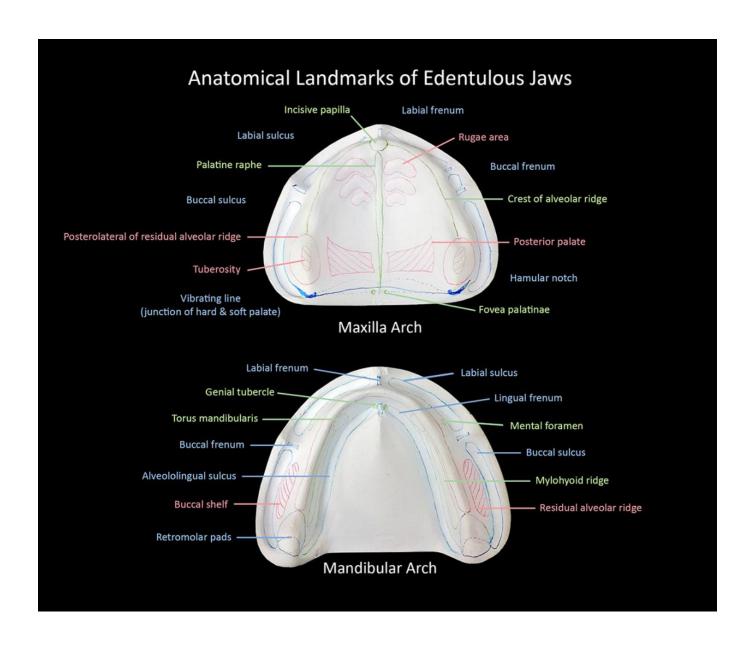
Complete Denture – Anatomical Landmarks

د حسين الديوه جي



The anatomy of the edentulous ridge in the maxilla and mandible is very important for the design of a complete denture. Objective in fabrication of a complete denture is to provide a prosthesis that restores lost teeth and associated structures functionally, anatomically and aesthetically as much as possible with preservation of underlying structures and the knowledge landmarks help us in achieving our objective.

The landmarks of an edentulous jaw are grouped into **limiting structures**, **supporting structures and** relief area.

A) Limiting structures

- These are the sites that will guide us in having an optimum extension of the denture so as to engage maximum surface area without encroaching upon the muscle actions.
- Encroaching upon these structures will lead to dislodgement of the denture and/or soreness of the area while failure to cover the areas up to the limiting structure will imply decreased retention stability and support.

B) Supporting structures / Stress-bearing areas

- Supporting structures are the load bearing areas. The denture should be
 designed such that most of the load is concentrated on these areas.
- Support is the resistance to the displacement towards the basal tissue or underlying structures.

C) Relief area

- Relief areas are areas where they are either resorb under constant load, having fragile structures within or covered by thin mucosa which can be easily traumatized.
- It should be designed in such away that the masticatory load is not concentrated over these area.

Anatomical Landmarks – MAXILLA

LIMITING STRUCTURES

A) Labial & buccal frenum



- Fibrous band covered by mucous membrane.
- Labial frenum extends from the labial aspect of the residual ridge to the lip.
- A passive frenum and has no active muscle fibers.

• A **v-shaped notch** (labial notch) should be provided very carefully which should be narrow but deep enough to avoid interference and should snugly around frenum if peripheral seal is to be achieved.

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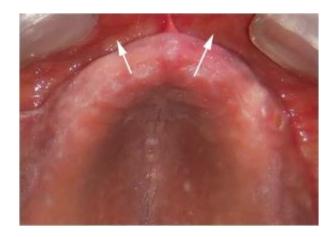
• **Buccal frenum** has the attachment of following muscles; levator anguli oris, orbicularis oris and buccinator.



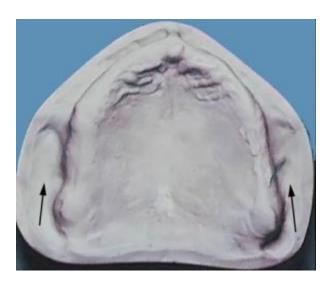
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• It needs **greater clearance** on buccal flange of the denture (shallower and wider) than the labial frenum.

B) Labial & buccal vestibule (sulcus)

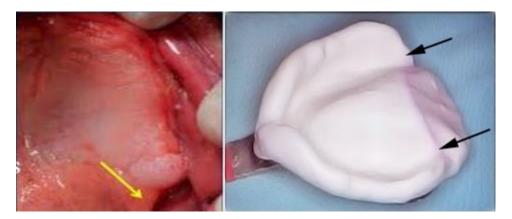


- Labial sulcus is bounded on one side by the teeth, gingiva and residual alveolar ridge and on the outer side by lips.
- It runs from one side of the buccal frenum of one side to the other side ; dividing in two compartments-left and right by the labial frenum.
- **Buccal sulcus** extends from buccal frenum anteriorly to the hamular notch posteriorly.



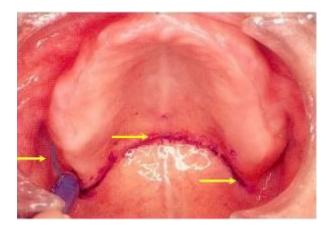
 The size of the vestibule is dependant upon:i) Contraction of buccinator muscle.ii) Position of the mandible.iii) Amount of bone loss in maxilla.

C) Hamular notch



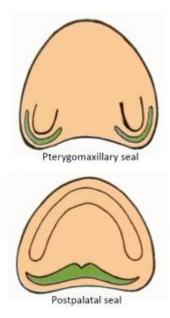
- It is **depression** situated between the maxillary tuberosity and the hamulus of the medial pterygoid plate. It is a soft area of **loose connective tissue**.
- Significance:
 - it houses the disto-lateral termination of the denture.
 - Aids in achieving posterior palatal seal.
 - Overextension causes soreness.
 - **Underextension**_poor retention

D) Posterior palatal seal area (post-dam)



It is a **soft tissue area at or 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**.

Parts:



Pterygomaxillary seal – The part of the posterior palatal seal that extends across the hamular notch and It extends 3-4 mm anterolaterally to end in the mucogingival junction on the posterior part of the maxillary ridge.

Postpalatal seal – This is a part of the posterior palatal seal area that extends between the two maxillary tuberosities.

Extensions:

- 1. Anteriorly Anterior vibrating line
- 2. Posteriorly Posterior vibrating line

3. Laterally – **3-4 mm anterolateral to hamular notch**

WHAT IS VIBRATING LINE?

- An imaginary line drawn across the posterior part of the palate that marks
 the division between the movable and immovable tissue of the soft palate
 which can be identified by asking the patient to say 'ah'.
- It is extending from one hamular notch to the other hamular notch; lying usually 2mm in front of fovea palatinae.

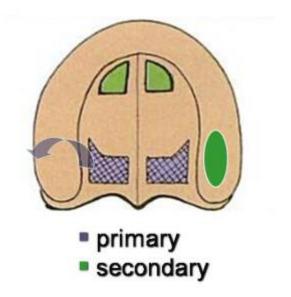
The distal end of the denture must:

- cover the tuberosities
- extend into the hamular notches
- It should end 1-2 mm posterior to the vibrating line

Functions of the posterior palatal seal:

- Aids in **retention**.
- Prevents food accumulation.
- **Compensation** for polymerization shrinkage.
- Reduces the tendency for gag reflex as it prevent the formation of the gap
- between the denture base and soft palate during functional movement.

SUPPORTING STRUCTURES



A) Primary stress bearing area / Supporting area

- 1. Posterior part of the palate
- 2. Posterolateral part of the residual alveolar ridge

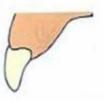
B) Secondary stress bearing area / Supporting area

- 1. The palatal rugae area
- 2. Maxillary tuberosity

RELIEF AREAS

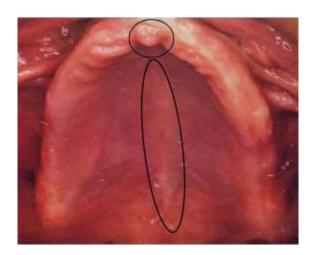
A) Incisive papilla





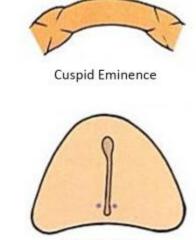
- Midline structure situated behind the central incisors.
- It is an exit point of nasopalatine nerves and vessels.
- It should be relieved if not, the denture will compress the nerve or vessels and lead to necrosis of the distributing areas and paresthesia of anterior palate.

B) Mid-palatine raphe



- Extends from incisive papilla to distal end of hard palate.
- Median suture area covered by thin submucosa
- Relief is to be provided as it is supposed to be the most sensitive part of the palate to pressure

C) Crest of the residual alveolar ridge



Fovea palatinae



D) Fovea palatinae

Few areas like the **cuspid eminence**, **fovea palatinae and torus palatinus** may be relieved according to condition required.

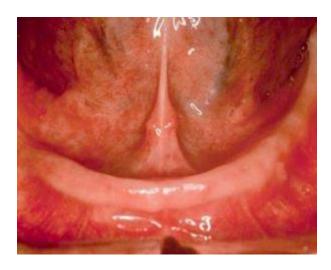
Anatomical Landmarks – MANDIBULAR

LIMITING STRUCTURES

A) Labial, lingual & buccal frenum

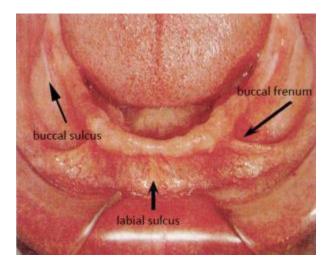
- It is fibrous band extending from the **labial aspect** of the residual alveolar ridge to the lip containing a band of the fibrous connective tissue the that helps in attachment of the **orbicularis oris muscle**.
- It is quite sensitive hence the denture should have an appropriate labial notch.
- The fibers of **buccinator** are attached to the **buccal frenum**.
- Should be relieved to prevent displacement of the denture during function.
- The lingual frenum relief should be provided in the anterior portion of the lingual flange.

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- This anterior portion of the lingual flange called **sub-lingual crescent** area.
- The lingual notch of the denture should be well adapted otherwise it will affect the denture stability.

B) Labial & buccal vestibule

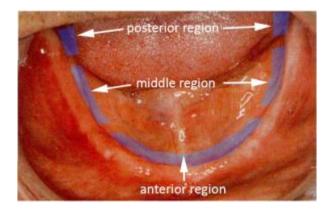


- The labial sulcus runs from the labial frenum to the buccal frenum on each side.
- Mentalis muscle is quite active in this region.
- The **buccal sulcus** extends posteriorly from the buccal frenum to outside back corner of the retromolar region.
- Area maximization can be safely done here as because the fibers of the buccinator runs parallel to the border and hence displacing action due to buccinator during its contraction is slight.
- The impression is the widest in this region.

C) Alveololingual sulcus

- Between lingual frenum to retromylohyoid curtain.
- Overextension causes soreness and instability.

It can be divided into three parts:



i) Anterior part:

- From lingual frenum to mylohyoid ridge
- The shallowest portion(least height) of the lingual flange

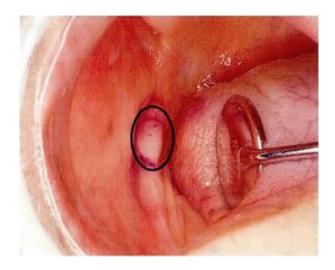
ii) Middle region:

• From the premylohyoid fossa to the the distal end of the mylohyoid region

iii) Posterior portion:

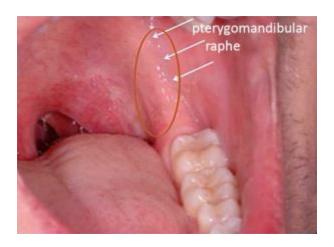
- From the end of the mylohyoid ridge end to the retromylohyoid curtain
- Provides for a valuable undercut area so important retention
- Overextension causes soreness and instability
- Proper recording gives typical S –form of the lingual flange

D) Retromolar pad



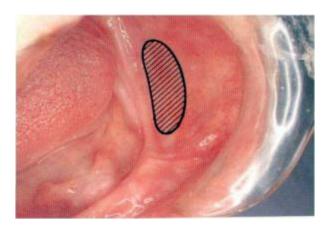
- Pear-shaped triangular soft pad of tissue at the distal end of the lower ridge is referred to as the retromolar pad.
- It is an important structure, which forms the posterior seal of the mandibular denture.
- The denture base should **extend up to 2/3rd** of the retromolar pad triangle.

E) Pterygomandibular raphe



SUPPORTING STRUCTURES

A) Primary stress bearing area / Supporting area



- 1. Buccal shelf area
- Extends from buccal frenum to retromolar pad.
- Between external oblique ridge and crest of alveolar ridge.

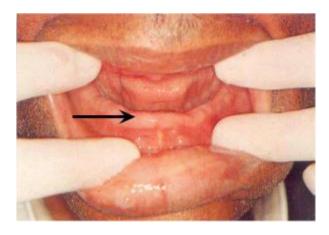
Its boundaries are:

- 1. Medially the crest of the ridge
- 2. Laterally the external oblique ridge
- 3. Distally the retromolar pad

4. Mesially the buccal frenum

The width of this area increases as the alveolar resorption continues.

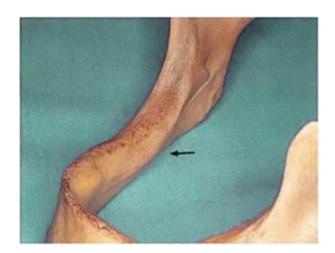
B) Secondary stress bearing area / Supporting area



- 1. Residual alveolar ridge
- Buccal and lingual slopes are secondary stress bearing areas.

RELIEF AREAS

A) Mylohyoid ridge



- Attachment for the mylohyoid muscle.
- Running along the lingual surface of the mandible.
- Anteriorly: the ridge lies close to the inferior border of the mandible.
- **Posteriorly** it lies close to the residual ridge.
- Covered by the thin mucosa which may be traumatized by denture base hence it should be relieved.
- The extension of the lingual flange is to be beyond the palpable position of the mylohyoid ridge but not in the undercut.

B) Mental foramen



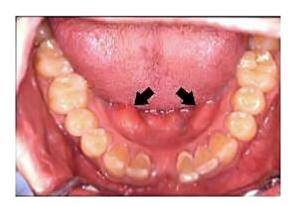
- Lies on the external surface of the mandible in between the 1st and the 2nd premolar region.
- It should be relieved specially in case it lies close to the residual alveolar ridge due to ridge resorption to prevent parasthesia.

C) **Genial tubercle**



- Area of muscle attachment (Genioglossus and Geniohyoid).
- Lies away from the crest of the ridge.
- Prominent in resorbed ridges therefore adequate relief to be provided.

D) Torus mandibularis



- Abnormal bony prominence.
- Bilaterally on the lingual side near the premolar area.
- Covered by thin mucosa so it should be relieved

A Comparison Between Edentulous Jaws

Maxilla	Mandible
1. Has more supporting areas	1. Has less supporting area.
2. Limiting structures are less in number	2. Limiting structures are more in number
3. Have a less stronger influence over the denture border	3. Have a stronger influence over the denture border

Primary Impression for complete denture

Dr.Hussein AlDewachi

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.

- 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

Materials used for primary impression

- Impression compound
- Alginate
- Putty body

alginate





Impression compound





Putty body



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

- Primary impression
- Final impression
- >>>>To make an impression we should have a suitable tray and impression material.

Tray

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

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

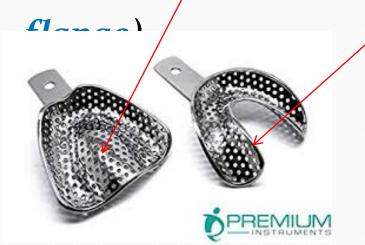
Parts of the trav

- Body
- >>floor-
- >>flange

Handle



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*



Tray 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.

In general there are two types of tray

- Stock tray
- Special (custom tray)

Stock tray

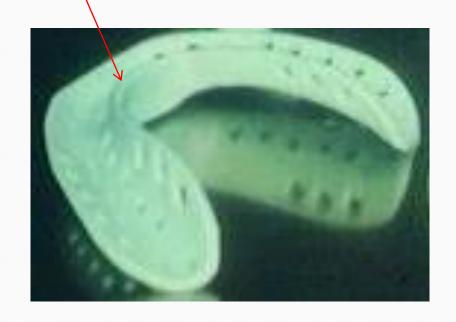
• It is an impression tray serves to carry the impression material to the mouth and support it in the correct position while it is hardening. This type of trays can be used for making primary impression. It makes from different materials such as Aluminum, Tin, Brass or plastic, in variety of shapes,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

Types of stock tray: 1-stock tray for edentuous 2- stock tray for dentulous

There are Difference between them:

Stock tray for edentulous 2. 2. 2	Stock tray for dentulous
Short flanges	Long flanges. 🛭 .
Oval and narrow floor	Flat and wide floor

Stock tray edentulous stock trat dentulous





Classification of stock tray according to material used:

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





Factors affect selection of stock tray

- Type of material used: 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
- Size of arch: stock tray comes in different sizes.
- Form of 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

• The primary cast is produced by pouring the primary impression with plaster which is the positive reproduction of the oral tissues.



Mtethod of mixing

• 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).

• When 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.

Final Impression for complete denture

Dr.Hussein AlDewachi

Final 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.*



Materials used for final impression

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

Zinc oxide eugenol impression paste



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

 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

The technique used for taking final impression

- The basic differences in techniques for final impressions can be resolved as those that record the soft tissues in a:
- Functional position (Closed mouth technique, Pressure technique)
- Rest position

Rest position

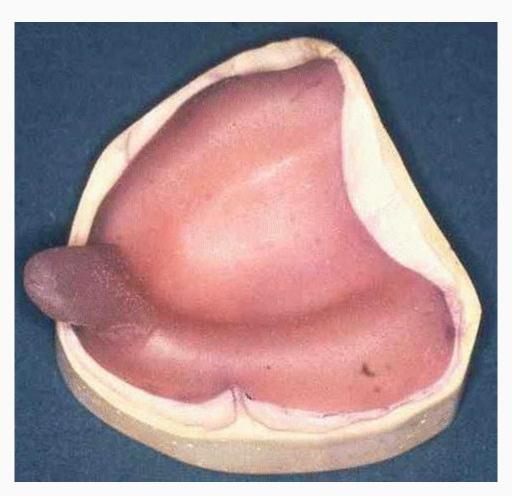
- Non pressure technique (Passive technique, Mucostatic technique).
- Selective pressure technique

Special tray (individual or 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

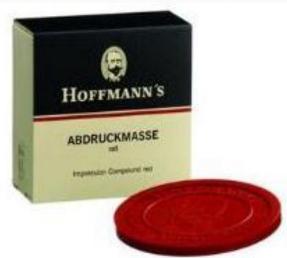
- Economy in impression material (less impression material required in special tray).
- More accurate impression.
- Special tray provides even thickness of impression material. This minimizes tissue displacement and dimensional changes of impression material

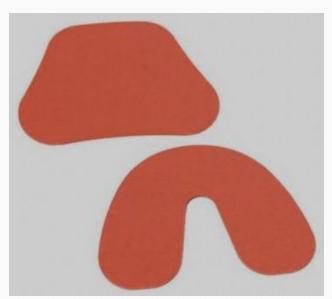
- The work with special tray is easier and quicker than modifying stock tray to provide accurate impression
- Special tray is more accurately adapted to the oral vestibules this helps in better retention of the denture.
- Special tray is less bulky than stock tray which is more comfortable for the patient

Materials used for construction of special tray

- Cold and heat cured acrylic.
- Light cured resin.
- Impression compound (higher fusing tray compound).









