Complete denture prosthesis definition and objective

Prosthodontics :Is (the branch of dental arts and science pertaining to the restoration and maintenance of oral function by the replacement of missing teeth and structures by artificial devices).

The term ***Prosthodontics*** is a combination of the words prosthesis and dentistry.

Prosthesis: Is defined as the replacement of an absent part of the human body by an artificial part. *Thus, any dental restoration is a prosthesis.*

Branches of prosthodontics:

1. Fixed prosthodontics

2. Removable prosthodontics

a) complete denture prosthodontics

b) partial denture prosthodontics

3. Implant prosthodontics

4. Maxillofacial prosthetics

.The complete denture: A dental prosthesis that replaces the lost natural dentition and associated structures of the maxilla and mandible.

The partial denture: A prosthesis that replace one or more, but less than all, of the natural teeth and associated structures and that is supported by the teeth and/or mucosa.

Fully dentulous or dentulous: mean having all teeth in oral cavity

Edentulous :mean all teeth missing.

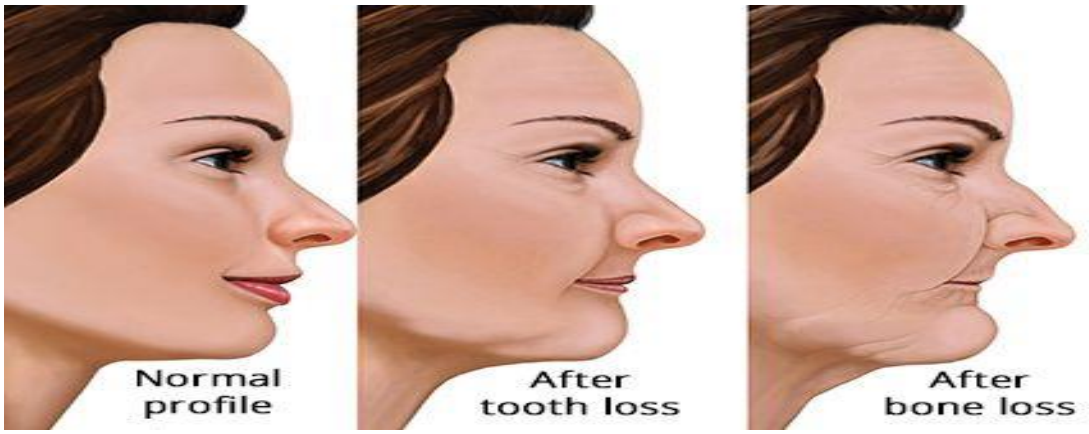
Partially edentulous: Mean some teeth present

Anatomical and esthetic changes after loss of teeth

1-Unattractive appearance when the person has lost one or more of anterior teeth.
2-Change in the shape of the lips or cheeks due to loss of support by teeth

3-Change in a person's appearance due to conscious or subconscious efforts to avoid smiling

4-Change in facial contour resulting from loss of support from muscles of facial expression
5-Illusion prominent chin resulting from the mandible being closer to maxilla i.e. loss of vertical dimension.



Objectives of complete denture

1-To restore masticatory function. Chewing makes eating more enjoyable.
2-To restore or improve the appearance of an individual.
3-To improve speech. Many sounds are formed by the tongue contacting against the teeth.
4-To carry out these procedures in such a manner as to cause the patient no harm or discomfort. An uncomfortable patient is unhappy.
5-Preservation the health of alveolar bone and tempro -mandibular joint

The primary difference between a complete denture and a removable partial denture is the method by which the prosthesis gains support.

**A complete denture is supported by bone covered by soft tissue (mucosa).

**A removable partial denture gains support from the bone covered the mucosa, and from the remaining teeth

complete denture have 3surfaces:-

1- The fitting surface (denture basal surface)

It is that portion of the denture surface which has its contour determined by the impression. It includes the borders of the denture and extends to the polished surface.

2- The occlusal surface. :-

The portion of the denture surface that makes contact with its antagonist (opposing occlusion) include teeth

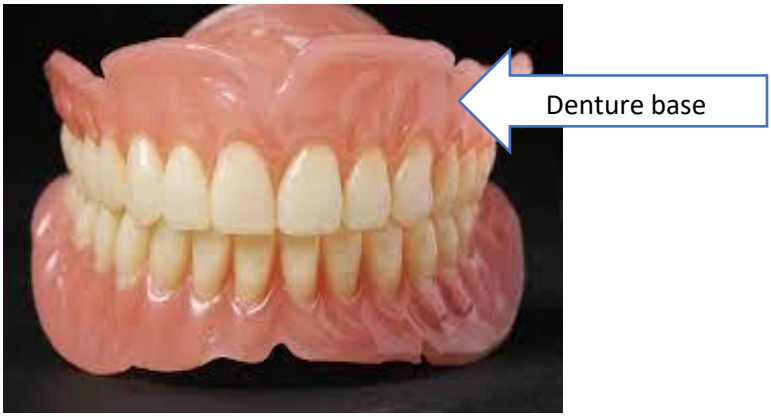
3- The polished surface:

That portion of the denture surface which extends in an occlusal direction from the border of the denture and includes the palatal surface. It is part of the denture base

which is usually polished and includes the buccal and lingual surfaces of the teeth.

Parts of complete denture:

1-denture base: which cover the edentulous area and carries artificial teeth
2-teeth :which are attached to denture base for the purpose of chewing ,mastication ,phonetics ----etc.



Anatomical landmarks of the mandibular arch

They can be divided into :

Limiting structures: which determine the extent of the denture

1- Labial frenum

2- Labial vestibule

3- Buccal frenum

4-buccal vestibule

5- lingual frenum

6- Alveo lingual sulcus

7- Retromolar pads

Labial frenum:- It is a fibrous band similar to that found in the maxilla .Unlike the maxillary labial frenum , it is active . It receive attachment from the Orbicularis Oris muscle.

Labial Vestibule:- This is the space between the residual alveolar ridge and the lips. The length and thickness of the labial flange of the denture occupying this space is influence lip support and retention.

Buccal frenum:- It should be relieved to prevent displacement of the denture during function.

Buccal Vestibule:- It extend posteriorly from the buccal frenum till the retro molar region

retromolar region . It is bounded by the residual alveolar ridge on one side and buccinator muscle on the other side .

Lingual Frenum:- The height and width of the frenum varies considerably . Relief should be provided in the anterior portion of the lingual flange. A high lingual frenum should be corrected if it affects the stability of the denture.

Alveo lingual Sulcus:- It extends from the lingual frenum to the retro mylohyoid curtain . It is considered in three regions anterior, middle and posterior.

a-Anterior region:- it extends from the lingual frenum to the pre mylohyoid fossa

b-Middle region :- it extends from the pre mylohyoid fossa to the distal end of the mylohyoid ridge this region is shallower than other parts of the sulcus this is due to the prominence of the mylohyoid ridge and action of the mylohyoid muscle.

c-Posterior region :- the retro mylohyoid fossa is present here this region complete the typical S –form of the lingual flange of the lower denture

Retromolar pad:- It is an important structure, which forms the posterior seal of the mandibular denture . It is non - keratinized pad of tissue seen as a posterior continuation of the pear-shaped pad, located distal to the third molar . It is a collection of loose connective tissues with an aggregate of mucosal glands.

Supporting Structure:-

The support for mandibular denture comes from the body of the mandible . The available denture –bearing area for an edentulous mandible is 14cm^2 but for maxilla is 24cm^2 . So, the mandible is less capable of resisting occlusal forces.

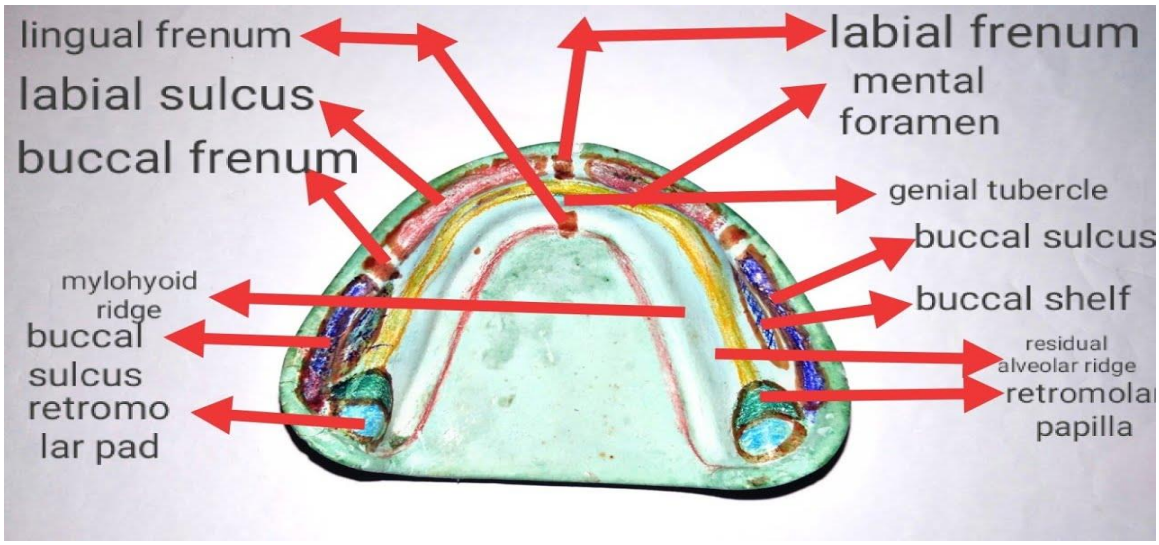
supporting structure are:-

1- Buccal shelf area

2- Residual alveolar ridge.

- **Buccal shelf area:-** It act as a primary stress bearing area , located between the buccal frenum and anterior border of the masseter muscle. *The external oblique ridge is most prominent in the molar area and forms a distinct ledge with relation to the base of the alveolar process, this ledge is called the buccal shelf. The buccal shelf is a ledge located buccal to the base of the alveolar ridge in the bicuspid and molar regions.*

  Residual alveolar ridge:- The edentulous mandible may become flat due to resorption and become inclines outward and becomes progressively wider.



Relief areas:-

1- Mylohyoid ridge.

2- Mental foramen

3- Genial tubercle

4- Torus mandibularis

Mylohyoid ridge:-

Located on the internal surface of the mandible, the mylohyoid ridge occupies a position similar to the external oblique ridge on the external surface. The mylohyoid ridge passes forward and downward from the internal aspects of the ramus onto the body of the mandible and fades out near the midline.

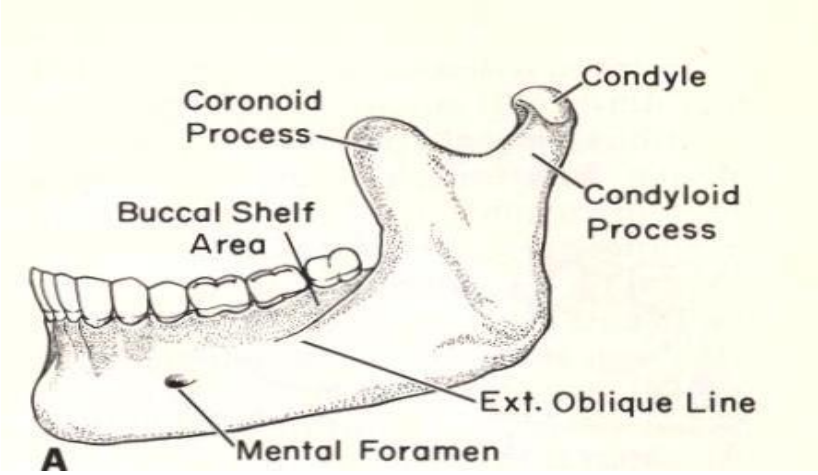
Thin mucosa over the mylohyoid ridge may get traumatized and should be relieved.

Mental foramen:- It lies between the 1st and 2nd premolar region .Pressure over the nerve produces numbness and paresthesia, so it should be relieved.

***Genial Tubercles**. Slightly above the lower border of the mandible in the midline, the bone is elevated to a more or less sharply defined prominence forming the genial tubercles*

Due to resorption, it may become increasingly prominent making denture usage difficult.

***Torus mandibularis**:- It is an abnormal bony prominence found bilaterally on the lingual side, near the premolar region. It is covered by a thin mucosa .It has to be relieved or surgically remove if large in size.*



Impression , primary impression,

Trays and stock tray

An Impression is defined as :- negative likeness of the teeth and/or edentulous areas where the teeth have been removed ,made by a plastic material which becomes relatively hard or set while in contact with these tissues. Impressions may be made of full complements of teeth , or areas where some teeth have been removed , or in mouth from which all teeth have been removed.

COMPLETE DENTURE IMPRESSION:-

is a negative registration of the entire denture bearing, stabilizing and border seal areas of either the maxilla or the mandible present in the edentulous mouth.

