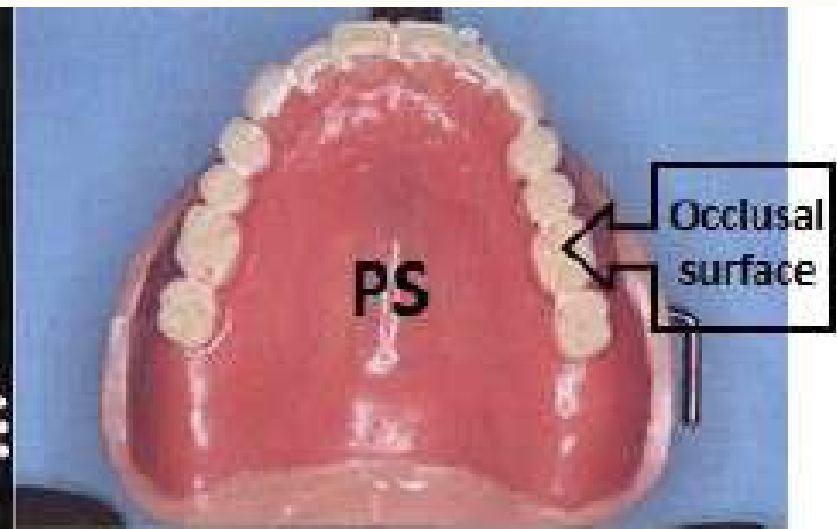
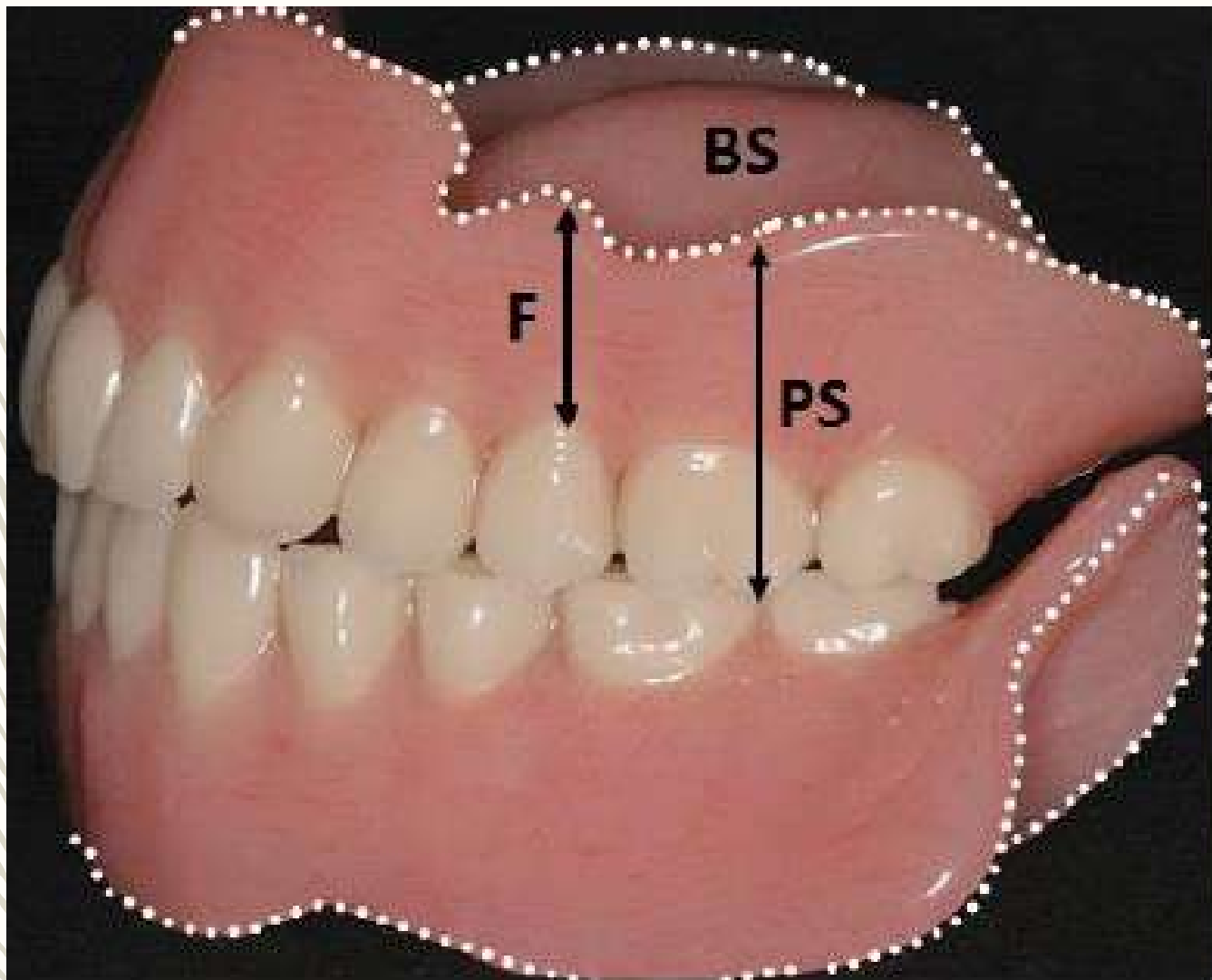


Figure (1-5): Basal surface (BS), polished surface (PS), denture border (dotted line), denture flange (F).

Extra Oral Landmarks



Extra-oral landmarks

The following extra-oral anatomical features should be noted:

Philtrum: is a midline shallow depression of the upper lip, which starts at the labial tubercle and ends at the nose.

Labial tubercle: is a little swelling in the mid portion of the vermillion border of the upper lip.

Vermillion borders: the lip is covered by the skin at its facial surface and the mucous membrane at its inner surface. The transitional area between the skin and the mucous membrane of the upper and lower lips is a pink or red zone of thinner epithelium, which is called the vermillion border.



Extra-oral landmarks

The following extra-oral anatomical features should be noted:

Naso-labial groove: is a furrow of variable depth that extends from the wing (ala) of nose to end at some distance from the corner of the mouth.

Labio-mental groove: is a sharp or deep groove that lies between the lower lip and the chin.

Extra-oral landmarks

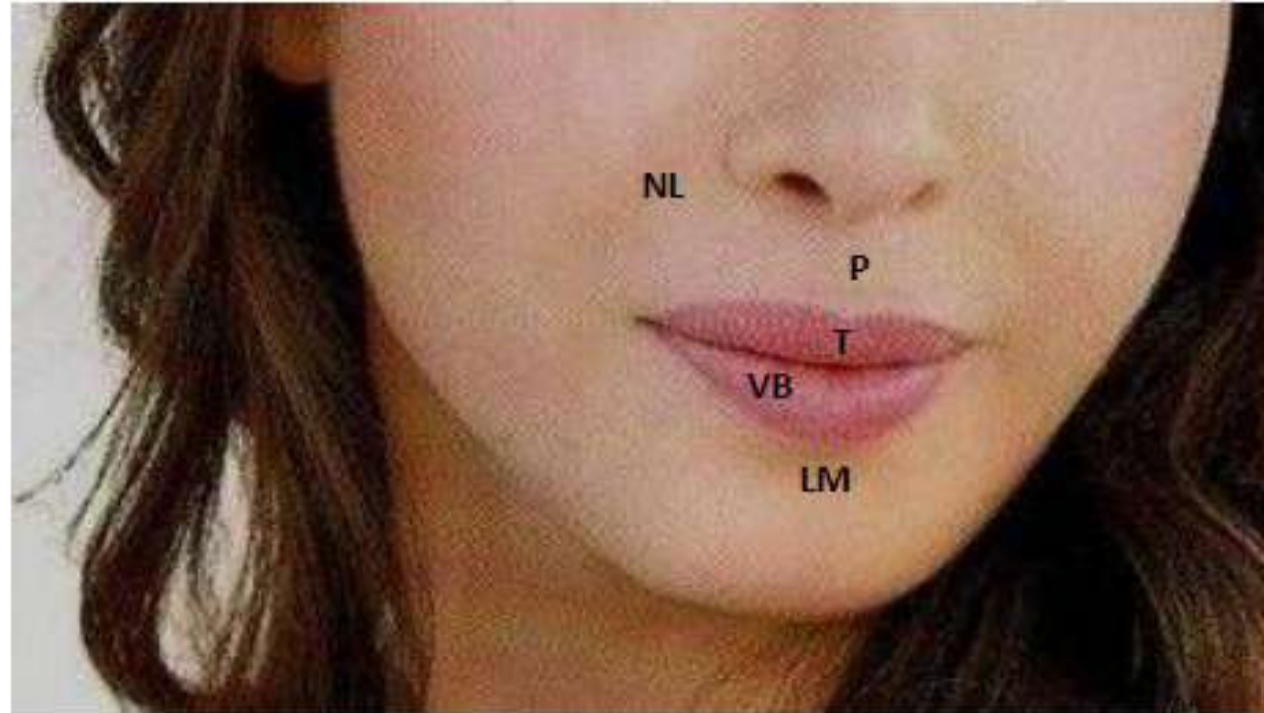


Figure (2-1): Philtrum (P), Nasolabial groove (NL), Labial tubercle (T), Vermillion border (VB), Labio-mental groove (LM).

Extra-oral landmarks

The following extra-oral anatomical features should be noted:

Naso-labial Angle: is an angle between columella of nose and philtrum of lip, normally, approximately 90° as viewed in profile.

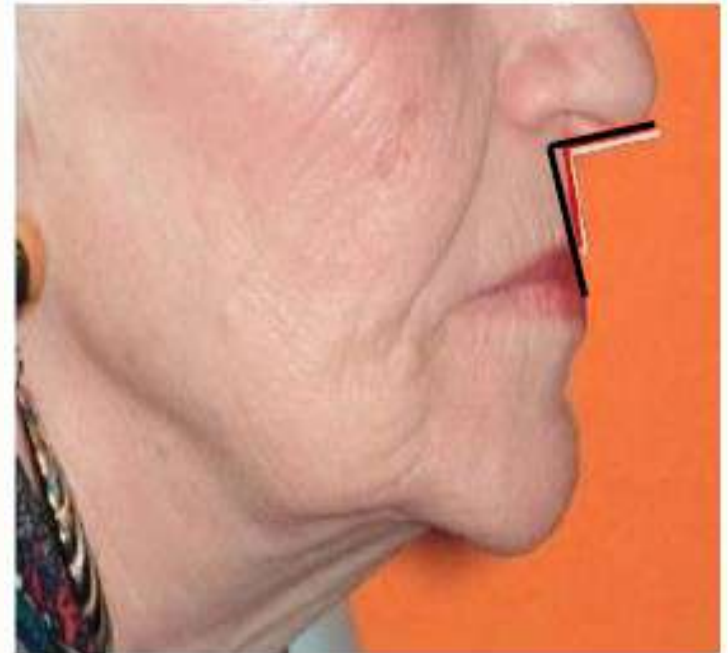


Figure (2-2): Nasolabial angle

Extra-oral landmarks

The following extra-oral anatomical features should be noted:

Angle of the mouth and Labial commissure: Angle of the mouth is the lateral limit of the oral fissure. Labial commissure is a junction of upper and lower lips lateral to the angle of the mouth.



Extra-oral landmarks

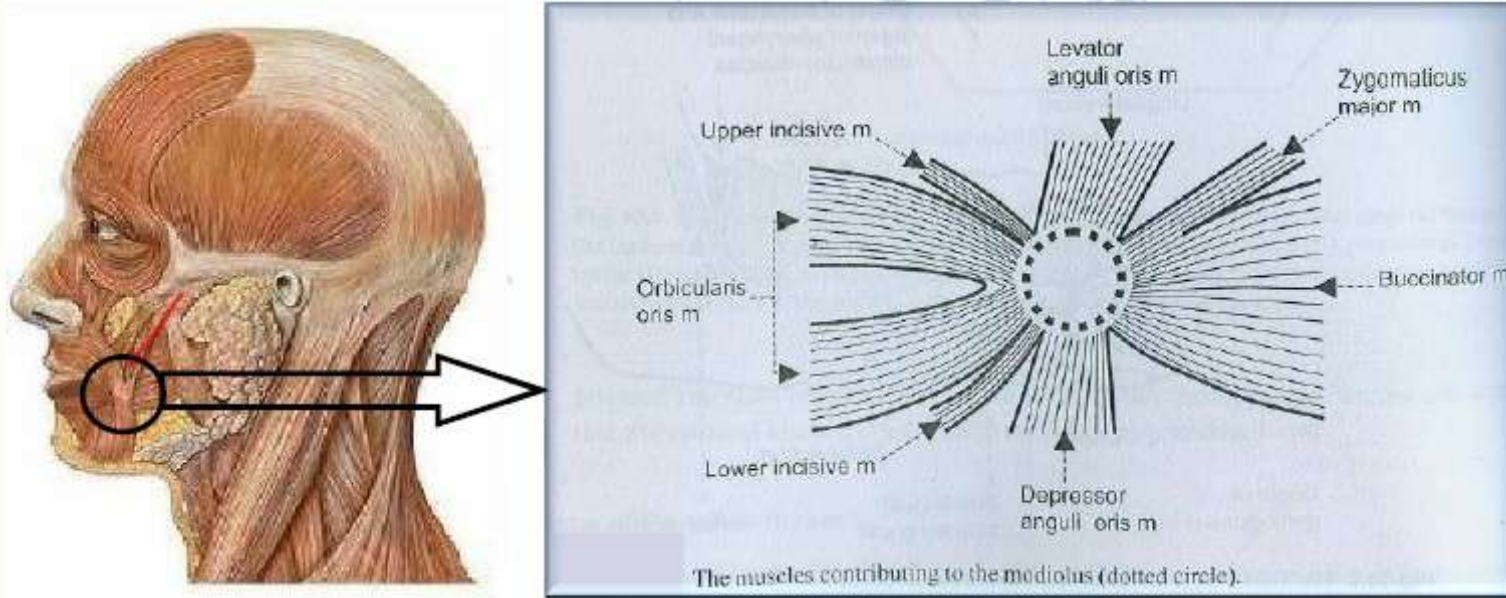


Figure (2-4): Modiolus and contributing muscles.

The following extra-oral anatomical features should be noted:

Modiolus: This muscular knot is at the angles of the mouth.

Modiolus may lie laterally to the lower premolars so it will displace a lower denture if those teeth are set too far buccally.

THANK YOU





Intraoral Landmarks

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Intraoral Landmarks

- The anatomy of the edentulous ridge in the maxilla and mandible is very important for the design of a complete denture.
- The consistency of the mucosa and architecture of the underlying bone is different in various parts of the edentulous ridge.
- Hence some parts of the ridge are capable of withstanding more force than other areas.
- A thorough knowledge of these landmarks is essential even prior to impression making.

Anatomical landmarks in maxillary arch

- 1) Limiting structures.
- 2) Relief areas.
- 3) Supporting structures.

Anatomical landmarks in maxillary arch

1- limiting structures:

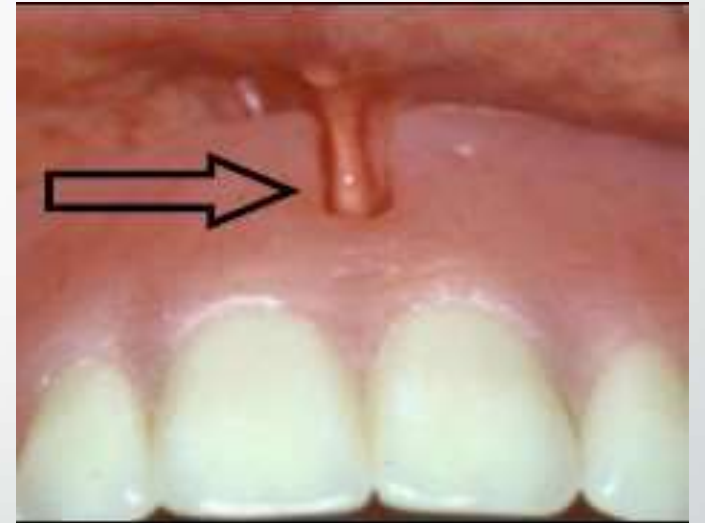
1. Labial frenum.
2. Labial sulcus (labial vestibule).
3. Buccal frenum.
4. Buccal sulcus (buccal vestibule).
5. Hamular notch (pterygo-maxillary notch).
6. Posterior palatal seal area.

Anatomical landmarks in maxillary arch

1- limiting structures:

1- Labial frenum:

- It is a **fold of mucous membrane** extending from the mucosal lining of the upper lip to the labial surface of the residual ridge **at the median line**.
- The frenum may be **single or multiple; narrow or broad**.
- It contains no muscle fibers, but it is moved with muscles of lip, and inserts in a vertical direction, which creates the maxillary **labial notch** in the impression or denture.



Labial frenum and labial notch.

Anatomical landmarks in maxillary arch

1- limiting structures:

2- Labial sulcus (labial vestibule):

- It is a space extends on both sides of the labial frenum to the buccal frenum bounded **externally** by the upper lip and **internally** by the residual ridge.
- The reflection of the mucous membrane **superiorly** determines the height of the vestibule (mucogingival line limits upper border).
- In the denture, the area that fills this space is known as **labial flange**.
- It is **very important** to record adequate depth/width of vestibule, flange overextension causes instability/soreness and proper contouring gives optimal esthetics.

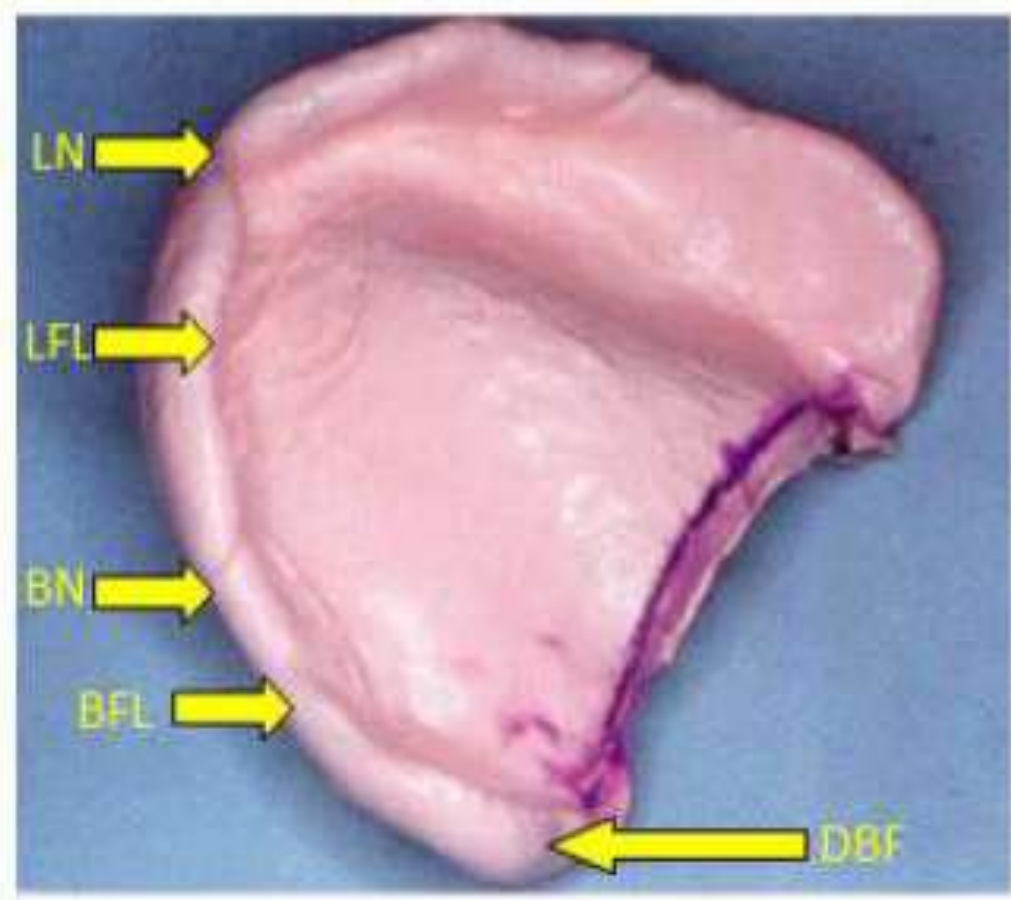
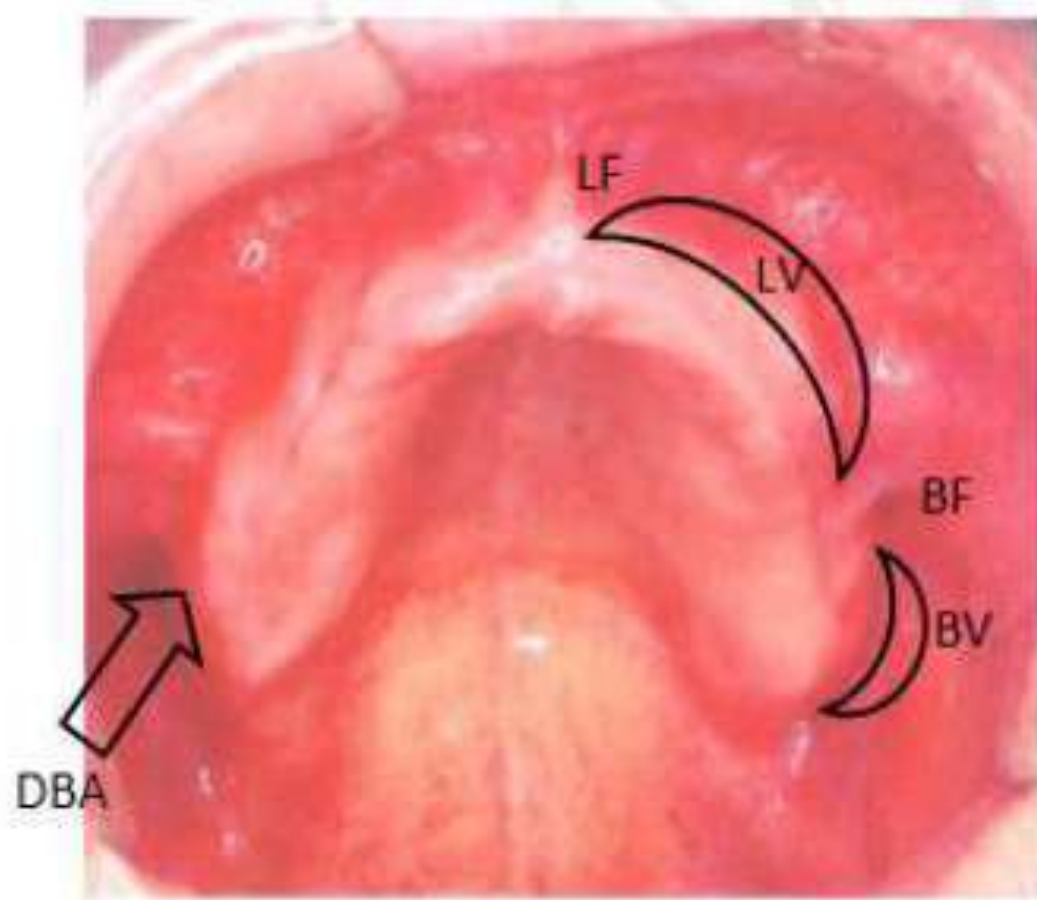


Figure (2-7): Labial frenum (LF), Labial vestibule (LV), Buccal frenum (BF), Buccal vestibule (BV), Disto-buccal area (DBA), Labial notch (LN), Labial flange (LFL), Buccal notch (BN), Buccal flange (BFL), Disto-buccal flange (DBF).

Anatomical landmarks in maxillary arch

1- limiting structures:

3- Buccal frenum:

- A fold or folds of mucous membrane varies in size and shape and **extends from** the buccal mucous membrane reflection area toward the slope or crest of residual ridge.
- It contains **no muscle fibers** and its **direction is anteroposterior**.
- It produces the maxillary **buccal notch in the denture** which must be broad enough to accommodate the movement of frenum which is affected by some of the facial muscles as the orbicularis oris muscle pull it forward while buccinator muscle pull it backward.

Anatomical landmarks in maxillary arch

1- limiting structures:

4- Buccal sulcus (buccal vestibule) :

- It is the space **distal to the buccal frenum to the hamular notch**.
- It is bounded **laterally** by the cheek and **medially** by the residual ridge.
- The area of the denture which fills this space is known as **buccal flange**.
- The stability and retention of the denture are greatly enhanced if the vestibule is properly filled with the flange distally, so recording adequate depth/width is very important and improper extension causes instability/soreness.
- Its **size** related to the **contraction of buccinators muscle**, **position of mandible** and **the amount of bone loss from maxilla**.
- The **distal end** of the buccal vestibule is called (**distobuccal area**) or (**coronomaxillary space**).
- It is influenced by **coronoid process of mandible**.

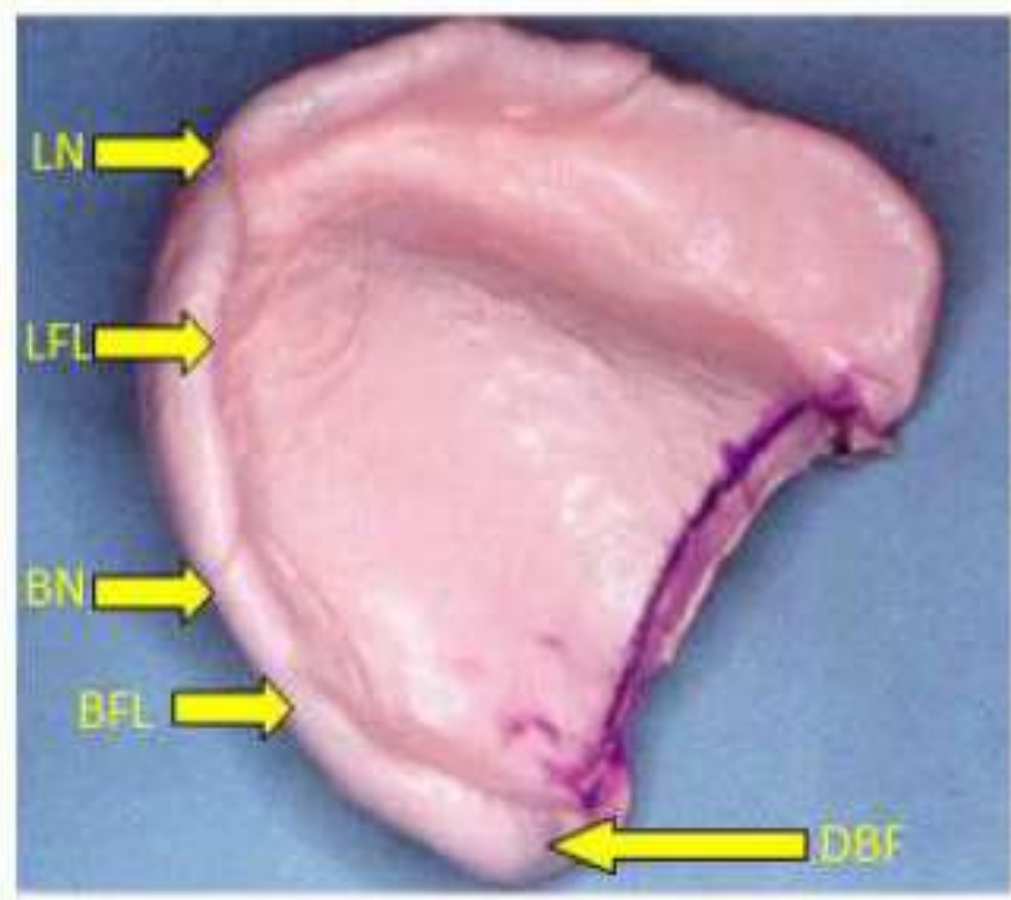
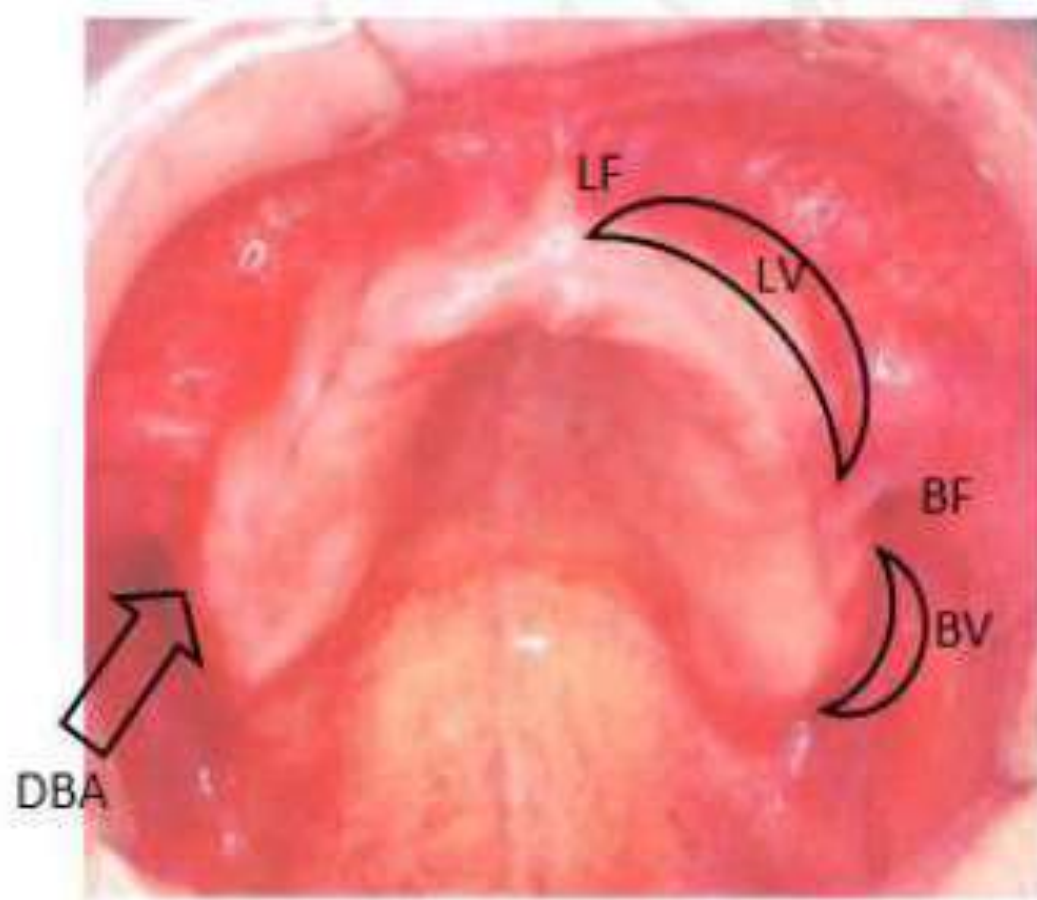


Figure (2-7): Labial frenum (LF), Labial vestibule (LV), Buccal frenum (BF), Buccal vestibule (BV), Disto-buccal area (DBA), Labial notch (LN), Labial flange (LFL), Buccal notch (BN), Buccal flange (BFL), Disto-buccal flange (DBF).

Anatomical landmarks in maxillary arch

1- limiting structures:



5- Hamular notch (pterygo-maxillary notch):

- It is a narrow cleft of loose connective tissue between distal surface of tuberosity and the hamular process of the medial pterygoid plate.
- The width is approximately (**2 mm**) anteroposteriorly.
- It uses as a **boundary of the posterior border** of the maxillary denture.
- It houses the **disto-lateral termination** of the denture and **aids in achieving posterior palatal seal**.
- The overextension of the denture base beyond the pterygo-maxillary notch may cause soreness, and underextension may cause poor retention.

Anatomical landmarks in maxillary arch

1- limiting structures:

6-posterior palatal seal area

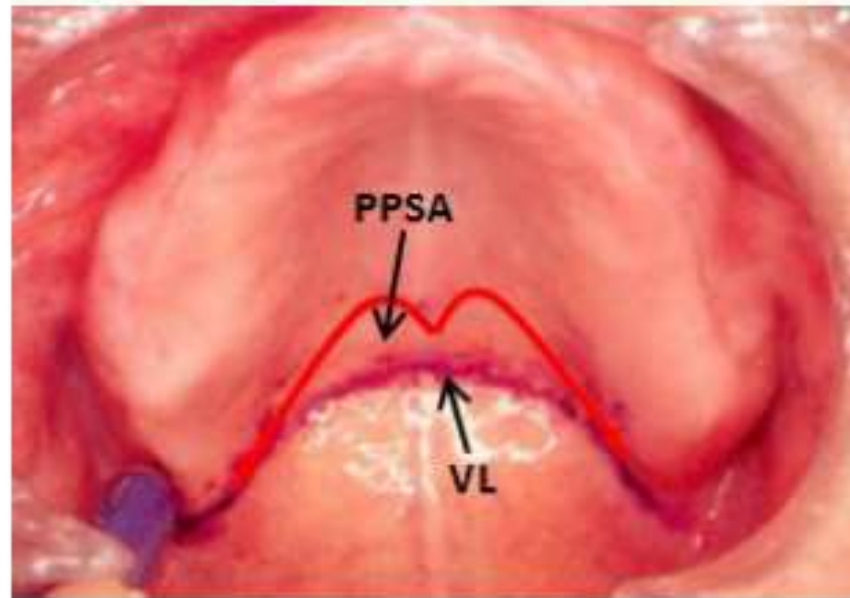
- The soft tissue area beyond the junction of the hard and soft palates on which pressure within physiological limits, can be applied by a complete denture to aid in its retention.
- The imaginary line across the posterior part of the palatal seal area marking the division between the movable and immovable tissues of the soft palate called *Vibrating line (AH-line)*.
- It extends from one hamular notch to the other about (**2 mm**) in front of the fovea palatina.
- This can be identified when the movable tissues are functioning; when the individual says series of short "**AH**" sounds.

Anatomical landmarks in maxillary arch

1- limiting structures:

6-posterior palatal seal area

- It is not well defined as a line, therefore it is better to describe it as an area rather than a line.
- In the denture, the posterior border of the denture that lies over vibrating line is known as (post dam) to form posterior seal.



Anatomical landmarks in maxillary arch

2- Relief areas:

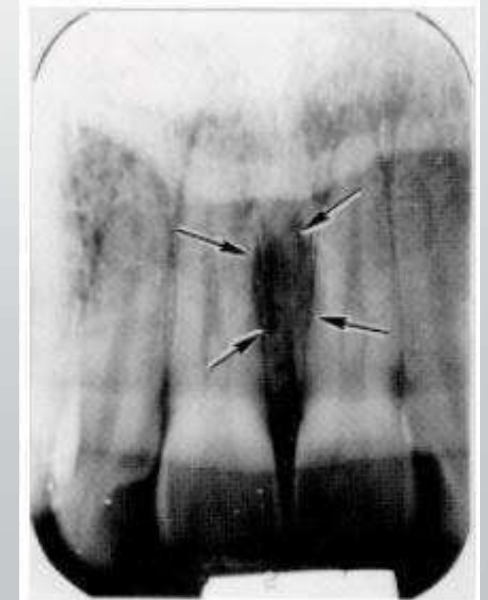
1. Incisive papilla.
2. Canine eminence (Cuspid eminence).
3. Zygomatic process (Malar bone).
4. Fovea palatinae.
5. Midpalatine raphe.
6. Torus palatinus.

Anatomical landmarks in maxillary arch

2- Relief areas:

1- incisive papilla:

- It is a pad of fibrous connective tissue **lies between the two central incisors** on the **palatal side**; it overlies the incisive foramen of the nasopalatine duct where the nasopalatine nerve and vessels arises.
- In an edentulous mouth, it may lie close to the crest of the residual ridge.
- **Relief over the incisive papilla** should be provided in denture to avoid any interference with blood supply and nerve pathway which causes burning sensation and pain.
- It aids in determination of **the location of artificial central incisors**.
- The Location of the incisive papilla gives proper estimation to the **amount of alveolar bone loss**.



Anatomical landmarks in maxillary arch

2- Relief areas:

2- Canine eminence (Cuspid eminence):

- It is a round bony elevation in the **corner of the mouth** it represents the location of the **root of the canine**, which is helpful to be used as a guide for selection and arrangement of maxillary anterior teeth.

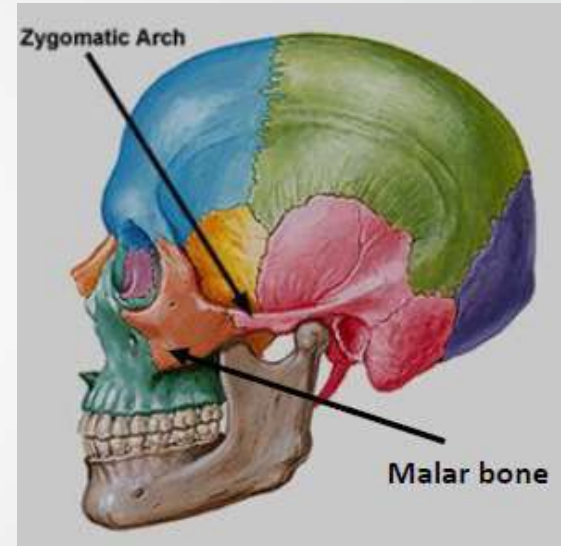


Anatomical landmarks in maxillary

2- Relief areas:

3-Zygomatic process (Malar bone):

- It is located **opposite to the first molar region**, hard area found in the mouth that has been **edentulous for long time**.
- Some dentures require relief over this area to prevent soreness of the underlying tissue.



Anatomical landmarks in maxillary arch

2- Relief areas:

4- Fovea palatinae:

- These are two indentations **on each side of the midline**, formed by a coalescence of several **mucous gland ducts**; they act as a guide for aiding in locating of the vibrating line and posterior border of the denture.



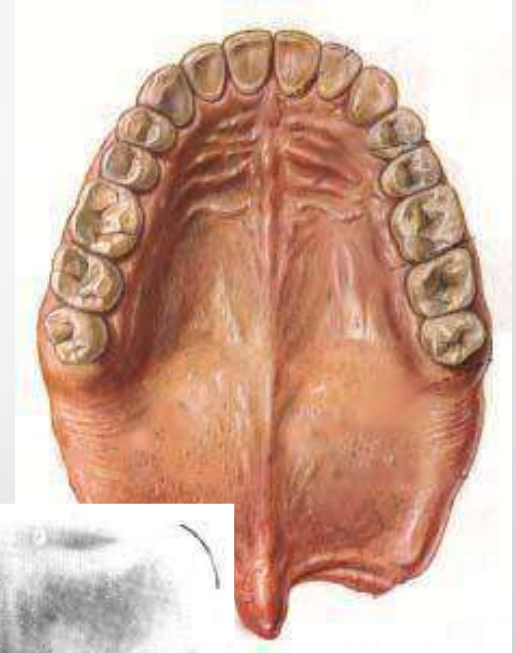
Figure (2-13): Fovea palatinae and incisive papilla.

Anatomical landmarks in maxillary arch

2- Relief areas:

5- Midpalatine raphe:

- It overlies the **medial palatal suture**, extended from the incisive papilla to the distal end of the hard palate.
- The mucosa over this area is usually tightly attached, thin and non-resilient; the underlying bony union being very dense and often raised, the palatal tori are located here if present.
- Relieve adequately to avoid trauma from denture base.



Anatomical landmarks in maxillary arch

2- Relief areas:

6- Torus palatinus :

- It is a hard bony enlargement that occurs in the **midline of the roof of the mouth (hard palate)**.
- It is found in 20 % of the population, relief done if it is small and surgical correction may be needed if the tori are very large and extends to the vibrating line.
- The **female: male ratio is 2:1.**



Anatomical landmarks in maxillary arch

3- Supporting structures:

A- Primary stress bearing areas:

1. Palatal shelf area.
2. Postero-lateral portion of the residual alveolar ridge.

B- secondary stress bearing areas:

1. Maxillary tuberosity.
2. Rugae area.

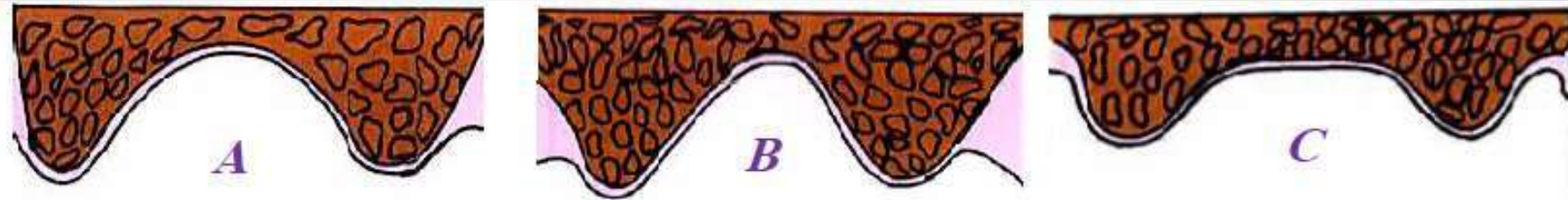
Anatomical landmarks in maxillary arch

3- Supporting structures:

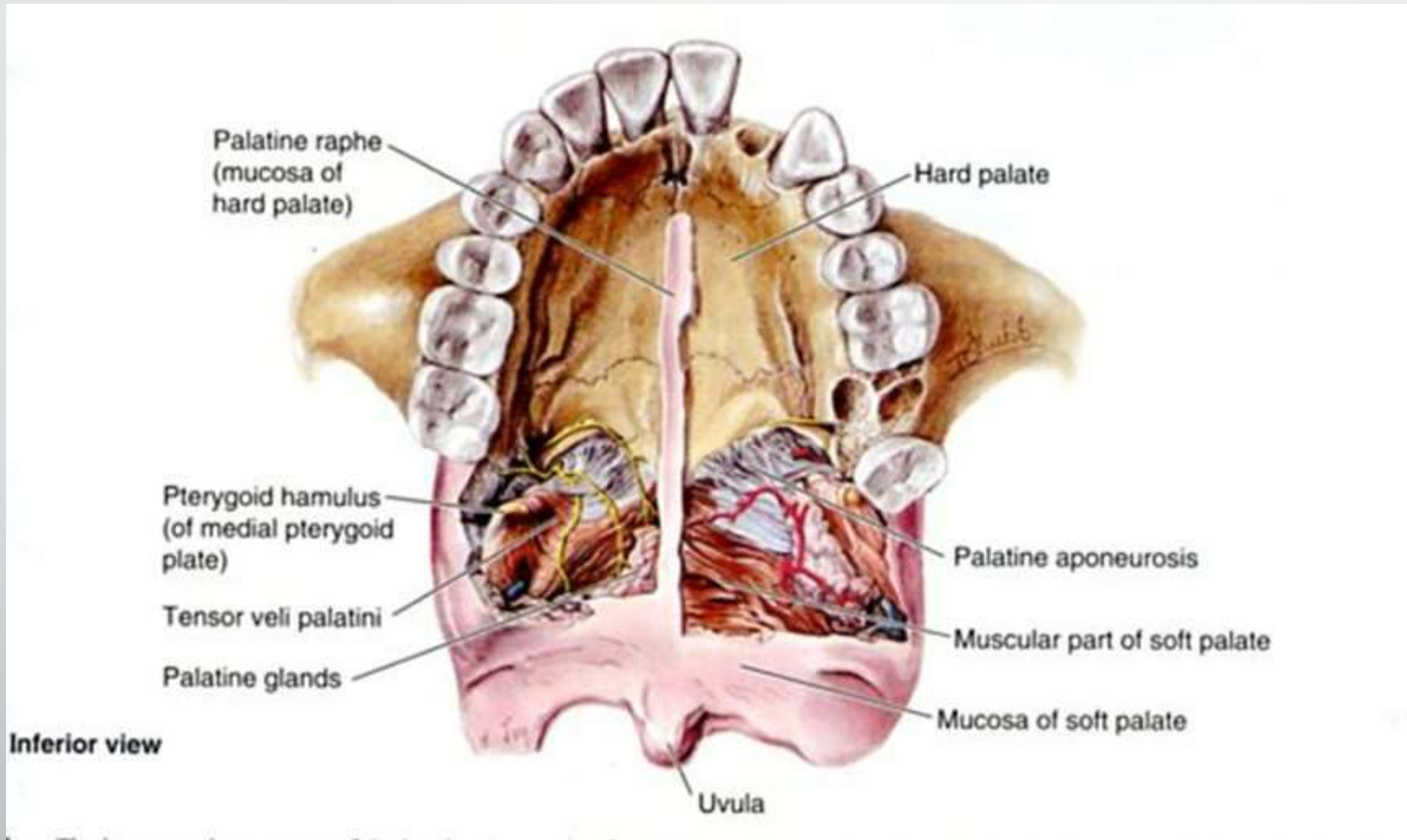
A- Primary stress bearing areas:

1. Palatal shelf area:

- The horizontal portion of the hard palate lateral to the midline (Palatine vault)



*Figure (2-17): Different shapes of palatine vault:
A: U-shape: Ideal for both retention and stability.
B: V-shape: Retention is less.
C: Flat shape: Reduced resistance to lateral and rotatory forces.*



Anatomical landmarks in maxillary arch

3- Supporting structures:

A- Primary stress bearing areas:

2. Postero-lateral portion of the residual alveolar ridge:

- **Residual ridge:** It is the bony process that remains after teeth have been lost, which is covered by mucous membrane.
- The residual ridge considered to be the primary stress bearing area.
- The residual ridge will produce the ridge fossa or groove in the impression or denture.



Anatomical landmarks in maxillary arch

3- Supporting structures:

B- secondary stress bearing areas:

1. Maxillary tuberosity:

- It is the area of the alveolar ridge that extends distal to the maxillary third molar to the hamular notch.
- In some patients it may be very large in size (fibrous or bony) that not allow for proper placement of the denture, so surgical correction may be indicated.



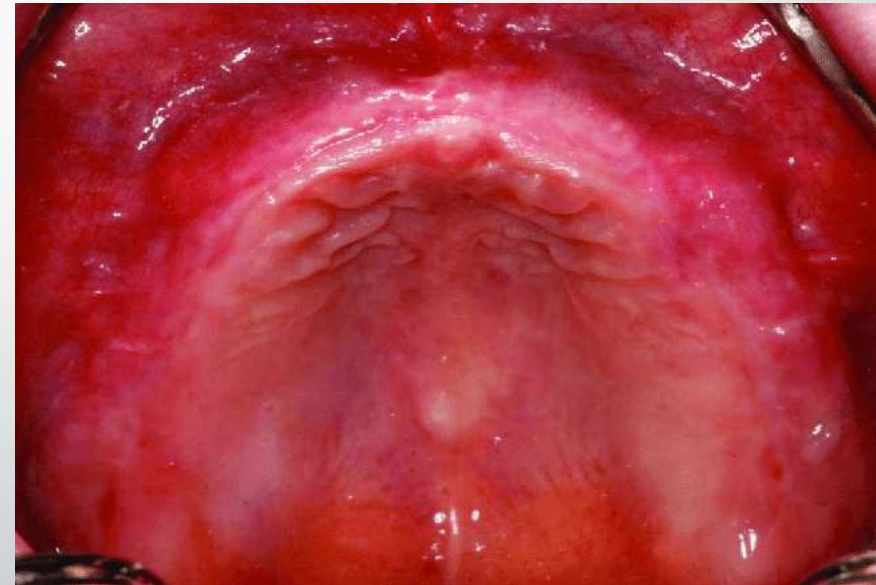
Anatomical landmarks in maxillary arch

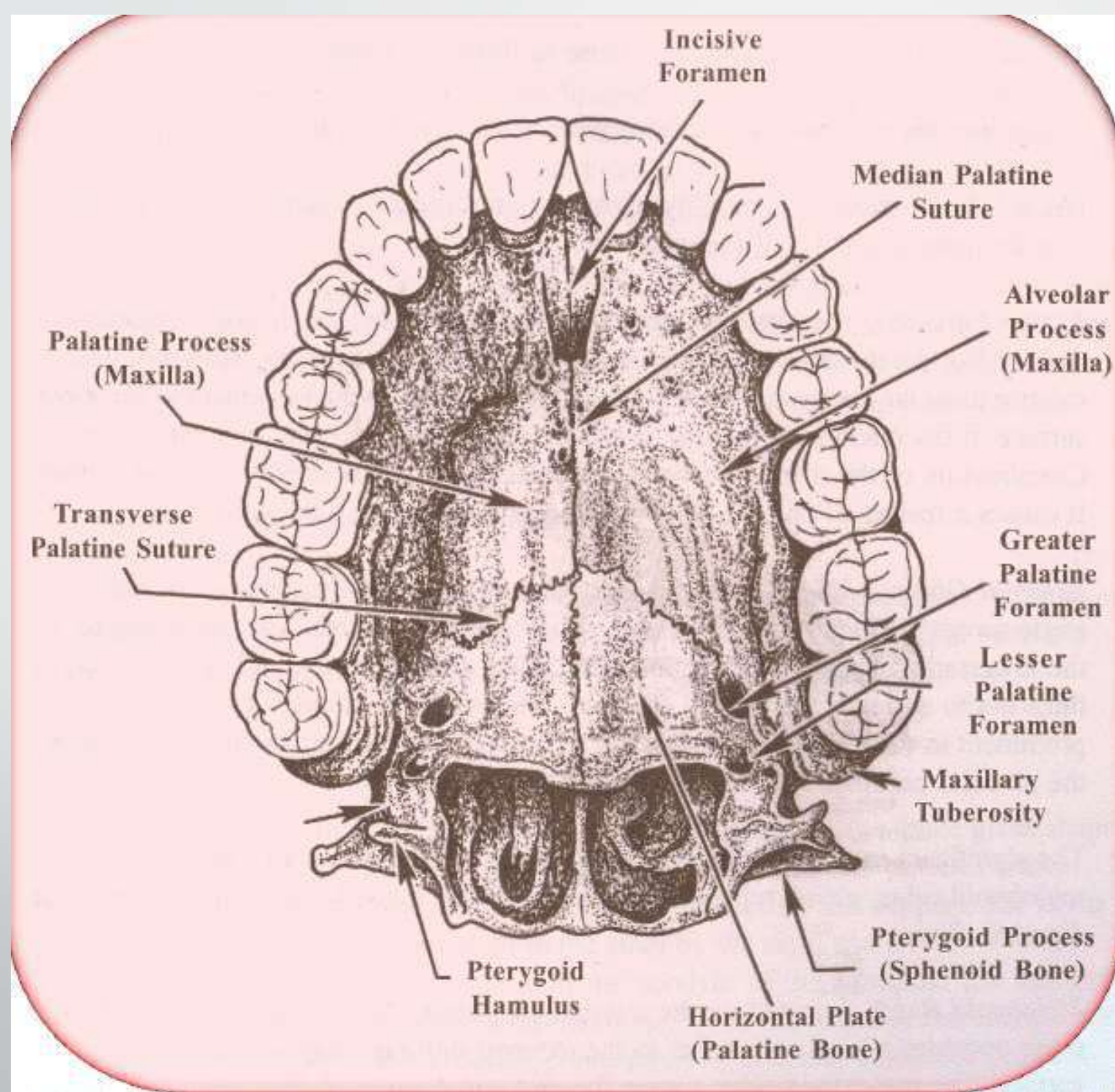
3- Supporting structures:

B- secondary stress bearing areas:

2. Rugae area:

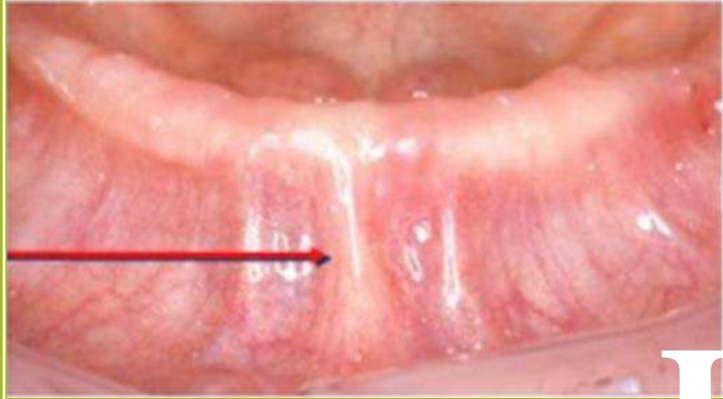
- These are raised areas of dense connective tissue radiating from the median suture in the anterior third of the palate.
- The folds of the mucosa play an important role in speech; also it is regarded as a secondary stress bearing area. It should not be distorted in the impression.







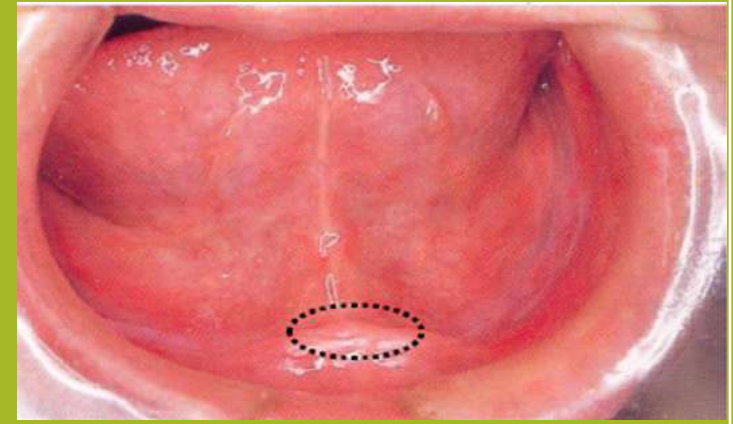
THANK YOU



INTRAORAL LANDMARKS (II)

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Anatomical landmarks in mandibular arch

1. **Limiting structures.**
2. **Relief areas.**
3. **Supporting structures.**

Anatomical landmarks in mandibular arch

1- limiting structures:

1. **Labial frenum.**
2. **Labial sulcus (labial vestibule).**
3. **Buccal frenum.**
4. **Buccal sulcus (buccal vestibule).**
5. **Lingual frenum.**
6. **Alveolo-lingual sulcus (lingual vestibule):**
7. **Retromolar pad.**
8. **Pterygomandibular raphe or ligament.**
9. **External oblique line.**

Anatomical landmarks in mandibular arch

1- limiting structures:

1. Labial frenum:

- It is a fold of mucous membrane.
- It is not usually as pronounced as the frenum in the maxillary arch, it is shorter and wider than the maxillary frenum, but is histologically and functionally similar.
- The frenum may be single or multiple; narrow or broad.
- It may contain fibrous band attached to the orbicularis oris muscle, therefore it may be active in mastication.

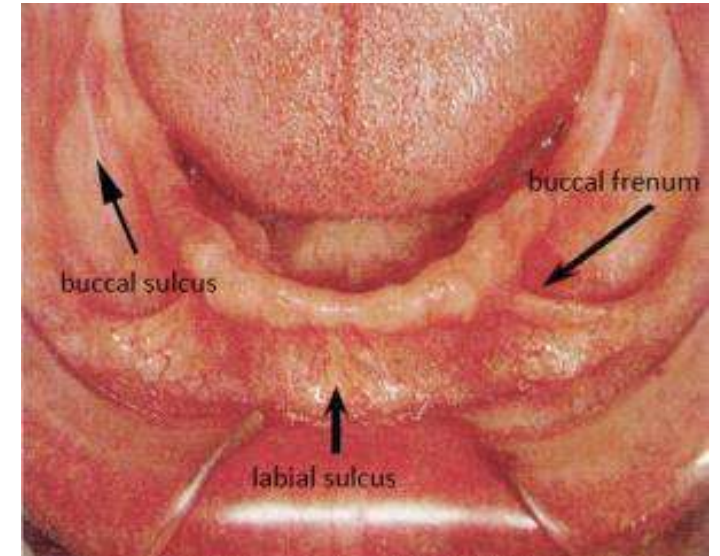


Anatomical landmarks in mandibular arch

1- limiting structures:

2. Labial sulcus:

- The labial flange space extending from the labial frenum to the buccal frenum in both sides, it is limited inferiorly by the mucous membrane reflection, internally by the residual ridge, and labially by the lower lip.
- It is very **important to record adequate depth/width of vestibule**, flange overextension causes instability/soreness and proper contouring gives optimal esthetics.



Anatomical landmarks in mandibular arch

1- limiting structures:

3. Buccal frenum:

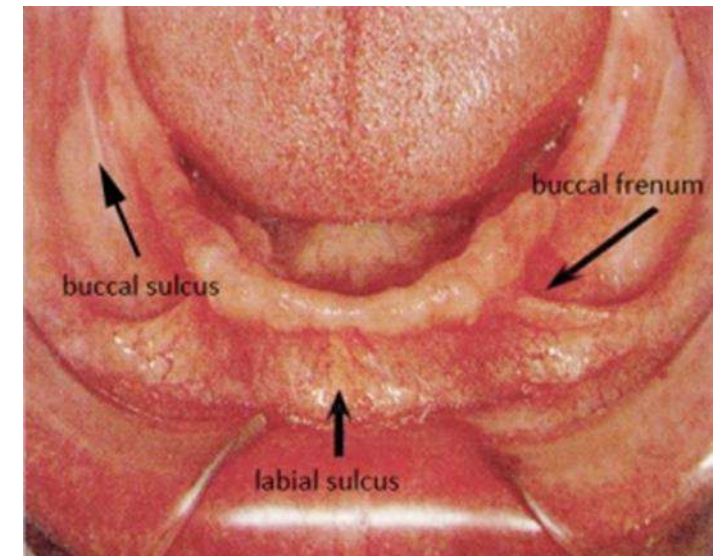
- It is a fold or folds of mucous membrane extending from the buccal mucous membrane reflection to the slope or crest of the residual ridge in the region just distal to the cuspid eminence.
- This membrane may be single or double; broad U-shaped or sharp V-shaped, in anteroposterior direction.
- It **must be molded and have enough space (notch)** in the denture to prevent displacement as it may be activated in function by the muscles.

Anatomical landmarks in mandibular arch

1- limiting structures:

4. Buccal sulcus (buccal vestibule):

- It is extended from the buccal frenum to the distal end of the arch .
- It is bounded externally by the cheek and internally by the residual ridge.



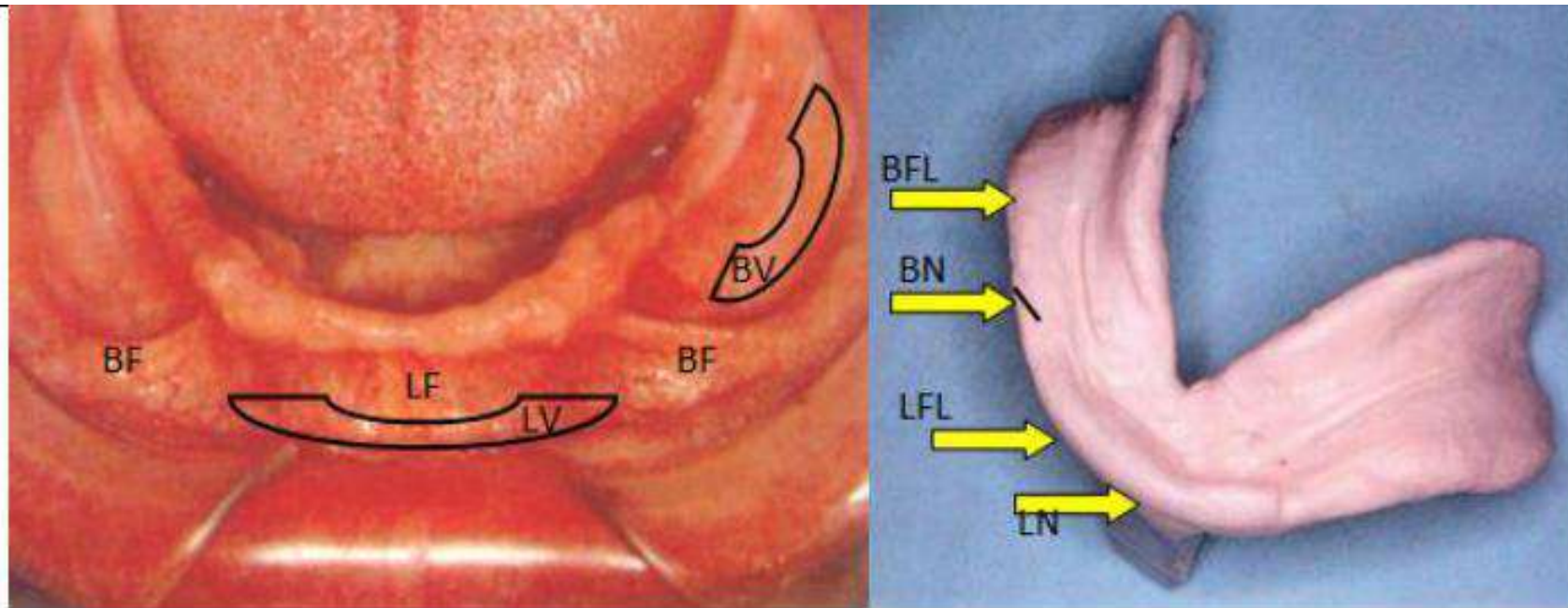


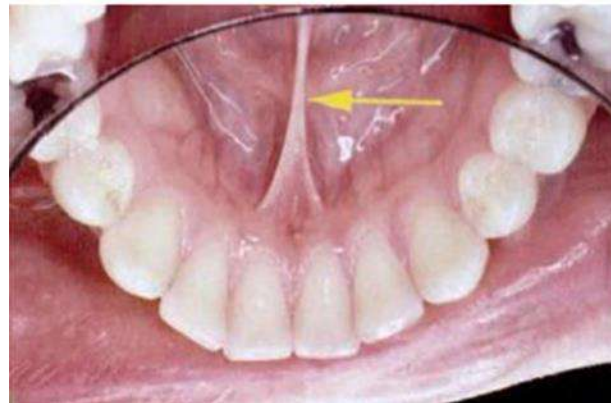
Figure (2-19): Labial frenum (LF), Labial vestibule (LV), Buccal frenum (BF), Buccal vestibule (BV), Labial notch (LN), Labial flange (LFL), Buccal notch (BN), Buccal flange (BFL).

Anatomical landmarks in mandibular arch

1- limiting structures:

5. Lingual frenum:

- It is a fold of mucous membrane can be observed when the tip of the tongue is elevated.
- This, the lingual frenum, **overlies the genioglossus muscle.**
- This frenum is **activated when the tongue is moved**; therefore it must be molded well in the impression to prevent displacement of the denture or ulceration of the tissue.



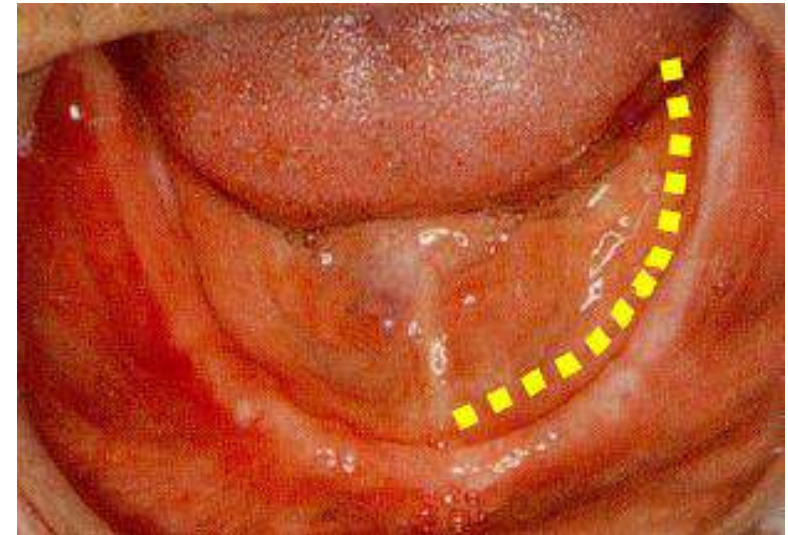
Anatomical landmarks in mandibular arch

1- limiting structures:

6. Alveolo-lingual sulcus (lingual vestibule):

It is extended from the lingual frenum to the retromylohyoid curtain; it is bounded externally by the residual ridge and internally by the tongue.

This space is filled by the lingual flange of the denture and can be divided into three parts:



Anatomical landmarks in mandibular arch

1- limiting structures:

6. Alveolo-lingual sulcus (lingual vestibule):

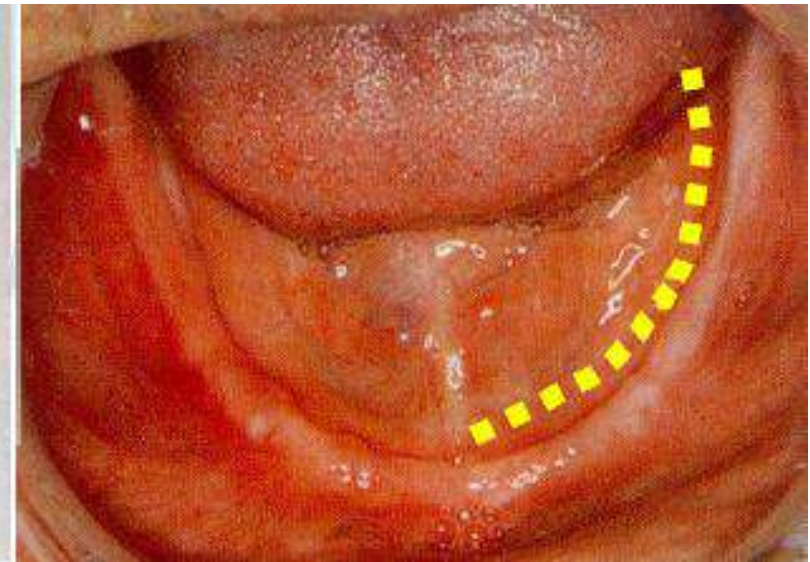
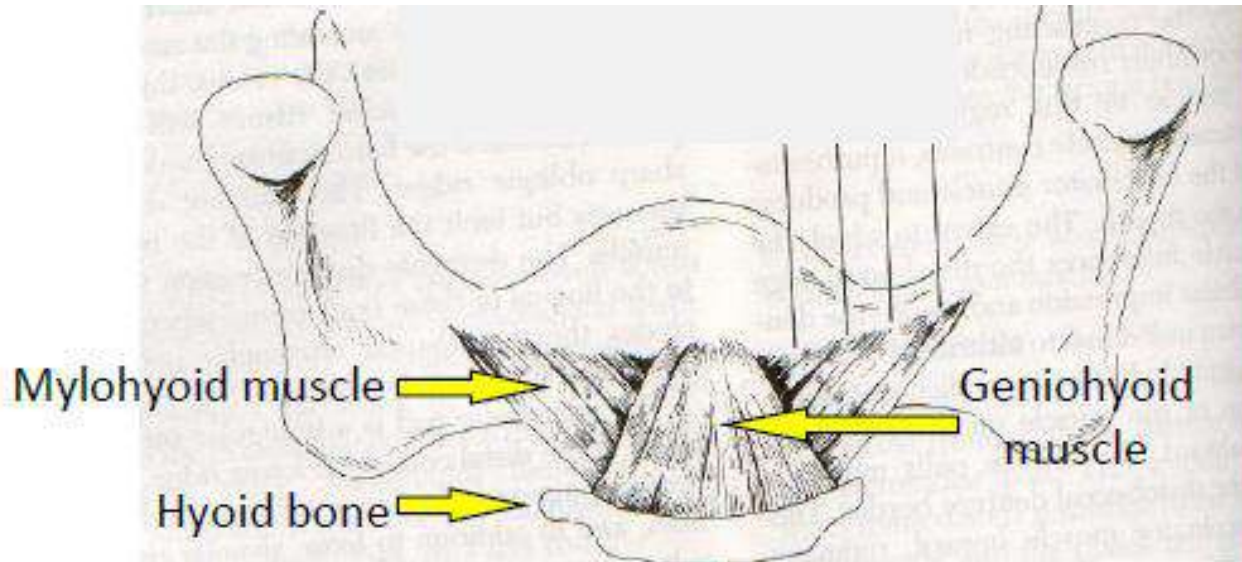
- A. **Anterior region (premylohyoid fossa):** It extends from the lingual frenum to the first premolar area which produces premylohyoid eminence in the impression.
- B. **Middle region (mylohyoid ridge):** It extends from the first premolar area to the distal end of the mylohyoid ridge; here the mylohyoid muscle forms the muscular floor of the mouth. It arises from the mylohyoid ridge, It is important in determining the contour of the lingual flange, lingual flange should extend below the level of the mylohyoid ridge, the tongue rests on the top of flange and aids in stabilizing the lower denture.
- C. **Posterior region (retromylohyoid fossa):** It extends from the distal end of the mylohyoid ridge to the retromylohyoid curtain. The lingual flange of the denture should extend laterally and fill the retromylohyoid fossa.

Anatomical landmarks in mandibular arch

1- limiting structures:

6. Alveolo-lingual sulcus (lingual vestibule):

Proper recording of these regions give typical *S-form* of the lingual flange,

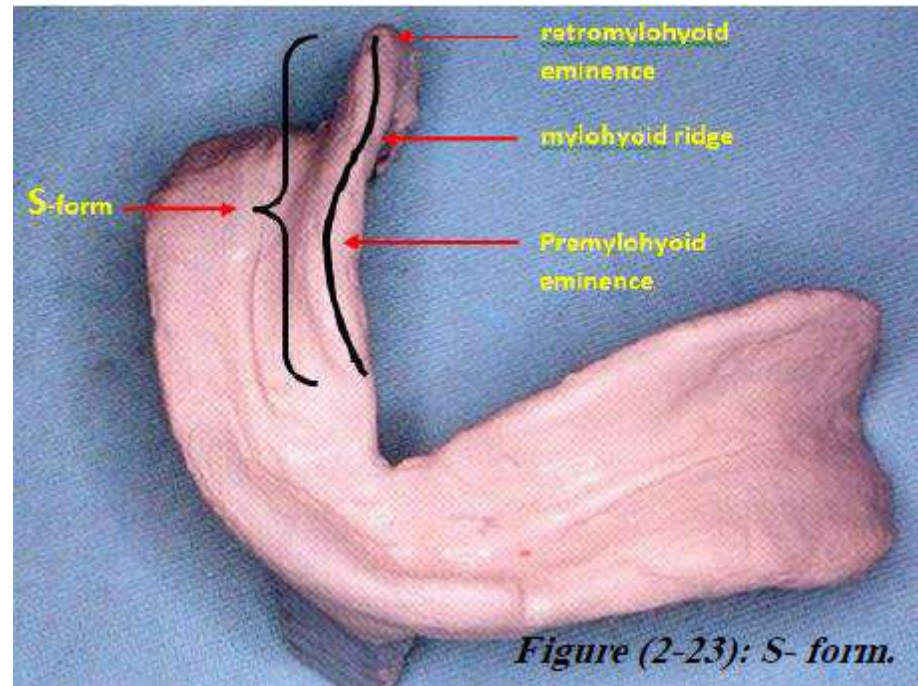


Anatomical landmarks in mandibular arch

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Anatomical landmarks in mandibular arch

1- limiting structures:

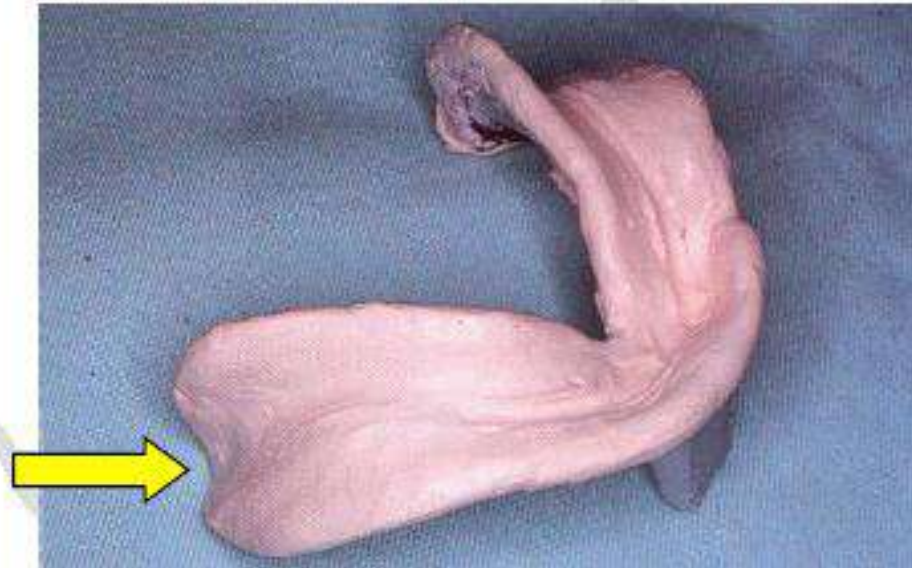
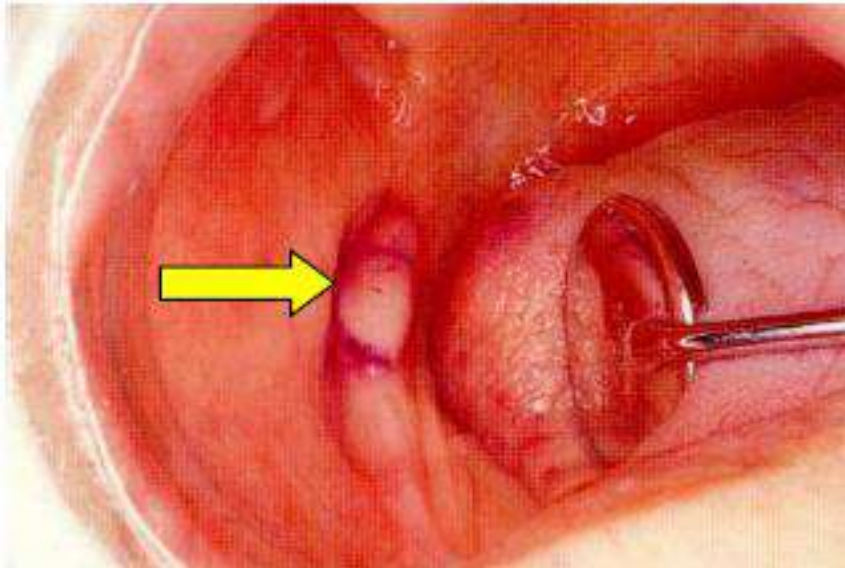
7. Retromolar pad:

- It is a pear-shaped area at the distal end of the mandibular residual ridge, containing loose connective tissue, glandular tissue, the lower margin of the pterygomandibular raphe (*fibers of buccinator and superior constrictor muscles*) along with fibers from the temporal tendon.
- Two third of pad must be covered by the denture to perfect the border seal of the denture; also it is used as a guide for locating the level of occlusal plane, which must not be higher than half its vertical height.

Anatomical landmarks in mandibular arch

1- limiting structures:

7. Retromolar pad:



Anatomical landmarks in mandibular arch

1- limiting structures:

8. Pterygomandibular raphe or ligament:

It is union of buccinator and superior constrictor muscles extending from hamular process to retromolar pad, it is stretched during mouth opening.

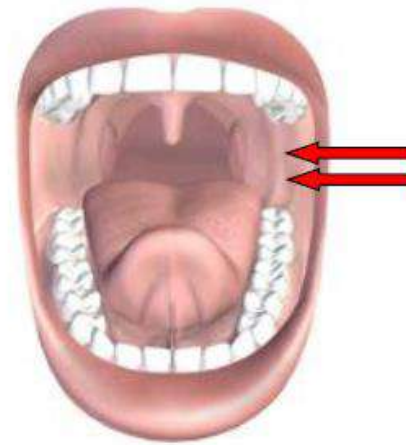
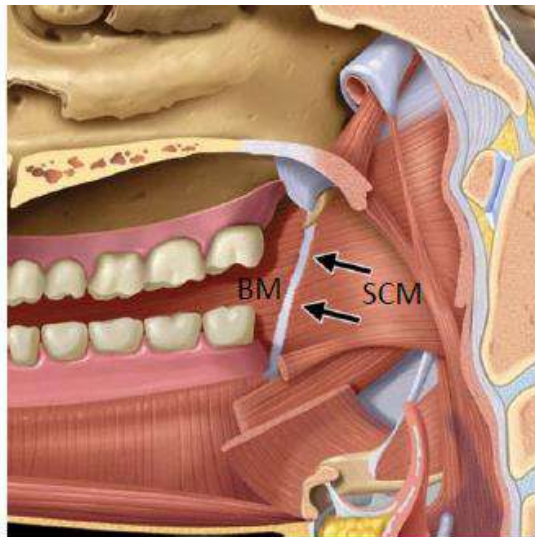


Figure (2-25): Pterygomandibular raphe (arrows), superior constrictor muscle (SCM), buccinator muscle (BM).

Anatomical landmarks in mandibular arch

1- limiting structures:

9. External oblique line:

- It is a ridge of dense bone outside the buccal shelf extending from just above the **mental foramen** coursing superiorly and distally, becoming continuous with the **anterior border of the ramus**.
- This line is the attachment site of the **buccinator muscle**.
- It is a guide for lateral termination of mandibular buccal flange.
- It shows a groove in impression.