Types of special tray

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

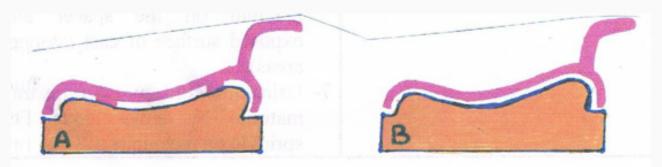
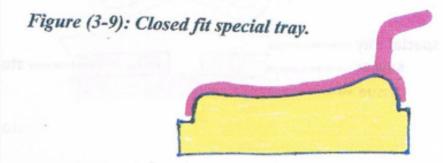


Figure (3-8): Spaced special tray. (A) With stopper. (B) Without stopper.



Fabrication of special tray

- The cast should be soaked in water.
- Severe undercuts should be blocked out using wax.
- The borders of the special tray and the relief areas should be marked.
- The borders of the tray marked on the cast are grooved deeper using a carver, this act as guide to trim the tray later.

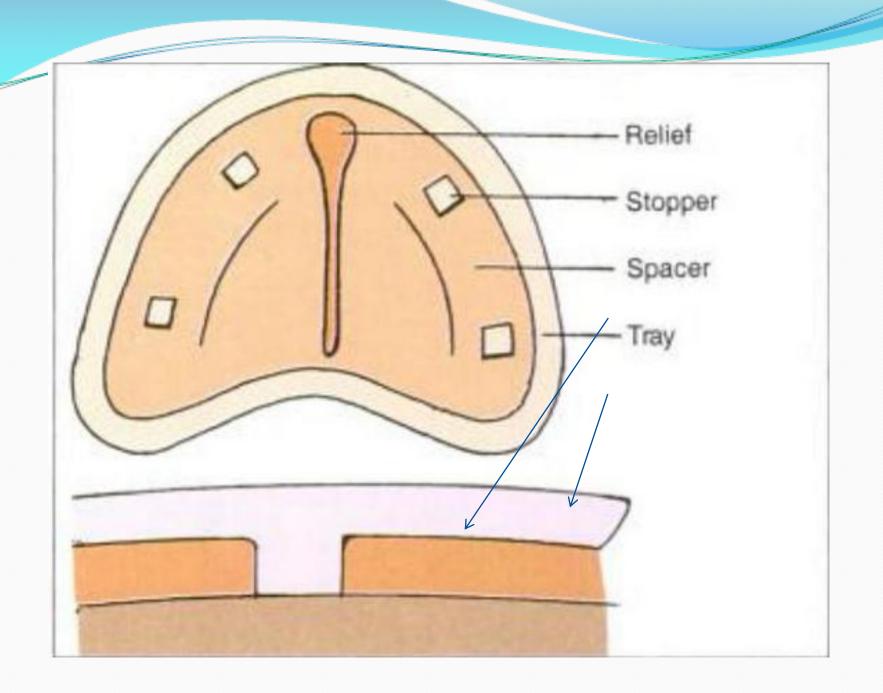
For closed fit>>>>

- Application of separating medium on study cast.
- Using the cold cure acrylic tray material by dough technique

For spaced>>>

- Adapting the wax spacer, should be about 2 mm thick, the posterior palatal seal area on the cast is not covered with the wax spacer.
- Spacer should be cut out in 2-4 mm places so that the special tray touches the ridge in this area. This is done to stabilize the tray during impression making.
- The part of the special tray that extends into the cut out of the spacer is called stopper, usually 4 stoppers are placed, 2 on the canine eminence and 2 in molar region on either side.

- Application of separating medium on the spacer and exposed surface of cast (stopper areas).
- Using the cold cure acrylic tray material by either dough or sprinkle on technique.
- When the special tray is removed from the cast, the wax spacer is left inside the tray to be properly positioned in the mouth during border molding procedure.



Wax spacer



Spacd special tray



Removing of wax spacer



Criteria for special construction tray

- The tray should be rigid and of sufficient even thickness that it will not fracture during its use.
- The special tray must not impinge upon movable structures.
- The borders must be (2 mm) under extended.

- 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.
- The tray must have a handle for manipulation, and the handle must not interfere with functional movement of the oral structures.

• The tray must be smooth on its exposed surfaces and should have no sharp corner or edges which would injury the patient.

Thank you•

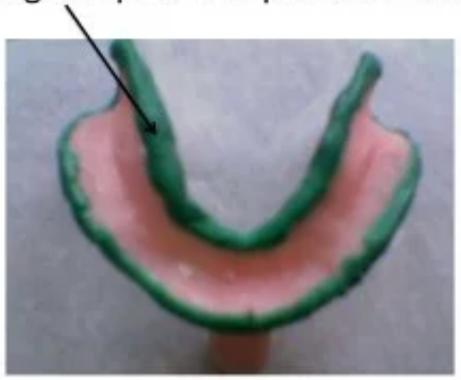
Record base

Hussein AlDewachi

 Tracing compound is similar to impression compound but is more stick to the tissues, it is added to the special tray step by step labially, buccally and lingually and molded in patient mouth with each new addition.



Tracing compound impression material

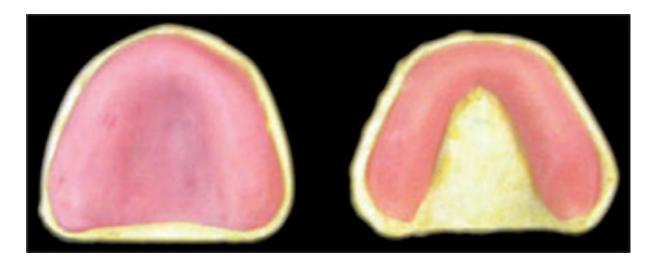


- Border molding it is shaping of the border areas of impression material by functional or manual manipulation of the size of the vestibule.
- *In case of flat residual ridges, special tray can be full covered by tracing not only its borders so as to increase impression and denture retention



Record base

 Record base: an interim denture base (temporary form) used to support the record rim material for recording maxilla-mandibular records.



Requirements of record base:

- 1. The record base must have rigidity.
- 2. The record base must have accuracy and stability.
- 3. The borders should be developed in the same manner as borders of finished denture.
- 4. All surfaces that contact lips, cheek and tongue should be smooth, round and polished.
- 5. The crest, labial and /or buccal slopes should be thin to provide space for teeth arrangement.

The accuracy of maxillo-mandibular relation record is affected by:

- * Rigidity of record base.
- * Stability of record base.
- * The movability of the record bases.
- * The smoothness of the polished surfaces contributes to the comfort of the patient.

 * The more comfortable and compatible the record bases are to the tissues, the more normal are the jaw movements.

Types and materials used in construction of record bases:

 Temporary record bases: They are discarded and replaced by denture base material, once their role in establishing jaw relation, teeth arrangement and try in complete denture

Types of temporary record bases:

- 1. Shellac base plate.
- 2. Reinforced shellac base plate.
- 3. Cold cure acrylic resin.
- 4. Visible light cure acrylic resin.
- 5. Vacuum formed vinyl and polystyrene.
- 6. Base plate wax (rarely used because it lacks rigidity and dimensional
- stability).

- Permanent record bases: they are not discarded and become part of the
- actual base of the finished complete denture.
- Types of permanent record bases:
- 1. Heat cure acrylic resin.
- 2. Gold.
- 3. Chromium-cobalt alloy.
- 4. Chromium-nickel alloy.

Occlusion rim

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Occlusion rim

Occlusion rim is occluding surfaces
 constructed on record bases for the purpose
 of making maxillomandibular relation records
 and for arranging artificial teeth. It is also
 called bite rim and record rim.

Bite rim





 The borders of the record bases and the polished surfaces of the occlusion rims should be smooth and round; since smooth and round surfaces are conductive to patient comfort and relaxation.

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 rim

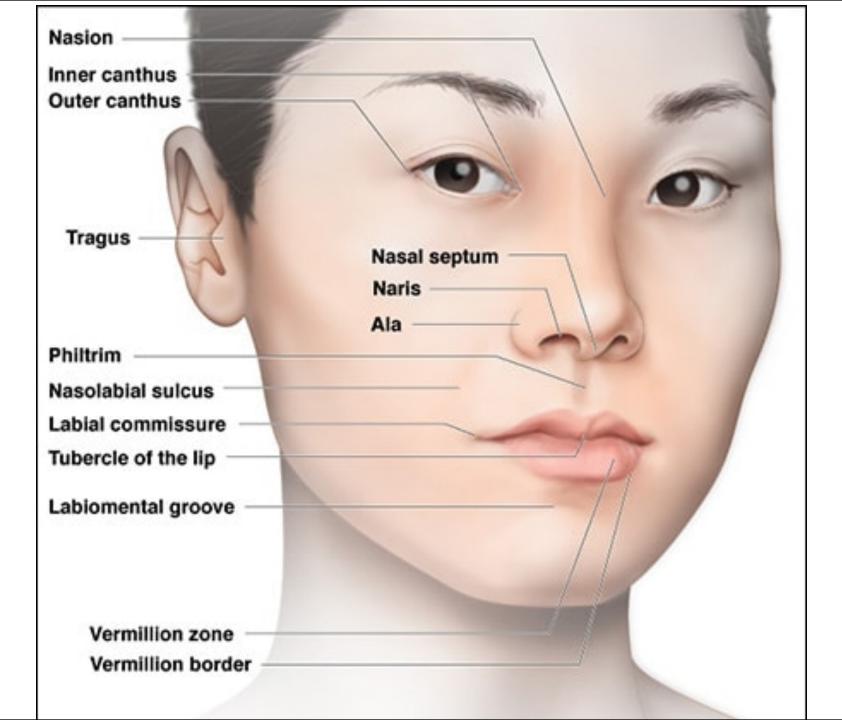
• 1- Establishment of the arch form (neutral zone).

2- Support of the facial musculature.

The position of the lip and cheeks are important in the recording of maxillomandibular 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.

The anatomic guides aid in determining the proper contouring of anterior section of maxillary and mandibular occlusion rims (proper lip contour)

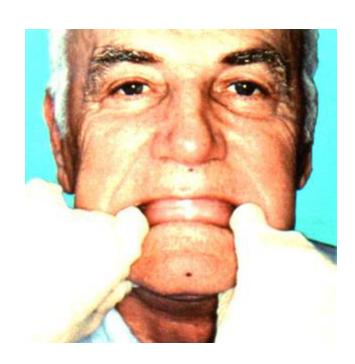
- The nasolabial sulcus.
- The labiomental sulcus.
- The philtrum.
- The commissure of the lips.



Uses of occlusion rim

- 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).

Vertical and horizontal jaw relations.

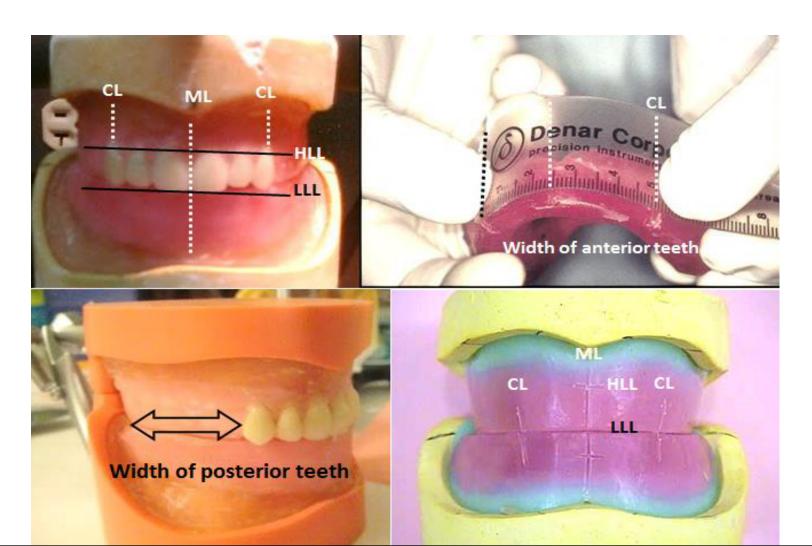


- 5- In selection of teeth:
- a) The position of midline can be determine

•

 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

Midline (ML), canine line (CL), high lip line (HLL), low lip line (LLL), drawn in bit rim.



• 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.
- 6) Setting up of teeth.

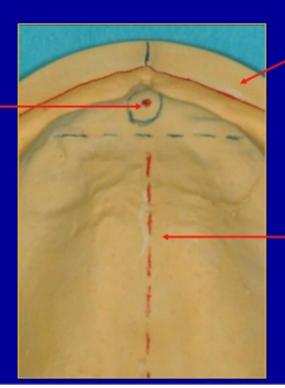


Measurments of maxillary bite rim

- It should be directly over the crest of the residual ridge.
- 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.

Guidelines drawn on the master casts

Incisive papilla



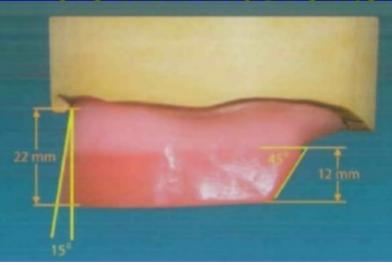
Anterior land area

Midline

Maxillary occlusion rim

- 22 mm height from labial frenum,
- 12 mm height in the tuberosity from the record base
- 8-10 mm width posteriorly

6-8 mm width anteriorly



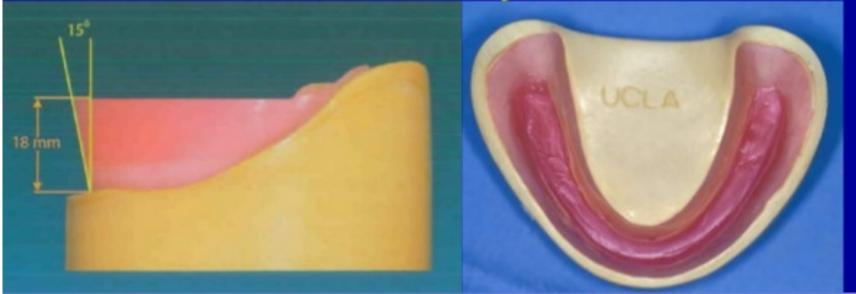


Measurments of mandibular bite rim

- It should occupy the space over the crest of the residual ridge.
- Mandibular incisal edge should be at the level of the lower lip and about (2 mm) behind the maxillary incisal edge.

Mandibular occlusion rim

- 18 mm height from labial frenum, midpoint or 2/3rds of retromolar pad posteriorly,
- 8-10 mm width posteriorly
- 6-8 mm width anteriorly



Prosthodontics

Dental articulator

Dr.Hussein AlDewachi

Definition:

It is a mechanical instrument that represents the TMJ and jaw members to which the maxillary and mandibular casts are attached to simulate some or all mandibular movements.

The design based on:

1-Theories of occlusion

Bonwill, Conical, Spherical

- 2-Types of record used for their adjustment.
- 3-Capability of adjustment of an articulator

Functions:

- 1-Allow most of the prosthetic work to be done in the absence of the patient.
- 2-Maintain jaw relation record during setting up of teeth.
- 3-Denture remounting after processing for correction of occlusal disharmony.

Requirements of an articulator:

- 1-It should hold the casts in the correct horizontal and vertical relationships
- 2-The casts should be easily removable and re-attachable
- 3-It should provide a positive anterior vertical stop (incisal pin)

- 4-It should accept face-bow transfer record
- 5-It should open and close in a hinge movement
- 6-It should be made of non-corrosive and rigid materials
- 7-It should not be bulky or heavy
- 8-There should be adequate space between the upper and lower members
- 9-The movable parts should move freely without any friction

Types of articulators:

1- Non-adjustable condylar path articulators

a- simple hinge articulators (class I)

it consists of an upper and lower members held apart at a certain distance by the screw which act at the back. The screw can increase or decrease the distance between the two members, and permits only a hinge like movement.



Possible movements:

Opening and closing movements only

Records required:

1-OVD

2-Centric relation record

Disadvantage:

Not represent the TMJ and the dynamic mandibular movements

B. Mean value or Fixed condylar path articulators (Class II)

The two members are joined by 2 joints that represent the TMJ. The horizontal condylar path is fixed at certain angle that ranges from 30-40 which is the average of the most patients. The incisal guide table is also fixed at a certain angle from horizontal. On the fixed condylar path articulators, the upper members are movable (the condyle) and the lower members are stationary.



The Condylar Path

- 1. Horizontal Condylar Path .
- 2. Lateral Condylar Path .
- 3. The Condylar Path Angle.







Incisal guidance

 This is defined as "angle formed by intersection of plane of occlusion and line with in sagittal plane determined by incisal edges of maxillary & mandibular central incisors when teeth are in maximum intercuspation" (GPT-8)





Possible movements

1-opening and closing

2-protrusive movement at a fixed condylar path angle.

Records required

- 1-OVD
- 2-Centric relation record
- 3-Face-bow record

(In some designs of these articulators, the upper cast can be mounted by a face bow transfer)

When an articulator doesn't accept face-bow record, the mounting is made according to (*Bonwill triangle*)

Bonwill found that in the mandible the inter-condylar distance as well as the distance from each condyle to the contact point of the lower central incisors was 4 inches (equilateral triangle). An anterior pointer is attached to the incisal pin of the articulator to locate the tip (midline) of the occlusion rim labially and thus to orients cast in relation on the Bonwill triangle.



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 in patients whose condylar angle approximates that of the articulator.
- 3-No lateral movements.

2- Adjustable condylar path articulators (class III and IV)

These types of articulators differ from fixed condylar path articulators in that have adjustable condylar and incisal guidance. they can be adjusted so that the movements of its jaw members closely resemble all movements of the mandible for each individual patient.

A-Semi adjustable condylar path articulators (class III)

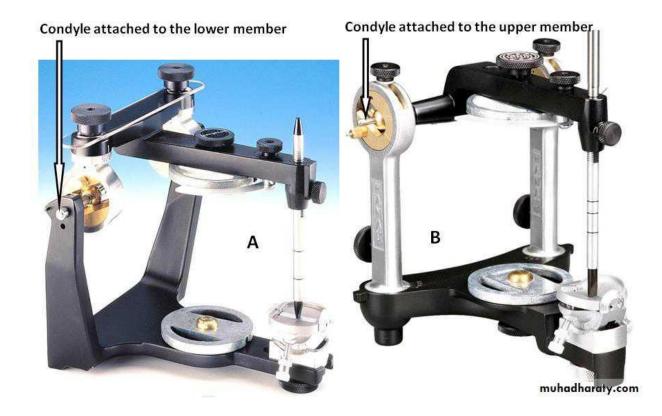
Design:

In these articulators (e.g. *Hanau's articulator*) the horizontal condylar path is adjusted by the protrusive record obtained from the patient.