Impression making is the primary step in the process of complete

denture fabrication . Impression are made to produce a negative replica of the patient, s mouth into which plaster or stone can be poured to form the positive replica –the **cast**. The cast consider as a template over which complete denture is fabricated. Errors in impression making can lead to treatment failure. Impression for completely edentulous patient consist from two impressions:

1-primary impression

2-secondary or final impression

Objectives of impression making:

1-esthetics 2-preservation of alveolar ridge and soft tissue

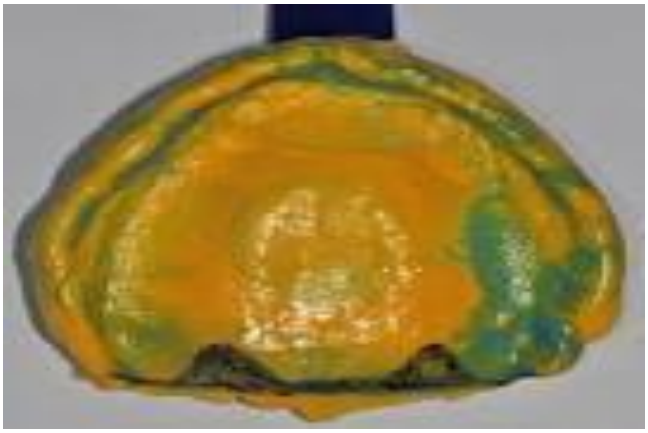
3-support 4-stability 5-retention

Primary impression

Also called preliminary or diagnostic impression is defined as a negative likeness made for the purpose of diagnosis ,treatment plan and for the construction of a 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.

When we making maxillary impression , it should include : the hamular notches, fovea palatine, frenum attachments, palate, and the entire labial and buccal vestibules.



When we making mandibular impression should include: the retro molar pad, the buccal shelf areas, the external oblique ridges, frenum attachments, sublingual space, retro mylohyoid space, and the entire labial and buccal vestibules.

Impression tray

is defined as:- A device which is used to carry ,confine and control an impression material while making an impression.

PARTS OF THE TRAY:-

1-Body (floor &flange)

2- 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 flange)

Classification of impression trays:-

Classification based on whether they are prefabricated or individualized:-

1-Stock tray (ready made):used for making primary impression

2- **Special tray (special made for individual patient):** Used for making secondary or final impression also called custom tray

Trays used for primary impression making are called **stock** trays

stock trays:- They are factory prepared and are available in standard sizes. They are made of metal or plastic, can be perforated or non-perforated , disposable plastic stock trays or non-disposable tray are available. As standardized trays will not adapt closely to the patients arch , an approximately tray should be selected for each patient. 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.

Types of stock tray:

a-Dentulous tray: which have square cross section for patient with teeth

b-Edentulous tray :have rounded cross section for patients without teeth

Requirement for stock impression tray :

1-tray must be rigid, flexible trays cause distortion of the impression

2-dimensional stability. tray should maintain its shape throughout the impression making.
3-it should be smooth to avoid injury to oral tissues
4-it should provide uniform space for impression material
5-it should not distort the vestibular areas.

MATERIALS USED FOR MAKING PRIMERY IMPRESSION

1-alginate(irreversible hydrocolloid)

2-silicone (putty type)\non hydrocolloid

3-impression compound (disk form)

Production of study cast:-

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

The plaster mixed with water by the saturation method in the rubber bowel and pour in the impression. When the plaster becomes hard, the cast is separated from the impression.

Common errors or faults in impression procedure:

1-poor selection of tray

2-insufficient material loaded in the tray

3-excessive material loaded in the tray

4-insufficient pressure during making impression

5-excessive pressure during impression making

RECORD BASES

A record base or base plate is representing the base of a denture and its either temporary or permanent .

Requirement:-

1-should be rigid.

2-should be accurate.

3-should be stable.

4-the borders should be round & smooth as the borders of finished dentures.

5-should be thin at the crest ,labial & buccal slopes to provide space for tooth arrangement.

TYPES OF RECORD BASE

1-Temporary record bases:

They are discarded and replaced by denture base material, once their role in establishing jaw relation, teeth arrangement and try in is complete.

OBJECTIVES

1-To retain the recording medium or device used for recording maxilla-mandibular relations.

2-to aid in transfer of accurate jaw relationships to an articulator.

3-To enable the setting of artificial teeth for the trial 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

2-Permanent record bases: They are not discarded and become part of the actual base of the finished complete denture.

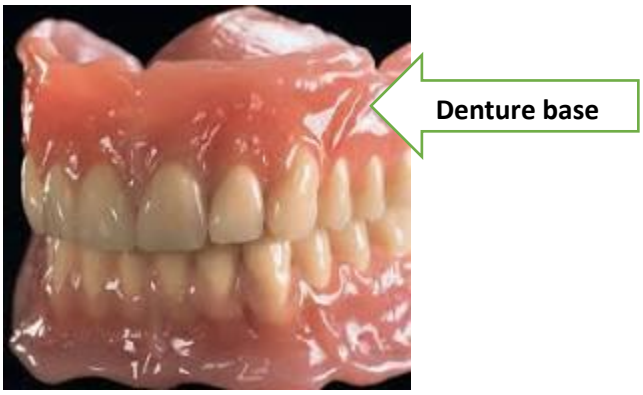
Types of permanent record bases:

1-Heat cure acrylic resin

2-Gold

3-Chromium-cobalt alloy

4-Chromium-nickel alloy



Bite rim - Occlusion rim

Definition : **occlusion rims are occluding surfaces constructed on record bases to be used in recording jaw relations and \or arranging teeth.**

Requirements :

1-the position should be in the anticipated position of the artificial teeth.
2-it must be securely attached to the base.
3-the occlusal surface must be smooth and flat.
4-it should be contoured to support the lip and cheeks accurately.
5-all the surfaces should be smooth.

Uses : The occlusion rims are used :

1-to establish the level of the occlusal plane
2-to establish the arch form
3-to record the maxillary mandibular jaw relations (vertical and horizontal)
4-for selection of teeth
a-the position of midline can be determined
b-canine line (cuspid line)is drawn on occlusal rim on the corner of the mouth on each side when occlusion rim seated in mouth and in occlusion
c-width of six anterior teeth is equal to distance between the2 canine line
d-the width of posterior teeth is equal to distance between the canine line and end wax rim posteriorly.
e-the high length of anterior teeth is determined by drawing high lip line(gum line or smiling line) when patient smiling ;the whole of anterior teeth should be seen
f-the low lip line (speaking line or relaxed lip line)is a line drawn on wax rim when lip is relax , in this case 2mm of anterior teeth should be seen .
5-for arrangement of the teeth.

occlusal rim should be:

1-Wax rims are smooth and have a flat occlusal surface. They are about as wide buccolingually as denture teeth – wider in the posterior, narrower in the anterior

2-The occlusal rim must be centered buccallingually over and parallel to the residual ridge crest.

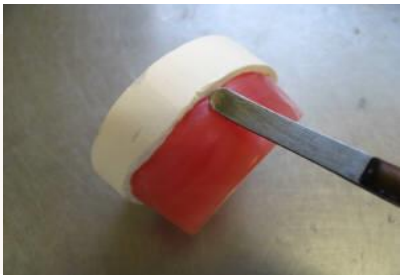
MATERIALS AND METHODS

A-bite blocks wax (ready made) occlusion rim

1-its supplied as a horse shoe shaped rim, adapt it in the proper position on the record base.

2-Softened it slightly, sealed it with the record base by the aid of a wax knife.

3-Smooth all the surfaces



B- Handmade Paraffine wax occlusion rim

1-Half a sheet of paraffin wax is softened and folded upon itself to produce a rectangular rim, approximately the length of the alveolar ridge.

2-Softened it slightly, sealed it with the record base by the aid of a wax knife.

3-Smooth all the surfaces .

c-modeling compound

wax fequently used more than compound because easier to manage in registrations and in the arrangement of teeth

MAXILLARY BITE RIM

1-The anterior wax rim height is 20-22mm
2-The posterior wax rim height is 17-18mm.
3-The width of the anterior rim is approximately 3- 5mm.
4-The width of the occlusal rim in the posterior region is approximately 8- 10mm.
5-The occlusal rim is properly sealed to the baseplate without any voids.
6-The posteriors of the occlusion rims are cut at a 30^0 to the occlusal plane
7-The anterior portion of the maxillary occlusal rim is **labially oriented**

MANDIBULAR BITE RIM

1-The anterior wax rim height is 17-18mm
2-The posterior wax rim height covers 2/3 of the retromolar pad.
3-The width of the anterior rim is approximately 3- 5mm.
4-The width of the occlusal rim in the posterior region is approximately 8-10mm. The occlusal rim is properly sealed to the baseplate without any voids

MAXILLO MANDIBULAR JAW RELATION

JAW RELATION:-any relation of the mandible to the maxilla

Types:-

1- Orientation jaw relation:- Establish the relation of maxilla to some anatomical landmarks in the cranium and orientation of occlusal plane.

2- Vertical jaw relation (at rest & at occlusion):- Establish the amount of jaw separation allowable for use for denture.

3-Horizontal jaw relation(Centric &Eccentric):- Establish front –to-back and side to side relations of one jaw to the other.

Recording jaw relation is very important step during complete denture construction after making final impression and obtaining Master cast.

(If the jaw relations are incorrect, **the dentures will move in order to occlude with subsequently be dislodged from the ridges during function**).

ORIENTATION JAW RELTION

1-determination occlusal plane by using fox bite (fox plane)

2-determination the relation between maxilla and crainium by using face bow

Occlusal plane

The average plane established by the incisal and occlusal surfaces of teeth. Generally, it is not a plane but represents the planar mean of the curvature of these surfaces. It is an imaginary surface which is related anatomically to the cranium and theoretically attached the incisal edges of the incisors and the tips of the occluding surfaces of posterior teeth.

The height of the occlusal plan (the vertical length of **maxillary** occlusion rim anteriorly) should be 1-2 mm below the relaxed **upper lip** and this will different from patient to other and affected by the age of the patient and type of the lip.

Generally there are 1-2 mm showing from the incisors in the average dentulous patient but each case should be considered separately in relation

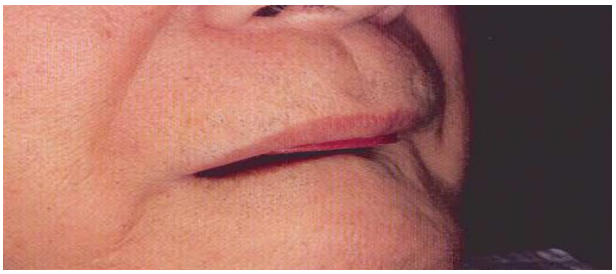
to the height of the lip, age of the patient and gender of the patient, e.g. for the patient that have long lip the height of the occlusal plane should be with the border of upper lip, while for the patient with short lip there is more than 2mm showing from upper lip.so each case should be considered separately for best appearance.

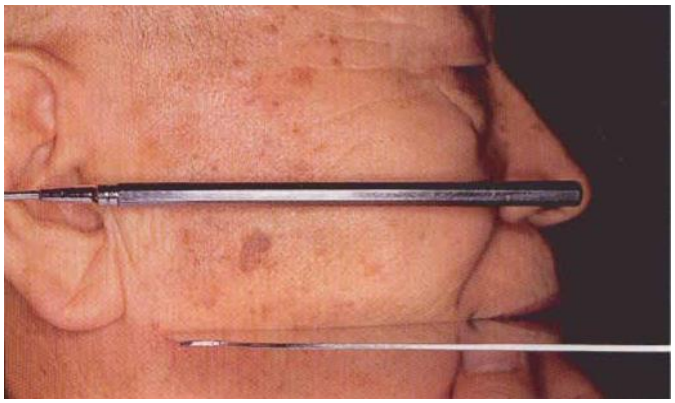
Fox bite (fox plane guide)

An appliance used to check the parallelism of wax occlusal rim anteriorly and posteriorly.

1-The anterior part of the wax rim should be parallel to the inter-pupillary line (this imaginary line running between the centers of the 2 pupils of the eyes when the patient is looking straight forward).

2-Posteriorly the occlusal plane starting from the canine region backward should be parallel to the (**camper´s line)**, this is a line running from the ala of the nose to the superior border of the tragus of the ear (ala-tragus line).



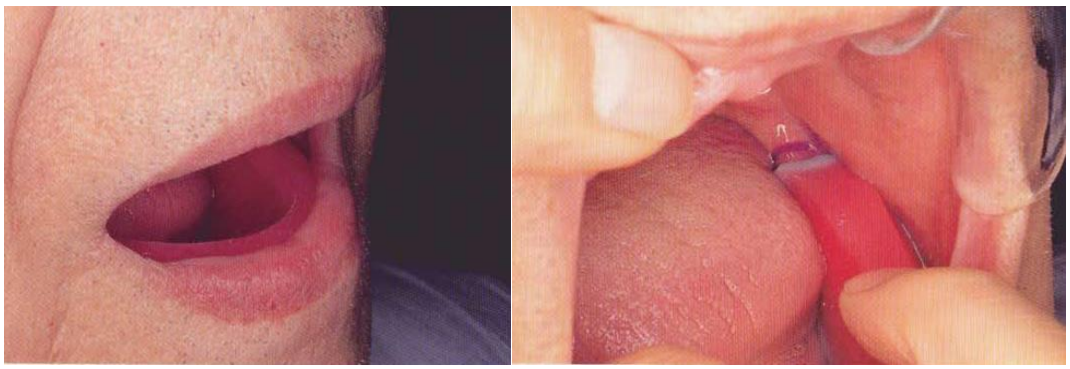


Campers line

The vertical length of the mandibular occlusion rim

1-Anteriorly the level of mandibular occlusion rim with the level of the lower lip & angle of the mouth.