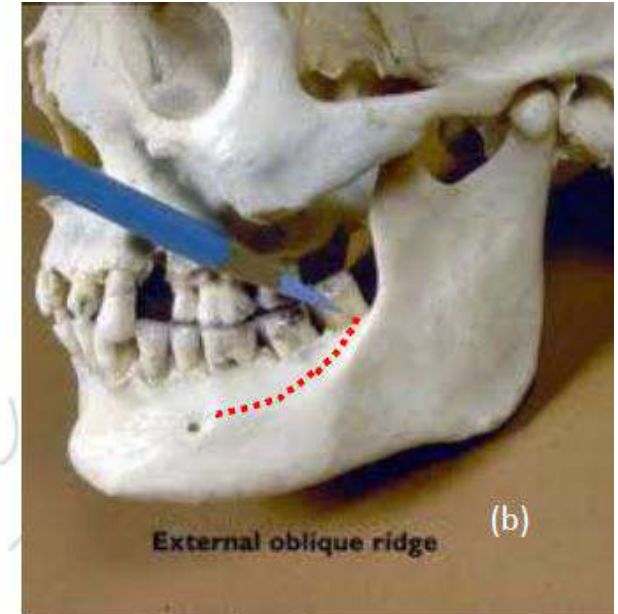
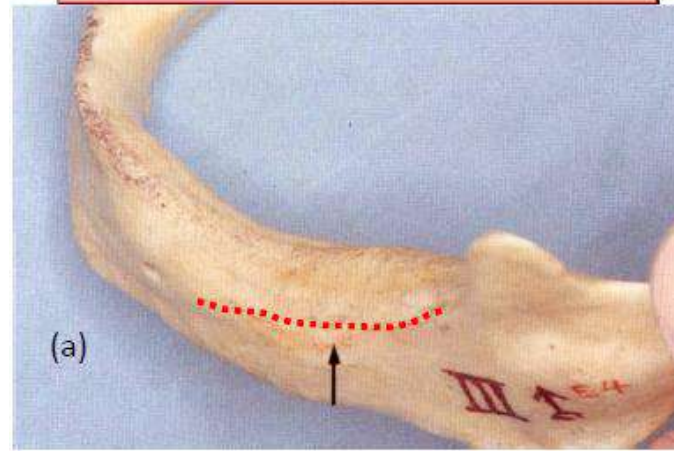
Anatomical landmarks in mandibular arch

1- limiting structures:

9. External oblique line:

Figure (2-26): External oblique ridge.

(a) Edentulous. (b) Dentulous.



Anatomical landmarks in mandibular arch

2- Relief areas:

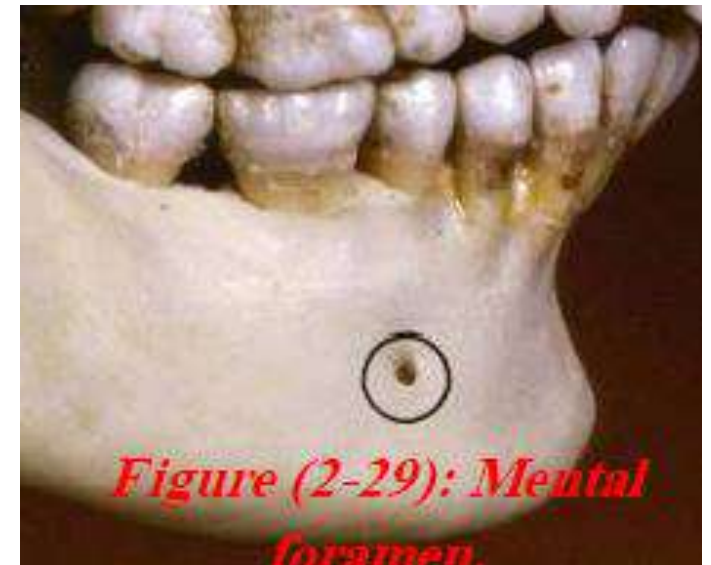
1. Mental foramen.
2. Mylohyoide ridge.
3. Torus mandibularis.
4. Genial tubercle.

Anatomical landmarks in mandibular arch

2- Relief areas:

1. Mental foramen:

- The anterior exit of the mandibular canal located on the external surface of the mandible between the first and second premolar area.
- In case of **severe resorption**, the foramen occupies a **more superior position** and the denture base must be **relieved** to prevent nerve compression and pain.



Anatomical landmarks in mandibular arch

2- Relief areas:

1. Mental foramen:

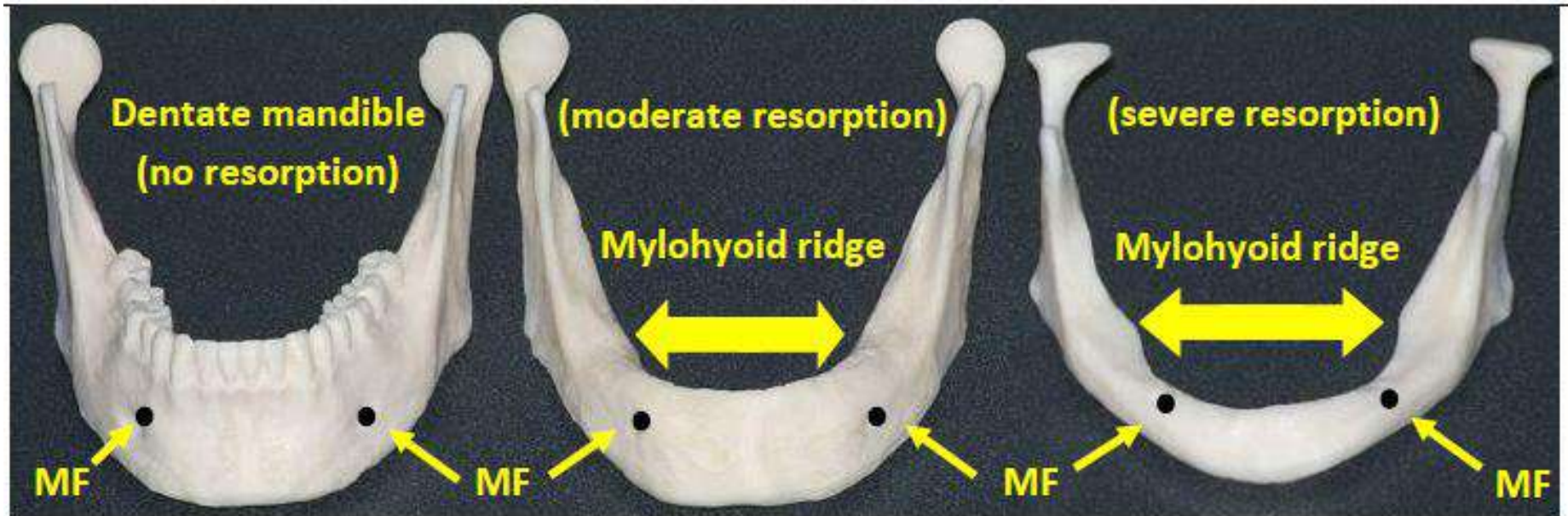


Figure (2-30): Position of mental foramen (MF) and mylohyoid ridge as they vary relative to the degree of residual ridge resorption.

Anatomical landmarks in mandibular arch

2- Relief areas:

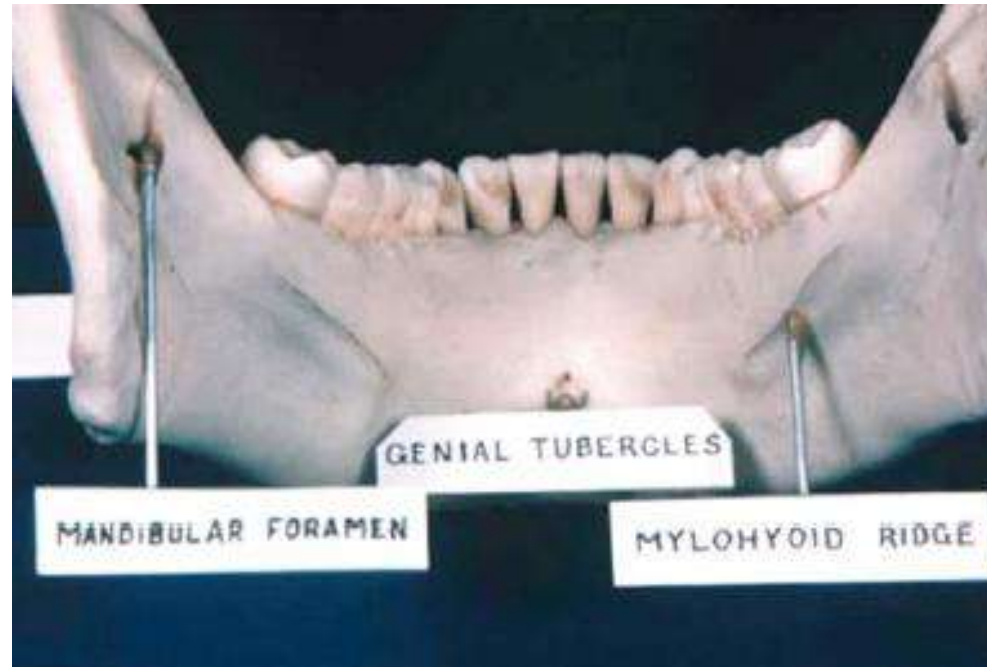
2. Mylohyoid ridge :

- It is sharp or irregular covered by the mucous membrane, it runs along the lingual surface of the mandible; anteriorly, the ridge lies close to the inferior border of the mandible; but become progressively higher on the posterior body of the mandible until it terminates just distal to the lingual tuberosity.
- The thin mucosa cover the mylohyoid ridge may get traumatized and should be relieved.
- The area under this ridge called undercut.

Anatomical landmarks in mandibular arch

2- Relief areas:

2. Mylohyoide ridge :



Anatomical landmarks in mandibular arch

2- Relief areas:

3. Torus mandibularis :

- It is a bony prominence on the lingual side, near the premolar region.
- It is covered by a thin mucosa.
- It is found in **6-8%** of the population; 80% of these cases found bilaterally.
- It has to be relieved or surgically removed as decided by its size and extent.
- The female: male ratio is **1:1**.

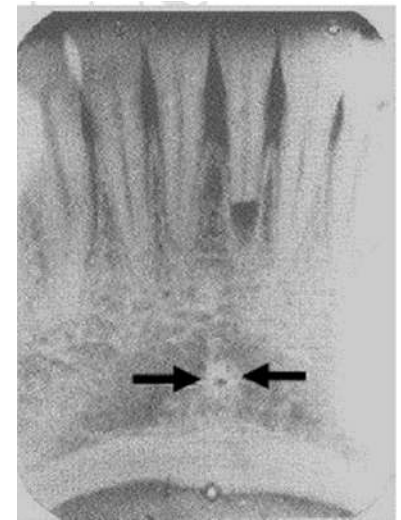
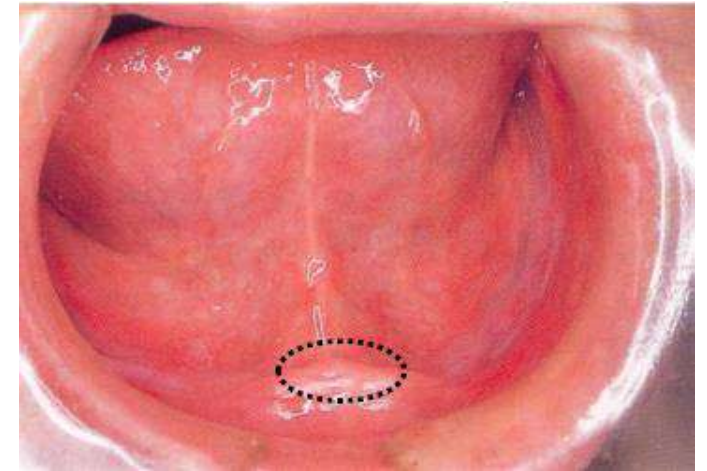


Anatomical landmarks in mandibular arch

2- Relief areas:

4. Genial tubercles (mental spine):

- These are a pair of bony structures found anteriorly on the lingual side of the body of the mandible.
- In case of severe bone resorption, they may occupy more superior position, surgical correction may be needed.
- The superior tubercle gives attachment to the genioglossus muscle and the inferior one gives attachment to the geniohyoid muscle.



Anatomical landmarks in mandibular arch

3- Supporting structures:

A- Primary stress bearing areas:

- 1. Buccal shelf area.**

B- secondary stress bearing areas:

- 1. Buccal and lingual slopes of residual ridge**

Anatomical landmarks in mandibular arch

3- Supporting structures:

A- Primary stress bearing areas:

1. Buccal shelf area:

- The area between the mandibular buccal frenum and the anterior border of the masseter muscle is known as buccal shelf area.
- It is bounded medially by the crest of the residual ridge, laterally by the external oblique line, anteriorly by the buccal frenum, distally by the retromolar pad.
- It serves as a primary stress bearing area for the mandibular denture because; it is covered by a layer of compact bone, wide and at right angle to the direction of vertical forces.

Anatomical landmarks in mandibular arch

3- Supporting structures:

A- Primary stress bearing areas:

1. Buccal shelf area:

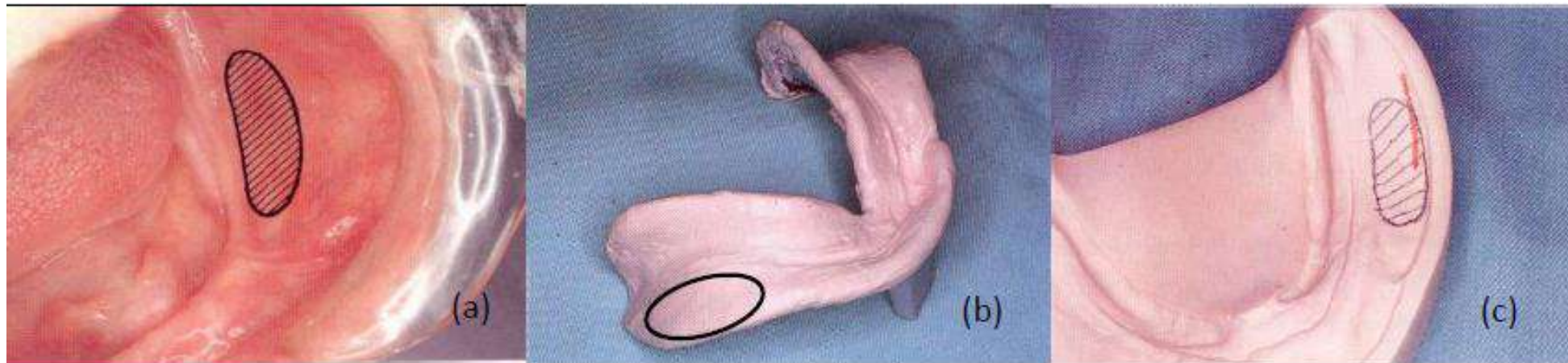


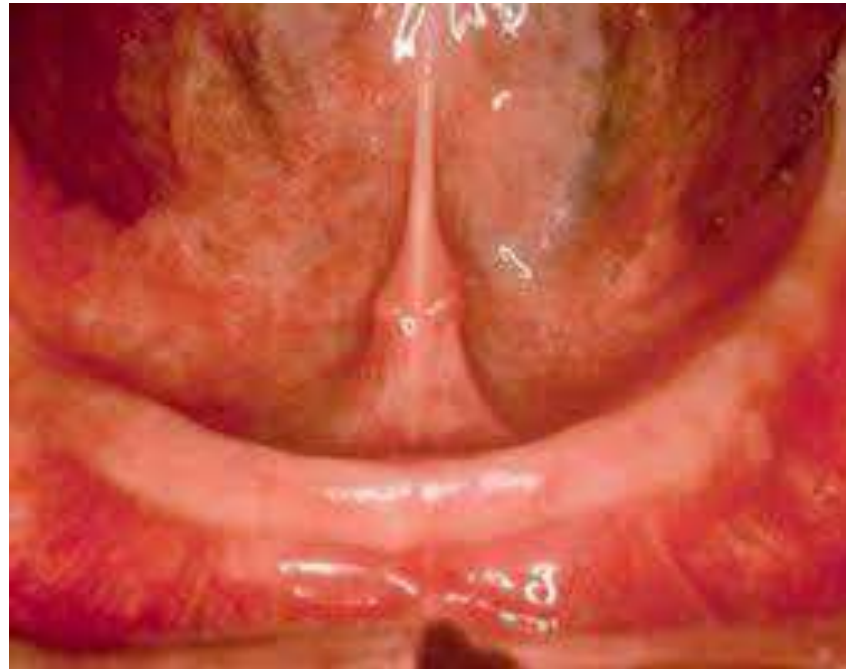
Figure (2-34): Buccal shelf area in the mouth (a), in the impression (b), in the cast (c).

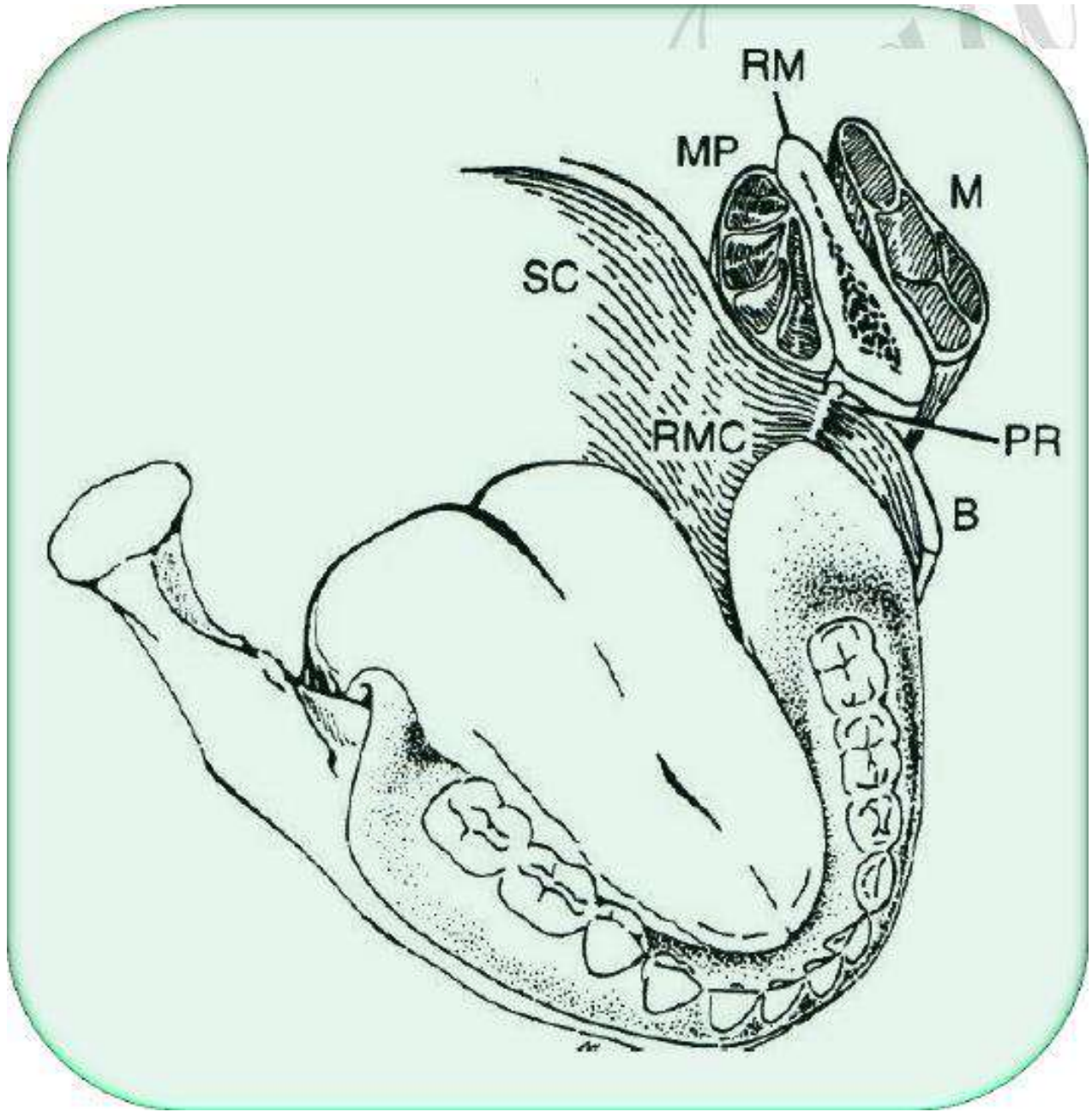
Anatomical landmarks in mandibular arch

3- Supporting structures:

B- secondary stress bearing areas:

1. Buccal and lingual slopes of residual ridge:





Thank You



Complete Denture Impression

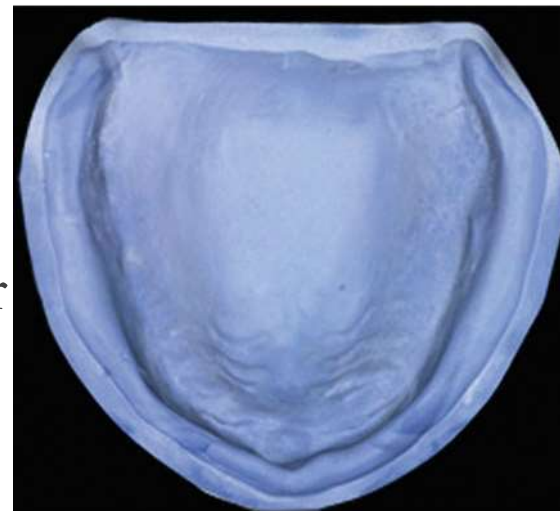
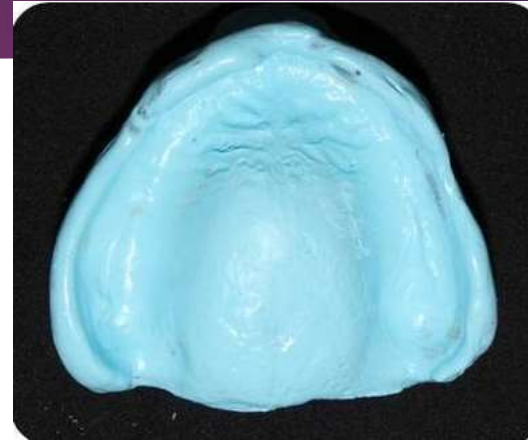


BUSHRA MOHAMMED ALI AL-AMEEN

B,D,S,. M,SC.(PROS)

Complete denture impression

- ▶ **Impression:** generally is a negative likeness or copy in reverse of the surface of an object.
- ▶ **Dental impression:** is an imprint or negative likeness of the teeth and/or edentulous area and adjacent tissue.
- ▶ **Complete denture impression:** is a negative registration of the entire denture bearing, stabilizing and border seal areas of either the maxilla or the mandible present in the edentulous mouth.



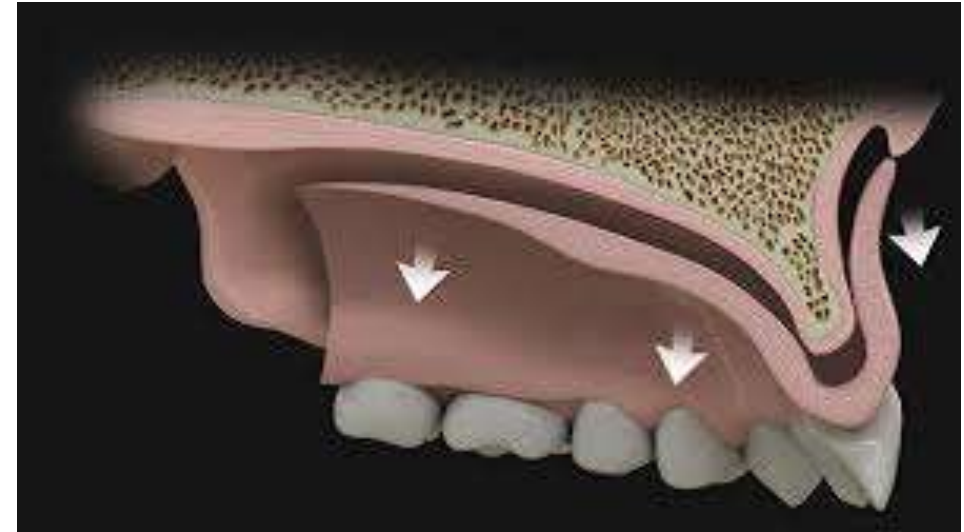
Objectives of impression making

Complete denture impression procedure must provide five objectives, In Order :

- 1- Preservation of the residual alveolar ridge and soft tissue.
- 2- Support for denture.
- 3- Stability.
- 4- Esthetic.
- 5- Retention.

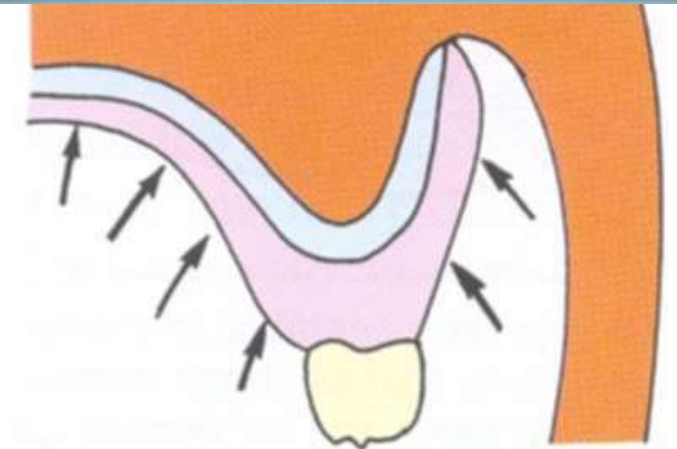
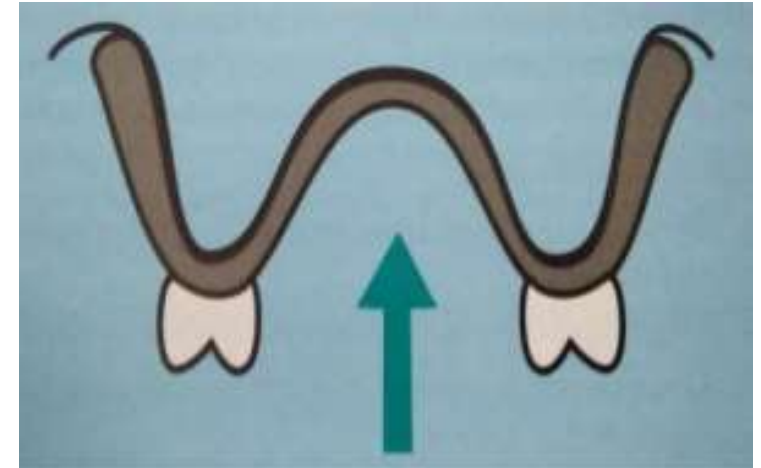
1- Preservation of the residual alveolar ridge and soft tissue.

- ▶ Prosthodontist should keep constantly in mind the effect of impression material and technique on the denture base and the effect of the denture base on the continued health of both the soft and hard tissues of the jaws.
- ▶ Pressure in the impression technique is reflected as pressure in the denture base and results in soft tissue damage and bone resorption.



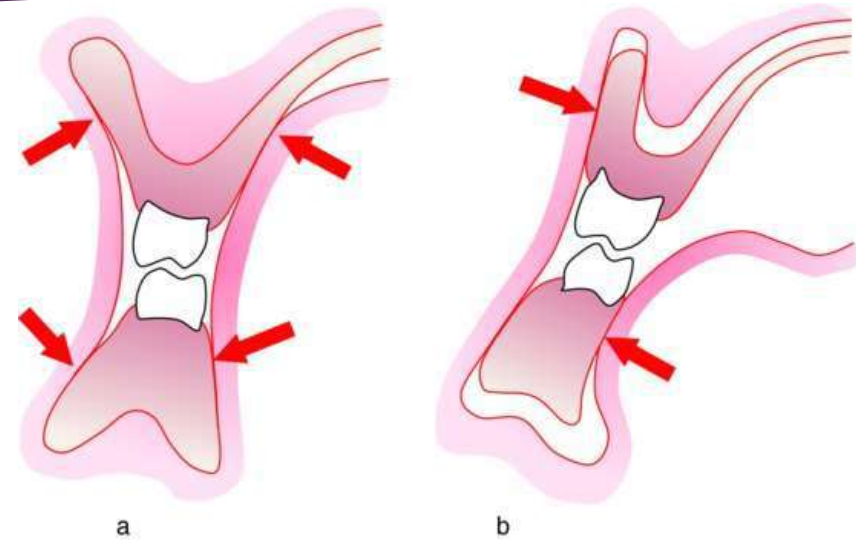
2- Support for denture

- ▶ **SUPPORT is:**
- ▶ The quality of prosthesis to resist the forces which try to dislodge the denture in a Tissue-ward direction.
- ▶ **SUPPORT depends on:**
 1. The anatomical and histological factors of the ridge.
 2. The way of pressure direction on the ridge during impression making procedure, therefore the maximum coverage provides the greater the support, which distributes applied forces over as wide an area as possible.
- ▶ **The best SUPPORT** for denture is: the compact bone covered with fibrous connective tissue. (*Support depends on: Denture base + Bone + soft tissue*).

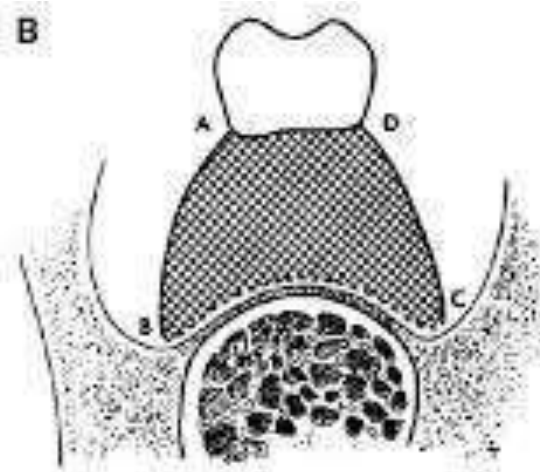
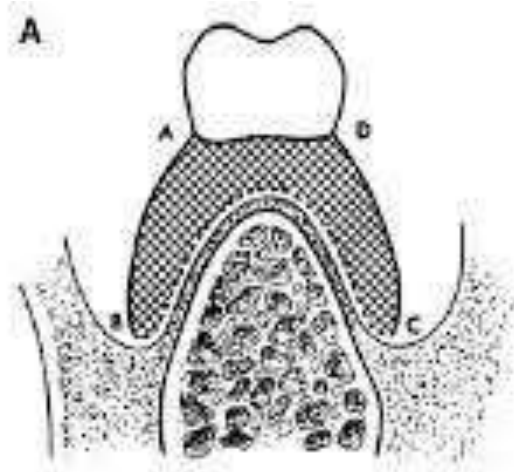


3- Stability

- ▶ **STABILITY** is: the resistance to functional horizontal or rotational movements which try to dislodge the denture.
- ▶ The **STABILITY** decreases with:
 1. The loss of vertical height of the residual ridges. **or with**
 2. Increase in flabby, movable tissue.
- ▶ **STABILITY** depends on: Denture base + Bone.



3- Stability



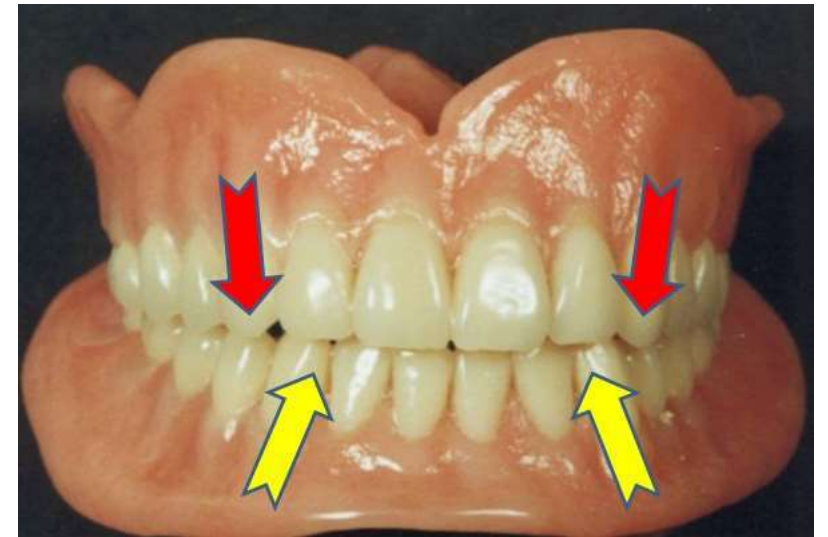
4- Esthetic

- ▶ **ESTHETIC:** border thickness should be varied with the needs of each patient in accordance with the extent of residual ridge loss.
- ▶ The vestibular fornix should be filled, but not overfilled, to restore facial contour.



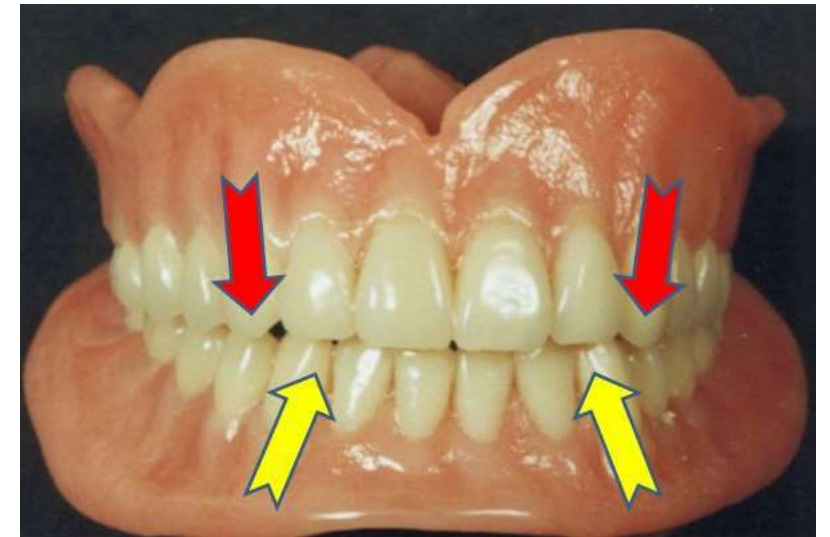
5- Retention

- ▶ **RETENTION is:** the resistance to the forces which tries to dislodge the denture in a direction opposite to the path of insertion (away from the tissue).
- ▶ It should be readily seen that if the other objectives are achieved, retention will be adequate.
- ▶ **RETENTION** depends on: Denture base + soft tissue.



5- Retention

- ▶ **RETENTION** must hold the denture in its position when it is seated at rest.
- ▶ **Factors may affect the RETENTION:**
 1. Atmospheric pressure.
 2. Adhesion.
 3. Cohesion.
 4. Mechanical locks.
 5. Muscle control.
 6. Patient tolerance.
- ▶ An impression that records the depth of the sulcus, but not its width, will result in a denture that lacks adequate retention.



5- Retention

Figure 1: The chain of intermolecular forces contributing to retention.

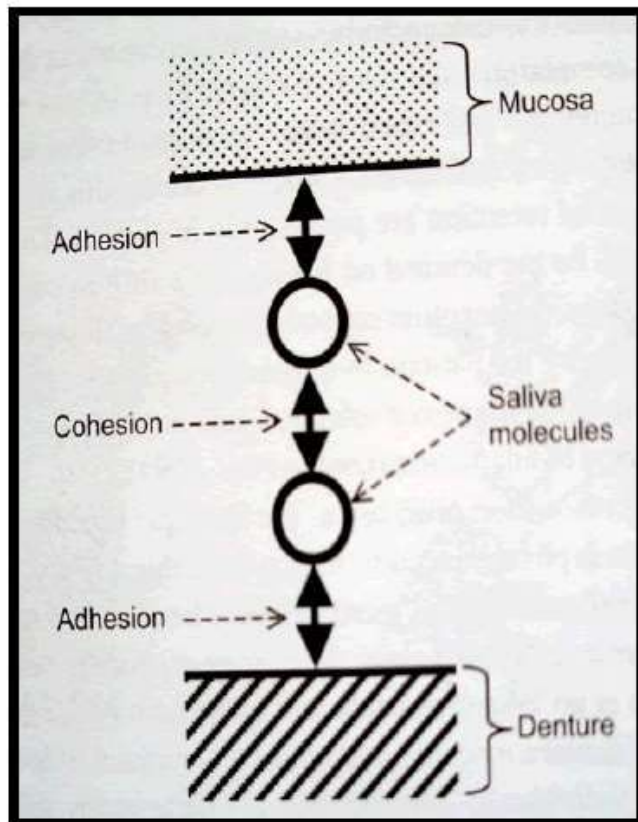
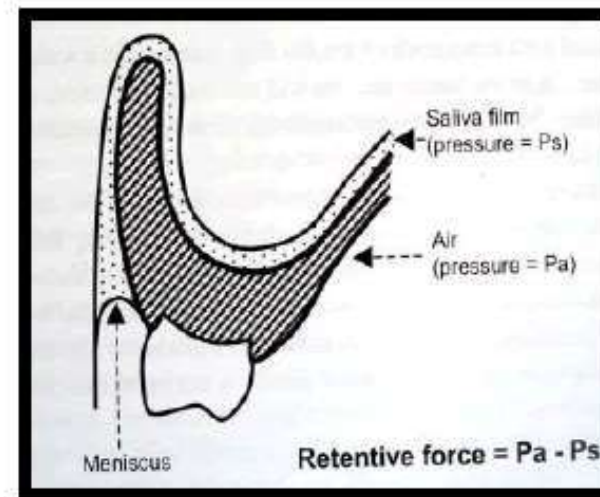
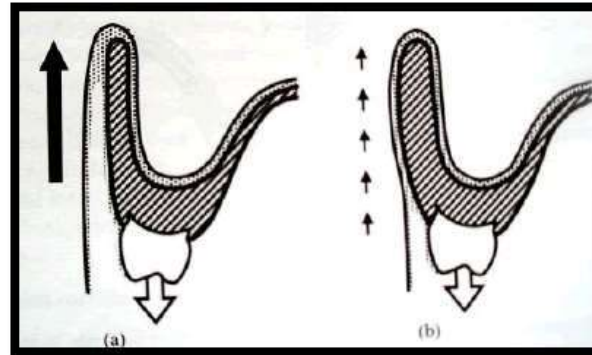


Figure 2: Retention due to pressure differential between the saliva film and air



5- Retention

Figure 3: Relationship between the width of the buccal channel and resistance to flow of saliva



- a) Wide channel, rapid flow, poor retention.
- b) Narrow channel, slow flow, good retention.

Figure 4: Drop in pressure of the saliva film beneath the denture causing the impaction of the buccal mucosa and greatly increased retention.





Figure (3-1): Retention, support, and stability.

Primary impression

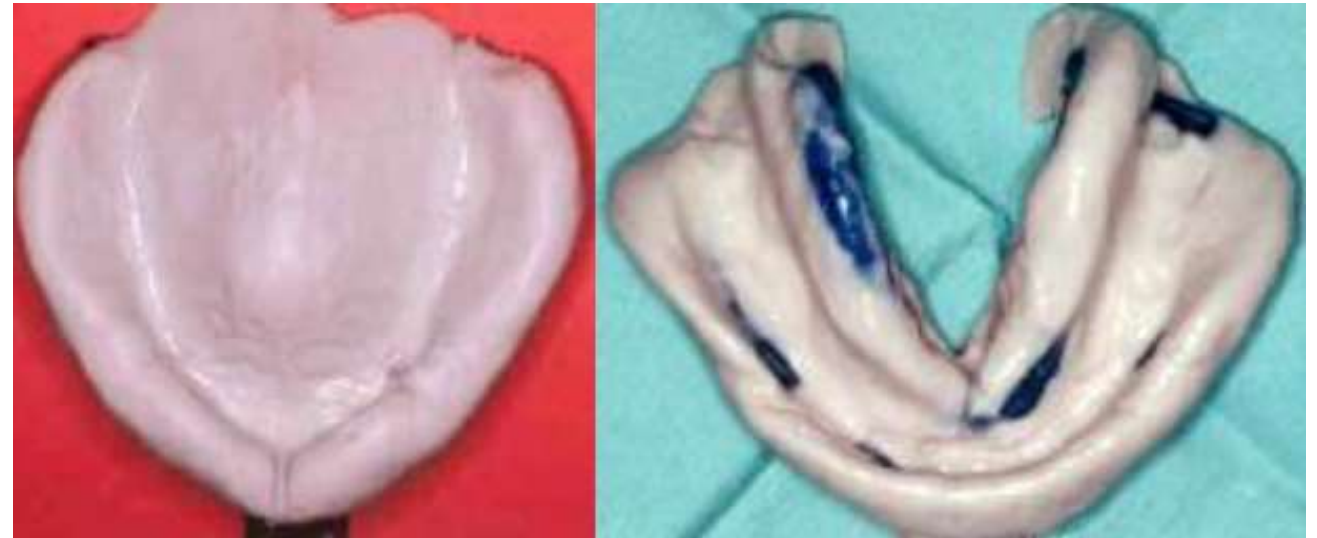


Primary impression

- ▶ It is an impression made for the purpose of diagnosis, treatment planning and construction of special tray.
- ▶ It is the first impression made for the patient and from which the study cast was produced.
- ▶ These impressions are obtained by a stock tray.
- ▶ When the primary impression is made, the objectives are to record all areas to be covered by the impression surface of the denture and the adjacent landmarks with an impression material that is accurate.

Primary impression

- ▶ The **maxillary impression** should **include**: the hamular notches, fovea palatina, frenum attachments, palate, and the entire labial and buccal vestibules.
- ▶ The **mandibular impression** should **include**: the retromolar pad, the buccal shelf areas, the external oblique ridges, frenum attachments, sublingual space, retromylohyoid space, and the entire labial and buccal vestibules.



Primary impression

Materials used for making primary impression:

- 1- Impression compound.
- 2- Alginate impression material.
- 3- Putty body silicon rubber base.

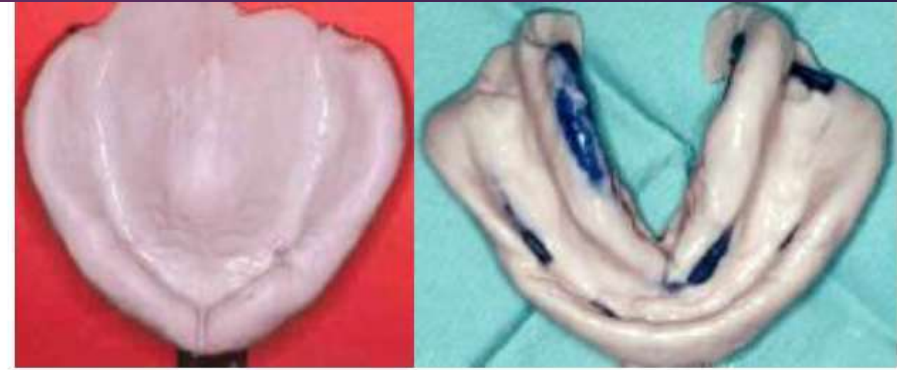


Figure (3-2): Alginate primary impression for complete edentulous maxillary and mandibular ridges.



Figure (3-3): Impression compound primary impression for complete edentulous maxillary and mandibular ridges.

Impression trays

In complete denture prosthesis, we make two impressions for the patient:

1- primary impression.

2- secondary impression.

▶ **To make an impression we should have a suitable tray and impression material.**

Impression trays

Tray:

It is a device that is used to carry, confine and control the impression material while making an impression.

During the impression making, the tray facilitates insertion and removal of the impression material from the patient's mouth.

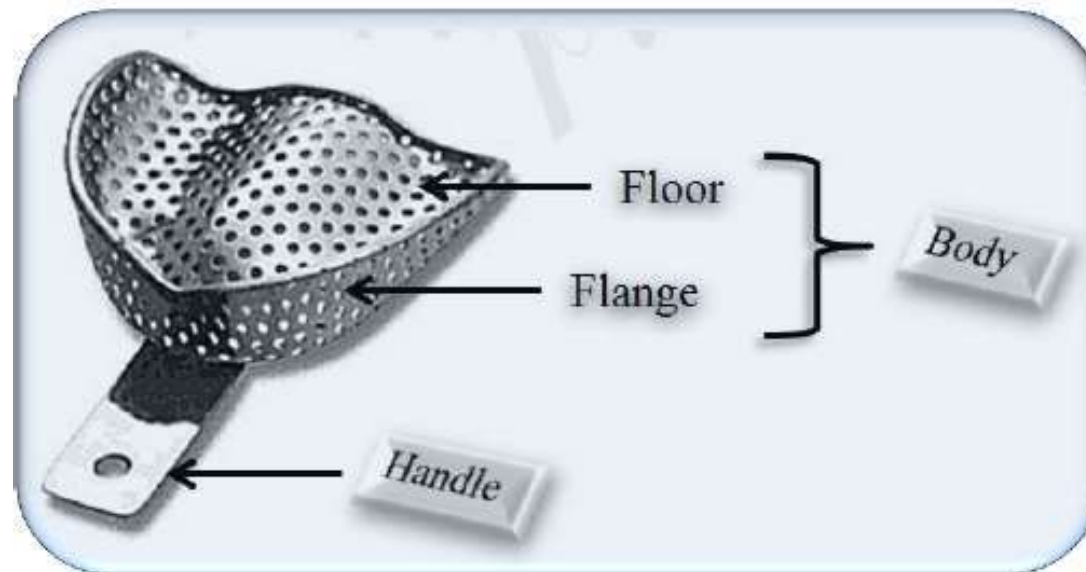
Parts of the tray:

It consists of:

1- Body:

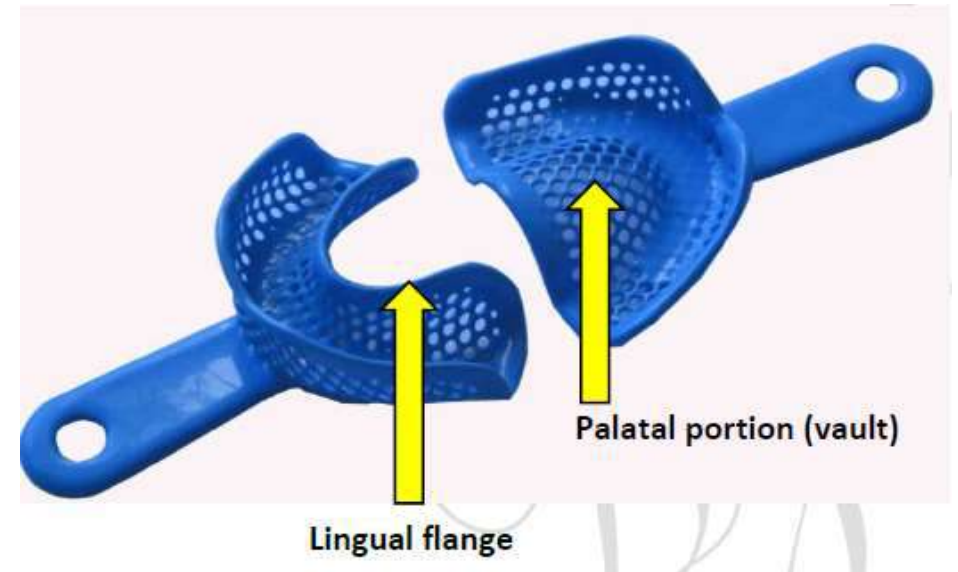
a) Floor. b) Flange.

2- Handle.



Impression trays

- ▶ There is upper tray and lower tray, the difference between them is that, in the **upper tray**, there is a palatal portion that called (*vault*), and in the **lower tray**, there is a (*lingual flange*).
- ▶ **Handle:**
- ▶ It is an extension from the union of the floor and labial flange in the middle region (*midline*), it is (**L**) in shape so that, it will not interfere with lip during impression procedure.



Impression trays

In general there are two types of the trays:

1. Stock tray: It is used for primary impression procedure.
2. Special tray (individual tray) (custom tray): It is used for final impression procedure.

1- Stock trays:

It is an impression tray serves to carry the impression material to the mouth and support it in the correct position while it is hardening. This type of trays can be used for making primary impression. It makes from different materials such as Aluminum, Tin, Brass or plastic, in variety of shapes, sizes to fit different mouth.

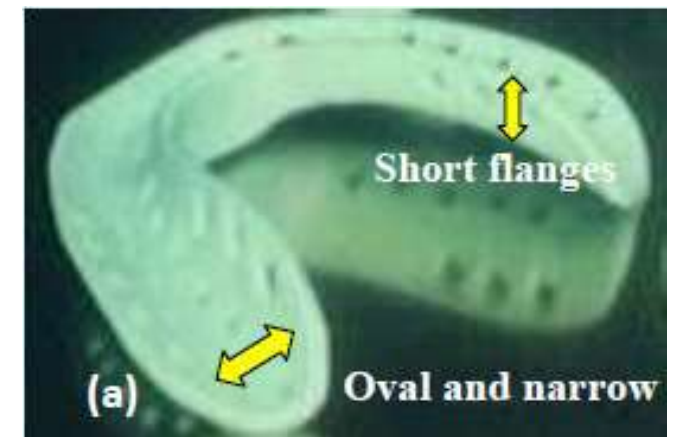
Impression trays

Types of Stock trays:

- 1- Stock tray for dentulous patient.
- 2- Stock tray for edentulous patient.

We can distinguish between them by:

Stock tray for edentulous	Stock tray for dentulous
<ul style="list-style-type: none">• Short flanges.• Oval and narrow floor.	<ul style="list-style-type: none">• Long flanges.• Flat and wide floor.



Impression trays

Classification of Stock trays according to the impression material used:

- 1- **Perforated stock tray:** used with alginate impression material.
- 2- **Non-perforated stock tray:** used with sticky impression material like impression compound.



Figure (3-7): Non-perforated stock tray.



Figure (3-8): Perforated stock tray.



Impression trays

Factors affecting the selection of Stock trays:

1. The type of material used in the primary impression procedure, like **impression compound** we used **non-perforated tray**, because it will be stick on the tray. And if we use **alginate** material we should use **perforated stock tray** for mechanical retention of impression material to the tray surface.
 2. Size of the arch, stock tray comes in different sizes.
 3. Form of the arch, (ovoid, square, V-shaped).
- ▶ The stock tray must **cover all the anatomical landmarks** needed in complete denture and give a sufficient space (**4-5 mm**) for the impression material in all directions.

Primary cast

Production of study model (primary cast):

- ▶ The **primary cast** is produced by pouring the primary impression with **plaster** which is the positive reproduction of the oral tissues.
- ▶ The plaster mixed with water by the saturation method in the rubber bowl and pour in the impression compound impression material after beading and boxing of the impression.
- ▶ When the plaster becomes hard, the cast is separated from the impression by the use of hot water (55-60°C).



Primary cast

Production of study model (primary cast):

- ▶ Using very hot water, the impression compound will be sticky and it will be difficult to remove from the cast.
- ▶ The **special tray**, which is used to make the final impression, will be constructed on the **primary cast**.
- ▶ After construction of the special tray, it is tried in the patient mouth and checked for proper extension and adaptation on the residual ridge, the special tray is a primary factor in obtaining a good working impression.







secondary impression

Secondary impression

- ▶ It is an impression made for the purpose of fabrication of prosthesis.
- ▶ This impression is made with **individual tray**.
- ▶ Final impression must be poured with **stone** material to produce the master cast.



Secondary impression

Materials used for final impression:

- 1- Zinc Oxide Eugenol impression material.
- 2- Alginate impression material.
- 3- Elastomers impression materials (Rubber base).
- 4- Impression plaster.



- ▶ Irrespective of which material is selected, the optimum result will be achieved only if the custom tray has been constructed and refined correctly.

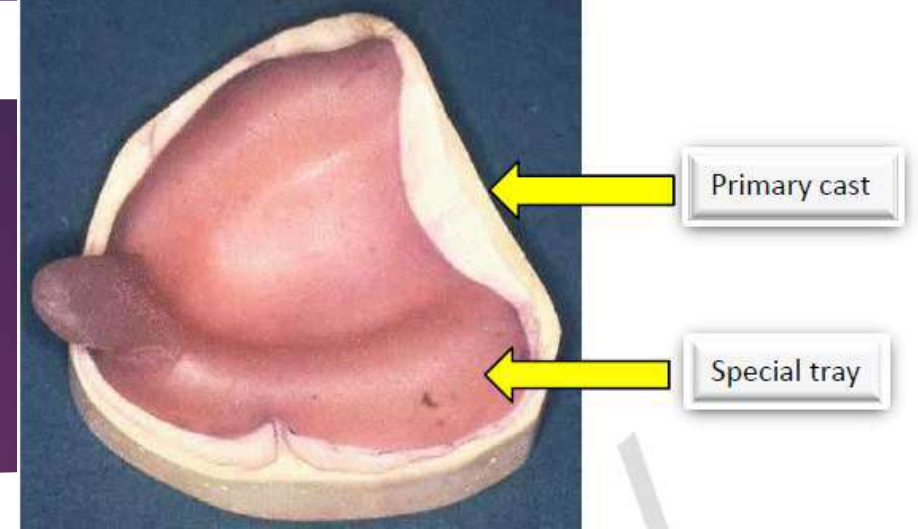
Secondary impression

The techniques used for making final impression:

The basic differences in techniques for final impressions can be resolved as those that record the soft tissues in a:

1. Functional position (Closed mouth technique, Pressure technique)
2. Rest position
 - A. Nonpressure technique (Passive technique, Mucostatic technique).
 - B. Selective pressure technique.

Special tray



Special tray (individual tray, custom tray):

- ▶ It is defined as a custom made device prepared for a particular patient which is used to confine and control an impression material making an impression.
- ▶ An individualized impression tray makes on the cast obtained from primary impression.
- ▶ It is used in making the final impression.
- ▶ On the primary cast (study cast), special tray is constructed because edentulous ridge shows variations in shape and size, some have flattened ridges and other have bulky ridge, and the stock tray can fit the ridge only in an arbitrary manner.

Special tray

Advantages of special tray:

1. Economy in impression material (less impression material required in special tray).
2. More accurate impression.
3. Special tray provides even thickness of impression material. This minimizes tissue displacement and dimensional changes of impression material.
4. The work with special tray is easier and quicker than modifying stock tray to provide accurate impression.
5. Special tray is more accurately adapted to the oral vestibules this helps in better retention of the denture.
6. Special tray is less bulky than stock tray which is more comfortable for the patient.

Special tray

Material used for construction of special tray:

1. Cold and heat cured acrylic.
2. Light cured resin.
3. Impression compound (higher fusing tray compound).

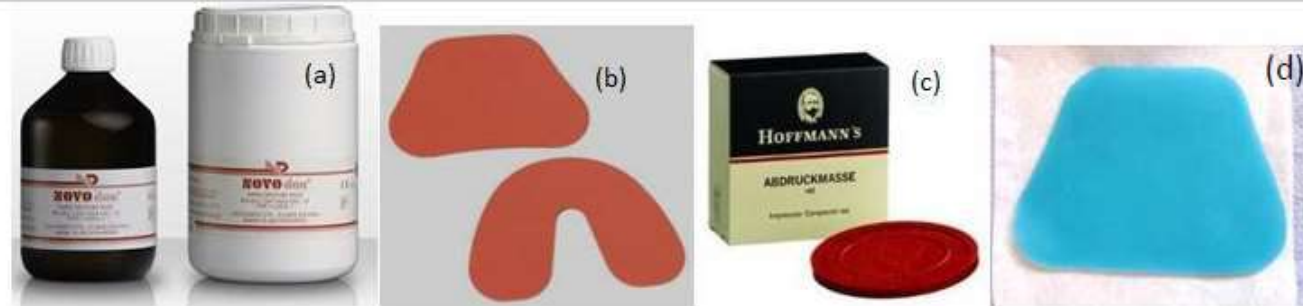


Figure (3-20): Materials used for construction of special tray. Cold and heat cured acrylic (a), shellac base plate (b), impression compound (c), Light cured tray material (d).

Special tray

Types of special tray:

1. Spaced special tray (with or without stoppers).
2. Closed fit special tray.

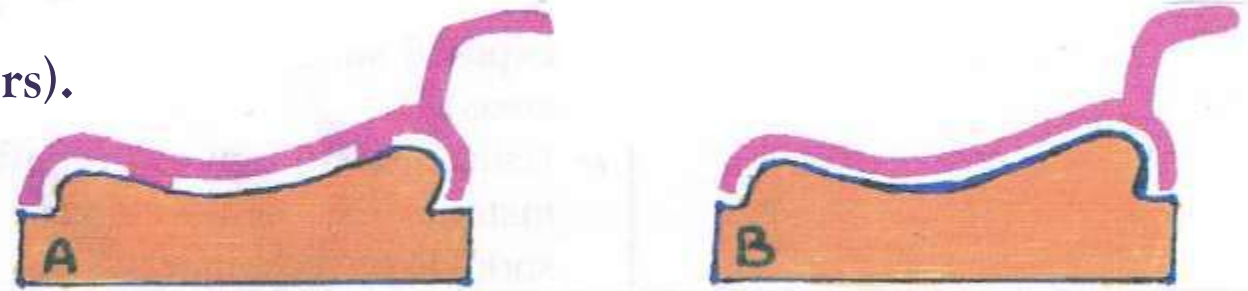
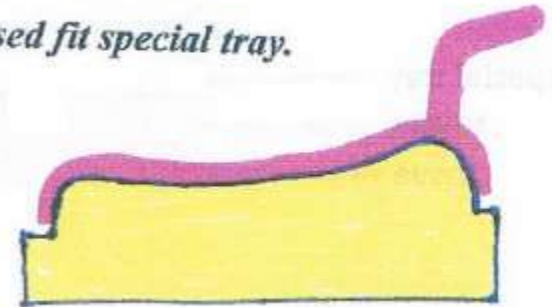


Figure (3-21): Spaced special tray. (A) With stopper. (B) Without stopper.

Figure (3-22): Closed fit special tray.



Special tray

Criteria for special tray construction:

1. The tray should be rigid and of sufficient even thickness that it will not fracture during its use.
2. The special tray must not impinge upon movable structures.
3. The borders must be (2 mm) under extended.
4. The posterior limits of the impression tray should be slightly over extended to ensure inclusion of the posterior detail for development of the post-dam area in upper tray.
5. The tray must have a handle for manipulation, and the handle must not interfere with functional movement of the oral structures.
6. The tray must be smooth on its exposed surfaces and should have no sharp corner or edges which would injury the patient.

Beading and boxing

Beading and boxing impression and making the cast:

- ▶ Beading is done to preserve the width and height of the sulcus in a cast.
- ▶ Boxing is the enclosing of an impression with a beading wax to produce the desired size and form of the base of the cast. Boxing impression can be used for primary and final impressions, this procedure cannot usually be used on impression made from hydrocolloid materials (*alginate*) because the boxing wax will not adhere to the impression material as well as the alginate can be easily distorted.

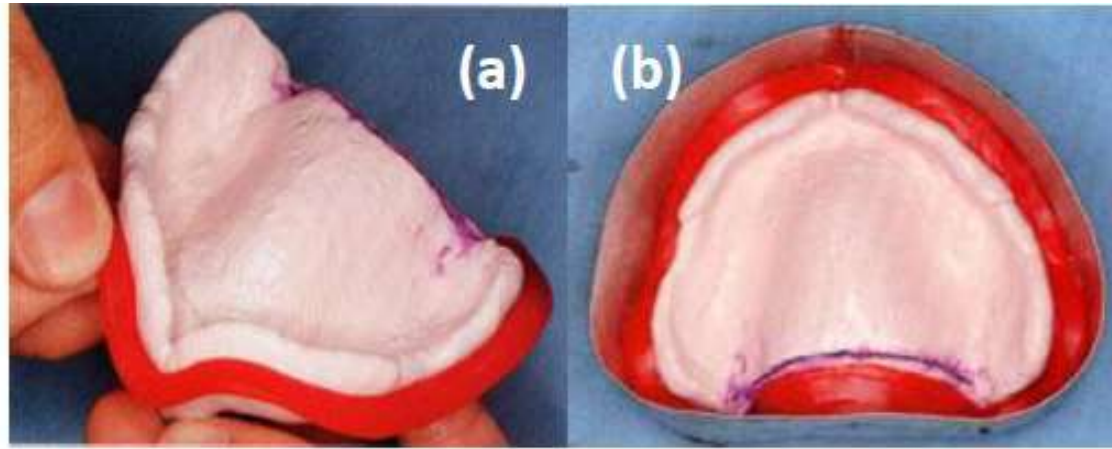


Figure (3-30): Beading (a) and boxing (b) the maxillary ZOE impression.

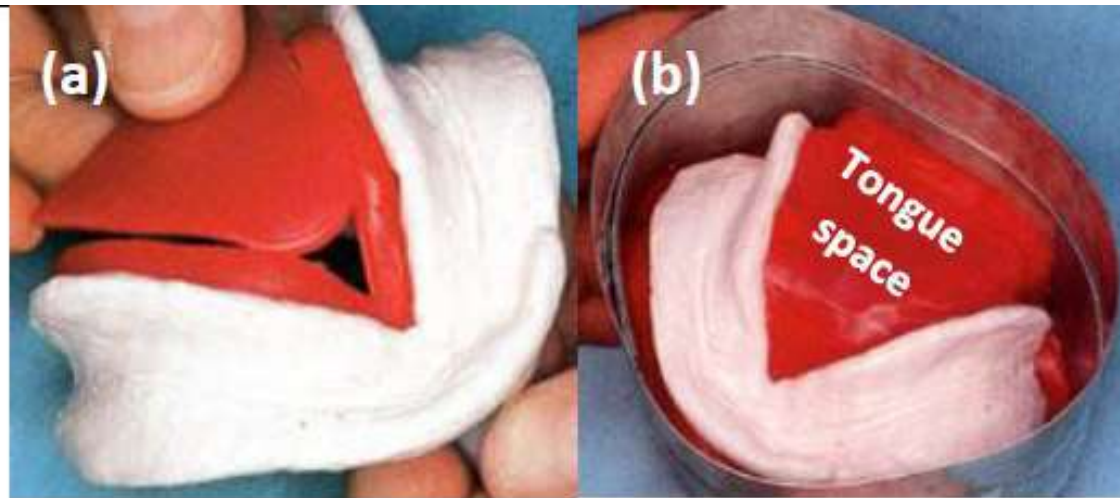


Figure (3-31): Beading (a) and boxing (b) the mandibular ZOE impression.

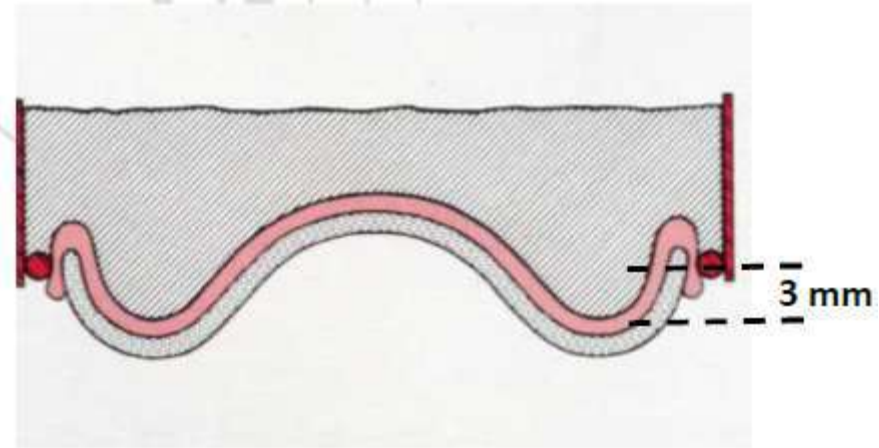


Figure (3-33): minimum thickness for the base of cast 11-15 mm.

Beading and boxing

Materials used for boxing impression:

1- Beading wax: a strip of wax is attached all the way around the outside of the impression approximately (2-3 mm) below the border; and sealed to it with wax knife.

2- Boxing wax: a sheet of wax is used to make the vertical walls of the box and it is attached around the outside of the beading wax strip so that it does not alter the borders of the impression, the width of the boxing wax is about 9-15 mm.

3- Base plate wax: a sheet of wax can be used to fill the tongue space in the mandibular impression that is sealed just below the lingual border of the impression.

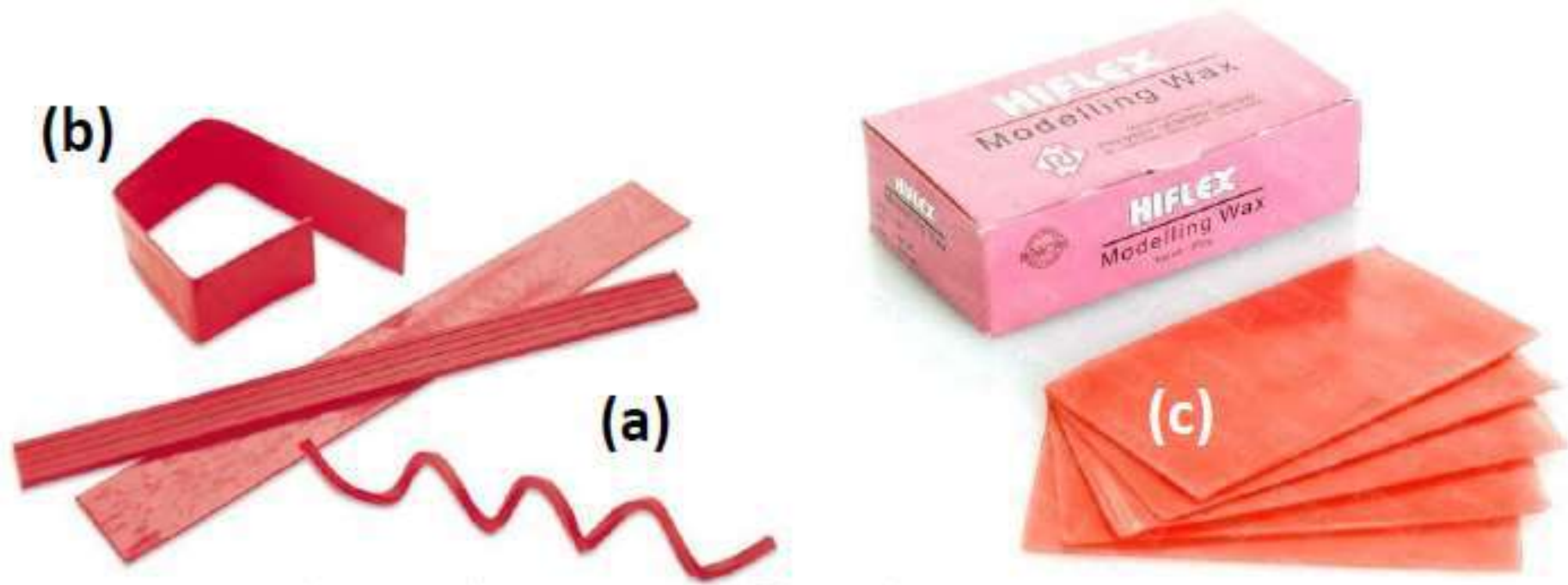


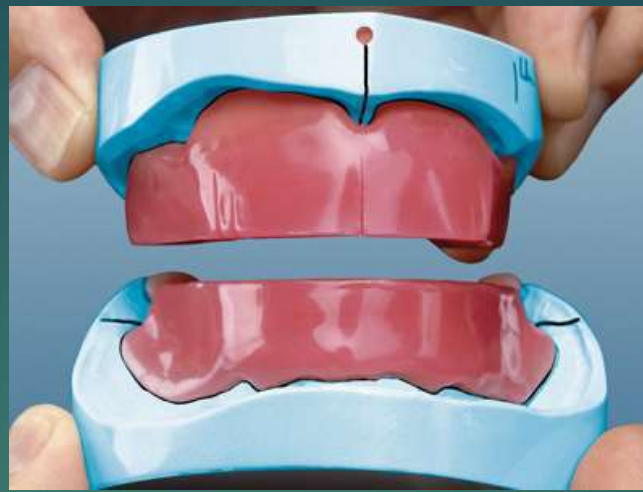
Figure (3-34): Beading wax (a), boxing wax (b), base plate wax (c).

Common faults in impression making:

1. Poor selection of the tray and materials.
2. Insufficient material loaded in the tray.
3. Excessive material loaded in the tray.
4. Failure to press the tray completely to position (insufficient seating pressure or excessive seating pressure).
5. In correct position of the tray before finally seating it.
6. Obstruction of the proper flow of the material by lips, cheek or tongue.

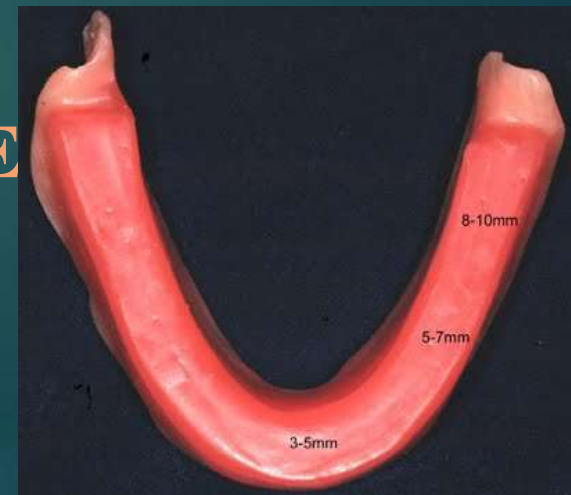


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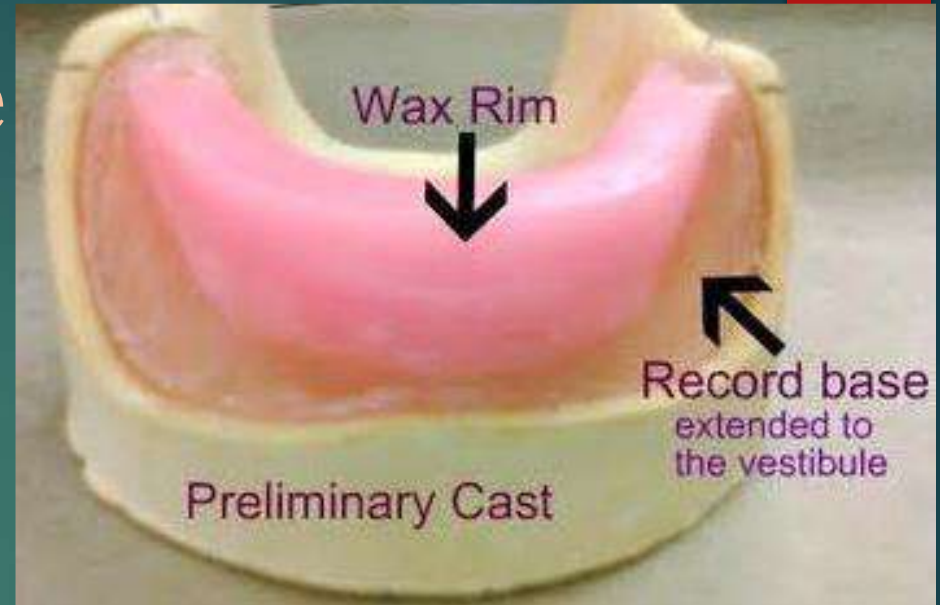
Laboratory Procedures Prior to Jaw Relation Records RECORD BASE

USHRA MOHAMMED ALI AL-AMEER
B,D,S,, M,SC.(PROS)



Record Base

- ▶ It is a **temporary** form representing the base of a denture. It is used for **making maxillomandibular relation** records and for **arrangement of artificial teeth**.
- ▶ It is also known as base plate, temporary base, trial base.



Requirement of record base

- 1- The record base must have **rigidity** to withstand occlusal loads.
- 2- The record base must have **accuracy and stability**.
- 3- The extent and the shape of the borders and **fitness should resemble a finished denture**.
- 4- All surfaces that contact lips, cheek and tongue should be **smooth, rounded and polished**.
- 5- The crest, labial and/or buccal slopes should be thinned to provide space for teeth arrangement.



Accuracy of maxilla-mandibular relation record affected by:

- 1) Rigidity.
- 2) Stability.
- 3) Movability of the record bases.



Materials used in construction of record base

1. Shellac record base.
2. Self-curing acrylic resin.
3. Light curing acrylic resin.
4. Thermoplastic resin.



Materials used in construction of occlusion rims

- ▶ 1) Bite block wax.
- ▶ 2) Base plate wax.
- ▶ 3) Modeling compound.

Wax is used more frequently; since it is easier to manage in the registration and in arranging teeth.

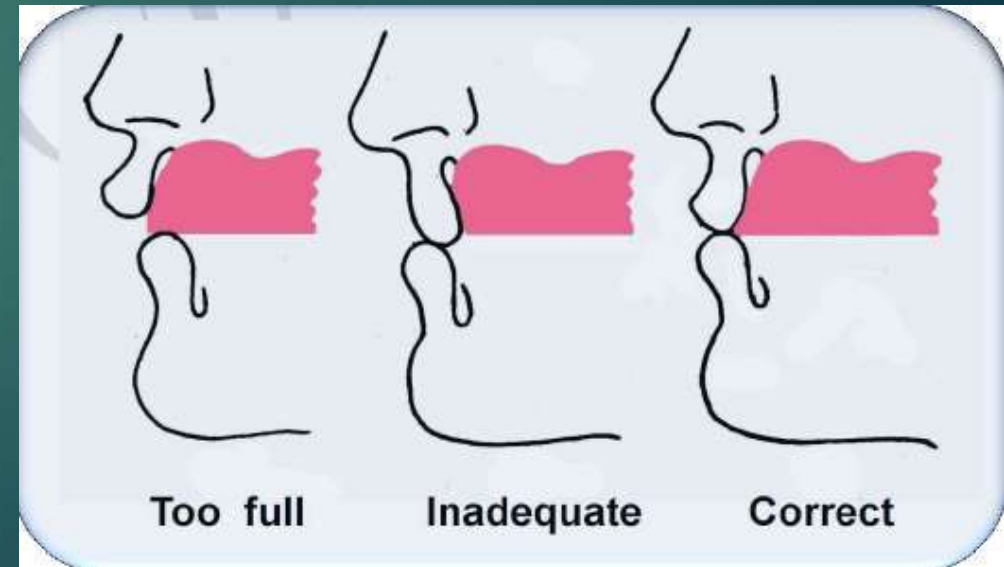
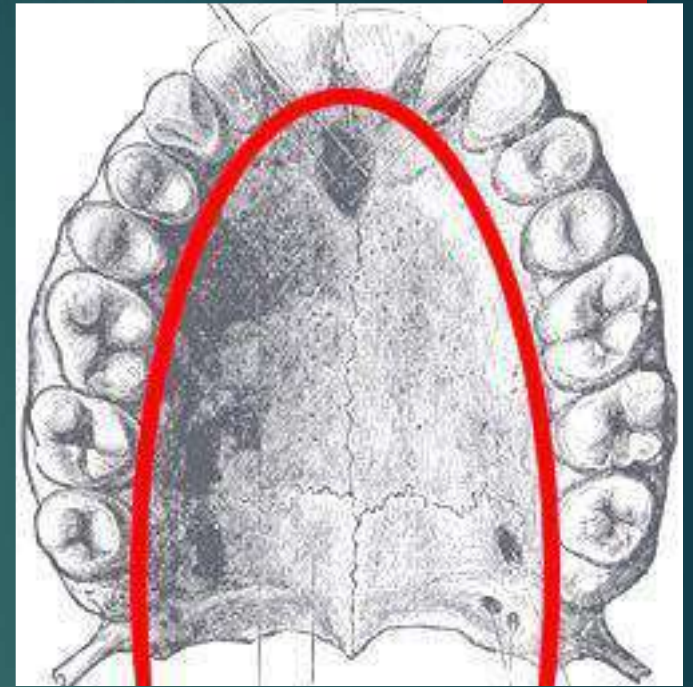


Uses of occlusion rims

1. Establishment of the arch form (neutral zone).

2. Support of the facial musculature.

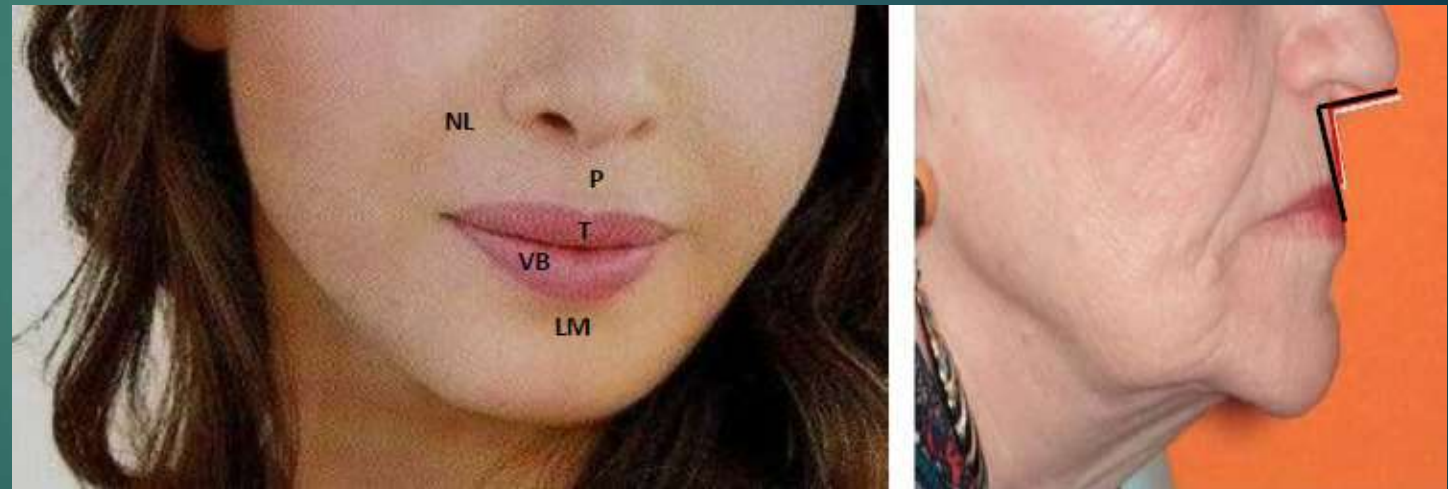
The position of the lip and cheeks are important in the recording of maxilla-mandibular relations. The proper contouring of the occlusion rims for lip and cheek support allows the muscles of facial expression to act in a normal manner.