The lateral condylar path inclination is adjusted according to the *Hanau's formula*: L=H/8+12. (L=lateral condylar path, H= the horizontal condylar path).

Some semi adjustable articulators are non-arcon, while others are arcon. The term arcon (articulator+condyle) is commonly used to indicate an instrument that has its condyles on the lower member and the condylar guides on the upper member.

The non-arcon or condylar articulator having the condylar guides (fossa assemblies) attached to the lower member.

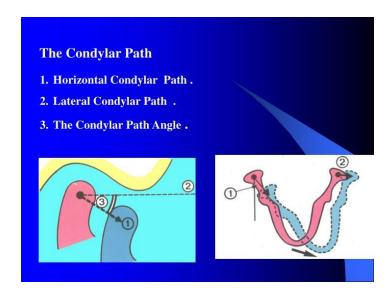


Arcon



Non-Arcon

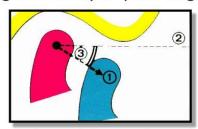




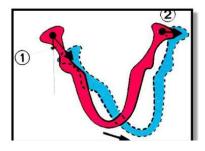
The inclination of the condylar path

Types:

A- Sagittal condylar path angle



B- Lateral condylar path angle



Possible movements:

1-Opening and closing

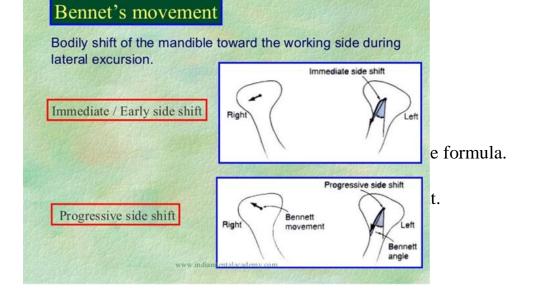
- 2-Protrusive movement according to the horizontal condylar path angle determined from the patient.
- 3-Lateral movement to the angle estimated from the Hanau formula.
- 4-Some types have Bennett movement (immediate side shift).

(lateral movement of the mandible toward the working side as the non-working condyle moves forward).

Records required:

- 1-A maxillary face bow record to mount the upper cast.
- 2-centric occluding relation record (vertical dimension and centric relation) to mount the lower cast.
- 3-protrusive record to adjust the horizontal condylar path inclination of the articulator.





B. Fully adjustable articulators (Class IV)

They differ from the adjustable articulators in that the lateral condylar path inclinations are adjusted according to records taken from the patient.

Possible movements:

The same movement for the semi-adjustable articulators in addition they have Bennett movement.



Records required:

- 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.
- 4-Right lateral record to adjust the left lateral condylar path inclination.
- 5-Left lateral record to adjust the right lateral condylar path inclination.

Disadvantages:

Multiple records are required with the possibility of errors. The semi-adjustable articulators are usually enough for complete denture construction.

Mounting

Dr. Hussein AlDewachi

The laboratory procedure of attaching the maxillary or mandibular cast to an articulator or similar tool.

The significant of mounting are:

- 1. To maintain of the vertical dimension of occlusion
- 2. To keep horizontal centric jaw relation.
- 3. To ease arrangement of artificial teeth

Preparation of articulator before mounting procedure:

For mean value articulator (class II)

- 1- the articulator should be clean from any remnant of previous plaster.
- 2-the incisal pin should be flushed (leveled) with the top of the upper member of articulator to give zero reading.
- 3-the mounting table should be properly fixed to the articulator.



Mounting table



Mean value articulator

The mounting table used to support the maxillary occlusion rim in it accurate position during mounting which fist mounted on articulator then mount the lower cast after taking centric jaw relations from patient.

For semi-adjustable articulator (class III)

- 1-The articulator should be clean from any remnant of previous plaster.
- 2-The incisal pin should be put at zero reading.
- 3-The incisal guidance put at (zero degree) (anterio posteriorly and laterally).
- 4- Set the condylar guidance and lateral guidance at zero degree bilaterally.
- *The maxillary cast with its record base and occlusion rim which must secured to the cast accurately by wax) is mounted first by means of the face bow to support the accurate position of upper occlusion rim during mounting.
- *Mount the lower cast after taking centric jaw relation.
- *Take protrusive record from the patient and adjust the articulator (incisal, condylar, and the lateral guidance) according to protrusive record and Hanau's formula.





Hanau's semi-adjustable articulator

Preparation of the casts and mounting the upper cast on class II articulator:

- 1-Determine the midline of the cast according to midline of incisive papillae and continue this line posteriorly all around the cast.
- 2-With laboratory knife, form 3 or 4 (V) shape cuts on the base of upper and lower casts, so as to facilitate the laboratory remounting. The cuts should be approximately ¼ inch deep and ½ inch wide, then lightly coated the base of the casts and the cuts with Vaseline or any separating medium.



3 (V) shape cuts on the base of the cast

- 3-The base plate with occlusion rim should be sealed to the cast by wax.
- 4-Alignment of the midline of occlusion rim (upper) 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.
- 5-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.
- 6-Plaster is mixed according to the correct w/p ratio (2 plaster to 1 water) and 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 pin touch the incisal table.
- 7-Smoothing and polishing of the plaster is done. The mounting should be cleaned and any debris removed from the articulator and the mounting table.

Mounting the lower cast:

- 1-The centric relation is taken from the patient mouth.
- 2-The lower occlusion rim should be well secured to the lower cast with it record base by using of the wax, also sealing should be done between the upper and lower occlusion rims.
- 3-Care should be taken that there is no posterior interference between the upper and lower casts (Healer's area).
- 4-Plaster is mixed and poured over the base of the lower cast and the articulator is closed until the incisal pin touch the incisal table then the plaster should be smooth and polished.

After setting of plaster, the mounting should be checked for:

- 1-The midline of upper cast should be coinciding with the midline of lower cast and midline of articulator.
- 2-Centralization of upper cast with upper member of articulator then the centralization of lower cast which depend on accuracy of the upper cast.
- 3- Incisal pin checked if it does not touch the incisal table.
- 4- Healer's area checked if there is any contact.

Errors occurred during mounting:

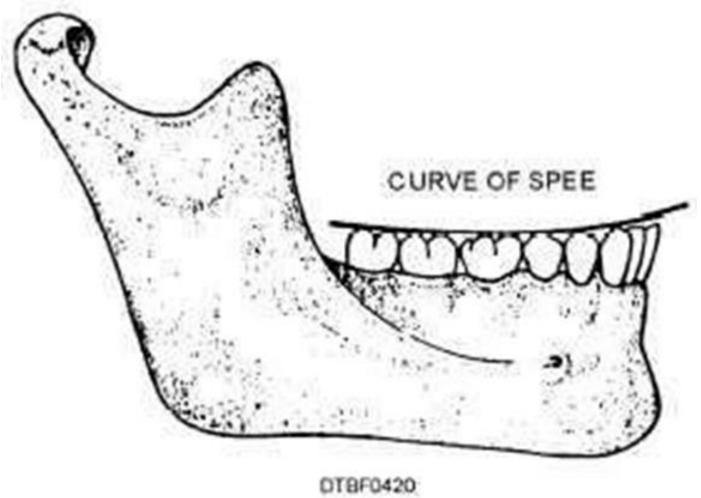
- 1-The record base is not properly secured to the cast.
- 2-Interference of the casts posteriorly.
- 3-The incisal pin is not properly screwed.
- 4-The incisal pin not touching the incisal table.
- 5-Wrong transference of the midline of the articulator with that of the casts (shifting of the midline).
- 6- Movement of the casts during mounting.
- 7- Upper and lower occlusal rims are not properly fixed for orientation.
- 8- Dimensional changes in the plaster.
- 9- Face bow record defected.

Compensating Curves

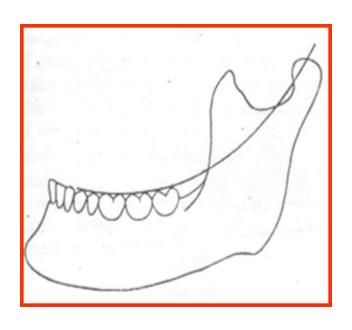
د حسين الديوه جي

- Artificial curves introduced into complete denture occlusion to achieve balanced occlusion
- Are among the most important determinents of occlusal balance

 The anteroposterior curving (in the median plane) and the mediolateral curving (in the frontal plane) within the alignment of the occluding surfaces and incisal edges of artificial teeth that is used to develop balanced occlusion



 The anatomic curve established by the occlusal alignment of the teeth, as projected onto the median plane, beginning with the cusp tip of the mandibular canine and following the buccal cusp tips of the premolar and molar teeth, continuing through the anterior border of mandibular ramus, ending with the anterior most portion of the mandibular condyle.



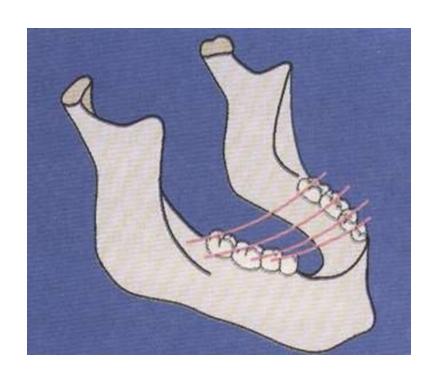
Curve of Spee

Sagittal planes.

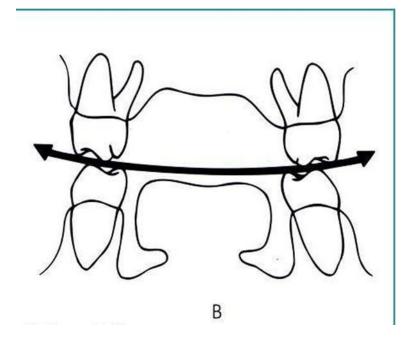
 Incisal Ridges of the anterior teeth and the Buccal cusps of the posterior teeth follow a curve which end at the anterior surface of the condyle.

when the arches were observed from a point opposite first molar.

Curve of Wilson



- contacts buccal and lingual cusp tips of molars on each side of arch
- In mandibular arch -results from inward inclination of lower posterior teeth-making lingual cusps lower than buccal cusps –curve being concave
- In maxillary arch-results from outward inclination of posterior teeth-making buccal cusp higher than lingual cusps-curve being convex



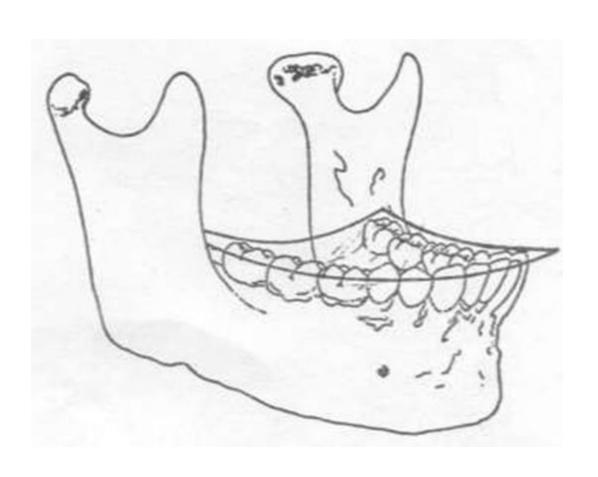
Curve of Wilson

Coronal plane.

 The occlusal surfaces of posterior teeth conform to a curved plane.

 The crowns of mandibular posterior teeth must incline to the lingual while the crowns of maxillary posterior teeth must incline toward the buccal. Deeper posteriorly—— molars inclination is greater than that of the premolar

Curve of Monson

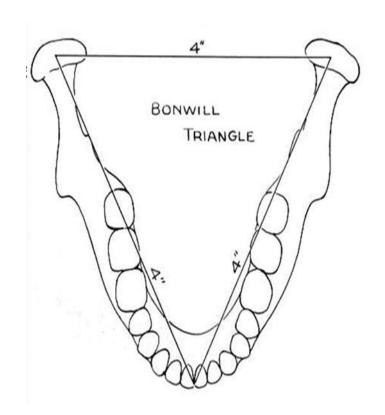


- Combination of curve of Spee and the curve of Wilson.
- coronal and sagittal planes.
- concave for the mandibular arch and convex for the maxillary arch.
- in centric occlusion form a segment of a sphere of 4 inches radius with the center of the sphere at the glabella

Bonwill Triangle

 Describe the mandible and found that the mandibular dental arch adapts itself to an equilateral triangle of 4 inches length. Apex — at the mesial contact area of the lower central incisors

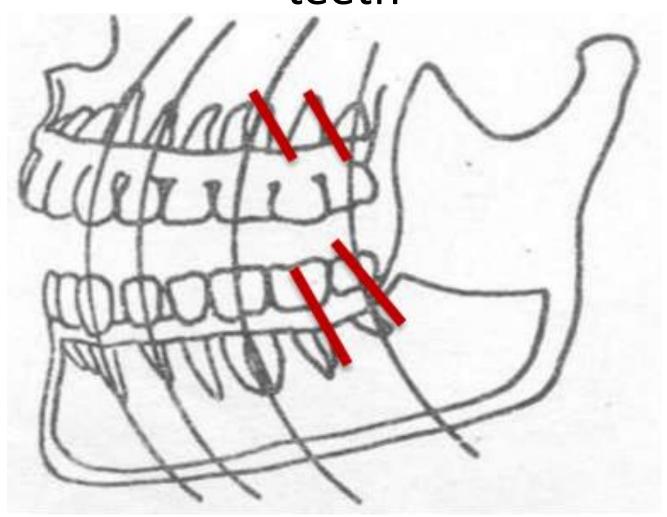
Angles of the base
 at the centers of each condyle



Importance of compensatory curves:

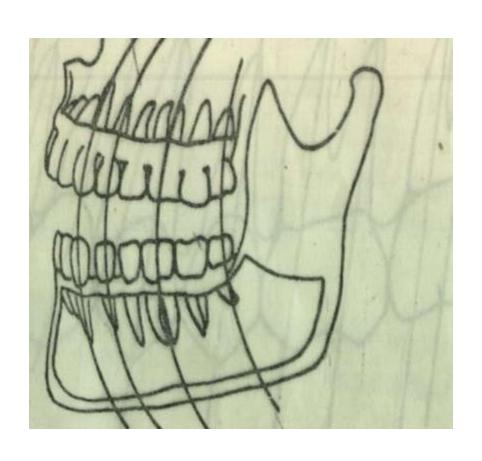
 The significant of these curve as guidance for mandible Movement to complement the condyle paths and for balance of mandible

Compensating curvatures of individual teeth



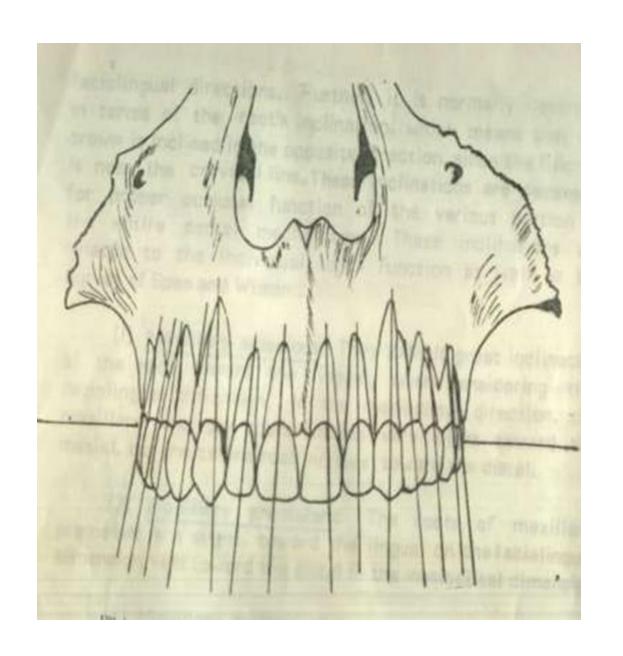
- long axis of posterior Teeth are not perpendicular To a horizontal plane but show axial curvature
- importance :
- stability of teeth to resist force of mastication .

- Upper second and thord molar distally inclined to prevent any distal drift of the posterior teeth.
- Lower second and third molar mesially inclined to strike the maxillary molar



Angulations of individual teeth in relation to various planes

- The inclination of a tooth from a vertical axis in mesiodistal and faciolingual directions
- 1- upper anterior:
- FL>>>>inclined lingually
- MD >>>1&2 inclined slightly mesial but canine toward distal

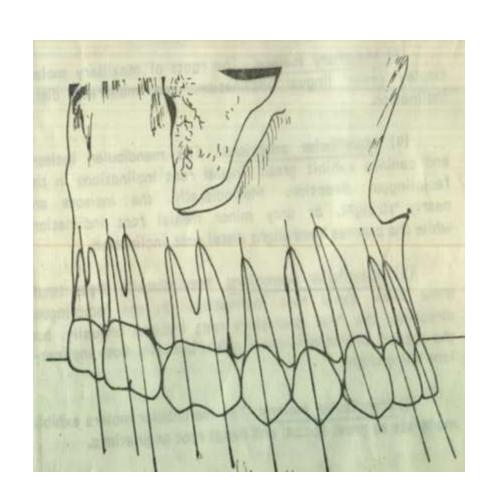


 Def. Inclination of the tooth from a vertical axis in a MD and FL direction.

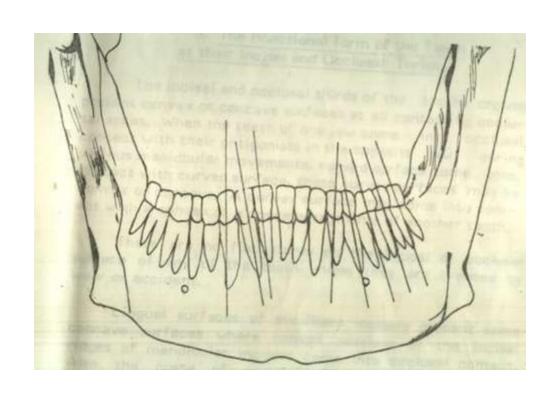
- (Considered root inclination so the crown inclined in opposite direction).
- importance: Proper occlusal function (each tooth must be placed at the angle that best withstand forces during function)

2 -Maxillary premolars are slight lingual in FL, Distal in MD

3- Maxillary Molars roots have lingual inclination with distal inclination



 Mandibular anterior have greet lingual root inclination in FL. In MD incisors are nearly straight or minor root inclination while canine has distal root inclination

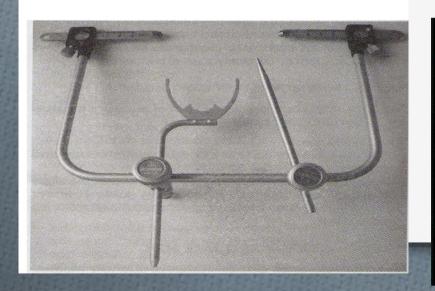


 Mandibular premolars In MD have distal inclination but in FL 1st premolar incline lingually. But 2nd premolars is offset buccally 6- Mandibular molars moderate to great buccal and distal toot angulations

\			

Face bow:

<u>Definition</u>: is a caliper-like instrument used to record the spatial relationship of the maxillary arch to some anatomic reference point or points and then transfer this relationship to an articulator.