2-Posteriorly the vertical length of the rim with level of the retromolar pad.



FACE-BOW

The face-bow is a caliper- like device that is used to record the relationship of the maxilla to the temporo-mandibular joints or the opening axis of the jaws and to orient the casts in this same relationship to the opening axis of the articulators

The face-bow consist of :

1. U- shaped frame or assembly. 2. The condyle rods. 3. The bite fork.
4-locking device **5-orbital pointer with clamp**

Types of face-bow: There are two basic types of face-bow:-

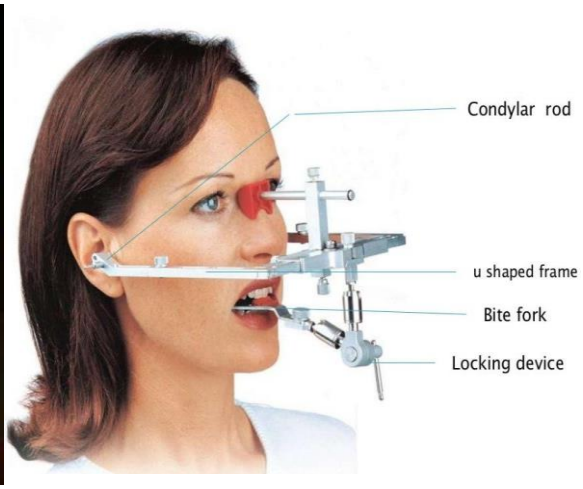
1-the kinematic and 2-the maxillary.

1. The kinematic (mandibular, hinge axis locator) face-bow: It is used to locate the kinematic (true or terminal) transverse hinge axis. The transverse hinge axis is an imaginary line, in which the mandible rotates during opening and closing.

2- The maxillary face-bow: It is used to record the position of the upper jaw in relation to the hinge axis and transferring the relation to the articulator

The maxillary face-bow is oriented to the kinematic or arbitrary hinge axis. The arbitrary axis is positioned on a line extending from the outer canthus of the eye to the middle of the tragus of the ear and approximately 13 mm in front of the external auditory meatus.

The ear face-bows are designed to utilize an arbitrary axis by fitting into the external auditory meatus.



Important of the face-bow:

1-mounting of the maxillary cast without a face-bow transfer can introduce errors in the occlusion of the finished denture.

2. A face-bow transfer allows minor changes in the occlusal vertical dimension on the articulator without having to make new maxilla-mandibular records.
3. It is helpful in supporting maxillary cast while it is being mounted on the articulator.

Horizontal jaw relation

Horizontal jaw relations :- is the relationship of mandible to maxilla in a horizontal plane (in anteroposterior and side to side direction). It include:

1) Centric jaw relation

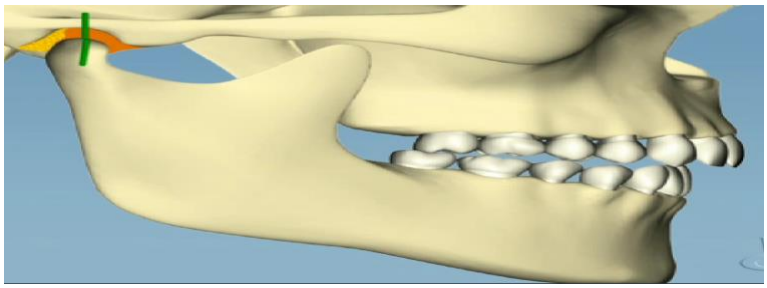
2) Eccentric jaw relation which includes :

1. Protruded or forward relation. 2. Lateral relation (Left or right).

Centric jaw relation

This position is independent on teeth contact and can be noticeable clinically as :-the most retruded relation of the mandible to the maxillae when the condyles are in the most posterior unstrained position in the glenoid fossae from which lateral movement can be made, at any given degree of jaw separation

It is restricted to a purely rotary movement about the transverse horizontal axis (bone-to-bone relationship)



Centric occlusion: It is the contact between the occlusal surface of the maxillary teeth with the opposing mandibular teeth when the mandible in centric relation,(tooth to tooth)relationship

• **Maximal Intercuspal Position**: The most complete interdigitation of the teeth independent of condylar position. Hence, maximal intercuspation is a maxillomandibular relationship determined by tooth-to-tooth relationship

Importance of centric relation

1- It is a reference position.
2- It is learnable, repeatable and recordable position.
3- It is the start point for developing occlusion.
4- Functional movement like chewing and swallowing are performed in this position.
5- It is a reliable jaw relation, because it is bone to bone relation.

Methods of Recording the Centric Jaw Relation

1-Physiological methods - Tactile or inter-occlusal check record method

2. Functional (chew-in) method

a– Needles house method

b-patterson method

c - Swallowing technique

3. Graphic methods - Intraoral - Extraoral

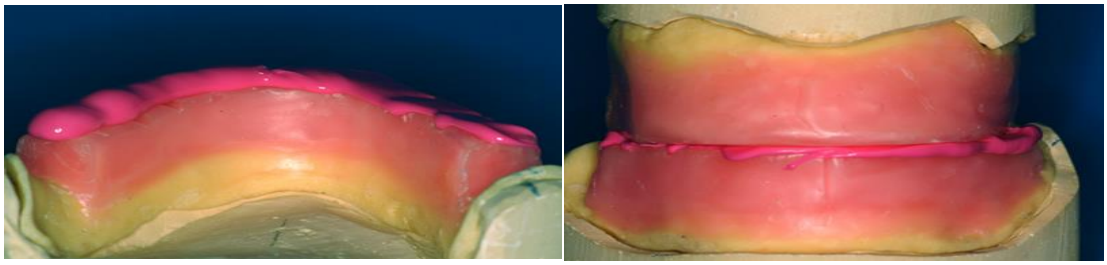
4. Radiographic method

1- physiologic method\Tactile or inter-occlusal check record

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

This method has the advantage of causing minimal displacement of the recording bases in relation to the supporting bone. This method is essential in making an accurate record, the visual insight, the sense of touch by the dentist in the making of centric relation record, this phase developed with experience.

Materials that are commonly used for interocclusal check record include wax, plaster, zinc oxide eugenol, silicon and polyether.



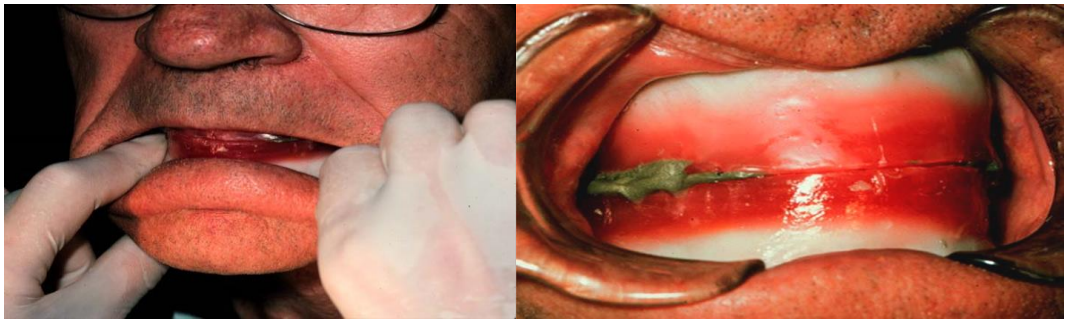
Procedure:

1-Apply thin layer of recording medium on the mandibular occlusal rim.

2- Instruct the patient to close in centric relation position.

3- Remove both rims together

4- This method is simple, because mechanical devices are not used in the patient mouth and are not attached to the occlusion rims.



• Indication of inter occlusal check record method:

1- Abnormally related jaws.
2- Displaceable, flabby tissue.
3- Large tongue.
4- Un controllable mandibular movements.
5- It can also be done for patients already using a complete denture.

2-Functional Method or Chew-in Method

The patient is asked to perform border movements such as protrusive and lateral excursive movements in order to identify the most retruded position of the mandible include:

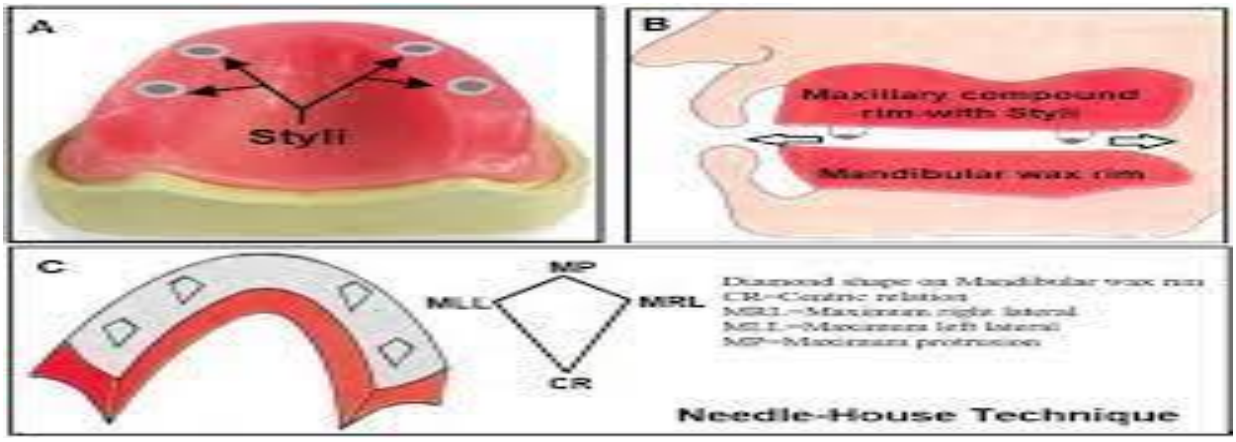
a--- Needles house method –

b-Patterson method

c- Swallowing technique

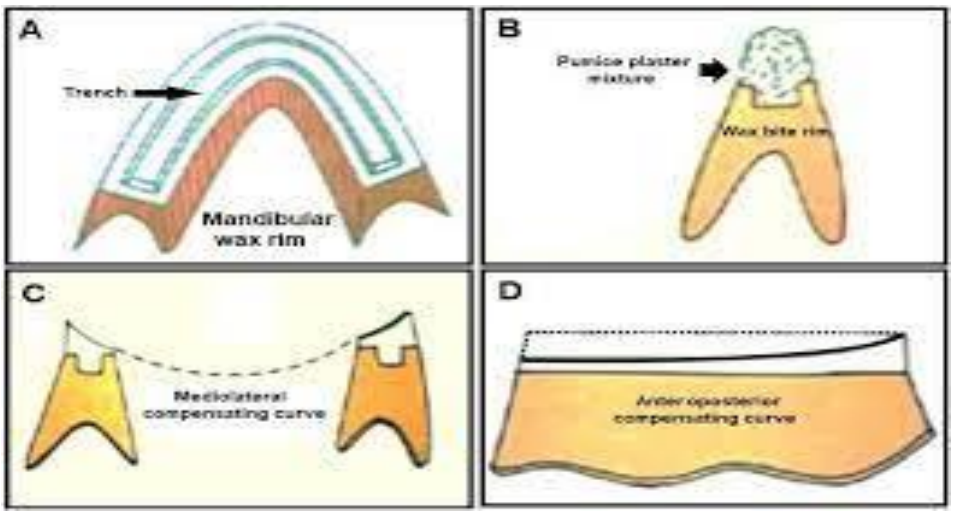
a-Needles house method

- occlusion rims made from impression compound.
- four metal styli placed in the maxillary rim.
- direct the patient to move the mandible on protrusive and right and left lateral.
- diamond-shaped pattern is formed.
- The anterior most point of this diamond pattern indicates the centric jaw relation



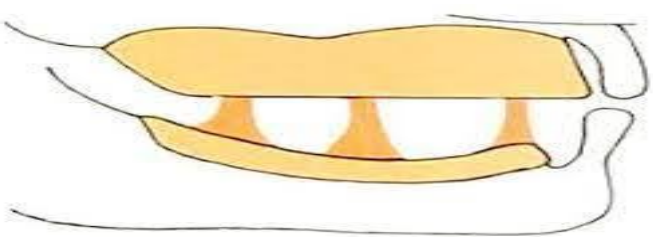
b-Patterson method –

A trench is made along the length of mandibular rim. -mixture of pumice and dental plaster 1: 1 is loaded into the trench. -patient moves his mandible compensating curves on the mixture will produced, and the height of the mixture is also reduced, movements till a predetermined vertical dimension is obtained. -Finally the patient is asked to retruded his jaw and the occlusal rims are fixed in this position with metal staples. The disadvantages of functional methods involve lateral and anteroposterior displacement of the recording bases in relation to the supporting bone while the record is being made.



c-Swallowing technique

In this method soft cones of wax are placed on the lower record base. The wax cones contact the upper occlusion rim when the patient swallows.