Uses of occlusion rims

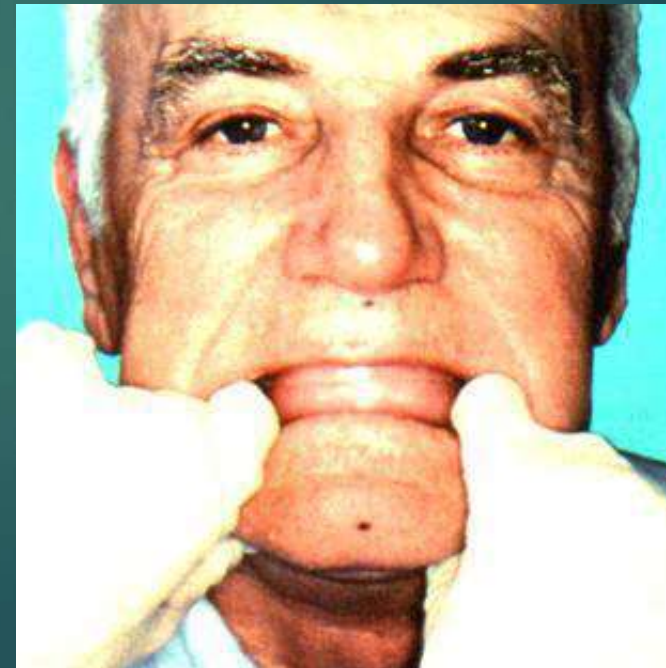
2. Support of the facial musculature.

- ▶ The anatomic guides aid in determining the proper contouring of anterior section of maxillary and mandibular occlusion rims (proper lip contour).
- ▶ **The nasolabial sulcus.**
- ▶ **The labiomental sulcus.**
- ▶ **The philtrum.**
- ▶ **The commissure of the lips.**



Uses of occlusion rims

3. Establish the level/height of the occlusal plane.
4. In determining of jaw relation which include:
 - a) Determination of the vertical dimension.
 - b) Determination of the horizontal (centric and eccentric jaw relations).



Uses of occlusion rims

5. In selection of teeth:

- a) The position of midline can be determine
- b) Canine lines (cuspid lines) are drawn at the corner of mouth on each side, width of 6 anterior teeth is equal to the distance between the two canine lines + 7 mm, the width of posterior teeth is equal to the distance between the canine line and the end of wax rim posteriorly.

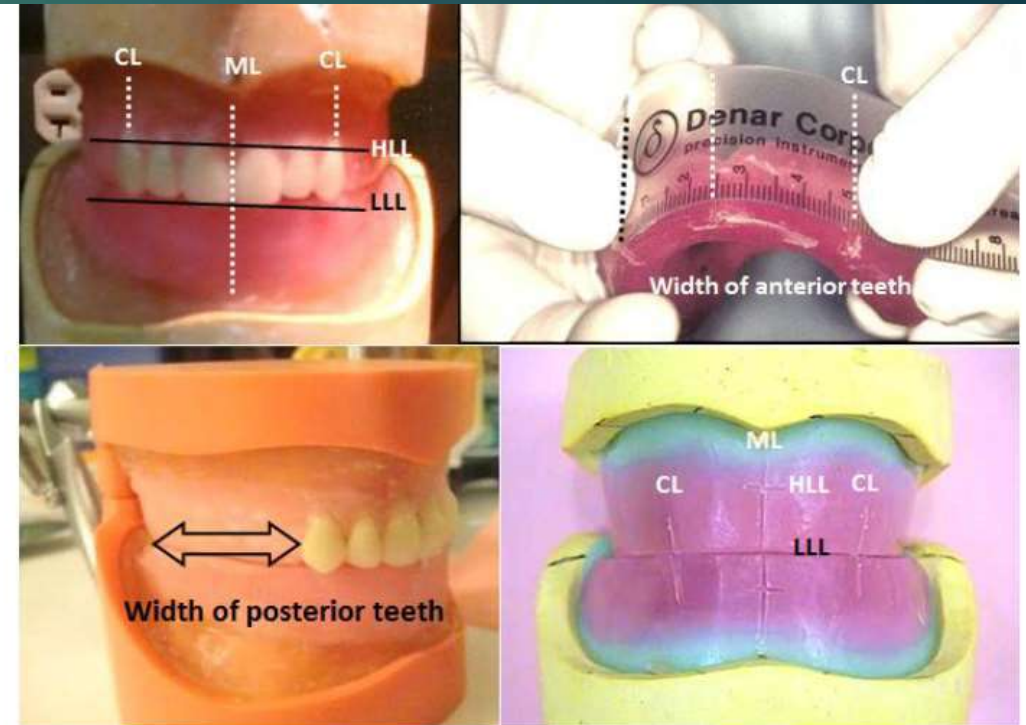


Figure (4-5): Midline (ML), canine line (CL), high lip line (HLL), low lip line (LLL), drawn in bit rim.

Uses of occlusion rims

5. In selection of teeth:

c) The high length of anterior teeth is determined by drawing high lip line (gum line, smiling line) when patient smiling, the whole of anterior incisors should be seen.

d) The low lip line (speaking line, relaxed lip line) is a line drawn on wax rim when lip is relax, in this case (2 mm) of anterior teeth should be seen.

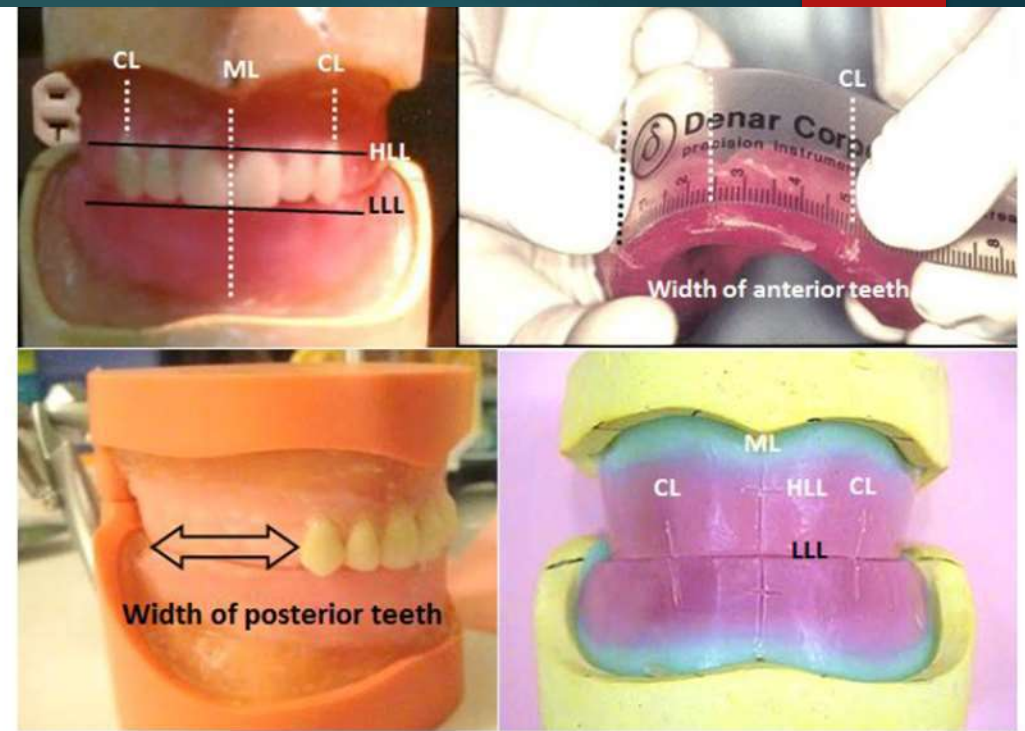
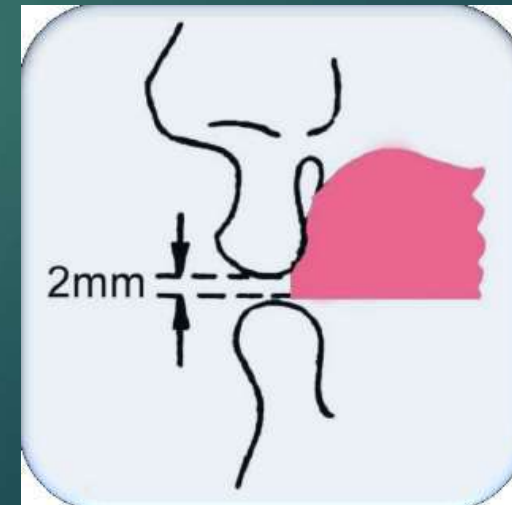


Figure (4-5): Midline (ML), canine line (CL), high lip line (HLL), low lip line (LLL), drawn in bit rim.



Uses of occlusion rims

6. Setting up of teeth.

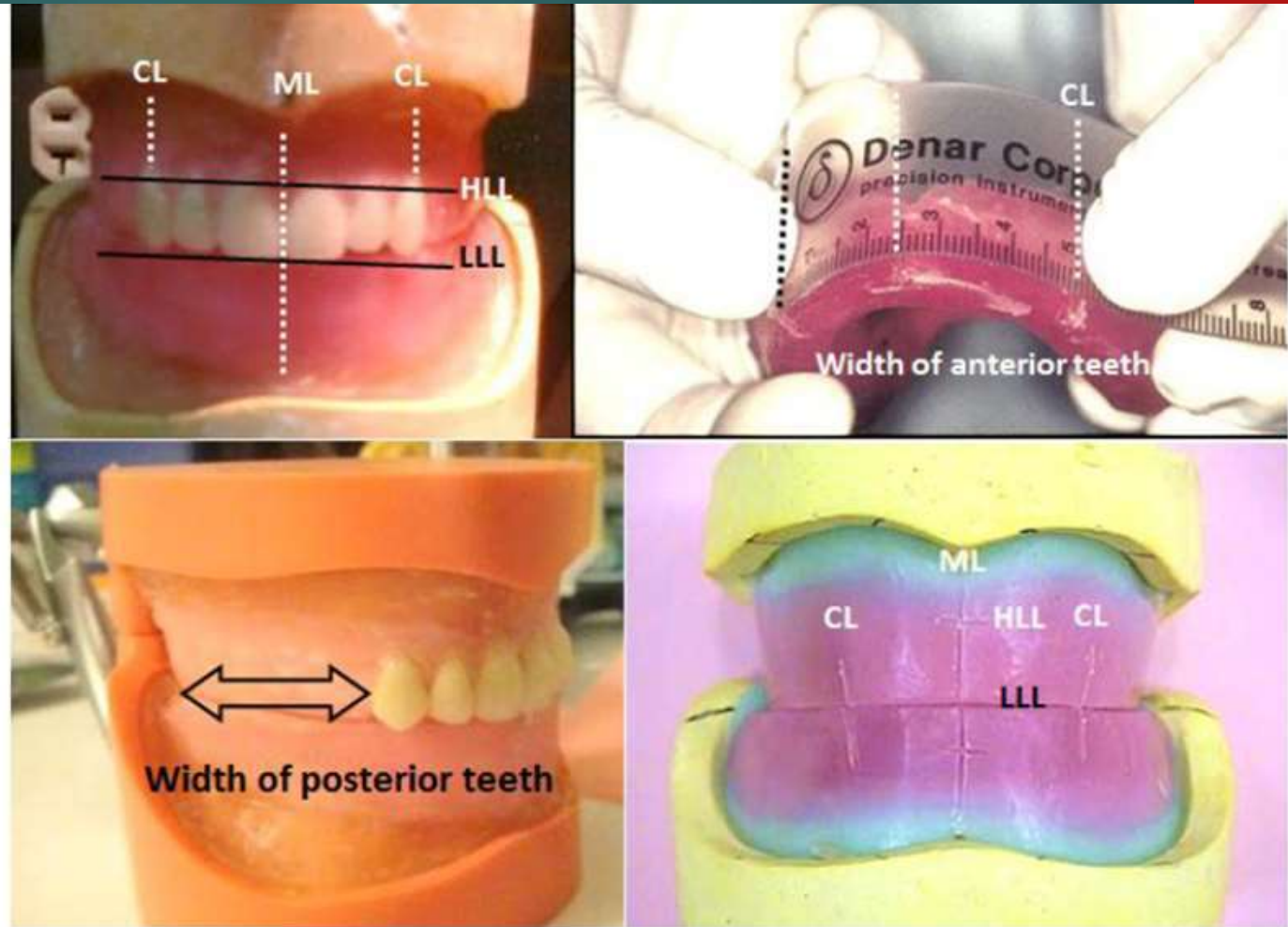
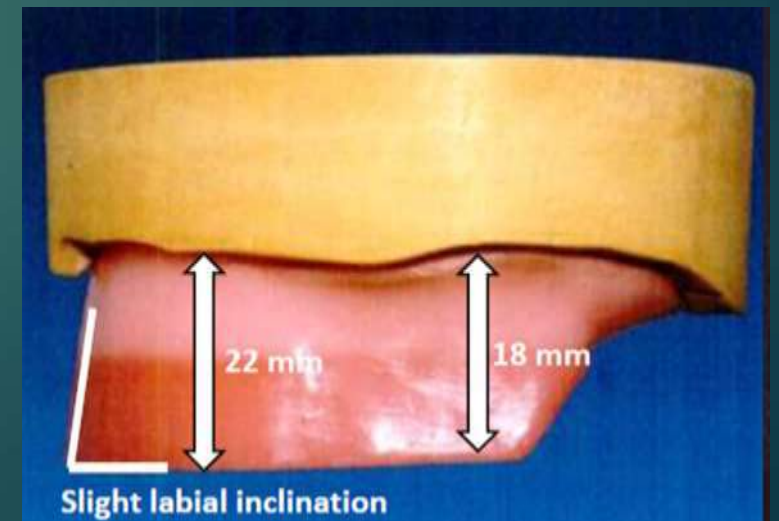
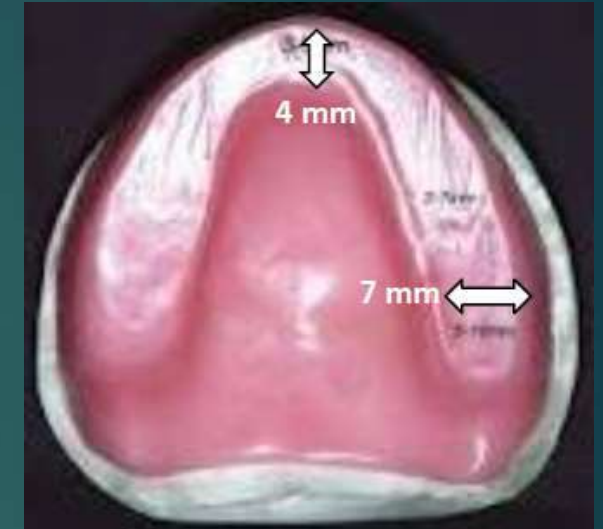


Figure (4-5): Midline (ML), canine line (CL), high lip line (HLL), low lip line (LLL), drawn in bit rim.

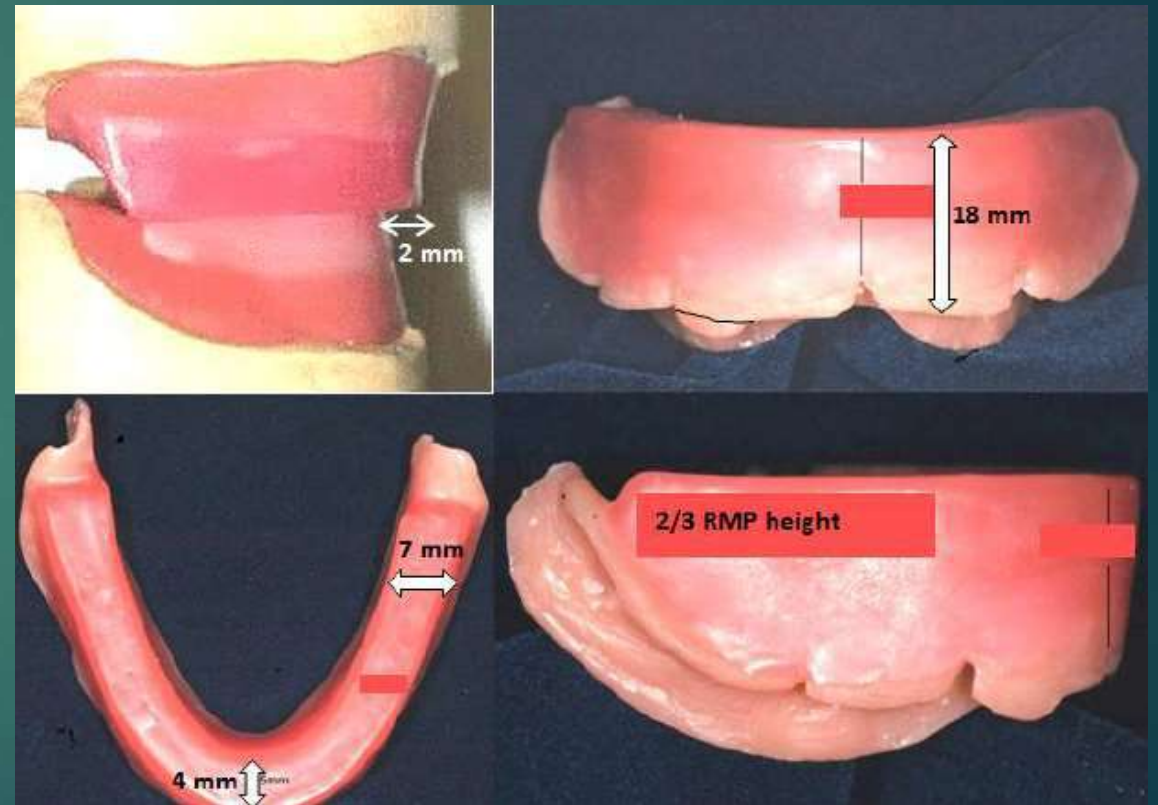
Measurement of maxillary occlusal rim

1. It should be directly **over the crest** of the residual ridge.
2. The anterior edge of the maxillary rim should have a slight **labial inclination** and the maxillary labial surface should be about **(8 mm)** anterior to the line bisecting the incisive papillae.
3. The final wax rim should be **(4 mm) width anteriorly** and gradually becomes wider **posteriorly to measure (7 mm)**.
4. The occlusal height of maxillary rim should be **(22 mm) high** from the depth of the sulcus at the region of canine eminence (lateral to the labial frenum) and **(18 mm) high** when measured from the depth of the sulcus in the posterior region (from the buccal flange to the tuberosity area).



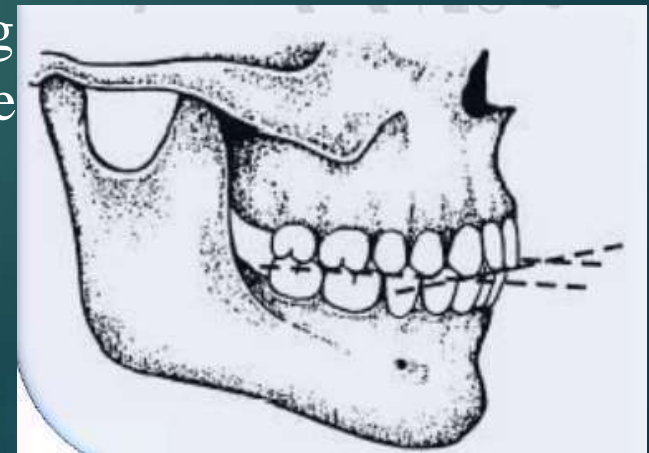
Measurement of mandibular occlusal rim

1. It should occupy the space over the crest of the residual ridge.
2. Mandibular incisal edge should be at the level of the lower lip and about **(2 mm)** behind the maxillary incisal edge.
3. The final wax rim should be **(4 mm)** width anteriorly and gradually becomes wider posteriorly to measure **(7 mm)** in molars area.
4. The occlusal height of mandibular rim should be **(18 mm)** high from the depth of the sulcus at the region of canine eminence (lateral to the labial frenum) and **the occlusal plane should flush to two-third height of the retromolar pad in the posterior region.**



Occlusal plane

- ▶ The average plane established by the incisal and occlusal surfaces of the teeth. Generally, it is not a plane but represents the planar mean of the curvature of these surfaces.
- ▶ The height of the occlusal plane should be 1-2 mm below the upper lip and this will be different from patient to other and affected by the age of the patient and type of the lip.
- ▶ Generally, there are 1-2 mm of the incisors in the average dentulous patient will be seen, but for best appearance, each case should be considered separately in relation to the height of the lip, age and sex of the patient e.g for the patient that have long lip the height of the occlusal plane should be with the border of the upper lip, while for the patient with short lip, more than 2 mm of incisors should appear from upper lip.



Fox Plane Guide

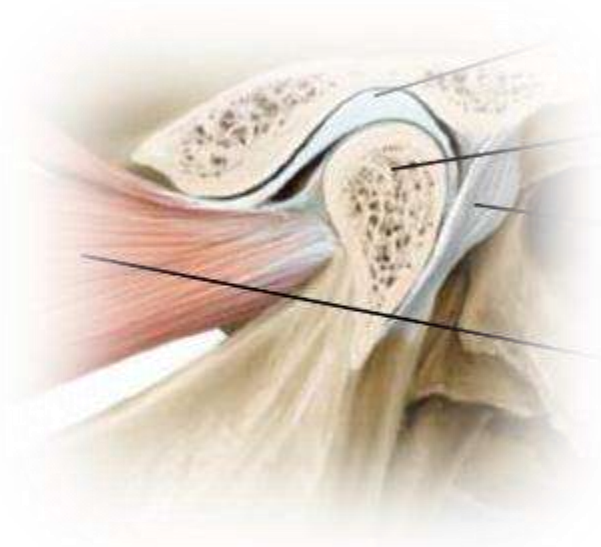
- ▶ It is an appliance used to check the parallelism of the wax occlusal rim anteriorly and posteriorly, also known as (occlusal plane plate).
- ▶ **The anterior part of the wax rim :** should be parallel to the inter-pupillary line (this is an imaginary line running between the centers of the two pupils of the eye when the patient is looking straight forward).
- ▶ **The posterior part of the wax rim:** starting from the canine region backward which should be parallel to the Camper's line, this is a line running from the inferior border of the ala of nose to the superior border of the tragus of the ear also called (ala-tragus line).



Thank

you!

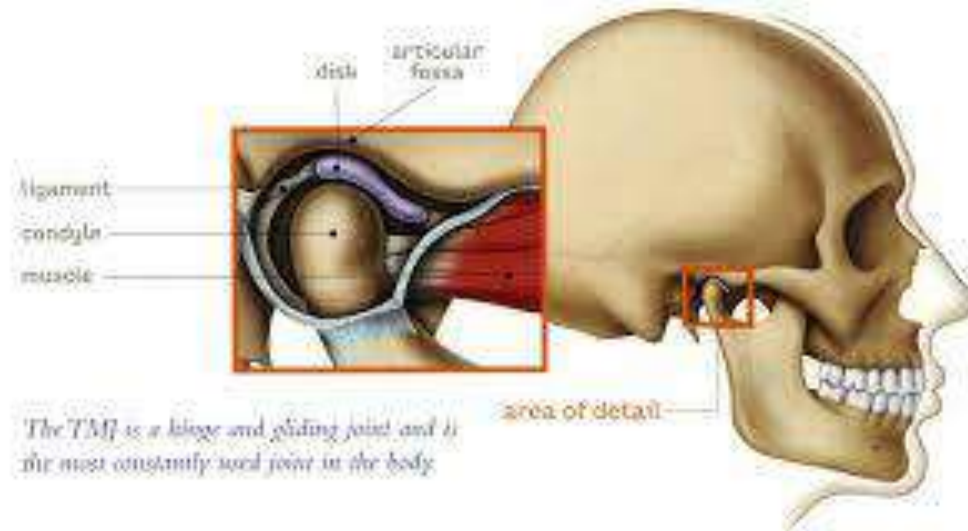
ANATOMY AND PHYSIOLOGY OF TEMPOROMANDIBULAR JOINT



Bushra Mohammed Ali Al-Ameen
B,D,S,. M,Sc.(Pros)

TEMPOROMANDIBULAR JOINT (TMJ):

- It is the articulation of the condyle of the mandible, and the inter-articular disc; with the mandibular fossa (glenoid fossa) of the temporal bone.
- The joint has a capsule and an articulating disc.
- It is considered as a compound joint (a compound joint is one with more than two bones articulating); in TMJ, the articular disc acts like the third bone.



TMJ CONSISTS OF THE FOLLOWING PARTS:

1. The mandibular fossa (glenoid fossa) of temporal bone.
2. The condyle or head of the mandible.
3. Synovial cavity.
4. The articular disc or (meniscus).

Meniscus is found between the condyle and the glenoid fossa. It divides the synovial joint or TMJ into upper and lower (superior and inferior) compartments.



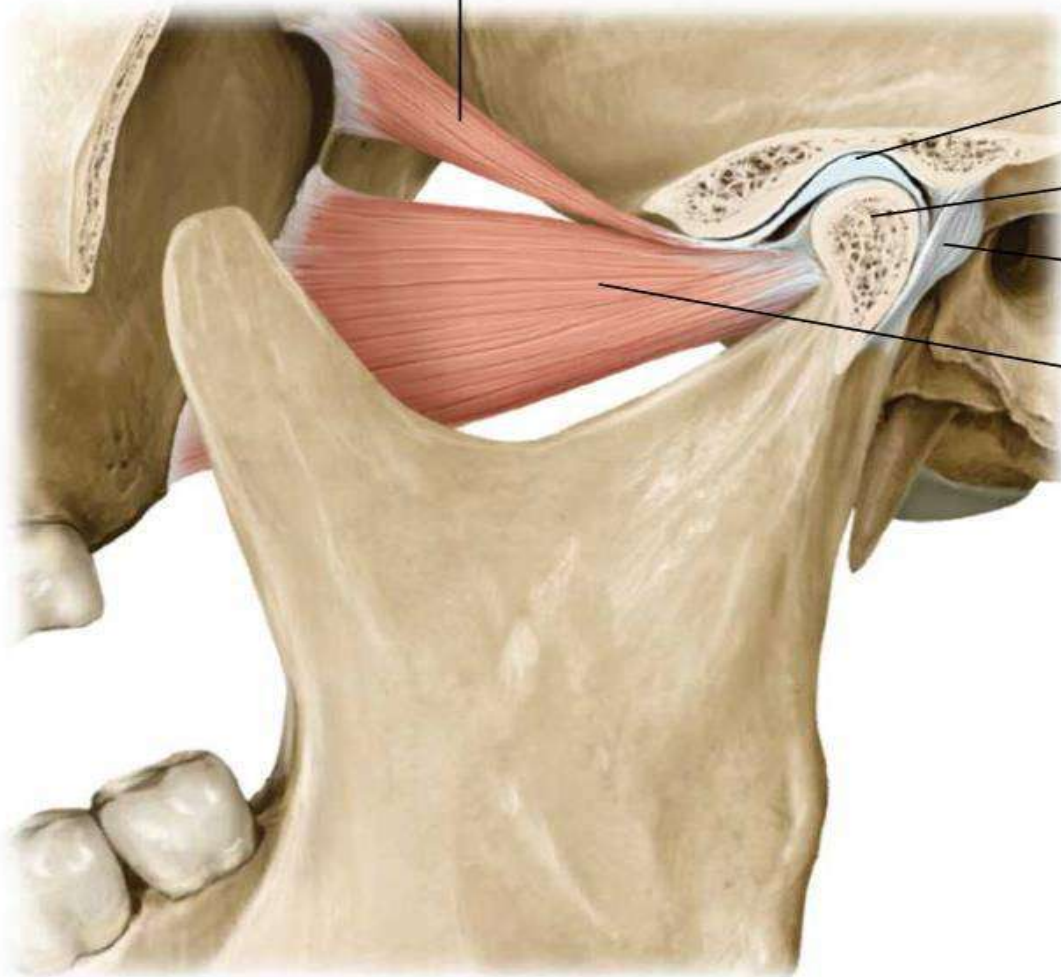
Lateral pterygoid muscle,
superior head

Articular disk

Head of mandible

Joint capsule

Lateral pterygoid
muscle,
inferior head



THE MUSCLES THAT CONTROL THE MOVEMENT OF THE MANDIBLE:

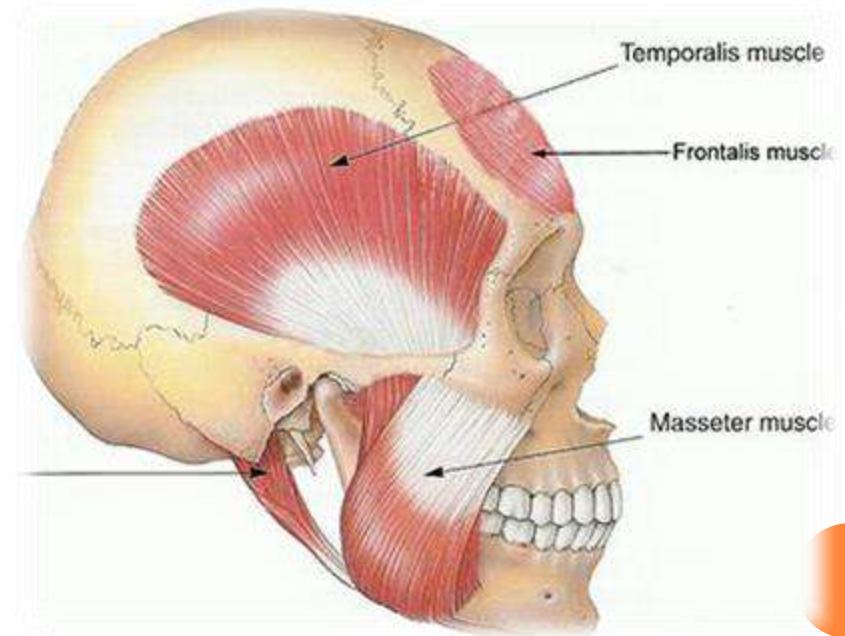
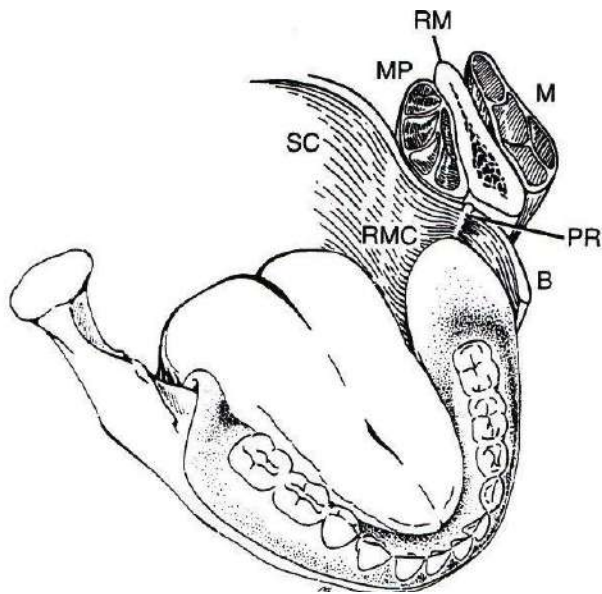
There are three groups of muscles:

1. Closing muscles.
2. Gliding muscles.
3. Opening muscles.



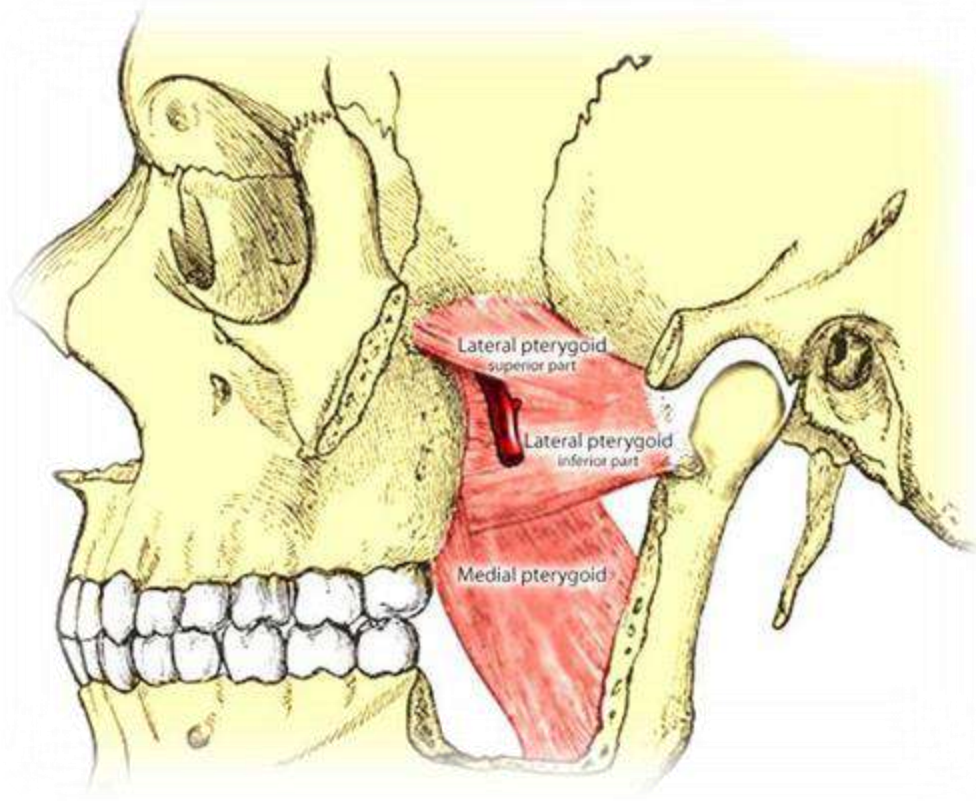
CLOSING MUSCLES:

1. The temporalis muscles.
 2. Masseter muscles.
 3. Medial pterygoid muscles.
- (elevating and closing the mandible).



GLIDING MUSCLES:

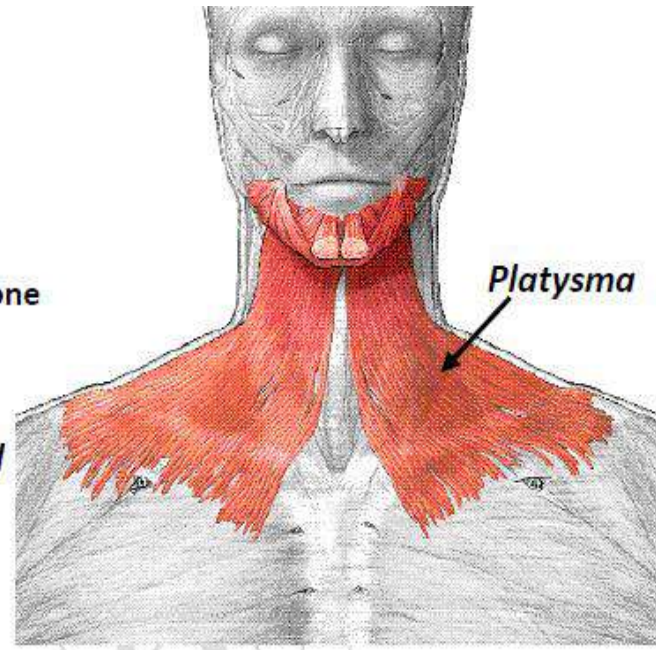
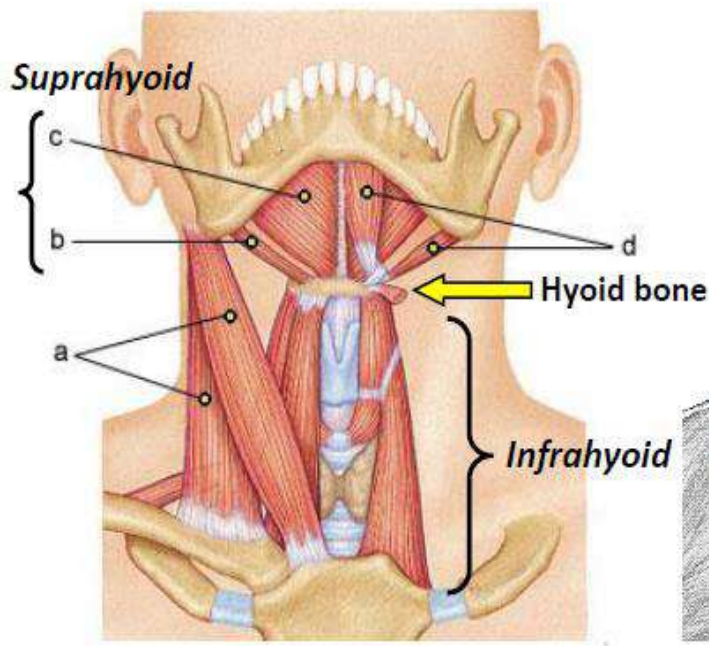
- The lateral pterygoid muscle (protrude the jaw or to move it laterally).



OPINING MUSCLES:

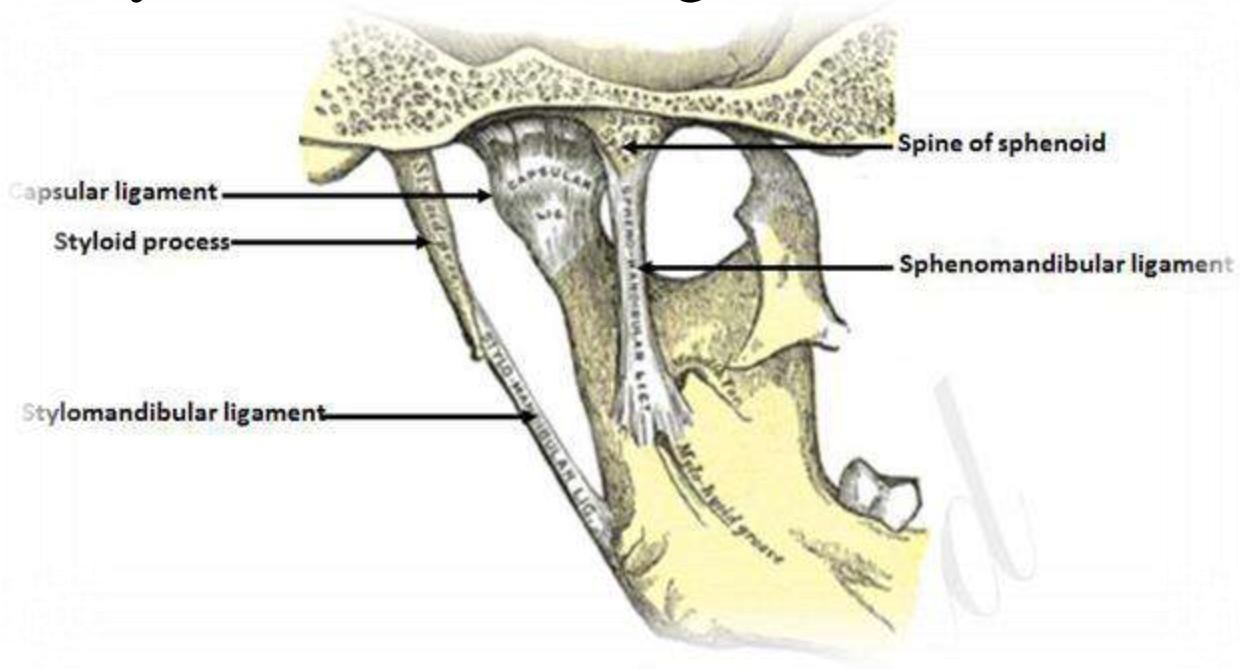
1. Suprahyoid muscles.
2. Infrahyoid muscles.
3. Platysma.

(depress (open) mandible)



LIGAMENTS AFFECT THE MOVEMENT OF MANDIBLE CONSIST OF:

1. Temporomandibular and capsular ligaments.
2. Sphenomandibular ligament.
3. Stylomandibular ligament.



MANDIBULAR AXES AND MANDIBULAR MOVEMENTS



- The temporomandibular joints affect the dentures and likewise the dentures affect health and function of the joints.
- The mandible is connected to the cranium at the two temporomandibular joint by the temporomandibular and capsular ligaments.
- The sphenomandibular and stylomandibular ligaments also connect the bones in such a way as to limit some motions of the mandible.



Sagittal Plane

Coronal Plane

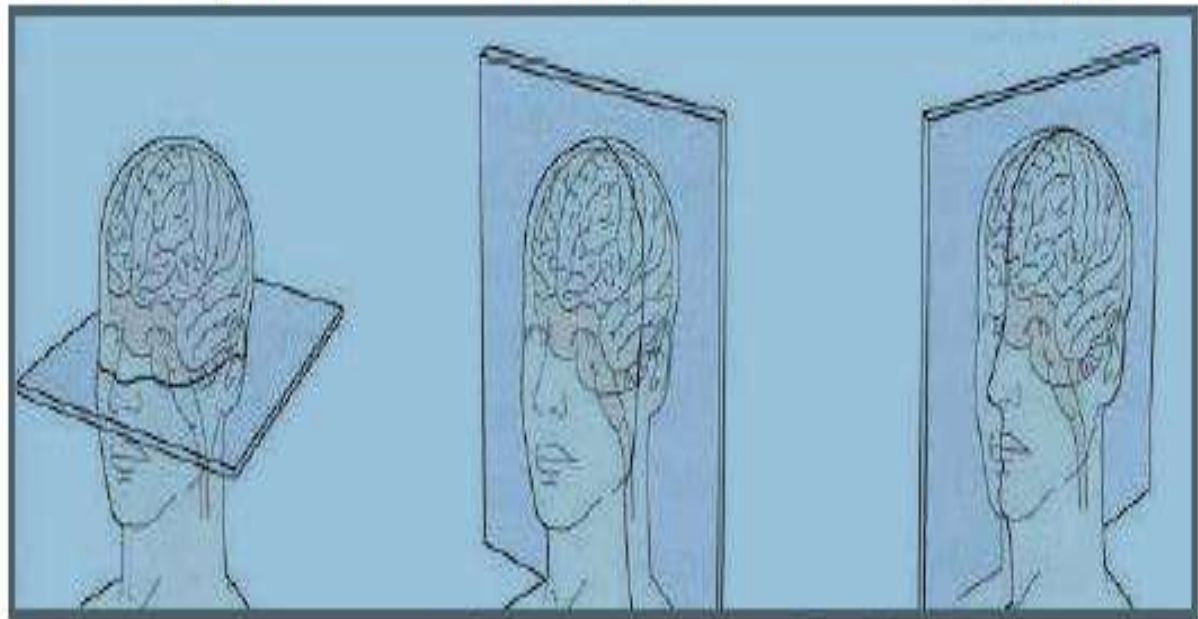
Transverse Plane

Body Planes

Transverse plane

Coronal plane

Sagittal plane



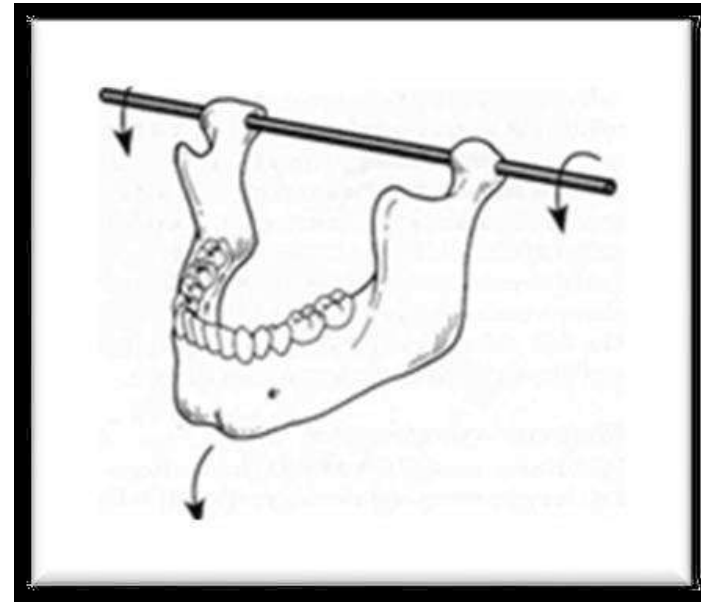
MANDIBULAR AXES

- There are three axes around which the mandibular movements take place, the mandibular movements are related to three planes of skull (sagittal, transverse (horizontal), and coronal (frontal)).



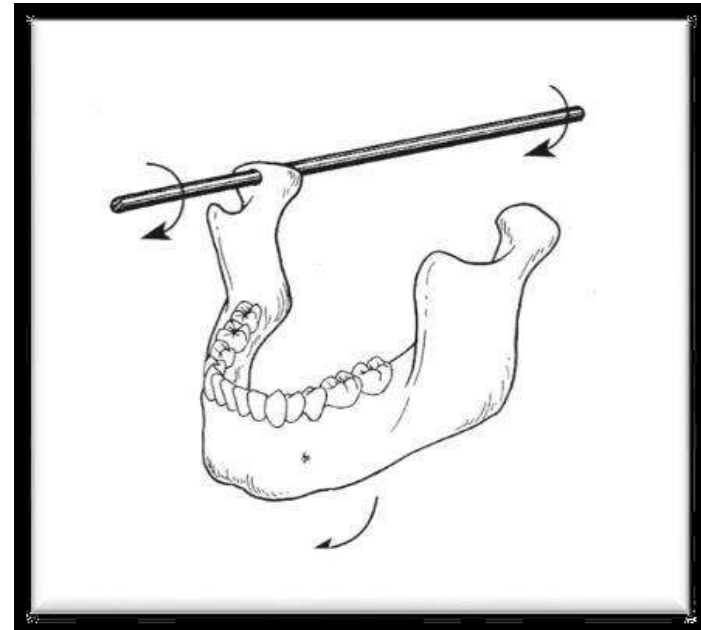
1- HINGE AXIS OR TRANSVERSE AXIS

- It is an imaginary line around which the mandible may rotate within the sagittal plane (during opening and closing movement)



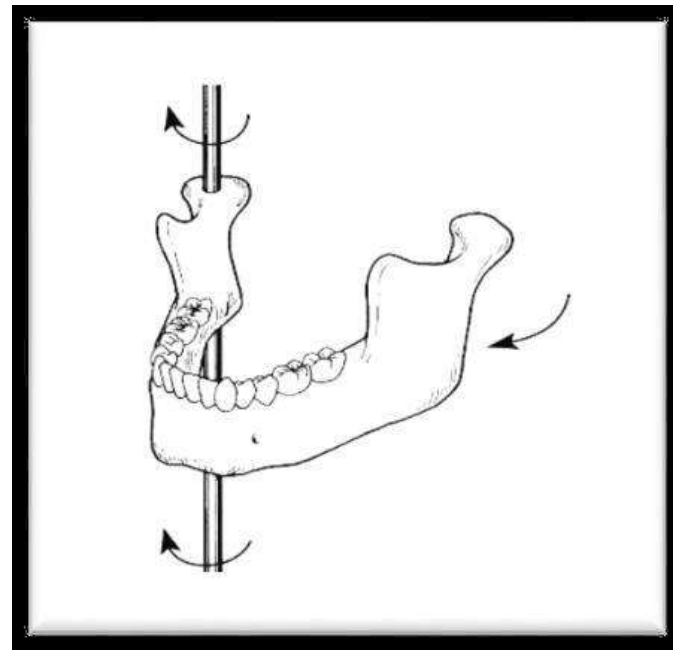
2- SAGITTAL AXIS OF THE MANDIBLE

- It is an imaginary anteroposterior line around which the mandible may rotate within the frontal plane.



3- VERTICAL AXIS OF THE MANDIBLE

- It is an imaginary line around which the mandible may rotate through the horizontal plane.



MANDIBULAR MOVEMENTS

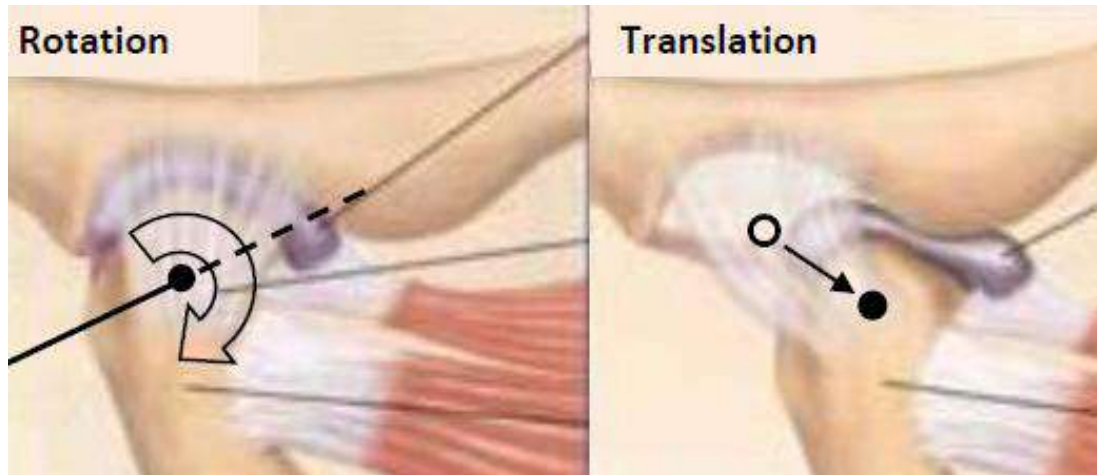
○ Based on the dimension involved in the movement

1- Rotational

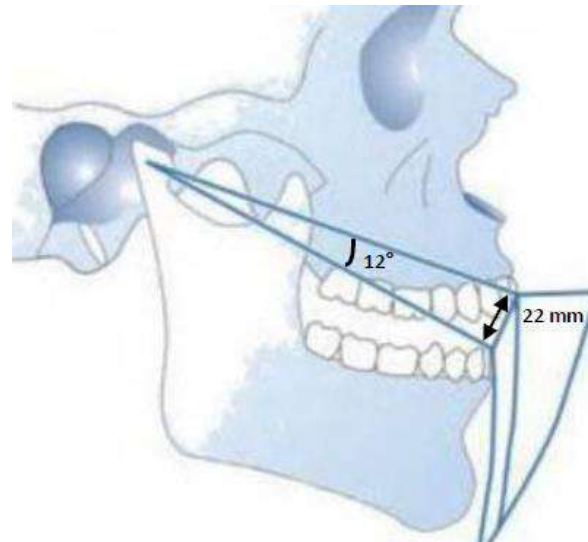
- a- Rotation around the transverse or hinge axis.
- b- Rotation around the anteroposterior or sagittal axis.
- c- Rotation around the vertical axis.

2- Translational or gliding

They are considered as *basic movements of the mandible*.



- *The upper compartment shows anteroposterior gliding movement, when this movement takes place, the condyle and the disc move as a single unit against the glenoid fossa.*
- *The lower compartment shows hinge movement, during hinge movement the condyle moves against the articular disc and the glenoid fossa, which together act as a single unit. True condylar rotation is 12° with the maximum incisal separation of 22 mm.*



MANDIBULAR MOVEMENTS

o Based on the type of movement:

1- Hinge movement.

2- Protrusive movement.

3- Retrusive movement.

4- Lateral movement.

a- Lateral rotation or (laterotrusion).

Right.

Left.

b- Lateral translation or (Bennett movement).





Figure (5-10): 1- Closed mouth. 2- Hinge movement. 3- Protrusion. 4- Retrusion.



Figure (5-11): Laterotrusion (left and right).



MANDIBULAR MOVEMENTS

○ Based on the extent of movement:

1- Border movement

- a- Extreme movement in the sagittal plane.
- b- Extreme movement in the horizontal plane.
- c- Extreme movement in the frontal plane.
- d- Envelope of motion.

2- Intra-border movement

a- *Functional movement.*

- Chewing cycle.*
- Swallowing.*
- Yawning.*
- Speech.*

b- *Para-functional movement*

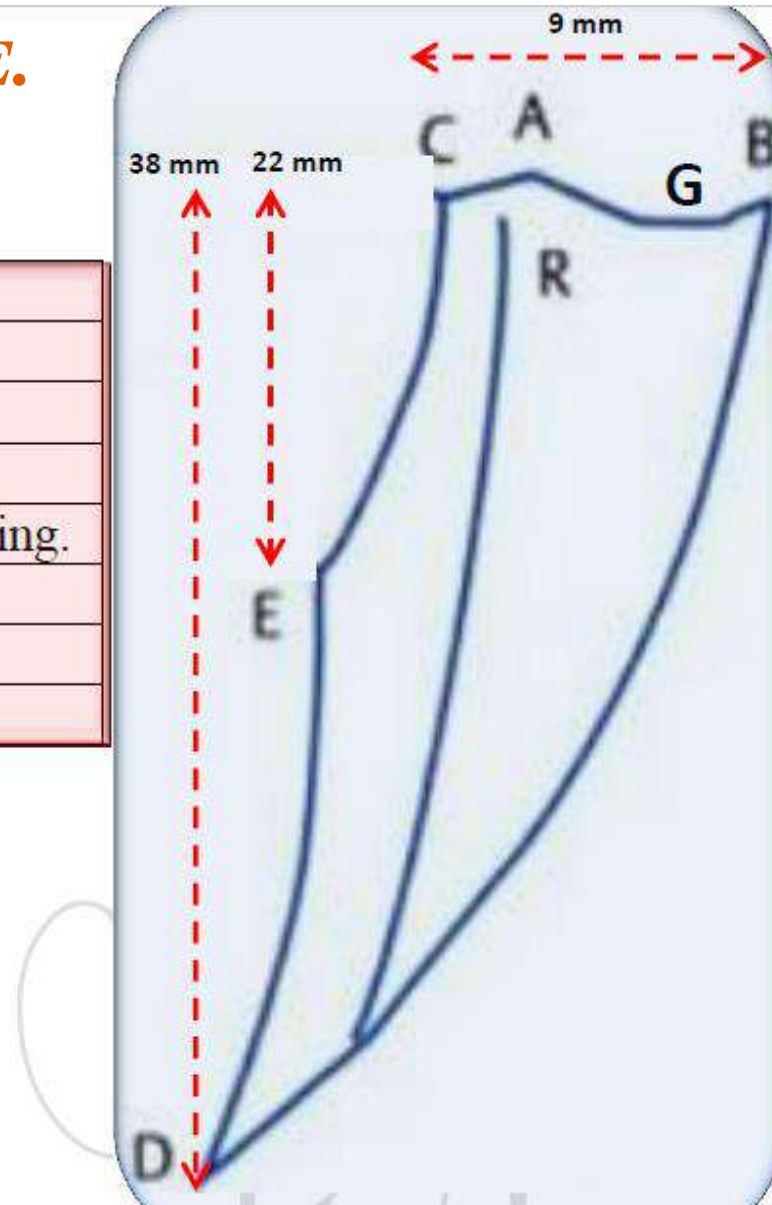
- Clenching.
- Bruxism.
- Other habitual movements.





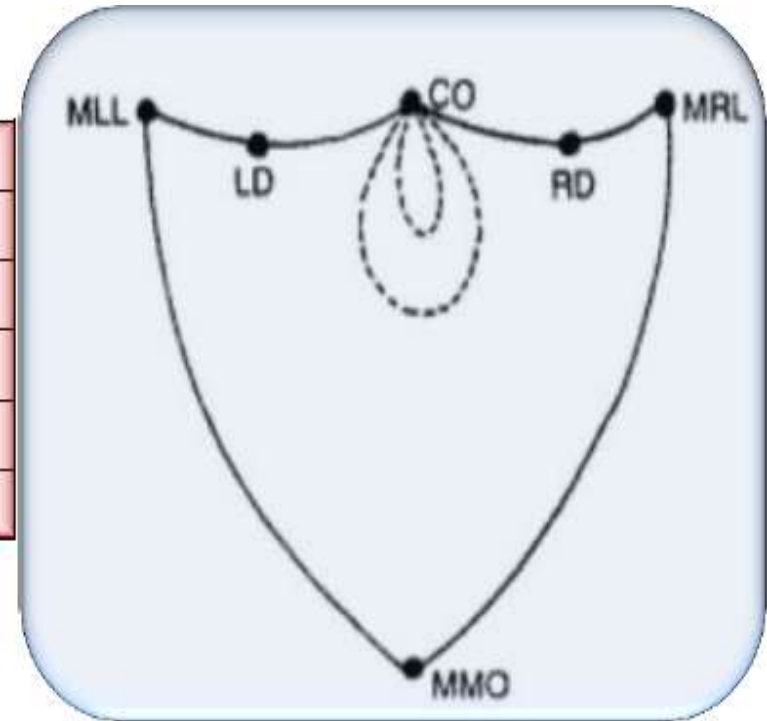
BORDERS MOVEMENTS RECORDED IN THE SAGITTAL PLANE.

C	Centric relation.
A	Centric occlusion.
G	Edge to edge relationship.
B	Maximum protrusion.
D	Maximum mandibular opening.
C-E	Hinge motion.
E-D	Gliding.
R	Resting position.



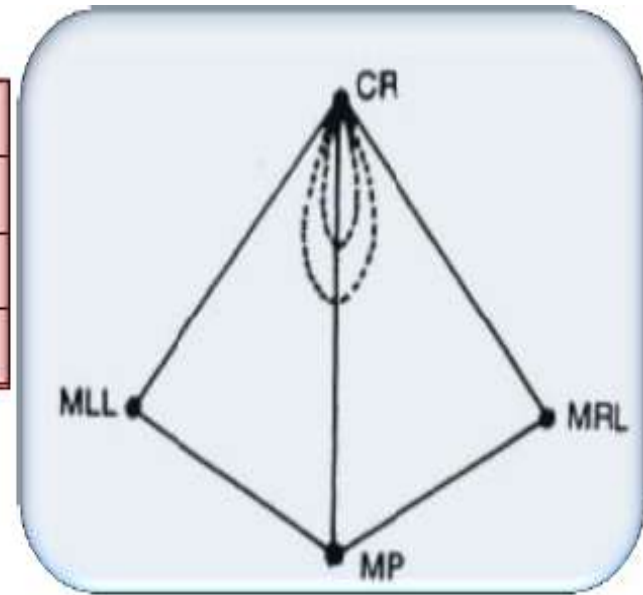
BORDER MOVEMENTS RECORDED IN THE CORONAL PLANE.

CO	Centric occlusion.
RD	Right disocclusion.
MRL	Maximum right lateral position.
MMO	Maximum mouth opening.
MLL	Maximum left lateral position.
LD	Left disocclusion.



BORDER MOVEMENTS RECORDED IN THE HORIZONTAL PLANE.

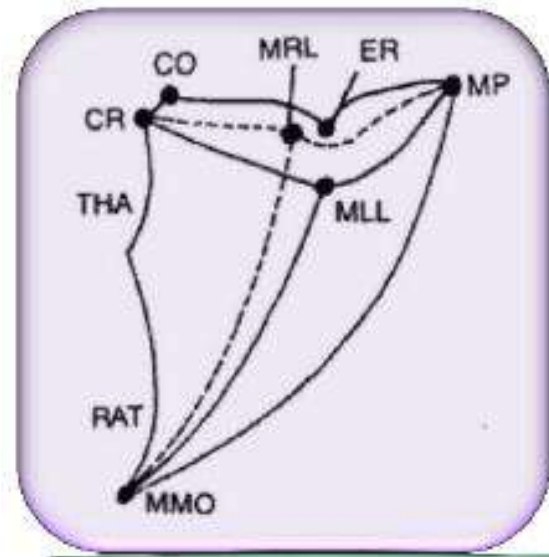
CR	Centric relation.
MRL	Maximum right lateral position.
MP	Maximum protrusion.
MLL	Maximum left lateral position.



ENVELOPE OF MOTION

- When we combine the border movements of all the three planes, we get a three dimensional space within which mandibular movements is possible, this three dimensional limiting space is called the (*envelope of motion*).

Envelope of motion:
(It is the combination of border movements in all three planes).



A watercolor illustration of various flowers and berries. In the foreground, a large pink flower with a bright orange-red center is prominent. To its right, a smaller pink flower with a yellow center is visible. In the background, there are clusters of small red berries and a yellow flower. The overall style is soft and artistic, with delicate brushstrokes and a pastel color palette.

THANK YOU

Face bow and Articulators



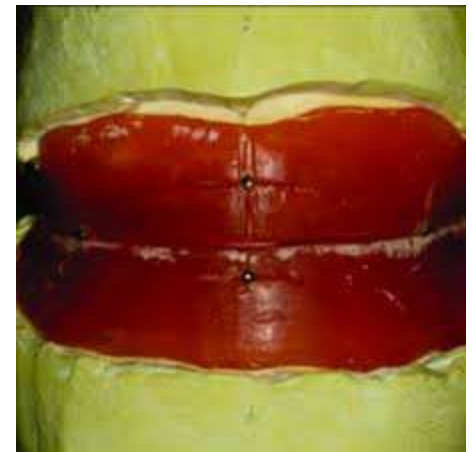
Bushra Mohammed Ali Al-Ameen
B,D,S,. M,Sc.(Pros)

- **Jaw relation (Maxillomandibular relationship):**

any one of the infinite spatial relationships of the mandible to the maxilla.

- **Jaw relation record:**

It is a registration of any positional relationship of the mandible relative to the maxilla. These records may be made at any vertical, horizontal, or lateral orientation; it is also known as: *Maxillomandibular record*, *maxillomandibular registration*.



TYPES OF JAW RELATION

1- Orientation relation

2- Vertical Jaw Relations

a- Rest Vertical Dimension (*RVD*)

b- Occlusion Vertical Dimension (*OVD*)

3- Horizontal Jaw Relations

a- Centric Relation

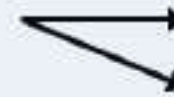
b- Eccentric Relations

Protrusive relation

Lateral relations

Right.

Left.



Orintation relation

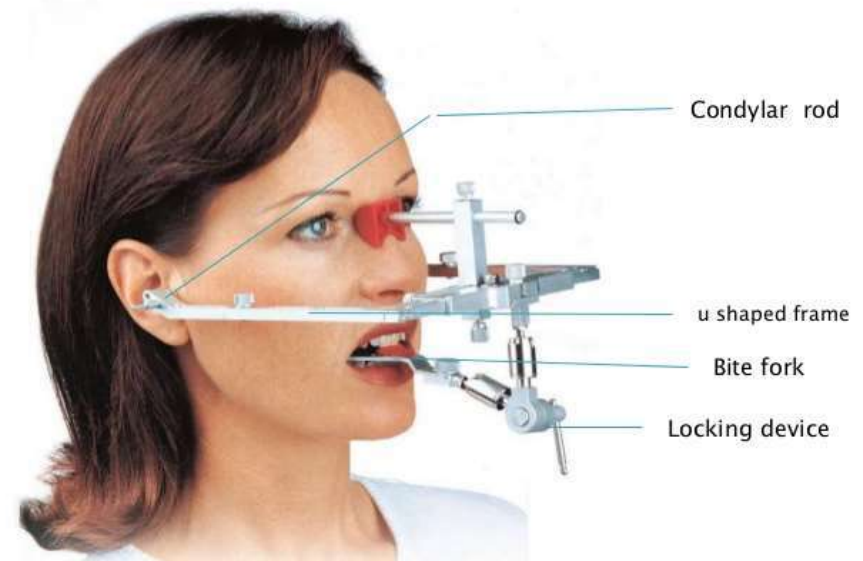
- It is defined as the jaw relation when the mandible is kept in its most posterior position, it can rotate in the sagittal plane around an imaginary transverse axis passing through or near the condyles.
- **This record gives the position of the maxilla in relation to the base of the skull.**
- It is necessary to do orientation jaw relation *before carrying out other jaw* relation.
- The casts on the articulator must relate to the hinge axis of the instrument.
- *This relation can be recorded by mean of the face-bow.*

Orientation Jaw Relations & Face- Bow



Face bow

- It is a caliper-like device used to record the relationship of the maxillary arch to the temporomandibular joints (base of the skull) or the opening axis of the jaws, and then transfer this relationship to the opening axis of the articulator.



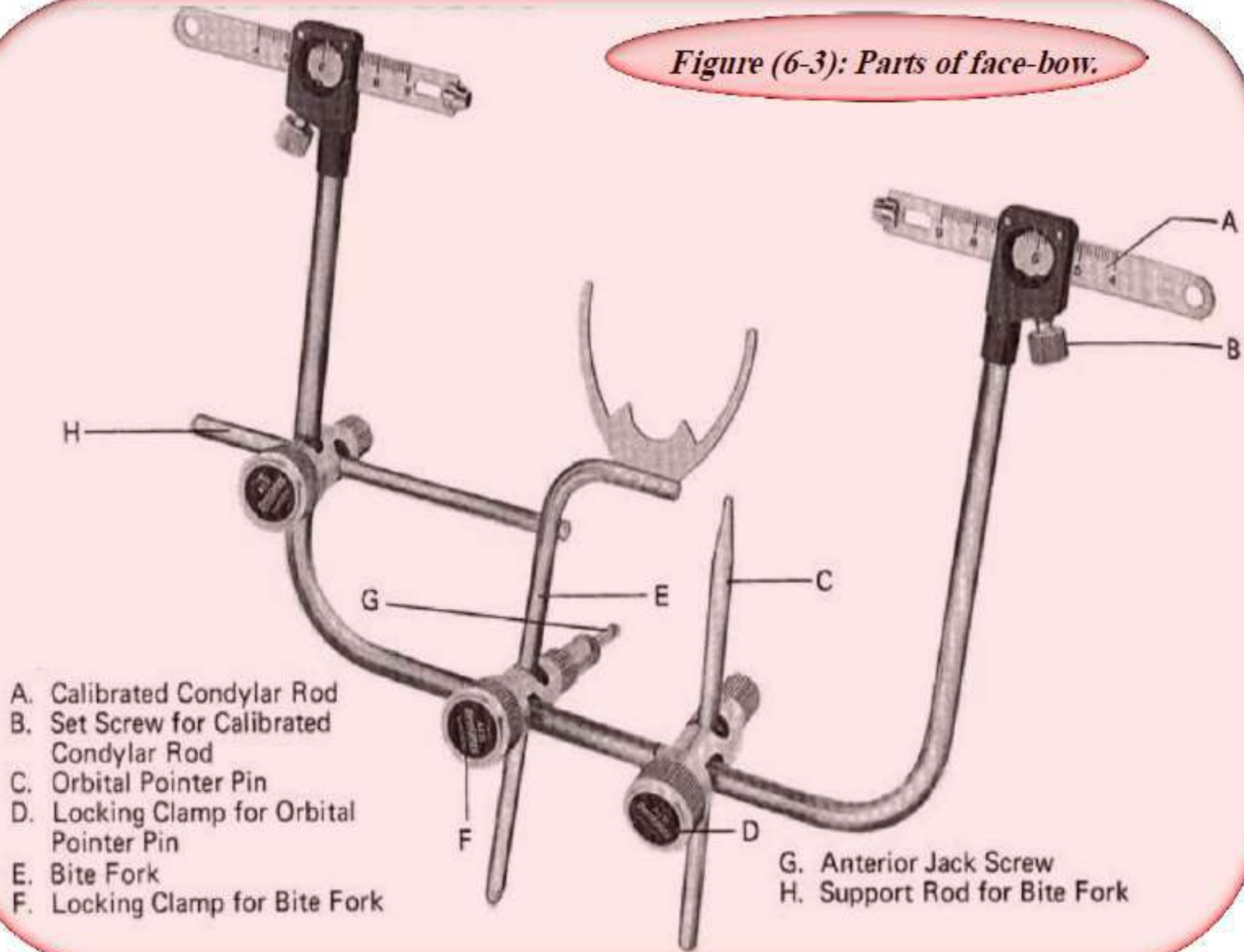
Parts of the face bow

The face-bow *basically contains three sections:*

- 1- U-frame:** it represents the plane of the cranium. It is the main frame of the face-bow; all other components are attached to the frame. It should be large and wide enough to avoid contact with the sides of the face.
- 2- Bite fork:** it represents the plane of the maxilla. It is a U-shaped plate, which is attached to the occlusal rims.
- 3- Locking device:** it locks the first two sections without altering their plane.

- *Also the face-bow contains*
- **Condyle rods:** These are two small rods on either side of the free end of the frame that contacts the skin over the TMJ, over the hinge axis and transverse the hinge axis of TMJ by attaching to the condylar shaft in the articulator.
- **Orbital pointer with clamp:** It is designed to mark the anterior reference point (infraorbital notch) and can be locked in position with a clamp. It is present only in the arbitrary face- bow.

Figure (6-3): Parts of face-bow.



- A. Calibrated Condylar Rod
- B. Set Screw for Calibrated Condylar Rod
- C. Orbital Pointer Pin
- D. Locking Clamp for Orbital Pointer Pin
- E. Bite Fork
- F. Locking Clamp for Bite Fork

- G. Anterior Jack Screw
- H. Support Rod for Bite Fork

Types of the Face-Bow

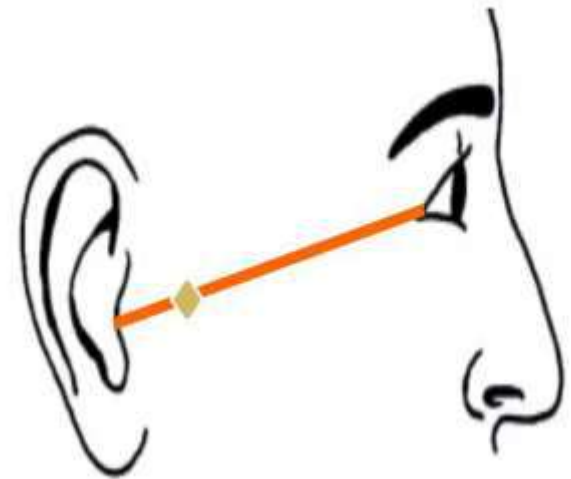
1. Arbitrary face-bow:

- It is the **most commonly** used face-bow in complete denture construction.
- The **hinge axis is approximately located**, it orients the maxilla to an arbitrary hinge axis and transverse it to the articulator and **it does not exactly match the articulator axis to the actual hinge axis.**
- It is simplistic, less accurate, requires less complicated equipment and time.
- **It is used with semiadjustable articulators.**



The hing axis of Arbitrary Face Bow can be designed:

- **EITHER** arbitrarily, the condylar rods are positioned approximately **13 mm anterior to the posterior margin of the tragus of ear along a line** drawn from the outer canthus of the eye to the center of the tragus (**cantho-tragus line**) this point called (**Beyron's point**).

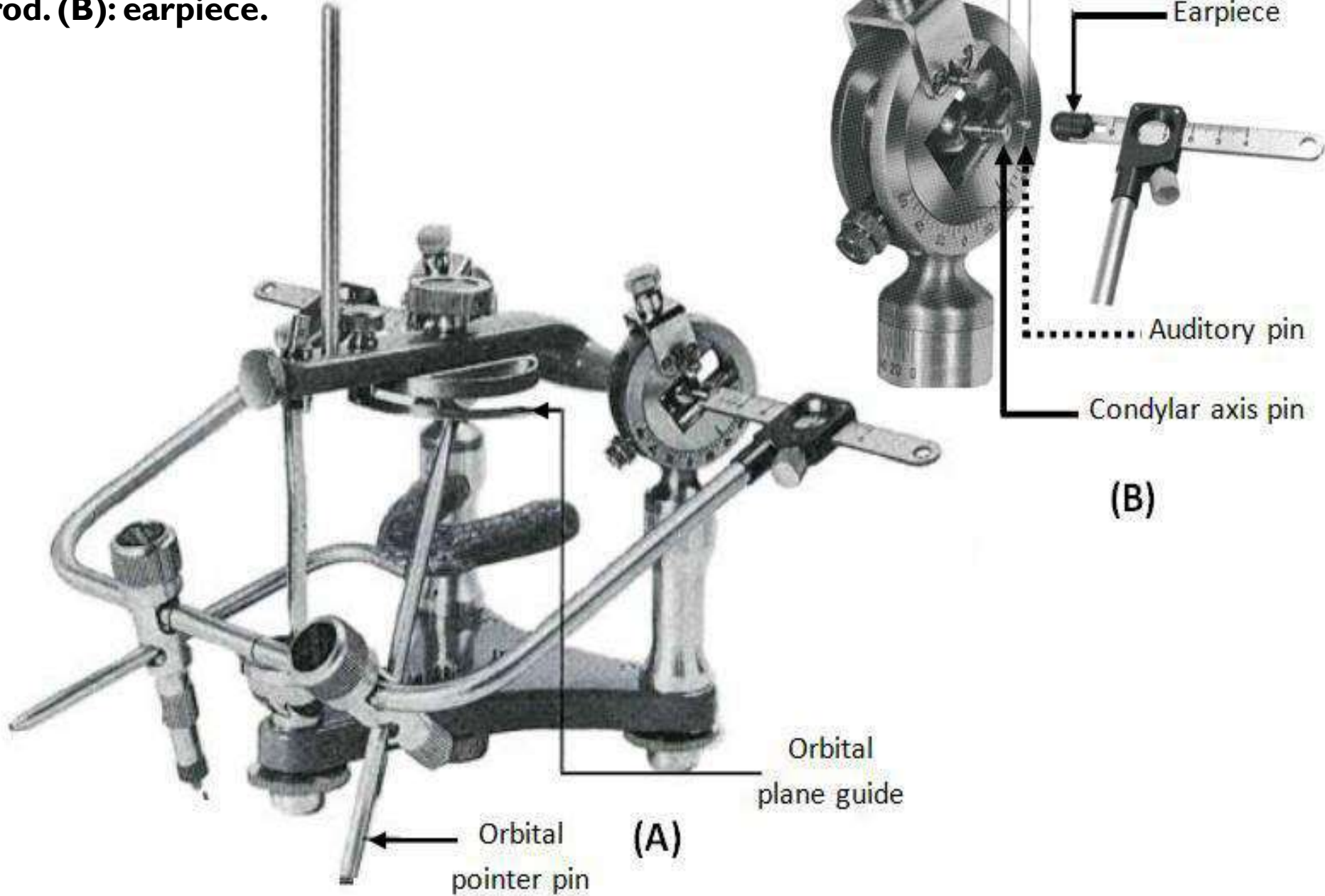


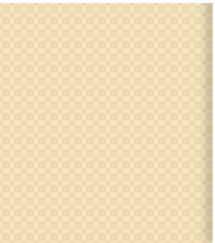
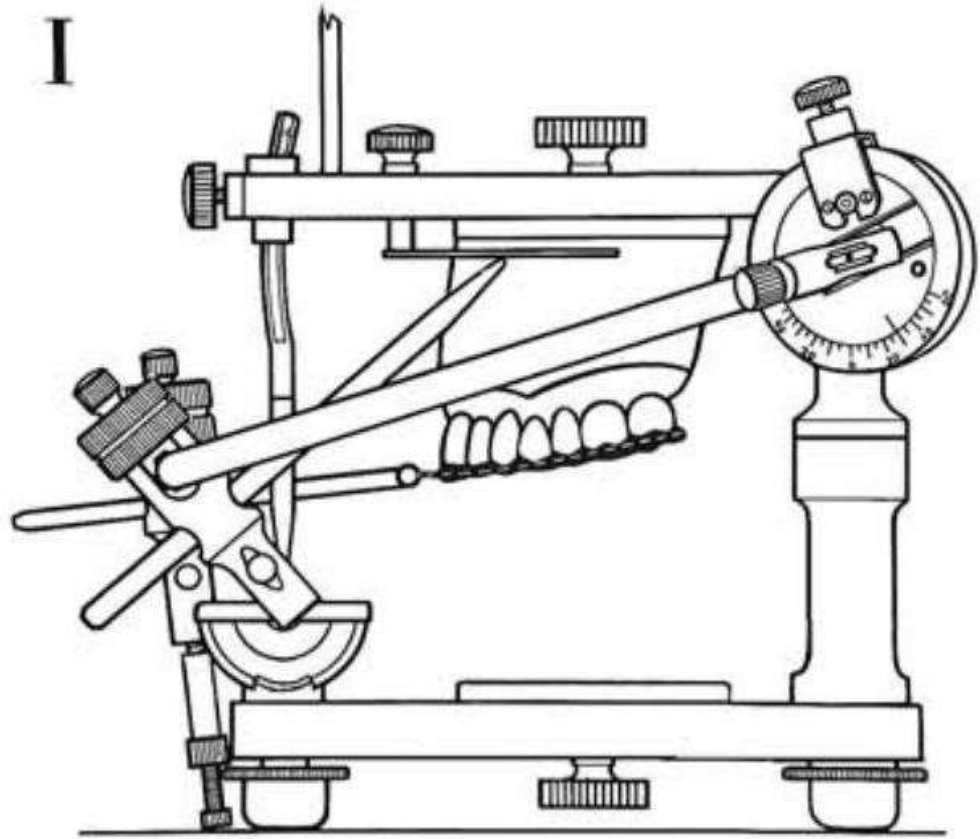
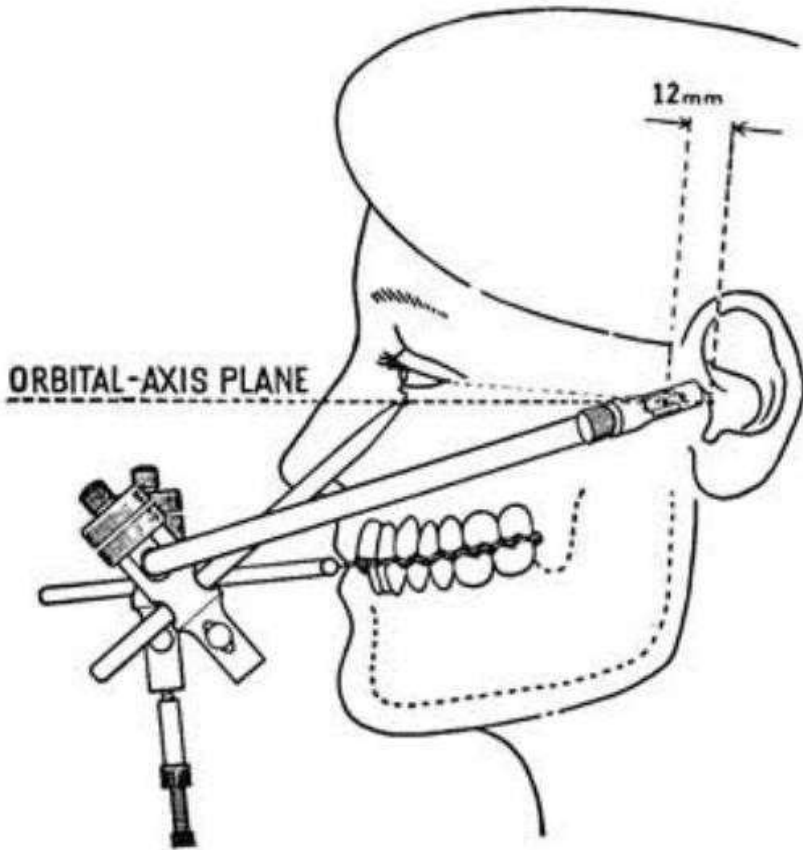
The hing axis of Arbitrary Face Bow can be designed:

- **OR** by the position of the earpieces in the external auditory meatus. The difference in the position of the earpiece position is accommodated by the design of the articulator and its earpiece receiver points (***auditory pin***).