MAKING THE EAR BOW RECORD Two posterior reference points

Objectives of face bow

• To record the relationship of the jaws to the opening axis of the jaws <u>and</u> to orient the casts in this same relationship to the opening axis of the articulator.

• To support the maxillary cast while it is being

mounted on the articulator.

Indications of face bow:

- $ilde{\hspace{0.1cm}}$ 1)During complete denture fabrication while balanced occlusion is desired
- 2) During fixed partial denture fabrication to obtain accurate crowns and ridges.
- 3) When cusp form of teeth are used for complete denture fabrication.
- 4) When interocclusal check records are used.
- 5) During full mouth rehabilitation when accurate occlusal restorations are to be made.
- 6) When vertical dimension at occlusion is to be changed during teeth setting.
- 7) In gnathological studies and treatment.
- 8) For making occlusal corrections after denture processing.

Types of face bow:

- 1) Arbitrary face bows
 - A. Fascia type

Example:

- Hanau fascia type face bow.
- Denar fascia face bow.
- 1) Arbitrary face bows
- B.Ear piece type

Example:

Hanau ear piece type face bow Hanau spring bow.

Whip mix quick mount face bow.

Denar slidematic face bow.



2) Kinematic face bow or hinge bow *Example:*

Hanau kinematic face bow.

Denar kinematic face bow.



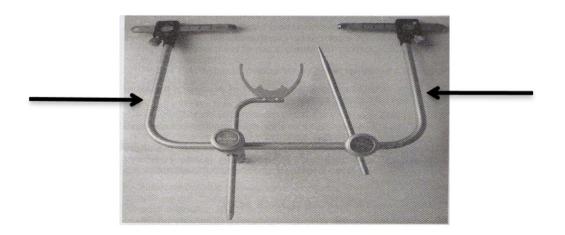


- 1. U-shaped frame or assembly.
- 2. Condyle rods / Ear pieces.
- 3. Bite fork
- 4. Locking device
- 5. Orbital pointer
- **6. Nasion relator assembly**
- 7. Intercondylar scale
- 8. Electronic device
- 9. Transfer zig



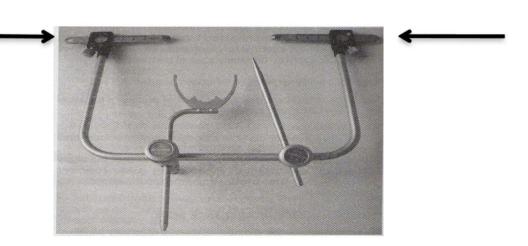


- It is the main part of face bow to which all other parts are attached with the help of clamps.
- It should be large enough that extend from the region of one TMJ around the front of the face to the other TMJ and wide enough to avoid contact with sides of face.



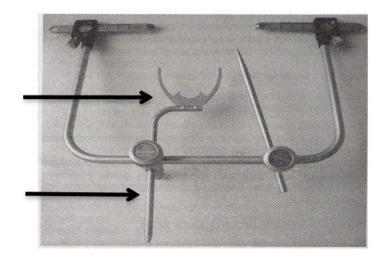
Condyle rods and ear pieces

- They are attached on either side of the free end of U-shaped frame.
- Fascia type of arbitrary face bows and kinematic face bows have condylar rods. Ear piece type of arbitrary face bows have ear pieces.





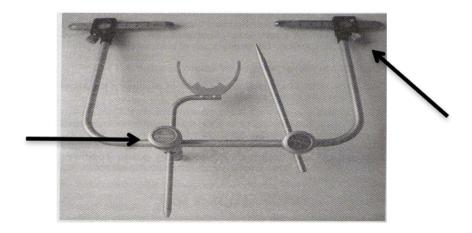
- They are attached on either side of the free end of U-shaped frame.
- They are positioned on the patient at the approximate or absolute location of the hinge axis or opening axis of jaws.







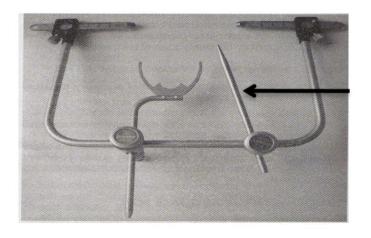
- Locking device helps in attaching bite fork to the face bow.
- It also serves to support the face bow, the maxillary occlusion rim and the maxillary cast while the casts are being attached to the articulator.





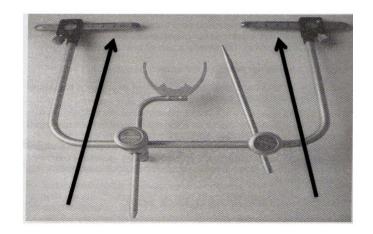


- It is present in Hanau arbitrary face bows.
- It marks the anterior reference point, which is orbitale in case of Hanau arbitrary face bows.





- It is a part of whip-mix quick mount arbitrary face bow.
- It is present in front of face bow and indicates the inter condylar distance as small, medium and large (S, M, L).



Advantages of face bow

- 1. Avoids errors in occlusion of finished prosthesis.
- 2. Allows minor changes in the occlusal vertical dimension in articulator without having to make new maxillo-mandibular relations.
- 3. Most helpful in supporting the maxillary cast while it is being mounted on the articulator.
- 4. Allows more accurate programming of the articulator.

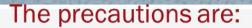
Mounting of casts

When the dentist has completed recording the maxillo-mandibular records and making the face bow transfer, the dentist should do mounting of casts on articulator.

Precautions must be observed when mounting casts on articulator, if not, then, the casts mounted in an improper position and defects in occlusion in the final prosthesis may occur.



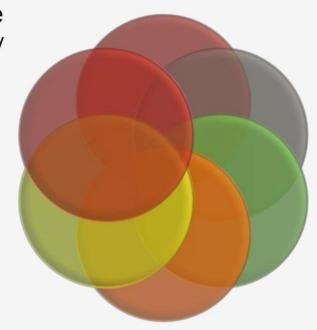






The casts must be seated completely in there respective occlusion rims.

The mounting rings must be firmly attached.



There must be no lateral play in the articulator.

The articulator must be checked to be sure it is adjusted correctly.

The condylar elements must be locked in centric position.

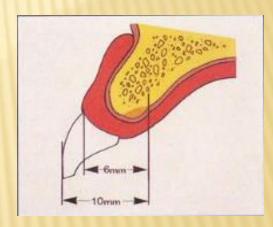
Thank you

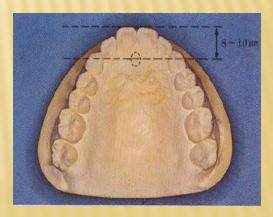
Artificial teeth arrangement

ARRANGEMENT OF ANTERIOR TEETH

POSITION OF TEETH

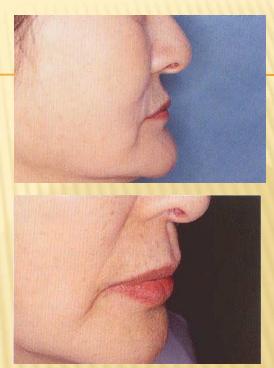
- ***** Anterior teeth
- 1. Incisive papilla
- × Aid in determining the mid line
- Labial surfaces of the central incisors are usually 8-10 mm in front of the papillae (distance increase with excessive bone loss)





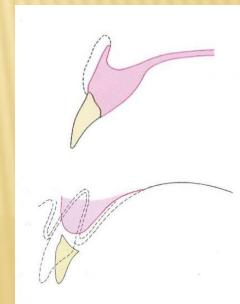
2. Lip

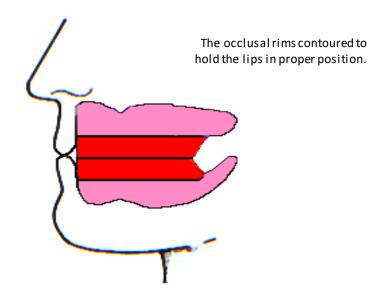
- Labial surfaces & incisal edges of the teeth are anterior to the tissues at the reflection, where the denture borders would be placed
- Tone of the skin of the lips

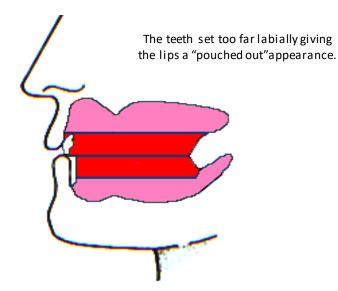


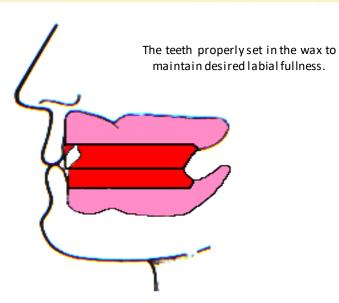
3. Crest of the ridge

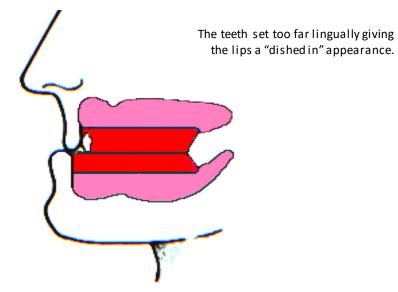
- Upper anterior teeth anterior to the crest of the upper ridge
- Lower anterior teeth over the crest of the lower ridge



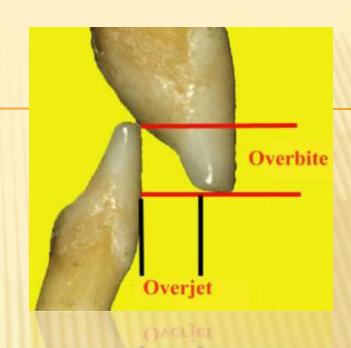


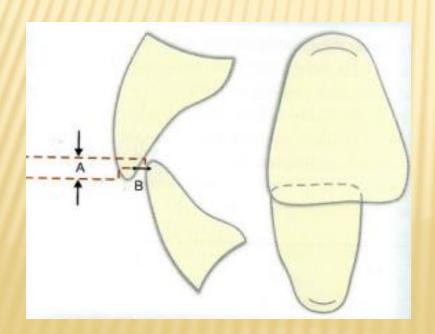


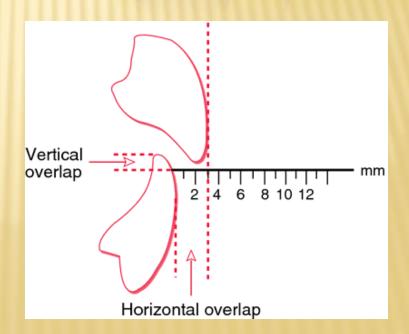


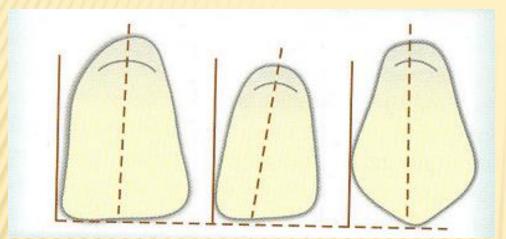


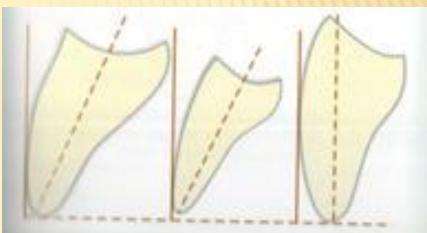
- Over bite: the vertical distance between the incisal edges of maxillary and mandibular teeth.
- Over jet: the horizontal distance between the incisal edges of maxillary and mandibular teeth.









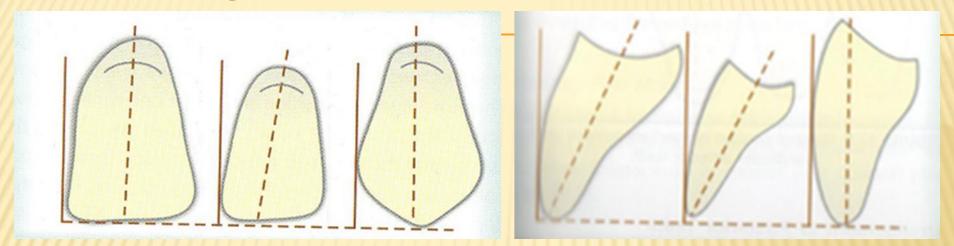


Upper central incisor

- Long axis shows slight mesial inclination.
- The incisal edge is on the occlusal plane.
- The neck of tooth should be slightly depressed.

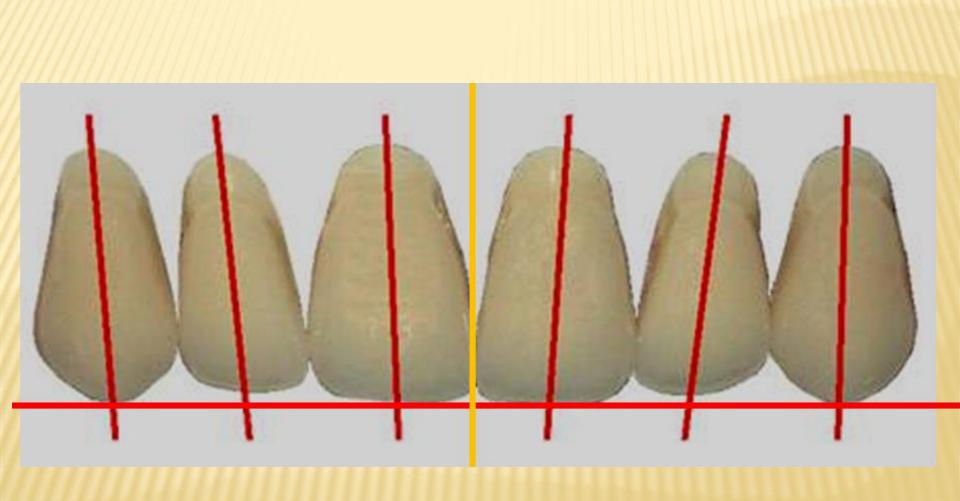
Upper lateral incisor

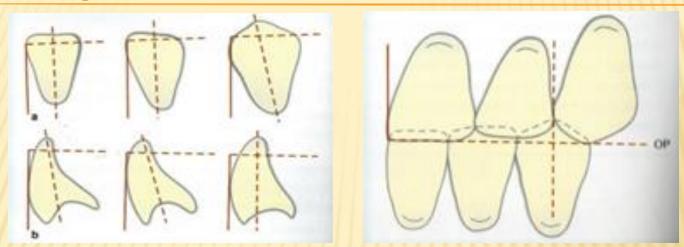
- Long axis shows more mesial inclination.
- The incisal edge is usually 0.5-1mm above the occlusal plane.
- The neck of tooth depressed more than that of central incisor.



Upper canine

- The canine tooth is an important tooth in any tooth arrangement because it forms the corner of dental arch.
- The maxillary canine have two planes in the facial surface; the mesial plane should follow the contour of the anterior teeth while distal plane will be in line with posterior teeth.
 - 1. Long axis perpendicular to the occlusal plane.
 - 2. The cusp tip touch the occlusal plane.
 - 3. The neck of tooth should be prominent (support the corner of the mouth).





Lower central incisor

- Long axis slightly inclined mesially.
- The neck of tooth should be slightly depressed.
- The incisal edge should form (1-2mm) horizontal and vertical overlap in respect with upper central incisor (above the occlusal plane).

Lower lateral incisor:

- Long axis mesially inclined.
- It placed as in central incisor.

Lower canine:

- Long axis slightly inclined mesially.
- The neck of tooth should be set prominent and the cusp tip 2mm above the occlusal plane.

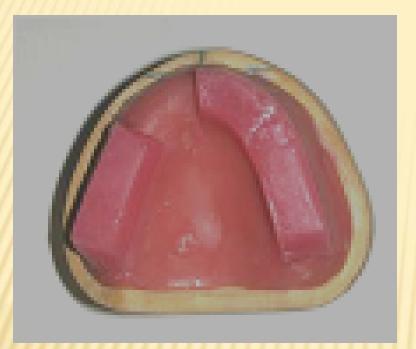






•The middle of the crest of the mandibular ridge should be recorded.

•mark the midline of the patient's face by placing a dot on the incisive papilla and marking this midline on the maxillary anterior land area, extending down the front of the cast. The incisive papilla is a much more reliable landmark for the midline than the labial frenum.





 Make a cut with a heated, sharp knife, at the midline in the anterior wax rim. Cut all the way to the baseplate. Make a similar cut just distal to the canine point. Remove this section of wax in its entirety.





Use a flat plate to position the central incisor so that it contacts the occlusal plane.
Set the rest of the anterior teeth on the right side according to the curve defined by (occlusal rim).





Use a flexible plastic ruler to verify that the incisal portion of the tooth's labial surface is properly located and in contact with the anterior curvature of the occlusion rim.





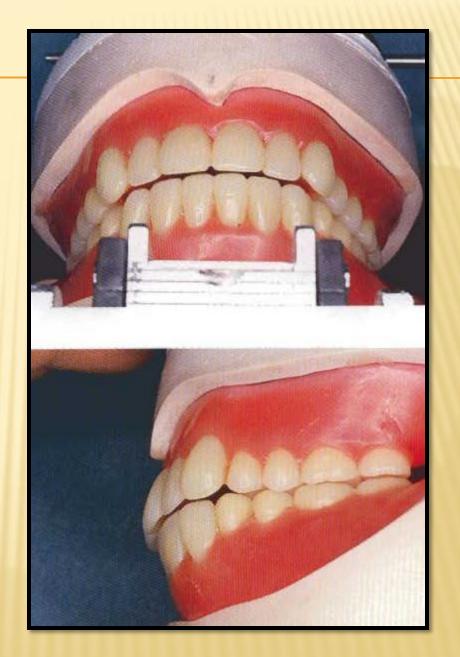
An anterior view of the maxillary anterior teeth shows that only the lateral incisors do not touch the occlusal plane as recorded by mandibular wax rim.





- •Mark the midline of the mandibular ridge on the mandibular wax rim and cut out a section representing the right mandibular anterior teeth from the rim.
- •Arrange the lower anterior teeth following the arch shape
- •Position the teeth over the crest of the ridge and the incisal edges labially inclined.