Methods used for assisting patient to retruding the mandible:

1. Instruct the patient to let his jaw relax, pull it back, and close slowly on his back teeth"

2. Instruct the patient to contact with his tongue a piece of wax placed on the posterior palatal seal area and slowly close

3. The patient asked to bring his upper jaw forward while occluding on the posterior teeth.

4. The head tilted backward, which makes protrusion more difficult

5. The patient asked to swallow and close slowly.

6. Instruct the patient to do routine jaw exercises

Factors that complicate centric relation record:

1- Resiliency of the tissues supporting the denture base.

2- Stability and retention of the record bases.

3- The TMJ and its neuromuscular mechanism.

4- Amount of pressure applied in making the record.

5- Technique employed in making the record.

6- The ability of the dentist.

Eccentric jaw relations:

Any relationship between the jaws other than centric relation:-

1-Lateral jaw relation: The relation of the mandible to the maxillae when the lower jaw is in a position to either side of centric relation.

2-Protrusive jaw relation: The relation of the mandible to the maxillae when the mandible is thrust forward

Methods of recording eccentric jaw relations:

The main reason in making an eccentric jaw relation is to adjust the articulator to simulate the eccentric movement of the mandible to the maxilla, and establish balanced occlusion. The methods are similar to that made for centric relation and include, the functional, graphic and inter occlusal records Inter occlusal eccentric records (Protrusive, left and right lateral movement), can be made on the occlusion rim or on the posterior teeth at the try-in appointment. For Hanau articulator the following formula is used to obtain lateral inclination:

L=H/8+12 L= lateral condylar inclination. H= horizontal condylar inclination as established by protrusive record

Arrangement of posterior teeth

The arrangement of the posterior teeth involves the application of principles similar to those followed in the arrangement of anterior teeth. The artificial posterior teeth should be placed as nearly as possible where the natural teeth were.

position of teeth

Notes :-

1-Posterior teeth should be put in **Neutral zone** area when forces exerted by the cheeks & tongue should be equal.

2-The mandibular posterior teeth should be placed so that the antero-posterior groove (central) is placed on **the crest(center) of the residual ridge**.as figure (1)

3-**The crest of the mandibular residual ridge** is marked on the edentulous cast by a line drawn from the crest of the ridge in the 1st premolar and canine area up to the mesial of the retromolar pads. If the teeth are placed buccal to the ridge, the dentures may tip on the opposite side when pressure is applied to these teeth. The teeth should not be placed lingual to the residual ridge because this will cause lack of space for the tongue, and the dentures will be displaced when the tongue moves.

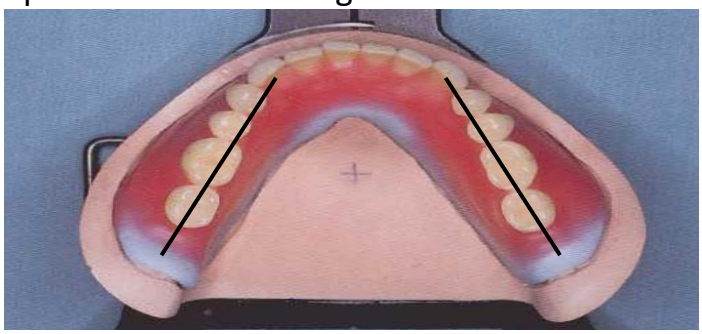


Figure (1)

Arrangement of maxillary posterior teeth

1-The maxillary 1st premolar:

1-FACIALLY:-The long axis of the tooth is parallel to the vertical axis from the front. The facial surface of 1st premolar must harmonies with canine**.**

2-PROXIMALLY:-the long axis is parallel to the vertical axis when viewed from the side

3-OCCLUSALLY:-buccal cusp touches the occlusal plane and the palatal cusp is positioned about 0.5-1mm above occlusal plane**.**

4-Long axis of tooth perpendicular to the occlusal plane.

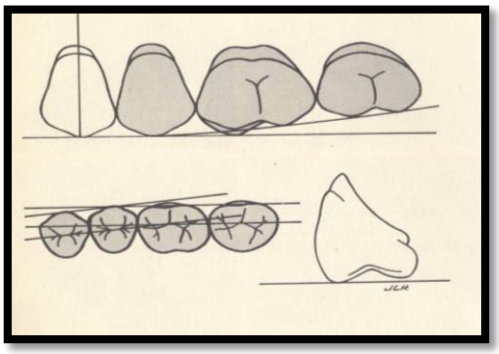
5-Palatal cusp over crest of mandibular ridge

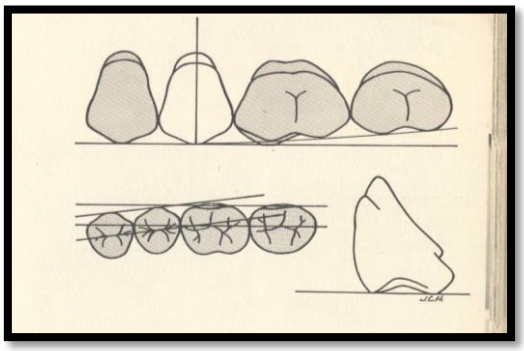
2-The maxillary 2nd premolar:

1--FACIALLY:- is parallel to the long axis

2-PROXIMALLY:-parallel to the long axis

3-OCCLUSALLY:-both buccal and palatal cusp touch the occlusal plane Long axis of tooth perpendicular to the occlusal plane. Palatal cusp over crest of mandibular ridge.





3-The maxillary 1st molar:

PROXIMALLY:-long axis is tilted buccally when viewed from the side.

FACIALLY:-when viewed from the front-tilted distally. The facial surface 1st molar must

harmonies with 1st & 2nd premolar

OCCLUSALLY:-the mesio-palatal cusp touches the occlusal plane, disto palatal above occlusal plane about 0.5m .Palatal cusp over crest of mandibular ridge

4-The maxillary 2nd molar

PROXIMALLY:-the long axis is tilted buccaly, when viewing from the side

FACIALLY:-tilted distally , when viewed from the front side

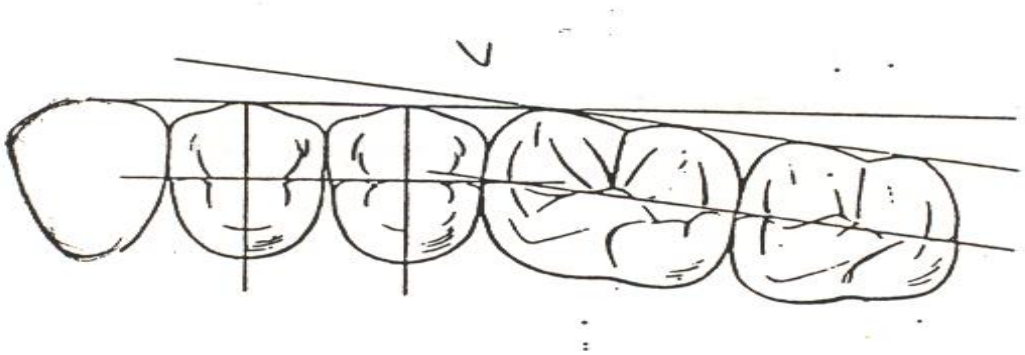
OCCLUSALLY:- All four cusps are above the occlusal plane. The facial surface of 2nd molar must harmonies with 1st molar

The maxillary teeth viewed from the occlusal surface should follow the following guidelines":

1- The distobuccal surface of the canine, the buccal surfaces of the premolars and the mesiobuccal surface of the 1st molar should follow a straight line.

2-Buccal surfaces of the 2nd molar are slightly inwards and are placed so that all buccal surfaces of the 1st and 2nd molars follow a straight line.

The posterior teeth should be placed so that the central grooves of the maxillary posterior teeth follow the line of the crest of the mandibular residual ridge.



The position of the mandibular posterior teeth:

The placement of the mandibular posterior teeth determines how well the teeth occlude, both in centric occlusion and in lateral and protrusive excursions. After placing each mandibular tooth in the correct position the incisal guide pin should be checked to insure that it is in contact with the guide table.

1-Lower first premolar

PROXIMALLY: the long axis of the tooth slopes slightly lingualy when viewed from the side.

FACIALLY:-the long axis parallel when viewed from the front.

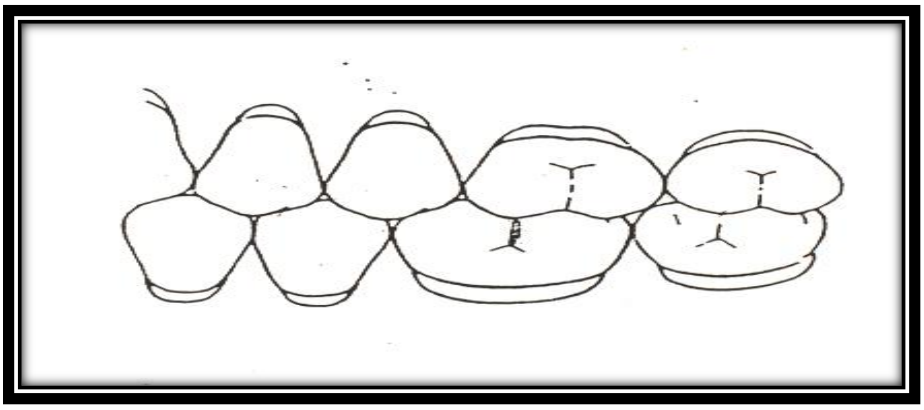
OCCLUSALLY:-the buccal cusp should be 2mm above the occlusal plane. Lingual cusp is below the occlusal plane.

2-Lower second premolar

Facially: the long axis slopes slightly lingually when from front

Proximally:-the same when viewed from side

Occlusally:-Both cusps are 2mm above the level of the occlusal plane.



3-lower first molar

proximally:-the long axis of the tooth slopes slightly lingually when viewed from the side.

facially:-The long axis of the tooth is tilted mesially when viewed from the front**.**

OCCLUSALLY:-all the cusp above the level of occlusal plane**.**

4-lower second molar

PROXIMALLY: the long axis slopes slightly lingually

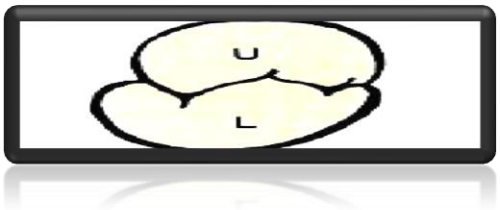
FACIALLY:-the long axis tilted mesially when viewed from the front.

OCCLUSALLY:-All the 4 cusps above the occlusal plane**.**

Keys of Occlusion

a-Canine Key of occlusion: The distal arm of the lower canine should align with the mesial arm of the upper canine.

B- Molar Key of occlusion :-The mesio-buccal cusp of the maxillary molars coincides with the mesio-buccal groove (buccal groove) of the mandibular molars **.**

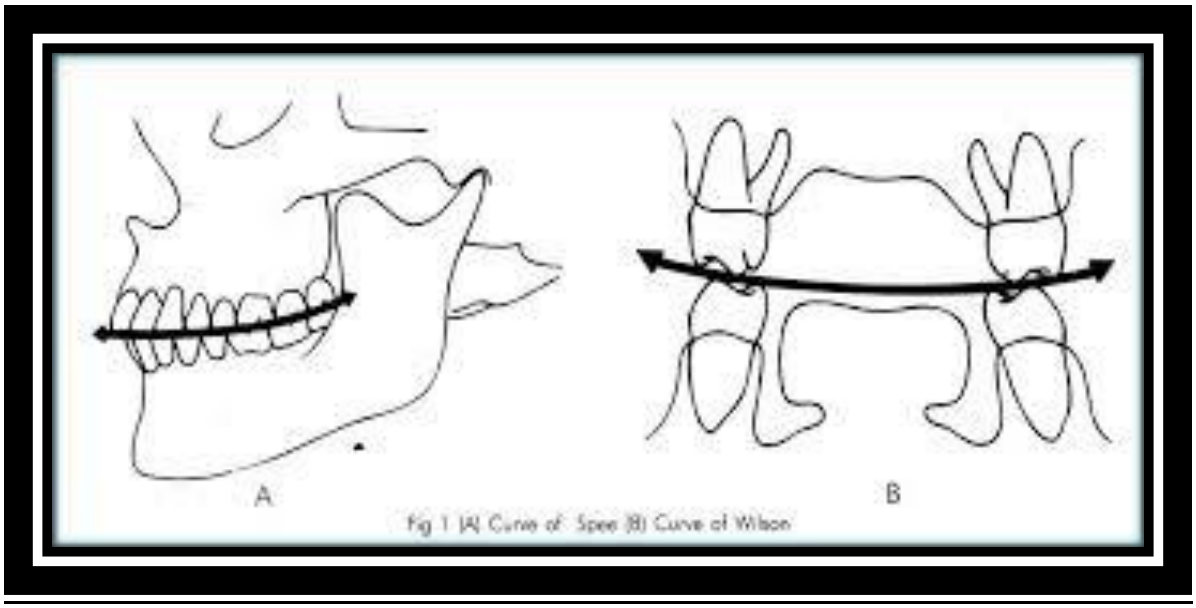


*Compensating curve

: is the anterio-posterior curvature of the occlusal surface of a complete denture teeth (in sagittal plane) and the mediolateral curvature in the (frontal plane). The compensating curves are called so because they compensate for that present in natural dentition. Compensating curves may be increased or decreased in an artificial dentition to help achievement of balanced occlusion.