Figure :Attachment of the arbitrary face bow to the semiadjustable articulator (A):condylar rod. (B): earpiece.

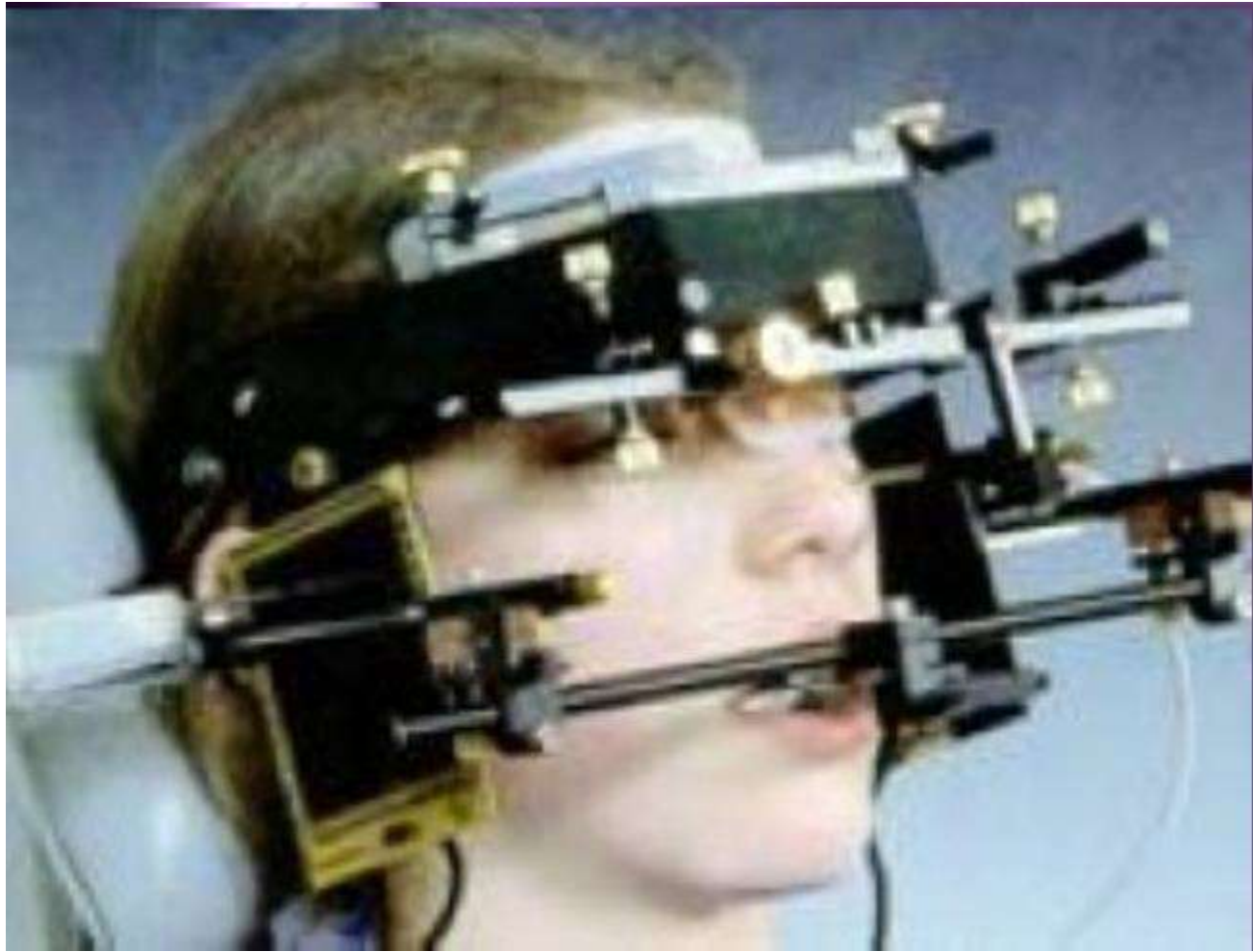




Types of the Face-Bow

2. Kinematic face-bow:

- A face-bow attached to the mandible with caliper ends (condyle rods) that **can be adjusted to permit the accurate location of the true axis of rotation** of the mandible.
- It is generally used for the fabrication of **fixed partial denture and full mouth rehabilitation**.
- It is generally **not used for complete denture fabrication** because it requires a long and complex procedure to record the orientation jaw relation.
- **It orients the maxilla to the actual hinge axis and transverse it to the articulator.**
- It is most sophisticated, **most accurate**, required more elaborate equipment and time.
- It is used with **fully-adjustable articulators**.



The axis of kinematic Face Bow can be designed:

- The first step involves the fabrication of **clutch** (it is occlusal rim made of impression compound with a bite fork tightly attached to it).
- *Once the* clutch has been attached to the mandible and hinge bow attached to it, guide the patient in making only hinge opening and closing movement.
- Left and right **styli** are attached via a face-bow to a clutch.

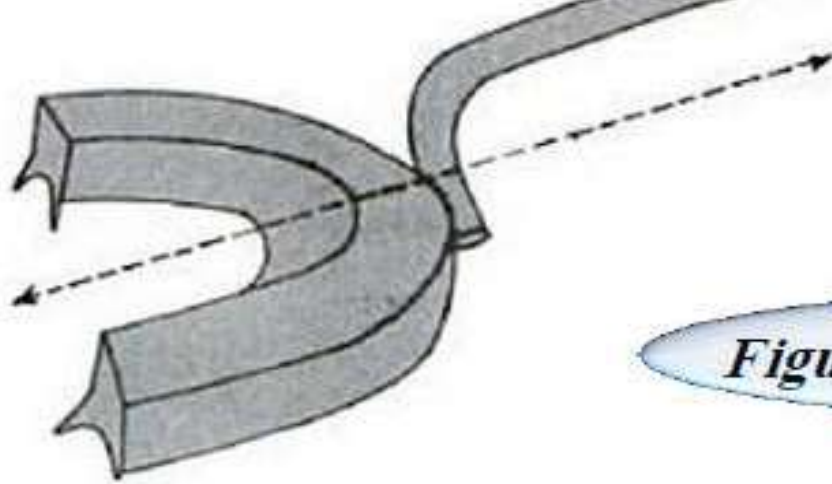


Figure (6-10): Mandibular clutch.

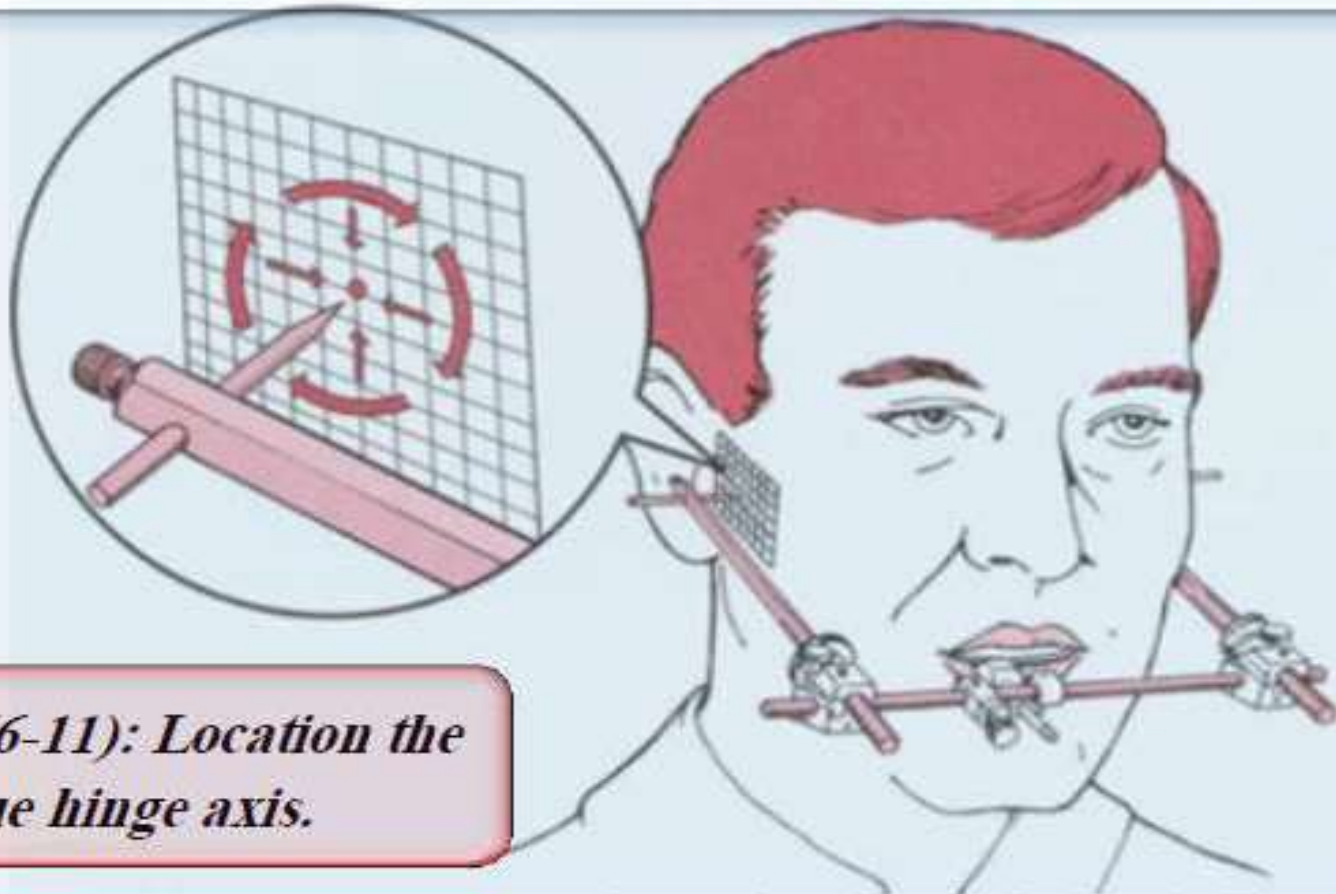


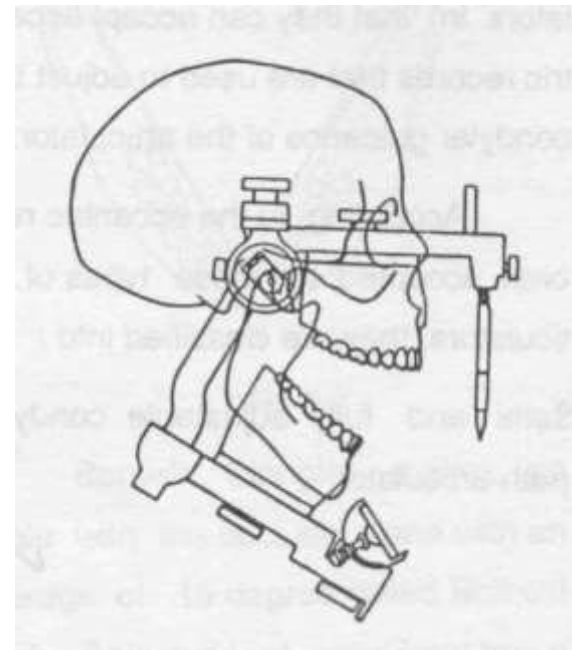
Figure (6-11): Location the true hinge axis.

Importance of the Facebow

1. The mounting of maxillary cast without face-bow transfer can produce errors in the occlusion of the finished denture.
2. A face-bow transfer allows minor changes in the occlusal vertical dimension on the articulator without having to make new maxillomandibular records.
3. It is helpful in supporting maxillary cast while it is being mounted on the articulator.

Articulator

- It is a mechanical instrument that represents the temporomandibular joints and jaws, to which maxillary and mandibular casts may be attached to simulate some or all mandibular movements.



Uses of Articulators

- To diagnose the state of occlusion in both the natural and artificial dentitions.
- To plane dental procedures based on the relationship between opposing natural and artificial teeth.
- To aid in the fabrication of restorations and prosthodontic replacements.
- To maintain the jaw relation record during arrangement of artificial teeth.
- To correct and modify completed restorations (remounting the dentures after processing for correction of occlusal disharmony).

Requirments of an articulator

- It should hold casts in the correct horizontal relationship.
- It should hold casts in the correct vertical relationship.
- The casts should be easily removable and re-attachable.
- It should provide a positive anterior vertical stop (incisal pin).
- It should accept face-bow transfer record.
- It should open and close in a hinge movement.
- It should be made of non-corrosive and rigid materials.
- It should not be bulky or heavy.
- There should be adequate space between the upper and lower members.
- The moving parts should move freely without any friction.

CLASSIFICATION OF ARTICULATORS

1- Non-adjustable condylar path articulator

a- Simple hinge articulator (*Class I*).

b- Mean value or fixed condylar path articulator (*Class II*).

2- Adjustable condylar path articulator

a- Semi-adjustable condylar path articulator (*Class III*).

b- Fully-adjustable condylar path articulator (*Class IV*).

Simple hinge Articulator

- These are simple holding instruments capable of accepting a single static registration.
- Only vertical motion is possible.
- They orient the opposing casts to each other without reference to anatomical landmarks.



Simple hinge Articulator

- **DESIGN:** It consists of upper and lower members held apart at certain distance by a screw which acts at the back. The screw can increase or decrease the distance between the two members, and permits only a hinge like movement.
- **Possible movement:** This type of articulators gives only hinge opening and closing movement.

Simple hinge Articulator

- **Records required for programming this type:**

- 1- Vertical dimension of occlusion.

- 2- Centric relation records.

- **Disadvantages:**

These articulators do not represent the temporomandibular joint and the dynamic mandibular movements.

Mean value (fixed condyler path articulator)

- These are an instrument that permits horizontal as well as vertical motion but does not orient the motion to the temporomandibular joints.



Mean value (fixed condylar path articulator)

- **DESIGN:** The two members of this type of articulators are joined together by two joints that represent the temporomandibular joints.
- The horizontal condylar path is fixed at certain angle that ranges from 30° which is the average (mean) of the most patients.
- *The incisal guide table is also fixed at a certain angle from horizontal.*
- *The distance between the condylar and incisal guide is derived from the average (mean) distance of the population.*
- *In the most fixed condylar path articulators, the upper member is movable and the lower member is stationary.*

Mean value (fixed condyler path articulator)

- **Possible movements:**

1. Opening and closing.
2. Protrusive movement at a fixed condylar path angle.

- **Records required for programming this type:**

1. Vertical dimension of occlusion.
2. Centric relation record.
3. Face-bow record.

Mean value (fixed condyler path articulator)

- **Disadvantages:**
 1. Most of these articulators do not accept face-bow record.
 2. The condylar path moves to a fixed angle and it is successful only in patients whose condylar angle approximates that of the articulator.
 3. No lateral movements.

Semi adjustable condyler path articulator.

- An articulator that allows adjustment to replicate average mandibular movements and it may be arcon or nonarcon instruments.



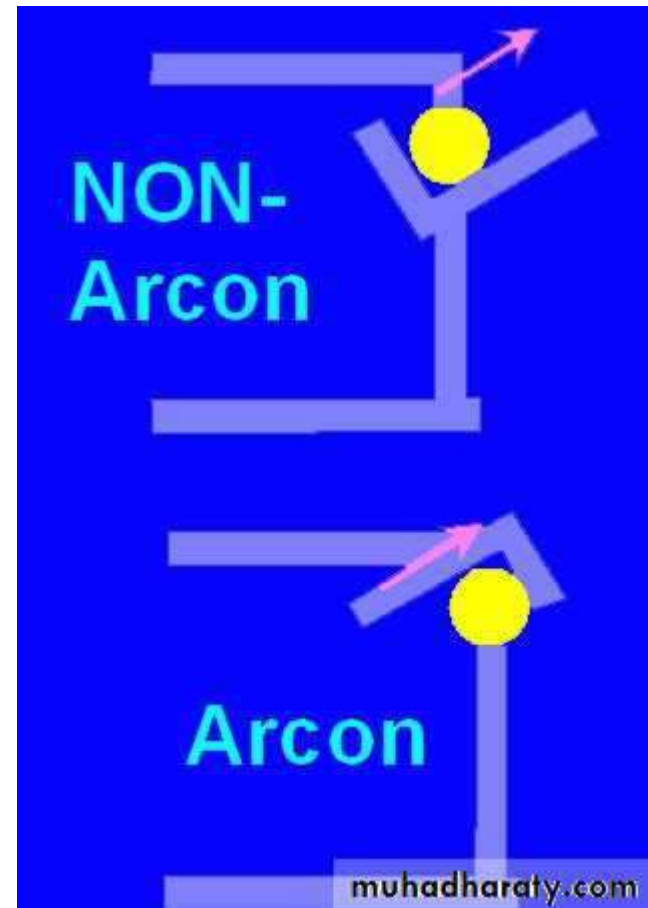
Semi adjustable condyler path articulator.

- In these articulators, the horizontal condylar path is adjusted by a protrusive record obtained from the patient, and the lateral condylar path inclination is adjusted according to the ***Hanau's formula when use Hanau type of semi-adjustable articulator.***

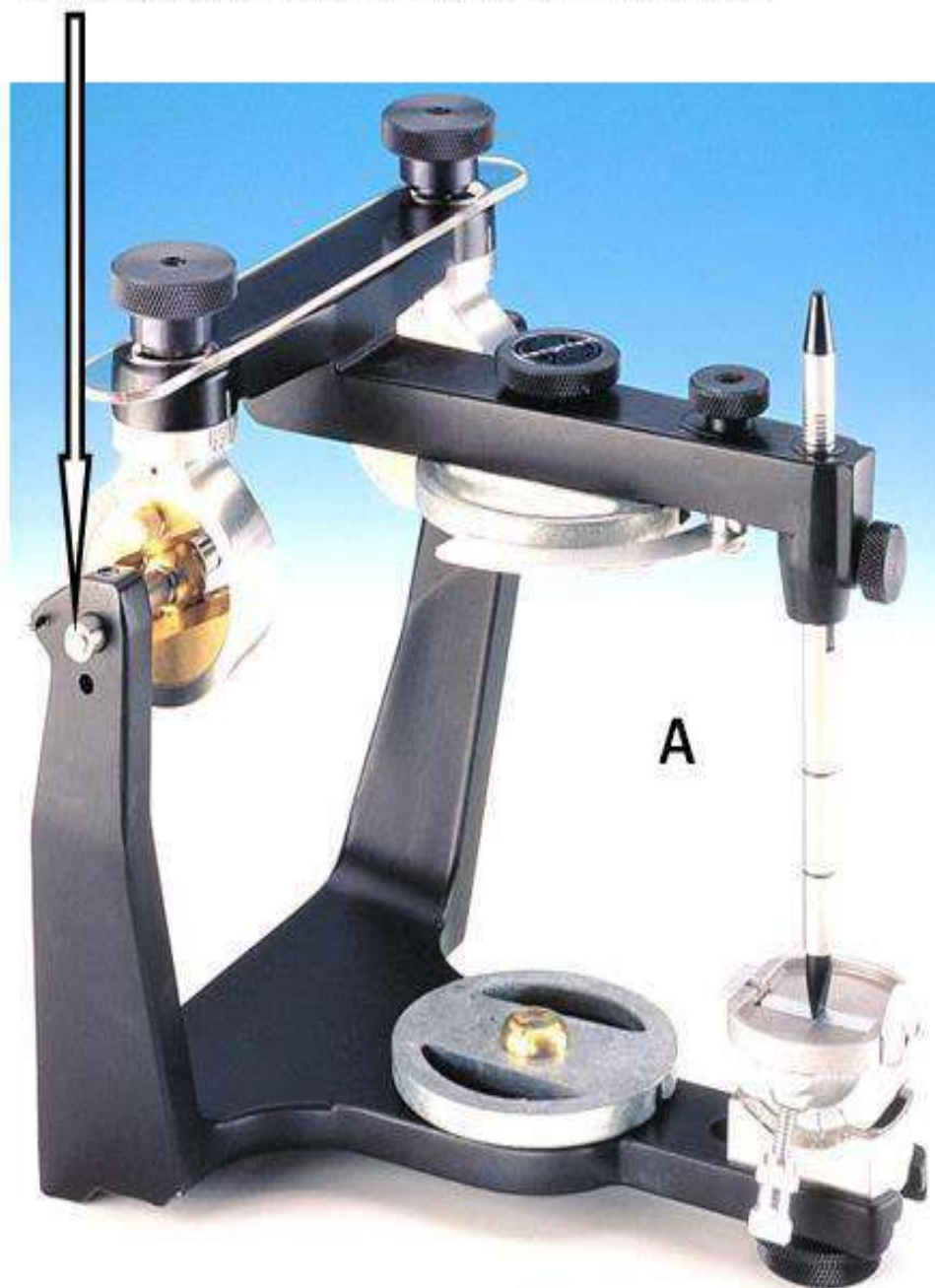
$$\text{Lateral inclination} = \frac{\text{Horizontal inclination}}{8} + 12$$

Semi adjustable condyler path articulator.

- They are classified as:
 1. Arcon semi-adjustable articulator.
 2. Non-arcon semi-adjustable articulator.
- The term *arcon* comes from (*mandibular condyle*). It is commonly used to indicate an articulator that has its condyles on the lower member and the condylar guide on the upper member.



Condyle attached to the lower member



Condyle attached to the upper member



Semi adjustable condyler path articulator.

- **Possible movements:**

1. Opening and closing.
2. Protrusive movement according to the horizontal condylar path angle determined from the patient.
3. Lateral movement according to the lateral condylar path inclination determined from the Hanau's formula.
4. Some types have ***Bennett movement (immediate side shift)***.

Semi adjustable condyler path articulator.

- **Records required for programming this type:**
 1. A maxillary face-bow record to mount the upper cast.
 2. Centric occluding relation record to mount the lower cast.
 3. Protrusive record to adjust the horizontal condylar path inclination of the articulator, and to find the lateral condylar path inclination from ***Hanau's formula***.

Semi adjustable condyler path articulator.

- **Disadvantages:**

1. The lateral condylar path angle is determined from a formula, not from the patient directly.
2. The condyles travel on a flat path cannot be used to reproduced eccentric movements exactly.
3. Most of these articulators have no ***Bennett movement***

Fully adjustable condyler path articulator.

- An articulator that will accept three dimensional dynamic registrations; these instruments allow for orientation of the casts to the temporomandibular joints and simulation of mandibular movements.
- They differ from the semi-adjustable articulators in that the lateral condylar path inclination is adjusted according to records taken from the patient.



Fully adjustable condyler path articulator.

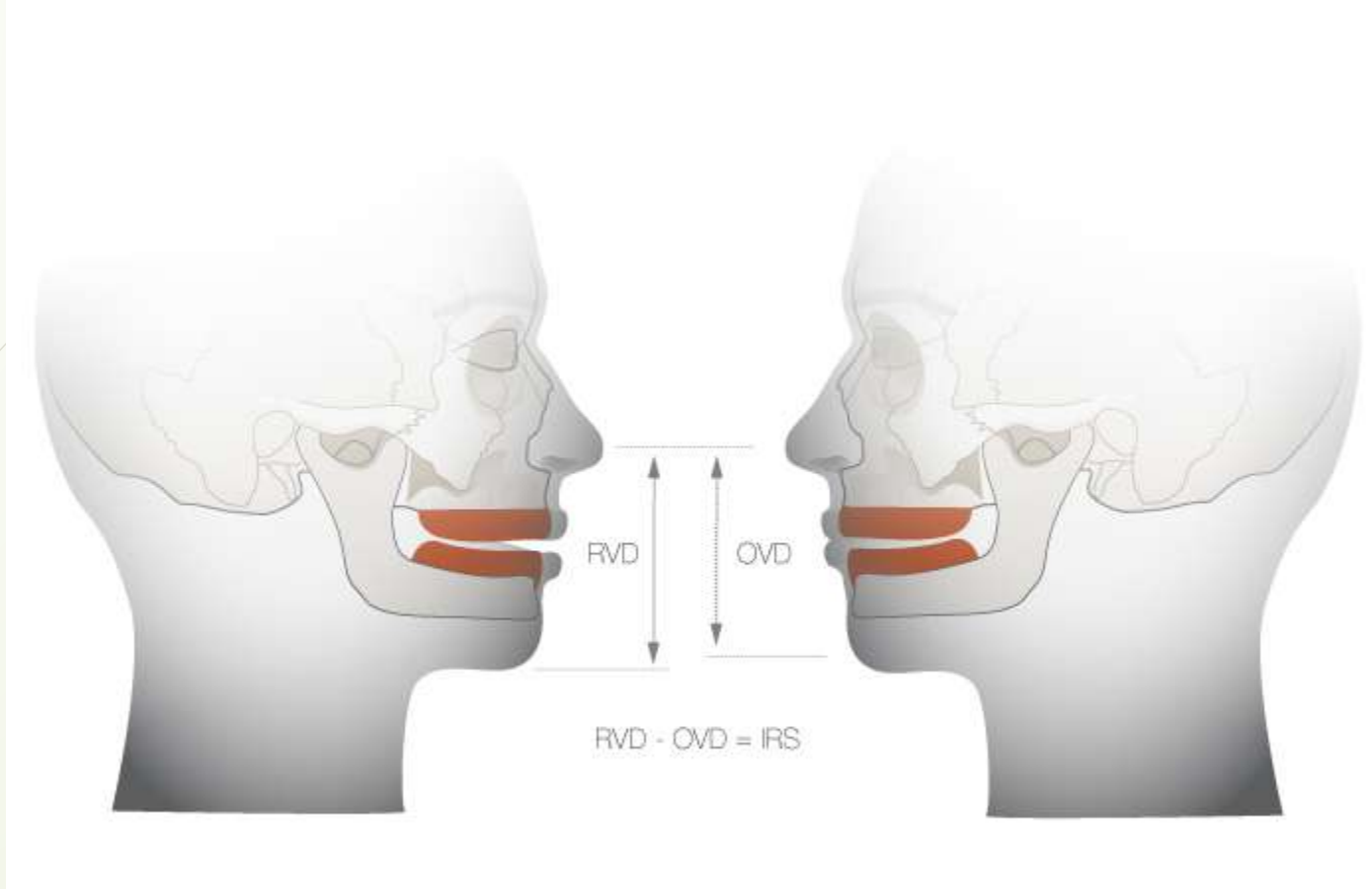
- **Possible movements:**
 1. Opening and closing.
 2. Protrusive movement according to the horizontal condylar path angle determined from the patient.
 3. Lateral movement according to the lateral condylar path inclination determined from the patient.
 4. Bennett movement.

Fully adjustable condyler path articulator.

- **Records required to program this type:**
 1. A maxillary face-bow record to mount the upper cast.
 2. Centric occluding relation record to mount the lower cast.
 3. Protrusive record to adjust the horizontal condylar path inclination of the articulator.
 4. Right lateral record to adjust the left condylar path inclination.
 5. Left lateral record to adjust the right condylar path inclination.
- **Disadvantages:**
 1. Multiple records are required with the possibility of errors.



Thank you



1

Vertical relation

Bushra Mohammed Ali Al-Ameen

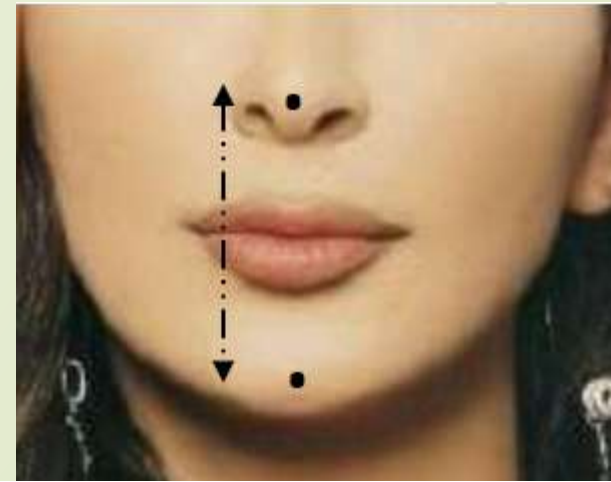
B,D,S,. M,Sc.(Pros)

Vertical relation

Vertical relation: It is the amount of separation between the maxilla and the mandible in a frontal plane.

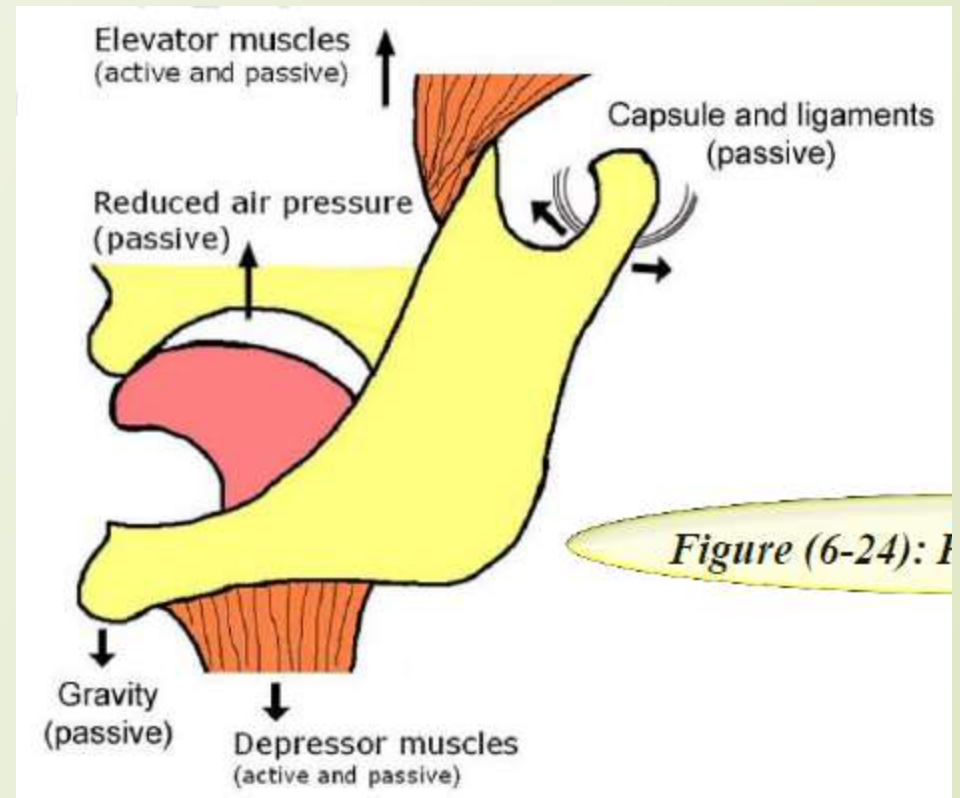
Vertical dimension: It is the distance between two selected points, one on a **fixed** and one on a **movable member**.

- In general, the vertical measurement of face could be recorded between any two arbitrary selected points which are usually located one above the mouth (**at the tip of nose**) and the other below the mouth (**at the tip of chin in the mid line region**).



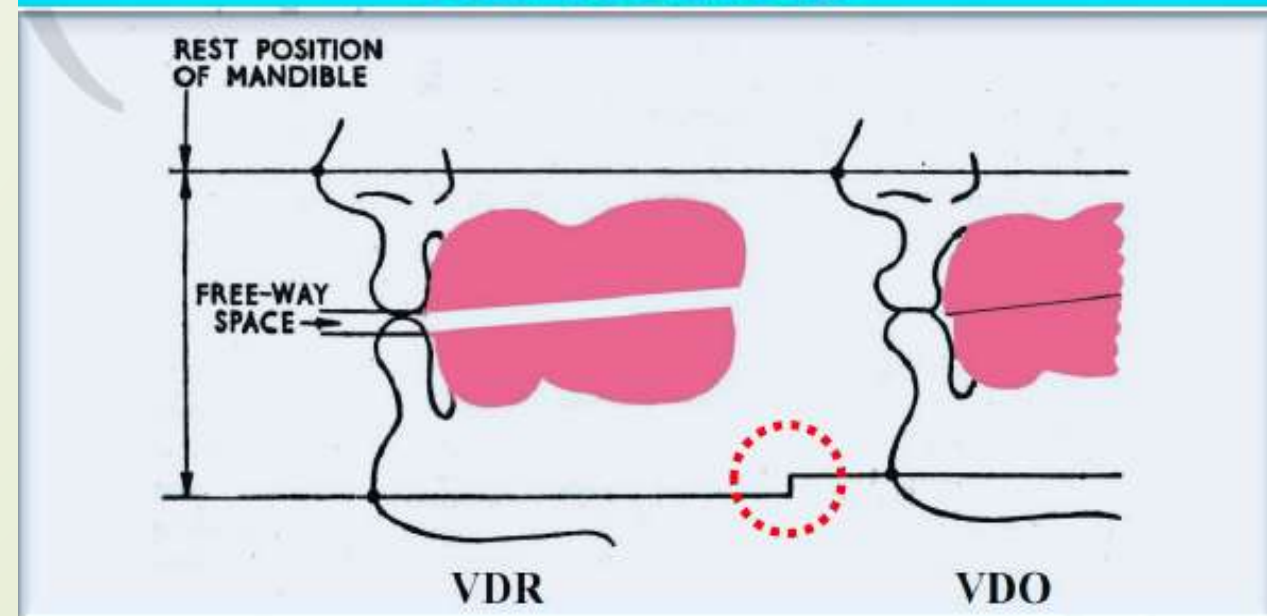
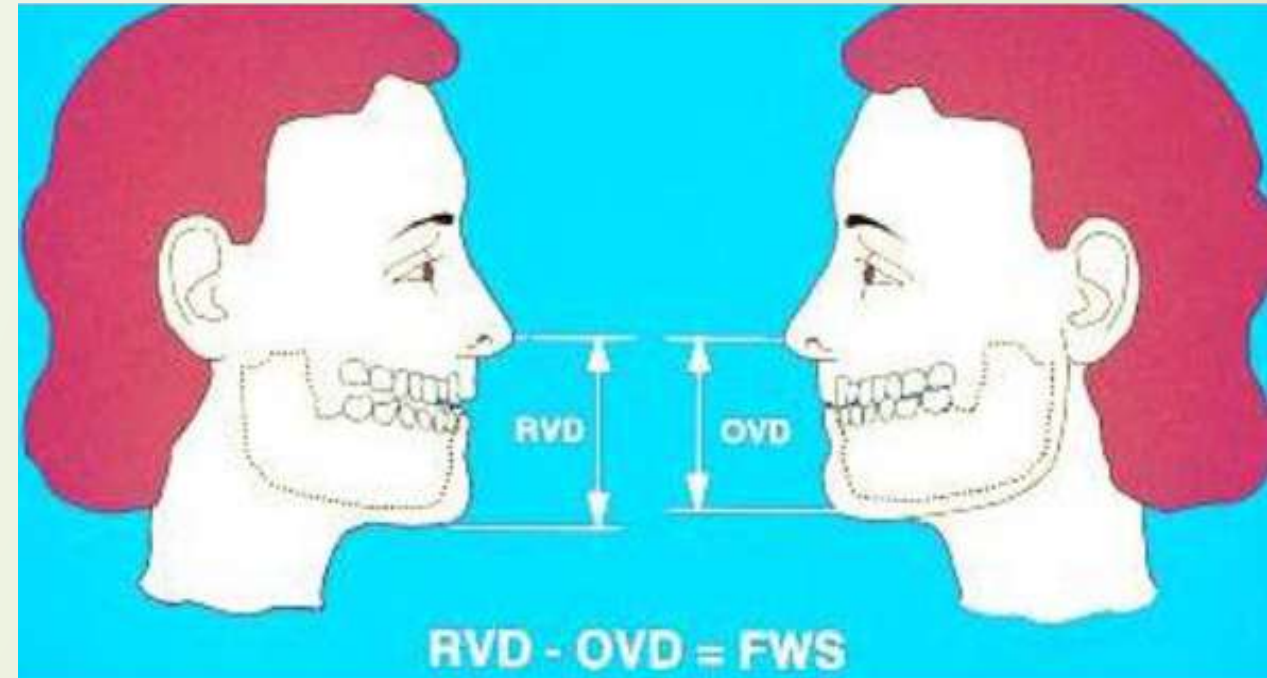
Physiological rest position:

It is the postural position of the mandible when an individual is resting comfortably in an **upright** position and the associated **muscles** are in a state of **minimal contractual activity**.



:Rest vertical dimension

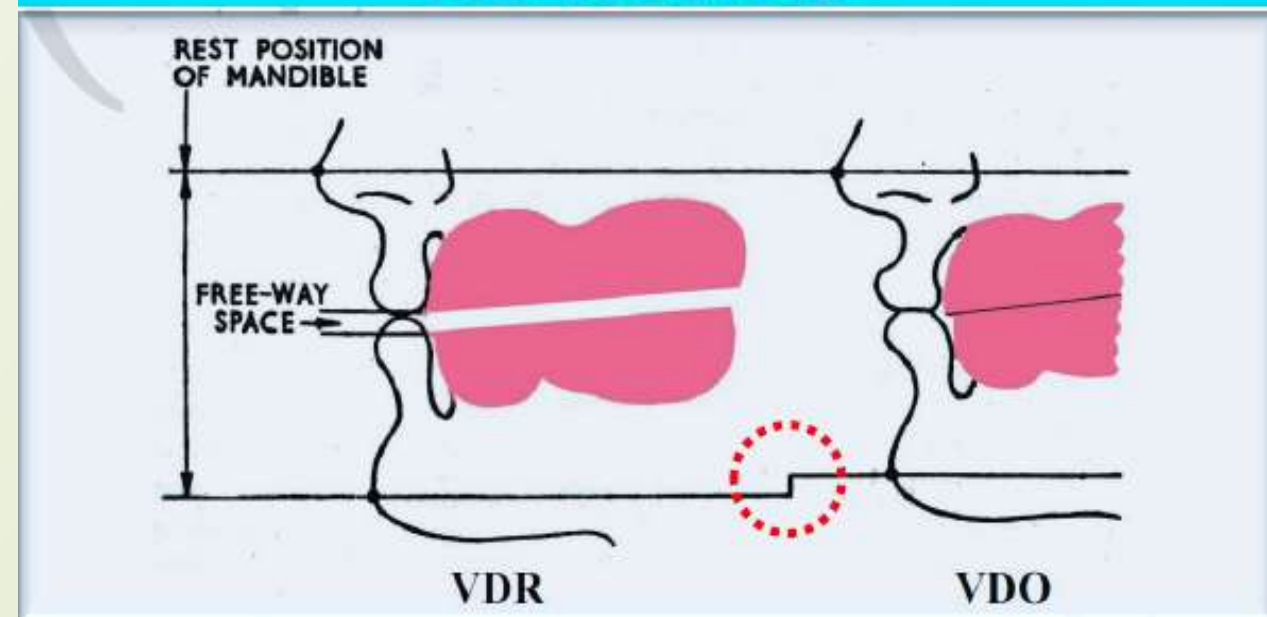
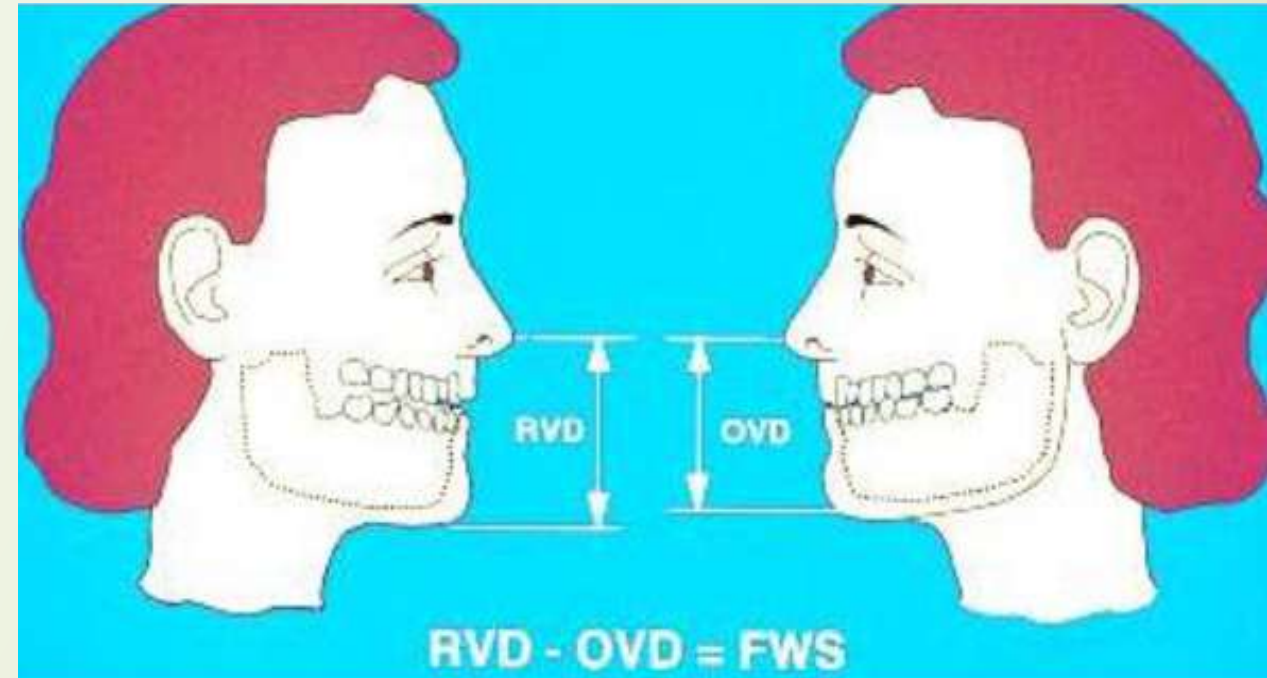
It is the distance between two selected points (one at the tip of nose and the other at the tip of chin in the mid line region) measured when the mandible is in the **physiologic rest position**.



5

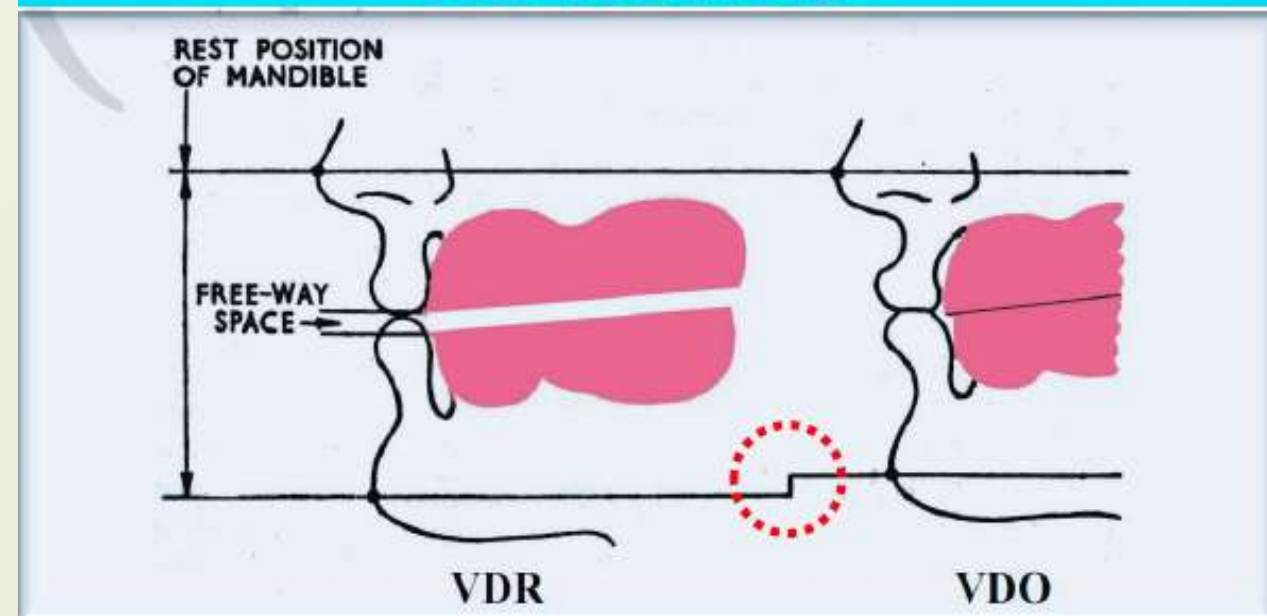
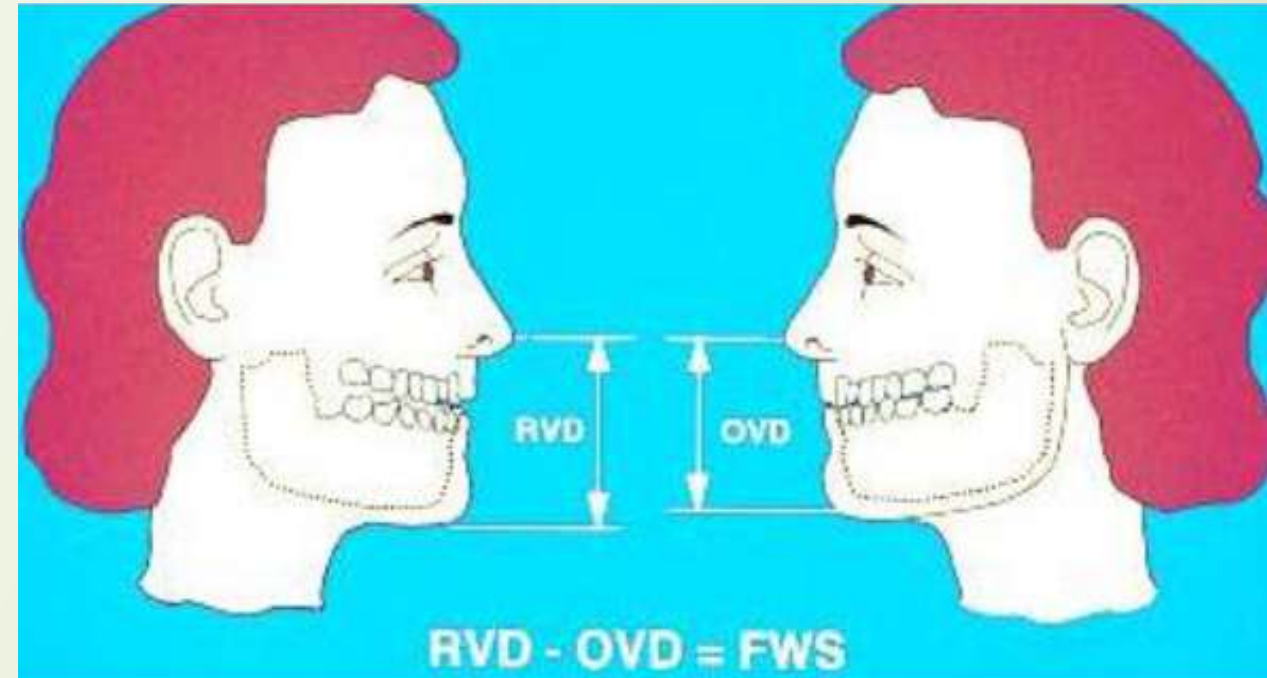
Occlusal vertical dimension

It is the distance measured between two points when the occluding members (teeth or occlusal rims) are in **contact**



Interocclusal distance :(interocclusal gap)

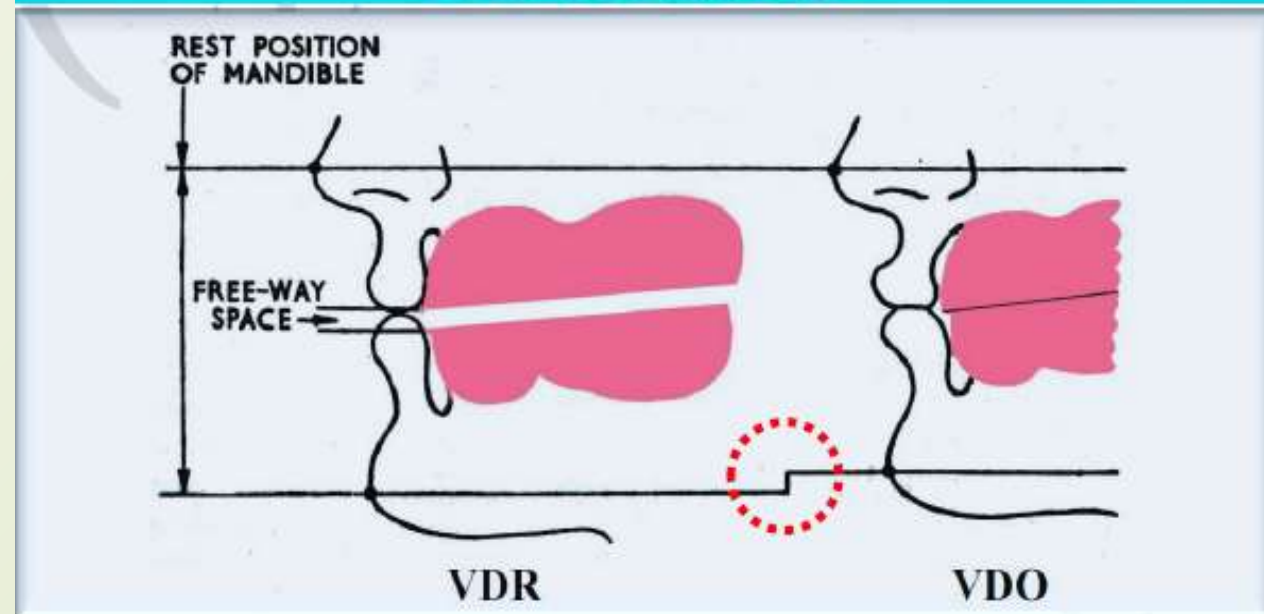
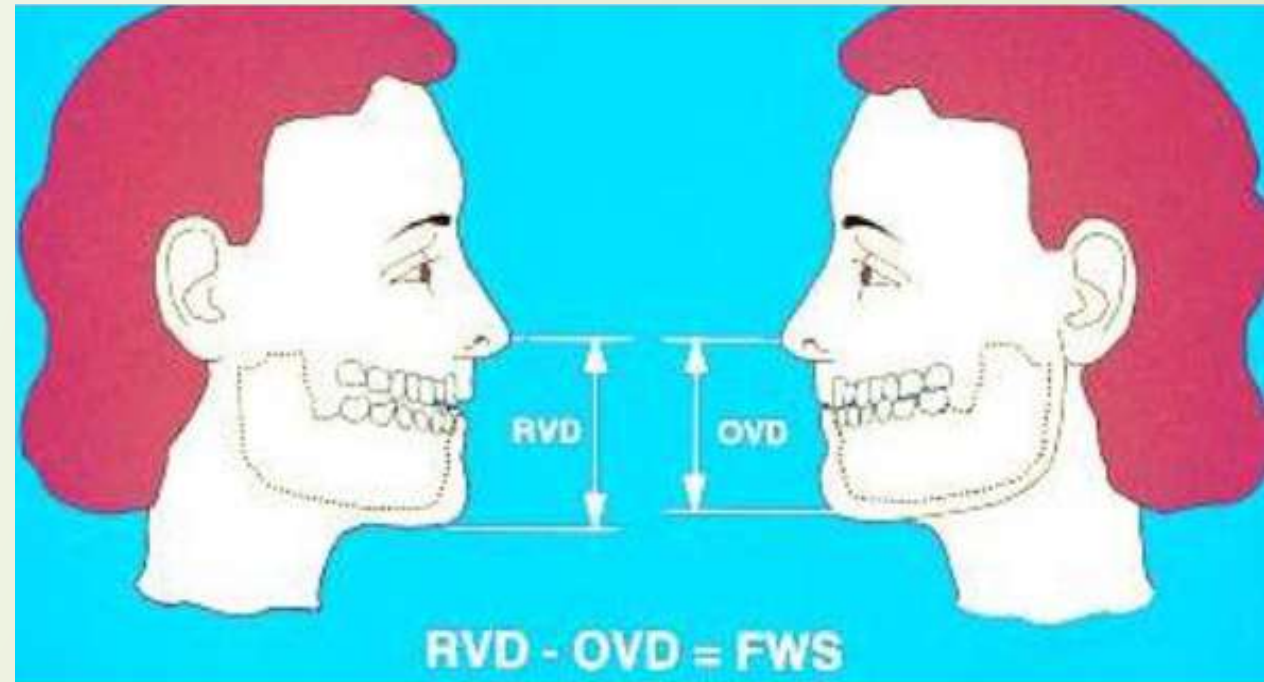
It is the distance between the occluding surfaces of the maxillary and mandibular teeth when the mandible is in a **.specified position**



Interocclusal rest space :(freeway space)

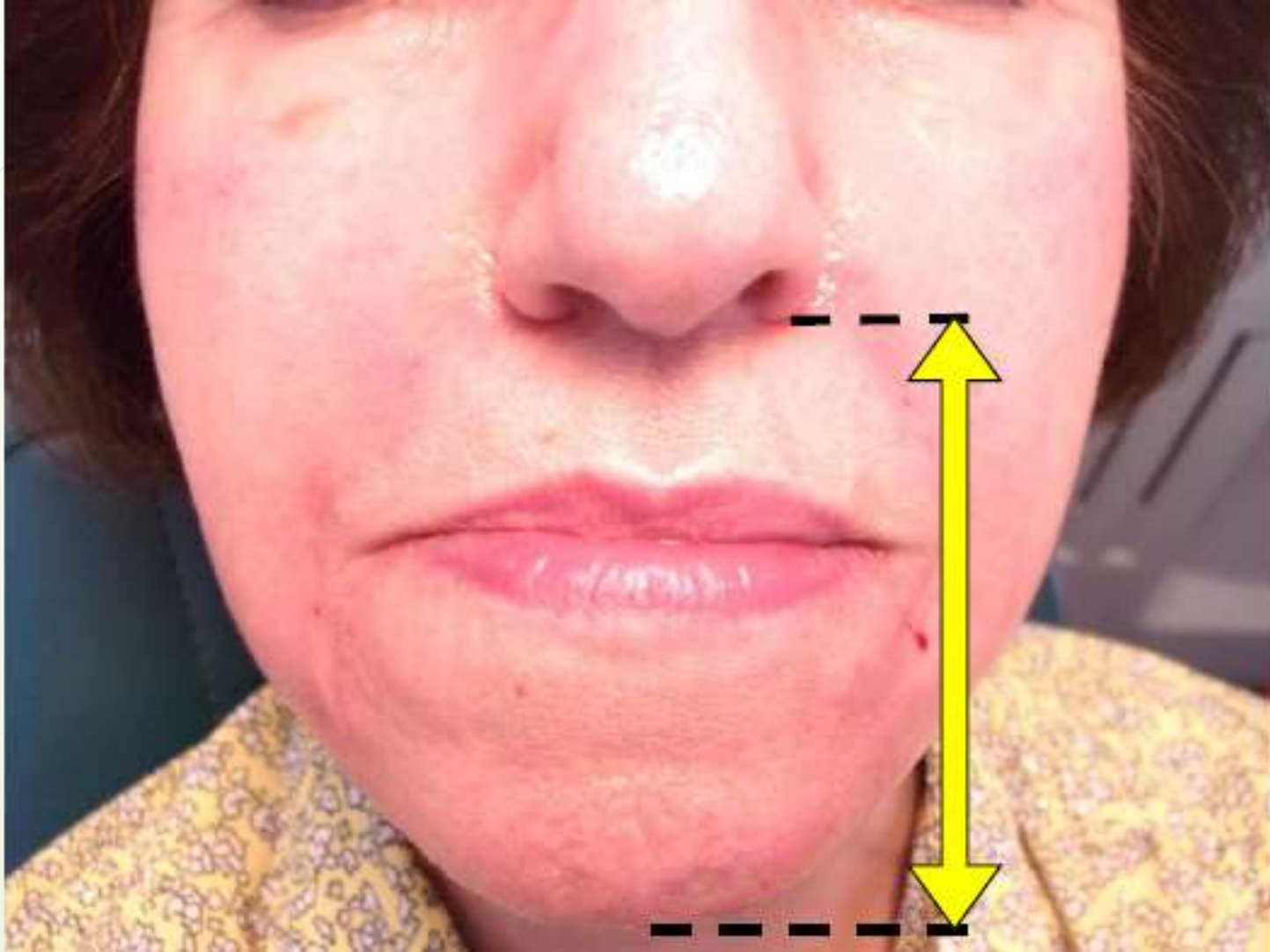
It is the distance between the occluding surface of maxillary and mandibular teeth when the mandible is in its **physiological rest position**. It is the **difference between the vertical dimension of rest and the vertical dimension of occlusion**

$RVD - OVD = \text{Freeway space}$
normally $\approx (2-4 \text{ mm})$



Increased vertical dimension (over opening)

- Increased trauma to the denture bearing area (acceleration of residual ridge resorption).
- Inharmonious facial proportion (increased lower facial height).
- Difficulty in swallowing and speech.
- Pain and clicking in the temporomandibular joint and muscular fatigue.
- Stretching of the facial muscles and skin.
- Increase space of the oral cavity.
- Loss of biting power.
- Increase nasolabial angle.
- Sensation of bulky denture.
- Premature contact of upper and lower teeth.
- Instability of dentures due to their excessive height.
- Clicking of teeth in speech and mastication.
- Separated upper and lower lip with poor esthetic and difficulty in bilabial sound (/p/b/m/).
- Seem unable to open the mouth widely.
- Excessive display of artificial teeth and gum.



Decreased vertical dimension (over closure)

- Comparatively lesser trauma to the denture bearing area.
- Inharmonious facial proportion (decreased lower facial height).
- Difficulty in swallowing and speech.
- Pain and clicking in the temporomandibular joint and muscular fatigue.
- Loss of muscle tone and presence of wrinkles and folds that is not due to age.
- Decreased space of the oral cavity, and pushing the tongue backward.
- Loss of biting power.
- Nasolabial angle is less than 90° .
- Angular cheilitis due to folding of the corner of the mouth.
- Cheek biting.
- Thinning of the vermilion borders of the lip.
- Prominence of lower jaw and chin.
- Obstruction of the opening of the *Eustachian tube* due to elevation of the soft palate due to elevation of the tongue and mandible.



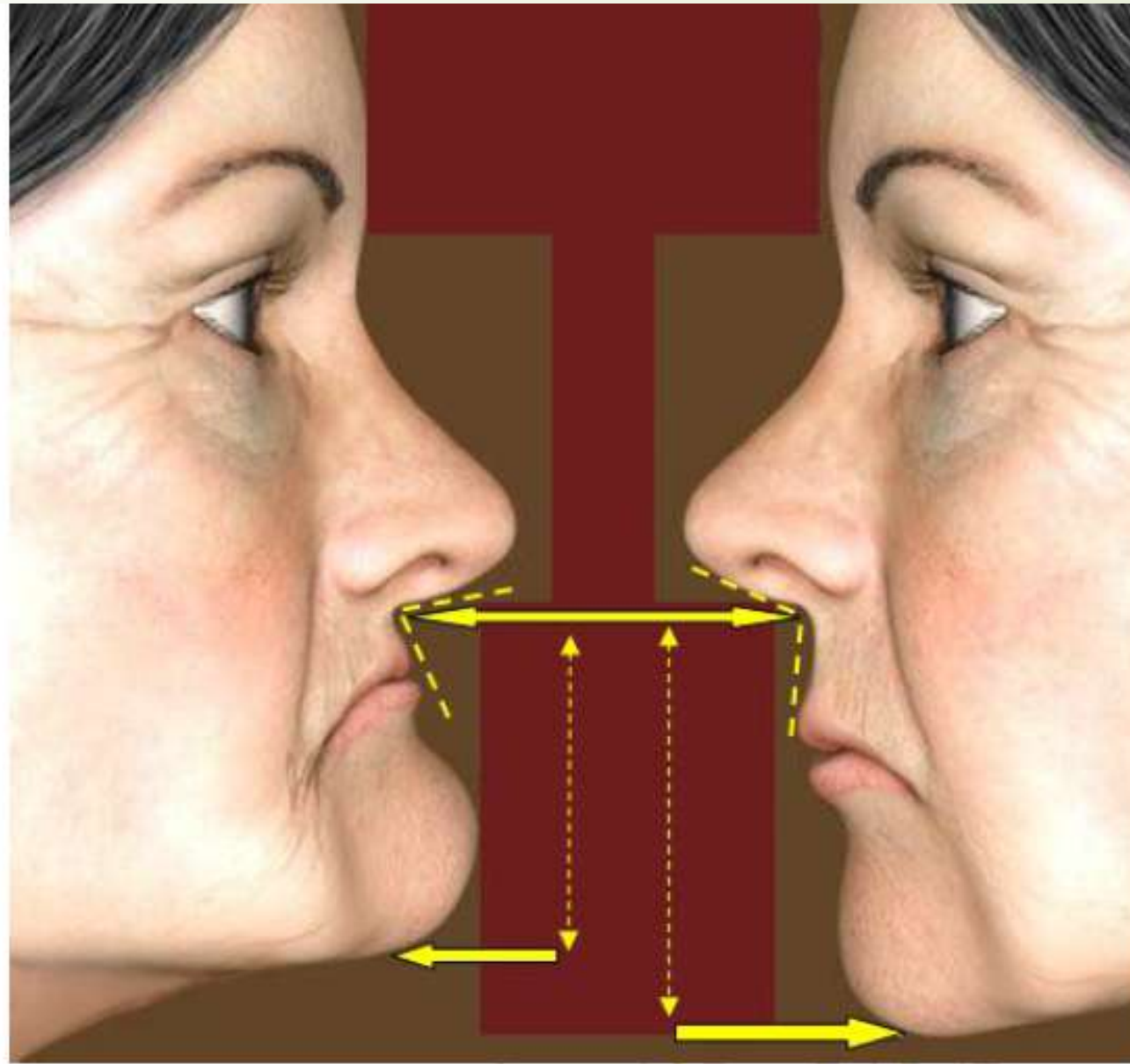


Figure (6-28): The differences between increased and decreased vertical dimension.

Importance of vertical dimension

- **Functional roles**; include:

a- Mastication.

b- Deglutition.

c- Phonetics.

d- Respiration.

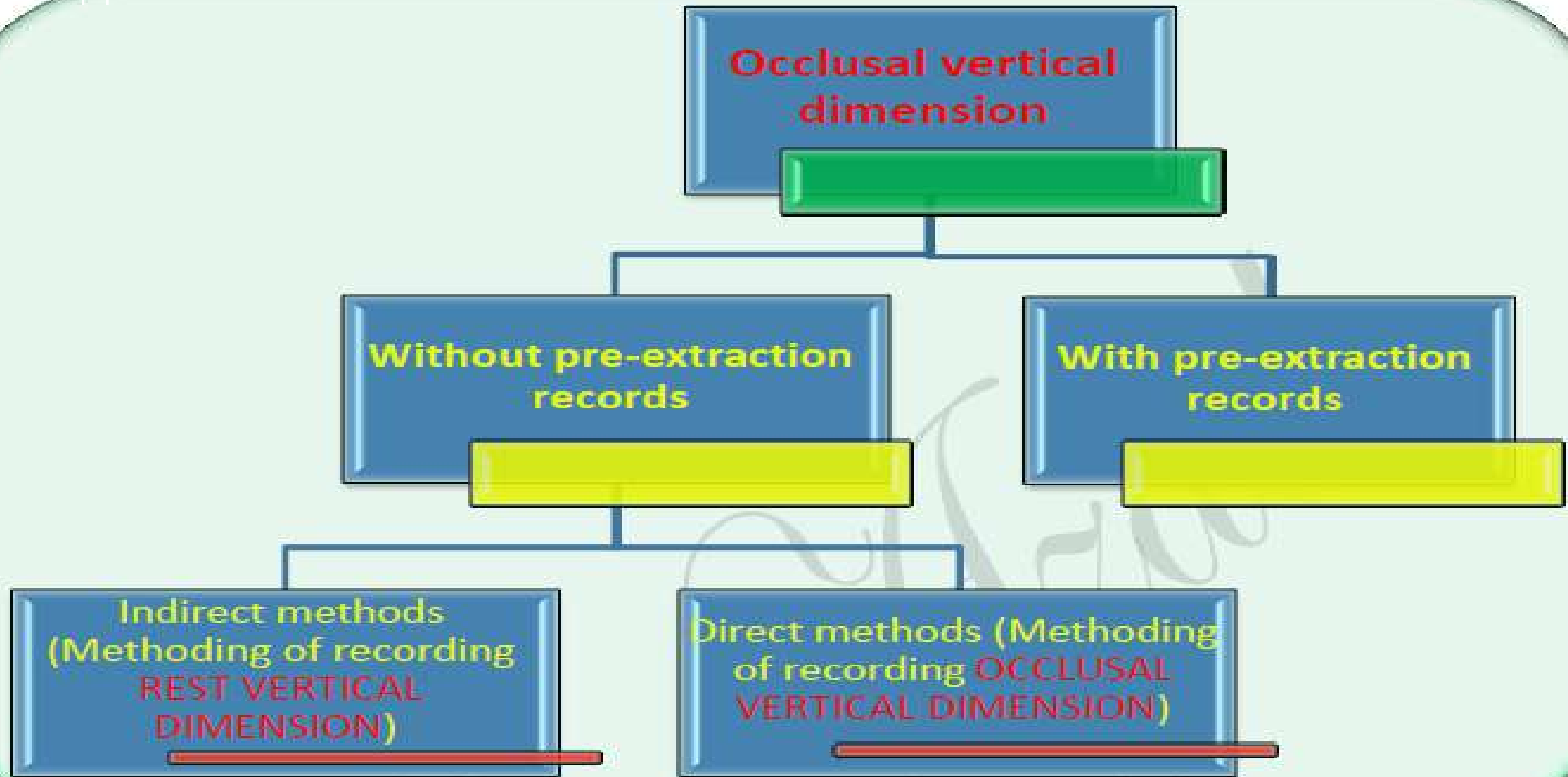
- **Physiological roles:**

by maintenance health of tissue (mucosa, bone, muscles, and temporomandibular joint); also called comfortable role.

- **Esthetic role**
- **Psychological role**

Methods of recording occlusal vertical dimension

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Methods of recording occlusal vertical dimension

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Pre-extraction records- 1

These records are made before the patient extracts all teeth and loses his occlusal vertical dimension; these records are:

1- Profile photographs :

- They are made and enlarged to life size. Measurements of anatomic landmarks on the photograph are compared with measurements using the same anatomic landmarks on the face.
- These measurements can be compared when the records are made and again when the artificial teeth are tried in.
- The photographs should be made with the teeth in maximum occlusion, as this position can be maintained accurately for photographic procedures.



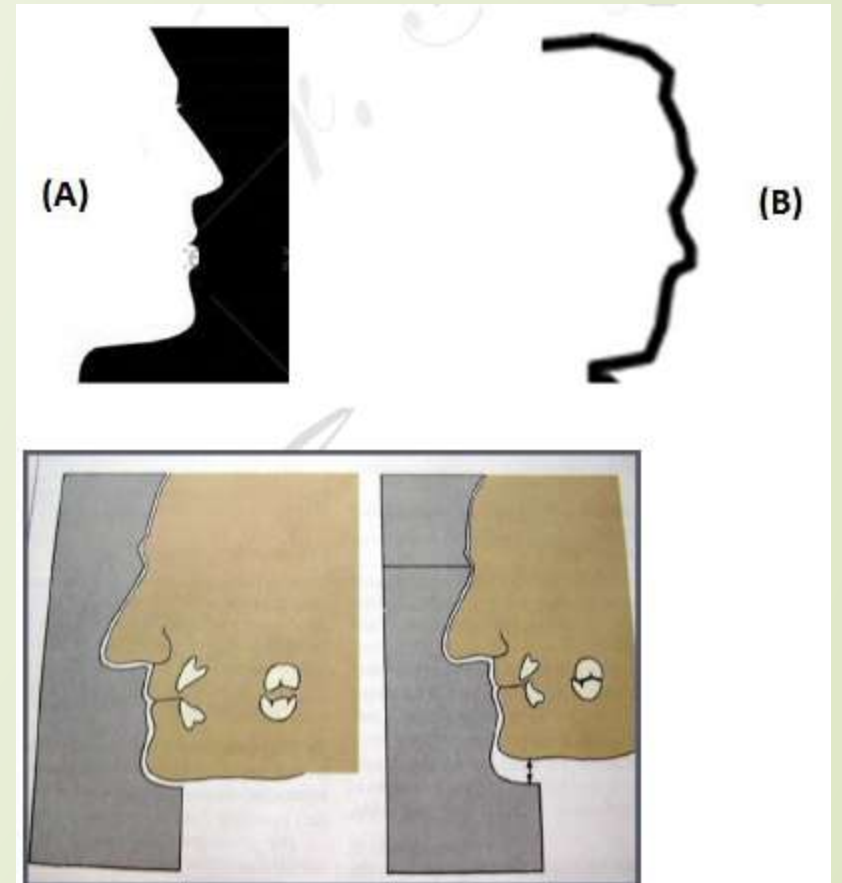
Methods of recording occlusal vertical dimension

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Pre-extraction records- 1

2- Profile silhouettes:

- An accurate reproduction of the profile silhouettes can be cut out in cardboard or contoured in wire.
- The silhouettes can be repositioned to the face after the vertical dimension has been established at the initial recording and/or when the artificial teeth are tried in.



Methods of recording occlusal vertical dimension

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Pre-extraction records- 1

3- Profile radiographs:

- They have been much used in researches of vertical dimension of occlusion rather than routine clinical use in prosthodontic treatment for edentulous patients.
- The two types of radiographs advocated are the **cephalometric** profile radiograph and radiograph of the **condyles** in the fossae.
- The **inaccuracies** that exist in either the technique or the method of comparing measurements make this method unreliable.



Cephalometric radiograph.

Methods of recording occlusal vertical dimension

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Pre-extraction records- 1

4- Articulated casts

This method is valuable with patients whose ridges are **not sacrificed** during the removal of the teeth **or resorbed** during a long waiting period for denture construction.



Dentulous patient.

Methods of recording occlusal vertical dimension

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Pre-extraction records- 1

5- Facial measurements

- Before extraction, the patient is instructed to close the jaws into maximum occlusion, then two **tattoo points** have been marked, one on the upper half of the face and the other on the lower half.
- The distance is measured, after extraction these measurements are compared with measurements made between these points when the artificial teeth are tried in.



Facial measurements (tattoo).

Measurements from former dentures

- Dentures that the patient has been wearing can be measured, and measurements can be correlated with observations of the patient's face to determine the amount of change required. These measurements are made between the ridge crests in the maxillary and mandibular dentures with a **Boley gauge**.

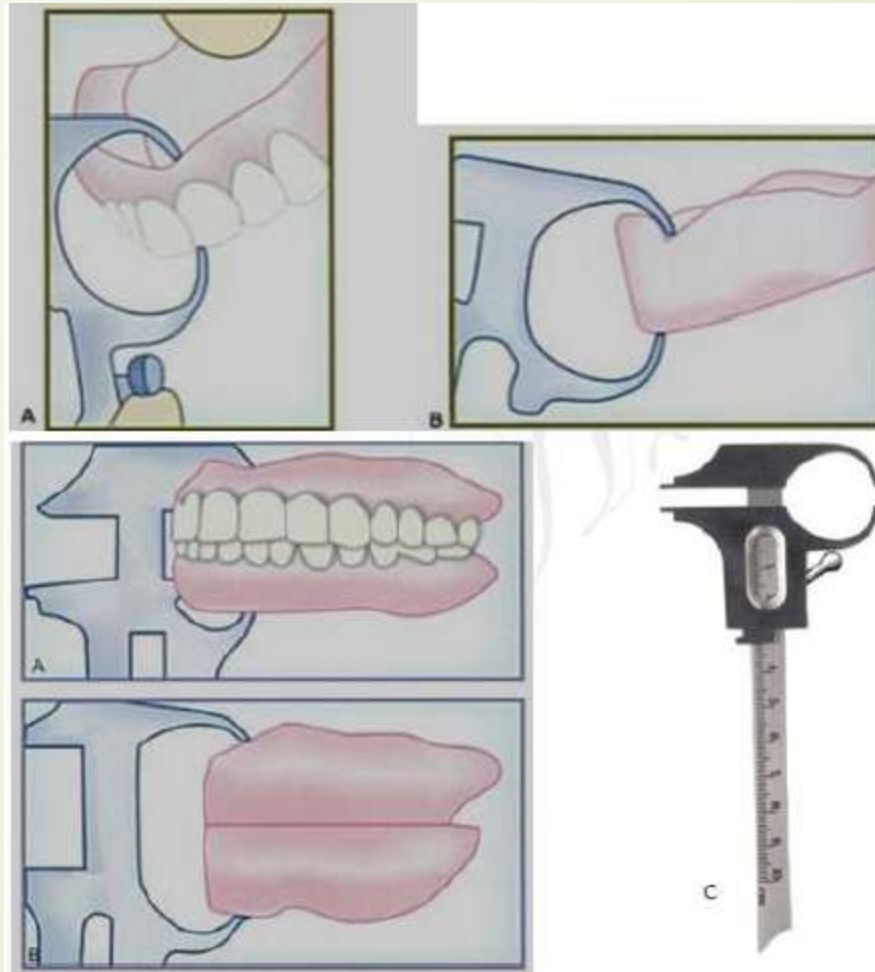


Figure (6-35): Distance from the incisive papilla to the incisal edge is measured and compared to the maxillary occlusion rim (A) Old denture (B) Occlusion rim.

Figure (6-36): Distance from the incisive papilla to the mandibular alveolar ridge is measured and compared to the vertical distance of that of the upper and lower occlusion rims (A) Old denture (B) Occlusion rim (C) Boley gauge.

Methods of recording occlusal vertical dimension Without Pre-extraction records- 1

A-Direct methods to find occlusal vertical dimension:

1. Boos power point method:

- A metal plate (*central bearing plate*) is attached to the maxillary record base.
- A bimeter (*an oral meter that measures pressure*) is attached to the mandibular record base.
- This bimeter has a dial, which shows the amount of pressure acting on it.
- The record bases are inserted into the patient's mouth and the patient is asked to bite on the record bases at different degrees of jaw separation.
- The biting forces are transferred from the central bearing point to the bimeter. The highest value is called the power point which represents the occlusal vertical dimension.



Figure (6-38): Central bearing plate.