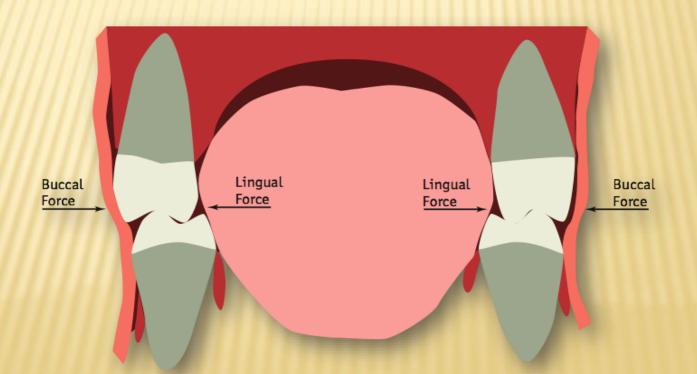
Set the mandibular central incisors so that the maxillary incisors cover them, 1mm vertically and 1mm horizontally (1mm horizontal and vertical overlap) if you are using anatomic posterior teeth



ARRANGEMENT OF POSTERIOR TEETH

POSITION OF TEETH

- × Posterior teeth
- Neutral zone
- Forces exerted by the cheeks & tongue should be equal

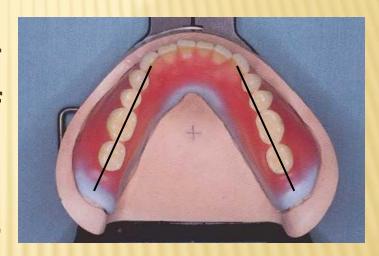




POSITION OF TEETH

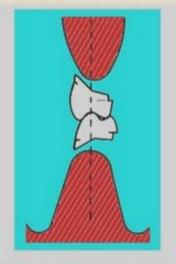
2. Crest of the ridge

- * Mandibular posterior teeth positioned along a line extending from the tip of canine to the middle of retromolar pad. This line should pass through the central fossa of mandibular premolars & molars
- Distance from distal of the canine to ascending area of the mandible



POSITION OF TEETH

Lingual cusps of maxillary posterior teeth occlude in the central fossae of the mandibular posterior teeth.



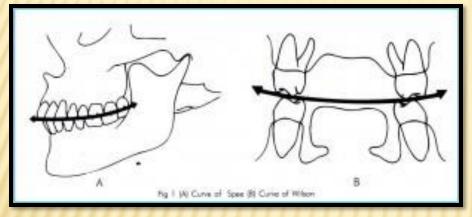
The Mandibular Residual Ridge as a Landmark for Setting Teeth.

This relation ship places the buccal cusp of maxillary posterior teeth lateral to the buccal cusps of mandibular posterior teeth so supporting the cheek & prevent cheek biting



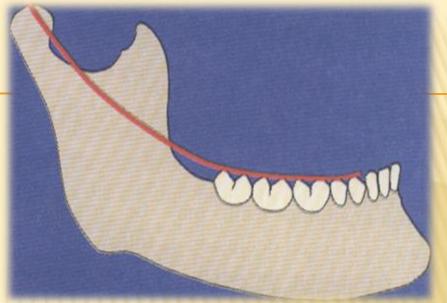
Curve of spee ----

Defined as the anatomic curve established by the occlusal alignment of the teeth in the median plane.

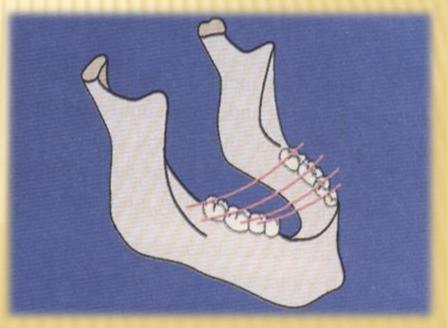


Curve of wilson →

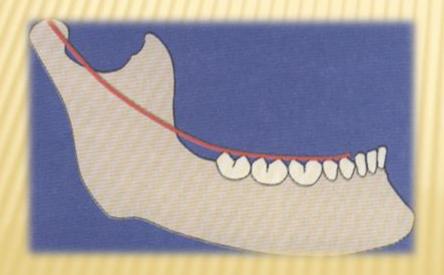
Defined as the mediolateral curve that contacts the buccal and lingual cusp tips on each side of the arch.

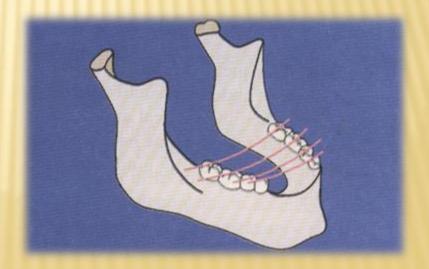


Present in natural dentition



- The occlusal plane: The occlusal plane is defined as the average plane established by the incisal and occlusal surfaces of the teeth".
- Compensating curve: the anterio-posterior curvature (in the median plane) and the mediolateral curvature (in the frontal plane) in the alignment of occluding of surfaces and incisal edges of artificial teeth of complete denture.





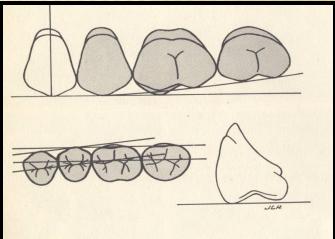
Upper first premolar

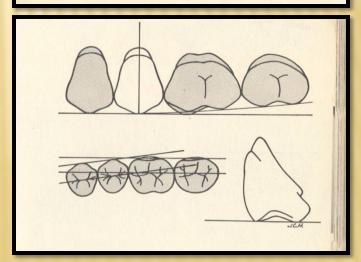
- The facial surface of 1st premolar must harmonies with canine.
- Long axis of tooth perpendicular to the occlusal plane.
- Buccal cusp touch the occlusal plane
- Palatal cusp is about 1 mm over the occlusal plane.
- Palatal cusp over crest of mandibular ridge

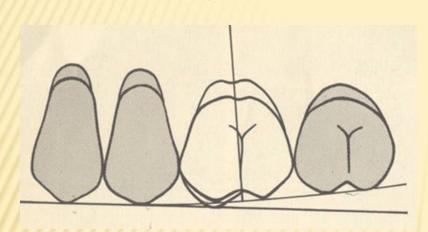
Upper second premolar

- Long axis of tooth perpendicular to the occlusal plane.
- Buccal and palatal cusps touch the occlusal plane
- Palatal cusp over crest of mandibular ridge











Upper first molar

- Mesiopalatal cusp touch the occlusal plane
- The facial surface 1st molar must harmonies with 1st and 2nd premolar
- Palatal cusp over crest of mandibular ridge

Upper second molar

- All four cusps are above the occlusal plane
- ★ The facial surface of 2nd molar must harmonies with 1st molar



Lower first premolar

- Long axis of tooth perpendicular to the occlusal plane.
- Buccal cusp above the occlusal plane
- Lingual cusp is below the occlusal plane.

Lower second premolar

- Long axis of tooth perpendicular to the occlusal plane.
- Buccal and palatal cusps above the occlusal plane

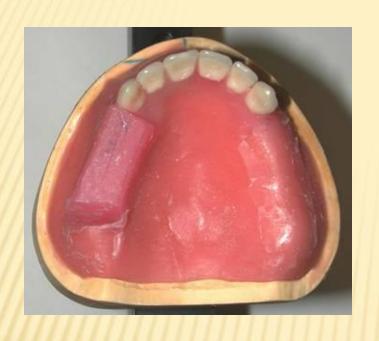


lower first molar

All cusps above the occlusal plane

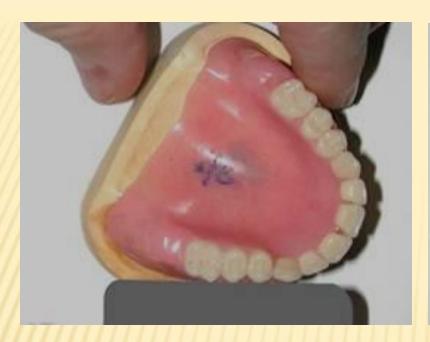
lower second molar

* All four cusps are above the occlusal plane





- •Remove the wax on one side of the maxillary baseplate.
- •The rim is left intact on the opposite side because this will help you to maintain the location of the occlusal plane.





Set the teeth on the maxillary right side so that the mesiolingual cusp of the maxillary first molar rests in the central fossa of the mandibular first molar.

Set the teeth so that the buccal surfaces of the premolar(s) and mesial cusp of the first molar line up with the mid-buccal surface of the canine.

The distobuccal cusp of the first molar should deviate approximately 20° from this plane and the second molar will fall along this plane.





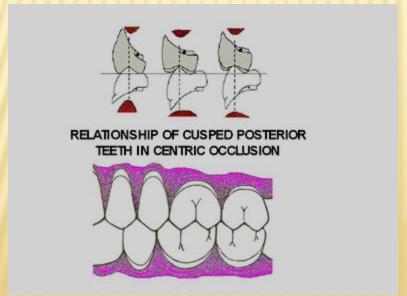
Remove enough wax to allow setting most of the posterior.





•Check the position of the teeth over the crest of the ridge.

- •Buccal cusp of the lower 1st premolar contacts the mesial marginal ridge of the upper 1st premolar.
- •Buccal cusp of the lower 2nd premolar contacts the fossa between two upper premolars.
- •Mesio buccal cusp of the lower 1st molar occludes in the fossa between upper 2nd premolar and 1st molar.
- •Mesio buccal cusp of the lower 2nd molar occludes in the fossa between upper 1st and 2nd molars.

















Arrangement of artificial teeth class II

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- The overjet increases up to 5 mm.
- 1 The stability of the denture base supported by such a ridge is a primary concern in the class-2 patient because the lower ridge is already compromised in size, compared with the upper ridge.
- 1 In the class-2 relation the lower ridge is smaller & markedly lingual in relation to the upper ridge.
- ② One must not attempt to place the teeth more labially as this may cause instability.

- The anterior teeth exhibit a pronounced horizontal overlap when they are arranged properly for esthetics.
- The vertical overlap should be kept as small as esthetics and phonetics will allow in order to establish and incisal guidance as shallow as possible.
- Class-2 problems can be due to insufficient growth of the lower jaw, an over growth of the upper jaw, or a commination of the two.
- Class-2 problems are treated via growth redirection to bring the upper and lower teeth and jaw into harmony.

NORMAL OCCLUSION

Molar Relationship:

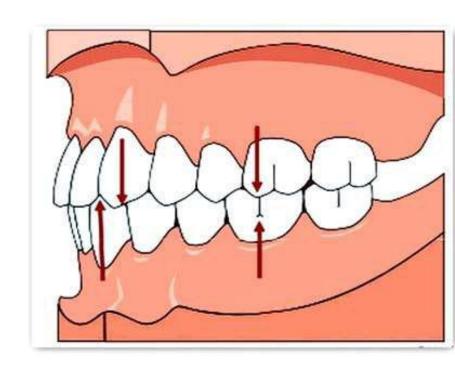
According to Angle, the mesiobuccal cusp of the maxillary first molar aligns

with the buccal groove of the mandibular first molar.

Canine Relationship: The maxillary

canine occludes with the distal half of the mandibular canine and the mesial half of the

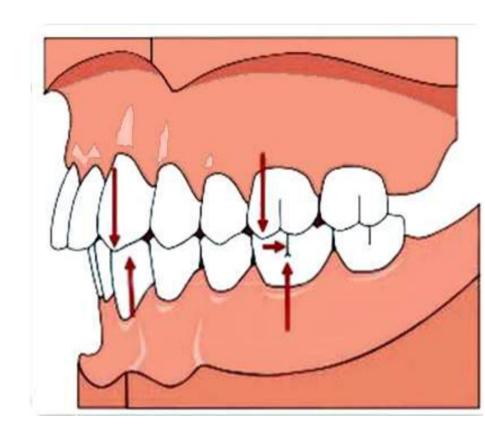
mandibular first premolar



- The mesial incline of the maxillary canine occludes with the distal incline of the mandibular canine. The distal incline of the maxillary canine occludes with the mesial incline of the mandibular first premolar.
- Normal Line of Occlusion, normal smooth curves. normal overbite and overjet and coincident maxillary and mandibular midlines.

Class II malocclusion

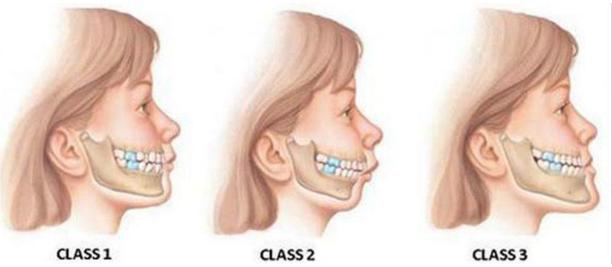
- Molar relationship: The molar relationship shows the mesiobuccal groove of the mandibular first molar is DISTALLY (posteriorly) positioned when in occlusion with the mesiobuccal cusp of the maxillary first molar.
- Usually the mesiobuccal cusp of maxillary first molar rests in between
 - the first mandibular molar and second premolar.



 Canine Relationship: The mesial incline of the maxillary canine occludes ANTERIORLY with the distal incline of the mandibular

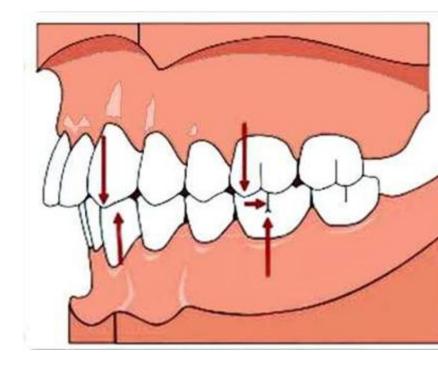
canine. The distal surface of the mandibular canine is POSTERIOR to the mesial surface of the maxillary canine by at least the width of a premolar. Problem >> Convex face profile resulting from a mandible that is too small or maxilla that is too

large.



Class II

- Distobuccal cusp of maxillary first
 molar falls
- on the mesiobuccal groove of mandibular first permanent molar.



It is divided into:

Class II Div 1: Upper incisors are proclined

Class II Division I Malocclusion

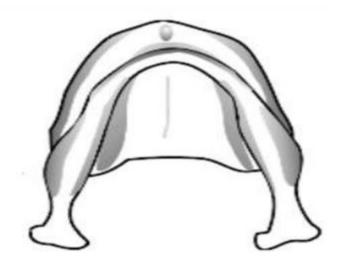
Class II Div 2: Upper laterals overlap centrals and the centrals are retroclined



- Prosthodontical problems in angle class II
 - Problem in static relationship and functional relationship

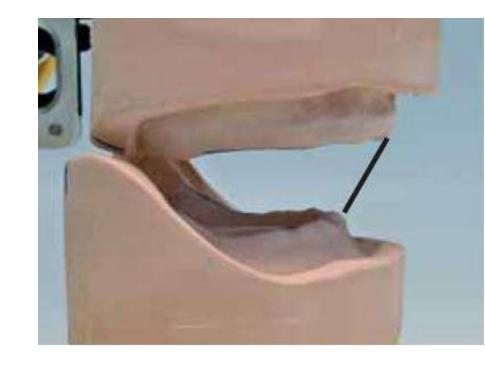






Prosthodontical problems in angle class II

- 1. Ridge is narrower than the upper and associated with a receding chin.
- 2. Setting the upper teeth inside the ridge and lower teeth outside the ridge does not produce marked stability

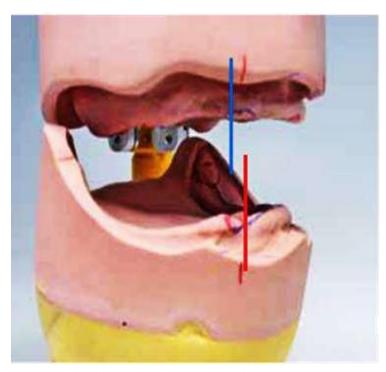


3.Large overjet is preserved.

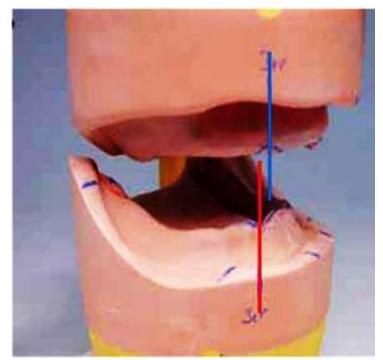
Angulations of the upper teeth give the patient a rabbit appearance

Angulations of the lower tend to unstabilise the denture

s II and cuspid relationships



ormal bite (class I) the upper cuspid is positioned for to the lower cuspid



In a class II deep bite a reverse cuspid relationship due strong overjet

Possible solutions

 1.Modifications Done In Setting Up Of Teeth for Angle Class II

 2 Modifications Done In Posterior Teeth Morphology: SR Orthotyp Teeth

Modifications Done In Setting Up of Teeth for Angle Class II

- Anterior teeth arrangement
- 1- Vertical overlap should be kept as minimal as the esthetics and phonetics permit.
- 2-Maxillary anteriors are set-up with their incisal edges inclined more palatal than their necks.
- 3- Labial inclination of lower anteriors.

• 4- Leave out a lower central or lateral incisor, or overlap lower teeth.

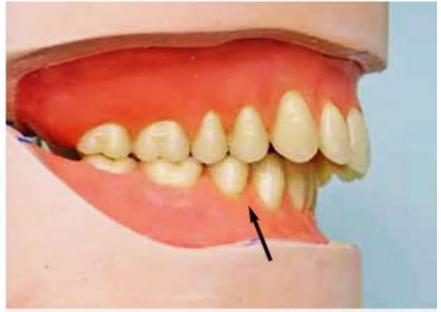


- 5. When retrusion is not extreme,
- > Narrower lower anteriors.
- > Slight spaces between the upper anterior teeth or
- > Slight crowding of lower anterior teeth



 6. When it is too great and can not be fixed by modification of anterior teeth Remove lower first bicuspid





In this case, the lower first bicuspid was dropped in order to achieve a correct posterior relationship

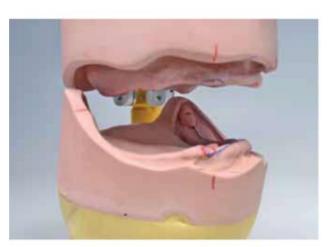
Angle's Class II division 2 :

·If the overbite and minimal overjet of these cases is reproduced in an artificial tooth set-up, the patient could be locked into an impossible situation. So there needs to be some re-positioning of the teeth to reduce the overbite as much as possible without overly compromising aesthetics

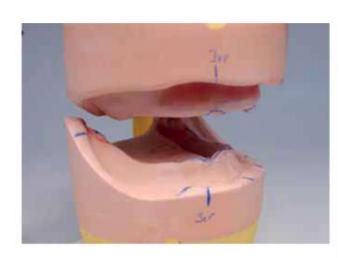




Slight labial inclination of lower anteriors + Slight lingual inclination of upper anteriors



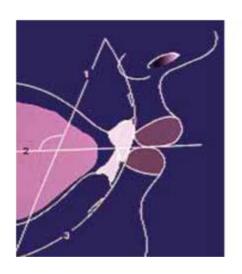






The incisal edge of the upper anteriors should point

toward the lower mucolabial fold





Posterior teeth arrangement

1.Non-anatomic teeth teeth with shallow inclines are selected to reduce the stress on the weaker lower ridge. 2. Eliminate lower 4

3. Upper posterior teeth can be placed slightly palatal to provide a working occlusal contact with the lower teeth.

4.The lower posterior teeth are placed over crest of the ridge. The upper teeth are then set so that they occlude with the lower teeth

• 5. Upper palatal cusp (lingualized occlusion)

 6. A combination of lever balance and occlusal balance is possible by incorporating both a buccal tilt and a lingual tilt in the posterior arrangement.