1-Compensating curve for curve of Spee is the curvature of the occlusal alignment of the teeth. It begins at the tip of the lower canine follows the buccal cusps of the premolars and molars and continues to the anterior border of the mandibular ramus.

2-Compensating curve for curve of Wilson is the curvature in the frontal plane through the cusp tips of both the right and left molars.



A:Curve of spee B-Curve of Wilson

Anatomical Land marks of Maxillary arch

A good knowledge about the intra-oral landmarks for the maxillary and mandibular arch will help the clinician to carefully manage a patient and it will act as positive guides to the limit of the impression and denture extensions.

A-LIMITING STRUCTURE :-

They determine and confine the extent of the denture ,which include:

1-labial frenum

2-labial vestibule

3-buccal frenum

4-buccal vestibule

5-hamular notch

6-posterior palatal seal area

1-Labial Frenum: The labial frenum is a narrow fold of oral mucosa, which is found in the approximate midline. It extends from the inner surface of the lip to the labial surface of the alveolar ridge. The labial frenum is not a reliable guide for determining the midline of the face when natural teeth are absent.

- Need relief.

2-Buccal Frenum: There are two buccal frena. These frena are located on each side of the arch, usually in the first bicuspid region. Each frenum extends from the mucosa of the cheek to the buccal aspect of the alveolar ridge.

- Need relief.

3-Sulci (VESTIBULES)

- The maxillary sulcus (vestibule) is a groove formed by the mucosa of the cheek or lip and the mucosa at the base of the alveolar ridge.
- The portion of the sulcus which lies between the labial and buccal frena is called the **labial sulcus (vestibule).**
  The part of the sulcus between the buccal frenum and the hamular notch is the **buccal sulcus (vestibule).** The muscles shaping the sulcus cause its depth to change with every facial expression a person makes

4-Hamular Notch: is a deep depression located posterior to the maxillary tuberosity. The depths of this depression is part of a series of guides used to determine the posterior border of a maxillary denture.

5-Posterior palatal seal area(Post dam):- The soft tissues at or along the junction of the hard and soft palates on which pressure within the physiological limits of the tissues can be applied by a denture to aid in the retention of the denture.

Functions of the Posterior palatal seal :-

1-Aids in retention

2-Reduce the tendency for gag reflex as it prevents the formation of the gap between the denture base and the soft palate during functional movements

3-Prevent food accumulation between the posterior border of the denture and soft palate.

4- Compensates for polymerization shrinkage of acrylic.

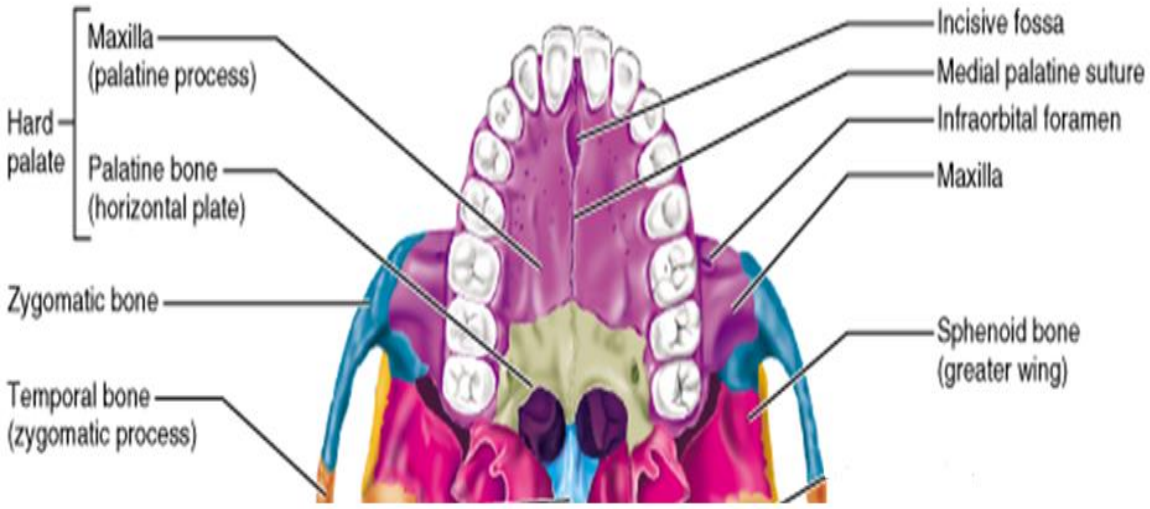
Palate

- The palate extends from the roof of the mouth all the way back to the uvula: divided into:
- 1-Hard Palate. The hard palate is made up of the anterior two-thirds of the palatal vault supported by bone (palatine processes of the maxillae and the horizontal plates of the palatine bones).

- The horizontal portion of hard palate lateral to mid line provides primary support area for denture.
-
- 2-Soft Palate. The soft palate is made up of the posterior one-third of the palatal vault that is not supported by bone. The soft palate is a muscular extension from the posterior edge of the hard palate, and it is very movable, especially during speaking and swallowing.
-

Vibrating Line

- The vibrating line is an imaginary line drawn across the palate that marks the beginning of motion in the soft palate when an individual says "ah".
- It extends from one hamular notch to the other.
- At the mid line it usually passes about 2 mm in front of the foveae palatine.



b-Supporting structure

These areas are the load-bearing areas . They show minimal ridge resorption even under constant load. The denture should be designed such that most of the load is concentrated on these areas which include:

Primary supporting structure

1- hard palate-

2- lateral slopes of residual alveolar ridge.

Residual ridge:-The portion of the alveolar ridge and its soft tissue covering which remains following the removal of teeth. It resorbs rapidly following extraction and continue throughout life in a reduced rate. The maxilla resorb upward and inward pattern.

Secondary supporting structure

1-Rugae

2-Maxillary tuberosity.

1-Rugae:are irregular ridges of fibrous tissue found in the anterior one-third of the hard palate.

- It plays important role in speech.
- It is considered secondary stress bearing area.
- Aids in stability and retention of denture.

Maxillary tuberosity:-It is a bulbous extension of the residual ridge in the second and third molar region .The posterior part of the ridge and the tuberosity areas are considered as one of the most important areas of support because they are least likely to resorb.

C-Relief Areas

These areas resorb under constant load or contain fragile structures within . The denture should be designed such that masticatory load is not concentrated over these areas.

1- Incisive papilla

2- Cuspid eminence

3- Mid-palatine raphe

4- Fovea palatine

1-Incisive papilla:- It is a midline structure situated behind the central incisors. It is the exit point of the naso-palatine nerves and vessels . It should be relieved if not , the denture will compress the vessels or nerves and lead to necrosis of the distributing areas and paresthesia of anterior palate.

2-Cuspid Eminence :- It is a bony elevation on the residual alveolar ridge formed after extraction of the canine. It is located between the canine and first premolar region .

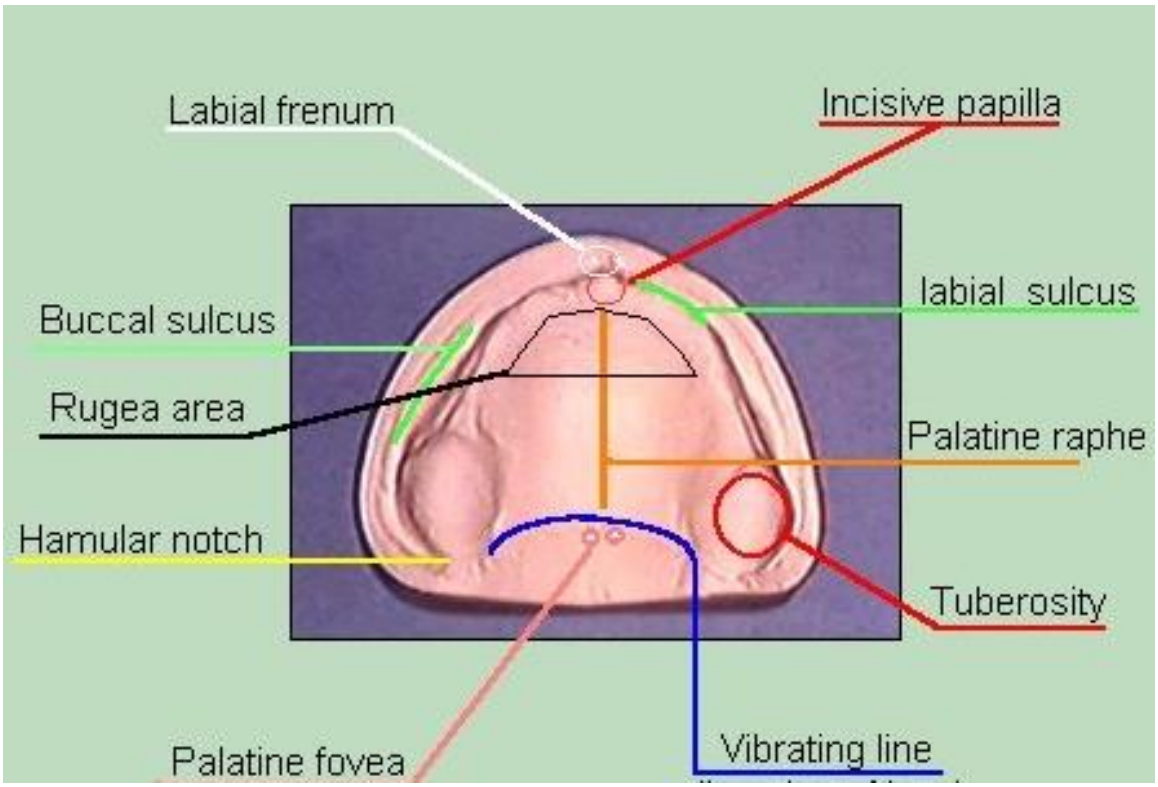
3-Mid-palatine raphe:-This is the median suture area covered by a thin sub-mucosa. It should be relieved during denture fabrication this area is the most sensitive part of the palate to pressure.

4-Fovea palatine

The fovea palatine are indentations located on each side of the midline of the palate and slightly posterior to the junction of hard and soft palates formed by coalescence of several mucous gland ducts.

They are always in the soft tissue which makes them an ideal guide for the location of the posterior border of the denture.

The secretion of the fovea spreads as a thin film on the denture there by aiding in retention. In patient with thick ropy saliva , the fovea palatine should left uncovered or else the thick saliva flowing between the tissue and the denture can increase the hydrostatic pressure and displace the denture.



Special tray definition , types and materials

Special Tray(individual tray):- a device prepared for a particular patient that is used to carry, confine and control impression material made on study cast for making a final impression.

On the ***study cast*** , special tray is constructed –(why?)as edentulous ridge show variations of shape & size, some have flattened ridges & other have bulky ridge, So stock tray can fit the ridge only in an **arbitrary manner**, so special tray is constructed.

Advantages of special trays:

1- Economy in impression material (used less impression material required in special tray).

2- More accurate impression.

3- Special tray provides even thickness of impression material. This minimize tissue displacement & dimensional changes of impression material

4- The work with special tray is more easier & quicker than modifying stock tray to provide accurate impression.

5- Special tray is more accurately adapted to the oral vestibules, this helps in better retention of denture.

6- Special tray are less bulky than stock tray which is more comfortable for the patient.

Materials used in construction of special tray:

1-cold cure acrylic

2-shellac base plate

3-light cure acrylic

4- vacuum formed thermoplastic resin sheets

5-heat cure acrylic

Types of special tray:-

1-spaced tray with wax(with or without stoppers)

2-closed fitted special tray without wax.

Fabrication of special tray with cold cure acrylic

1-The cast should be soaked in water.

2-Severe undercuts should be blocked out using wax.