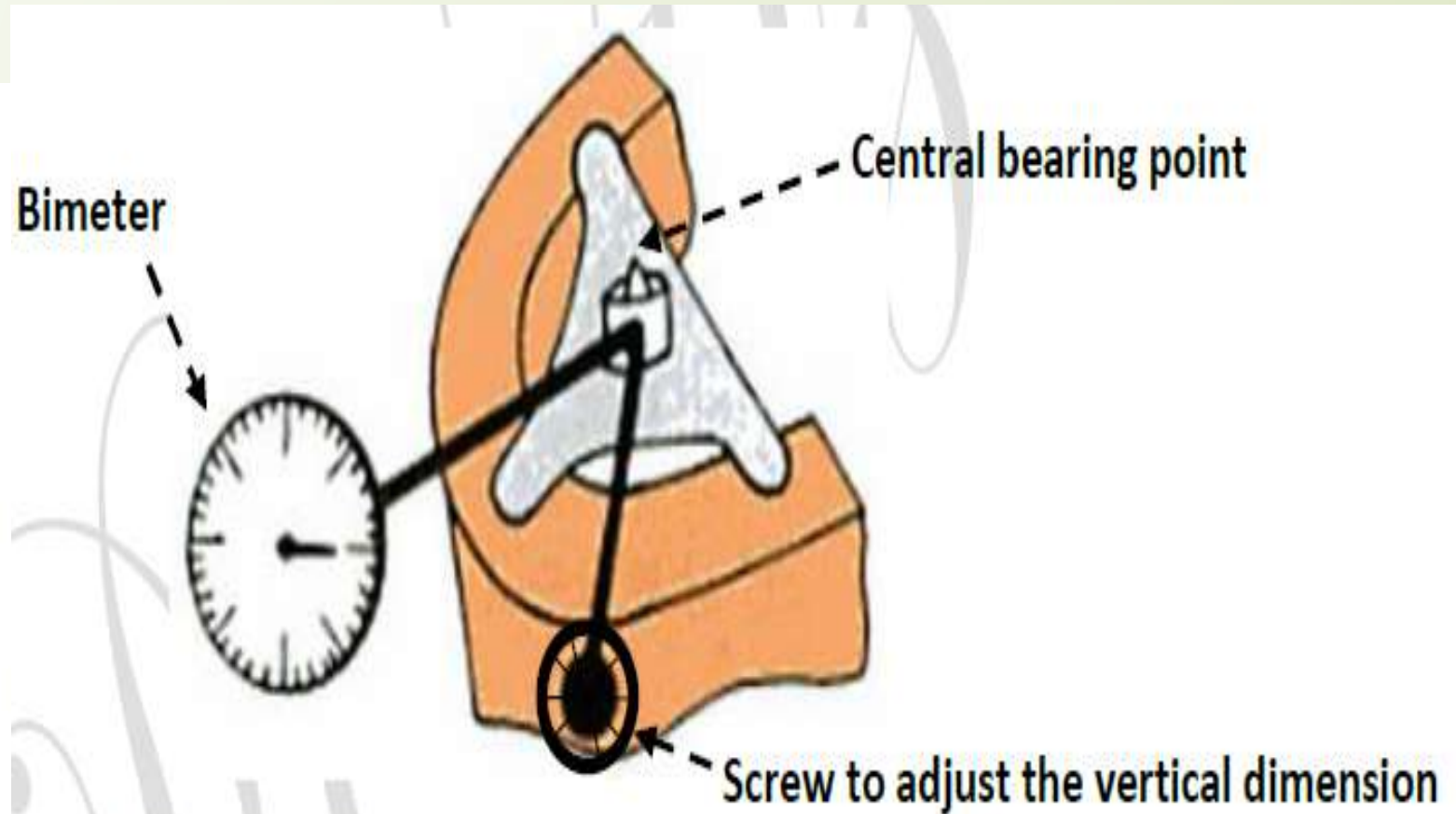


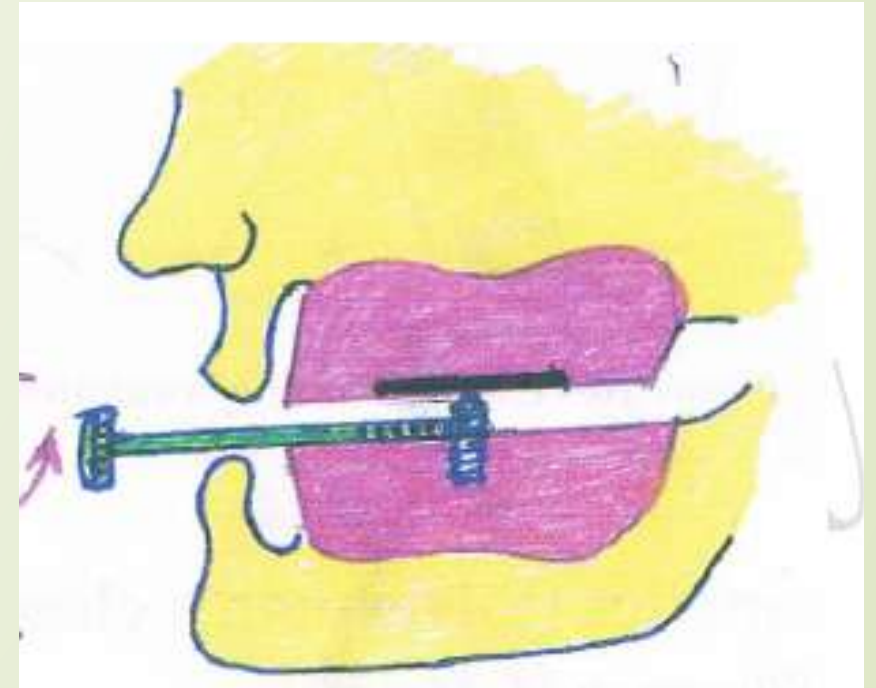
Figure (6-37): Boos power point method.

Methods of recording occlusal vertical dimension Without Pre-extraction records- 1

A-Direct methods to find occlusal vertical dimension:

2. Tactile sense or neuromuscular perception:

- A central bearing screw/central bearing plate apparatus is used and attached to accurately adapt record bases permits the patient to experience through neuromuscular perception the different vertical relations.
- The central bearing screw is adjusted downward and upward until the height of contact feels right to the patient and this represents the occlusal vertical dimension.



Methods of recording occlusal vertical dimension

Without Pre-extraction records- 1

A-Direct methods to find occlusal vertical dimension:

3. Swallowing threshold:

- The theory behind this method is that at the beginning of swallowing cycle, the teeth of the upper and lower jaws almost come together with a very light contact. This factor can be used as a guide to determine the occlusal vertical dimension.
- The technique involves fabrication of cones of soft wax on the mandibular record base. The maxillary and mandibular record bases are inserted in the patient mouth. Salivation is stimulated and the patient is asked to swallow. The repeated action of swallowing the saliva will gradually reduce the height of the wax cones to allow the mandible to reach the level of occlusal vertical dimension.

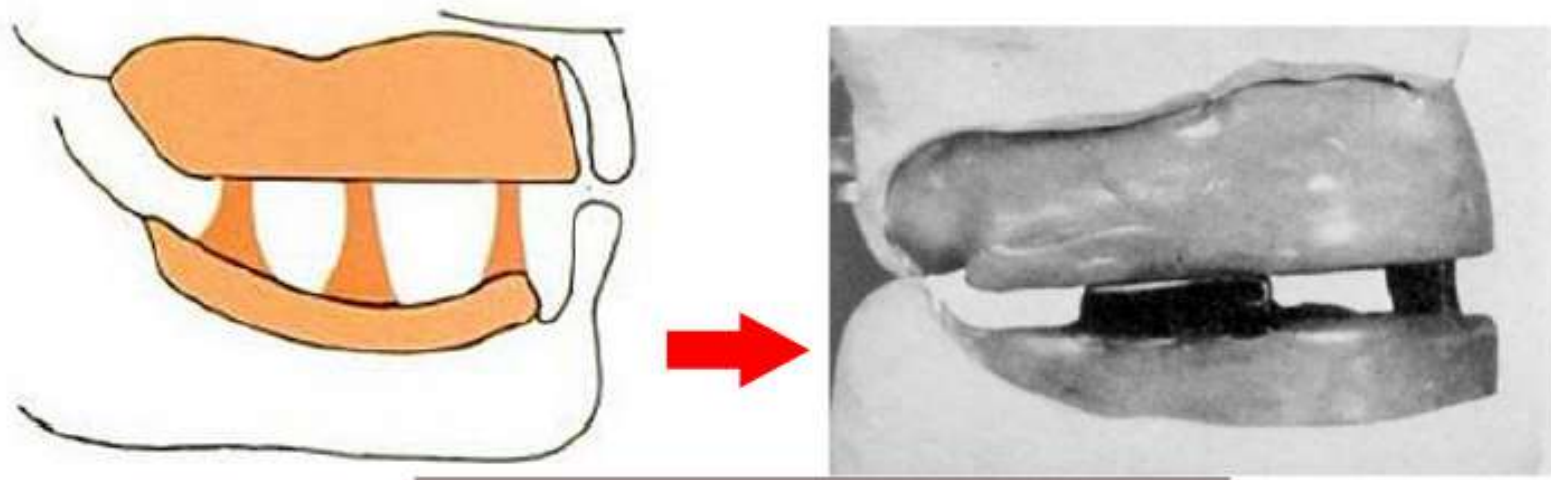


Figure (6-40): Swallowing method

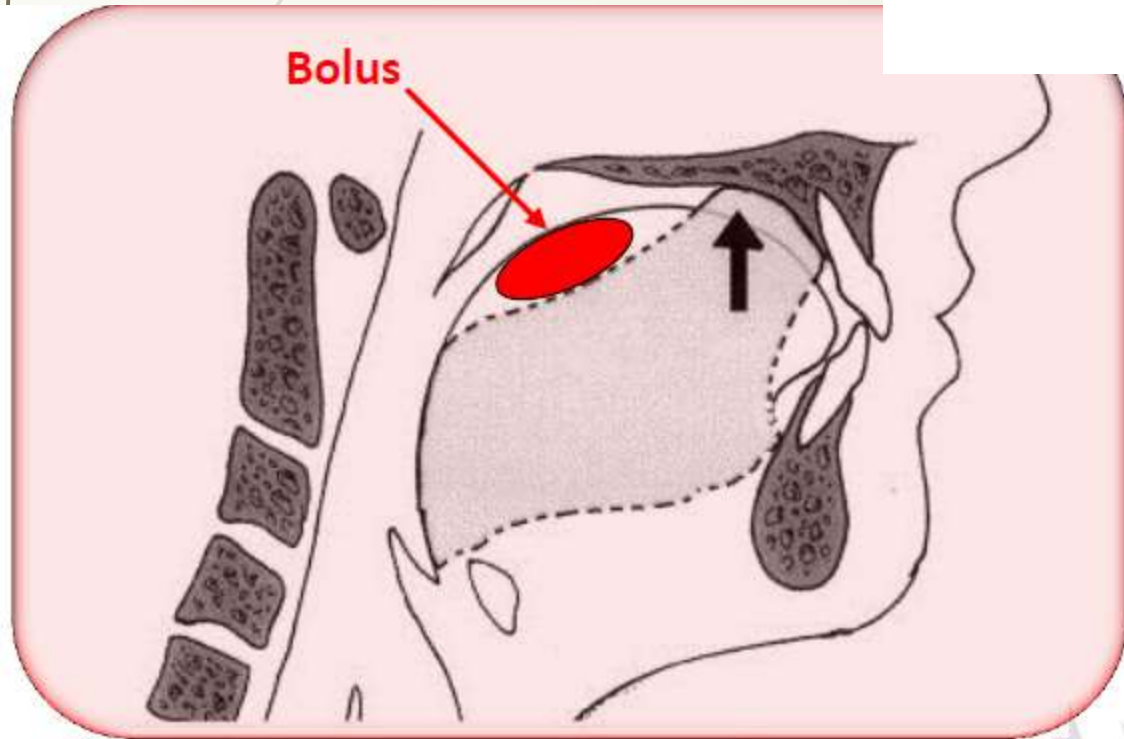


Figure (6-41): Beginning of swallowing cycle (very light teeth contact).

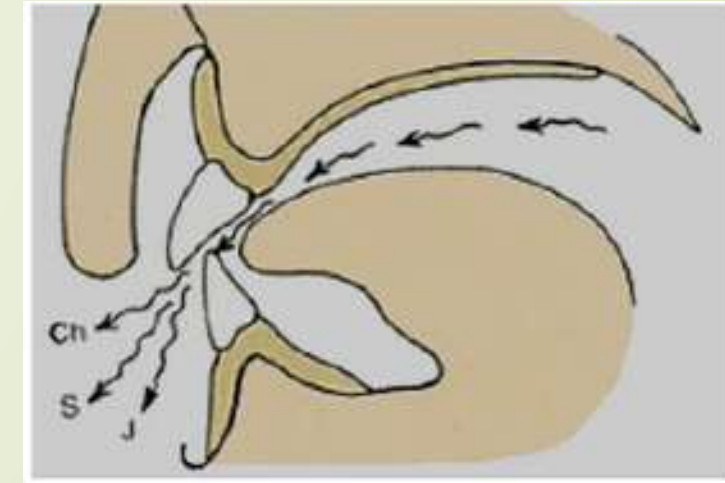
Methods of recording occlusal vertical dimension Without Pre-extraction records- 1

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A-Direct methods to find occlusal vertical dimension:

4. Phonetics (silversman closest speaking space):

- **Silverman's closest speaking space:** It is the minimal amount of interocclusal space between the upper and lower teeth when sounds like **ch**, **s**, and **j** are pronounced.
- There is **1-2 mm** clearance between teeth when observed from the profile and frontal view.
- Phonetic tests of the vertical dimension include listening to speech sound production and observing the relationships of teeth during speech.
- The production of **ch**, **s**, and **j** sounds brings the anterior teeth closest together without contact. If the distance is too large, it means that too small a vertical dimension of occlusion may have been established. If the anterior teeth touch when these sounds are made, the vertical dimension is probably too great.



Methods of recording occlusal vertical dimension

Without Pre-extraction records- 1

B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

1. Facial measurements:

- Instruct the patient to stand or sit comfortably upright with eyes looking straight ahead at some object which is on the same level.
- Insert the maxillary record base with the attached contoured occlusion rim.
- With an indelible marker, place a point of reference on the end of the patient's nose and another on the point of the chin. The patient is asked to perform functional movements like wetting his lips and swallowing, and to relax his shoulders (this is done to relax the supra- and infrahyoid muscles).
- When the mandible drops to the rest position, the distance between the points of reference is measured. Repeat this procedure until the measurements are consistent. Such measurements are helpful but cannot be considered as absolute.

Methods of recording occlusal vertical dimension Without Pre-extraction records- 1

B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

2. Tactile sense:

- Instruct the patient to stand or sit erect and open the jaws wide until strain is felt in the muscles.
- When this opening becomes uncomfortable, ask them to close slowly until the jaws reach a comfortable, relaxed position.
- Measure the distance between the points of reference.

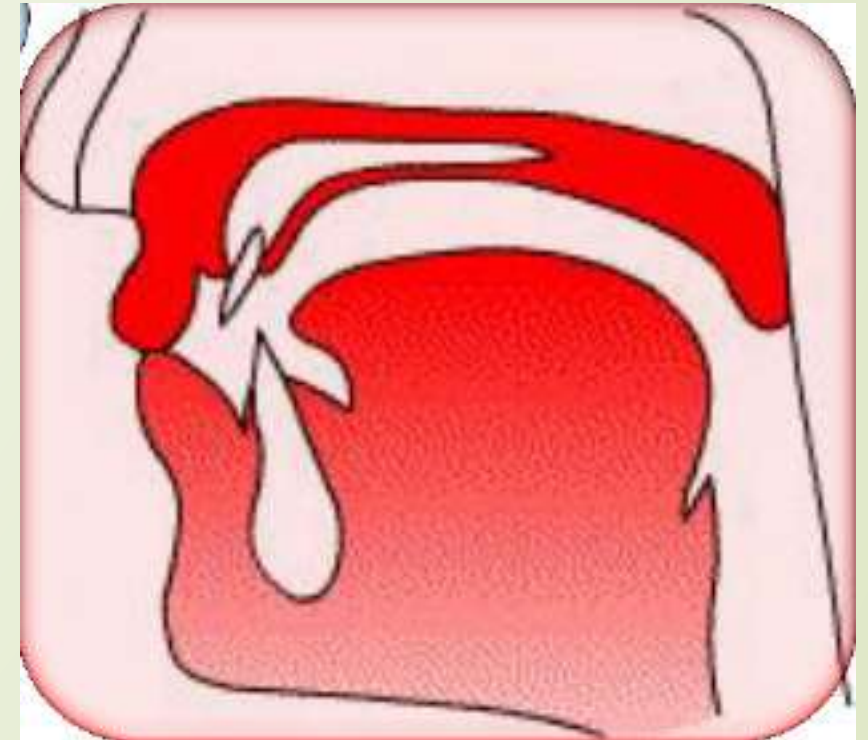


Methods of recording occlusal vertical dimension Without Pre-extraction records- 1

B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

3. Phonetics:

- Ask the patient to repeat pronounce the letter m a certain numbers of times, like repeat the name **Emma** until they are aware of the contacting of the lips as the first syllabus **em** is pronounced.
- When patient have rehearsed this procedure, ask that they stop all jaw movement when the lips touch. At this time measure between the two points of reference.



Methods of recording occlusal vertical dimension

Without Pre-extraction records- 1

B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

4. Facial expression :

- The experienced dentist may notice the relaxed facial expression when the patient's jaws are at rest.
- **The following facial features indicate that the jaw is in its physiological rest position:** The upper and lower lips should be even anteroposteriorly and in slight contact in a single plane. The skin around the eyes and over the chin should be relaxed; it should not be stretched, shiny, or excessively wrinkled. The nostrils are relaxed and breathing should be unobstructed. These evidences of rest position of the maxillomandibular musculature are the indications for recording a measurement of the vertical dimension of rest.

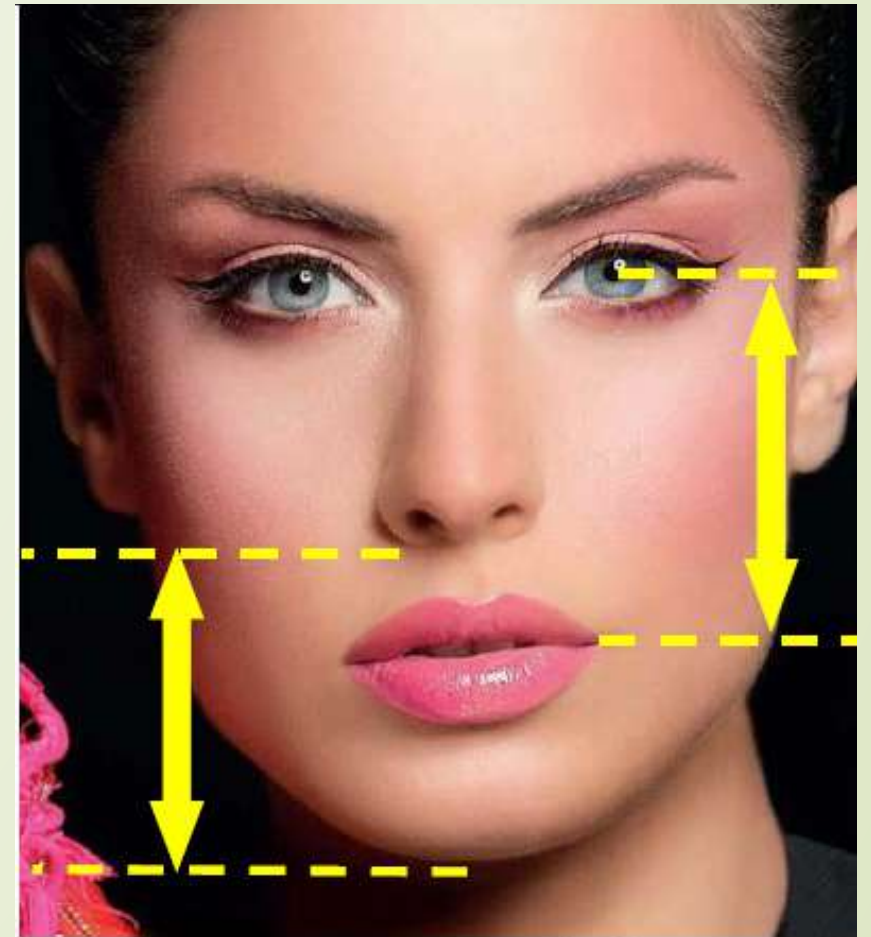
Methods of recording occlusal vertical dimension

Without Pre-extraction records- 1

B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

5. Anatomical landmarks (Willis method) :

- The Willis guide is designed to measure the distance from the pupils of the eyes to the corner of the mouth and the distance from the anterior nasal spine to the lower border of the mandible.
- When these measurements are equal, the jaws are considered at rest. Its accuracy is questionable in patients with facial asymmetry.



Methods of recording occlusal vertical dimension

Without Pre-extraction records- 1

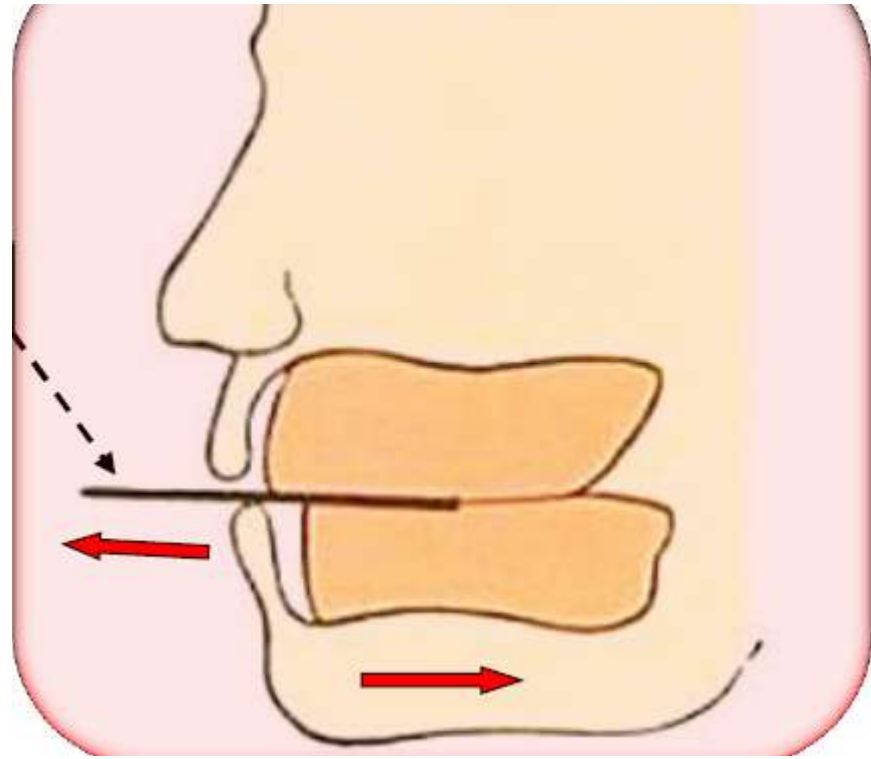
B- In-Direct methods to find occlusal vertical dimension (methods of recording rest vertical dimension) :

6. Electromyographic method (EMG)

- By using a special device that measures the tone of masticatory muscles, when the tone is at its least, this means these muscles are in rest position and the jaws are at rest position.



Thank
you



Horizontal relations

Bushra Mohammed Ali Al-Ameen

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:Horizontal jaw relations

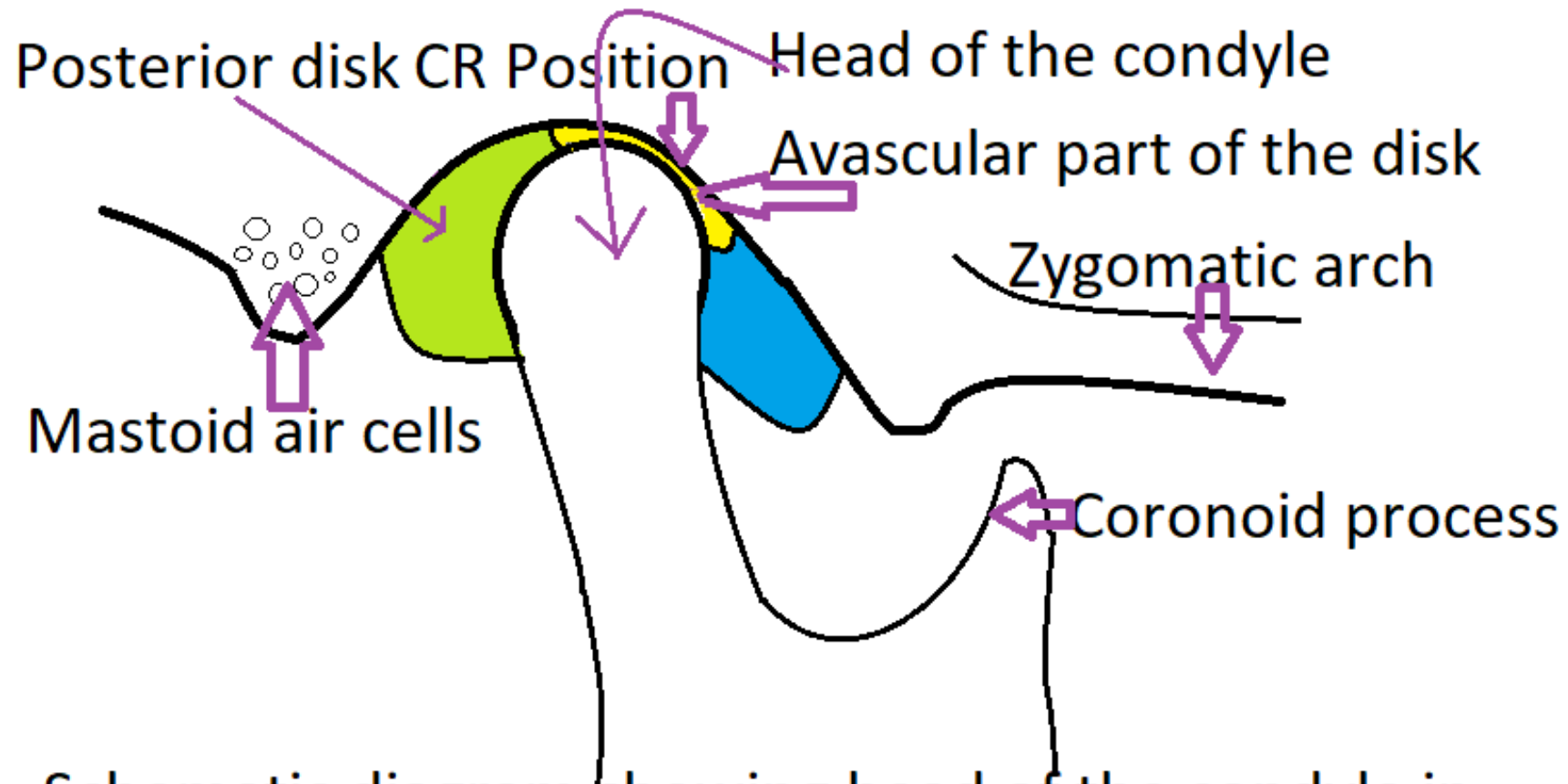
The relationship of mandible to maxilla in a horizontal plane (in anteroposterior and side to side .direction)

The horizontal relations include

- 1- Centric jaw relation.**
- 2- Eccentric jaw relation:**
 - a- Protruded or forward relation.**
 - b- Lateral relation (Left or right).**
 - c- Intermediate positions.**

:Centric jaw relation

- ▶ It is the maxillomandibular relationship in which both condyles articulate with the **thinnest avascular portion** of their respective disks with the **complex** in the **anterior-superior position** against the shapes of the articular eminencies.
- ▶ This position is **independent of tooth contact**.
- ▶ It is restricted to a **purely rotary movement** about the transverse horizontal axis .
- ▶ *it is bone-to-bone relationship*



Schematic diagram showing head of the condyle in most superior and anterior position in glenoid fossa in centric relation position

Centric occlusion:

- ▶ The occlusion of opposing teeth when the mandible is in centric relation.
- ▶ This may or may not coincide with the maximal intercuspal position (*it is tooth-to-tooth relationship dictated by bone to bone relationship*).

Maximal intercuspal position:

- ▶ The most complete interdigitation of the teeth independent of condylar position.
- ▶ Hence maximal intercuspation is a maxillomandibular relationship determined by *tooth-to-tooth relationship*.

Importance of centric jaw relation :(Significance)

1. It is learnable, repeatable, and recordable position which remains constant throughout life.
2. It is a reference position from which the mandible can move to any eccentric position and return back involuntarily.
3. It is the start point for developing occlusion.
4. Functional movements like chewing and swallowing are performed in this position, because it is the most unstrained position.
5. It is a reliable jaw relation, because it is bone to bone relation.

Methods of recording centric jaw relation

1- FUNCTIONAL OR CHEW IN METHODS

a- Needleshouse method.

b- Patterson method.

2- GRAPHIC METHODS

a- Intraoral method.

b- Extraoral method.

3- PHYSIOLOGICAL METHODS

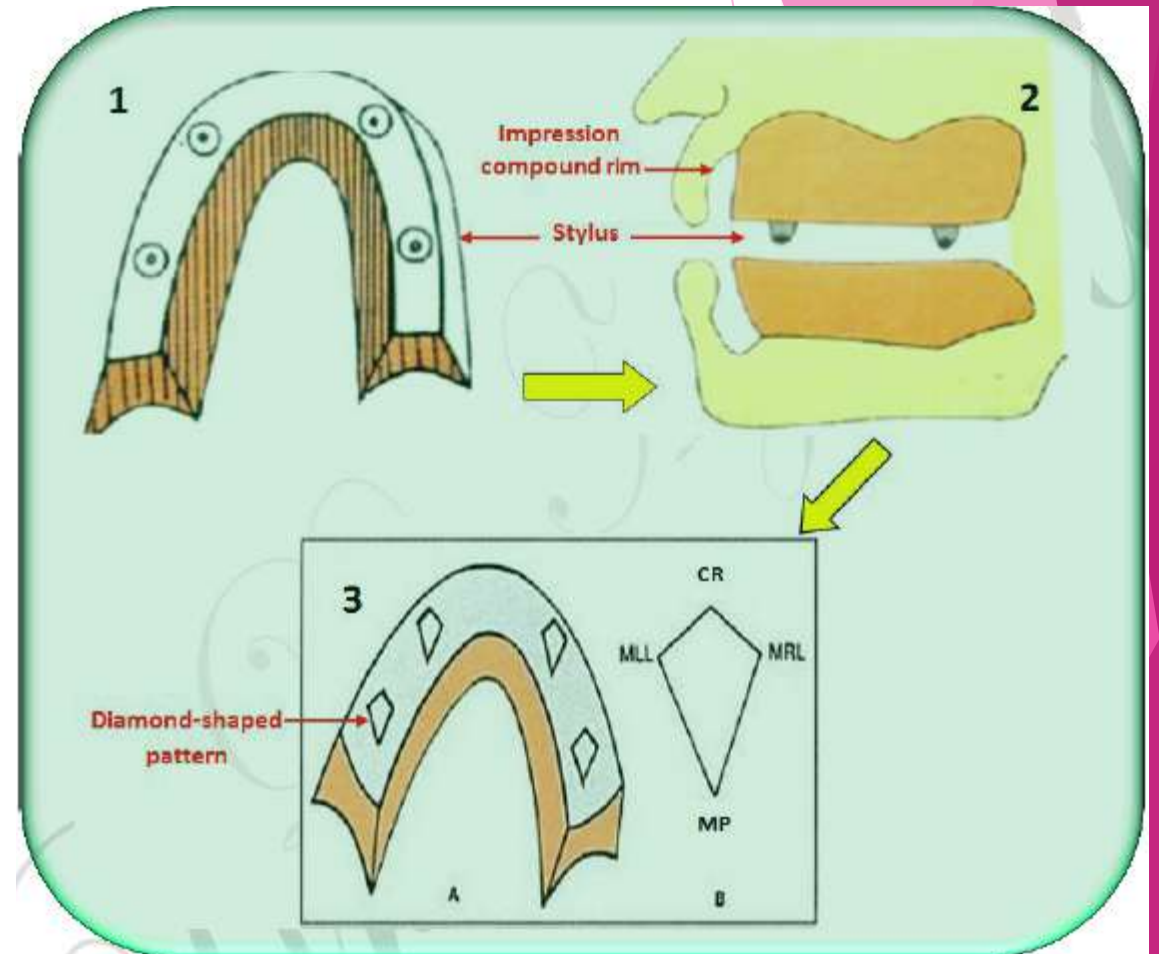
a- Tactile or inter-occlusal check record method.

4- OTHER METHODS

a- Swallowing method.

Needleshouse methods

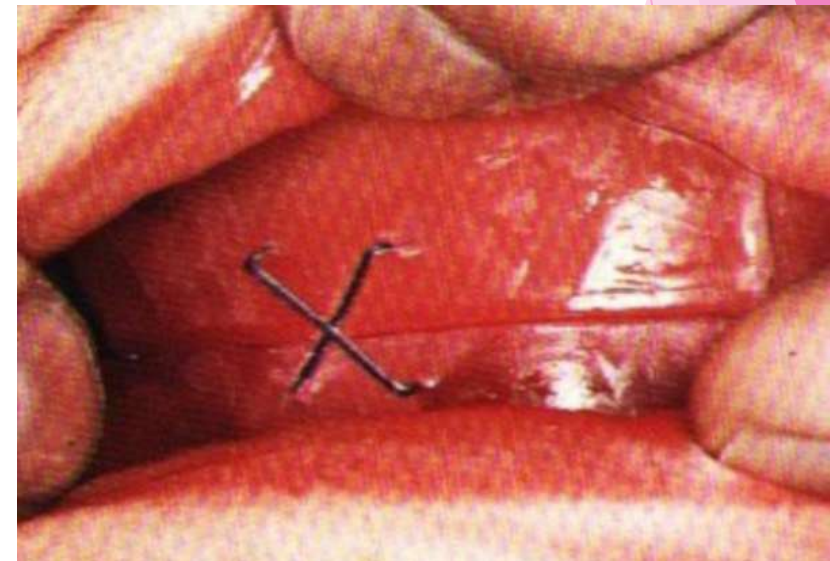
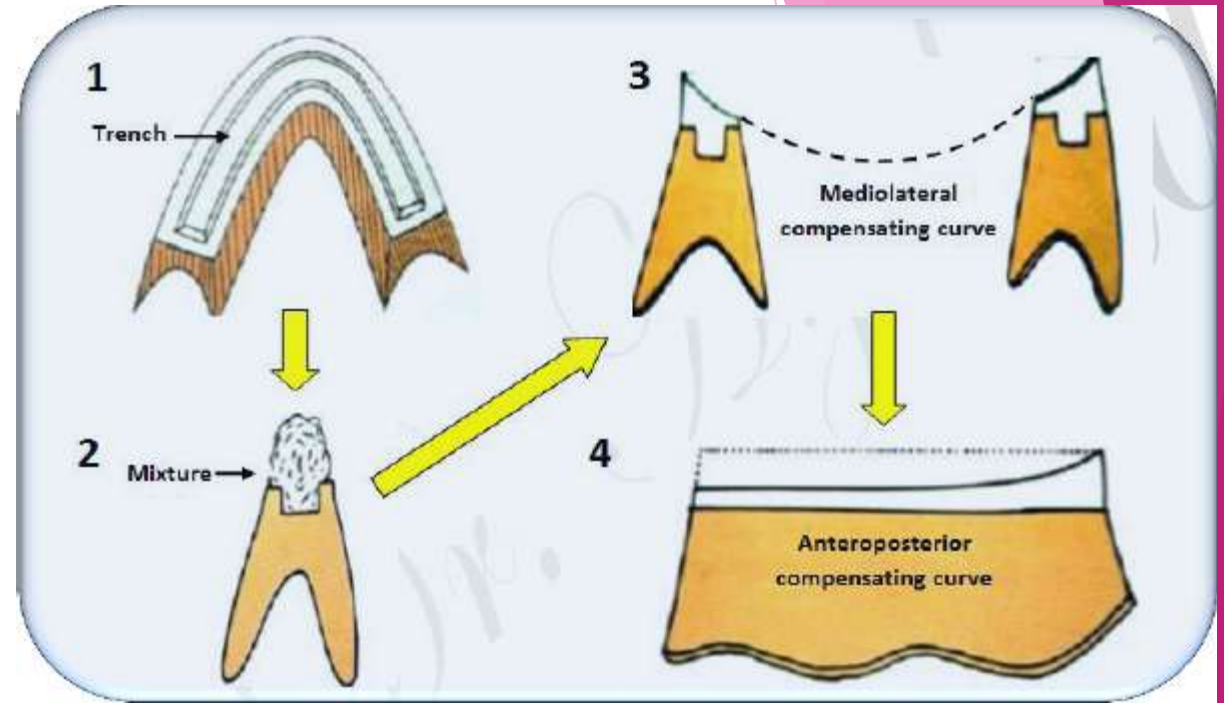
- ▶ In this method used impression compound occlusion rims with four metal styli placed in the maxillary rim. When the patient moves his mandible, the styli on the maxillary rim will create a marking on the mandibular rim, after all mandibular movements are made, and a diamond-shaped pattern is formed. The anterior most point of this diamond pattern indicates the centric jaw relation.



Patterson method



- ▶ In this method used wax occlusion rims. A trench is made along the length of mandibular rim.
- ▶ A 1:1 mixture of pumice and dental plaster is loaded into the trench. When the patient moves his mandible, compensating curves on the mixture will produced, and the height of the mixture is also reduced.
- ▶ The patient is asked to continue these movements till a predetermined vertical dimension is obtained.
- ▶ Finally the patient is asked to retruded his jaw and the occlusal rims are fixed in this position with metal staples





The disadvantages of functional methods involve lateral and anteroposterior displacement of the recording bases in relation to the supporting bone while the record is being made.



Graphic method

- ▶ These methods are called so because they use graphs or tracing to record the centric relation.
- ▶ The general concept of this technique is that a pen-like pointer is attached to one occlusal rim and a recording plate is placed on the other rim, the plate coated with carbon or wax on which the needle point can make the tracing, when the mandible moves in horizontal plane, the pointer draws characteristic patterns on the recording plate.
- ▶ The characteristic patterns created on the recording plate is called ***arrow point tracing***, also known as ***Gothic arch tracing***.
- ▶ The apex of the arrow point tracing gives the centric relation, with the two sides of the tracing originating at that point being the limits of the lateral movements.
- ▶ The apex of the arrow head should be sharp else the tracing is incorrect.

Graphic method



- ▶ The graphic methods are either *intraoral* or *extraoral* depending upon the placement of the recording device.
- ▶ The extraoral is preferable to the intraoral tracing, because the extraoral is more accurate, more visible, and larger in comparing with the intraoral tracing.



Graphic method

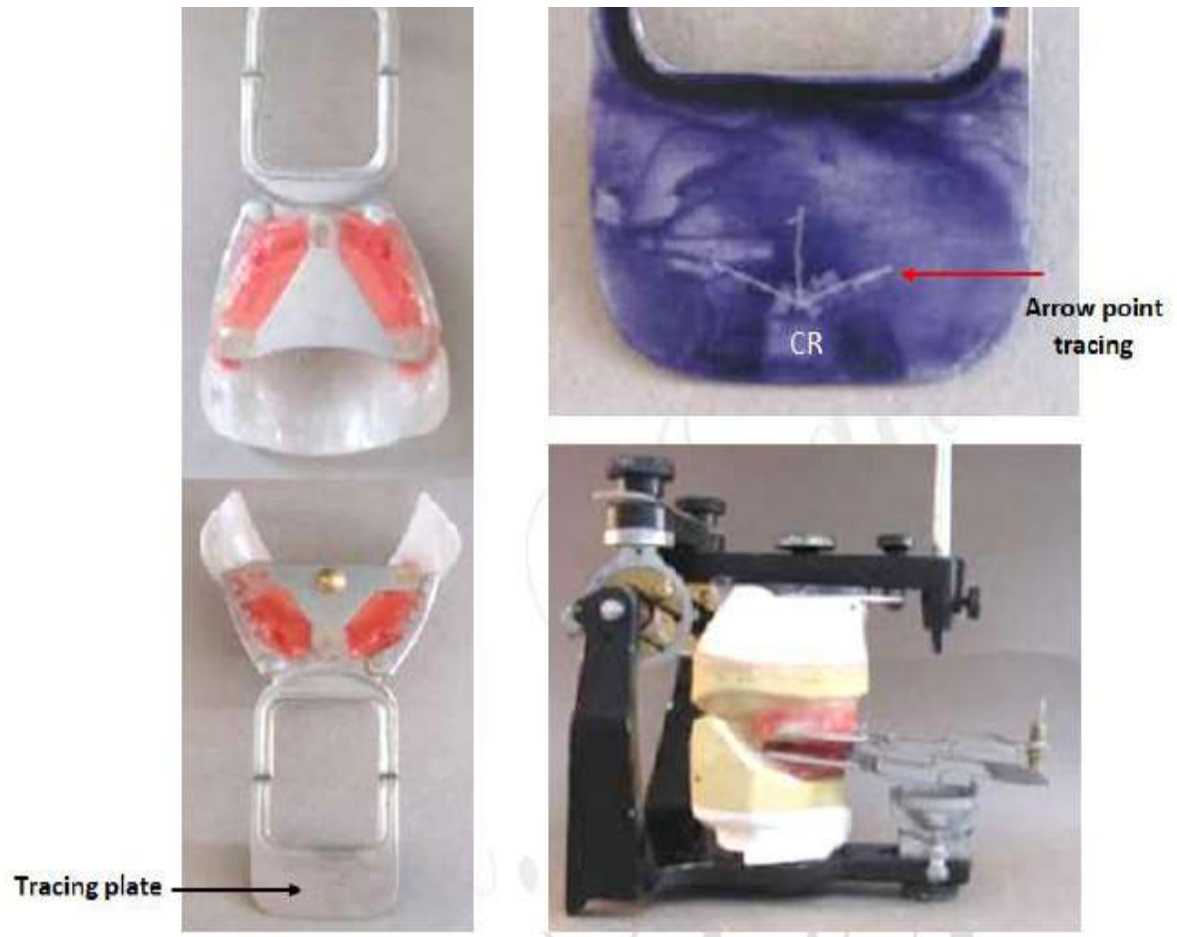


Figure (5-53): Extraoral graphic method (Note the difference of the apex of the arrow point tracing between the intra- and extraoral method).

Figure (6-52): Intraoral graphic method (CR: centric relation).

Tactile or interocclusal check record method

- ▶ In this method the centric relation is recorded by placing a record medium between the record bases when the jaws positioned at centric relation.
- ▶ The patient closes into the recording medium with the lower jaw in its most retruded unstrained position and stops the closure at predetermined vertical dimension.

Advantages:

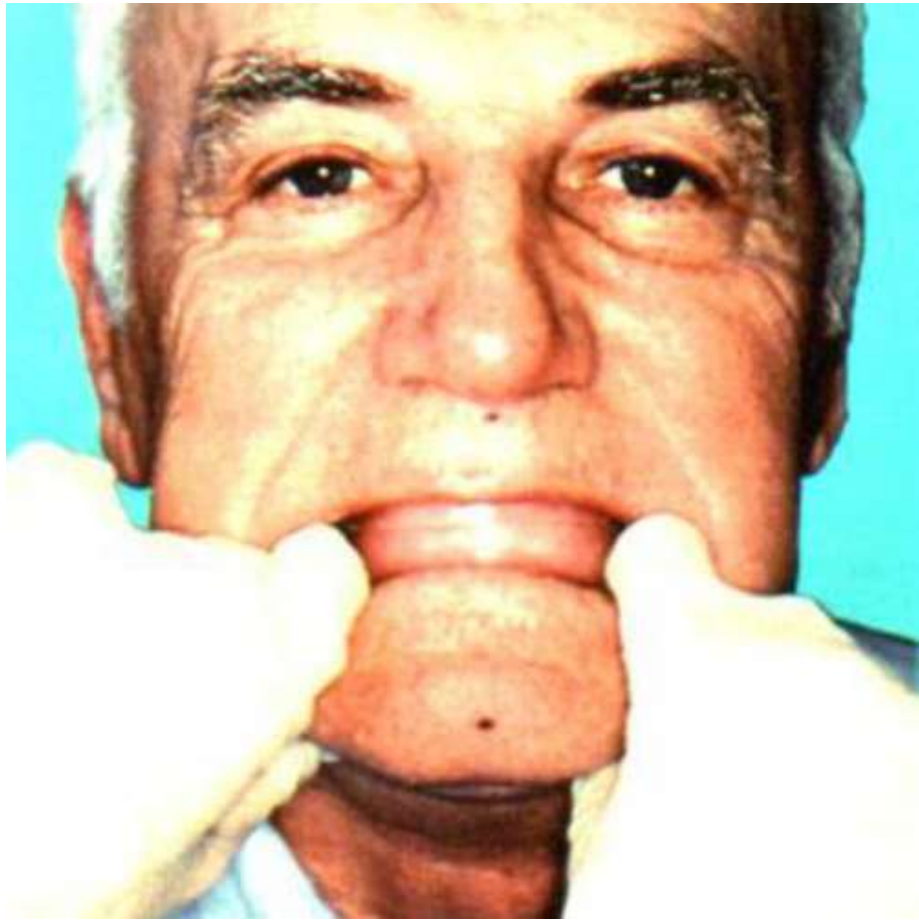
1. This method is simple, because mechanical devices are not used in the patient mouth and are not attached to the occlusion rims.
2. This method has advantage of causing minimal displacement of the recording bases in relation to the supporting bone.
3. This method is essential in making an accurate record, the visual acuity and the sense of touch of the dentist also inter in making of centric relation record, this phase is developed with experience and it is difficult to teach to another individual.

Materials that are commonly used for interocclusal record are:

- ▶ Wax.
- ▶ Impression compound.
- ▶ Silicon and polyether impression material.
- ▶ Zinc oxide eugenol paste.
- ▶ Cold cure acrylic.
- ▶ Rapid setting dental plaster.

Indications of interocclusal check record

- ▶ Abnormally related jaws.
- ▶ Displaceable, flabby tissues.
- ▶ Large tongue.
- ▶ Uncontrollable mandibular movements.
- ▶ It can also be done for patient already using a complete denture.



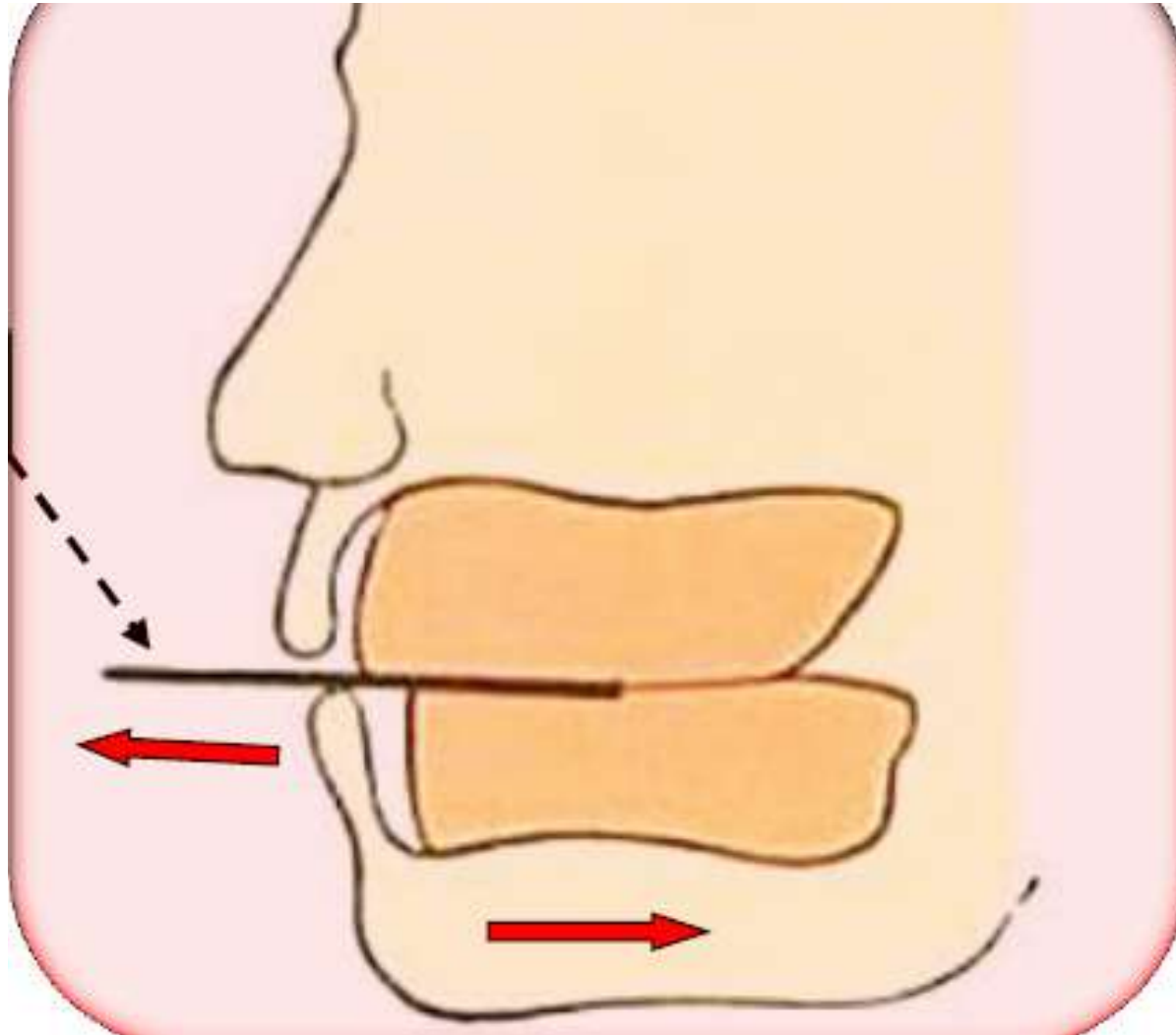
Methods of assisting patient to move the mandible to the centric relation

- ▶ The dentist must guide the mandible of patient to the centric relation not force it
- 1. The patient is instructed to let his jaw relax (palpate the temporalis and masseter muscles to relax them), pull it back and close slowly on the back teeth.
- 2. The patient is instructed to get the feeling of pushing his upper jaw out and then close the mouth with back teeth in contact.
- 3. Assist the patient to protrude and retrude the mandible repeatedly with the operator holding the finger lightly against the chin.
- 4. **Boo's series of stretch exercise:** The patient is instructed to:
 - a- Open the mouth wide and relax.
 - b- Move the jaw to the left and relax.
 - c- Move the jaw to the right and relax.
 - d- Move the jaw forward and relax, in series of movements.

The results to be expected are for the patient to be able to follow the dentist's directions in moving the jaw to centric relation and the desired eccentric positions.

Methods of assisting patient to move the mandible to the centric relation

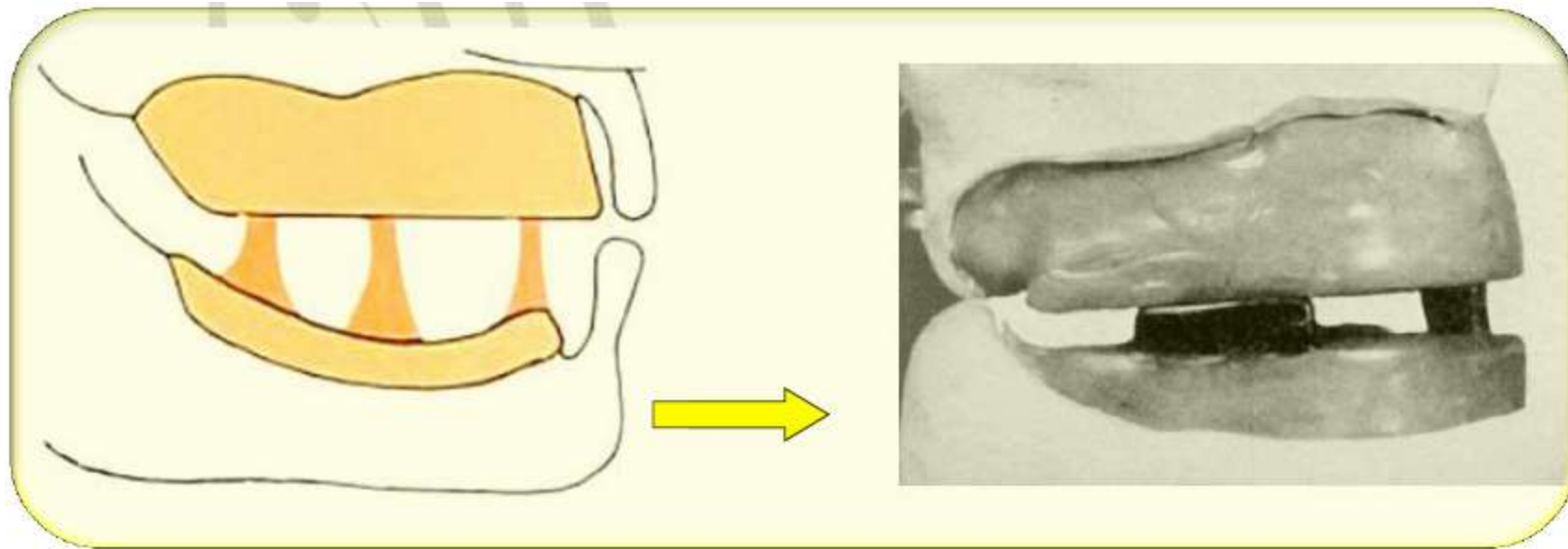
5. The patient can be instructed to turn the tongue towards the posterior border of the upper record base and close the rims together until they meet. The disadvantage with this method is the likelihood of displacing the mandibular record base by the action of the elevated tongue.
6. Tilt the patient head back, the tension of muscles under chin make protrusion more difficult.
7. Exert pressure in molars in both sides and ask the patient to close (molar reflex method).
8. Celluloid strip is placed between the rims and pulled out. Ask the patient to restrain the strip from slipping away; the mandible involuntarily goes to centric relation.



Pulling a strip of celluloid interposed between the occlusal rims will automatically retrude the mandible to centric relation

Swallowing method

- ▶ In this method, soft cones of wax are placed on the lower record base. The wax cones contact the upper occlusion rim when the patient swallows. This procedure is supposed to establish both proper vertical and horizontal relation of mandible to maxilla.



Eccentric jaw relations

- ▶ It is defined as any relationship of the mandible to the maxilla other than the centric relation.
- ▶ It includes protrusive and lateral relations.
- ▶ The main reason in making an eccentric jaw relation record is to adjust the horizontal and lateral condylar inclination in the adjustable articulator, and to establish the balanced occlusion.
- ▶ The protrusive and left and right lateral movements records are made in the same manner as for centric relation record and these include:
 1. Functional or chew in methods.
 2. Graphic methods.
 3. Physiological methods (tactile or inter-occlusal check record method).

Eccentric jaw relations

- ▶ The interocclusal eccentric records may be made either on the occlusion rim before the teeth are set up or on the posterior teeth at the try-in appointment.
- ▶ When the protrusive eccentric record is made on Hanau articulator, the following formula is used to obtain an acceptable lateral inclination.

$$L = \frac{H}{8} + 12$$

H: Horizontal condylar inclination in degrees as established by the protrusive relation record.

L: Lateral inclination in degrees as obtained from the formula.

Thank
you ♡

#200850103

Lab Procedure Prior to Try- in Mounting



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Mounting

- It is the procedure of attaching the maxillary and mandibular casts to the articulator in their recorded jaw relation.
- It is also called *articulation*.
- The maxillary cast is first articulated, and then the mandibular cast is articulated after recording the vertical and centric jaw relations.



Zeroing or resetting the articulator before mounting

In mean value articulator (Class II articulator):

1. The articulator should be clean from any remnant of previous plaster.
2. The movable surfaces of the articulator should move freely without any hindrance.
3. The incisal pin should be flushed with the top of upper member of articulator to give zero reading.
4. The mounting table should be properly fixed to the articulator.



Zeroing or resetting the articulator before mounting

In semiadjustable articulator (Class III articulator):

1. The articulator should be clean from any remnant of previous plaster.
2. The movable surfaces of the articulator should move freely without any hindrance.
3. The incisal pin should be flushed with the top of upper member of articulator to give zero reading.

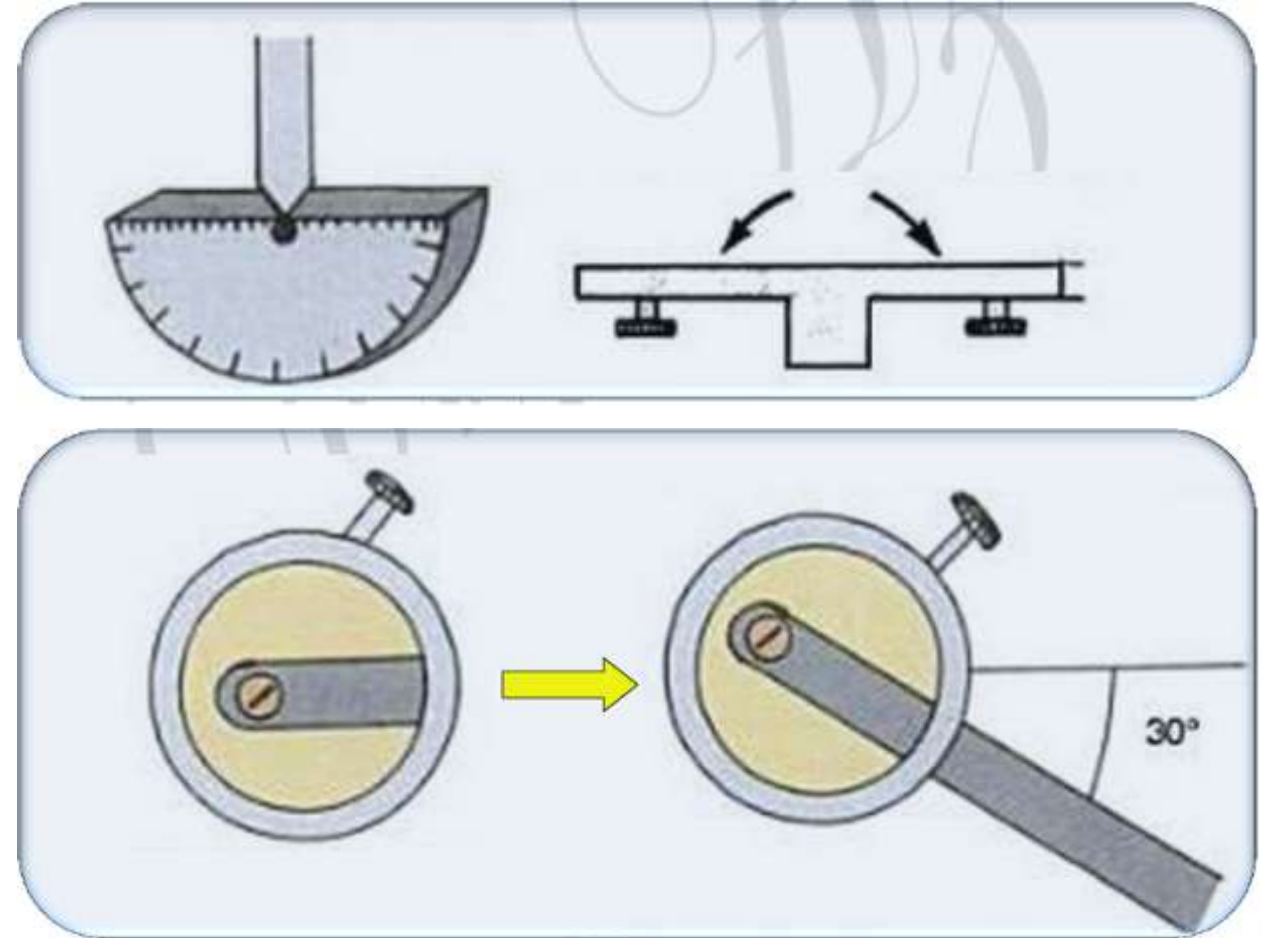


Zeroing or resetting the articulator before mounting



In semiadjustable articulator (Class III articulator):

4. Set the incisal guide table at 0° anteroposteriorly and laterally.
5. Set the condylar track in the horizontal condylar guidance at 30° bilaterally.

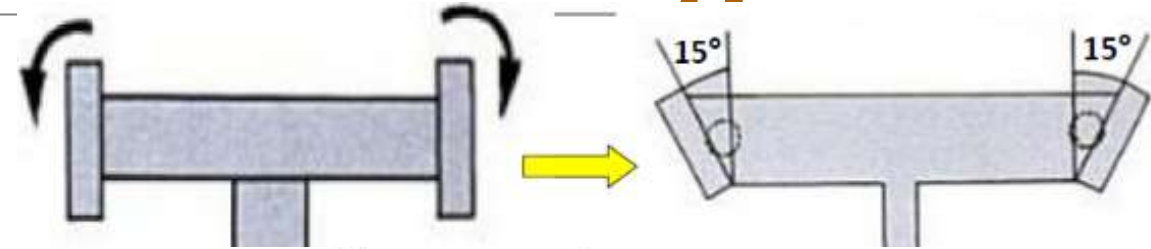


Zeroing or resetting the articulator before mounting



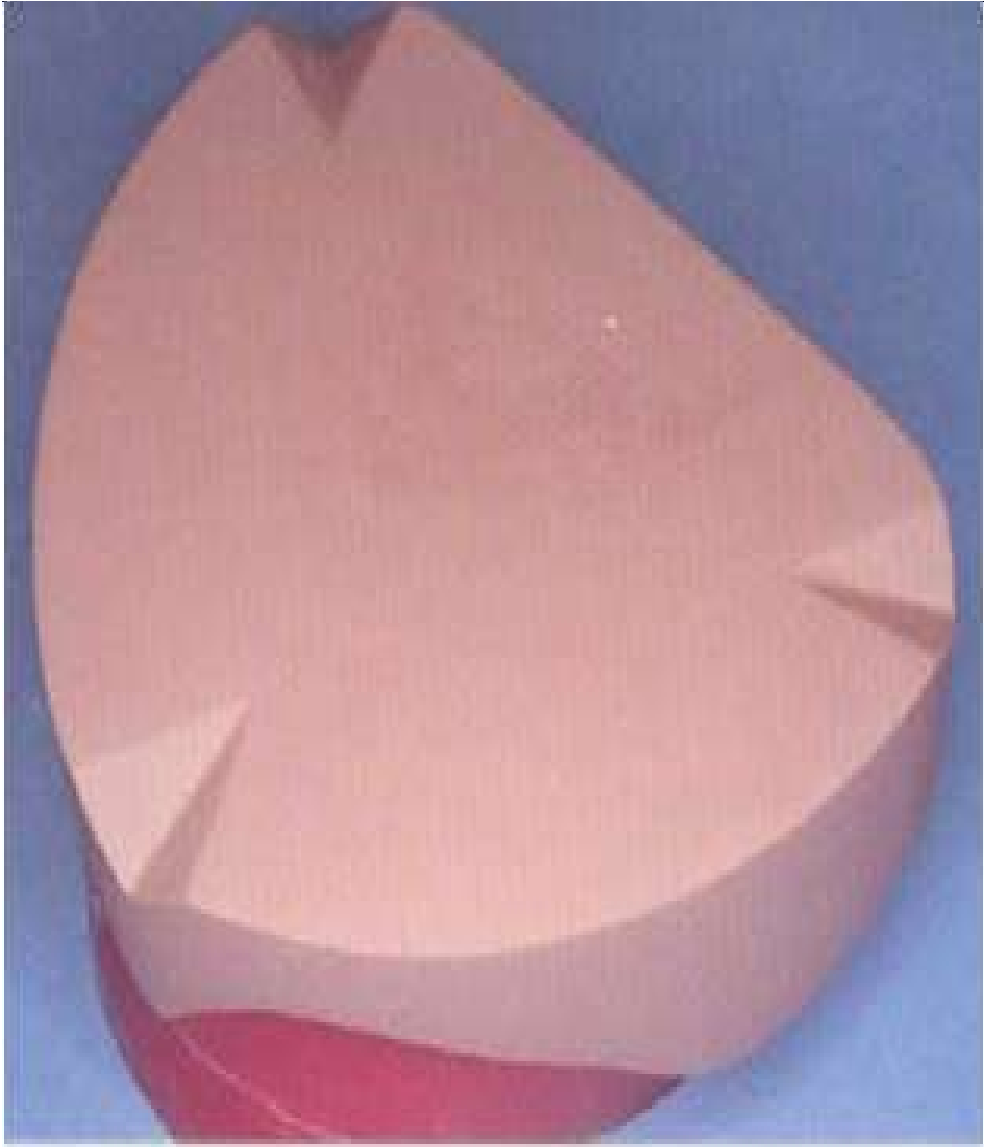
In semiadjustable articulator
(Class III articulator):

6. Set the Bennett angle at 30° .
7. Set the lateral condylar guidance at 15° ; (A).
8. Lock the opening axis (hinge axis) of the articulator into centric position by placing the condylar ball element all the way forward and turning up the locking pin; (B).



Preparation of the casts for mounting

1. Determine the midline of the cast according to the midline of incisive papilla and continue this line posteriorly all around the cast.
2. The casts should be placed in slurry water for better adhesion of the casts to the mounting plaster.
3. With wax knife, **V-shape** cuts on the base of upper and lower casts, so as to facilitate the laboratory remounting.
4. The cut should be approximately **1/4 inch** depth and **1/2 inch** width.
5. Lightly coated the base of the casts with Vaseline or any separating medium.
6. The base plate with occlusion rim should be sealed to the cast by wax.



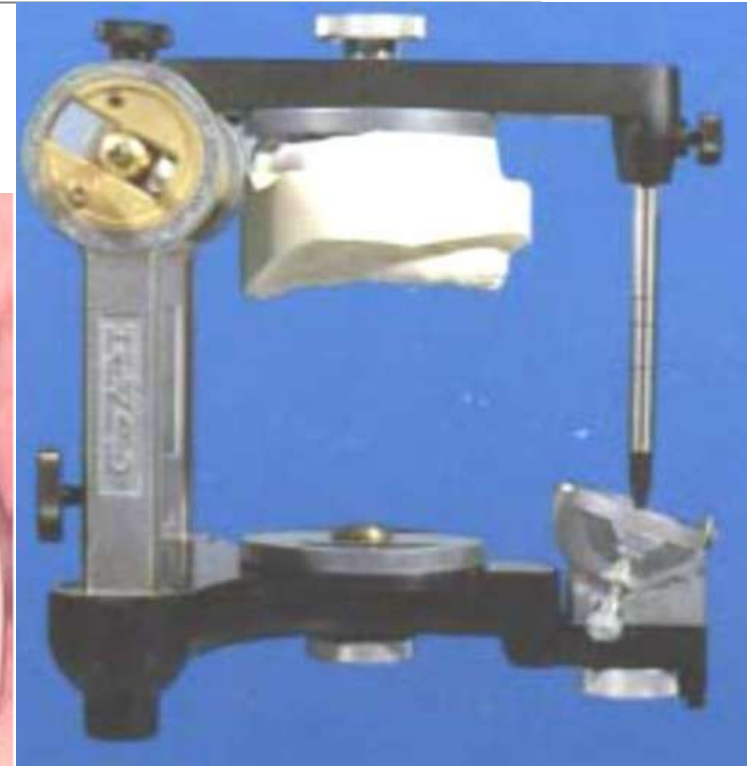
Mounting the maxillary cast

- ❖ The maxillary cast is first attached to the upper member of the articulator after orientation jaw relation by using the face-bow with adjustable type of articulators.
- ❖ while for the mean value articulator use the mounting table to support the maxillary occlusion rim in its position during mounting.
- ❖ The mandibular cast is articulated after recording the vertical and centric jaw relations.

Face-bow transfer supports the maxillary occlusion rim in its position during mounting in semi-adjustable articulator



Face-bow transfer supports the maxillary occlusion rim in its position during mounting in semi-adjustable articulator



After recording the orientation jaw relation, the following steps are carried out

- ✓ Enough space should be present between the base of the cast and the upper member of the articulator to accommodate for the plaster material over the cast. If there is not enough space trimming should be done to the base of the cast.
- ✓ Alignment of the midline of the maxillary occlusion rim to the center of the cross midline which found on the mounting table anteriorly and posteriorly, so that the cast will be centralized to the mounting table and the occlusal rim fixed to the mounting table by wax.

After recording the orientation jaw relation, the following steps are carried out

- ✓ Plaster is mixed according to the manufacturer instruction then the plaster is poured over the base of the cast and the upper member is closed until the incisal pin touches the incisal table.
- ✓ Smoothing and polishing of the plaster is done.
- ✓ The mounting should be cleaned and any debris removed from the articulator and mounting table.

Mounting table supports the maxillary occlusion rim in its position during mounting in mean value articulator



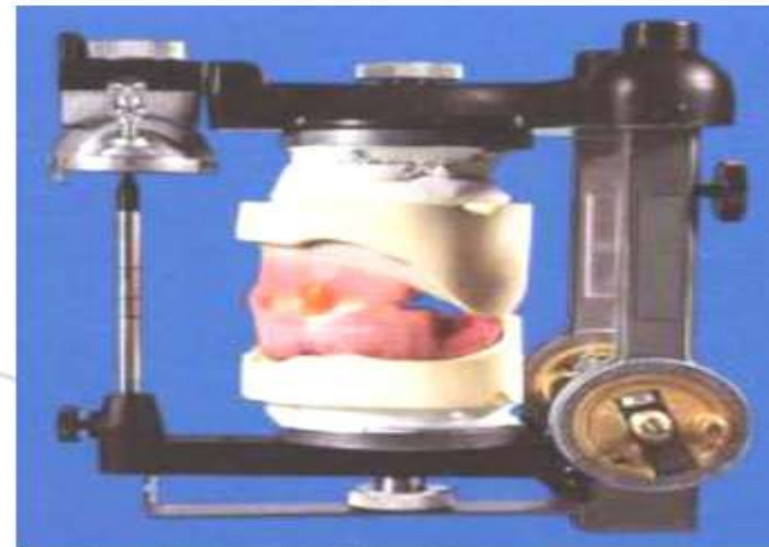
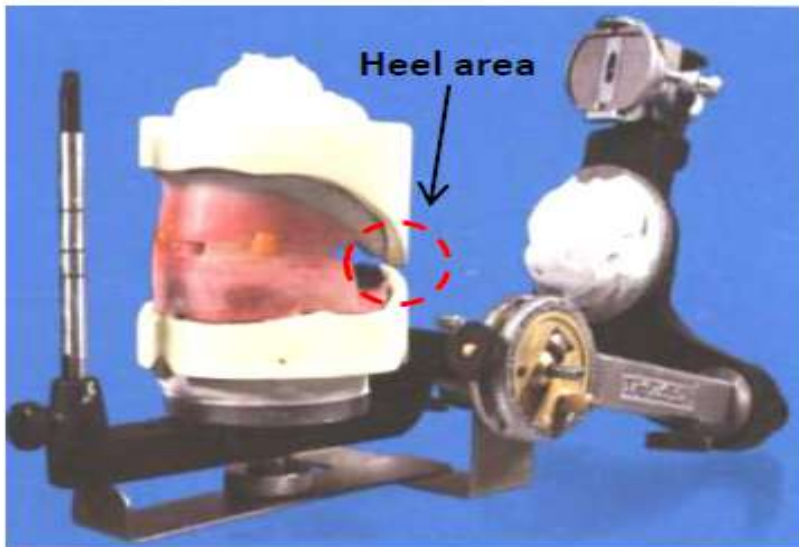
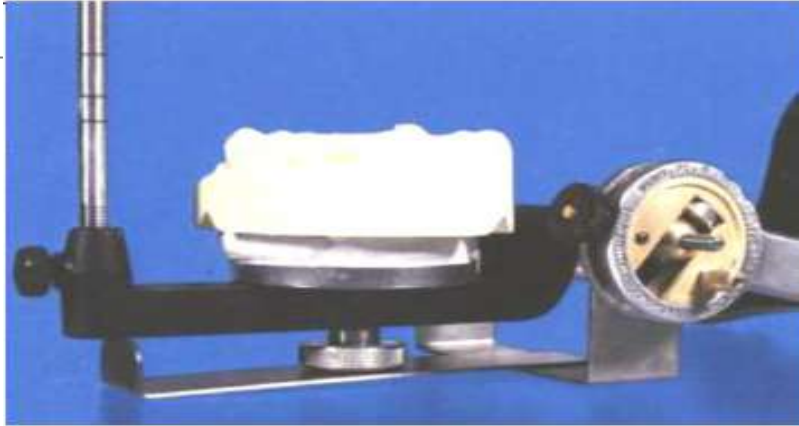
Mounting the mandibular cast

- The mandibular cast is mounted after recording the tentative vertical and centric jaw relations.
- The mandibular occlusion rim should be well secured to the mandibular cast with its record base by using wax, also sealing should be done between the maxillary and mandibular rims after making tentative centric jaw relation.
- Care should be taken that there is no posterior interference between the maxillary and mandibular casts (*Heel area*).
- The articulator with the mounted maxillary cast is inverted to aid in the mounting the mandibular cast.

Mounting the mandibular cast

- The maxillary occlusal rim with mandibular occlusal rim (centric record) placed on the maxillary cast.
- The mandibular cast is placed on the mandibular occlusal rim (It should be soaked in slurry water before mounting).
- The plaster is mixed and poured over the base of the mandibular cast and the articulator is closed until the incisal table touch the incisal pin, then the plaster should be smoothed and polished.

Mounting the mandibular cast in .semiadjustable articulator



Mounting the mandibular cast in mean value .articulator



Checking the mounting

- The midline of maxillary cast should be coincided with the midline of mandibular cast and midline of articulator.
- Centralization of maxillary cast with upper member of articulator then the centralization of lower cast which depend on accuracy of the maxillary cast.
- Incisal pin checked if it does not touch the incisal table.
- Heel area checked if there is any contact between the maxillary and mandibular casts.



Possible errors might occur during mounting

1. The record base is not properly secured to the cast.
2. Interference of the casts posteriorly.
3. The incisal pin does not touch the incisal table.
4. The incisal pin is not properly screwed.
5. Wrong transference of the midline of the articulator with that of the casts (shifting of the midline).
6. Movement of the casts during mounting.
7. Maxillary and mandibular rims are not properly fixed after making centric record.
8. Dimensional changes in the plaster material.



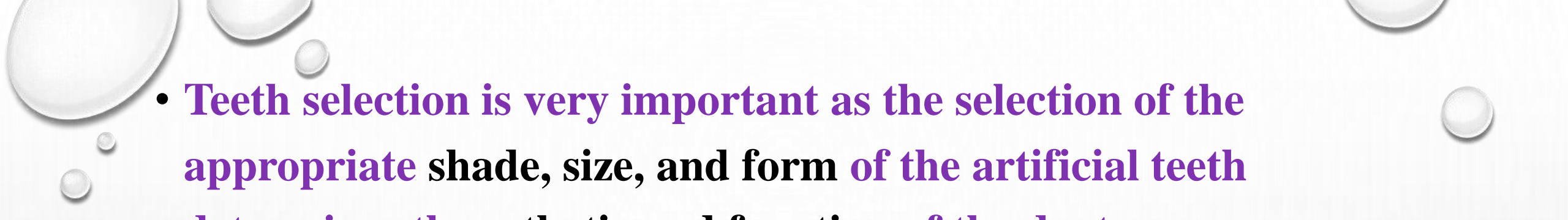
Thank you!

Selection of artificial teeth




BUSHRA MOHAMMED ALI AL-AMEEN

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- **Teeth selection is very important as the selection of the appropriate shade, size, and form of the artificial teeth determines the esthetic and function of the denture.**

- **Objectives in teeth selection:**

1. The teeth should be in harmony with the surrounding tissues.
 2. They should maintain the vertical dimension.
 3. They should be efficient for mastication.
 4. Anterior teeth are selected predominantly based on esthetic.
 5. The posterior teeth should be selected based on the function.
- 



Selection of artificial teeth

- 1. Selection of anterior teeth.**
- 2. Selection of posterior teeth.**



Selection of anterior teeth

- Anterior teeth are primarily selected to satisfy esthetic requirements, so the dentist's professional obligation is to give the patient adequate information, guidance, and opportunity to choose their teeth.
- Anterior teeth selection is the area of prosthodontic care in which the patient should be given a primary responsibility to determine the esthetic outcome.

Records of shade, size, and form of teeth could be obtained from pre-extraction records which include

- 1- preserved extracted teeth.
- 2- previous diagnostic casts with natural teeth.
- 3- pre-extraction radiograph.
- 4- pre-extraction photograph.
- 5- observation of teeth of close relatives.
- 6- The old denture might help in teeth selection by ask the patient, if (like or dislike) the teeth and decide to change or not.



Factors to be considered when pre-extraction records are not available

- 1. SHADE**
 - 2. SIZE**
 - 3. FORM**
- 

Shade

- **It is the degree of darkness of the color.**
- There are two basic shades, the yellow and grey, and the other shades vary in between.
- Many patients will ask for very light shade, tell them that the proper shade gives more natural appearance, never force the patient to accept a shade that they do not want, they will never be satisfied with the denture.



Factors of shade selection

1- Age.

2- Gender.

3- Complexion.

4- Patient Preference.



Factors of shade selection

1- Age:

The younger the patient, the lighter the shade is preferred.

The shade of natural teeth will be darkening with age *because of*

1. deposition of secondary dentin.
2. Consequent reduction in size of the pulp chamber.
3. Wearing a way of enamel.
4. External staining of the exposed dentin from oral fluids, foods, or tobacco.

Factors of shade selection

2- Gender:

The gender may affect the shade; it seems that females are given lighter and brighter teeth than males.

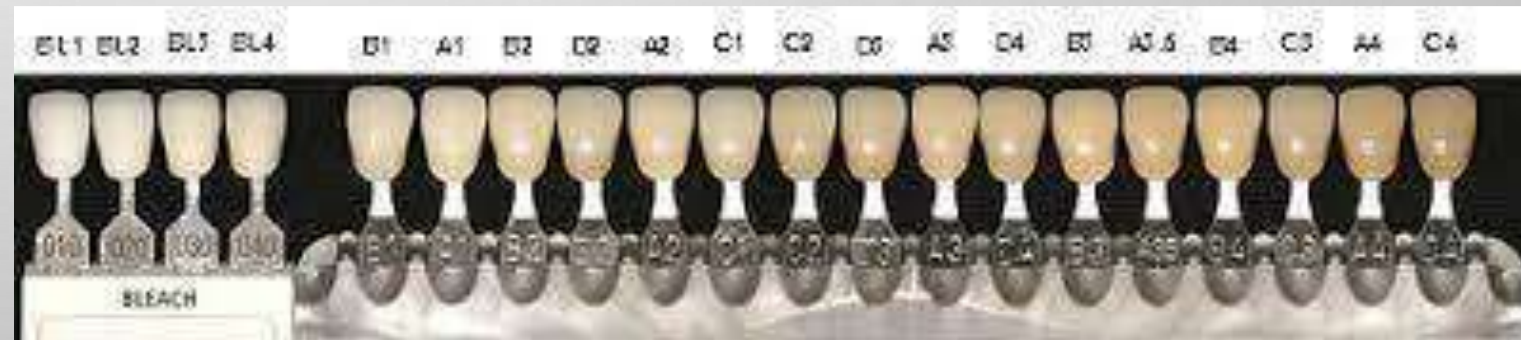
3- Complexion:

The color of the face should harmonize the shade of the teeth. Lighter teeth are suitable for lighter skin, while darker teeth are suitable for darker skin. Although people with dark skin seemed to have very light teeth, this is because of contrast in the skin and teeth color.

Factors of shade selection

4- Patient Preference:

- Show the patient a complete shade guide and select the two tabs that are the lightest and the darkest, hold them against the patient lip and ask them to point to the one that they prefer this method called (method of pair comparison).
- More than two or three shades should be selected and comparison between them would help in final right selection.