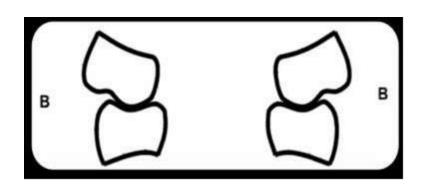
- If the upper arch is much wider than lower arch:
- Set the lower first on the ridge
- Set the upper and lower separately

 The lever balance obtained in the premolar area is nearly at the anteroposterior center of the denture

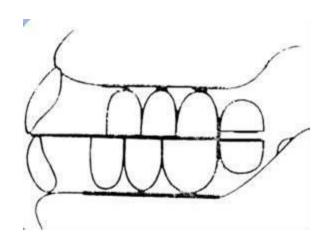
foundation.

- It is also where the class-2 patient functions during light to heavy intermediate chewing.
- The first molar occlusal surface directs the force of chewing directly to the ridge without unfavorable lever activity when positioned over the ridge crest

- lingualized occlusion



- Monoplane occlusion

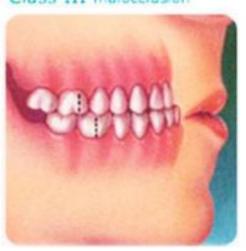


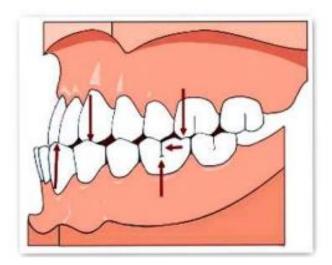
Arrangement of artificial teeth (class III)

د حسين الديوه جي

Class III malocclusion has 3 subdivisions:

Class III malocclusion





1. TRUE class III malocclusion (SKELETAL)

which is genetic in origin due to excessively large mandible or smaller than normal maxilla.

The mesiobuccal cusp of the lower fist molar occludes mesial to the class I position

2- PSEUDO Class III malocclusion



(FALSE or postural) which occurs when mandible shifts

anteriorly during final stages of closure due to premature

contact of incisors or the canines. It's also known as

postural class III.

Forward movement of the mandible during jaw closure can also result from premature loss of deciduous posterior teeth.

3- Class III Sub-division:



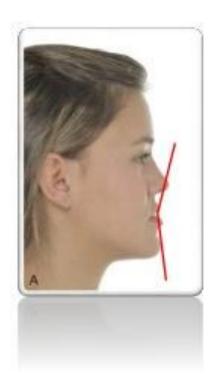
 Class III molar relationship exists on one side and the other side as a normal Class I molar relationship. Angle class III

Problem >> Concave face profile with prominent mandible is associated with Class III malocclusion.

CLINICAL FEATURES

A] Extraoral features :

- 1. Concave profile
- 2. Anterior facial divergence
- 3. Retrusive nasomaxillary area
- Prominent lower third of face/chin
- 5. Steep mandibular plane angle



Problems associated with class III cases

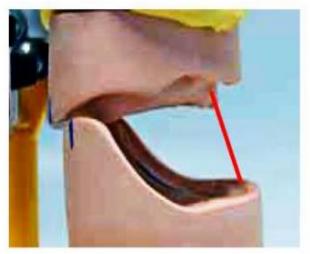
- 1. The relation between the ridges may vary from edge to edge relationship to extreme prognathism of the lower arch.
- 2. Wider lower arch leads to problems in selecting the size of the teeth as selecting the same mold size for both arches leads to spacing between lower anterior teeth which reduce aesthetics.

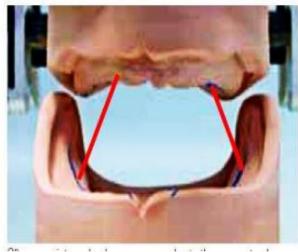
 3. The Crest of the lower arch is located further buccally than that of the upper one, leading to problems in obtaining an adequate occlusal relation between upper and lower teeth

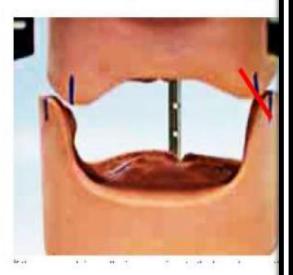
Class III - crossbite

There are different types of cross bites:

- 1. unilateral cross bite
- bilateral cross bite (due to maxillary atrophy, the lower arch is larger than the upper. Cross bite begins usually at the 2nd premolar)
- 3. bilateral cross bite including an anterior cross bite (rare; overdevelopment of the lower arch in comparison of the upper







Modifications Done In Setting Up of Teeth for Angle Class III

- Anterior teeth arrangement:
- 1. Edge to edge relationship
- 2. Inclining the mandibular anteriors lingually as possible without encroaching the tongue space.

 3. Inclining the maxillary anteriors more anterior to the crest of the ridge than usual, with their incisal edges being inclined more labial than their necks

- 4. Addition of lower lateral or central incisor
- 5. Wider lower anteriors
- 6. Slight crowding in upper anteriors



Slight crowding of upper anteriors

Posterior teeth arrangement:

- 1. Monoplane posterior teeth or cuspless teeth (preferred)
- 2. Upper posterior teeth can be placed slightly buccal to the crest of the upper ridge.

- 3. Cross-bite is accomplished to avoid unfavorable leverage that compromises denture stability
- 4. Larger sized upper posteriors + Medium sized lower posteriors

• 5. In case of wider lower arch, an interchange can be done by using upper teeth on the lower denture and lower teeth on the upper denture.



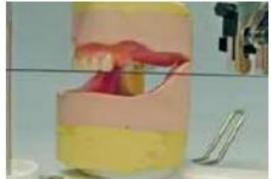




Positioning of the upper to the lower cuspid – 1-to-2 tooth relationship

Positioning of the upper to the lower cuspid – 1-to-2 tooth relationship







The distal edge of the lower cuspid should line up with the lower crest of the ridge

The distal edge of the lower cuspid should line up with the lower crest of the ridge





Final set-up



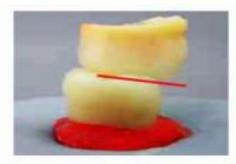


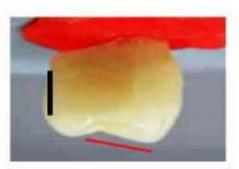


2. Modifications Done In Posterior Teeth Morphology:

- SR Orthotyp Teeth
 It was Designed by Dr. R Strack in the 1950's
- and manufactured by Ivoclar Vivadent.
- 12 His morphology recognizes the three bite
- classifications:
- Class I (normal bite –N mould)
- Class II (deep bite- T mould) and
- Class III (cross bite K mould).
- In They differ in the cusp angulations and the
- guiding surfaces.



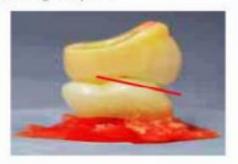


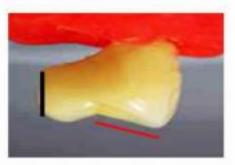


N mould (Normal) class I

- (A) guiding surfaces of the buccal cusp:
- (B) full body gives the correct lingual design for the tongue space

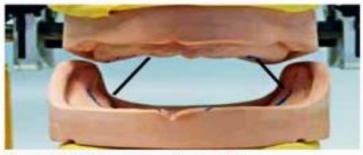


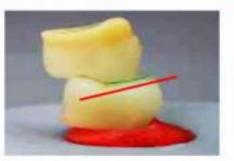


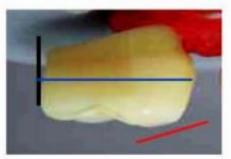


T mould (Tief-deep) class II

- (A) longer guiding surface on T mould
- (B) shorter body due to less interocclusal or interarch space often found in class II bites







K mould (Kreuz-cross) class III

- (A) reverse guiding surfaces on K mould due to a reverse cusp-fossa relationship;
- (B) longer body due to more interocclusal space in class III bites (bone resorption)
- (C) the upper posterior of the K mould is narrower buccolingually. Allows patient increased tongue space

Common errors in arrangement of teeth

- Failure to make the canine the turning point of the arch
- Setting mandibular 1st premolar to the buccal side of the canines.
- Setting the mandibular posterior teeth too far to the lingual side in the 2nd molar region which cause tongue interference and mandibular denture displacement
- Failure to establish the occlusal plane at the proper level and inclination
- Establishing the occlusal plane by an arbitrary line on the face

NOTE

 Generally monoplane teeth are more adaptable for unusual jaw relationships and permits the use of a simplified and less time consuming technique.

 Lingualised articulation is also recommended for the majority of cases where it can easily solve most difficulties provided the principles of balanced articulation.

Flasking

Dr.Hussein AlDewachi

Flasking is the process of **investing** the cast with the waxed denture in a **flask** to make a sectional mold that is used to form the acrylic resin denture base. Therefore it is also known as investing.





FLASKING TECHNIQUES

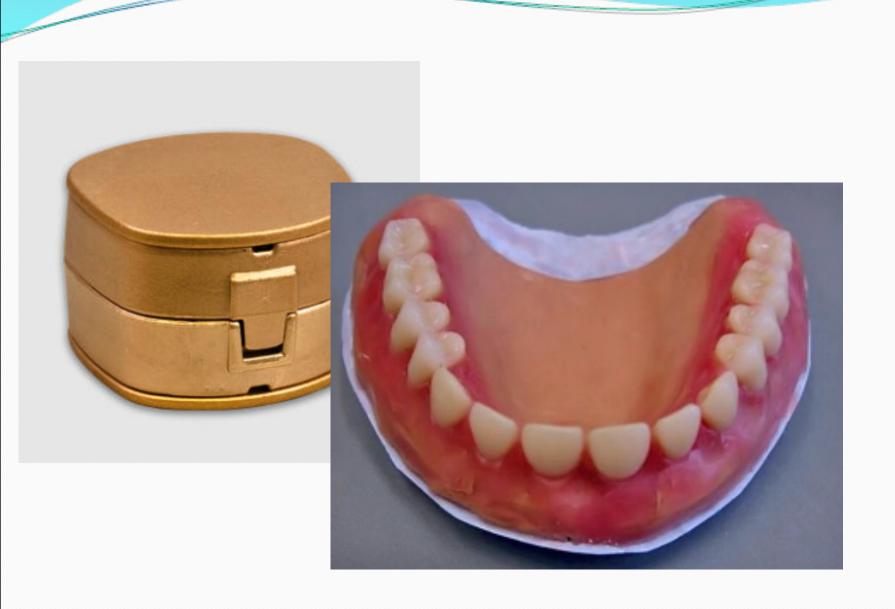
Compression technique (open-pack method) The master cast with the waxed trial denture is invested in the lower half of the flask with gypsum investment material. Then the upper half of the flask is put in place and gypsum is poured to the occlusal surfaces of the teeth. The top portion of the flask is poured with another layer of plaster or stone and the cover is placed on the flask.

• 2- Injection molding 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.

Flasking / Investing Procedure

- Flask must close fully and accurately without resistance. If a flask fails to do this, air-blows, distortion or excess increase in vertical dimension may occur.
- The model with the sealed try in denture must be covered with very thin layer of Vaseline.



- Any undercut should be covered by wax.
- All parts of the flask must be clean and covered by thin layer of Vaseline from inside.
- Models with the sealed (try in) are to be placed in cold water for 10 min. before flasking.

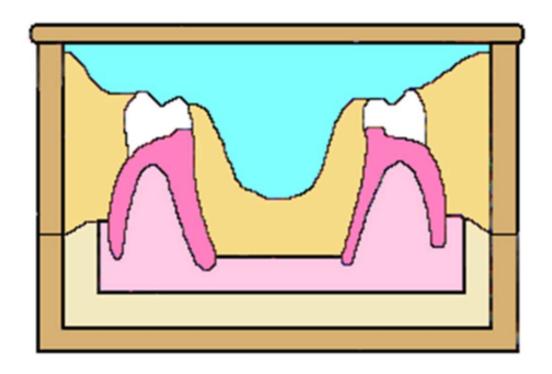
 Thin mixture of POP poured in the base of the flask, place the model, teeth should be vertical.

 All the parts of the model should be covered with POP and all the wax and teeth must be uncovered.



- After setting of POP cover it by thin layer of cold mold seal or Vaseline.
- Prepare a mixture of gypsum, put the mid part in its correct place and pour the gypsum without covering the occlusal surfaces.

- After setting of this layer also cover it with cold mold seal.
- Fill the flask with another layer of gypsum, cover it, put the flask under mild pressure to prevent gypsum from expanding, wait for complete setting.



COMPLETED FLASKING FOR THE MANDIBULAR COMPLETE DENTURE.

Flasking / Investing Procedure

Apply separating medium to flask and cast





Thin mixture of **POP** poured in the **base** of the flask, **place** the **model**, teeth should be vertical. All the parts of the model should be covered with POP and all the wax and teeth must be uncovered

Alter pouring plaster in lower hall of liask center the cast in flask

cast is pushed down to place until its rim is nearly level with the top edge of the bottom of the flask and remove

any undercut







Prepare a mixture of gypsum, put the mid part in its correct place and pour the gypsum without covering the occlusal surfaces. After setting of this layer also cover it with cold mold seal.



Flasking / Investing Procedure

Second step full plaster apply



Flasking / Investing Procedure

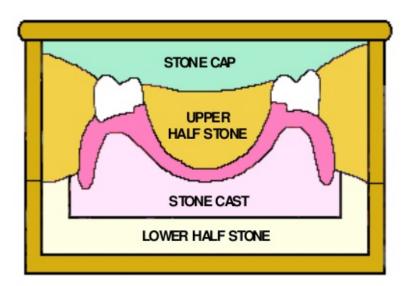


Hold flask by spring clamp to put in water bath

25



26



COMPLETED FLASKING.

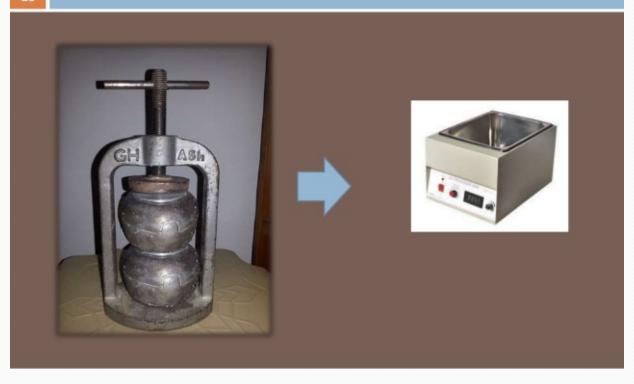
Wax Elimination

- After setting of gypsum, wax elimination procedure is to be done.
- Put the flask in boiling water for 5-7min.
- Separate the 2 parts of the flask.
- Remove the shellac base plate and the wax using the boiled water and detergent.
- Place the clean flask in open air to dry and cool it.

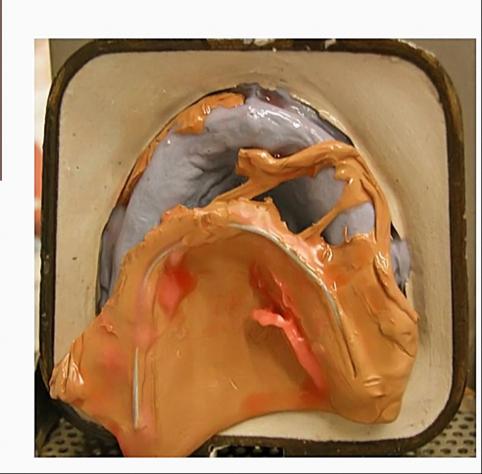
Wax Elimination

Put the clamp in water bath

-21







Wax Elimination

Deflasking and remove the remnant of wax

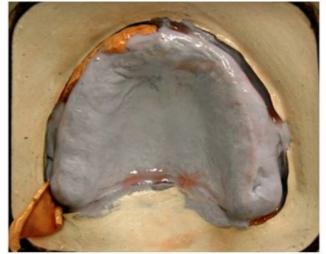
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Note:

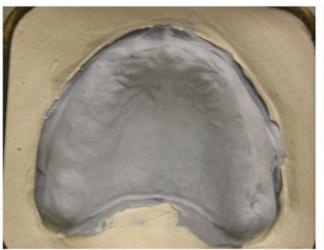
- Remove ALL wax residue since acrylic resin will NOT adhere to a surface coated with wax.
- Any residual wax will contaminate the acrylic resin and prevent bonding between teeth and the denture base.

Left over wax after dewaxing











- Isolate the gypsum of the flasking by using one of these systems of isolation:
- Physical separator or isolator: tin foil.
- Chemical isolator: solution of alginate (cold mold seal). It reacts with the calcium of the gypsum to form a film of insoluble calcium alginate.
- Use the brush, move it in one direction to spread the cold mold seal.

• . The cold mold seal should be **thin** and even on **all the parts** of the mold **except** the **teeth** which should not be separated. If the teeth covered by cold mold seal, they will not adhere to the denture base.

Mixing

• Acrylic resin is a resinous plastic material of various esters of acrylic acid. It is used as a denture base material. It is formed of a powder and liquid.

- **Powder:** polymethyl methacrylate PMMA (polymer)
 - + Benzoyl peroxide (initiator) +pigments.

Liquid: methyl methacrylate (monomer) + hydroquinone (inhibitor)Powder and liquid are mixed in a ratio of **3 to 1** by volume for an average sized denture.

Stages of acrylic mixing

- A **sandy** stage : where a fluid mass occur due to the settling of the polymer into the monomer.
- A **stringy** or **fibrous** stage: where the monomer starts to attack the polymer. In this stage the mix is tacky, sticky and adheres to the sides of the mixing jar.
- **Smooth** dough like stage: where the monomer diffuses into the polymer.

- **Rubber** like stage: further penetration of the monomer into the polymer. In this stage the acrylic resin cannot be packed or molded being too stiff.
- **Stiff** stage : hard





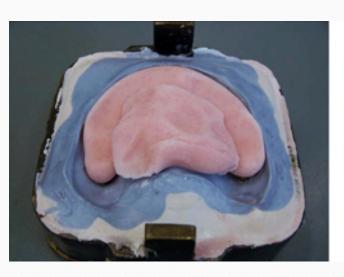


Packing of acrylic

It is the procedure of application of acrylic resin into the mold and pressing the flask by using sufficient pressure to compensate for the contraction of the acrylic after polymerization to prevent shrinkage and porosity.