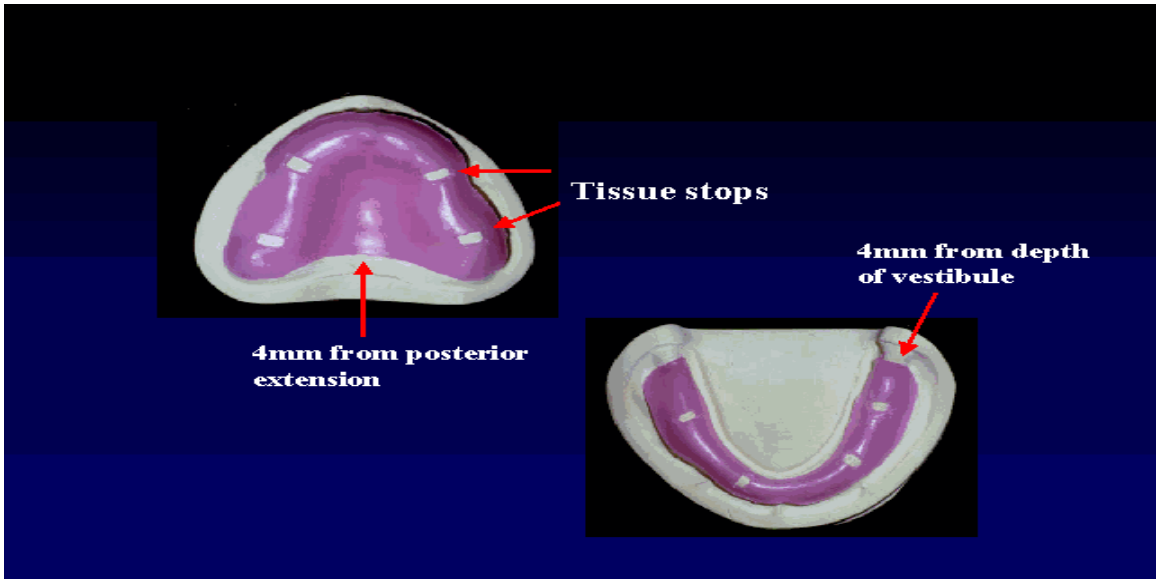
3-The borders of the denture border should be marked.

4-The borders of the tray marked on the cast are grooved deeper using a carver ,this act as guide to trim the tray later.

study cast

5-In closed fitted special tray :-application of separating medium on study cast **then** using the cold cure acrylic tray material

For spaced special tray:- adapting the wax spacer, should about 2mm thick, the posterior palatal seal on the cast is not covered with the wax spacer on the crest of the ridge ., wax should be cutted2 on canine and2 on molar area about 2-4mm and is called **stoppers** In order to stabilize the impression tray during impression making application of separating medium **then using the cold cure acrylic by mixing polymer and monomer and stay until reach dough stage then applied on study cast.**



Spacer (wax)

Method of Application of cold cure acrylic

dough method :-by this method mixing acrylic(powder called polymer with liquid called monomer) ,the accepted polymer \monomer ratio was 3\1 by volume.

The powder and liquid should be mixed in a mixing cup. After mixing the monomer and polymer the mix undergoes three stages:-

(***sandy stage*** → ***sticky stage*** → ***dough stage***)

in the dough stage the material is kneaded in the hand, to achieve a homogenous mix. Then the material shaped into a 2 mm thick sheet need a separating medium.

After that the sheet of acrylic is adapted over the cast from the center to the periphery to prevent the formation of wrinkles. Then cut the excess material with blade before setting the material. Then the material shouldbe held in position until complete polymerization. After that the excess dough material is used to handle fabrication.

Impression border molding

The shaping of the border area of special tray by functional or manual manipulation of the tissues adjacent to the borders to duplicate the contour and size of the vestibule, THEN MAKING FINAL IMPRESSION

OBJECTIVES of border molding:

1-To shape the border of impression in order to allow the muscles to function in harmony with the denture.

2-To improve the border seal of the denture[

MATERIALS USED FOR BODER MOLDING

1-Stick compound.

2-Polyether impression paste.

3-Impression wax

4-Tissue conditioners.

Final or Secondary impression:

It is an impression made for the purpose of fabrication of prosthesis. This impression is made with individual tray(special tray).

Final impression must be poured with ***stone*** material to produce the ***master cast.***

Master cast

Materials used for final impression:-

1-zinc oxide eugenol impression material(rigid irreversible)

2-Alginate impression material(elastic-irreversible)

3-agar (elastic -reversible)

4- polysulfide, polyether and silicon light body,(elastomers impression material-irreversible)

5-impression wax (rigid reversible).

-Zinc oxide euogenole-

-Poly ether impression material-

BOXING THE IMPRESSION

An impression is boxed by wax to preserve the borders of the impression so that it will be accurately reproduced in the cast.

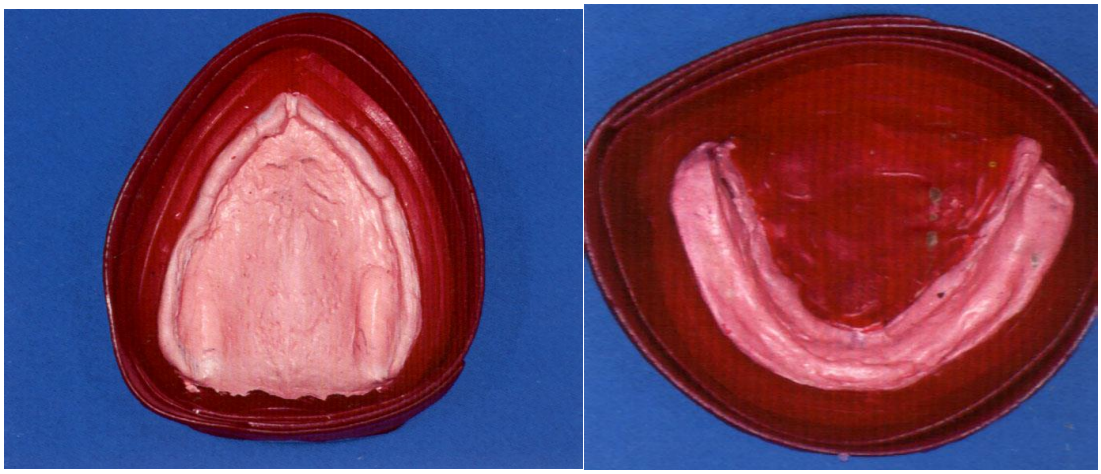
Advantages of boxing

1-the borders of the impression are preserved

2-the thickness of the cast can be controlled

3-time is conserved

4-material is conserved



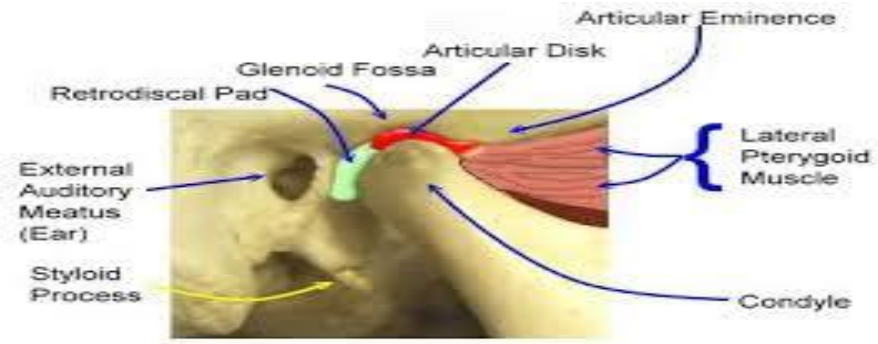
Artificial stone is mixed according to manufacturer s direction and sufficient stone is poured into the final impression so that the base of the cast will be from 10-15mm in thickness .The cast is called **master cast.**

Tmj component and mandibular movements

TMJ :Is the area where the mandible articulates with the cranium. It is described as a complex, multi axial ,synovial also called craniomandibular joint

TMJ Components:

1-crainial component(glenoid fossa)
2-mandibular component(ovoid condylar process)
3-TMJ capsule:- A dense, irregular collagenous connective tissue capsule encloses the articulating surfaces of the TMJ. It is attached above to the articular tubercle and the margins of the mandibular fossa and below to the neck of the mandible.
4-synovial fluid
5-ligaments
A-lateral temporomandibular ligament
B-spheno mandibular ligament
C-stylo mandibular ligament
6-articular disc (meniscus)-an oval fibrous plate that divides the joint into an upper and lower compartments. The articular disc is a pad of tough, flexible fibrocartilage situated between the condyle and the glenoid fossa .The disc is a shock-absorbing mechanism.
When the condyle moves out onto the articular eminence, the disc travels with it. The upper compartment (gliding movement),the lower compartment .permits Rotatory as well as gliding movement



The differences between TMJ and other Joints in the body are:

1. **TMJ has an articular disc which completely divides the joint spaces into upper and lower joint compartments.**

2. **TMJ is a Joint with :-**

a. **Hinge action (Rotation)**

b. **Slide Action (translation)**

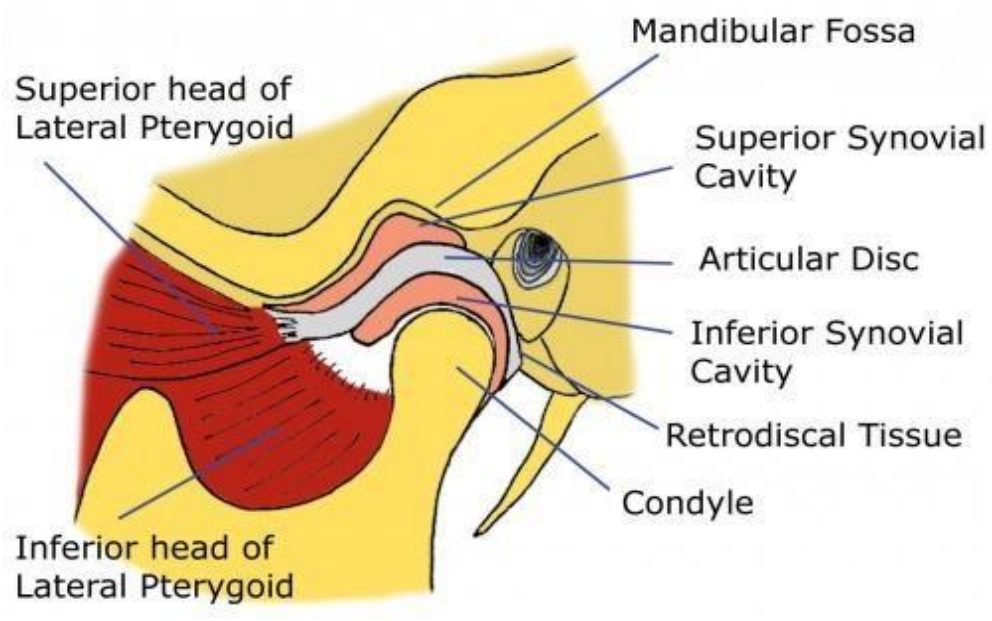
3. **Relationship of teeth affects the relationship of the articulating components.**

4. **The mandible is the only bone in the body hinged on both ends that is not capable of independent movement at one ends.**

Muscles of mastication :

a-1-temporalis 2-masseter 3-lateral pterygoid 4-medial pterygoid

b. Additional muscles: Suprahyoid muscles. And Infrahyoid muscles



The Temporomandibular Joint

Muscles control the mandibular movements :-

a-The muscles that cause depressionof mandible(opening):

a. Lateral pterygoid muscles.

b. Suprahyoid muscles.

c. Infrahyoid muscles.

d. Platysma muscles.

b-The muscles that cause elevation of mandible (closing):

a. Temporalis muscle.

b. Masseter muscle.

c-Medial pterygoid muscle

c-The muscles that cause protrusion of mandible:

a. Lateral pterygoid muscle.

b. Medial pterygoid muscle.

c-Superficial fibers of masseter muscle

d-The muscles that cause retraction of mandible:

a. Posterior fibers of temporalis muscle.

b. Deep fibers of masseter muscle.

e-The muscles cause side to side movements (grindingand chewing):

a. Temporalis muscle on same side.

b. Pterygoid muscles on opposite side.

c. Masseter muscle.

-Good prosthodontic treatment have a direct relation to the structures of the temporomandibular joints, since occlusion is one of the most important parts of treatment of the patients with complete dentures. The temporomandibular joints affect the dentures and likewise the dentures affect health and function of the joints.

Movement of mandible

All the mandibular movements lies into :

a-2 basic types of movement :

1-rotation : when an opening of 20-25mm measured at the central incisors the condyle rotates within glenoid fossa.

2-Translation occurs whenever a condyle leaves the glenoid fossa opening at the central incisors more than 20-25mm

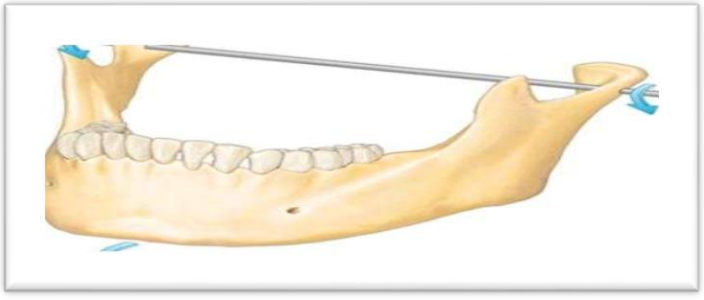
b-Functional movement: all mandibular movements except the terminal hinge movement, are combination of rotational and transitional (movement during food chewing and mastication). They are including:-

a. Symmetrical forward and backward movements.
b-Asymmetrical side wise movement or lateral movement

Mandibular axis:

There are three axes around which the mandibular movements takes place in horizontal, sagittal and frontal planes. These axes include the followings:

1. Hinge axis: or transverse horizontal axis: An imaginary line around which the mandible may rotate within the sagittal plane. (During the opening and closing movement).