Size

- **To select the size of anterior teeth, we have to consider the following:**
 - 1. Length**
 - 2. Width**
 - 3. Patient Preference**

Size

1- Length:

The length of anterior teeth is controlled by:

A- length of upper lip.

- In short lip more than **2 mm** seen from the maxillary central incisors.
- In medium lip length **1.5-2 mm** seen from the maxillary central incisors.
- In long lip nothing can be seen from the maxillary central incisors.

B- level of the lower lip.

- Length of mandibular anterior teeth should be with the level of lower lip.

C- Inter-ridge distance.

When the space is available, it is more esthetically acceptable to use a tooth long enough to eliminate the display of the denture base (teeth are more attractive in appearance than denture base materials).

Size



2- Width:

A- The width from the tip of left canine to the tip of right canine is almost equal to the width of the nose (*interalar width*) when measured by the *caliper*.

(Width of six anterior teeth = interalar width + 7 mm).

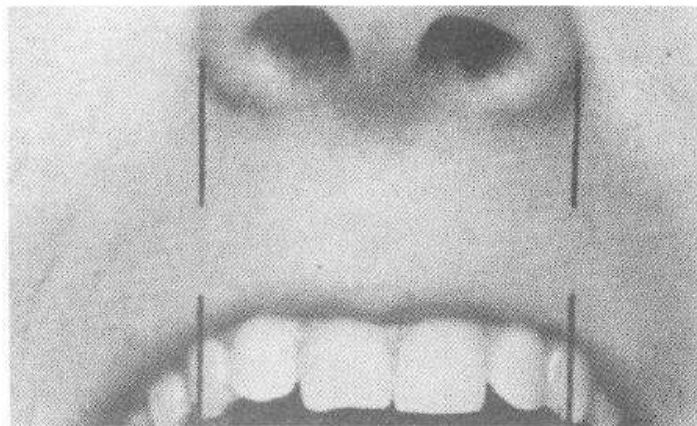
B- The width of maxillary central incisor equals approximately to 1/16 of bizygomatic width, and the width of maxillary anterior teeth equals to 1/3.36 of bizygomatic width.

C- Width of the anterior teeth can be measured on maxillary occlusal rim depending on the intraoral anatomical landmarks like: (buccal frenum, corner of the mouth, and canine eminence).

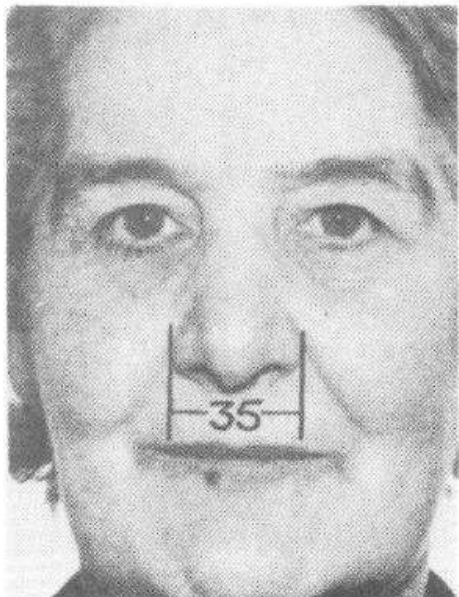
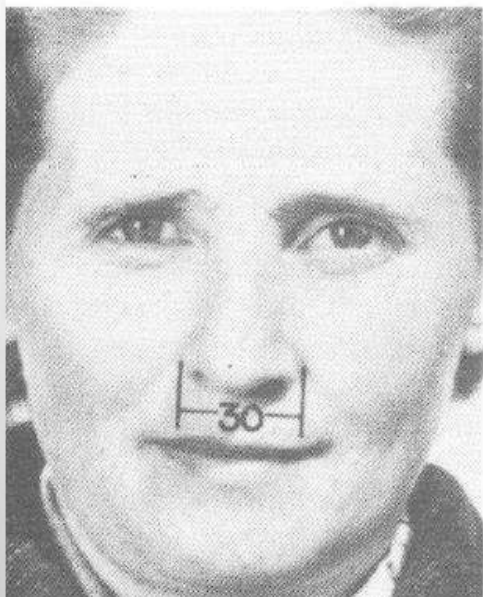
Size

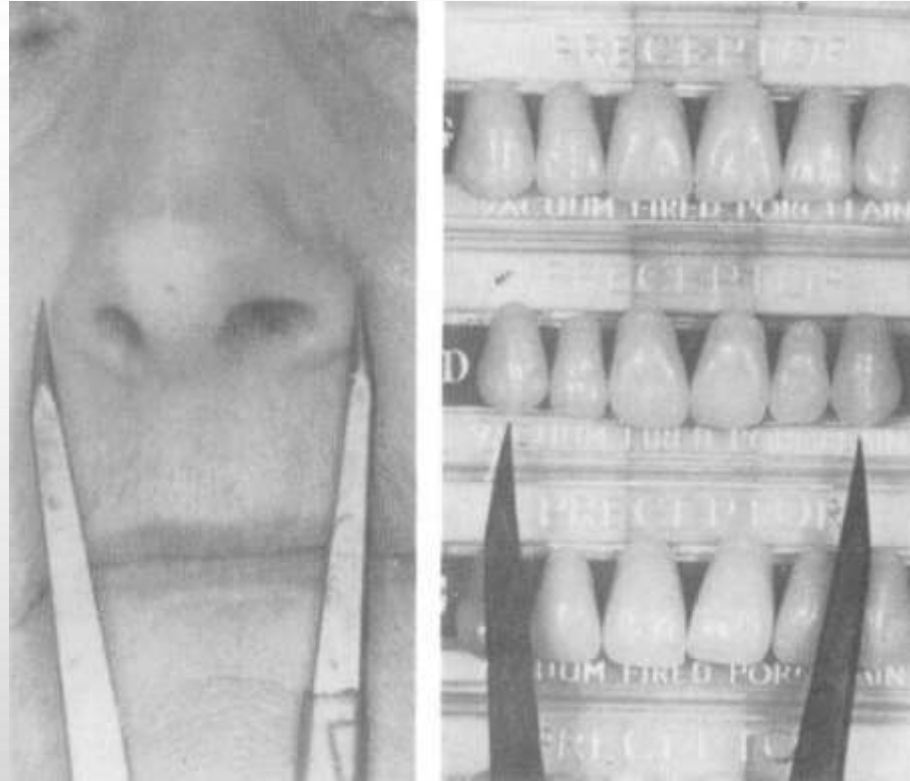
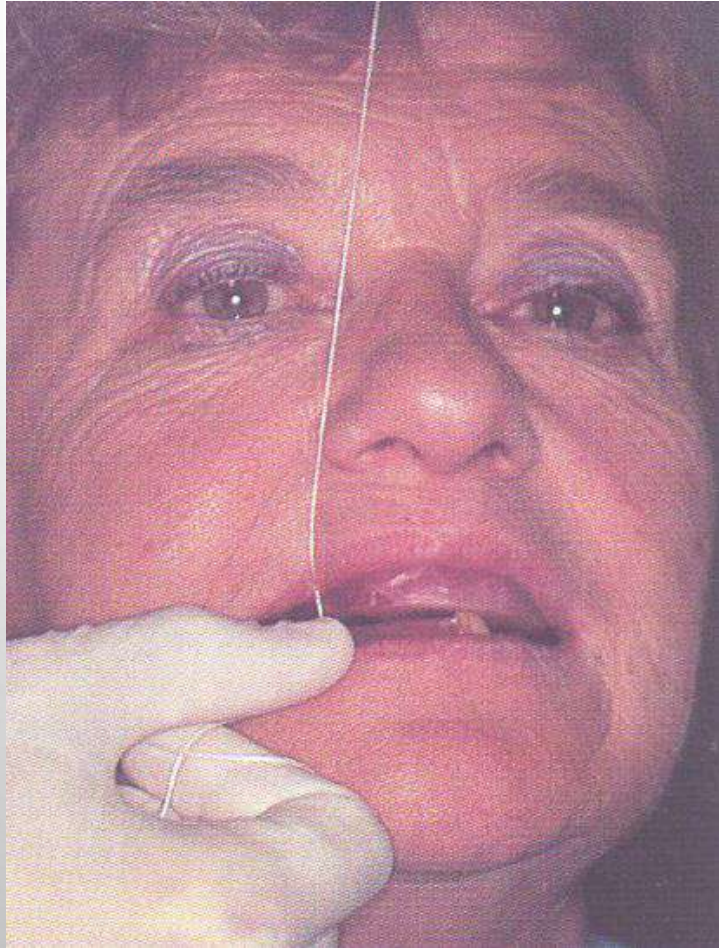
3- Patient Preference:

- Use the method of pair comparison to assist a patient to decide what size of tooth they prefer.
- Set two different sizes of teeth on a piece of wax rope, place them under the upper lip, and find out which one the patient prefers.



A





Form

- **The form or outline of anterior teeth depends on:**
 - 1. Facial form.**
 - 2. Gender.**
 - 3. Age.**
 - 4. Personality.**
 - 5. Patient preference.**

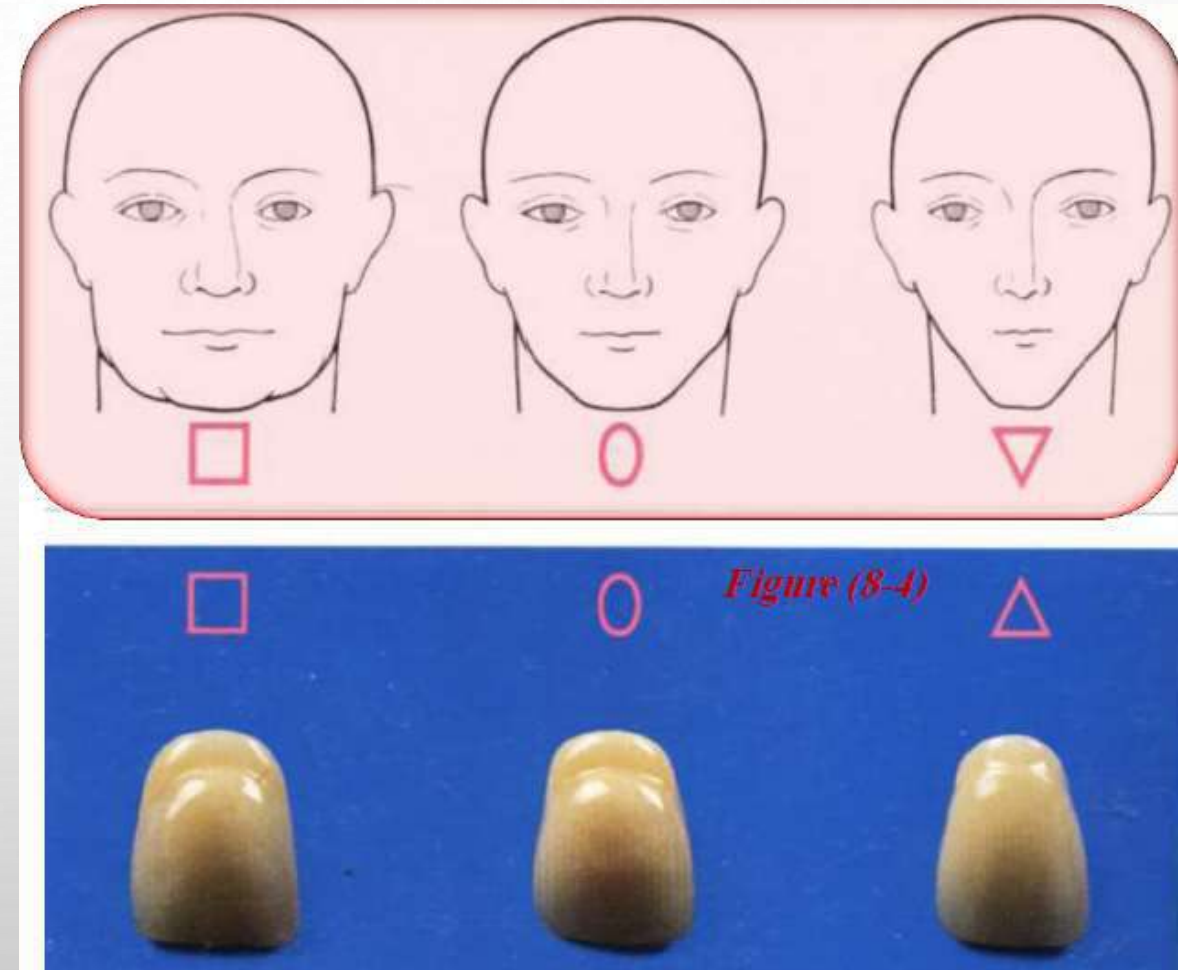
Form

- The form or outline of anterior teeth depends on:

1. Facial form:

According to frontal outline:

- the face could be classified into square, ovoid and tapering .
- the maxillary central incisor form should be in harmony with patient face.



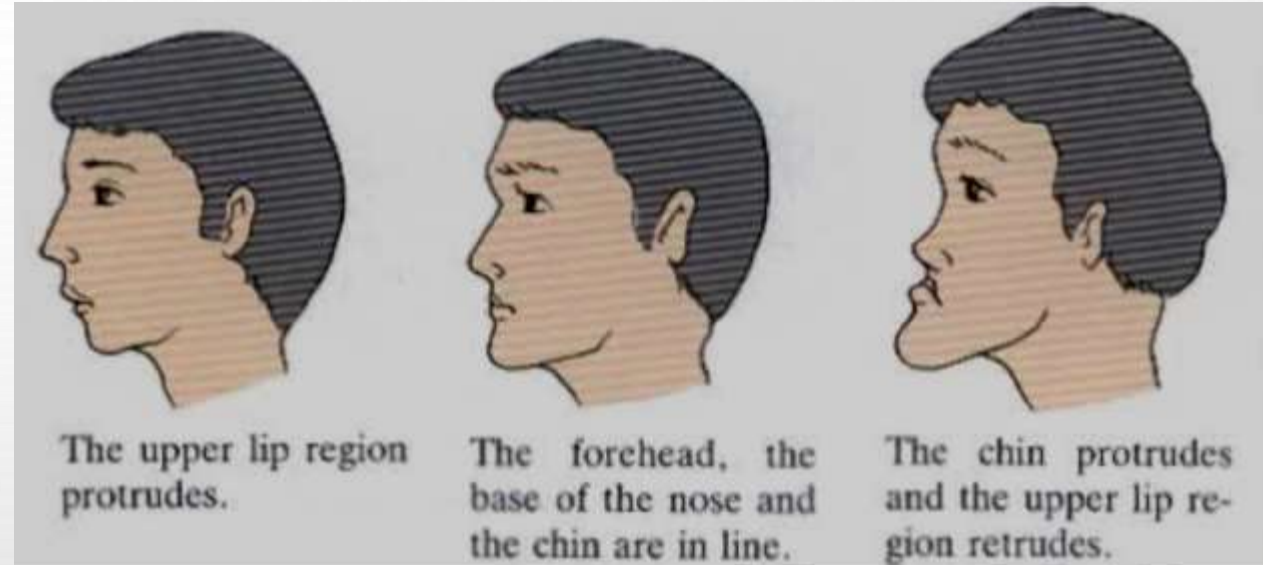
Form

- The form or outline of anterior teeth depends on:

1. Facial form:

According to profile:

- The face could be classified into: **straight**, **convex** and **concave**.
- The labial surface of maxillary central incisor viewed from mesial aspect should be in harmony with profile of face.



Form

- The form or outline of anterior teeth depends on:

2. Gender:

Masculine form:

- Is associated with *square, cuboidal, and angular* Form.

Feminine form:

- Is associated with more rounded, ovoid, and tapering features.

3. Age:

- In old patients the teeth tend to have square form due to attrition, more Round features disappear and line angle quite seen in those patients.

Form

- **The form or outline of anterior teeth depends on:**

4. Personality:

It seems reasonable that a large vigorous type of persons have teeth of more square, large teeth with prominent markings, different from those of delicate appearing persons.

5. Patient preference:

Allow the patient to select between the same size teeth but different Forms. Set two different forms of teeth on the right and left sides of a Piece of wax rope, and ask the patients which they prefer.

Materials of artificial teeth

Acrylic	Porcelain
They are made from acrylic resin.	We have vacuum fired and air fired, the vacuum fired is better because they are harder and have luster.
They are not brittle, but poor abrasion resistance, so they might become worn down with consequent loss of vertical dimension.	They are brittle and thus susceptible to fracture, more resistance to abrasion.
Esthetic very good, but cannot maintain luster for long time.	Excellent esthetic, does not stained, and maintain luster for long time.
Chemical bonding with denture base Easily ground and polished.	Mechanical bonding by pins or undercut holes.
Easily ground and polished.	Difficult to grind and polish.
There is no clicking during contact.	There is clicking during contact.

Materials of artificial teeth

Acrylic	Porcelain
Transmit less force to mucosa because they have greater resilience, so they cushion the underlying supporting tissue from occlusal load.	More forces transmit to the mucosa.
Thermal expansion same as that of acrylic denture base.	Thermal expansion is much lower than acrylic causes stresses in acrylic denture base and crazing may appear around teeth.

Selection of posterior teeth

- **Posterior teeth are selected for:**

- 1. Shade**

- 2. Mold (Size + Occlusal form)**

Shade

- Shade of posterior teeth should be harmonized to the shade on anterior teeth.
- Maxillary first premolars are sometimes used for esthetic more than function, so it is advisable to select premolar teeth with lighter color than the other posterior teeth, but not lighter than anterior teeth.
- Generally the shades of posterior teeth are slightly darker than anterior teeth.

Size

Occlusogingival height:

- It is determined by the available interarch distance.
- The occlusal plane should be located at the midpoint of the interocclusal distance.
- The length of the maxillary first premolar should be comparable to that of maxillary canine to have the proper esthetic effect.
- The height of posterior teeth usually divided into long, medium, and short. Long posterior teeth are generally more esthetic in appearance than are shorter teeth.

Size

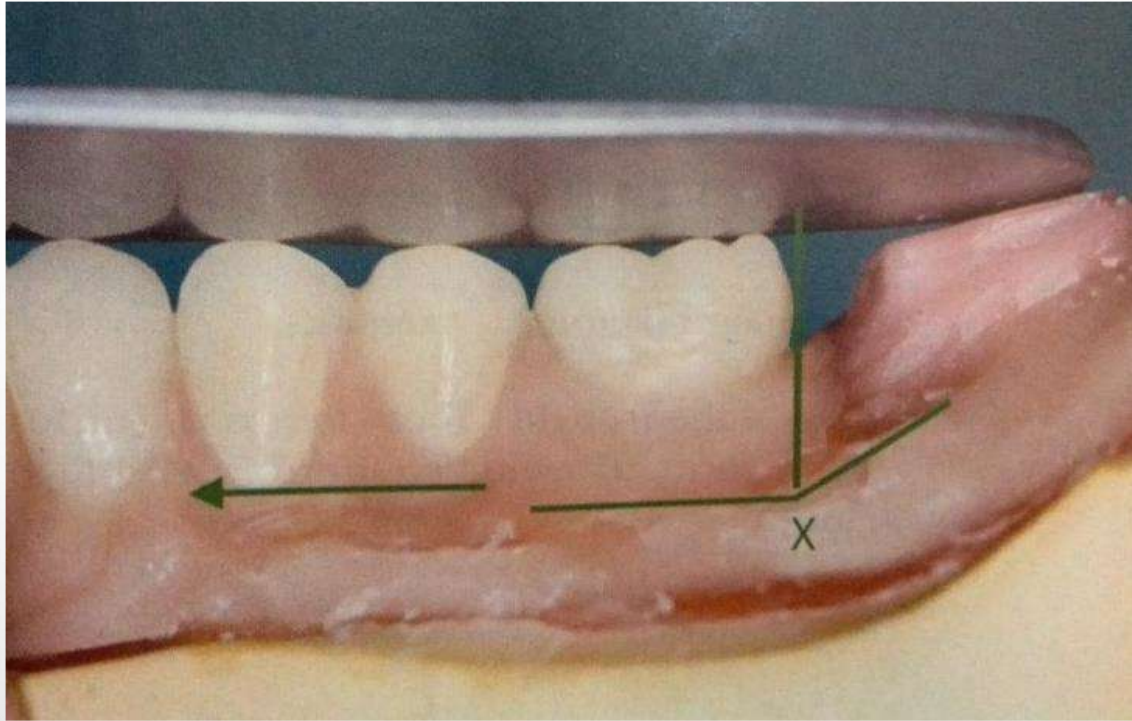
Buccolingual width:

- The buccolingual width of posterior teeth should be slightly narrower than natural teeth, because the broader occlusal surfaces which direct more stress during function to supporting tissue, leading to increase in the rate of ridge resorption.
- Broader teeth encroach into the tongue space leading to instability of the denture. Also, the teeth should not encroach into the buccal corridor space to avoid cheek biting.

Size

Mesiodistal length:

- The combined mesiodistal lengths of all maxillary posterior teeth in that side of the arch should be equal to the distance between canine line, and anterior border of maxillary tuberosity.
- For mandibular posterior teeth, the mesiodistal lengths should be equal to distance between the canine line and anterior border of retromolar pad.
- Placing a tooth on an inclined plane (*steep anteroposterior ridge slope*) should be avoided, otherwise this would lead to forward displacement of the denture and dislodgment of denture occurs.
- Similarly the teeth should not be placed over displaceable tissues like the retromolar pad as it will cause tipping of the denture during function.
- In case with inadequate mesiodistal length, the premolar can be omitted.



X indicates the beginning of the steep slope. The arrow indicates the potential movement of the denture during the function if the second molar were placed on the slope.

Occlusal form

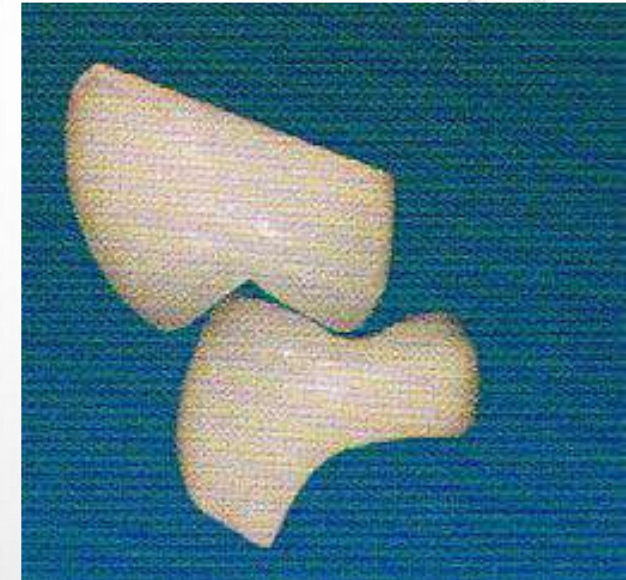
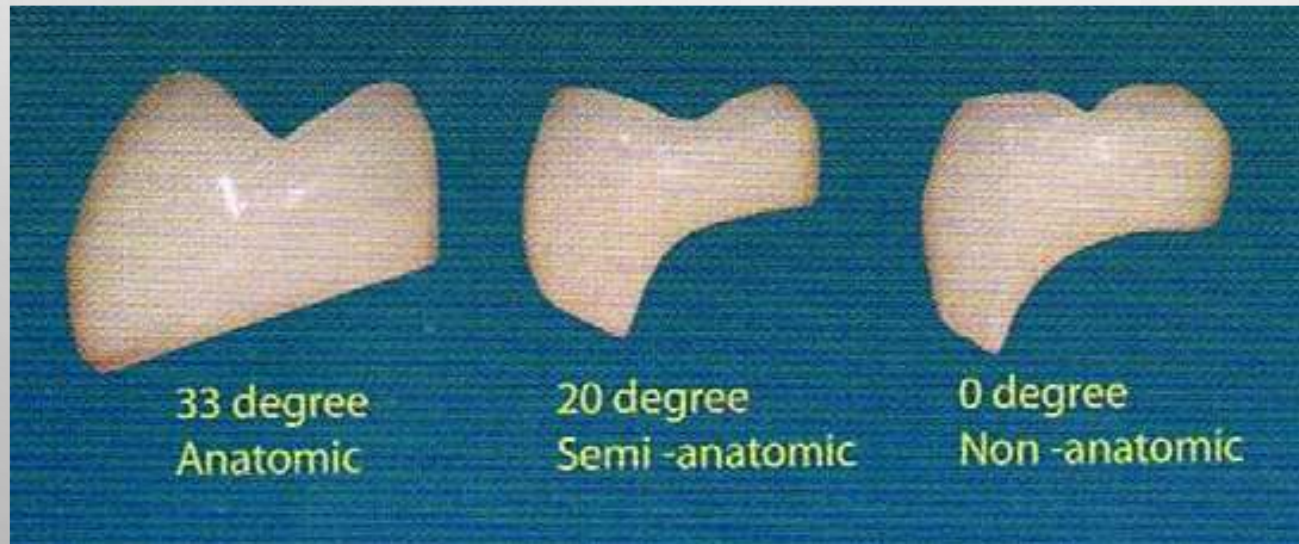
There are two forms :

A- Cusp form (anatomical teeth):

Anatomical teeth have cusp angles 33; 20; 5

B- Non-cusp form (non-anatomical or cusplless teeth):

They are also called monoplane, flat plane, or zero degree.



Advantages of cusp form teeth

- 1. More efficient in chewing.**
- 2. They can be arranged in balanced occlusion in eccentric position.**
- 3. The cusp fossa relationship between the maxillary and mandibular posterior teeth forms a definite point for return to centric occlusion.**
- 4. More acceptable esthetically.**
- 5. More compatible with surrounding oral environment.**

Advantages of non-cusp form teeth

- 1. Offer less resistance in non-masticatory movement like (bruxism); therefore less damaging to the supporting structure.**
- 2. More comfortable.**
- 3. Offer less resistance to lateral forces therefore, they are indicated in excessively resorbed ridges.**
- 4. Allow greater range of movement which is necessary in patient with malrelated jaws.**
- 5. They can be used with less damaging effect than cusp form teeth in patient with uncoordinated neuromuscular control which jaw relation records are not repeatable.**

thank you



Arrangement of artificial teeth

Bushra Mohammed Ali Al-Ameen

B,D,S,. M,SC.(PROS)



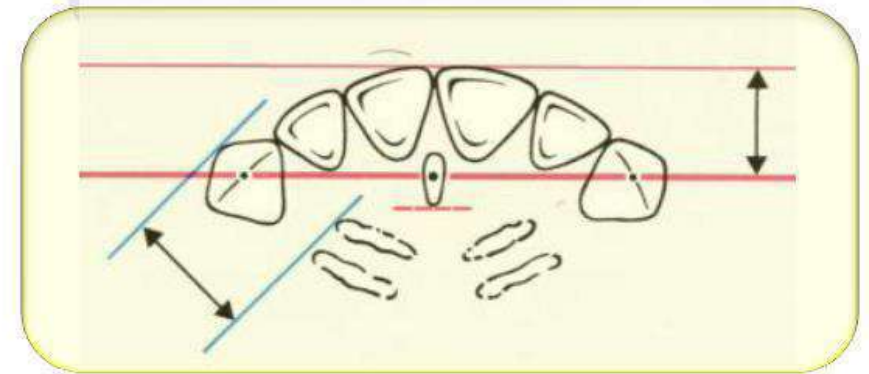
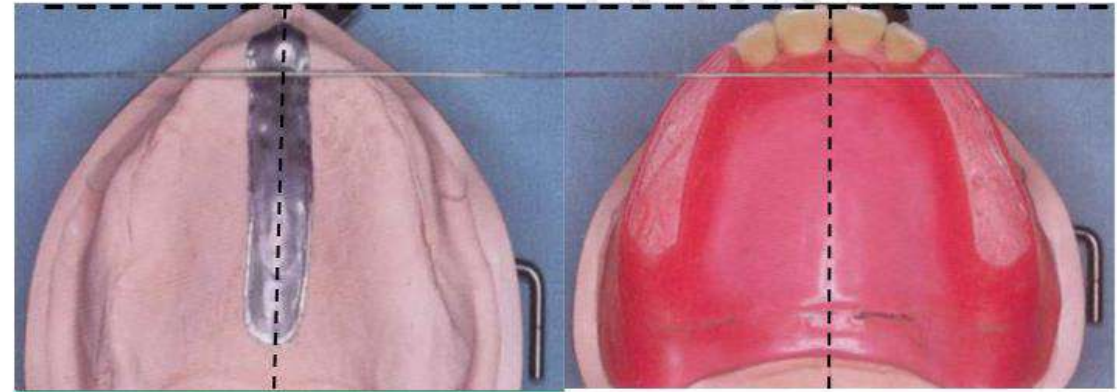
Arrangement of artificial teeth

It is the placement of teeth on a denture, or it is the setting of teeth on temporary bases.



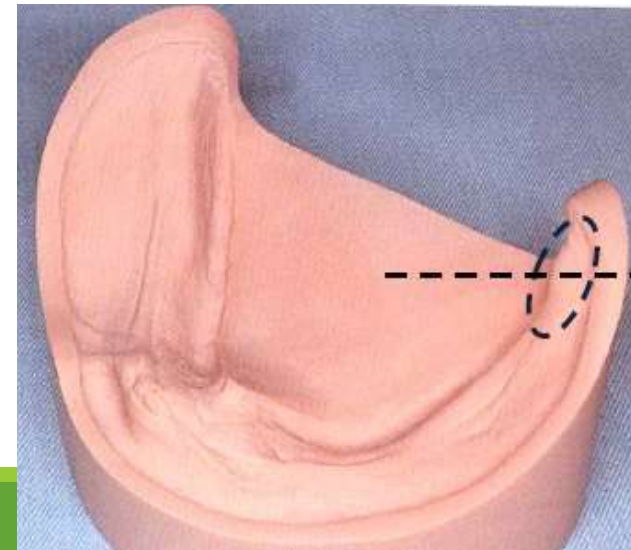
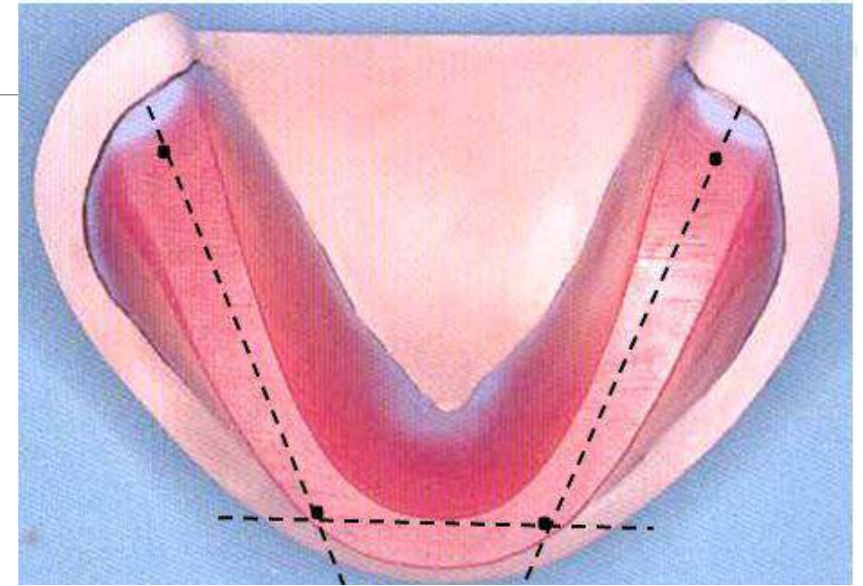
Guide lines of artificial teeth arrangement maxillary cast

1. A line is drawn parallel to the frontal plane that passes through the incisive papilla, aids in the positioning of the upper central incisors.
2. The midline follows the mid palatine raphe and bisects the incisive papilla; this line is perpendicular to first line.
3. The canine eminence lines are recorded on the cast where they are present.



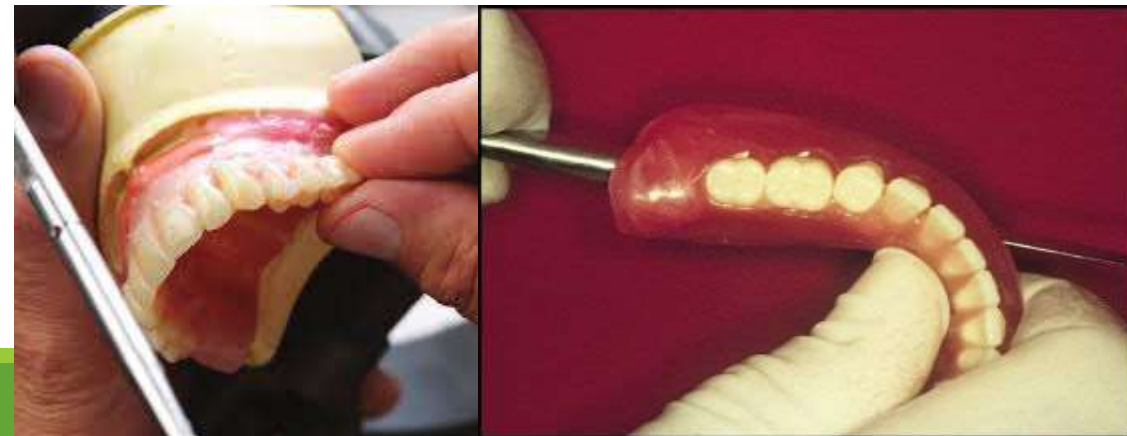
Guide lines of artificial teeth arrangement mandibular cast

1. A line is drawn parallel to the frontal plane bisecting the residual ridge, aids in positioning of the mandibular central incisors.
2. A point designates the distal of the mandibular canine.
3. A line follows the crest of the residual ridge from the canine point to the middle of retromolar pad, aids in the buccolingual position of the mandibular posterior teeth.
4. A line that bisects the vertical height of the retromolar pad aids in establishing the vertical position of the occlusal surfaces of the posterior teeth.



Sequence of teeth arrangement

1. **Maxillary anterior teeth:** Following the maxillary occlusion rim.
2. **Mandibular anterior teeth:** Using the occlusion rims and maxillary teeth as guides.
3. **Mandibular posterior teeth:** Using the anterior teeth, retromolar pads, and residual ridges as guides.
4. **Maxillary posterior teeth:** Using the mandibular posterior teeth as guides.



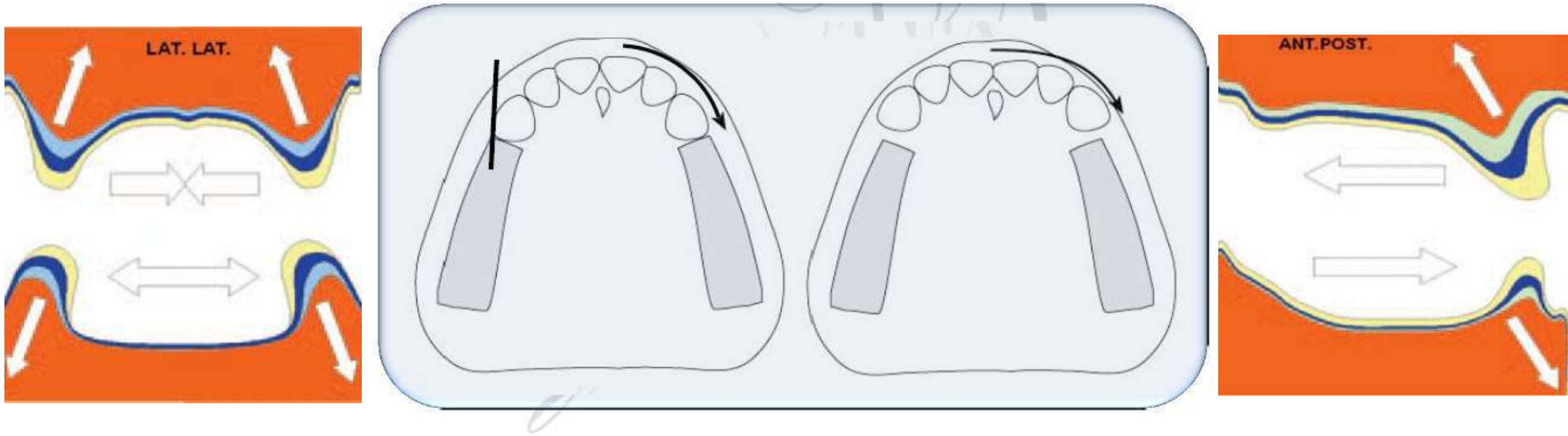
Arrangement of anterior teeth

The anterior teeth should be arranged to provide:

- 1- Proper lip support.
- 2- Permit satisfactory phonetic.
- 3- Pleasing esthetic.



The bone loss is *upward* and *backward* direction for the maxillary residual ridge; *downward* and *outward* for the mandibular residual ridge, therefore the maxillary artificial teeth should be arranged anteriorly and inferiorly to the residual ridge to occupy the space formerly occupied by the natural teeth.



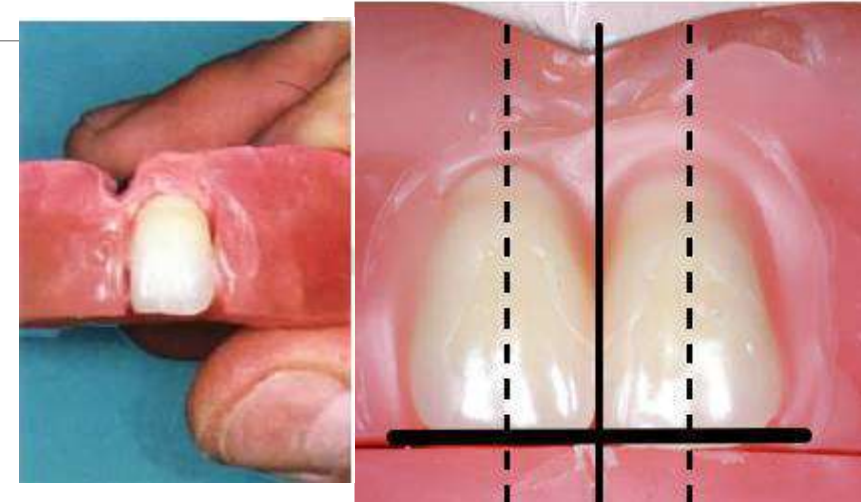
In setting the maxillary teeth, make sure the central and lateral incisors are placed so they begin to turn along the curvature of the arch.

Arrangement of maxillary anterior teeth

1- Maxillary central incisor

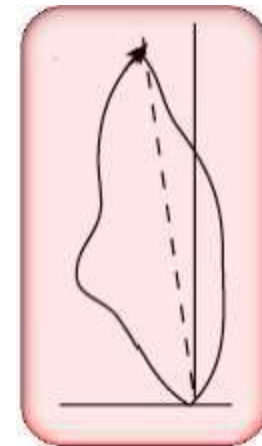
In frontal view

- The contact point between the right and left central incisors should be coinciding with the midline of cast.
- The incisal edge of each one should touch the occlusal plane.
- The long axis is perpendicular to the occlusal plane.



In sagittal view

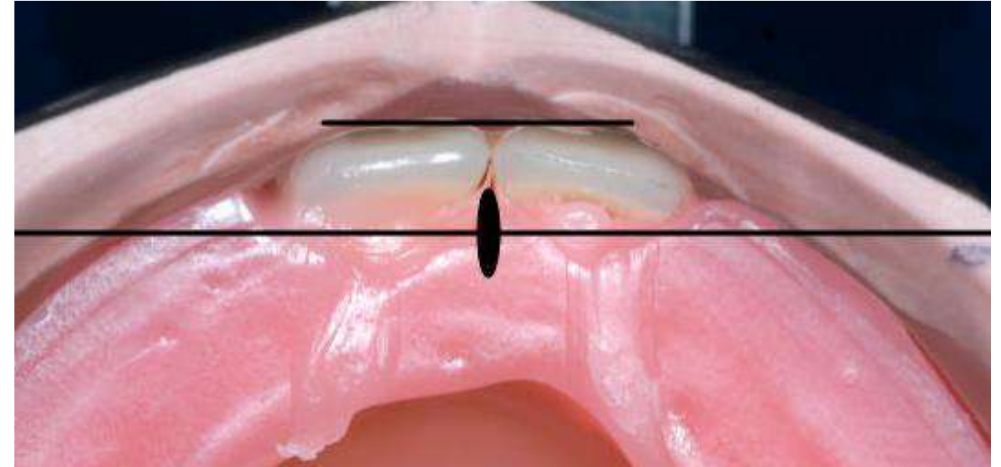
The central incisors should have slight (*5 degrees*) labial inclination.



Arrangement of maxillary anterior teeth

1- Maxillary central incisor

- In horizontal view (occlusal plane)
- The two central incisors should be placed to give the beginning of curvatures of the arch.
- Generally the labial surfaces of the two central incisors will be **8-10 mm** anterior to the center of the incisive papilla.

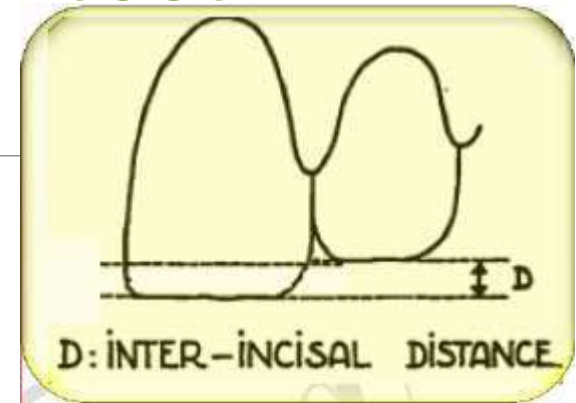


Arrangement of maxillary anterior teeth

2- Maxillary lateral incisor

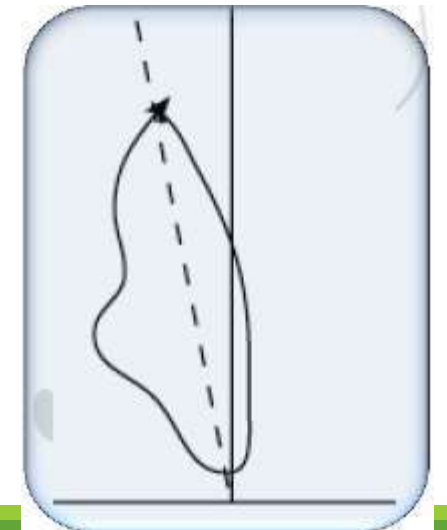
In frontal view

- The incisal edge of the lateral incisor should be *1 mm* above the occlusal plane, and the long axis show little distal inclination.



In sagittal view

- The upper lateral incisor should have slight labial inclination (*10 degrees*); the neck is slightly depressed.

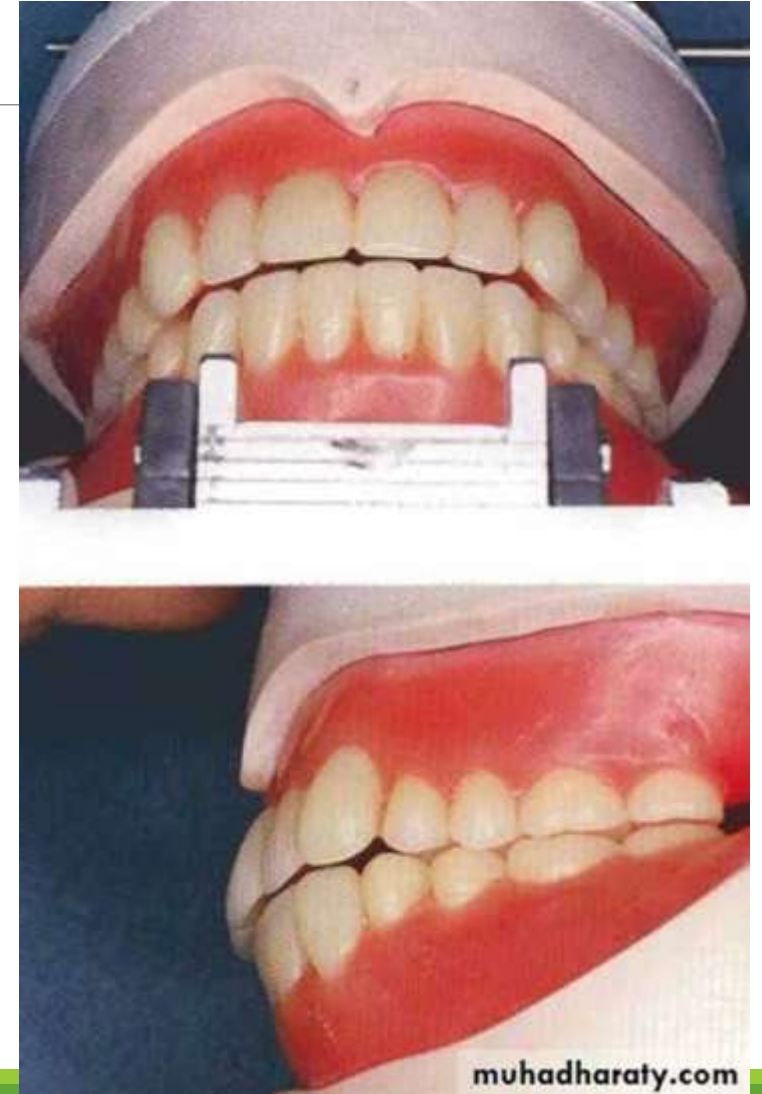


Arrangement of maxillary anterior teeth

2- Maxillary lateral incisor

In horizontal view

The cervical area is depressed more than the central incisor, and the distal edge should be rotated lingually to form the arch curvature.



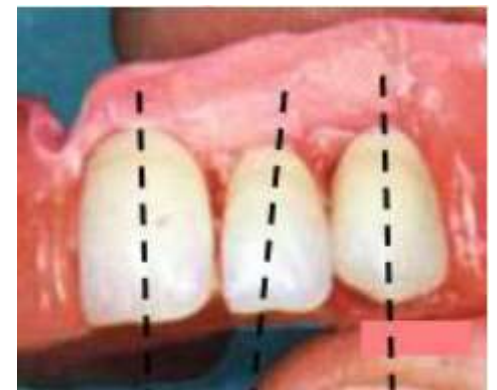
Arrangement of maxillary anterior teeth

3- Maxillary canine

The maxillary canine represents the corner of the mouth, it is the turning point of the maxillary arch, and also it forms the transition from the anterior teeth to posterior teeth.

In frontal view

- The tip of the canine should touch the occlusal plane, and the long axis is perpendicular to the plane, or tilted slightly to the distal.



Arrangement of maxillary anterior teeth

3- Maxillary canine

In sagittal view

- The long axis of canine is vertical.

In horizontal view

- The cervical area of canine is prominent.



Arrangement of mandibular anterior teeth

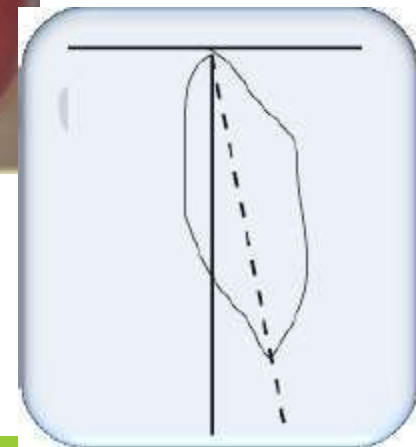
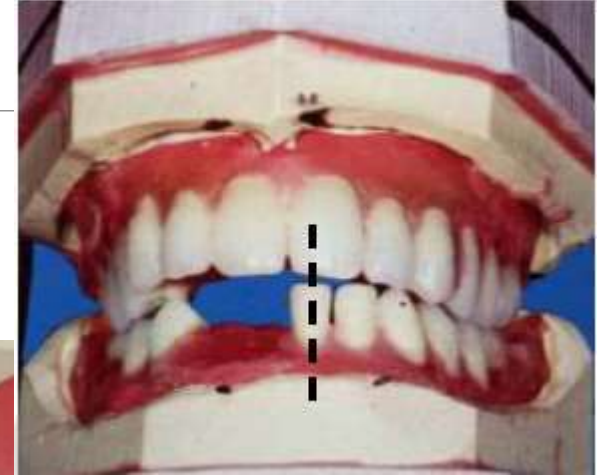
1- Mandibular central incisor

In frontal view

- The long axis is vertical and the midline of the mandibular central incisors, coincide with the maxillary midline.

In sagittal view

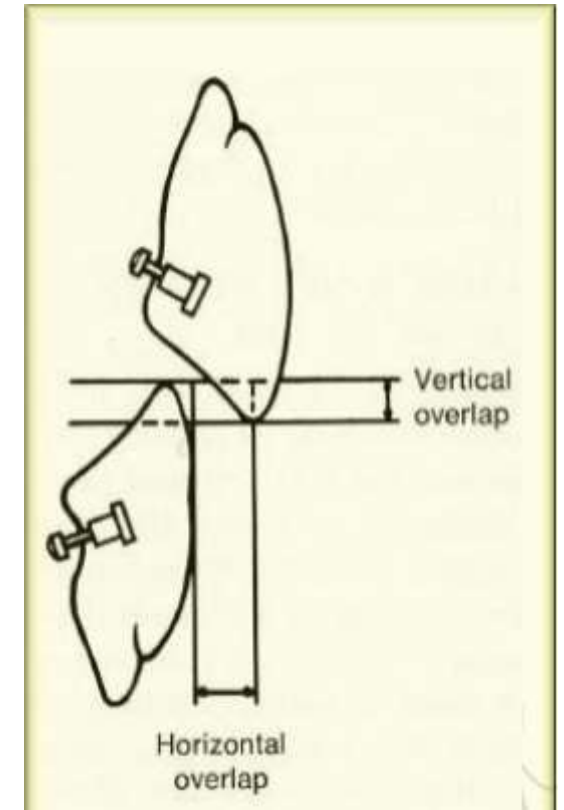
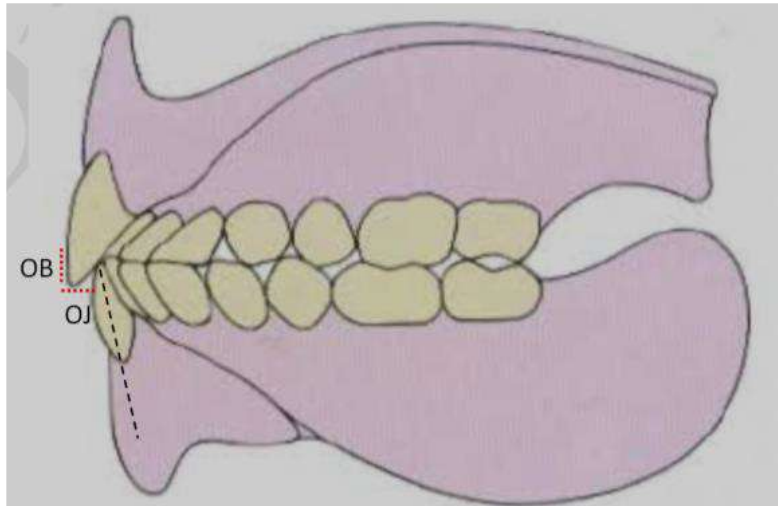
- The mandibular central incisors should have slight labial inclination.
- The incisal edge should have **1 mm** of vertical overlap (overbite), and **1 mm** of horizontal overlap (overjet) in respect to maxillary central incisors.

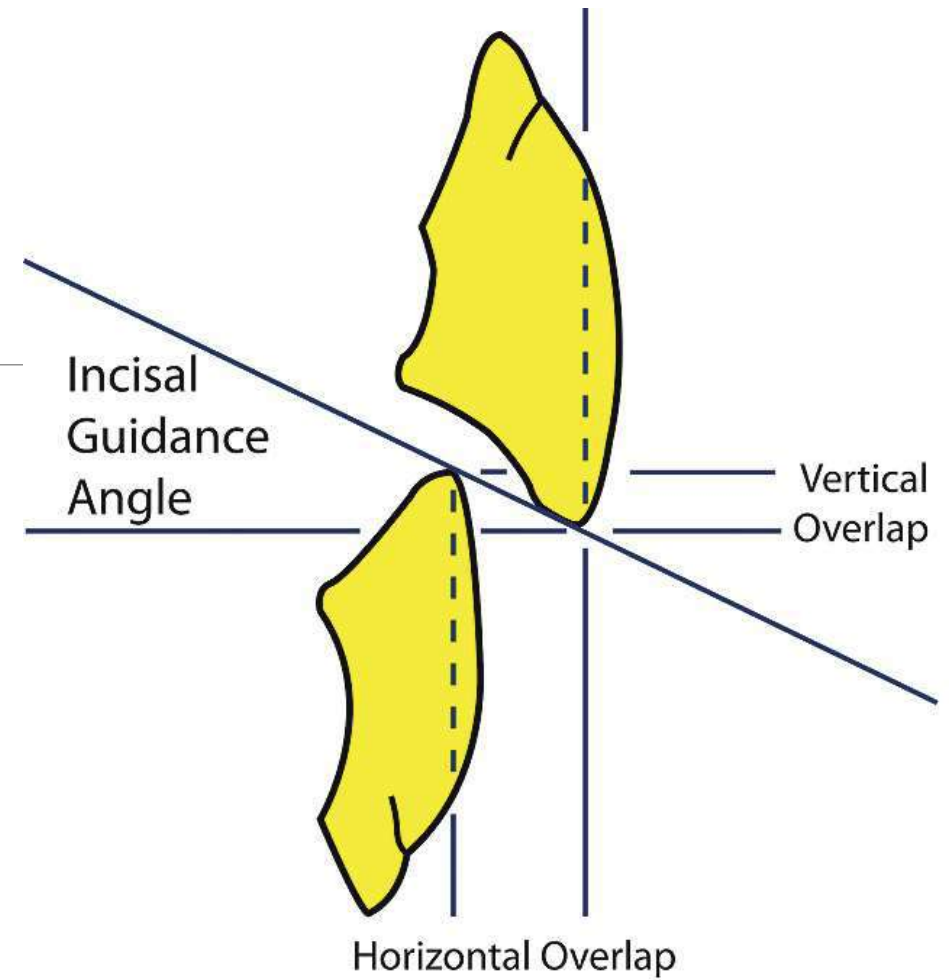
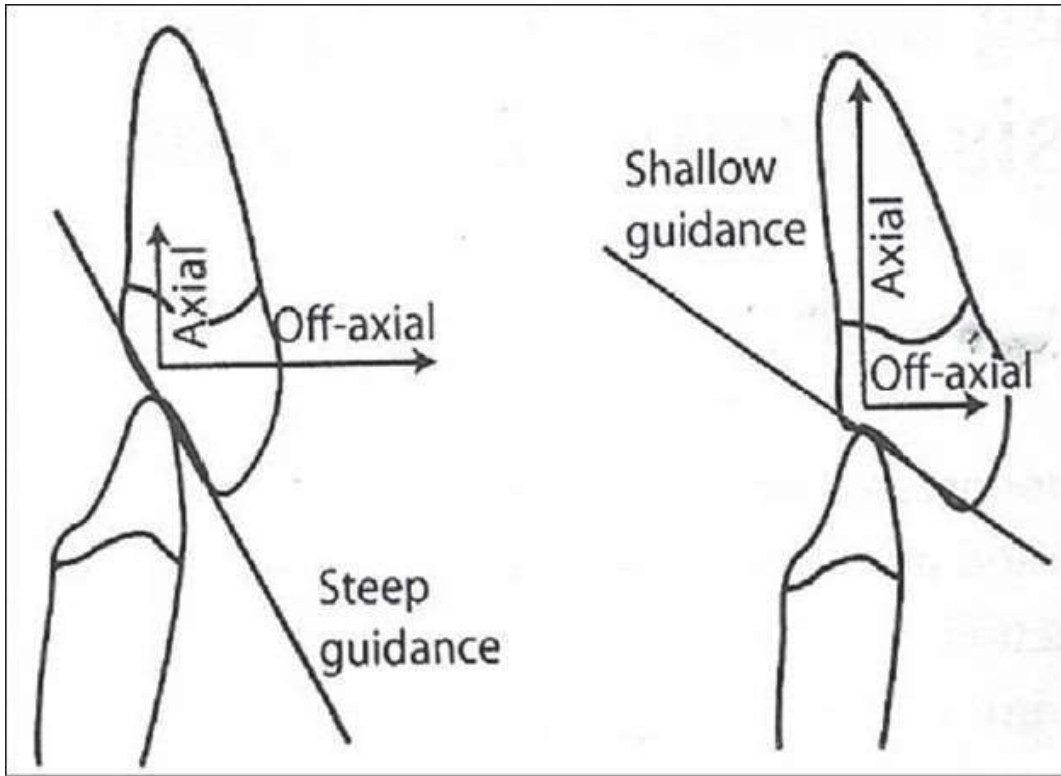


Overbite vs. Overjet

Overbite (vertical overlap): It is the vertical extension of the maxillary anterior teeth over the mandibular teeth in a vertical direction, when the opposing posterior teeth are in contact in centric occlusion.

Overjet (horizontal overlap): It is the projection maxillary anterior teeth beyond their antagonist in a horizontal direction.





The incisal guide angle denotes the angle by the palatal surface of the maxillary anteriors against the horizontal plane.

The incisal guidance can be raised by altering the labial proclination, overjet, and overbite of the maxillary anteriors.

Arrangement of mandibular anterior teeth

2- Mandibular lateral incisor

In frontal view

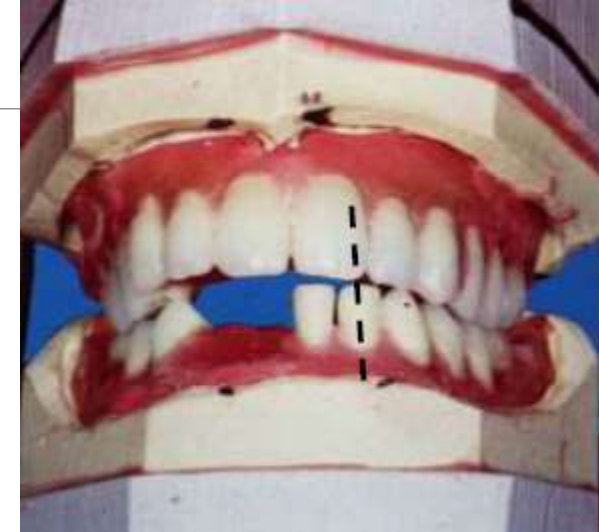
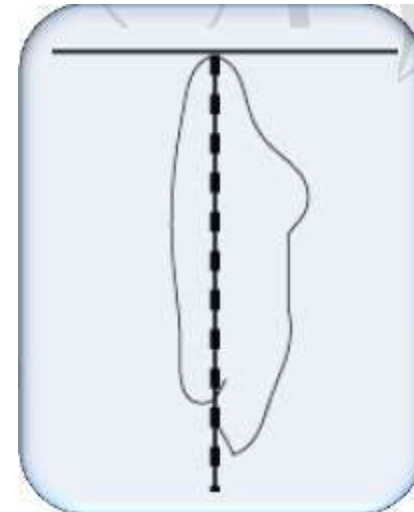
- The long axis is slightly distal inclined to the occlusal plane.

In sagittal view

- The lateral incisor is fairly upright, and the incisal edge should be **1 mm** of horizontal and vertical overlap in respect with the maxillary central incisor.

In horizontal view

- The distal edge rotated lingually to have the arch curvature.



Arrangement of mandibular anterior teeth

3- Mandibular canine

In frontal view

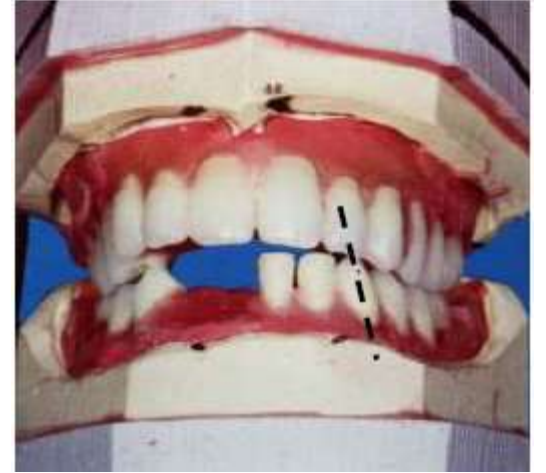
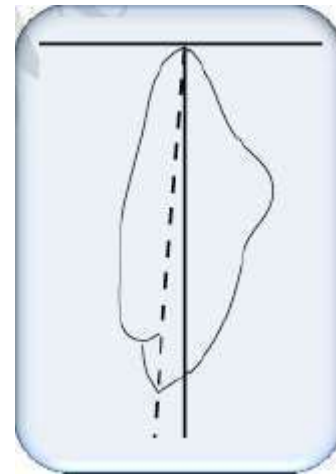
- The long axis should have slight distal inclination, and the tip of the mandibular canine should be placed in the embrasure between maxillary lateral and canine.

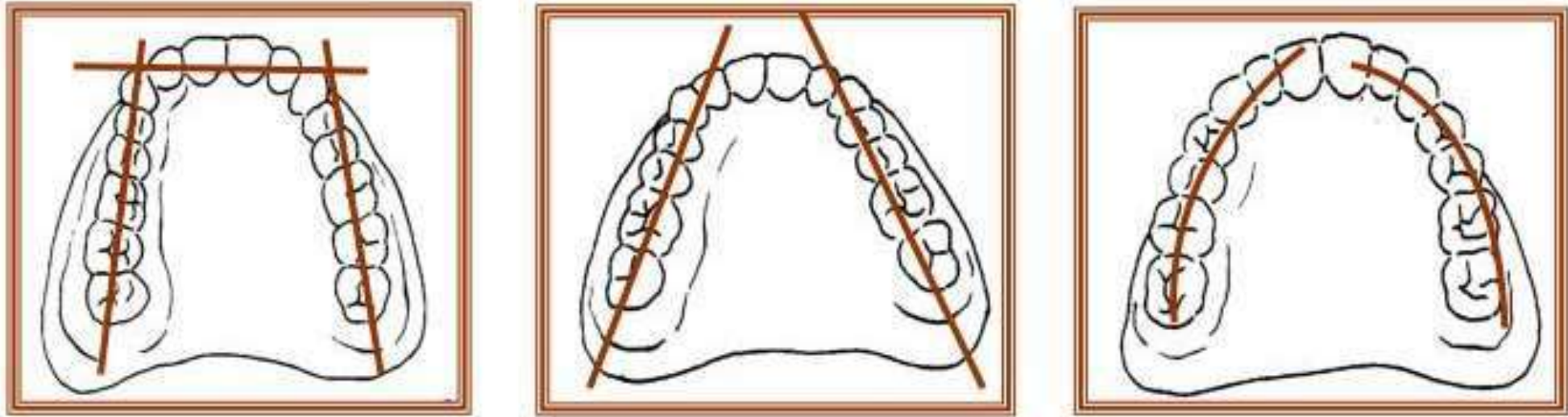
In sagittal view

- The long axis should have slight lingual inclination.

In horizontal view

- The cervical area is prominent.





- The arrangement of anterior teeth should follow the form of the arch which is ovoid, tapered, or square.
- In complete denture fabrication the mandibular incisors should not touch the maxillary incisors in centric relation (the incisal guidance angle as low as possible) to allow free movement of the teeth in eccentric jaw movement without compromising the denture stability.

Arrangement of posterior teeth

Importance of arrangement of posterior teeth (Significance)

Correct placement of posterior teeth is important for the retention and stability of both dentures.



Prior to arrangement of the posterior teeth, we must understand some of the definitions which are related to posterior teeth arrangement

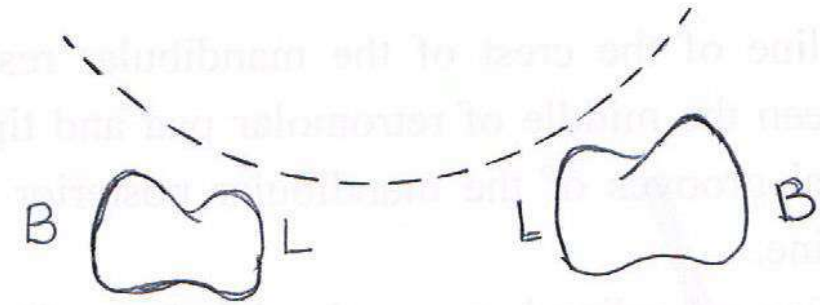
Curve of Spee:

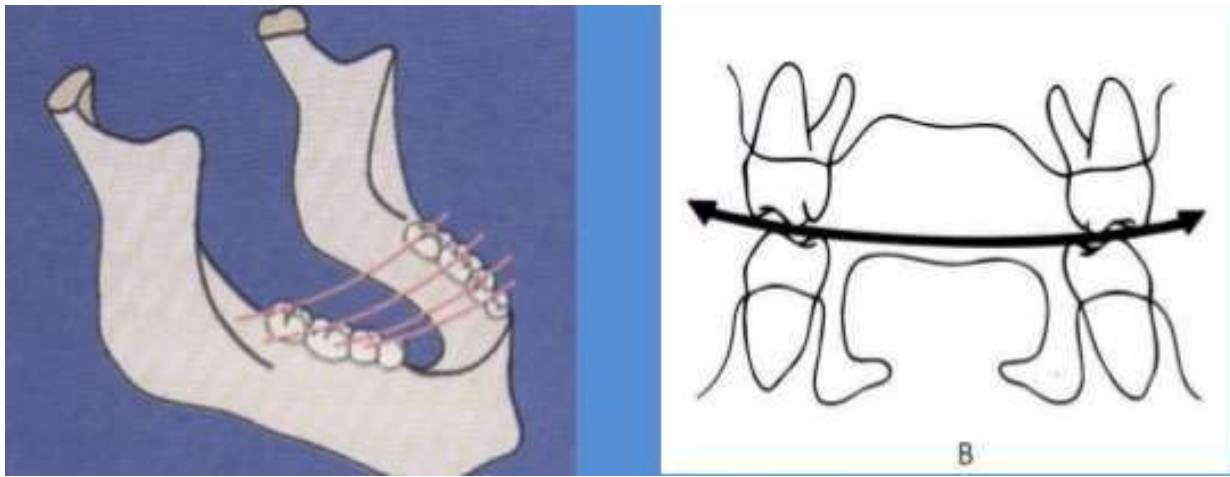
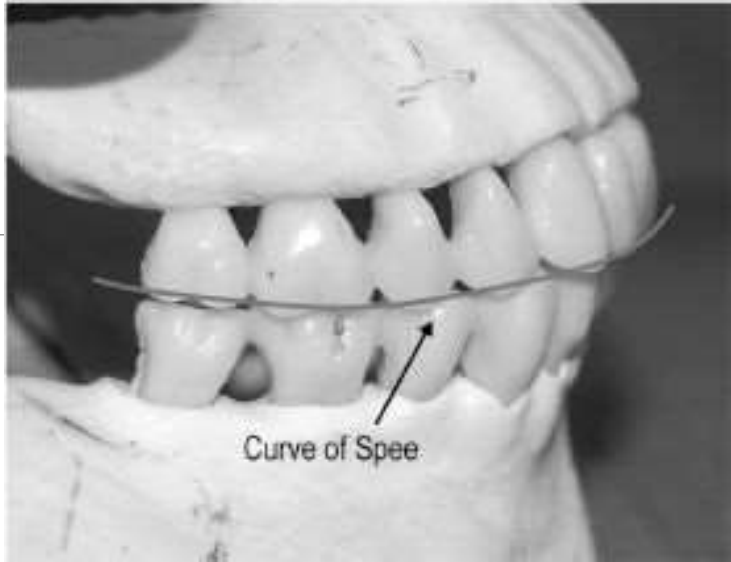
It is an anatomical curvature of the occlusal alignment of teeth, beginning at the tip of mandibular canine and following the buccal cusps of the natural premolars and molars, continuing to the anterior border of the ramus of mandible.



Curve of Wilson:

It is a curve extends mediolaterally from one side of the arch to the other si





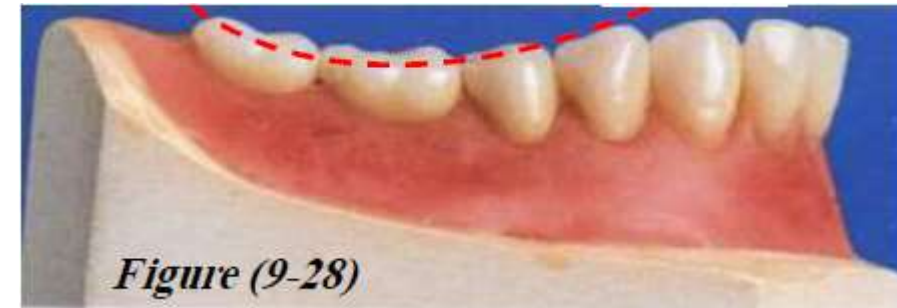
Prior to arrangement of the posterior teeth, we must understand some of the definitions which are related to posterior teeth arrangement

Compensating curve:

It is the anteroposterior, and lateral curvature in the alignment of the occluding surfaces and incisal edges of artificial teeth, which is used to develop balanced occlusion. (It compensates the opening that occurs during forward and lateral movement of the mandible).

Christensen's phenomenon:

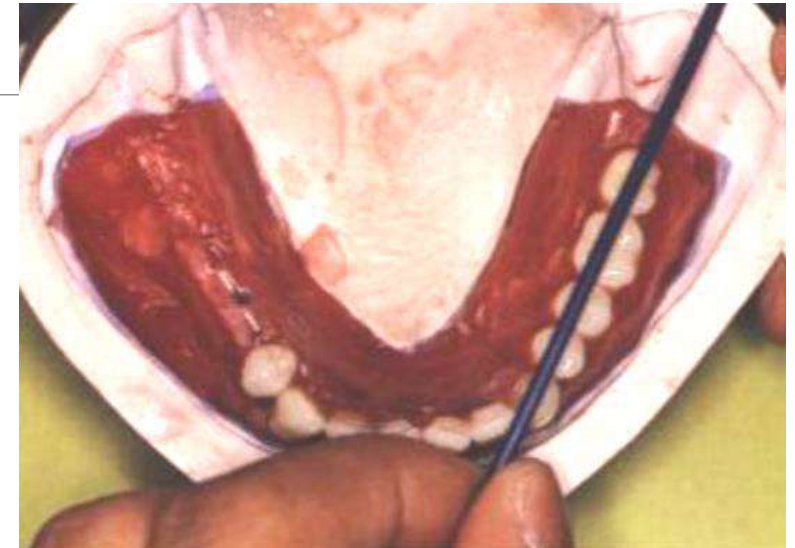
This is the posterior opening of the dental arches or occlusion rims during forward movement of the mandible. To compensate for the posterior opening during forward or protrusive movement we incorporate the compensating curve.



Arrangement of mandibular posterior teeth

The mandibular posterior teeth will be before the maxillary posterior, because there are more anatomical landmarks to locate the guidelines which are:

1. The line of the crest of the mandibular residual ridge, which extends between the middle of retromolar pad and tip of mandibular canine, the central grooves of the mandibular posterior teeth should coincide with this line.
2. The line extending between the tip of mandibular canine and upper 2/3 of retromolar pad will determine the height of mandibular posterior teeth.

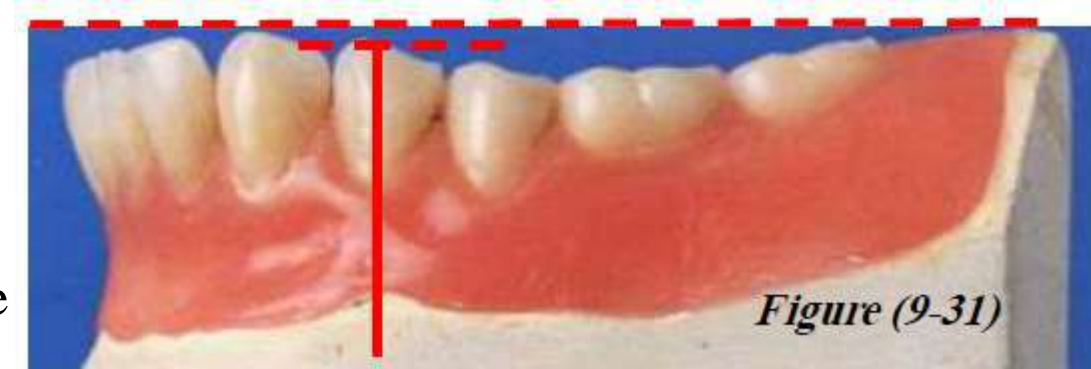


Arrangement of mandibular posterior teeth

1- Mandibular first premolar

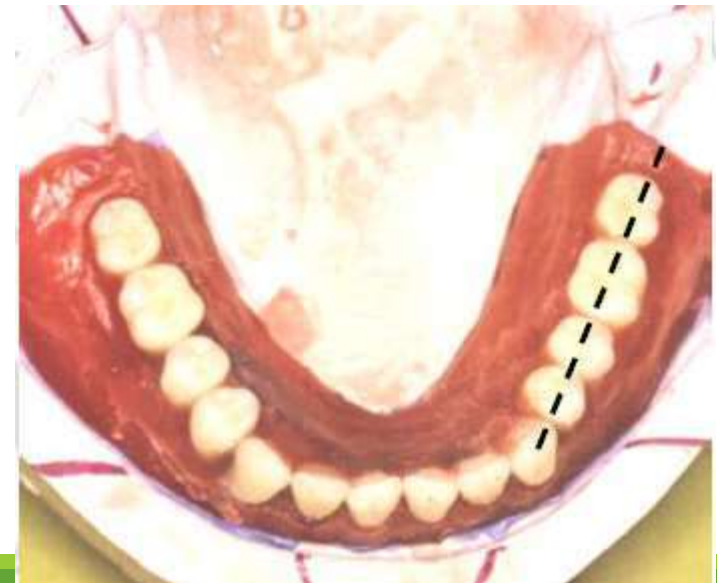
In buccal view

- The tooth should be set perpendicular to the occlusal plane.
- The tip of its buccal cusp should be **1 mm** below the line is planed from the tip of canine and the 2/3 of the vertical height of retromolar pad.



In horizontal view

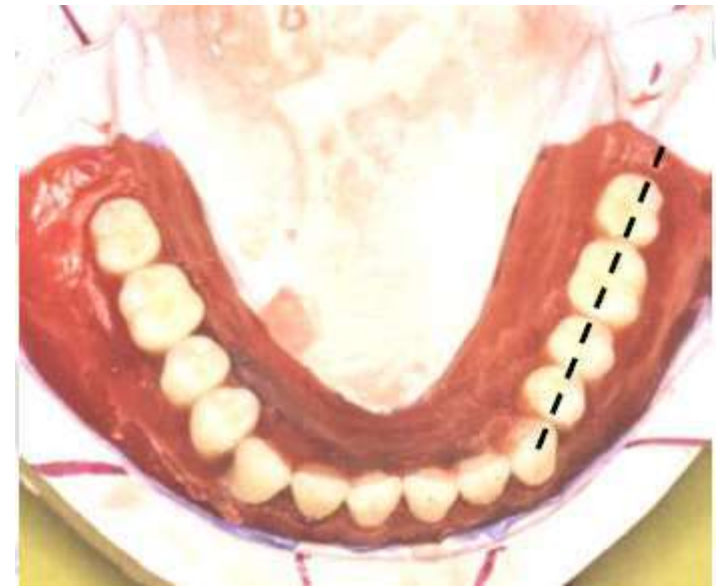
- The central groove should be over the crest of residual ridge.



Arrangement of mandibular posterior teeth

2- Mandibular second premolar

- It should be arranged in the same way as mandibular first premolar.

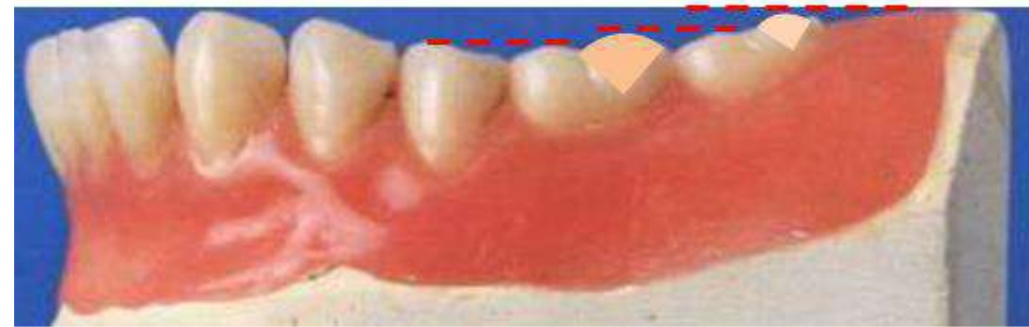


Arrangement of mandibular posterior teeth

3- Mandibular first molar

In buccal view

- The mesiobuccal cusp should be *1 mm* below the line, and the distobuccal cusp should be $\frac{1}{2}$ *mm* below the line.



In horizontal view

- The central groove should coincide with the crest of the residual ridge.



Arrangement of mandibular posterior teeth

4- Mandibular second molar

In buccal view

The mesiobuccal cusp is $\frac{1}{2}$ *mm* below the line, and the distobuccal cusp should touch the line.



In horizontal view

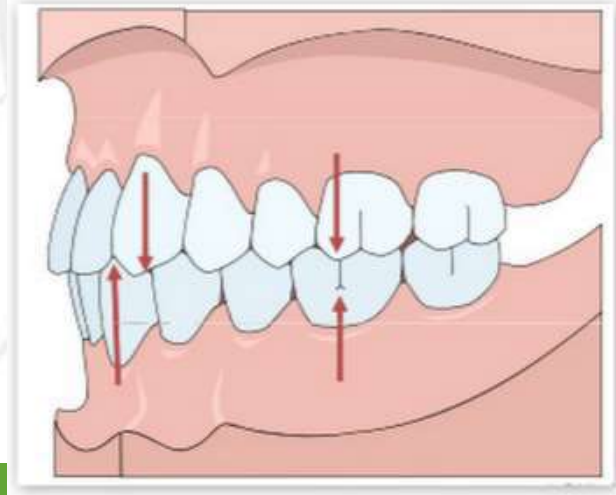
The central groove should coincide with the crest of the residual ridge.