Put acrylic in the mold, press in a clamp, do curing immediately.

- Note:
- **Too early** (Stage II) acrylic resin has too low viscosity to densely fill the mold. Results in porosity in the final prosthesis.
- **Too late** (Stage IV) inability to close the flask, loss of detail and increase in vertical dimension of occlusion in final prosthesis, as well as, movement and/or fracture of teeth.





 Acrylic placed into mold cavity and covered with cellophane for trial pack.



- Flask pressed until excess acrylic squeezes
 out around edges.
- Acrylic **flash** to be **trimmed** away, **small amount** of acrylic to be **added where needed**. Take note of the wrinkles from cellophane.
- The mold is full when the acrylic is pressed smooth and dense. A small amount will be added at wrinkles.
 - **Close** the upper and lower parts of the **flask** together •



Curing of Acrylic

• The packed mold is heated (cured) in an oven or in water bath. Temperature and time should be controlled.

Two water bath heating techniques may be used:

• a) Heating the flask in a special bath of water, beginning from the room temperature until reaching 72°C for 16 hours.

- b) Heating the flask in an ordinary water bath beginning from the room temperature, until reaching 72°C, lasting for 2 hours, then the temperature is raised to boiling for another 1 hour.
- This technique takes shorter time but there is a likelihood to be distorted during de-flasking. Also, the free monomer is more.

- Cooling of the flask / Bench Cooling:
- After curing, the flask is to be **cooled slowly on the** bench in its water bath.
- The **slow cooling** will permit the **relief of the internal stresses** caused by the difference in contraction between the acrylic and the mold material.

Cooling of the flask / Bench Cooling:



De-flasking Procedure

- It is the procedure of **opening the flask** after curing of acrylic resin. It should be done carefully to prevent the breakage of the denture. It includes the following steps:
- Remove the flask from the clamp.
- Remove the upper and lower lids.



Removing the lid



Separate the flask

De-flasking Procedure

- **Separate** the **2 parts** of the flask with attention using the **plaster knife**.
- Liberate the denture with its model, then try to **remove the model carefully**. If there is undercut, split the model into 2 or 3 parts to remove them easily.
- After gaining the denture, **remove the excess of acrylic** using the acrylic bur.





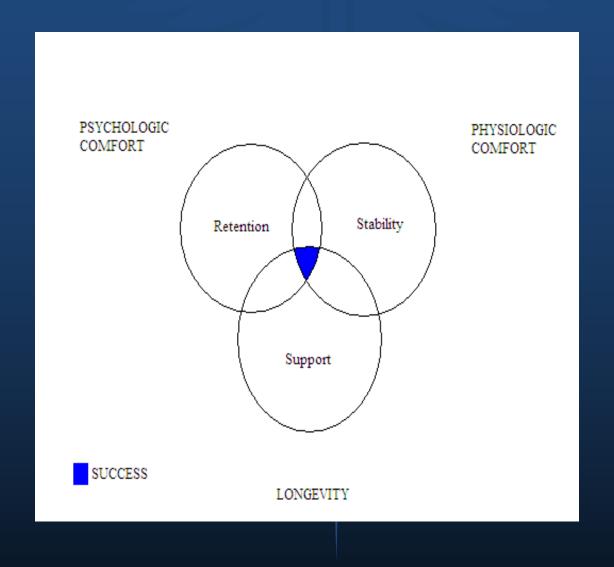


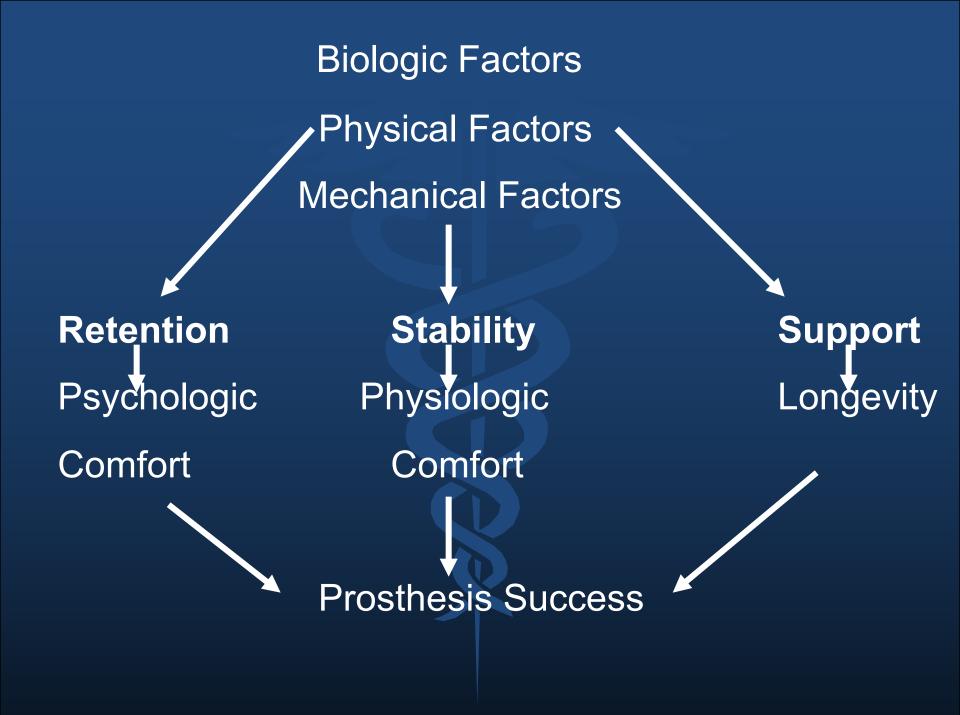
RETENTION, STABILITY

IN COMPLETE DENTURE

Dr.Hussein AlDewachi

Factor affecting Successful denture fabrication





RETENTION

It is the resistance to removal in a direction opposite to that of insertion.
 (GPT)

•

Factors affecting retention

- . Anatomical factors
- . Physiological factors
- . Physical factors
- . Mechanical factors
- . Oral& facial musculature
- . Psychological effects and patient's tolerance

ANATOMICAL FACTORS

1. Size of the denture bearing area

2.Quality of the denture bearing area

PHYSIOLOGICAL FACTORS

• Saliva-

Quality and viscosity

PHYSICAL FACTORS:

- Adhesion
- Cohesion
- Interfacial surface tension
- Capillary attraction
- Atmospheric pressure.

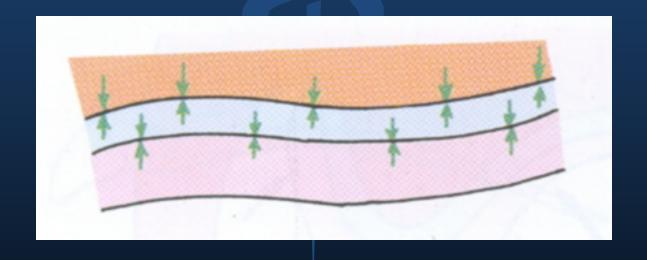
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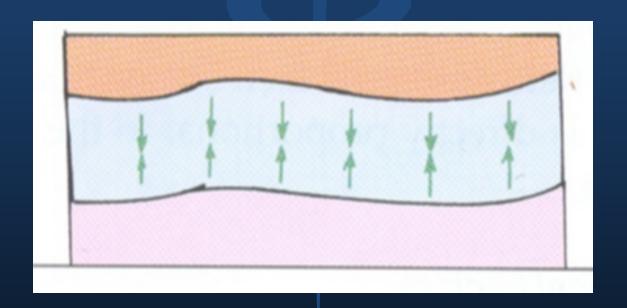
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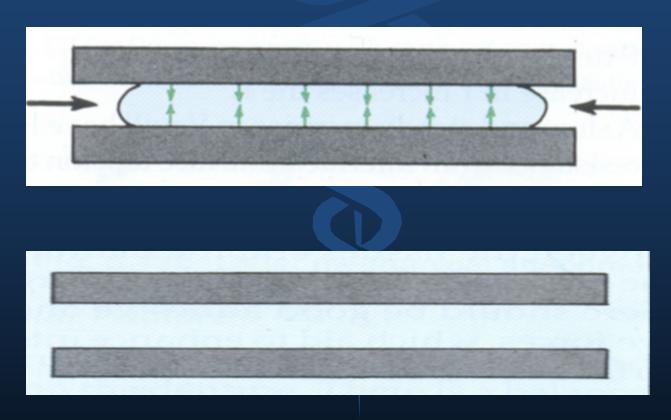
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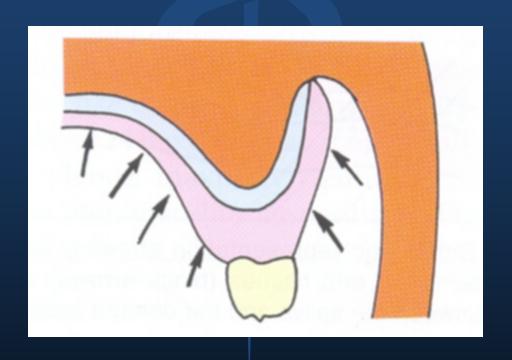
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Mechanical factors

- . Undercuts
- . Rotational insertion path
- . Parallel walls

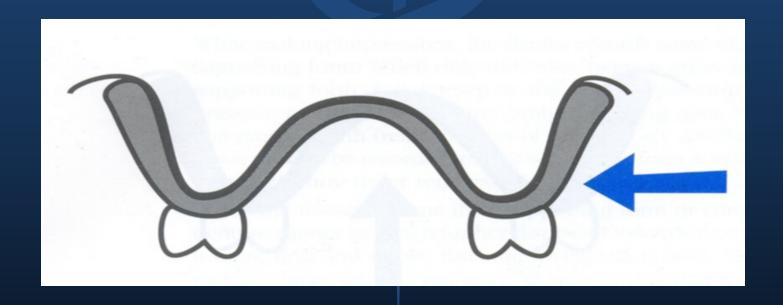
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 "the resistance against horizontal movements and forces that tends to alter the relationships between the denture base and its supporting foundation in horizontal or rotatory direction." In simpler words stability is defined as "the quality of a denture to resists displacement by functional stresses."