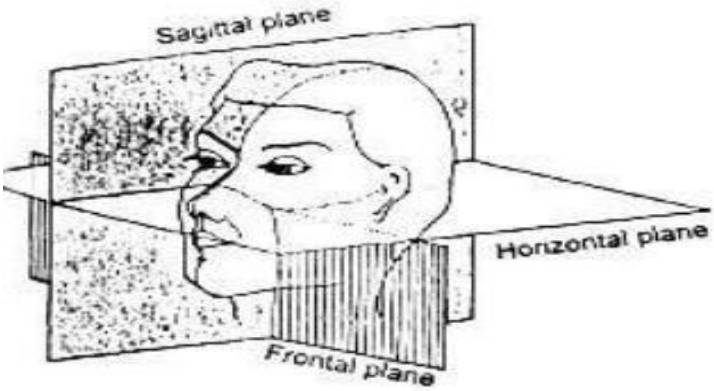
2. Sagittal axis of the mandible : An imaginary anteroposterior line around which the mandible may rotate when view in the frontal plane..

3-. Vertical axis of the mandible: An imaginary line around which the mandible may rotate through the horizontal plane.

Mandibular Movement:

Movement of the condyle occurs along the posterior slop of the articular eminence and extends as far forward as its crest. In some instances, movements may involve part of the anterior slope.

Mandibular movements are related to three planes of the skull: the horizontal, frontal, and sagittal. The mandible rotates in each of the three planes of space around the axes. The point of intersection of the three axes is called the **center of rotation**.



Vertical jaw relation

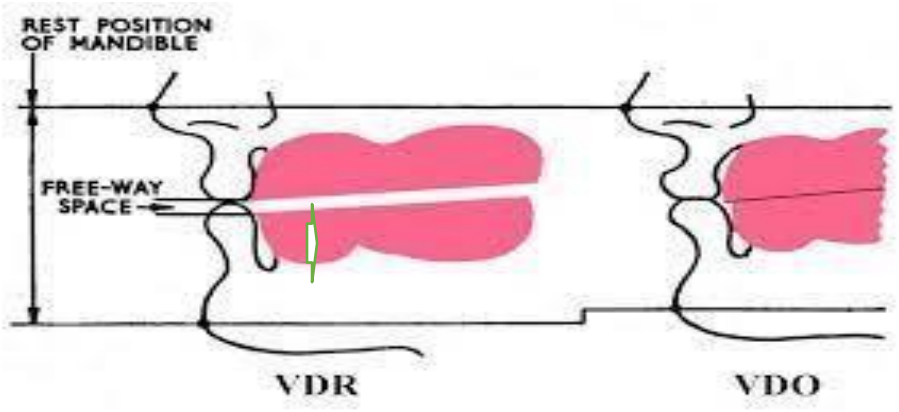
Are expressed as the amount of separation of the maxilla and mandible in frontal plane.

-Vertical dimension: the distance between two selected marked points (usually one ;on thetip of nose and the other on the chin), one on a fixed (maxilla) and one on a movable (mandible) member. ❖

-Occlusal vertical dimension (O.V.D.): the distance measured between two pointswhen the occluding members are in contact (teeth or occlusion rims are in contact).

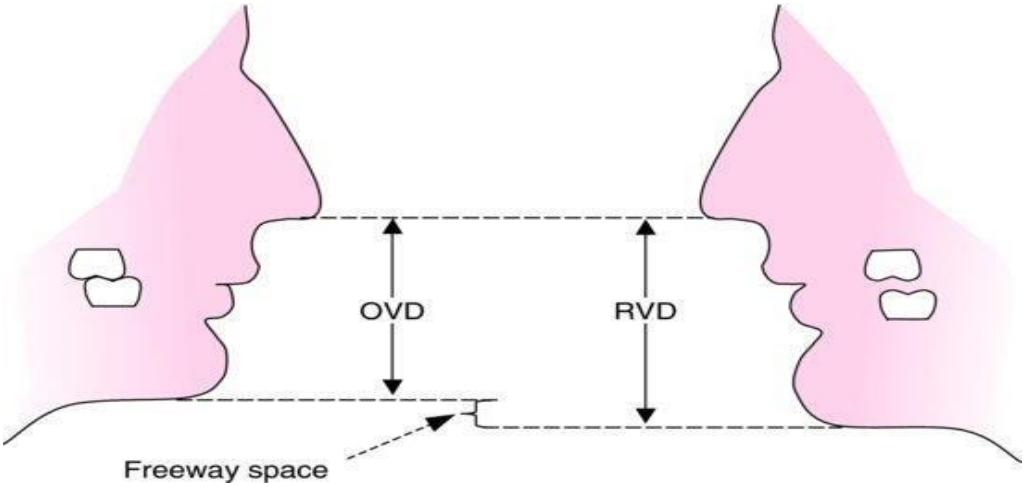
❖ **-Rest vertical dimension (R.V.D.)**: the distance between two selected pointsmeasured when the mandible is in the physiologic rest position.

-Inter-occlusal distance (Freeway space): the distance between the occluding surfaces of maxillary and mandibular teeth (or rims) when the mandible is in physiologic rest position. The difference between the (RVD) and the (OVD) is called freeway space and as an average it is 2-4 mm. (RVD- OVD = freeway space).



Importance of vertical dimension: Accurate vertical dimension of occlusion and rest will affect the following:

1. Function (mastication, respiration , deglutition, phonetics)
2. Esthetic (normal profile of the face)
3. Comfort (by maintenance the health of mucosa , bone, muscles and TMJ



Consequence of incorrect vertical dimension:

A. Increased vertical dimension (freeway space(less than 2-4mm) :

1. Interference with speech.
2. Accelerated resorption of residual ridge.
3. Loss of biting power.
4. Clicking of teeth during mastication.
5. Muscle fatigue.
6. Inharmonious facial proportion.
7. Excessive display of teeth causing poor aesthetic.

B. Decreased vertical dimension (freeway space(more than 2-4 mm):

1. Presence of wrinkles in the face (unsupported muscle).
2. Muscle fatigue.
3. Pain in the (TMJ).
4. Cheek biting. **
5. Decreased lower facial height with prominence of chin.
6. Poor esthetic (thin lip appearance).
7. Angular cheilitis **(due to folding of the corner of mouth)

METHODS OF RECORDING VERTICAL DIMENSION

These include the following:

A. Methods of recording REST Vertical Dimension.

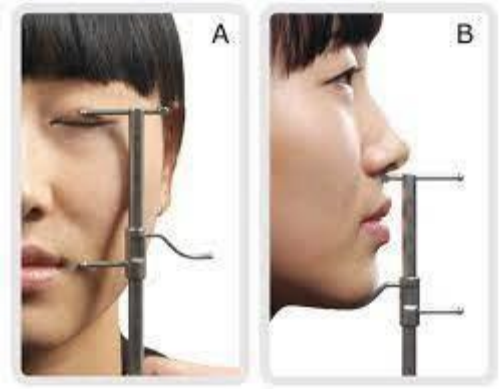
1-facial measurement: Patient is instructed to sit upright and asked to wet his lip with the tongue and swallow, then relax. In relaxation, the mandible should be at rest position, at this stage we measure between the two points (chin & nose).

2-phonetics: Instruct the patient to say the letter "M" and "hum", and we measure the distance between the two points .**The "M" sound is often close to R.V.D..**

3-tactile sensation: Patient is asked to open wide until he feel strain in the muscles, then he close the jaw slowly until he reach comfortable position, we measure the distance between the two points.

4-facial expression: This depends on the experience of the dentist to notice the relaxed facial expression of the patient. Usually upper and lower lip are in slight contact and the skin around the eyes and the chin are relaxed and not stretched.

5-anatomical landmarks: The jaws are considered at rest when the distance from the pupils of the eye to the corner of the mouth is equal to the distance from the anterior nasal spine to the lower border of the mandible. This is measured using **Willis guide**



WILLI 'S GAUGE

b-Methods for recording occlusal vertical dimension

1- With Pre-extractionrecords: (these records are made before the patient extract all his teeth)

2- Without Pre-extraction records

1-With pre extraction record

1-Profile photograph: They are taken in maximum occlusion and enlarged to life size. The anatomical land marks of the photograph are compared to that of the face at the try –in denture

2-Articulated cast :Maxillary and mandibular cast are made and mounted in articulator before extraction. It is compared to the same cast of the patient after extraction (interarch distance)

3- Radiograph :Profile radiograph may be used to determine the vertical dimension. This method is limited because of its inaccuracy

4- Measurements of old (former) denture: Measurements of old denture are made and used as a guide in the new denture.

2-without pre extraction record

1-facial measurement :occlusal vertical dimension should be less than rest about 2-4mm.

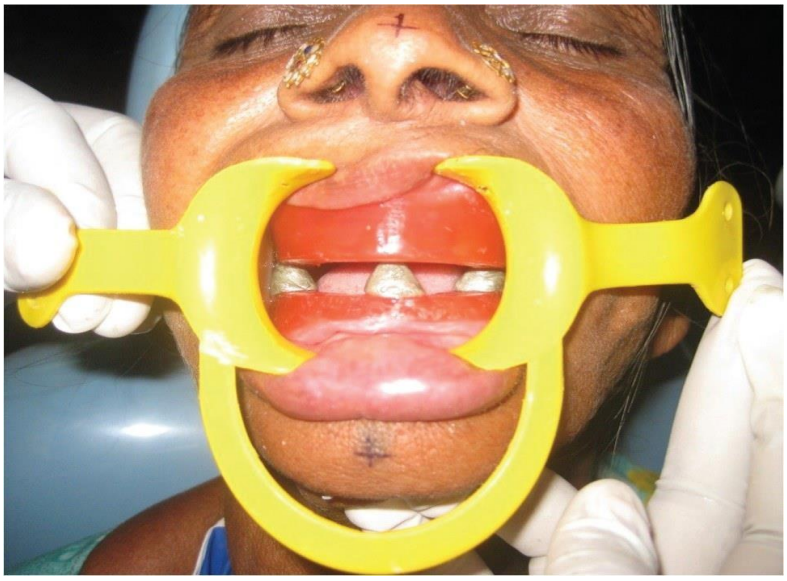
2-Neuromuscular perception(tactile sense):- A central bearing device attached to record bases. Different vertical relation are experienced by the patient through adjusting the screw upward or downward until the height of contact is comfortable to the patient and this represent the OVD of the patient.

3-Phonetics:- Used to evaluate the proper OVD. In some sounds like (ch, s, j) the upper and lower teeth reaches their closest relation withouttouching each other at the proper vertical dimension.

(The closest speaking space:is the closest relationship of the incisal edges of the mandibular teeth to the maxillary teeth during rapid speech (sounds ch, s, j)).

4-Swallowing threshold:- This method is based on the theory that when a person swallow the teeth come very light contact at the beginning of the swallowing cycle. The technique is by placing soft wax cones on the lower record base and saliva is stimulated by piece of candy so the patient can swallow many times against the upper record base. The repeated action of swallowing will gradually reduce the height of wax cones to allow the mandible to reach the proper OVD when the cones are evenly reduced

3-Swallowing threshold:



Articulators:

defined as a mechanical instrument that represents the temporo-mandibular joints and jaws to which the maxillary and mandibular casts may be attached to simulate some or all mandibular movements.

Uses\ function:

1- It allows most of the prosthetics work to be done in the absence of the patient.
2- Maintain jaw relation record during setting –up of teeth.
3- Denture re-mounting after processing for correction of occlusal disharmony.

Types of dental articulators:

1. Simple hinge articulators (Class I).

2. Mean value or fixed condylar path articulators (Class II).

3. Adjustable condylar path articulators.

a. Semi-adjustable condylar path articulators (Class III).

b. Fully-adjustable condylar path articulators (Class IV).

4. Digital computerized articulator programming.

1. Simple Hinge Articulators (plane line):

Design: It consists of un upper and lower members held apart at a certain distance by a screw which acts at the back. The screw can increased or decrease the distance between the two members, and permits only a hinge

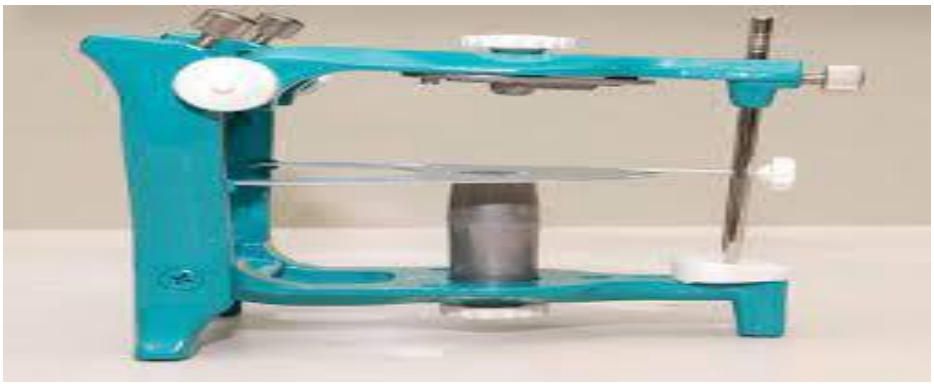
Possible movements: This type of articulators gives only opening and closing movements.