Arrangement of maxillary posterior teeth

1- maxillary first molar

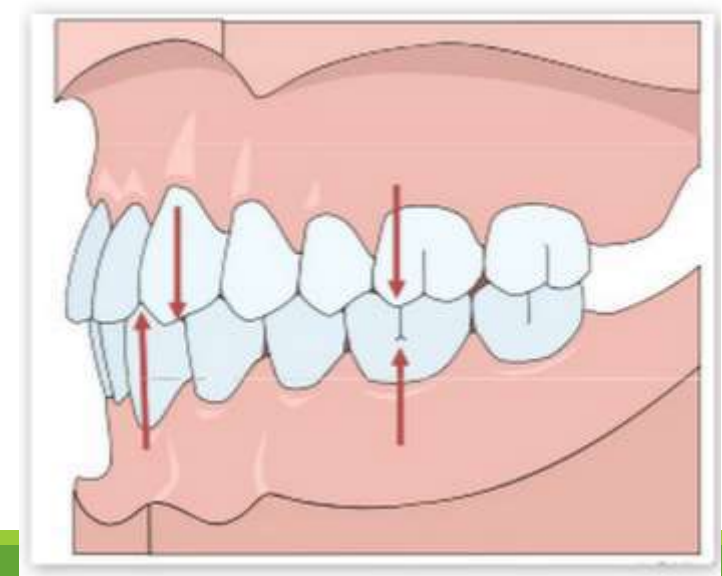
In order to get normal molar relation, the mesiobuccal cusp of maxillary first molar should rest in the buccal groove of the mandibular first molar, and the mesiopalatal cusp should seat into the central fossa of mandibular first molar.



Arrangement of maxillary posterior teeth

2- maxillary second premolar

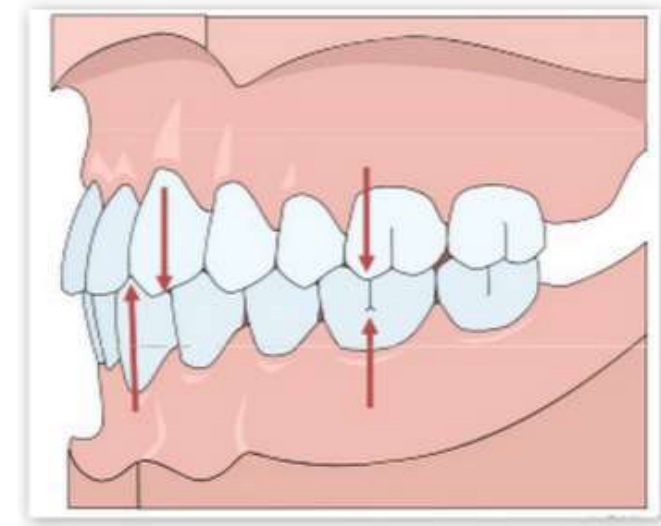
The palatal cusp should seat into the embrasure formed between the mandibular second premolar and first molar.



Arrangement of maxillary posterior teeth

3- maxillary first premolar

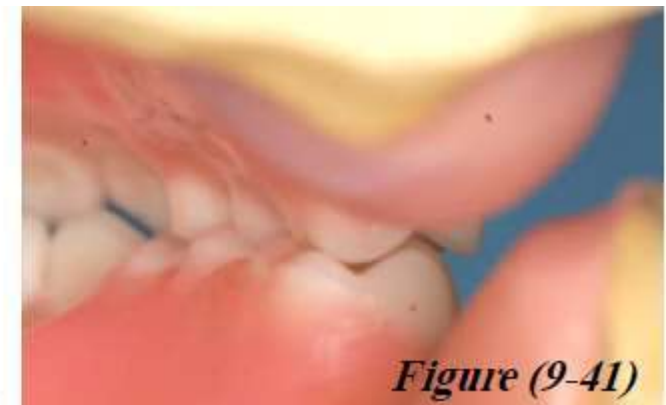
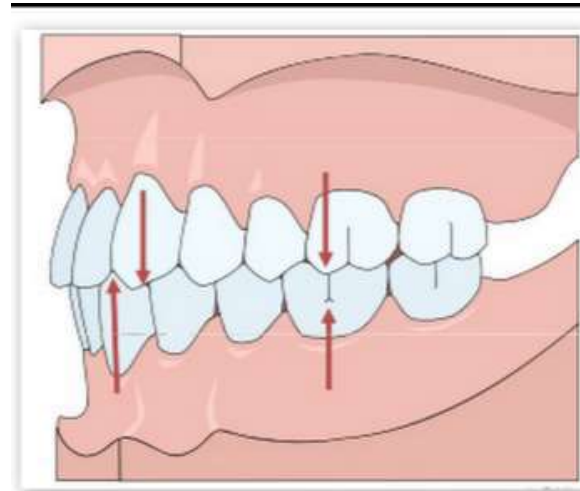
The palatal cusp should seat into the embrasure between the mandibular first and second premolars.



Arrangement of maxillary posterior teeth

4- maxillary second molar

The mesiobuccal cusp should rest in the buccal groove of mandibular second molar, and the mesiopalatal cusp should seat into the central fossa of the mandibular second molar





- ✓ Maxillary teeth overlap the mandibular teeth.
- ✓ Each tooth in both arches is opposed by two teeth, except the mandibular central incisor and the maxillary second molar.
- ✓ This arrangement of posterior teeth will provide maximum contact between the occlusal surfaces of mandibular and maxillary teeth in centric occlusion.

Common errors in arrangement of teeth

1. Setting mandibular anterior teeth too forward in order to meet maxillary teeth.
2. Failure to make the canine the turning point of the arch.
3. Setting the mandibular first premolars to the buccal side of the canines.
4. Failure to establish the occlusal plane at the proper level and inclination.
5. Establishing the occlusal plane by an arbitrary line on the face. When it is too low or too high, it is not look natural and cause difficulty in the mastication.



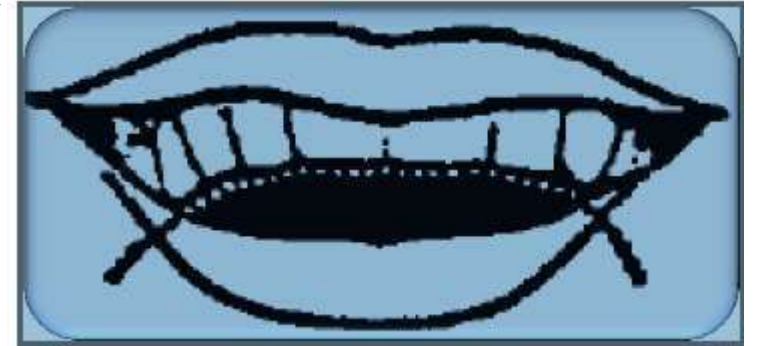
Common errors in arrangement of teeth

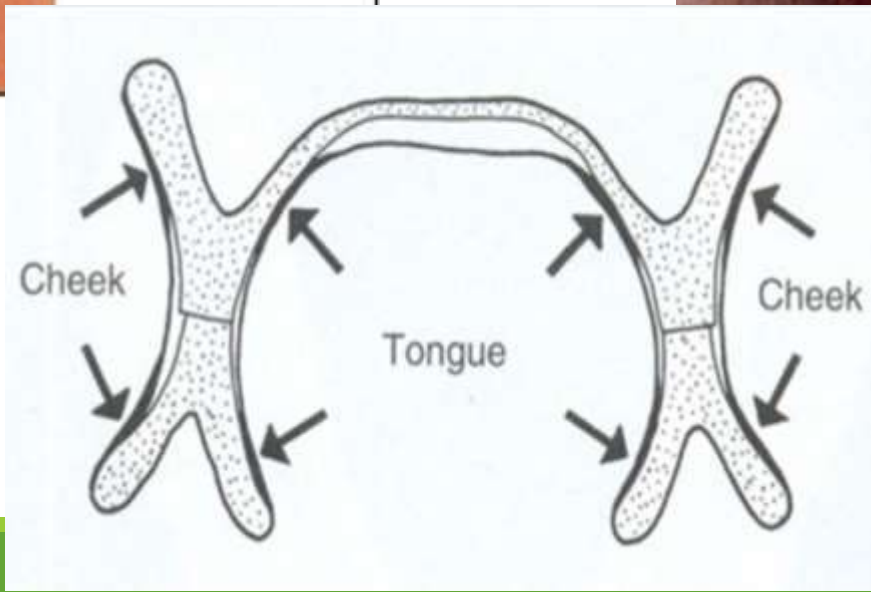
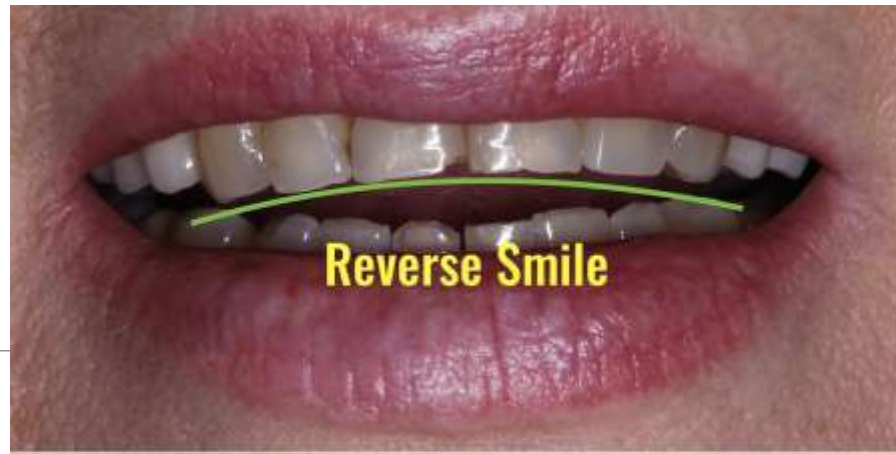
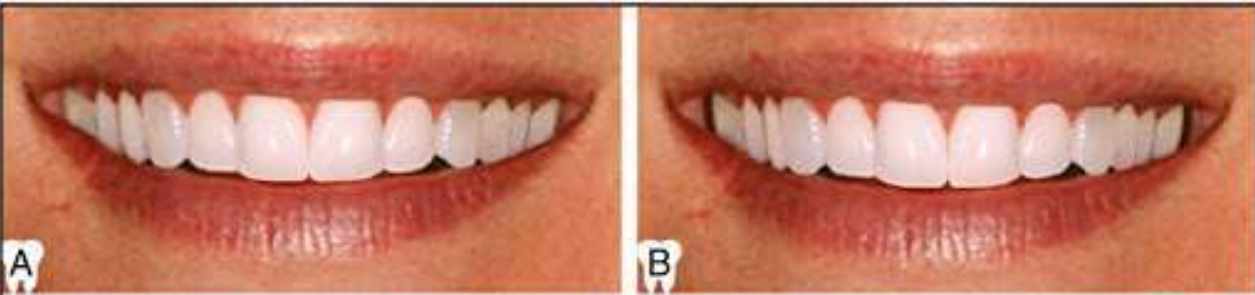
6. The posterior teeth should not appear longer than those teeth when the patient smile, the patient will have (reverse smile).

7. Lack of lingual rotation of anterior teeth to give a narrow effect. Tooth arranged too wide posteriorly, appear like many teeth in the mouth.

8. Setting the mandibular posterior teeth too far to the lingual side in the second molar region which cause tongue interference and mandibular denture displacement.

9. Teeth arranged too far toward the tongue or palate, there will be large dark space between the cheek and teeth when patient talk or smile (large dark buccal corridors).





Thank
you





Occlusion

Bushra Mohammed Ali Al-Ameen

B,D,S,. M,Sc.(Pros)



Occlusion

Occlusion:

- Any contact between teeth of opposing dental arches; usually, referring to contact between the occlusal surface.

Occlusion of complete denture:

- The static relationship between the incising or masticatory surfaces of the maxillary or mandibular teeth or tooth.



Occlusion

- ✓ In complete denture reconstruction, it is essential that the maximum intercuspation is in harmony with centric relation even though this condition does not always occur in natural dentition, so the dentist is responsible to record centric relation, and maintain this relationship in the laboratory procedure during mounting and arrangement of teeth in centric occlusion.
- ✓ In centric occlusion, the facial cusps of the mandibular teeth contact the central fossae of maxillary teeth, while the lingual cusps of maxillary teeth fit into the central fossae of the mandibular teeth. Note how the facial cusps of the maxillary teeth extend beyond the facial surfaces of the mandibular teeth. This overlap prevents cheek-biting when the dentures are completed.

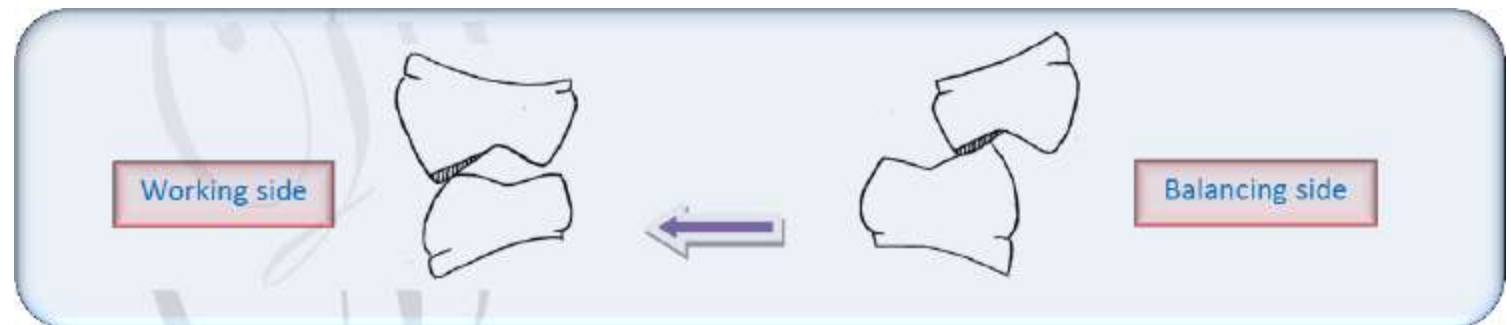
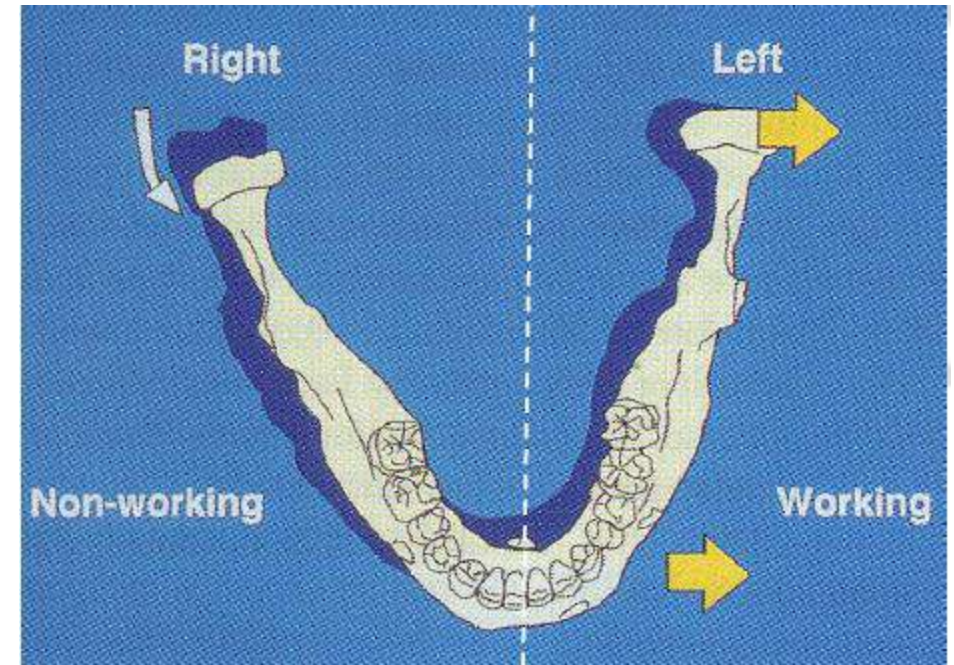


Concepts of occlusion

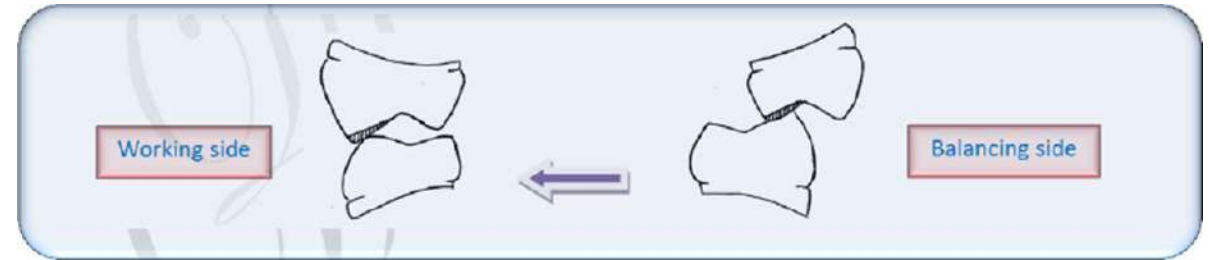
- **Concepts of occlusion :**
- **Balanced occlusion.**
- **Monoplane occlusion.**
- **Lingualized occlusion**

Balanced occlusion

- It is the simultaneous contacting of the maxillary and mandibular teeth on the right and left and in the anterior and posterior occlusal areas (working, balancing, and protrusive).
- Balanced occlusion is done to obtain stability of denture during parafunctional movement.
- Balanced occlusion is achieved by using of anatomical teeth and adjustable articulators.



Balanced occlusion

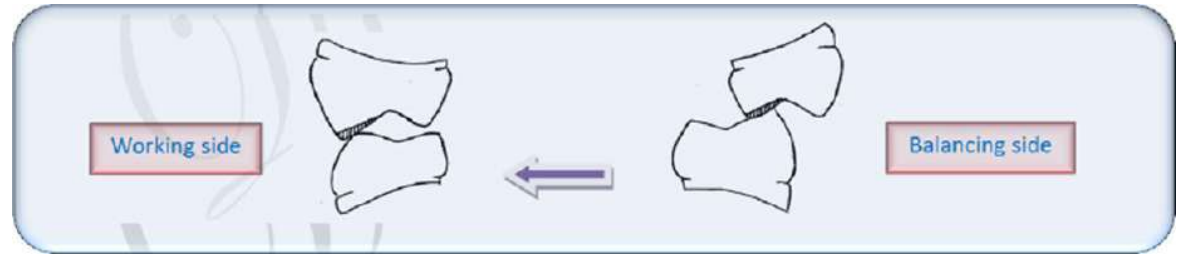


Working side:

- It is the side toward which the mandible moves in a lateral excursion.
- Working or functional occlusion occurs when the facial cusps of the maxillary teeth meet the facial cusps of the mandibular teeth and the lingual cusps of the maxillary teeth meet the lingual cusps of the mandibular teeth.
- The relationship is not cusp tip to cusp tip, but cusp tip into cusp valley with each maxillary cusp distal to the corresponding mandibular cusp.
- Working occlusion enable a person to hold and crush food.



Balanced occlusion



Balancing side (non-working side):

- That side of the mandible that moves toward the median line in a lateral excursion (the side opposite the working side).
- Balancing occlusion occurs simultaneously on the opposite side from working occlusion.
- Balancing occlusion functions to maintain the dentures in position during lateral excursive movements.
- In balancing occlusion, the lingual cusps of maxillary teeth contact the facial cusps of the mandibular teeth.
- In many techniques, balancing contacts are necessary only on the second molars, to decrease the cuspal interference.



Balanced occlusion

Protrusive occlusion :

- It is the relation acquired by the mandible when it moves in protrusive direction from centric position.
- The protrusive direction is downward and forward.
- When the condyles travel in this direction they bring the anterior teeth into a position favorable for incision.
- In protrusive balance, the distal inclines of the maxillary buccal cusps contact the mesial inclines of the mandibular buccal cusps.
- Protrusive balancing contact may occur on lingual cusps, this help to maintain denture stability.



Importance of balanced occlusion

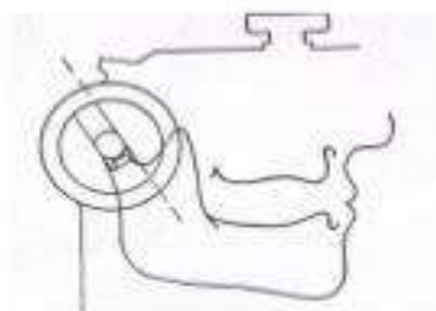
- 1) It avoids displacement of denture and help in its stability during functional and non-functional movements.
- 2) It helps in earlier repositioning of denture which becomes displaced during mastication.
- 3) It minimize period required for adaptation of patient to the denture due to its stability.
- 4) Prevent trauma to the supporting tissue since the pressure is equally distributed on the teeth.

Factors of balanced occlusion (factors of occlusion in complete denture)

- **1-** Inclination of condylar guidance.
- **2-** Inclination of incisal guidance.
- **3-** Cusp height.
- **4-** Orientation of the occlusal plane.
- **5-** Prominence of the compensating curve.

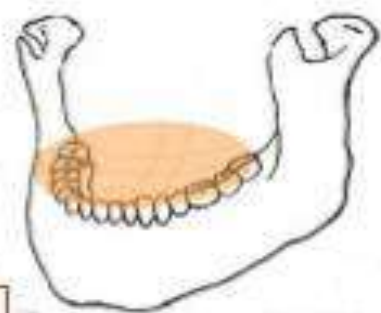
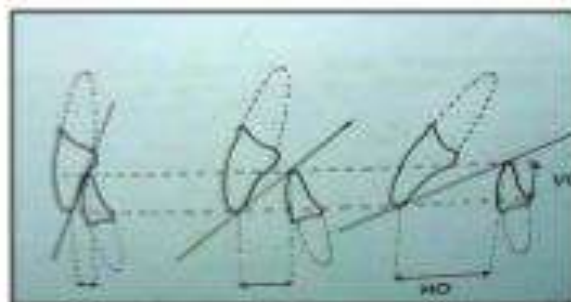
FACTORS AFFECTING

The five basic factors that determine the balance of an occlusion are:



1) Inclination of condylar guidance.

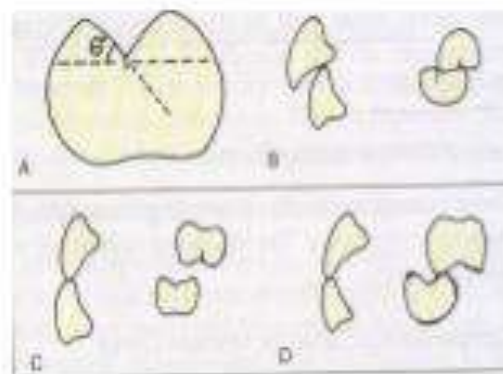
2) Inclination of Incisal guidance



3) plane of occlusion



4) Compensating curves



5) Cusp inclination

Advantages of balanced occlusion

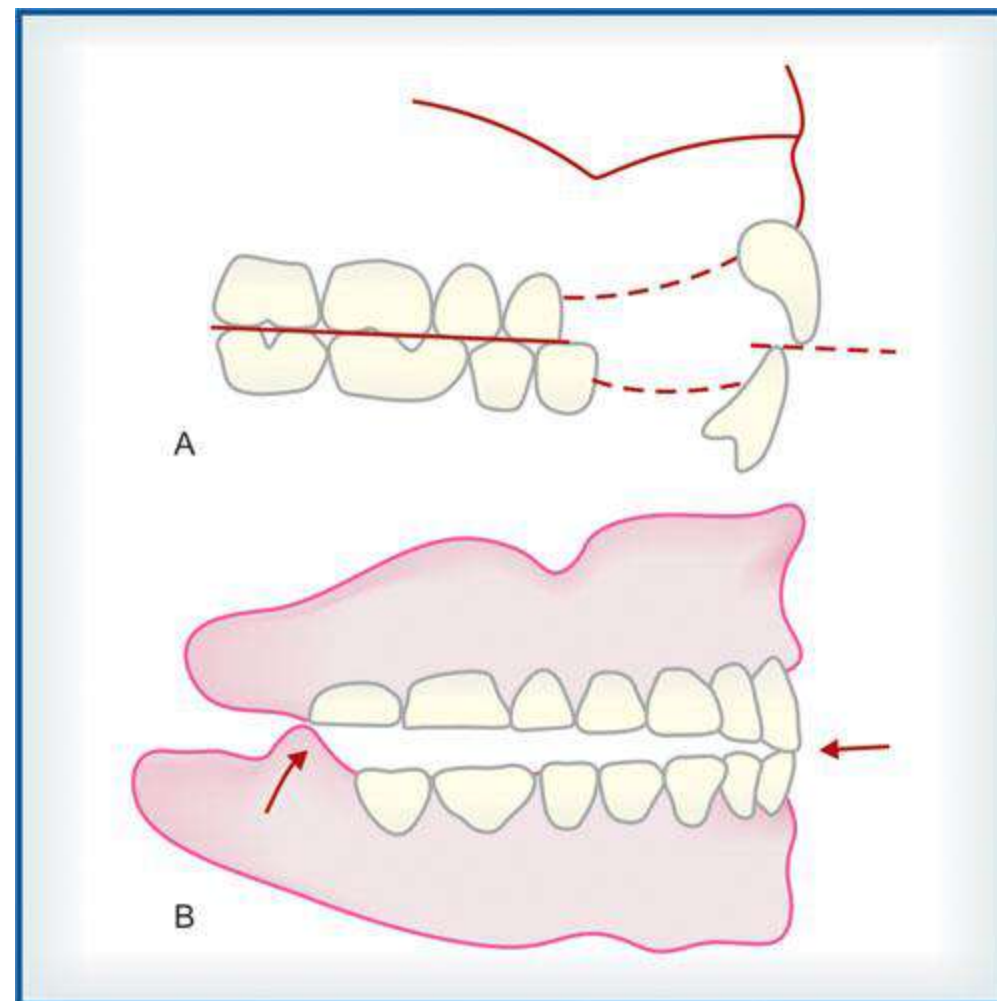
1. Penetration of food easily (good chewing efficiency).
2. Resistance to denture rotation (cusp interdigitation).
3. Better esthetic.
4. Act as guide for proper jaw closure.

Disadvantages of balanced occlusion

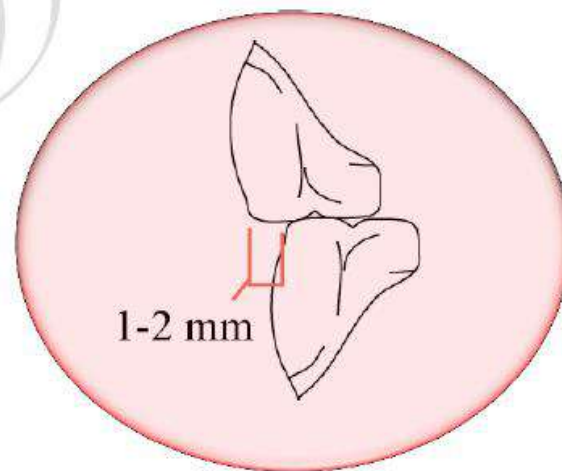
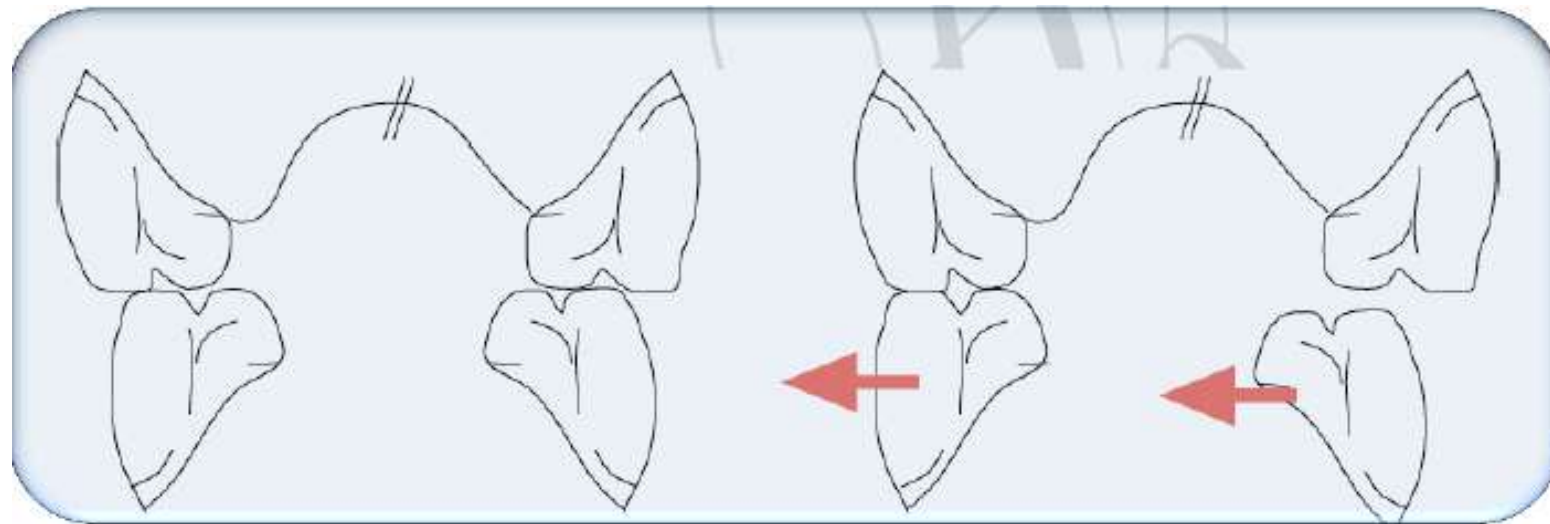
1. When there is occlusion disharmony during setting, difficult to correct it by adjusting.
2. Stable bases and precise jaw closure is required.
3. Increase horizontal forces.
4. Difficult to adapt in jaw relation other than skeletal class I.
5. Need adjustable articulators.

Monoplane (neutrocentric) occlusion:

- Monoplane occlusion is characterized by:
 - I. Occlusal contacts of maxillary and mandibular teeth initially in maximum intercuspation.
 - II. The disocclusion of posterior teeth as result of their arrangement in a single plane.
 - III. The contact of the anterior teeth during movement of the mandible (teeth are set in a flat plane with no vertical overlap of the anterior teeth).
- Protrusive balance compensation in monoplane denture occlusions needs a second molar slant (*ramp*).
- Monoplane occlusion is *achieved* by use of cusplless teeth, to obtain occlusal plane flat and parallel to the upper and lower residual ridges.



Monoplane (neutrocentric) occlusion:



Advantages of monoplaner occlusion:

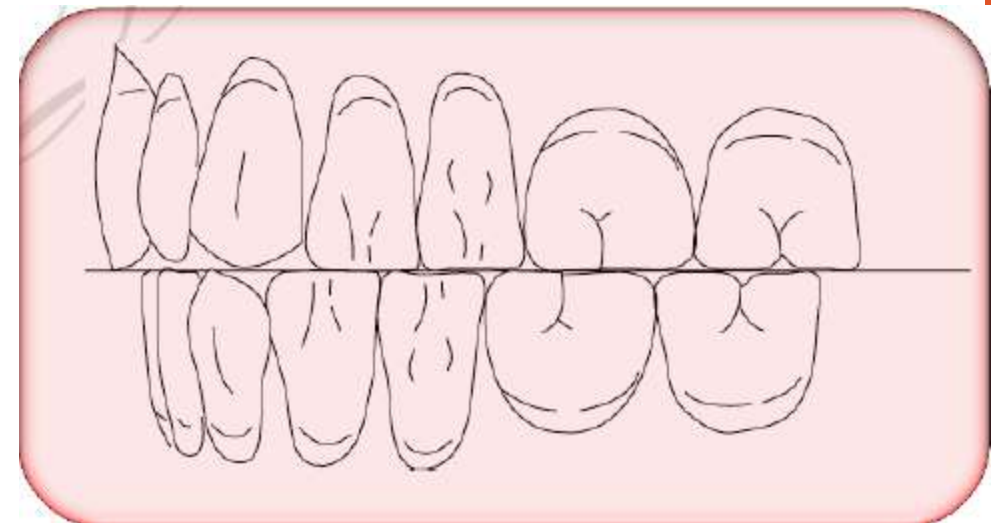
1. More denture stability due to absence of lateral force during vertical chewing, less resistance to lateral force and parafunctional movements.
2. Freedom in centric (mandible is not lock in centric by cuspal interdigitation).
3. Easier to use in skeletal class II and class III.
4. Simple articulator may be used.
5. Less damaging effect in uncontrolled neuromuscular movement.
6. More comfortable.

Disadvantages of monoplanar occlusion:

1. Decrease chewing efficiency (no cusp), increased by a metal insert in posterior teeth as cutting tool.
2. Poor esthetic, in premolar, absence of cusps; in anterior teeth there is edge to edge no overbite, no overjet due to absence of cusps in posterior teeth. This overcomes by using ramp (cusped posterior tooth) to have contact in protrusive movements that permits to set the anterior teeth in overbite and overjet.

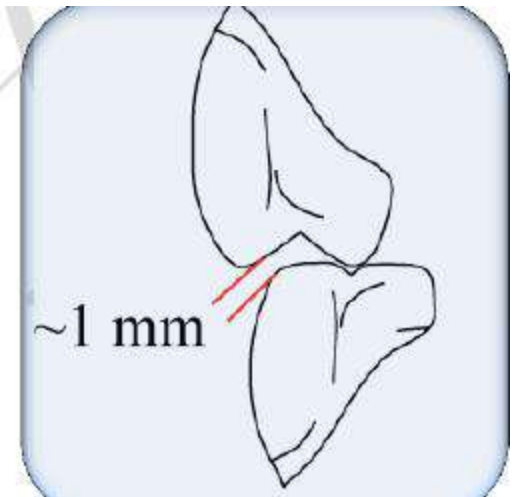
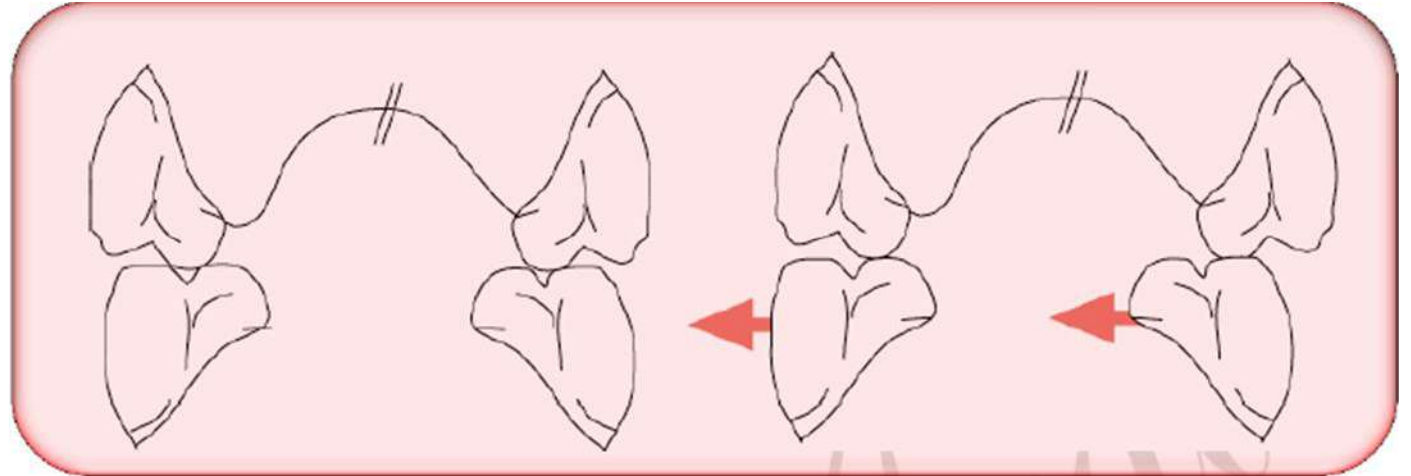
Used in :

This concept may be used in aged people with flat ridge and uncoordinated mandibular movements.



Lingualized occlusion:

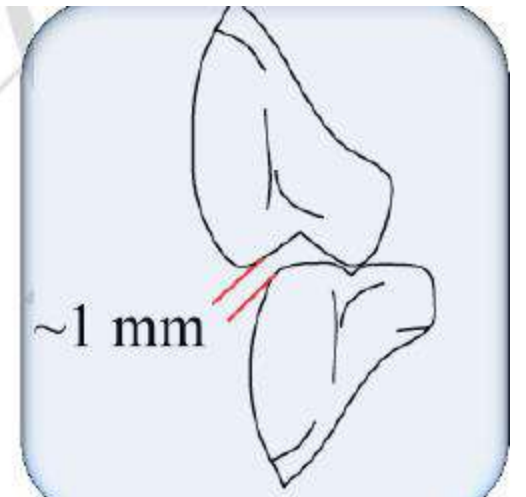
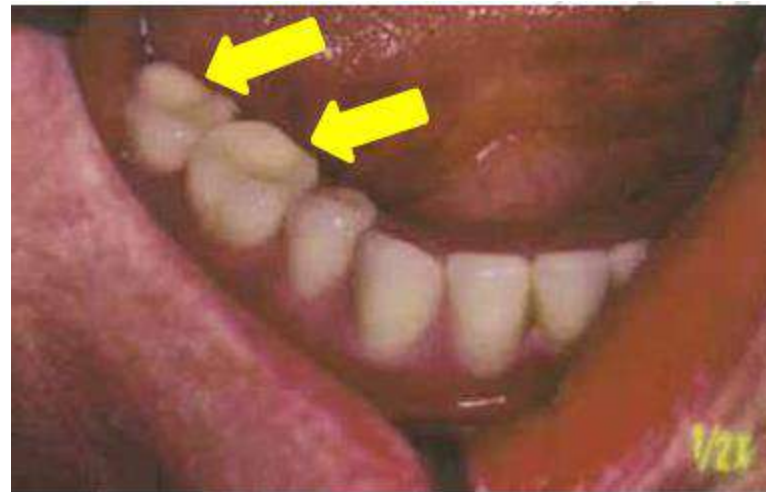
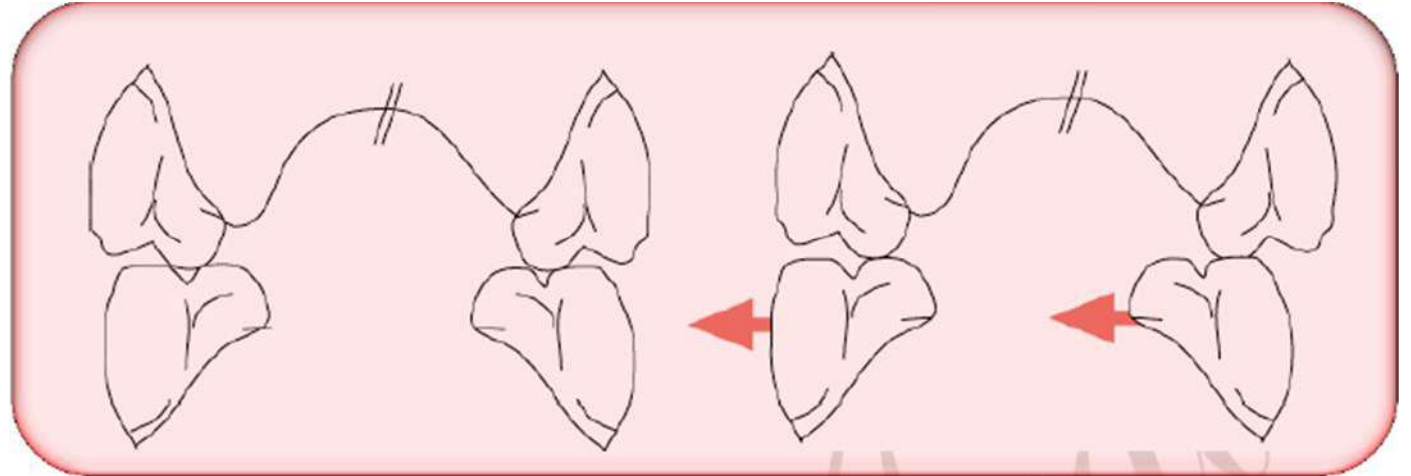
- The maxillary cusps (prominent lingual cusp) are the main functional occlusal elements.
- These may oppose mandibular 0° or shallow cusp teeth in balanced or nonbalanced patterns depending on the needs of the patient.



Lingualized occlusion:

Lingualized occlusion is *achieved* by using anatomical teeth or semi-anatomical teeth with some **modifications**:

- ❖ Reducing and flattening the cusps and cusp slope.
- ❖ Setting the posterior upper teeth so that the lingual cusps articulate in the middle of the fossae and the buccal cusps is out of occlusion (slight buccal tilt of upper posterior teeth).



Advantages of lingualized occlusion:

1. The presence of a cusped tooth in the maxillary premolar and first molar regions looks more natural when compared to a 0° tooth.
 2. The use of occlusal curves for purpose of balance allows for incisal overlap of the anterior teeth. This is more similar to the natural tooth overlap than can be provided by non-balanced occlusal schemes without violating the mechanics of complete denture function.
 3. The use of maxillary lingual cusps could be expected to centralize the occlusal forces and reduce the frictional resistance of flat teeth sliding over one another.
 4. Better stability can be gained during parafunctional movements.
- ❖ This concept fulfill the most of the advantages of anatomical and monoplane concepts.

A dense field of small, bright orange flowers, possibly marigolds, stretches across the entire frame. The flowers are in various stages of bloom, creating a textured, vibrant background. In the center of the image, the words "THANK YOU" are written in a large, bold, white, sans-serif font. The text is slightly shadowed, giving it a three-dimensional appearance as if it's floating above or resting on the flowers.

THANK YOU



Waxing And Carving

Bushra Mohammed Ali Al-Ameen

B,D,S,. M,Sc.(Pros)



Waxing

- It is the contouring of the wax base of trial denture into the desired form.
- The polished surface, which will be in contact with the oral tissues developed by contouring the wax.



The form of polished surface of a denture influences its

1. Retention and stability of the denture.
2. Esthetic values of the denture: the esthetic of complete denture is not related to arrangement of teeth alone, we attempt to simulate natural anatomy of patient mouth which include size, shape, and contour of missing oral tissues during construction of complete upper and lower dentures.



There are three principal surfaces concerned in functional stability of the denture

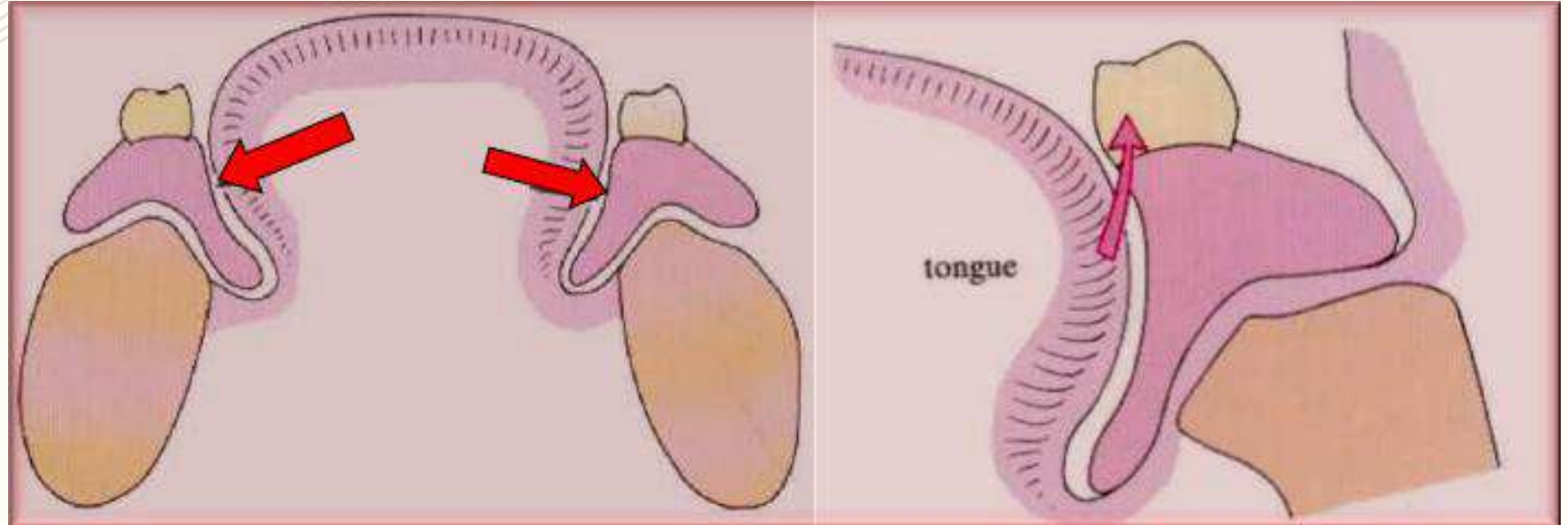
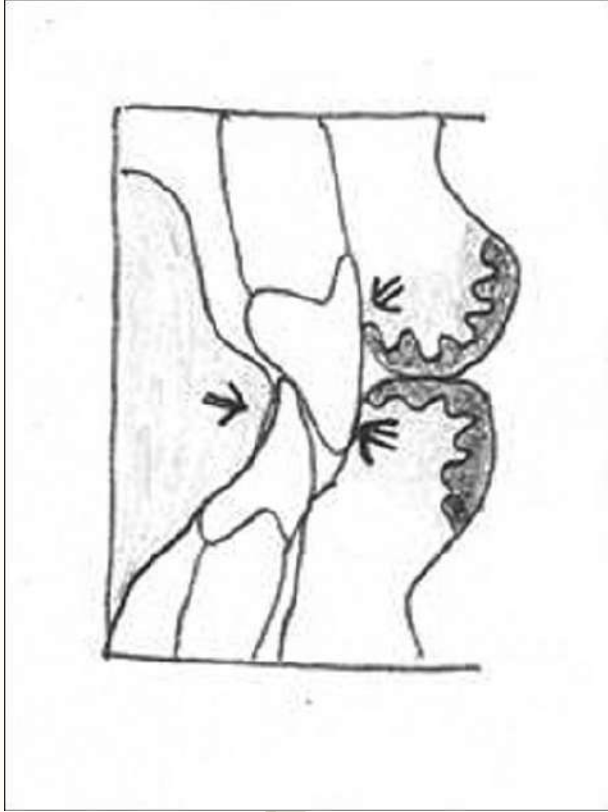
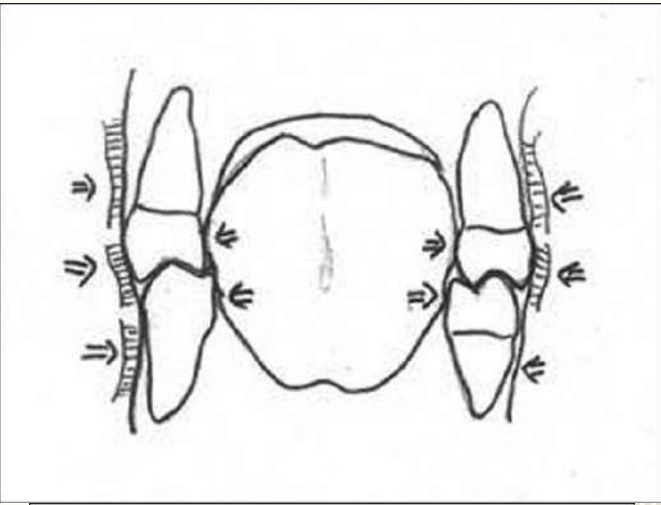
1. The basal or impression surface.
2. The leverage position and occlusal surfaces of the teeth.
3. The location and form of the polished surfaces.

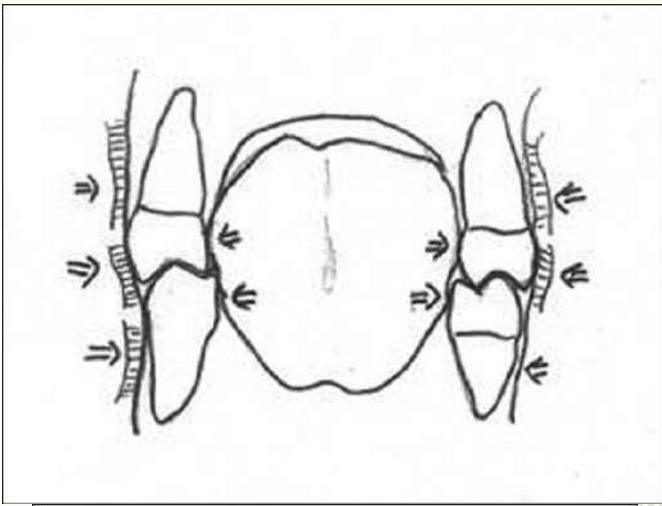


The polished surface is determined by

1. The width of the border of the denture.
2. The buccolingual position of the teeth.
3. The fullness given to the wax to obtain convexity or concavity both facially and lingually.

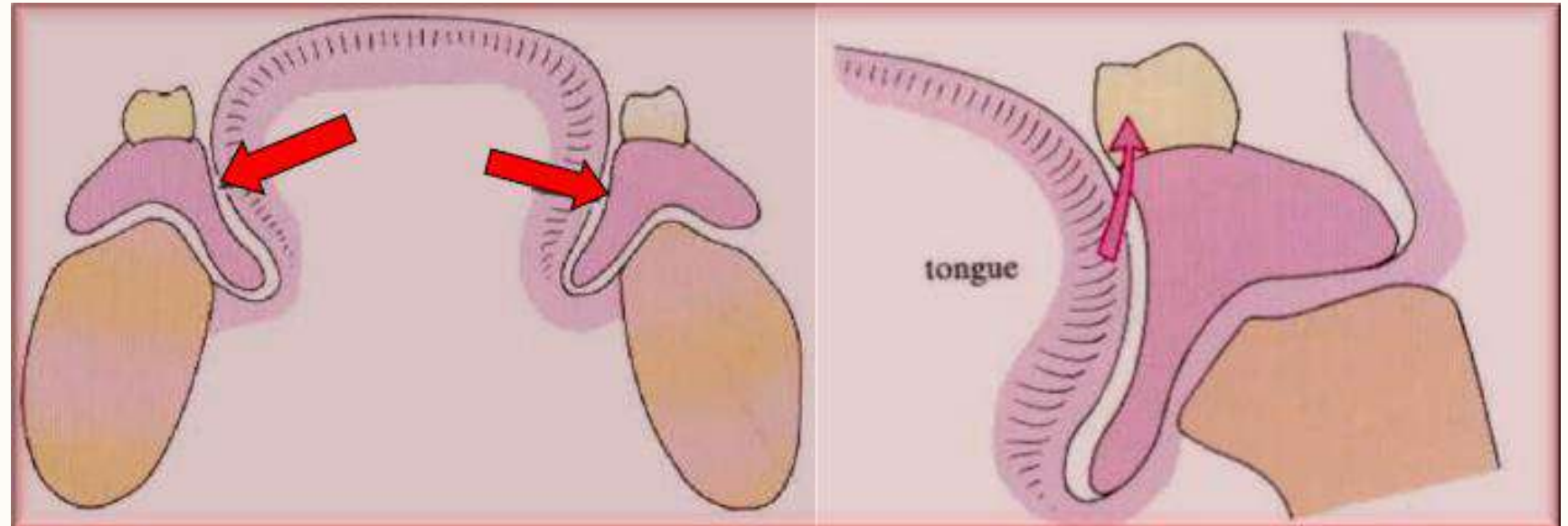
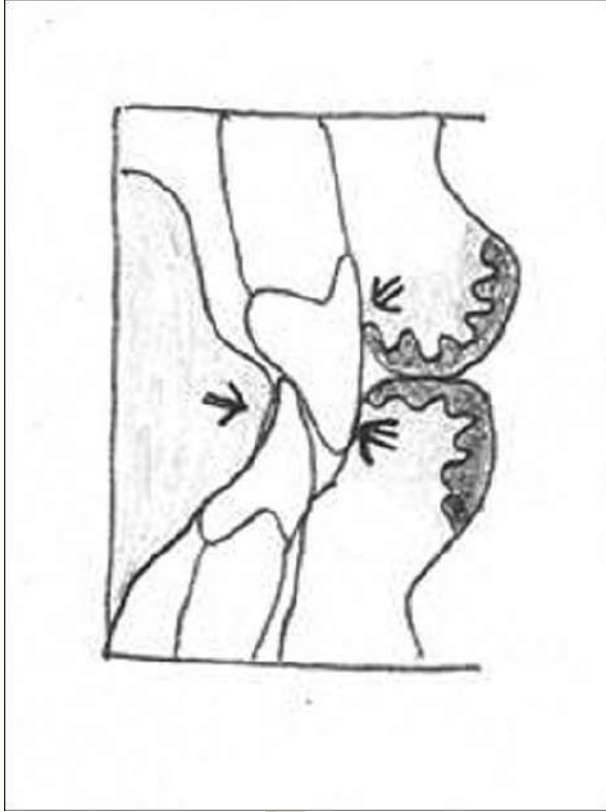
- The action of the muscles of the cheek and tongue, exerts horizontal force in the direction of the occlusal plane by the tongue and cheek can act either a placing or displacing agent, depending on the shape of the polished surface.

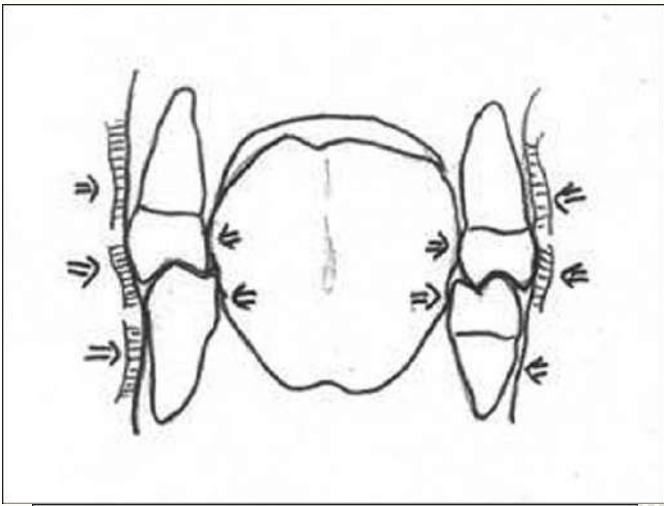




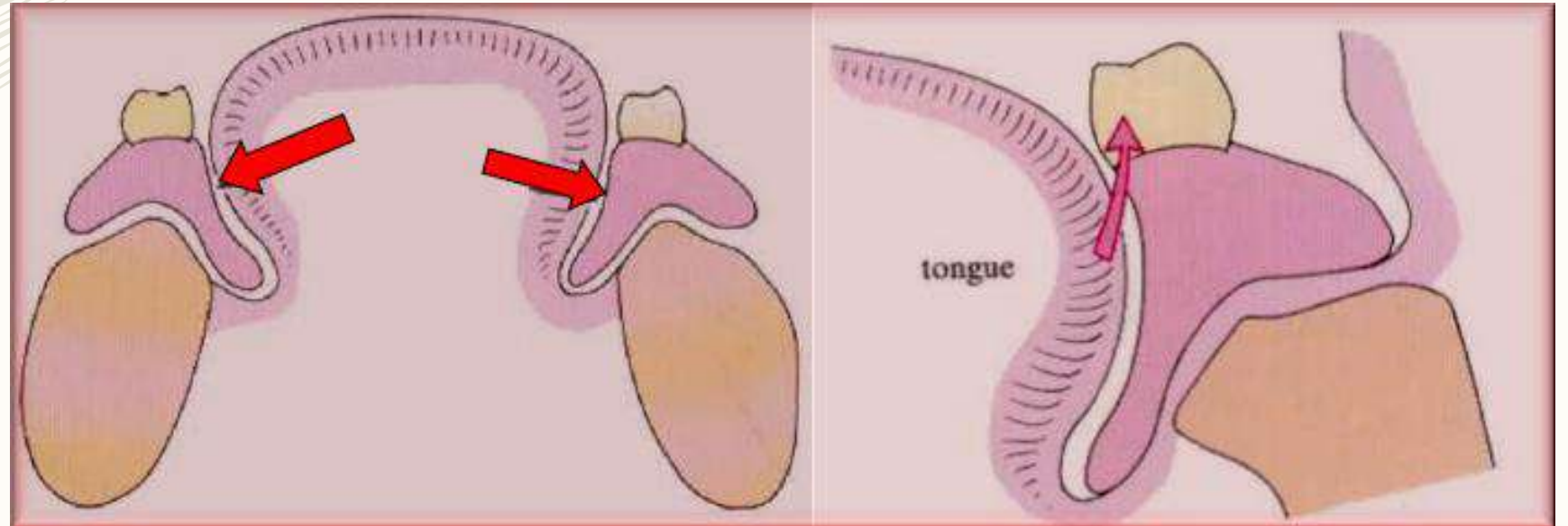
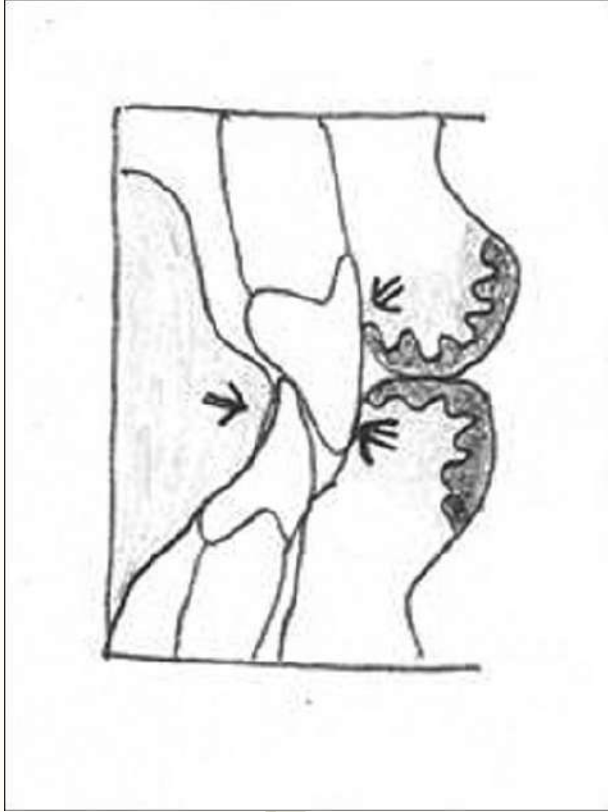
– When the lingual and buccal borders of a mandibular denture are being shaped, they can be made concave so that the tongue and cheek will grip and tend to seat the denture.

– In the opposite case where the lingual and the buccal surfaces are made convex by waxing, the forces resulting from pressures of the tongue and cheeks will tend to unseat the denture.

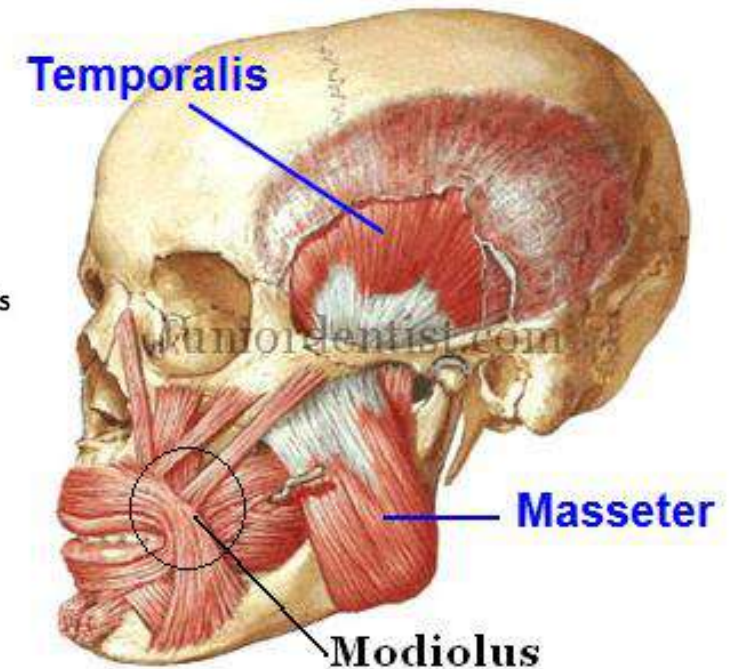
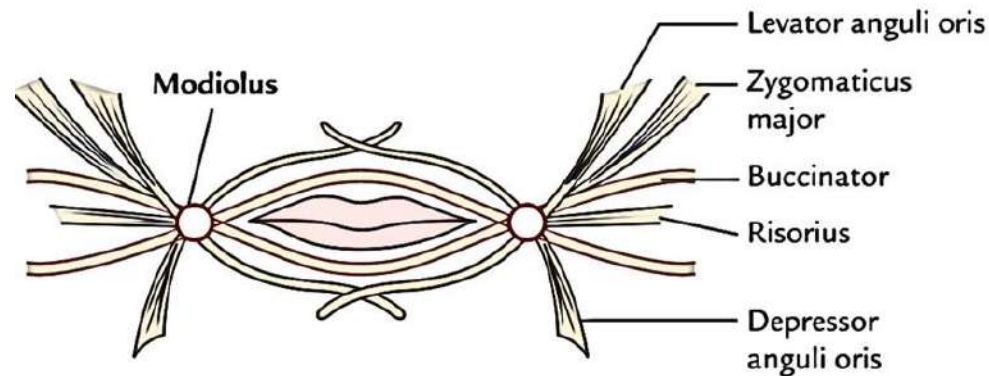
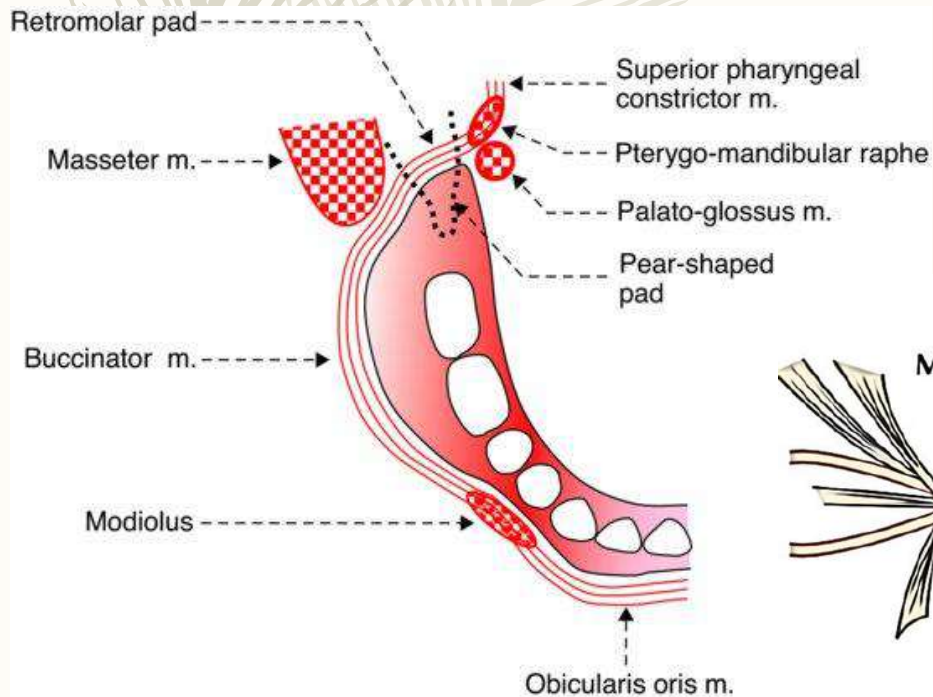




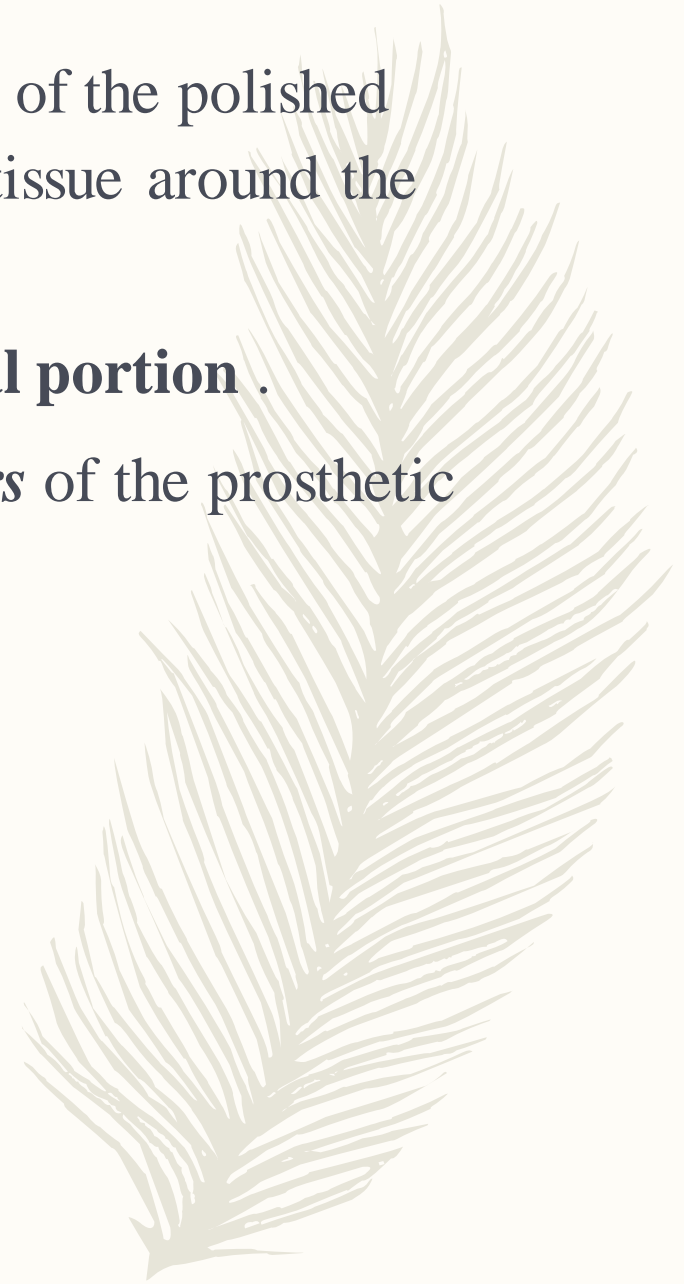
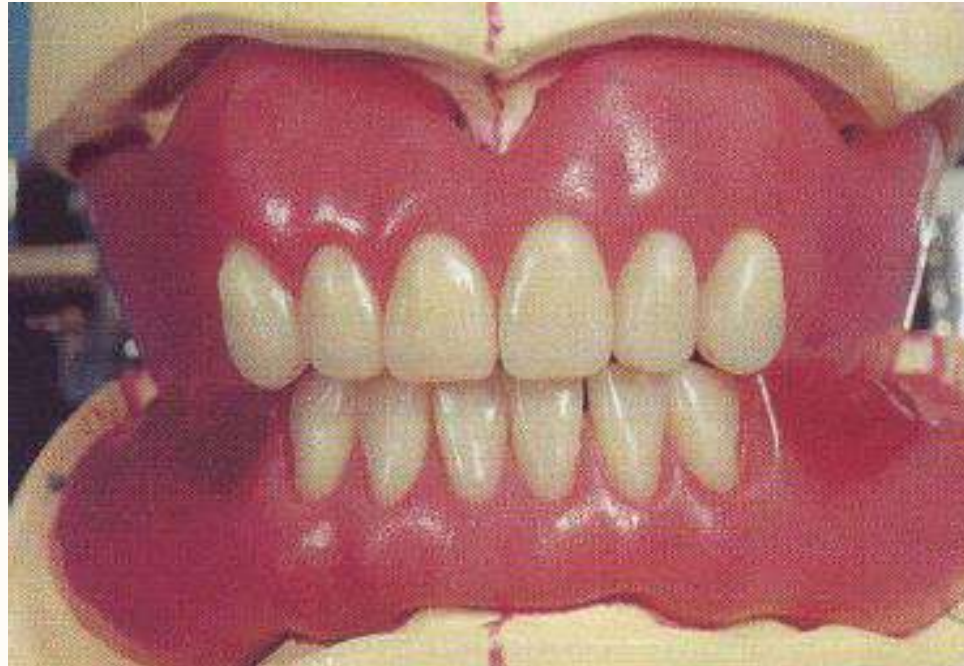
- The buccolingual position of the teeth is important because a buccal position of the teeth would necessarily shape the surface of the denture base in such a manner that the muscle action of the cheeks would tend to unseat the mandibular denture.



- The buccal surface of the mandibular dentures in the first premolar region should be shaped carefully so as not to interfere with the action of the **modiolus** (*connecting the facial muscles with the orbicularis oris*).
- This connecting point of the muscles can displace the mandibular denture if the polished surface inclines toward the cheek, or if the arch in the premolar region is too wide.





- The wax surfaces around the teeth are known as the **art portion** of the polished surface and should, for esthetic reasons, imitate the form of the tissue around the natural teeth.
- The upper part of the polished surface, known as the **anatomical portion** .
- The contours of the polished surface begin at the *gingival collars* of the prosthetic dentition.





Requirements of waxing the polished surface

1. They should duplicate the covered soft tissues as accurately as possible realistic, not exaggerated.
2. The borders, both labial and buccal should full the vestibules.
3. Notches should be provided to accommodate the mucous membrane attachment (frenum), both in size and direction.
4. The contour of the facial flanges should be compatible with the cheek and lips.
5. The contour of the lingual flanges should be compatible with the tongue.
6. The palatal section of the maxillary denture should be nearly a reproduction of the patient palate and rugae.
7. Avoid a bulky wax-up. The additional bulk of acrylic resin may contribute to porosity and dimensional processing error.



The procedure of waxing (festooning of complete denture)

1. Contour the wax carefully to prevent movement of the teeth.
2. Place strips of base plate wax along the facial surface of the trial denture so that they extend from the gingival third of the teeth to the edge of the cast.
3. With a hot spatula lute the strips to the underlying wax at $1\frac{1}{4}$ inch intervals, and melt the wax into contact with the necks of the teeth.
4. After the wax has cooled, carve the interdental papilla.

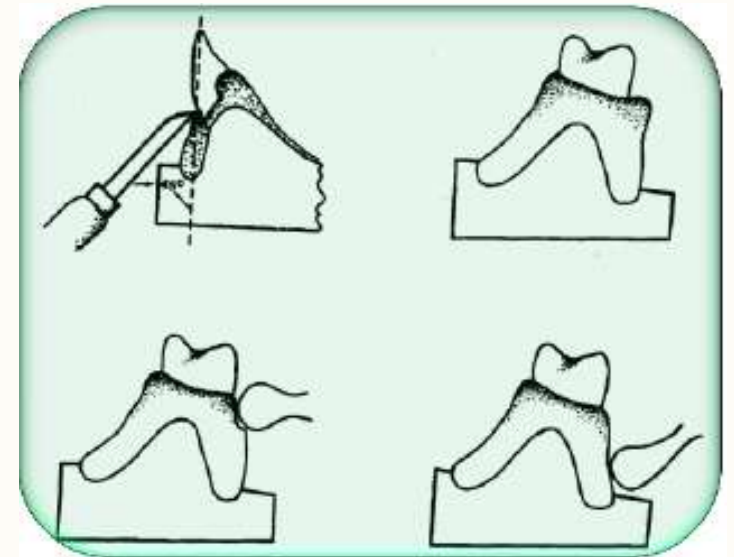
The rules of forming the papilla

1. The papilla must extend to the point of tooth contact for cleanliness.
2. The papilla must be of various lengths.
3. The papilla must be convex in all directions.
4. The papilla must be shaped according to the age of the patient.



The procedure of waxing (festooning of complete denture)

5. **Developing the margin by carving with an *ash no. 5* or *Le'Crone carver* at 45° angle to the neck of the teeth. The posterior area should have a marked fullness.**



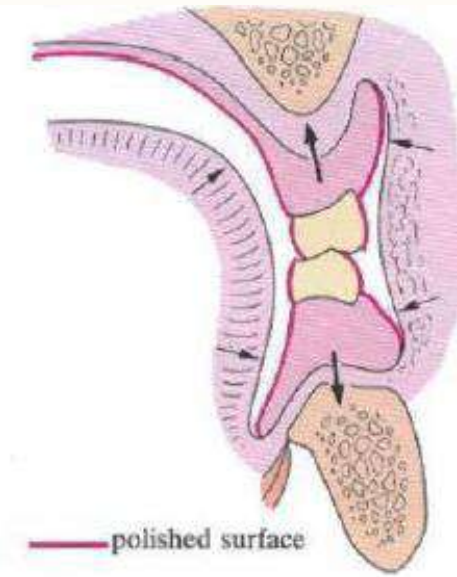
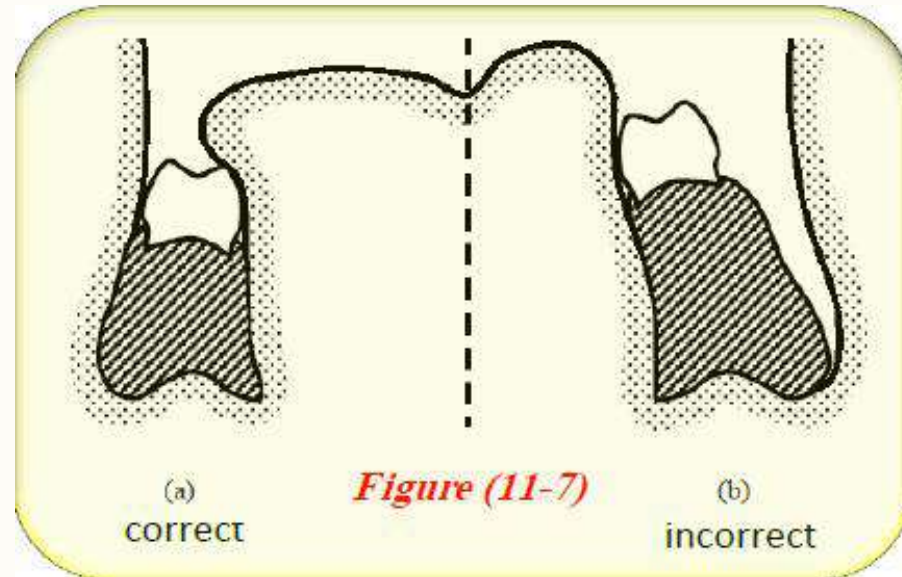
The procedure of waxing (festooning of complete denture)

6. The ledges around the teeth are not contoured as roots of the teeth other way to wax buccal and labial surfaces to produce shallow grooves in the inter-radicular spaces. These grooves should not extend to the gingival margins which should be slightly raised in the interdental space to form the papilla.



The procedure of waxing (festooning of complete denture)

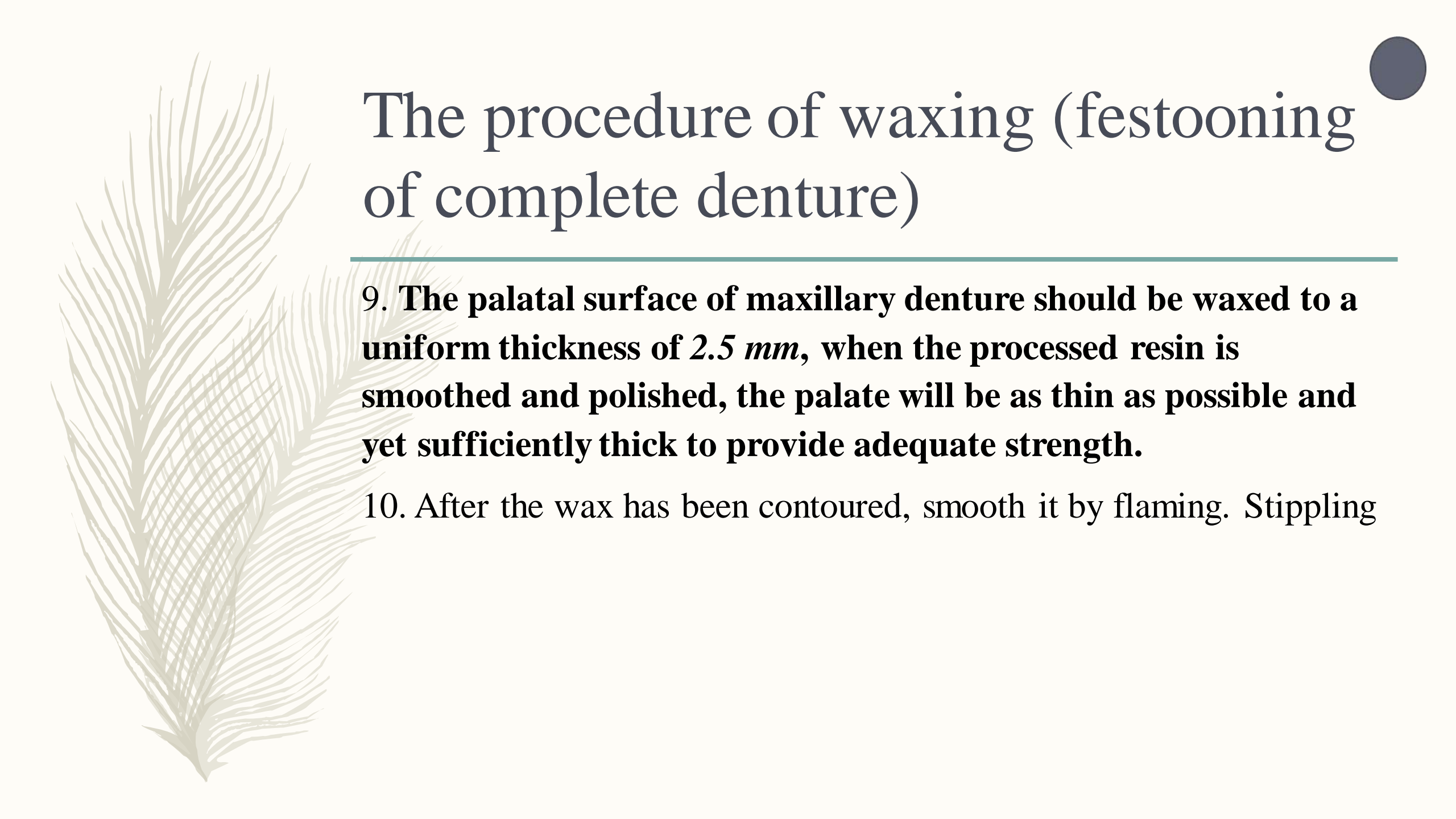
7. Wax the lingual flange of the mandibular denture thickly enough to fill all depressions and to slope down from the necks of the teeth and inward toward the tongue. The slope of the flange should be free from the undercuts and very slightly concave at or near the lower border.