- The qualities necessary to create and maintain stability are dependent upon the following factors:
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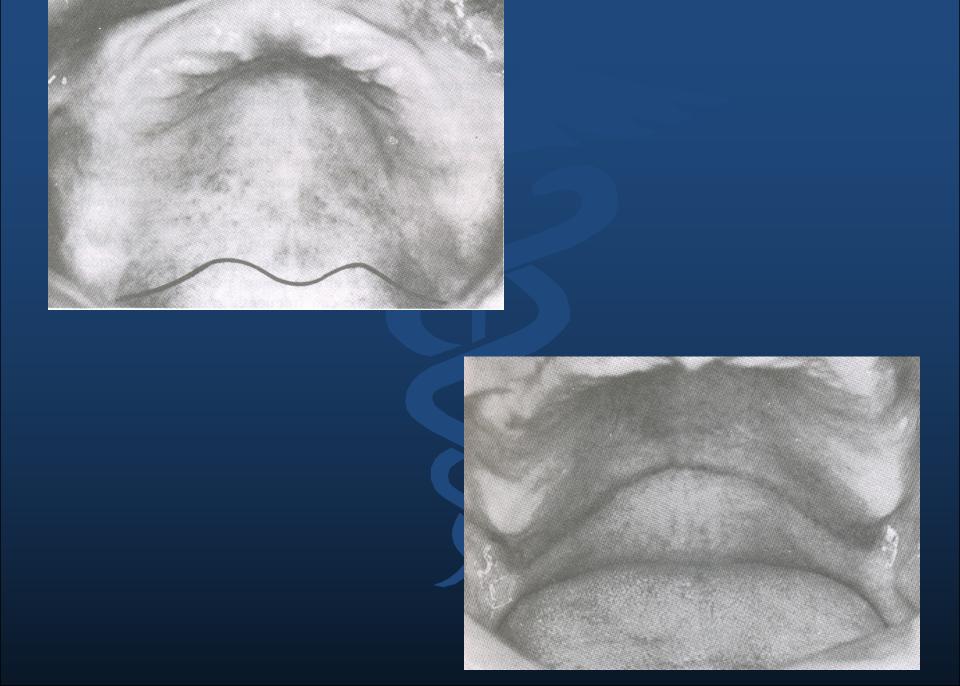
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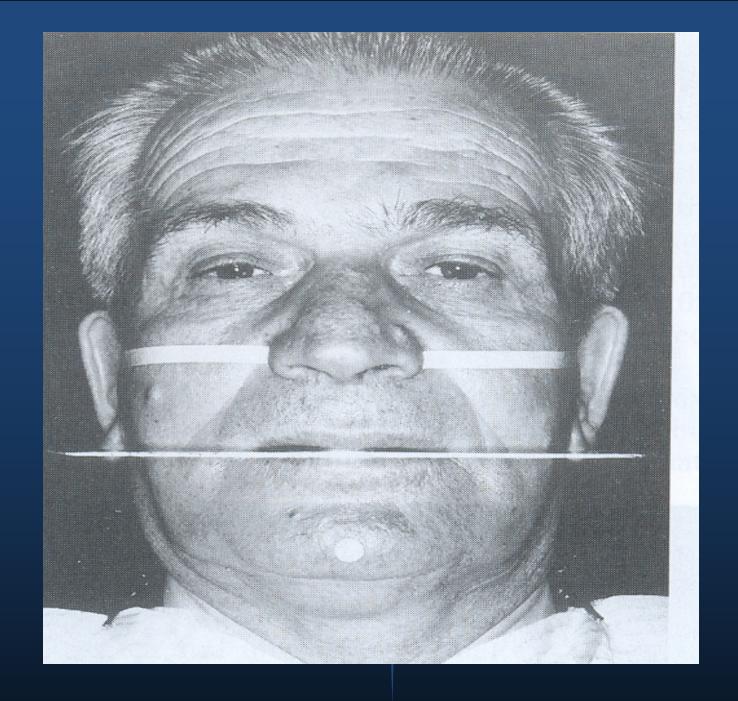
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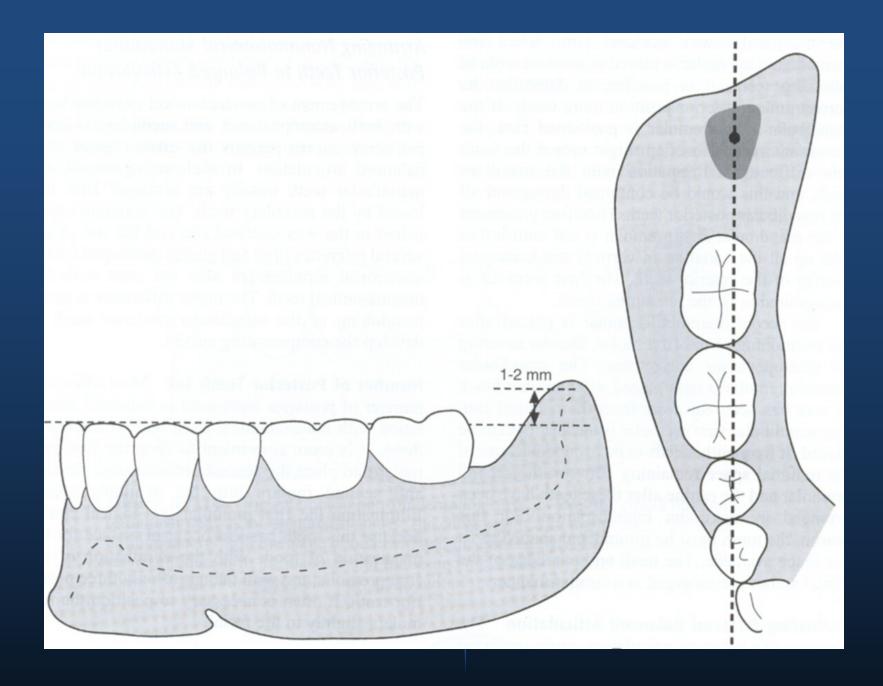
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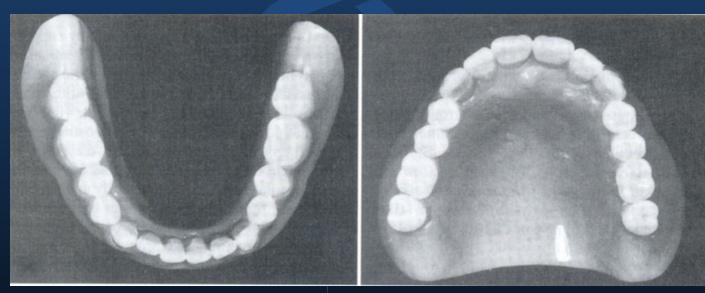
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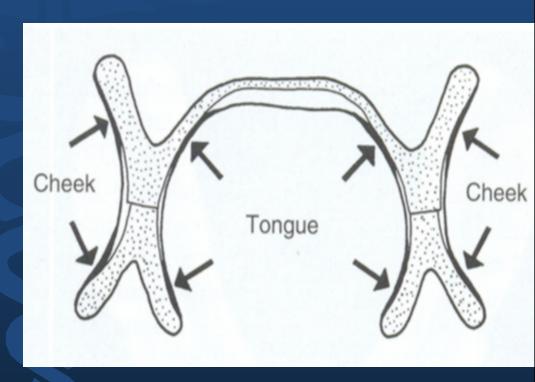
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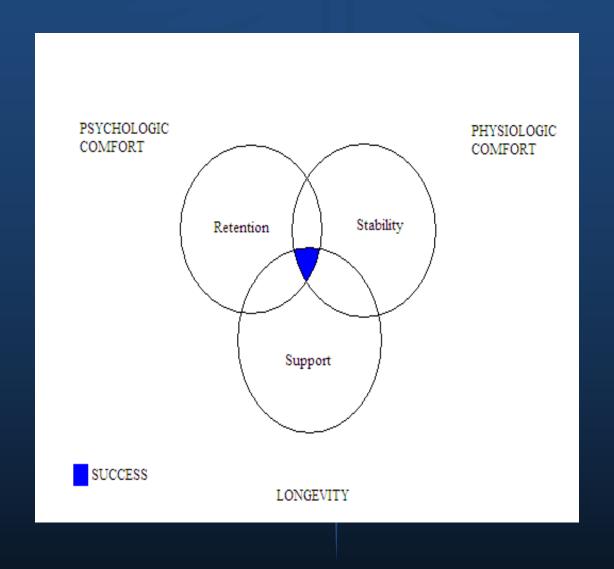
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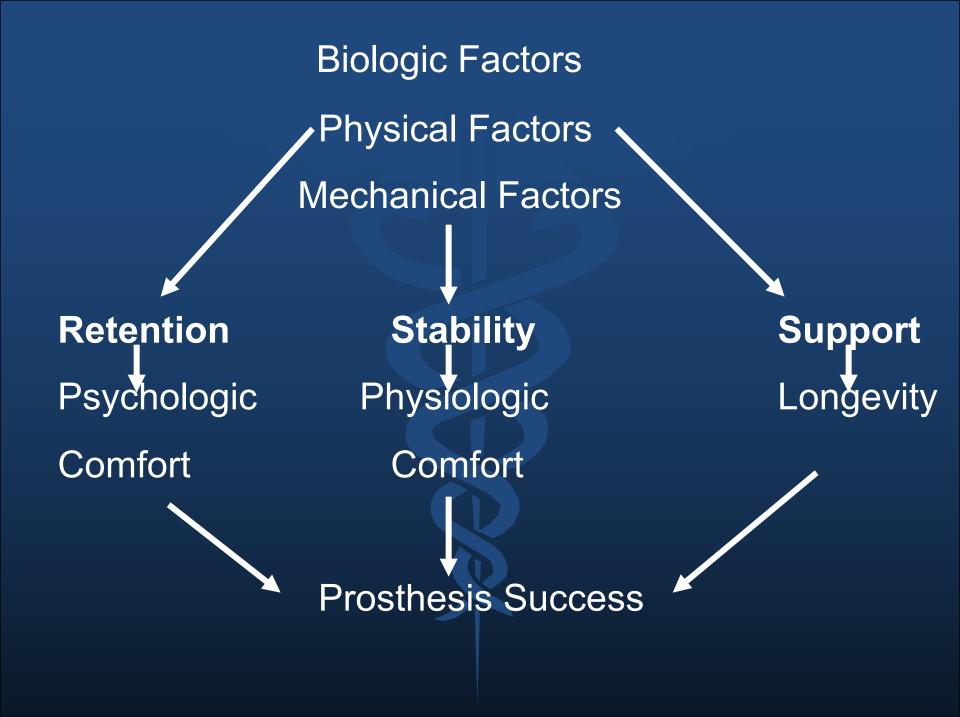
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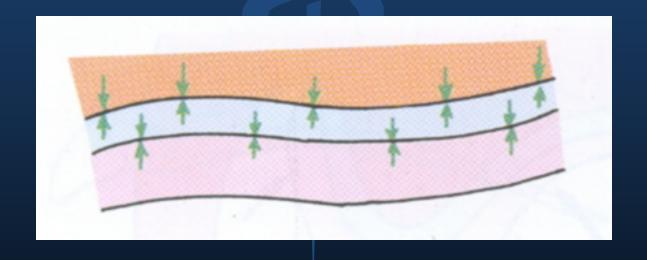
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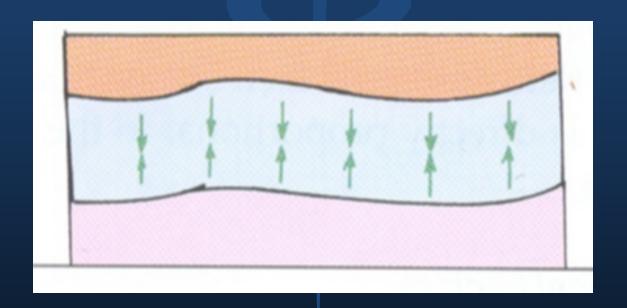
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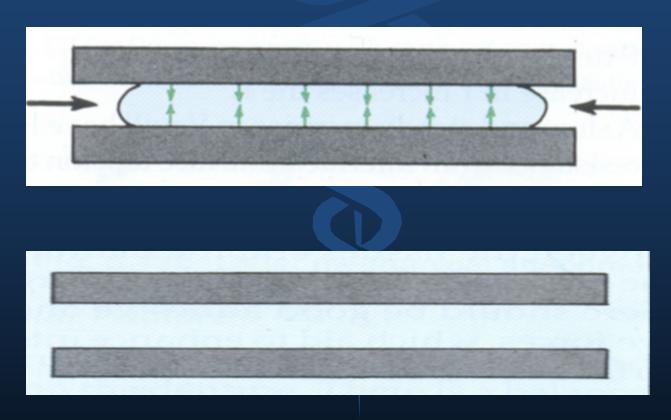
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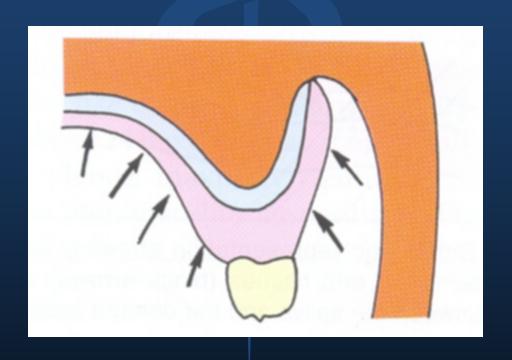
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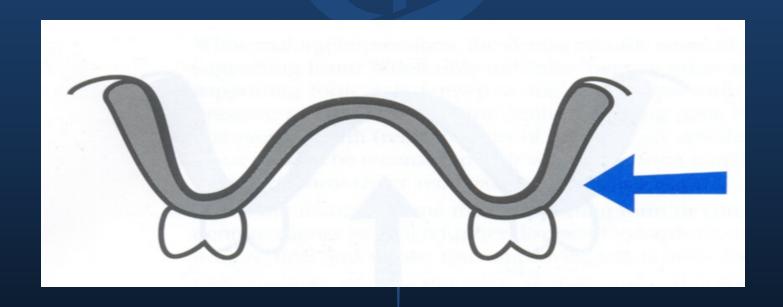
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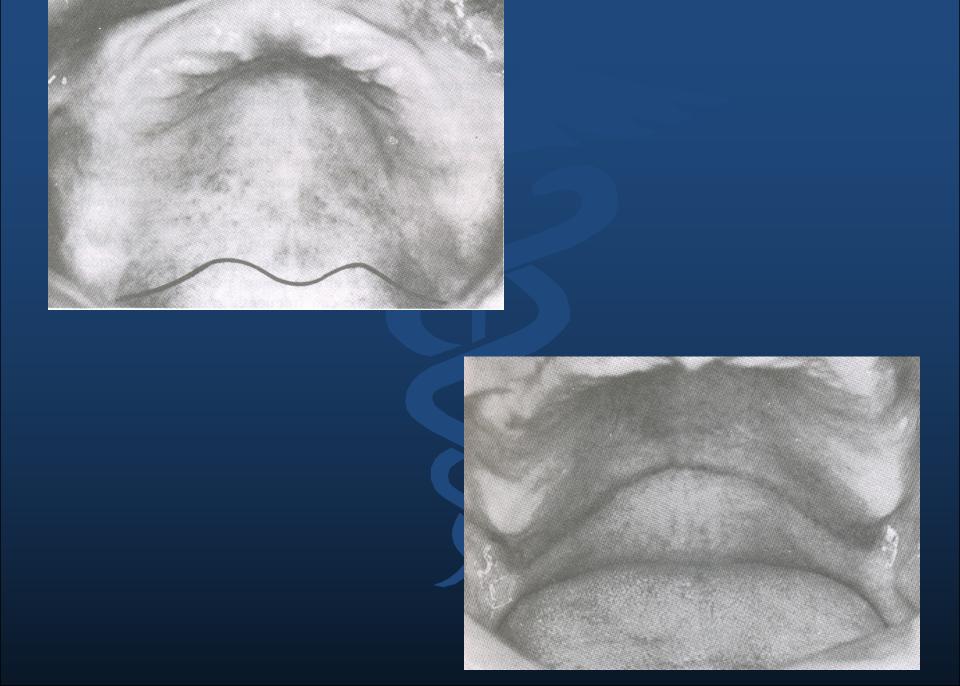
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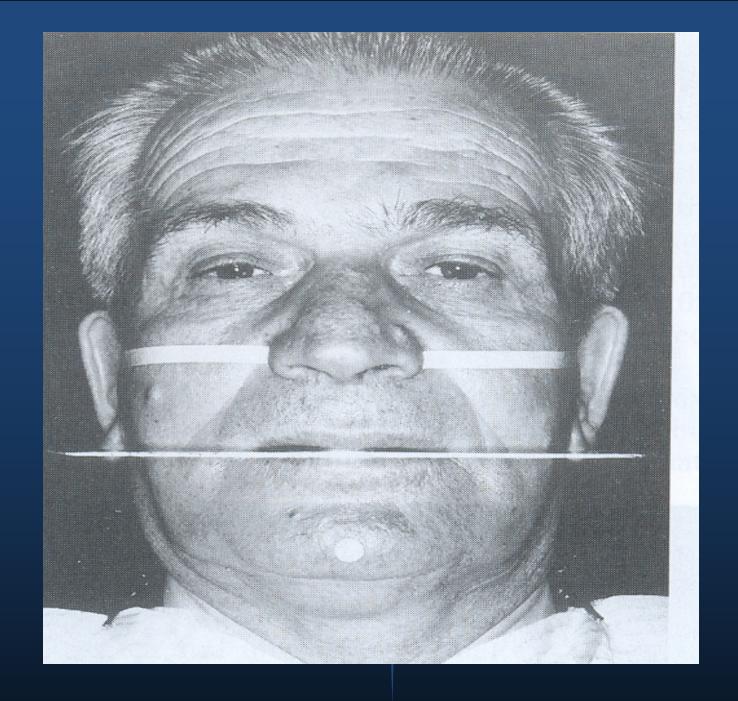
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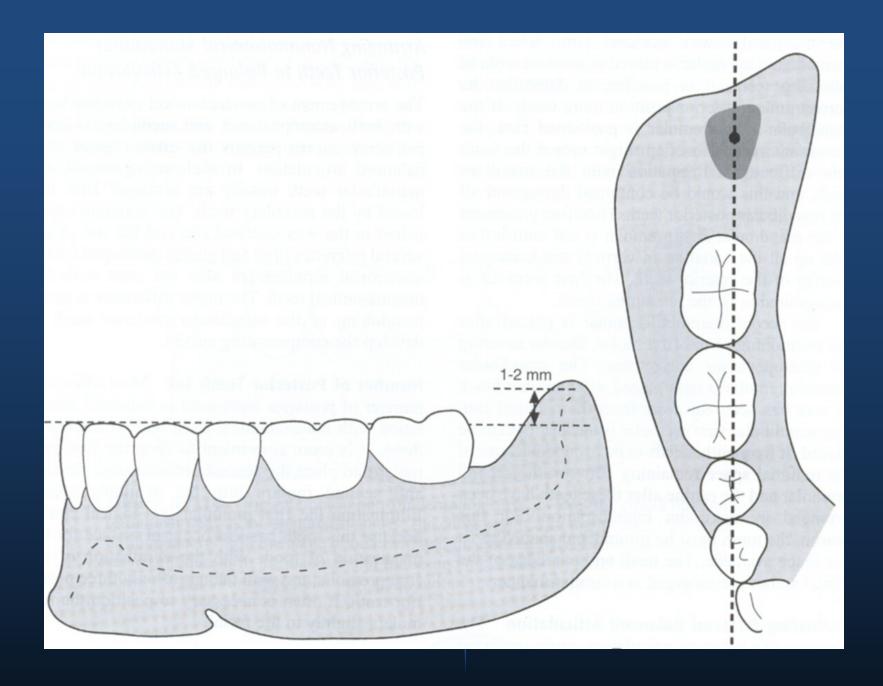
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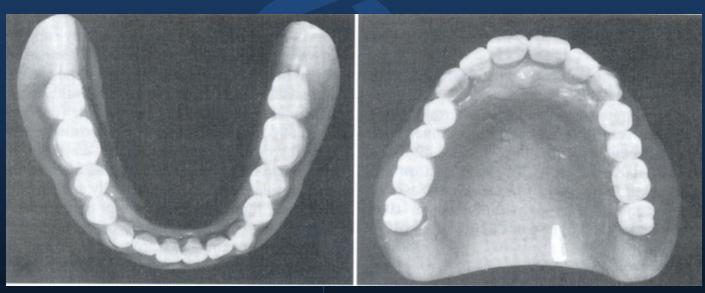
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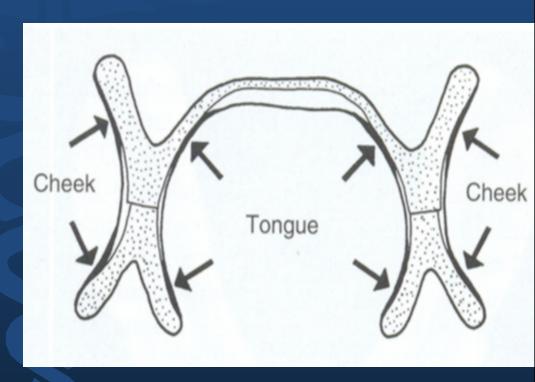
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Repair of complete denture

Heat polymerizing acrylic resin, since its introduction several decades ago, has been the material of choice for the construction of denture bases for numerous reasons:

- Excellent appearance
- **Lase** in processing
- Reparability
- Economical
- stable in oral environment

However, it is associated with two important clinical disadvantages:

- low flexure fatigue (bending force)
- impact resistance

bending forces are developed mainly during mastication because of poor adaptation of the denture to the underlying mucosa, improper occlusion, morphology of the palate, excessive masticatory forces, or denture deformation during use. Those forces in long term contribute to fatigue of the material.

Impact forces are created during an accidental fall into washbasin or onto floor.

Causes of fracture of denture:

during function

dropped on hard surface

Denture repair do more good in less time than most other dental procedure the advantage of acrylic denture base it is easy to work easy to repair.

Requirements of repair:

- 1 -must restore the original strength.
- 2-must be dimensionally stable.
- 3-must match the original color.

Classification of fractured dentures:

- 1. according to location of fracture:
 - a. midline fracture
 - b. any part fracture
- 2. according to extent of fracture:
 - a. without broken or missing part and/or teeth
 - b. with broken or missing part and/or teeth
- 3. according to timing of fracture

- a. early fracture
- b. delayed fracture
- 4. according cause of fracture
 - a. operator
 - b. patient

Midline fracture (mainly in the maxilla).



Causes:

- a) No or insufficient relief in the midline. Mid palatine raphae (M.P.R.) (Early fracture)
- b) Ridge resorption with loss of relief effect. (Delayed fracture) In the mandible with
- **a-**severe resorption the mentalis muscle encroaches on the crest of the lower ridge. When this combined with relief over the genial tubercles the anterior part of the lower denture tends to be made thin & is prone to fracture.

b-fatigue of the denture produced by repeated flexing of the denture during cleaning by the patient or during function.

Materials used for repair:

1-cold cure acrylic

2-light cure acrylic

3-heat cure acrylic

Cold cure acrylic has the advantage over heat cure acrylic:1-cheaper 2-faster 3-the denture base never warpaged due to heat.

Types of repair:

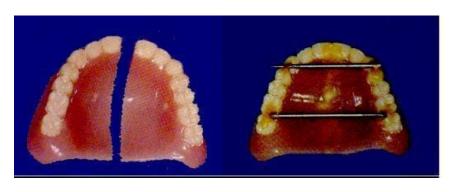
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- B. any part fracture repair
- C. missing part fracture repair
- D. tooth fracture repair

E. post dam repair

Laboratory procedure for repairing fractured denture base:

A- midline fracture repair:

- 1-Accurate reassemble of broken parts if not the denture will neither fit nor occlude properly
- 2-Apply sticky wax to the fractured line to maintain the two pieces in correct position. Do not allow the sticky wax to flow into the fractured lines, only cover the fracture line from the polished surface
 - 3-Reinforce the parts by attaching one or more old burs or plastic sticks to the occlusal surfaces
- 4-Block any undercut in the tissue side of the denture by wax & apply separating medium to the fitting surface.
- 5-A cast is poured into the denture using quick set plaster.
- 6-After setting remove the two pieces of the denture gently and cleaned from any traces of sticky wax.
- 7-Coat the cast with separating, set aside to dry.
- 8-Fractured edges are beveled toward the polished surface & reduced to form a groove of 8-10mm along the fractured line.
- 9-The pieces of the denture are reassembled on the cast. Self-cure resin is applied to the fractured area until the area is overfilled.
- 11-The denture is removed from the cast, remove the excess by burr.
- 12-Finished & polished in a conventional manner, then insert it in the patient's mouth.



B- Any part fracture repair:

- 1. hold the pieces of the fractured appliance together
- 2. flow sticky wax at the fracture line
- 3. any undercut on the fitting surface is block out with wax
- 4. the fitting surface is painted with separating medium
- 5. we make an index using fast setting plaster
- 6. after the plaster sets the denture is lifted off the index and the edges are beveled toward the outer surface. This will provide fresh acrylic to allow a better repair as well as provide more surface area for the repair acrylic to bond to.
- 7. The pieces of the denture are reassembled on the cast. Self-cure resin is applied to the fractured area until the area is overfilled.
- 8. The denture is removed from the cast, remove the excess by burr.
- 9. Finished & polished in a conventional manner, then insert it in the patient's mouth.

C- missing part fracture repair:

1-Small piece broke of the border can be fashioned by placing warmed molding plastic on the remaining border & then recontouring the missing area by placement in the patient mouth. After proper contouring a cast is poured into the denture. The modeling plastic is removed & self-cure resin is used to fill the area of the missing border. Then the resin is cured & polished.

2-an alternate method is to made an alginate impression with the denture placed in patient mouth, after pouring the cast either self-cure acrylic is applied to replace the missing part or wax is added & carved to resembled the broken denture part, followed by flasking, packing, curing, finishing & polishing.

D- tooth fracture repair:

if the tooth will come out intact just replace the tooth with self-cure acrylic.

If the tooth is fractured, we need to select another tooth of the same size and shade for the repair.

- 1-Fractured tooth is cut away with bur. Some care is taken to preserve the free gingival marginal area of the acrylic if possible.
- 2-The area lingual to the fractured tooth is reduced using a small bur.
- 3-The mold & shade of the tooth is determined & selected.
- 4-Place the new tooth in position.
- 5-Fix the tooth labially by sticky wax, a plaster index can be made by applying a layer of plaster on broken tooth & also include one tooth on each side.
- 6-Tooth to be repaired is removed together with all wax around it.
- 7-Tooth is then placed again exactly in its original position aided by plaster index.
- 8-Self cure acrylic resin is added from the lingual side until repair is over filled.
- 9-The denture then removed from the cast, then finished & polished in the conventional manner.



E. post dam repair:

this denture had a problem with retention. Error in posterior palatal seal area (post dam).

- 1. Take impression of the posterior area by using wax
- 2. After block out of the undercuts in the denture a cast is poured into the denture itself
- 3. The posterior area of the denture is removed
- 4. Care is taken to create a land area around the denture especially in the posterior area
- 5. The denture is removed from the cast
- 6. The posterior area corresponding to the palatal seal is a good reproduction of the inner surface of the denture with the impression wax. Remember the green stick had been molded in the patients mouth and the retention was seen to have been increased.
- 7. Auto polymerizing resin is painted on the cast and additional resin is added on the denture surface
- 8. The denture and cast is assembled applying firm figure pressure to remove the excess resin
- 9. Finishing and polishing is done as described previously.