The procedure of waxing (festooning of complete denture)

8. Contour the wax around the necks of the maxillary posterior artificial teeth to form part of clinical crowns and to make these teeth more natural in size and more compatible to the tongue.





The procedure of waxing (festooning of complete denture)

9. The palatal surface of maxillary denture should be waxed to a uniform thickness of *2.5 mm*, when the processed resin is smoothed and polished, the palate will be as thin as possible and yet sufficiently thick to provide adequate strength.

10. After the wax has been contoured, smooth it by flaming. Stippling

The procedure of waxing (festooning of complete denture)

11. **Stippling of the wax:** an alternative to gingival contouring some people stipple the wax and this produce a finished denture, whose surface shows an **orange peel** effect, produces a very pleasing result.

– This may be produced by tapping the surface of the wax with **bristles of a tooth-brush** after first warming the surface **or by a small burnishing bur** rotating in a hand-piece; and then polished it with wet cotton.

– **Disadvantage:** of stippling is that it produces a denture which is more liable to contamination by calculus deposits; if it done it should be confined to the area of the denture which can be seen when the patient grains broadly.



Figure (11-10)



Establishing of posterior palatal seal area

Posterior palatal seal area:

- It is the soft tissues along the junction of the hard and soft palates on which pressure within physiological limits of the tissues can be applied by a denture to aid in the retention of the denture.
- The posterior border of the denture is determined in the mouth and its location is transferred onto the cast.

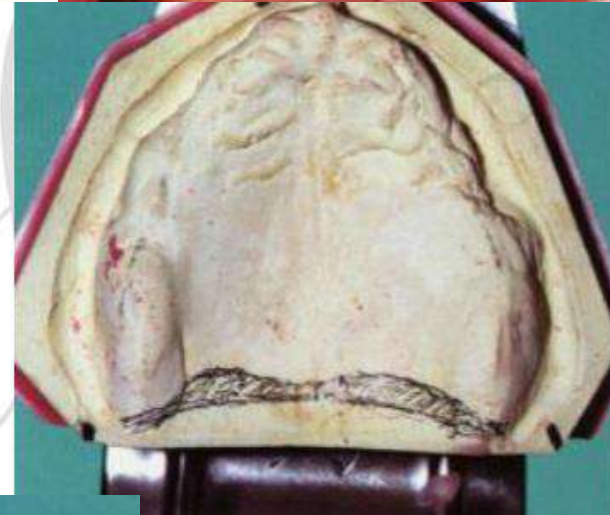
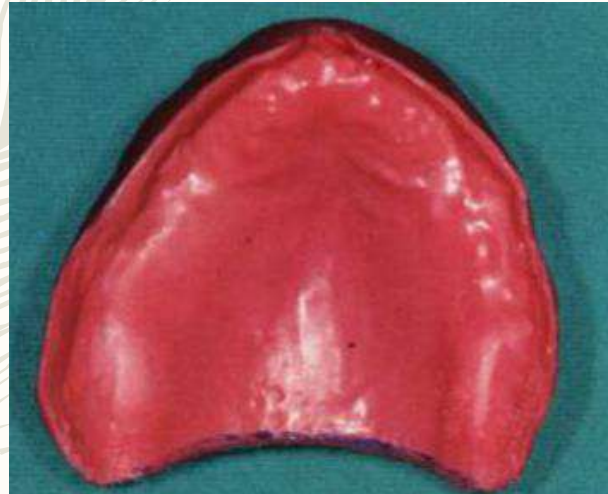


Establishing of posterior palatal seal area

Posterior palatal seal area:

- The locations of the right and left hamular notches are marked with an indelible pencil.
- Then the location of fovea palatinae near the median palatal suture is marked.
- The vibrating line (*the posterior part of the posterior palatal seal area*) normally used as a guide to the ideal posterior border of the denture, it may be slightly anterior to the fovea palatinae.

Carving posterior palatal seal





Advantages of posterior palatal seal area

1. It helps to determine the posterior border of the maxillary denture.
2. It helps to compensate for the shrinkage of the acrylic resin in this area during processing.
3. Provide a good seal in the posterior area of the maxillary arch which increase retention.
4. It prevents food to enter under the maxillary denture.
5. Reduces the tendency for gag reflex.

Processing of the denture

First : Flasking



- **Flasking** : It is the process of investing the cast with its waxed denture in a flask to make a two sectional mold used to form the acrylic resin denture base.
- **Flask**: It is a metal case uses the dental stone to invest the cast and trial wax denture to create the mold within it.



The flask consists of:

- **Lower half:** Drag (bottom), which contains the cast.
- **Upper half:** Cope (ring), which captures the teeth of the denture.
- **The cover:** Cap (lid).



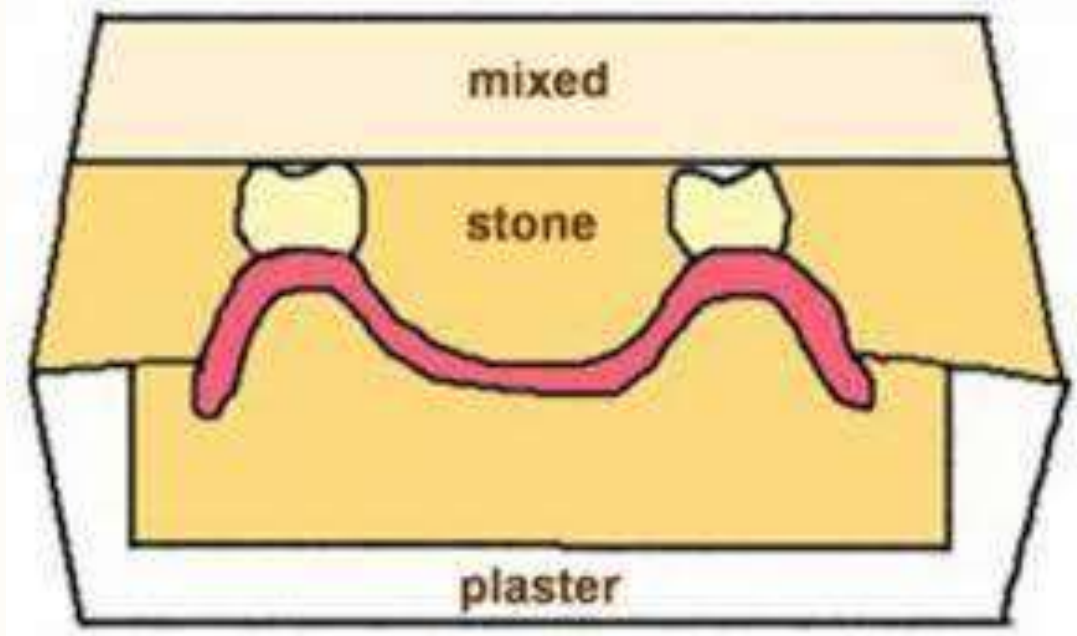
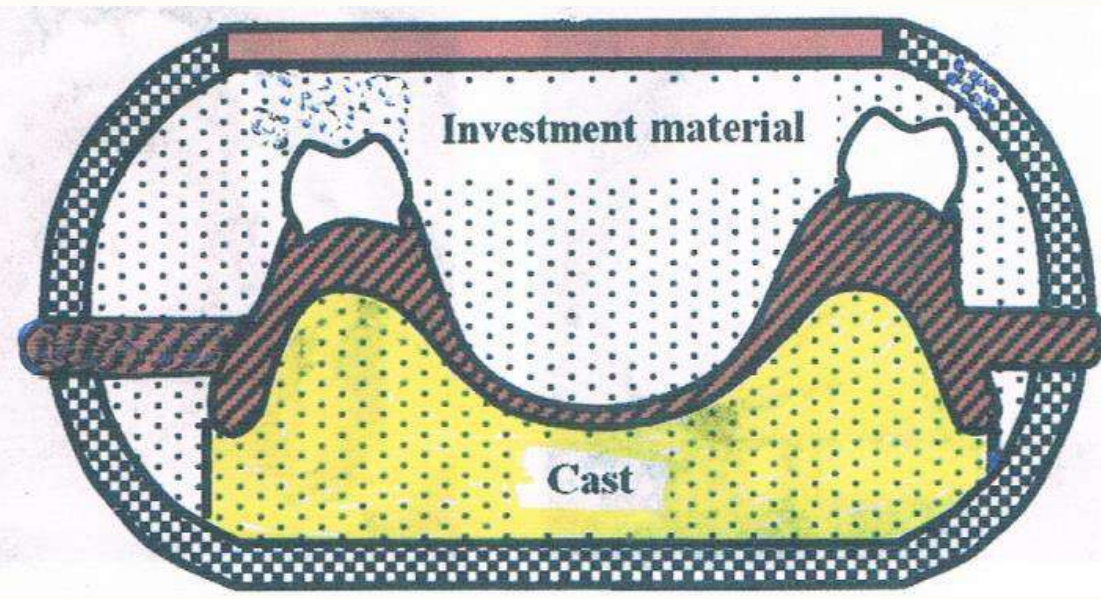
Flasking techniques:

1. Compression technique (open pack method):

The master cast with the waxed trial denture is invested in the lower half of the flask with gypsum investment material.

Then the upper half of the flask is put in place and gypsum is poured to the occlusal surfaces of the teeth.

The top portion of the flask is poured with another layer of plaster or stone and the cover is placed on the flask.





Flasking techniques:

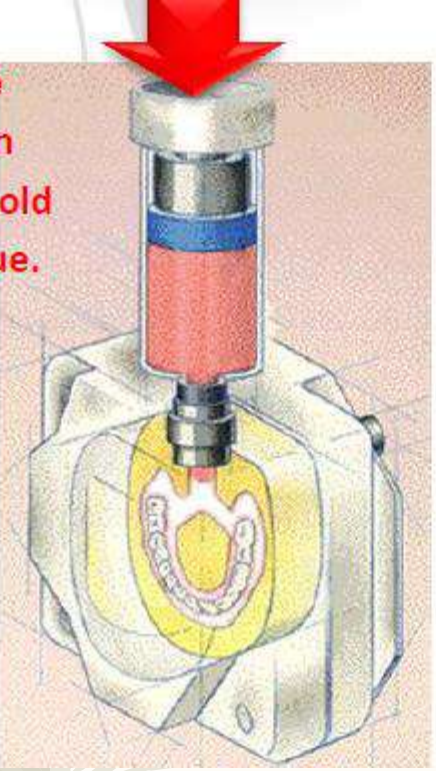
1. **Injection mold technique:**

It is a complicated procedure required special flask and equipment. In this technique the wax pattern is sprued and the material is injected into the mold. This process allows injection of further material during processing to compensate for the polymerization shrinkage.

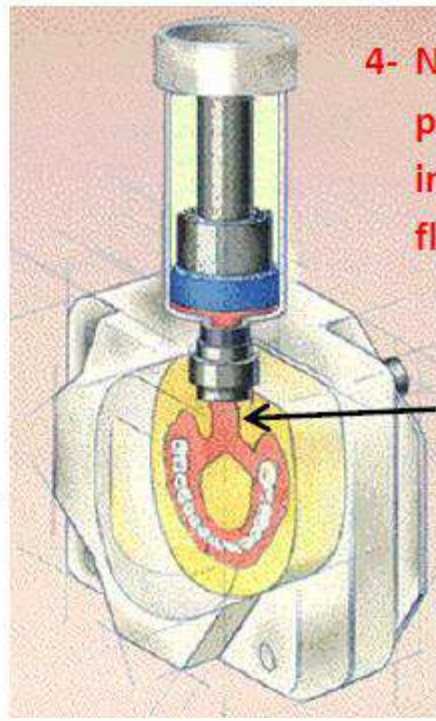
1- Nylon capsule in machine for heating and pressured inside the flask.



2- Injection the melted nylon inside the mold through sprue.

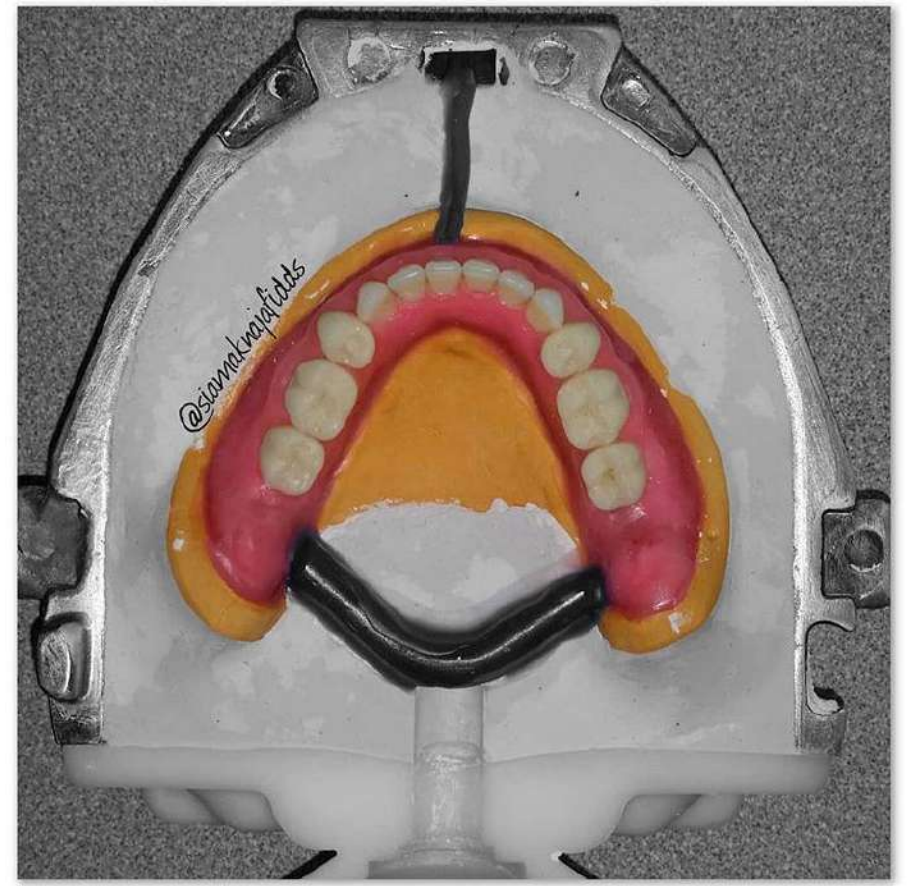


4- Nylon prosthesis inside the flask



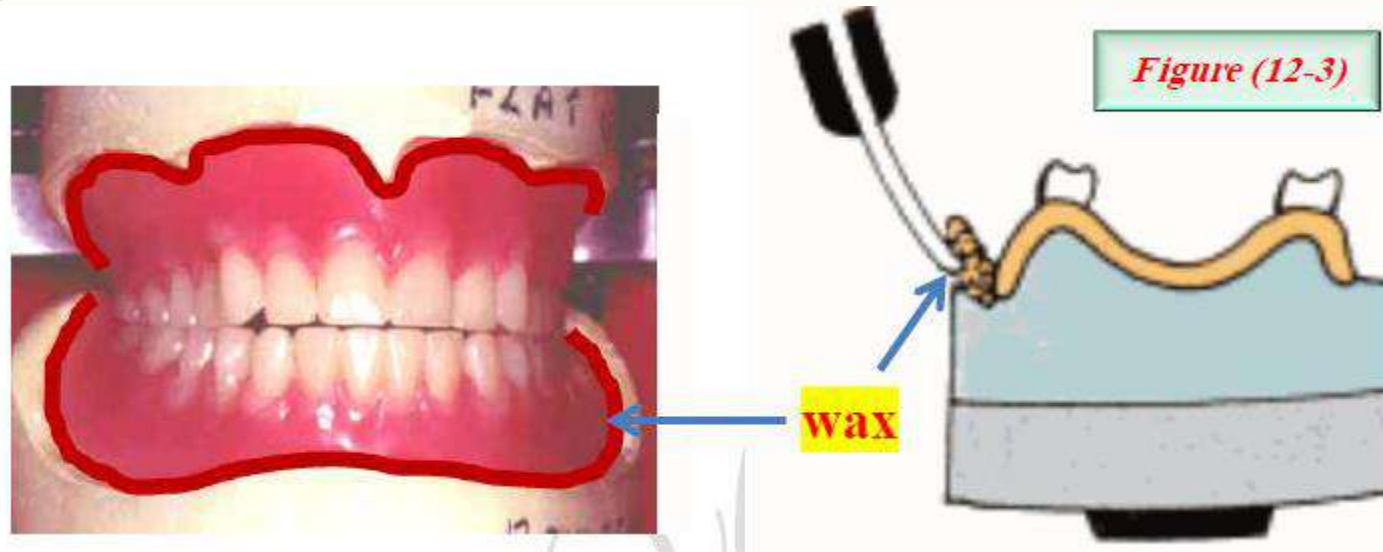
Sprue

Figure (12-2)



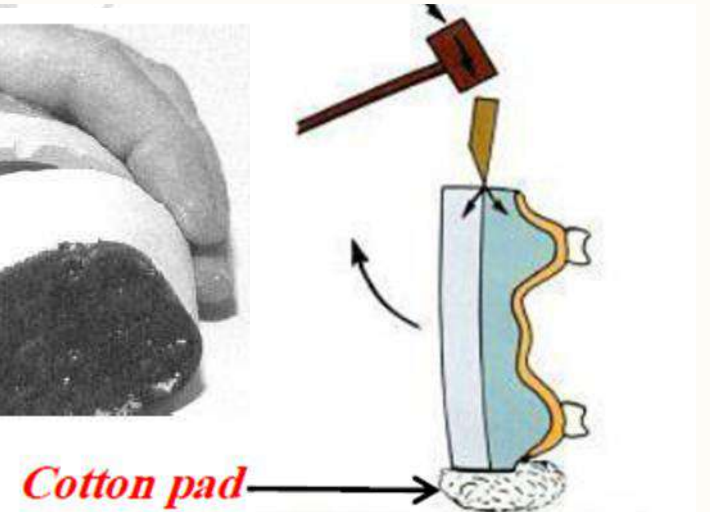
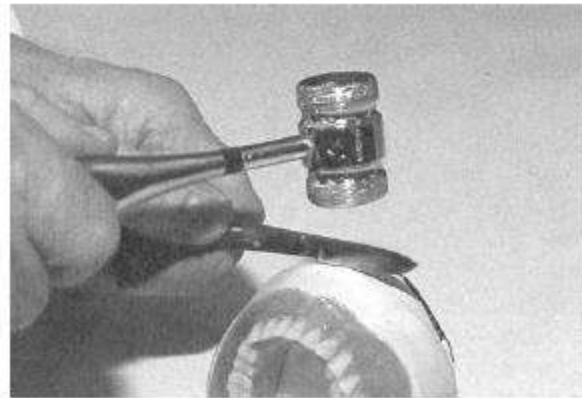
The procedure in processing the denture in compression technique

1. Sealing the upper and lower trial denture all over the border until the margin of the cast while the casts still on the articulator.



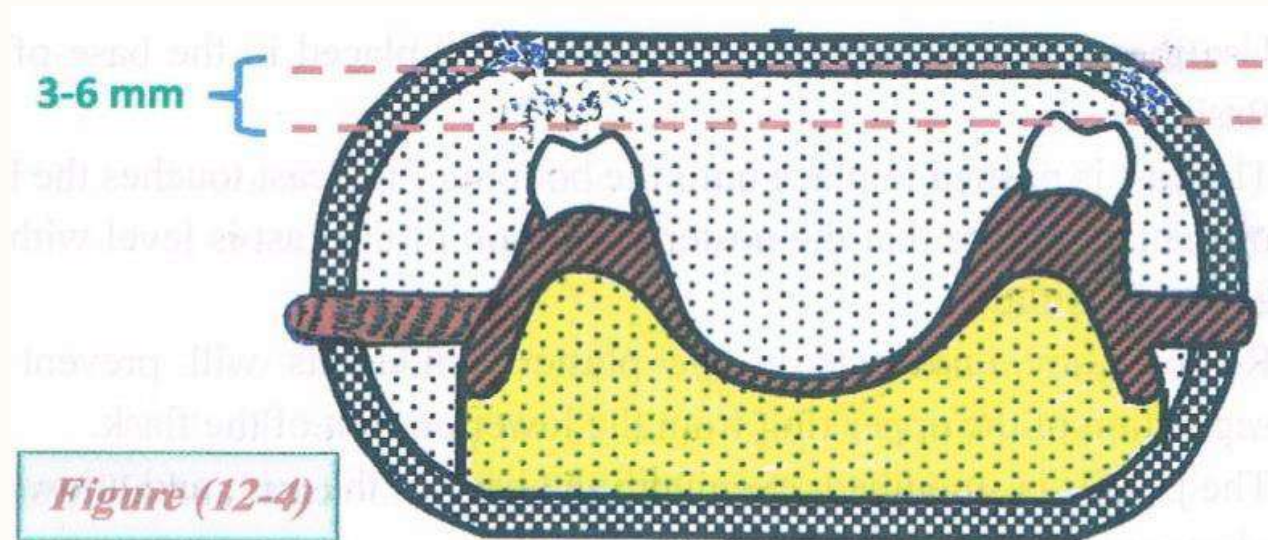
The procedure in processing the denture in compression technique

2. Soak the casts and the mounting plaster in water a few minutes to separate the casts from the mounting plaster, save the plaster mounting as it will be used to reposition the casts on the articulator after the dentures have been processed.



The procedure in processing the denture in compression technique

3. Make sure that there is enough space between the incisal and occlusal surfaces of the teeth and the top of the upper ring about **3-6 mm**, if there is no space then the cast base must be reduced in thickness.





The procedure in processing the denture in compression technique

4. Adapt a layer of tinfoil to the base of the casts, slightly overlapping the edges to insure clean removal from the investment, apply separating medium to the casts and flask.
5. Waxed denture painted with surface tension reducing agent to decrease likelihood of bubbles formation.

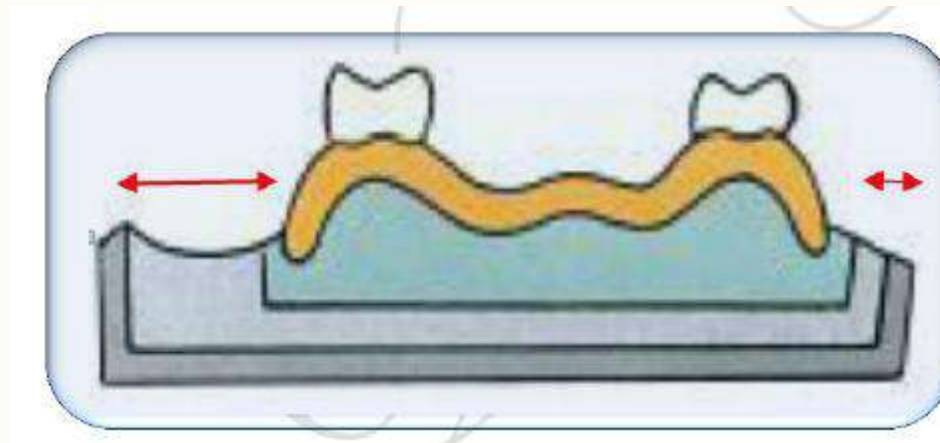
The procedure in processing the denture in compression technique

6. Invest the lower half of the flask first:

A- Use the mixture of the plaster or stone and placed in the bottom of the flask.

B- Center the cast in the lower half of the flask. The cast is pushed down to place until its rim is nearly level with the top edge of the bottom of the flask. Note that the posterior portion of the cast is level with the edge of

the flask.





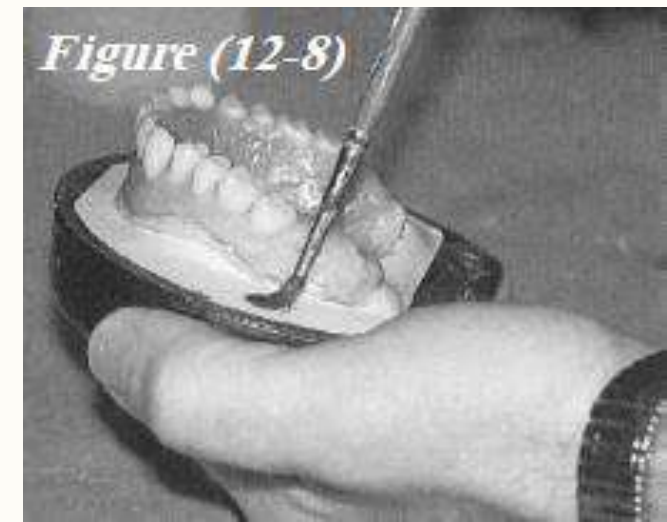
The procedure in processing the denture in compression technique

6. Invest the lower half of the flask first:

C- Remove any undercuts in the stone. Undercuts will prevent the separation of the upper ring from the lower portion of the flask.

D- The stone is smoothed and leveled between the edge of the cast and the rim of the flask, and then allows the stone to set.

E- After the final setting of stone has occurred, it will be coated with separating medium.





The procedure in processing the denture in compression technique

7. Invest the upper half of the flask first:

- A- Position the ring of the flask.
- B- Mixing of stone is done, pouring of the mixture to flow and reach all surfaces of teeth without any air bubbles by putting the flask on the vibrator. The investment material must reach the incisal edge and the occlusal surfaces of the teeth





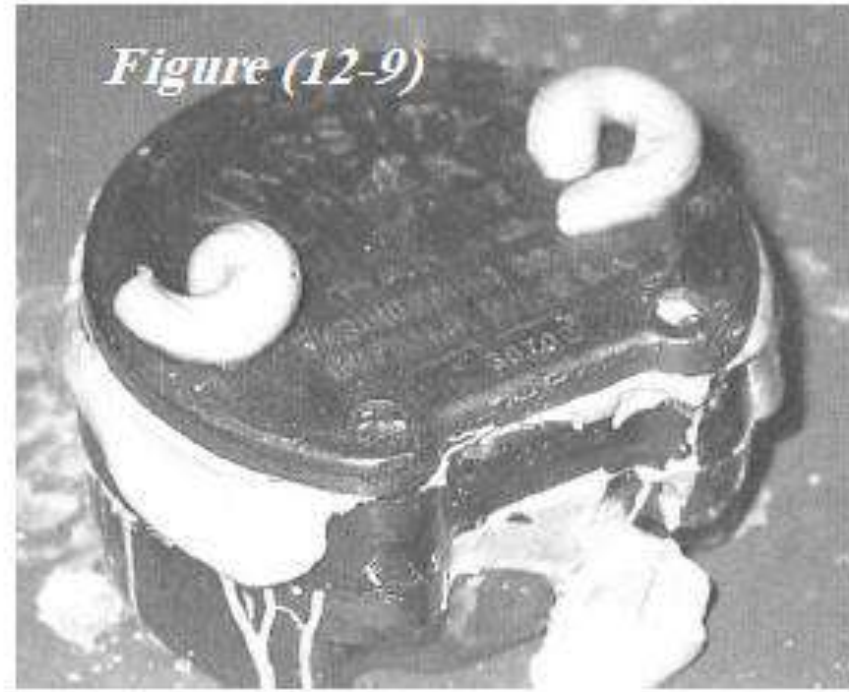
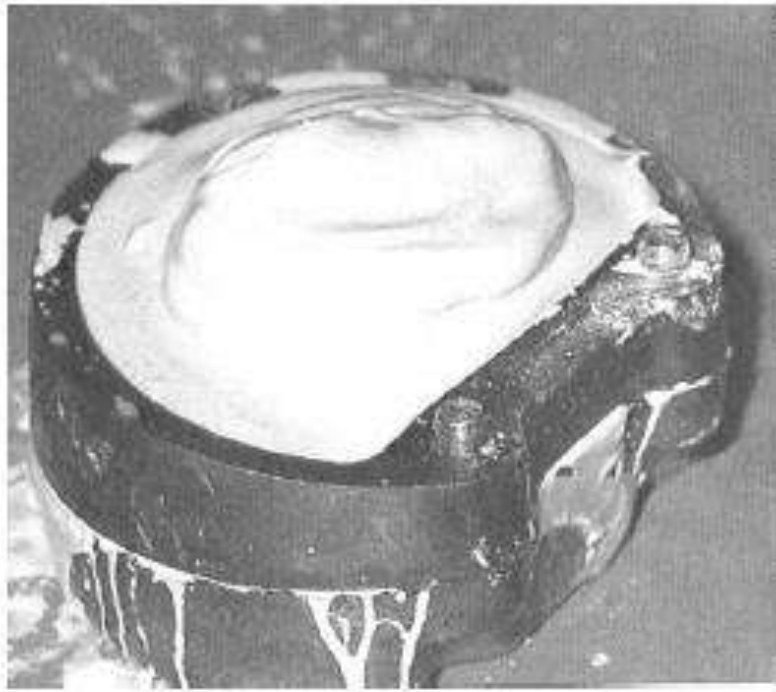
The procedure in processing the denture in compression technique

7. Invest the upper half of the flask first:

C- Separating medium is painted on the second layer of plaster after setting and smoothing of the plaster is done

D- A third mixing of stone is done and pouring it until the flask is filled with plaster and the flask is covered and some plaster enter through the holes in the cover and around the edges, this pour will easily be separated during divesting procedure, and will be aware of the position of the teeth when using any mechanical devices to break away the stone mold.

E- The plaster is left to set completely for about *45 minutes*.





Second : Wax Elimination

After the complete set of the gypsum the flask is ready for the next step which is “*wax elimination*”

A- Place the flask on the ladle and lower it into boiling *water bath* for *5 minutes*. This will soften the waxed denture base, which can be easily removed from the mold when the flask is opened.

B- After *5 minutes*, remove the flask from the boiling water and gently open it, insert a wax knife between the lower and upper halves and gently separate them.



Second : Wax Elimination

C- Remove the semisolid pieces of the waxed denture base. All the teeth should remain in the upper half of the flask, using more hot (boiling) water to flush out all the remnants of the wax.



Figure (12-12)



Second : Wax Elimination

D-Wax solvent can be used with stiff brush to remove any remaining wax on teeth.

E- As soon as possible flush the mold with clean hot water and detergent. The detergent will be flush out the wax residue from area that cannot be reached with the wax solvent. Immediately flush the mold with hot water to remove all traces of the detergent solution.

F- It is essential to remove all wax residues, the acrylic resin will not adhere to a surface coated with wax. (Artificial teeth basal area).

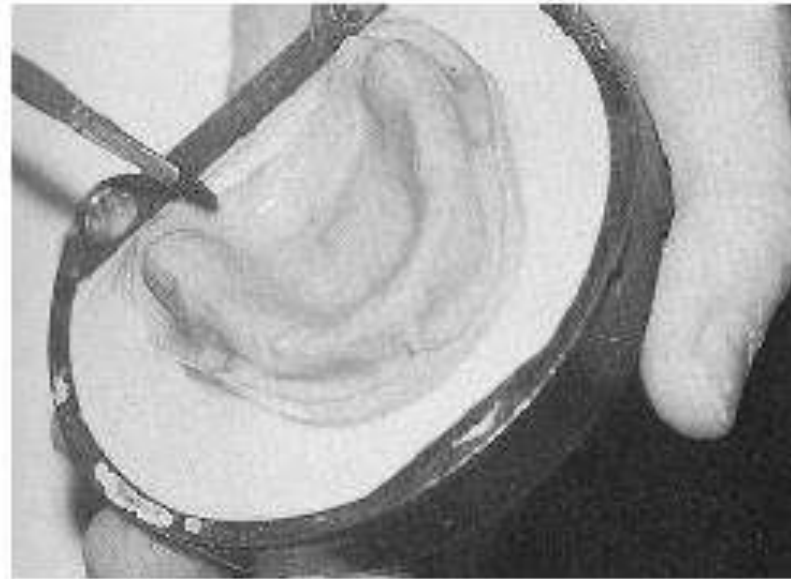
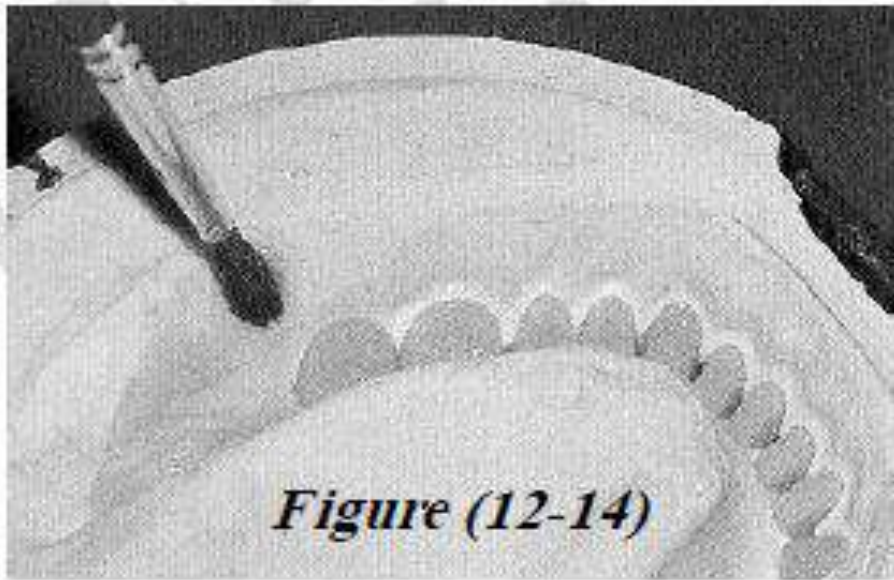
G- Stand the flask on its side and allow it to drain, dry, and cooled.



Third :Packing

- A- Separating medium is used on plaster or stone, care should be taken not to painting the teeth with separating medium.
- B- The mold is left to dry and another coat is painted on the flask and also left to dry.
- C- Heat cured acrylic is used polymer/monomer is mixed according to manufacturer instruction. Usually **10 cc** of monomer and **30 cc** of polymer will be enough to pack an average-sized denture, after mixing of the material on clean jar and reach dough stage, it is ready for packing.

Third :Packing



Third :Packing

D- Packing the material in the upper half of the flask, being sure to press it well into the area around the teeth. Use enough material to insure over packing on the first closure using nylon sheet. At least two trial closure are done and before the final closure a thin layer separating medium is applied on the cast and the nylon sheet is removed and then the two halves of the flask are closed under pressure by bench press of about ***100 kg/cm₂***, then the flask is put in spring clamp and the clamp is closed tightly.

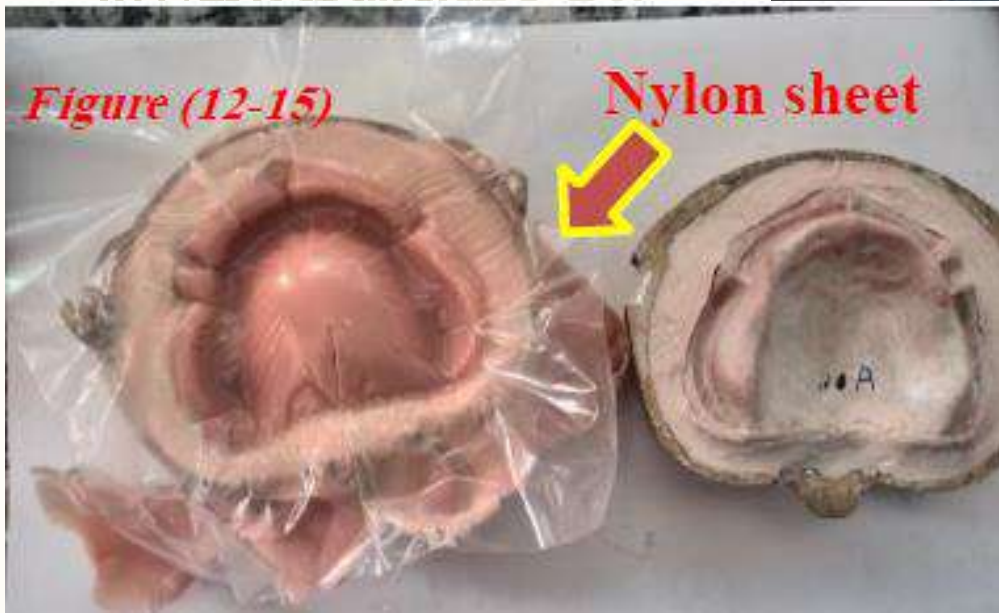


Figure (12-15)

Nylon sheet



Fourth : Curing

Curing: polymerization of acrylic resin by heat, the amount of heat must be controlled while processing acrylic resin.

Types of curing cycles:

- Long cycle (slow): heat the flask in water at 60-70 °C for 9 hours.
- Short cycle (rapid) : heat the flask in water at 74 °C for 90 minutes, then boil (100°C) for 1 hour for adequate polymerization of the thinner portions.

The best curing cycle is the slow curing cycle because most of the conversion of monomer to polymer occurs during the period at 70°C and the rapid curing cycle may induce greater dimensional changes in the dentures than slow curing method.

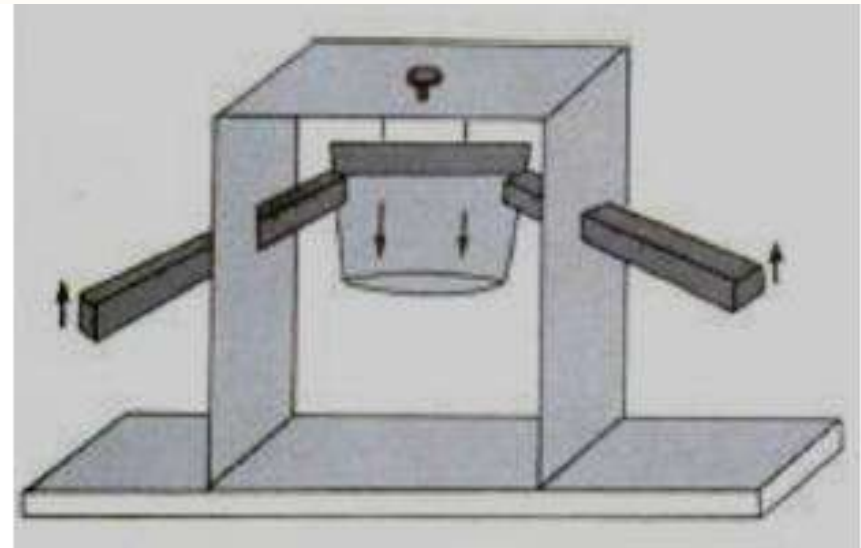
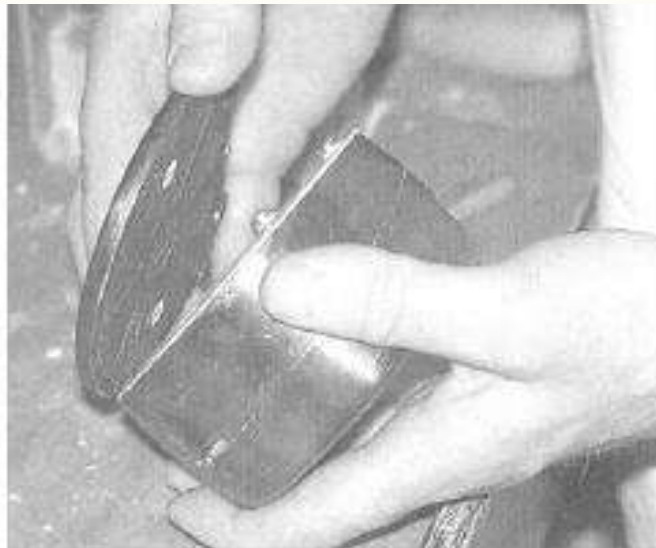
A decorative graphic of a feather, rendered in a light green color, is positioned on the left side of the slide. It has a central rachis with numerous barbs extending outwards, creating a fan-like shape.

Fourth : Curing

After curing and before deflasking, the flasks must cool slowly to room temperature to allow adequate release of internal stresses and thus minimize the risk of warpage of the bases.

Fifth: Deflasking

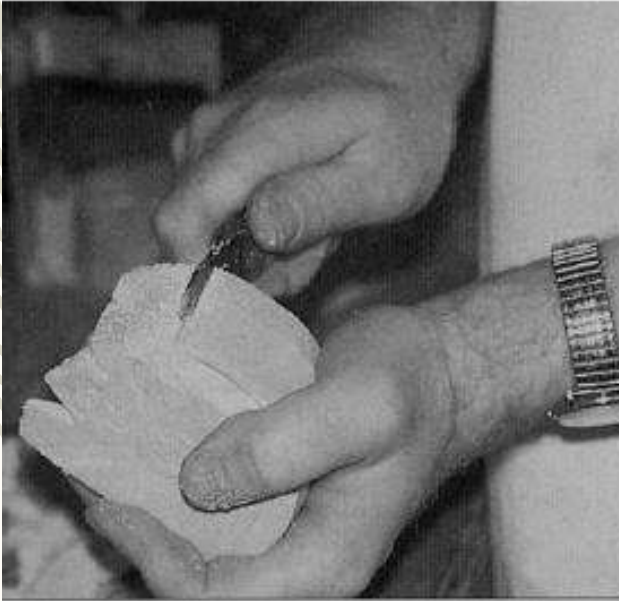
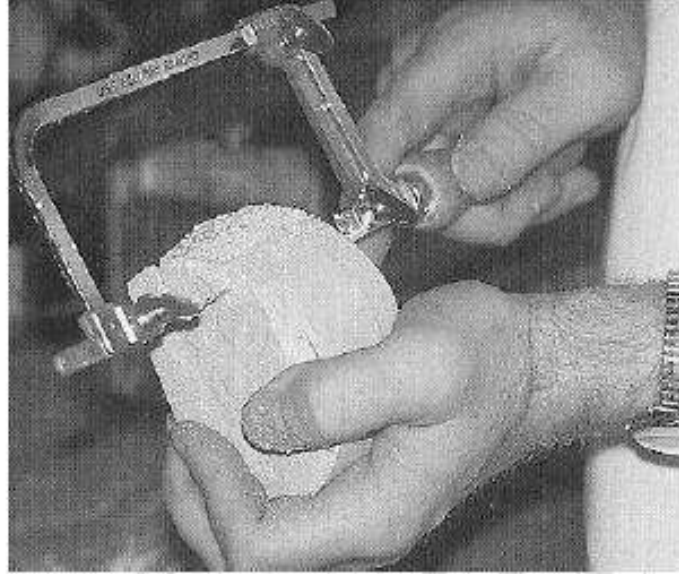
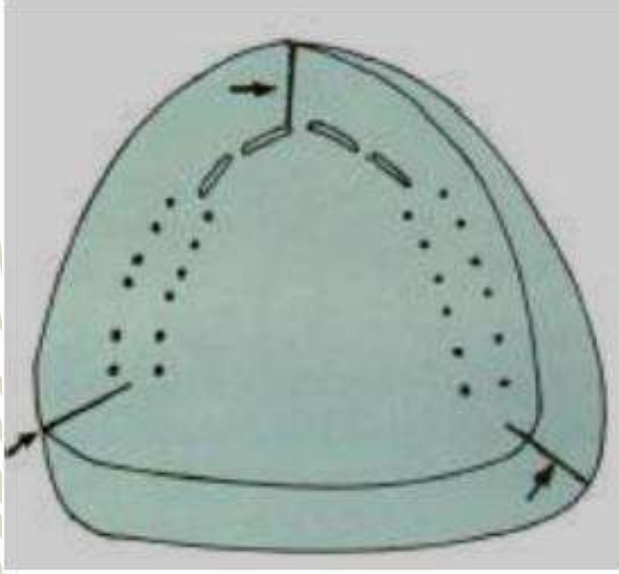
It is the removal of the mold from the flask and separates the denture and the cast from the mold (*divesting*). The flask is removed from the mold using a *flask ejector*, which is used to separate the flask from the mold after removing of the cover.





Fifth: Deflasking

By using a saw longitudinal and horizontal cuts are carefully made through the plaster or stone and the pieces are gently removed. The cured dentures and their casts have been removed from the mold.



The image features a dense, repeating floral pattern on a teal background. The pattern includes various types of flowers: light blue five-petaled flowers with black centers, small white flowers with yellow centers, and yellow flowers with black centers. There are also green leaves, fern-like plants, and clusters of small blue and yellow dots. The text "Thank you" is written in a white, elegant cursive font, centered horizontally and slightly above the vertical middle of the image.

Thank you



Occlusal Correction

Bushra Mohammed Ali Al-Ameen
B,D,S,. M,Sc.(Pros)

Occlusal correction

- Artificial teeth may move about to a minor degree during waxing and processing of the trial denture to a resin one (wax elimination, packing of acrylic resin, and curing).
- This teeth movement is due primarily to **dimensional changes** in the waxed denture base, the investing material, and in the resin denture base during curing. Occlusal discrepancies caused by these dimensional changes ordinarily are removed before the dentures are polished.

Causes of errors in occlusion

1. Inaccurate maxillo-mandibular relation record by the dentist.
2. Errors made in the transfer of maxillo-mandibular relation to the articulator.
3. Failure to use the face-bow and subsequently changing in the vertical relation on the articulator.
4. Failure to seat the occlusion rims correctly on the cast (ill-fitting record bases).
5. Incorrect arrangement of posterior teeth.
6. Failure to close the flask completely during processing.
7. Warpage of the dentures by overheating them in polishing stage.
8. Dimensional changes of the denture base material (acrylic resin).

The errors that are a result of processing changes can be eliminated before insertion of the dentures in the patient's mouth, correcting occlusal surface of the teeth by *selective grinding*.

◦ **Selective grinding :**

- It is the modification of the occlusal forms of the teeth by grinding according to a **plan**.
- The modification of the occlusal forms of the teeth by grinding at selected places marked by spots made by *articulating paper*, or marked by parts of the teeth cutting through a thin layer of *occluding wax* placed over the teeth.

Correction of occlusal records

Two methods are generally used in correcting errors due to processing changes, in both the occlusal surfaces of teeth are altered by selective grinding:

Intraoral (inside patient mouth, clinically).

Extraoral (on the articulator, in the laboratory).

Disadvantages of intraoral correction

1. It is difficult to see the errors because the soft tissues will be distorted and obscure the errors.
2. The denture bases will be shift in relation to the underlying bone when there are errors in occlusion due to the resiliency of the soft tissue.
3. The articulating paper marks are likely to be incorrect due to the presence of the saliva.
4. The central of jaw position depends entirely on the ability of the patient to place and move jaw correctly.

Advantages of extraoral correction

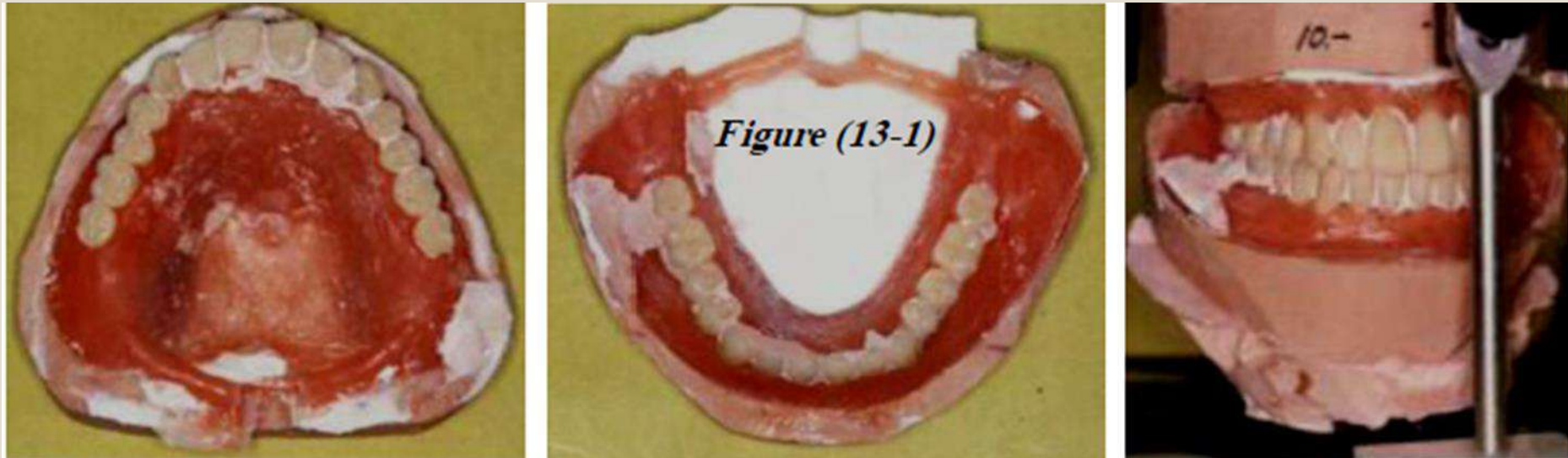
1. Easily visible.
2. Easily located.
3. Easily corrected by selective grinding.
4. The articulating paper marks can be quite easily made on dry teeth.
5. Make the correction away from the patient thus there is a psychological advantage.

Articulating paper and *occluding wax* can be used to detect the premature contacts, although it is preferable to use occluding wax because premature contact will cause the cusps to penetrate through the wax indicating heavy contact is present.



An alternate method to correct the occlusion before removal the dentures from the casts

1. Replace the upper and lower mounting casts and the dentures on the articulator, If processing changes in occlusion have occurred, they must be corrected.



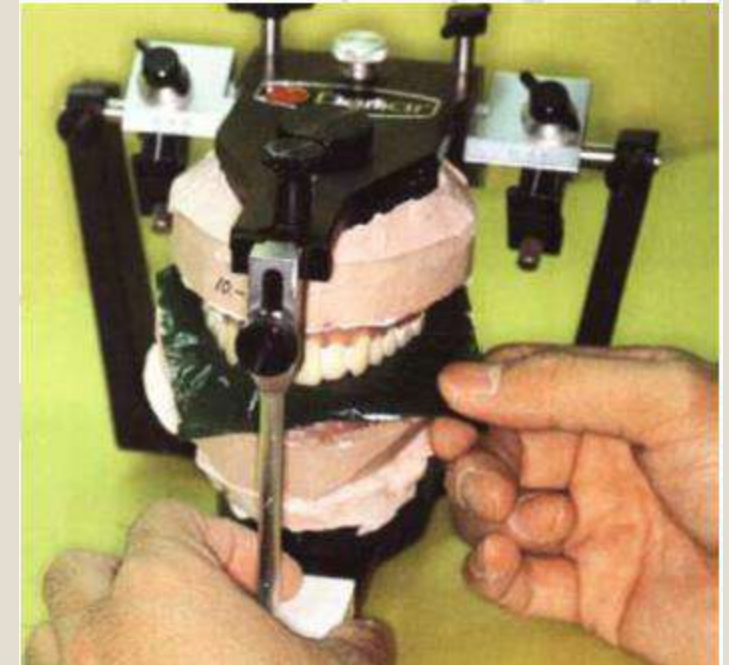
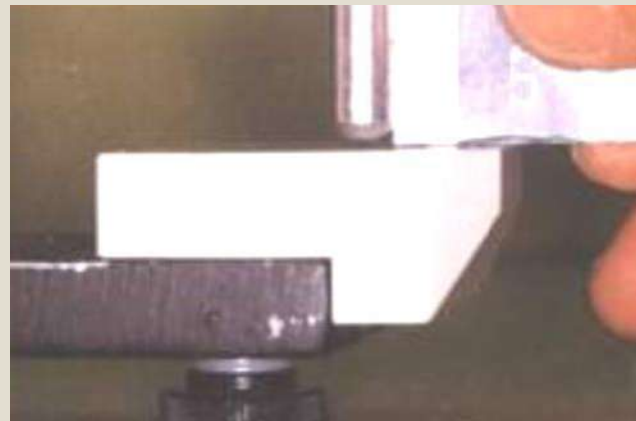
An alternate method to correct the occlusion before removal the dentures from the casts

2. Reestablished the vertical dimension of occlusion at this time, an opening in the vertical dimension can be noted by corresponding opening in the relationship of the incisal pin to the incisal table. The pin should contact the table.



An alternate method to correct the occlusion before removal the dentures from the casts

- If excessive opening between incisal pin and incisal table, the flask do not correctly closed.
- If the incisal pin touches the incisal table, the denture may have been under packed.
- If there is *1-1.5 mm* of incisal pin opening, proper technique have been followed through the investing and packing procedures.



An alternate method to correct the occlusion before removal the dentures from the casts

3. Refine and equalize the centric occlusion.
4. Perfect the working and balancing occlusions.
5. Correct the protrusive occlusion.

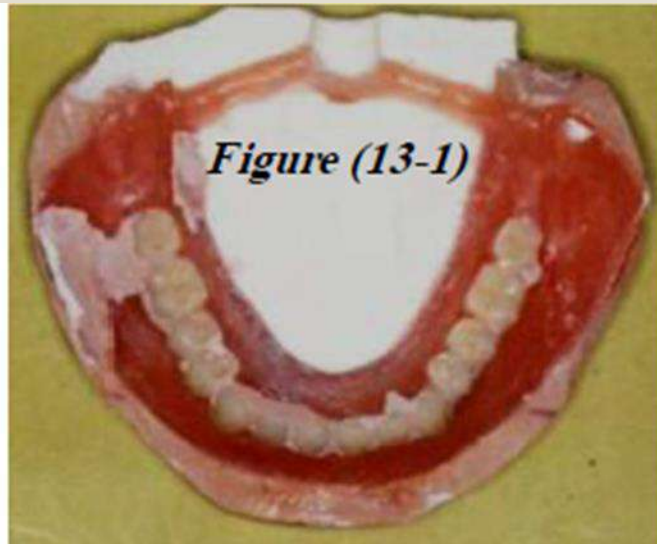
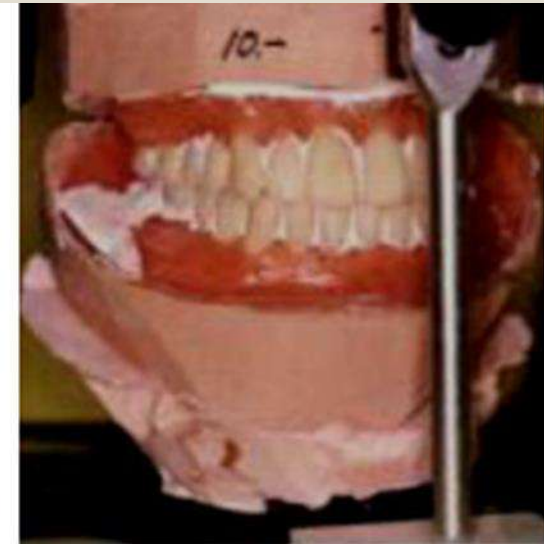
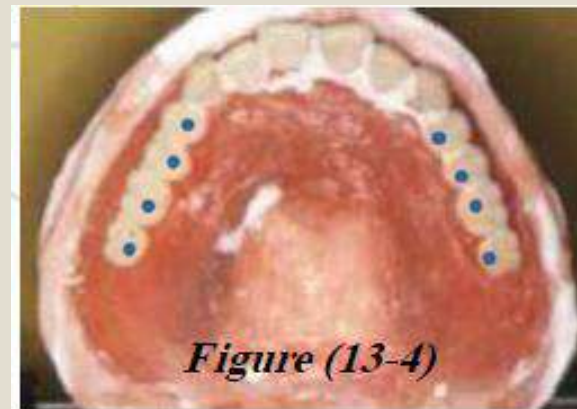


Figure (13-1)



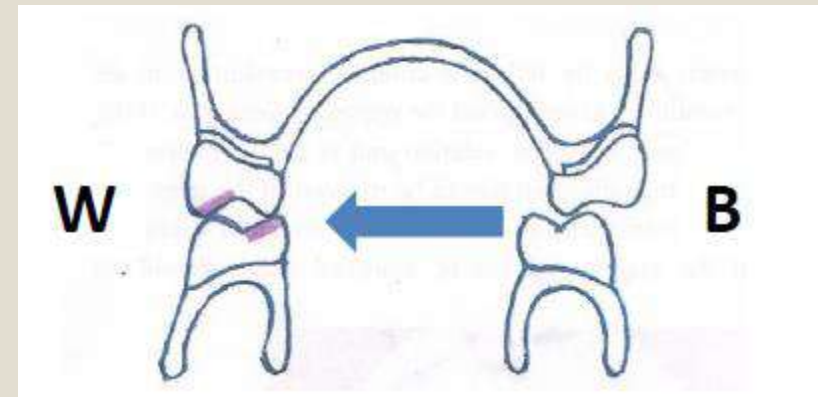
Rules of selective grinding

1. Never grind a centric cusp tip unless it contacts prematurely in all excursions of the mandible. Always grind the opposing fossa. (i.e. if the cusp is premature contact in centric relation and is also premature in balancing or working, then the cusp should be reduced; if the cusp is in premature contact in centric relation, but is not in working or balancing prematurity, then the opposing fossa or marginal ridge should be reduced).



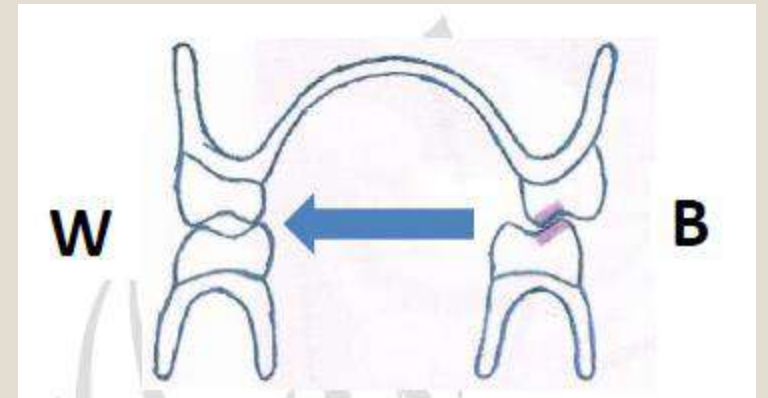
Rules of selective grinding

2. Utilize the **(BULL rule)** when perfecting **working occlusion** prematurity, grind the lingual incline plane of the **B**uccal cusps of the **U**pper teeth, or the buccal incline plane of the **L**ingual cusps of the **L**ower teeth.
- BULL rule applies **working side** only.



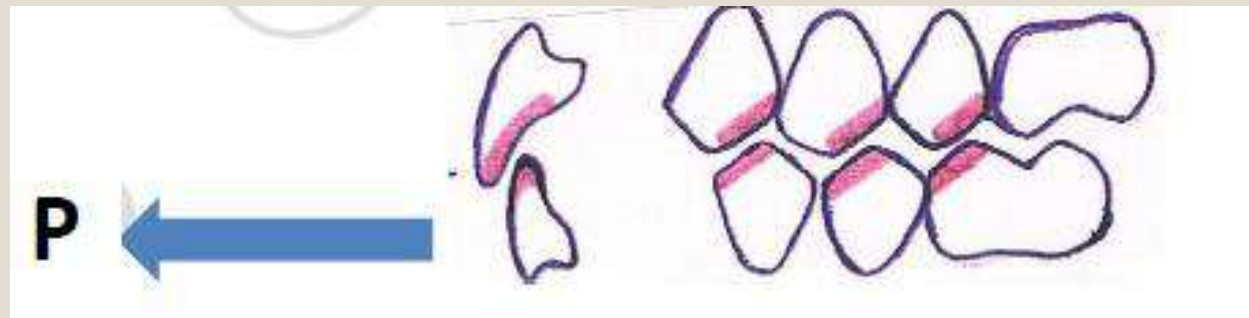
Rules of selective grinding

3. If there is a premature contact on the **balancing side**, then adjust the buccal incline plane of the lingual cusp of the upper teeth, or the lingual incline plane of the buccal cusp of the lower teeth.
- When grinding to perfect balancing occlusion prematurity, never grind the interfering cusp tips but grind the cusp inclines.
 - Usually this done in the mandibular teeth, do not adjust both maxillary and mandibular teeth.



Rules of selective grinding

4. In correcting protrusive interference in the anterior teeth grind the labial portion of the incisal edges of the mandibular teeth and the lingual portion of the maxillary teeth.
- For protrusive interference in the posterior teeth, reduce the distal slopes of the upper buccal cusps, or the mesial slopes of the lower lingual cusps.





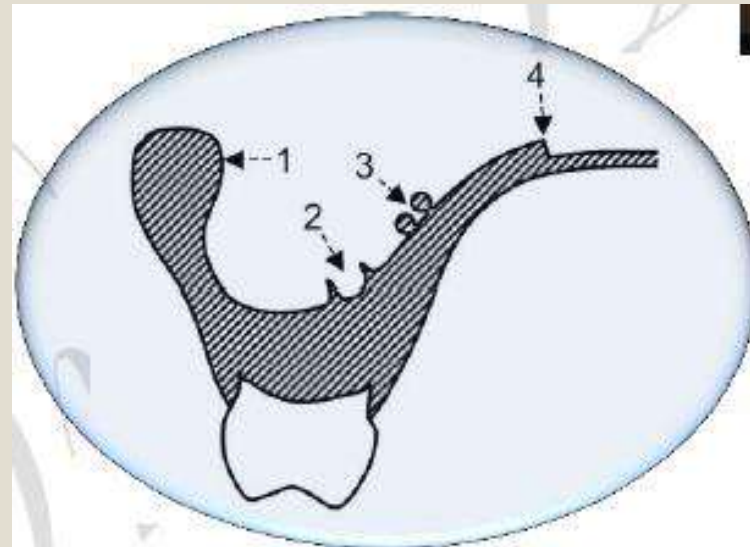
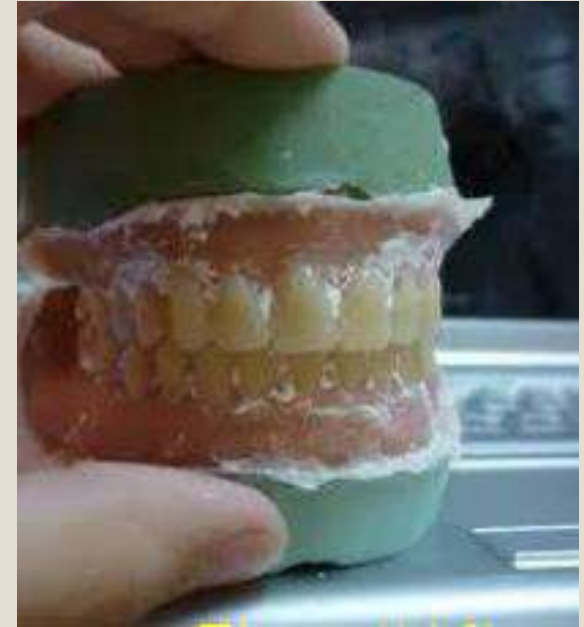
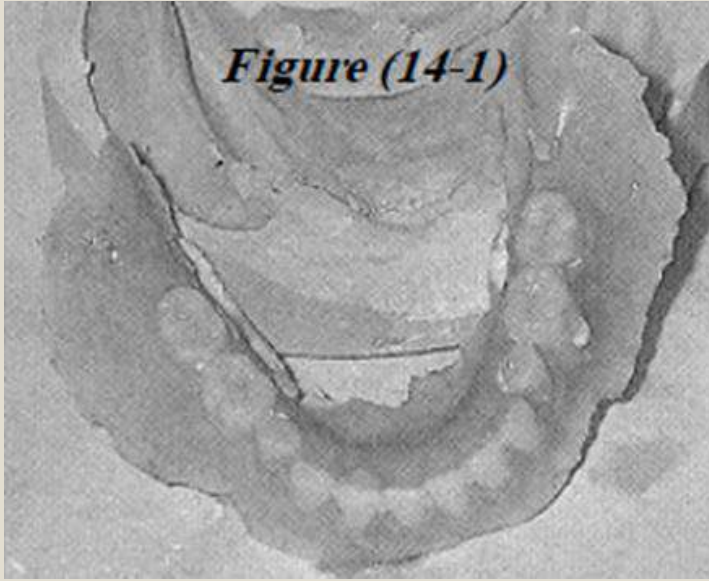
Finishing And Polishing

Finishing

Finishing: of complete denture is the process of perfecting the final form of the denture by removing any flash, stone remaining around the teeth, and any nodules of acrylic resin on the surfaces of the denture base resulting from processing.

Flash: It is the excess of acrylic resin at the denture border, the acrylic resin that was forced out between the two halves of the flask by the pressure applied during the processing procedure.

Figure (14-1)



Procedure for finishing

Take care to preserve the border and contour of the denture during the finishing process. If the impression was correctly molded and boxed, and the trial denture was carefully waxed contoured into the form desired in the finished denture, little finishing will be necessary.

1. Carefully remove *remaining stone around the neck of teeth* with *a small sharp knife*.

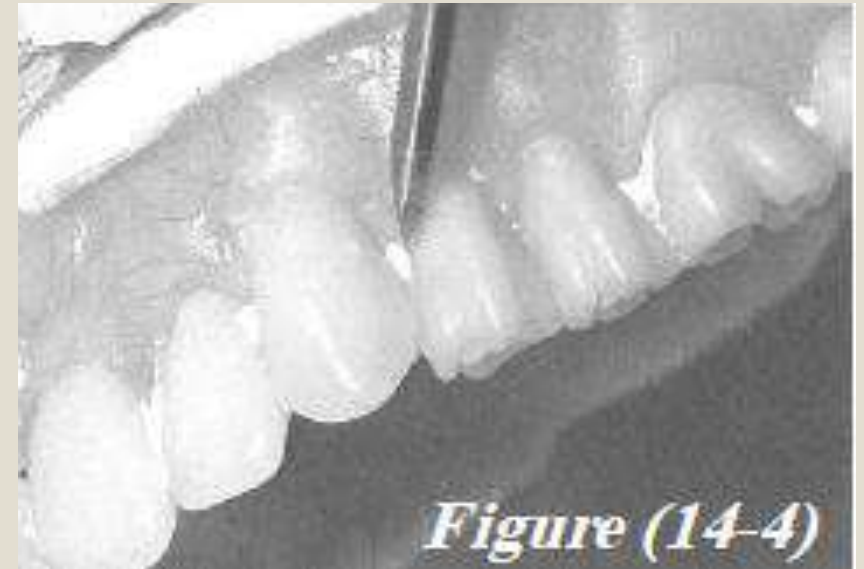


Figure (14-4)

Procedure for finishing

2. To remove the *flash* of acrylic resin from the denture border, press the denture base lightly against a slowly revolving *arbor band* mounted on the *dental lathe*. An alternate but less satisfactory to use a *large acrylic bur or stone bur* mounted in a *straight hand piece* to remove the flash. Take care not to change the form of the denture border but only remove the excess resin on the border of denture.

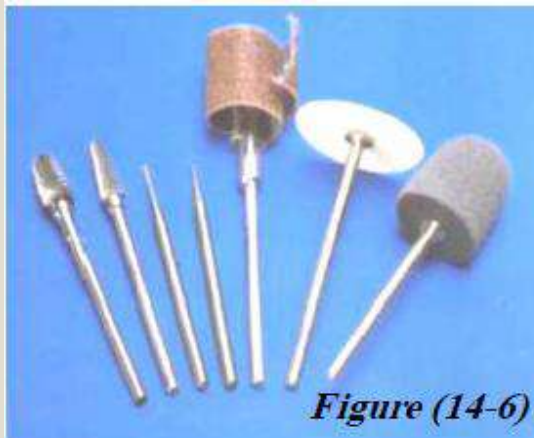


Figure (14-6)

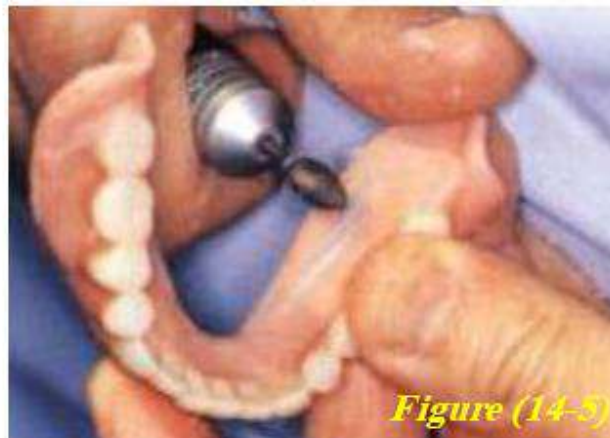
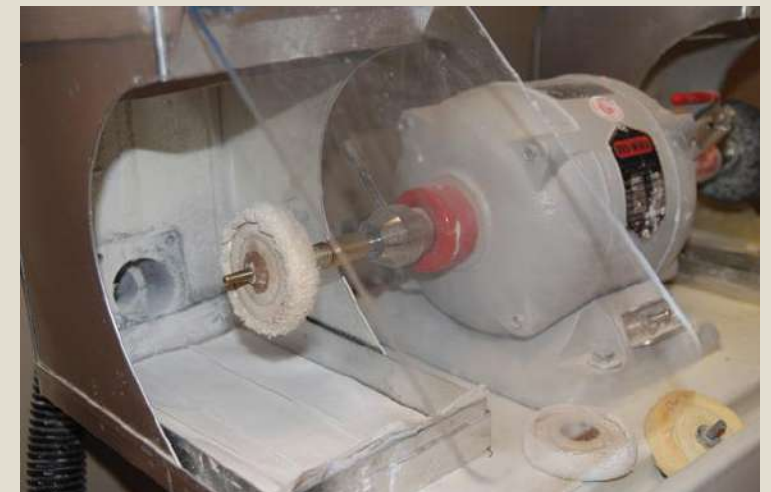
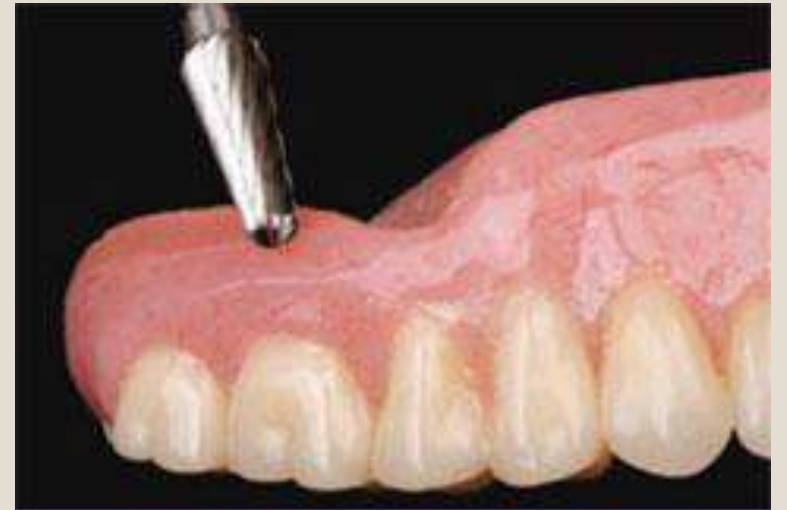
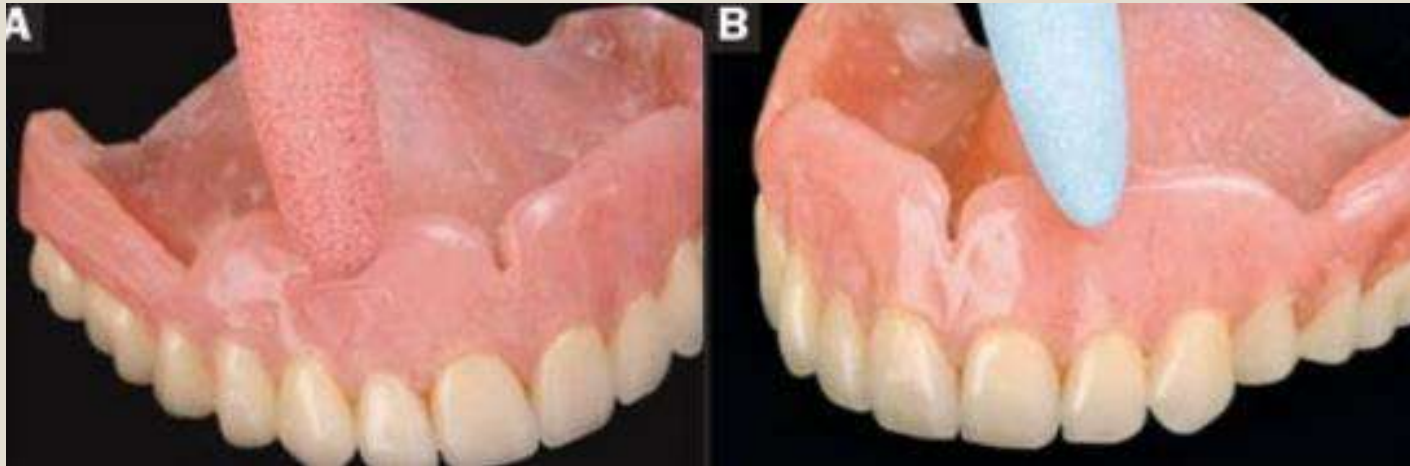


Figure (14-5)



Procedure for finishing

3. Remove *nodules of acrylic* with *small stone or acrylic carbide burs*.
4. The *posterior area of the palate* has been thinned to its proper thickness.



Polishing

- **Polishing:** is a process of removing scratches. Polishing consists of making the dentures smooth and glossy without changing the contours.



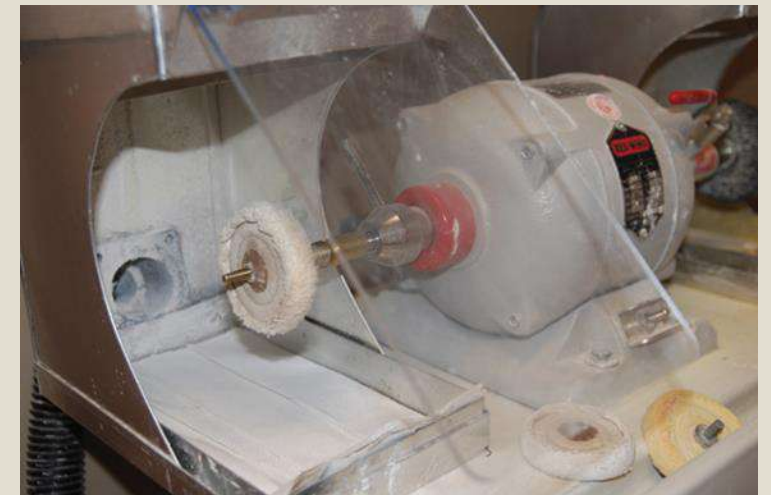
Principles of polishing

- 1- The tissue surface of a denture is never polished as a polishing destroys the details necessary for good fit and retention.
- 2- The polished surface extends just over the border, but the borders are not reduced in height and width during polishing.
- 3- Care must be taken when using pumice (it should be used as wet slurry) as this material is very abrasive and may obliterate the details placed on the denture when they were waxes (festooned).
- 4- Resin teeth have approximately the same hardness as the denture base, so polishing a denture with resin teeth requires some precautions not necessary with porcelain teeth.
- 5- When polishing, only the denture base and not the teeth are polished.
- 6- During the finishing and polishing we should minimize the reduction of bulk because this cause warpage.

Procedure for polishing

A- smoothening :

1- Polish *labial, buccal, lingual, and palatal external surfaces of the denture* with *wet pumice on rag wheel attached to dental lathe* running at **slow** speed. Keep plenty of pumice on the denture surface and keep the denture moving at all times; press the denture lightly against the wheel.



Procedure for polishing

A- smoothening :

2- Polish *acrylic around the teeth* with *wet pumice* and a *brush wheel attached to dental lathe* moving at slow speed. Be careful not remove previously developed contours.



Procedure for polishing

A- smoothening :

3- Polish the *border, lateral and palatal surfaces of denture* by using *wet muslin buffing wheel attached to dental lathe*.



Procedure for polishing

A- making the denture glossy :

1- Use *Rouge* (greasy material) this material is applied to *dry muslin buffing wheel*, this differ in that the polishing compound is applied to the wheel not as pumice to the piece of work being polished.



Procedure for polishing

A- making the denture glossy :

2- After the denture completely polished with rouge, it is scrubbed thoroughly.

3- Final polish is obtained by placing high shine material on the denture.



Procedure for polishing

A- making the denture glossy :

4- Store the polished dentures in water until they have been delivered to the patient. Store the dentures in water all the times otherwise they will undergo dimensional changes and shrinkage.



Every new set of complete dentures should be tested in mouth for tissue adaptation and retention and any pressure area should be indicated by using *pressure indicating paste*, and overextended borders should be indicated by using *disclosing wax*.



A watercolor illustration of a bouquet of roses and greenery. The roses are in various stages of bloom, with colors ranging from light pink to deep red. The greenery includes large, rounded leaves and smaller, feathery leaves. The entire illustration is set against a dark, solid background. The text "Thank you" is written in a white, elegant cursive font across the bottom of the image.

Thank you