Records required: a. Vertical dimension of occlusion. b. Centric relation records.

Disadvantages: These articulators do not represent the temporomandibular joint .

2. Mean Value or Fixed Condylar Path Articulators:

Design: The two members of these articulators are joined together by two joints which represents the TMJ. The horizontal condylar path is fixed at certain angle that ranges from(30^0-40^0) which is the average of the most patients. The incisal guide table is also fixed at a certain angle from horizontal.

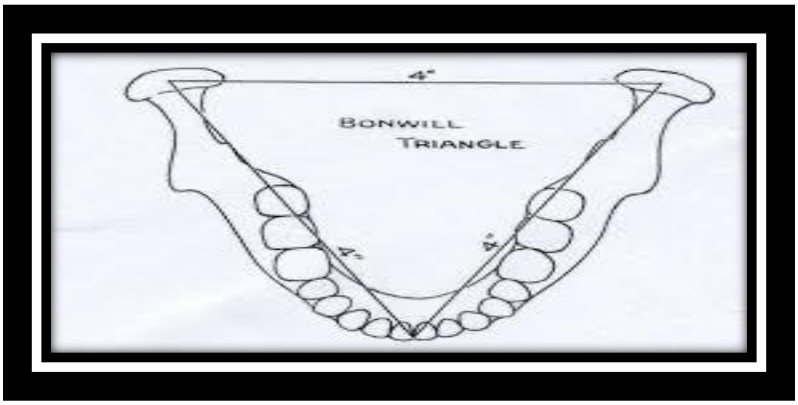


Possible movements: 1. Opening and closing. 2. Protrusive movement at a fixed condylar path angle.

Records required: a. Vertical dimension of occlusion. b. Centric relation record. c. Face-bow record. When the articulators dose not accepts face-bow record, the mounting is made according to Bonwill triangle.

Bon will: found in mandibles that the inter-condyle 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 of the occlusion rim labially and thus to orients cast in relation on the **Bon will triangle**



Disadvantages of mean value:

a. Most of these articulators do not accept face-bow record.

b. The condylar path moves to a fixed angle and it is successful in patients whose condylar angle approximates that of the articulator.

c. No lateral movements.

3. Adjustable Condylar Path Articulators:

These types of articulators differ from the fixed condylar path articulators in that it has 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(CL III):

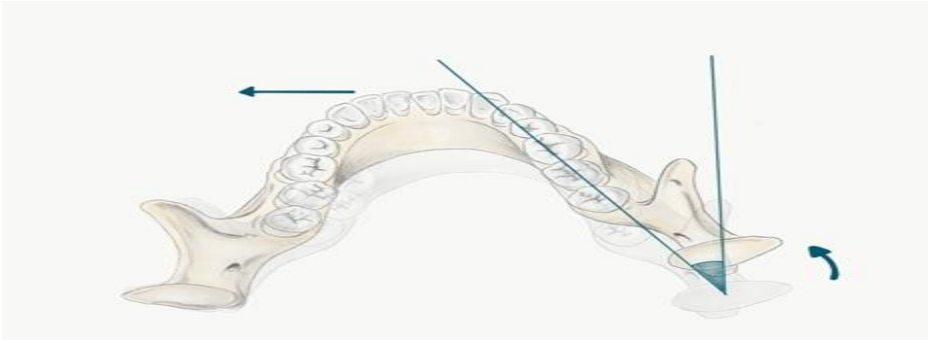
Design: In these articulators (e.g. Hanau`s articulator ). The lateral condylar path inclination is adjusted according to the **Hanau`s formula**: L= H/ 8+12. Where; L= The lateral condylar path. H= The horizontal condylar path.

Some semi-adjustable articulators are Non-Arcon while others are Arcon . The term Arcon (Ar mean articulator Con mean condyle)is commonly used

to indicate an instrument that has its condyles on the lower member and the condylar guides on the upper member.

4 

Possible movements: a. Opening and closing. b. Protrusive movement according to the horizontal condylar path angle determined from the patient. c. Lateral movement to the angle estimated from the Hanau`s formula. d. Some types have Bennett movement-(bodily lateral movement of mandible)resulting from movement of condyle along lateral inclines of mandibular fossa during lateral jaw movement)



Bennet angle

Disadvantages:

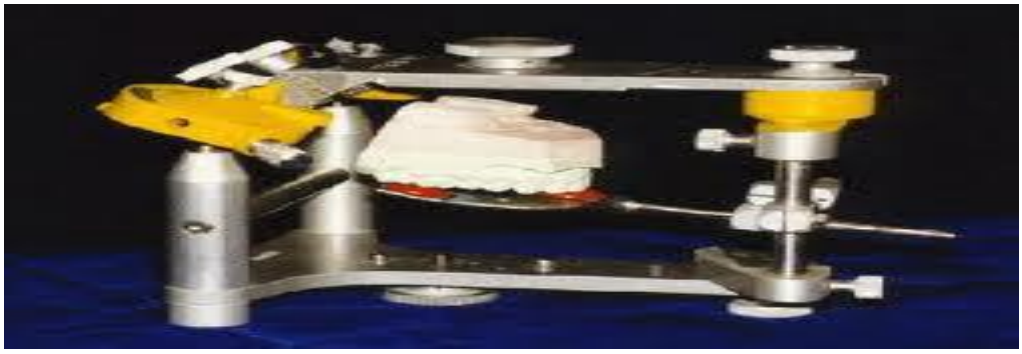
a. The lateral condylar path angle is determined from the formula.

b. Most of these articulators have no Bennett movement.

B- Fully-adjustable articulators: They differ from the semi-adjustable articulators in that the lateral condylar path inclinations are adjusted according to records taken from the patient

Possible movements: The same movements of the semi-adjustable articulators. In addition they have Bennett movement

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



4-digital computerized

The virtual articulators are able to design prostheses kinematically. They are ✖ capable of: -

1-simulating human mandibular movements. ✖

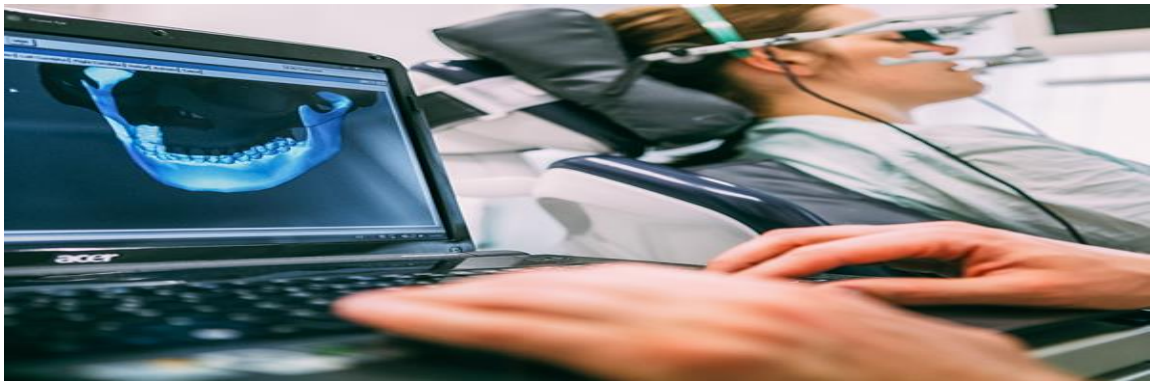
2-moving digitalized occlusal surfaces against each other according to these movements.

3-correcting digitalized occlusal surfaces to enable smooth and collision-free movements

There are two types of digital articulators.

1-One is Completely Adjustable Articulators, another is

2-Mathematically Simulated Articulator.



ADVANTAGES

1-Digital articulator is kept in digital form so no need for a storage place ✖

2-quick transmission to technician ✖

3-an estimation of digital cast is simple, automatic, and accurate. ✖

4-digital cast can be magnified and consequently pointing on anatomic focuses without any problem. ✖

5-it can save original malocclusion in digital format. ✖

6-there is no dust from alginate, plaster. etc. ✖

7-patient can get prosthesis in just one visit. ✖

8• Provides best communication between the dental specialist also, technician ✖

DISADVANTAGES ✖

1- during indirect scanning, the plaster dental cast ought to be pure (no errors) ✖

2 - mixed dentition is difficult to measure and recognize. • ✖

3- high expense of system as it requires the digital scanners an sensors, software's. ✖

mounting

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

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

. **We have 2types of mounting**:

1-arbitrary mounting

2-mounting using face bow

ZEROING OR RESETTING THE ARTICULATOR BEFORE MOUNTING.

In mean value articulator (Class II articulator-)

1- The articulator should be clean from any remnant of previous plaster.

2- The movable surfaces of the articulator should move freely without any hindrance.

3- The incisal pin should be flushed with the top of upper member of articulator to give zero reading.

4- The mounting table should be properly fixed to the articulator.

PREPARATION OF THE CASTS FOR MOUNTING

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

Mounting the maxillary cast

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

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

1- 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.

2- Alignment of the midline of the maxillary occlusion rim to the center of the cross midline which found on the mounting table anteriorly and posteriorly, so that the cast will be centralized to the mounting table and the occlusal rim fixed to the mounting table by wax

3-Plaster is mixed according to the manufacturer instruction then the plaster is poured over the base of the cast and the upper member is closed until the incisal pin touches the incisal table.

4- Smoothing and polishing of the plaster is done. The mounting should be cleaned and any debris removed from the articulator and mounting table.

Mounting the mandibular cast

The mandibular cast is mounted after recording the tentative vertical and centric jaw relations.

1- The mandibular occlusion rim should be well secured to the mandibular cast with it record base by using wax, also sealing should be done between the maxillary and mandibular rims after making tentative centric jaw relation.
2- Care should be taken that there is no posterior interference between the maxillary and mandibular casts (Heel area).
3- 3- The articulator with the mounted maxillary cast is inverted to aid in the mounting the mandibular cast.
4- 4- The maxillary occlusal rim with mandibular occlusal rim (centric record) placed on the maxillary cast.
5- 5- The mandibular cast is placed on the mandibular occlusal rim (It should be soaked in slurry water before mounting).
6- The plaster is mixed and poured over the base of the mandibular cast and the articulator is closed until the incisal table touch the incisal pin, then the plaster should be smoothed and polished.

CHECKING THE MOUNTING :

1- The midline of maxillary cast should be coincided with the midline of mandibular cast and midline of articulator.

2- Centralization of maxillary cast with upper member of articulator then the centralization of lower cast which depend on accuracy of the maxillary cast.

3- Incisal pin checked if it does not touch the incisal table.

POSSIBLE ERRORS MIGHT OCCUR DURING MOUNTING

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

Arrangement of anterior teeth

It is important that the artificial anterior teeth are placed in the same anterio posterior position and at the same length as the original natural esthetics and phonetics

Arrangement of maxillary anterior teeth:

In placing and positioning the maxillary anterior teeth the objective isto provide balance between maximum esthetics and proper phonetics.The maxillary anterior teeth should support the upper lip in a natural position.

1. After the loss of the natural anterior teeth, bone resorption usuallyoccurs more on the labial aspect than on the palatal aspect of the maxillary ridge. To compensate for this loss of bone structure the maxillary anterior teeth should be placed labial to the residual ridge.

2. The incisive papilla in the edentulous maxillary arch acts as a guide to proper placement of the maxillary central incisors. The maxillary central incisors fall approximately (8 to 10 mm)anterior to the point of intersection of a line that bisects the midline of the palate perpendicularly through the incisive papilla.

3. The labial contour of the teeth should follow the labial contour of the occlusal rim.

4. The right and left maxillary anterior teeth should be positioned symmetrically on either side of the arch.

Maxillary anterior teeth

1-MAXILLARY CENTRAL INCISOR:

-Mesio-distal inclination:

The maxillary central incisor is placed so that the long axisis parallel to the vertical axis, when viewed from the front

-Labio-lingual inclination: The neck of the tooth should be slightly depressed whenviewed from the side, the tooth slopes (incisal edge) towards the labial side.

-The incisal edge: Is in contact with the occusal plane

2-MAXILLARY LATERAL INCISOR:

-Mesio-distal inclination: The maxillary lateral incisor is placed with its long axisinclined distally when viewed from the front.

-Labio-lingual inclination: The neck of the maxillary lateral incisor is depressed morethan the central incisor, although the labial surface will benearly in line with the central incisor.

-The incisal edge: is ½ to 1mm above the level of the occlusal plane

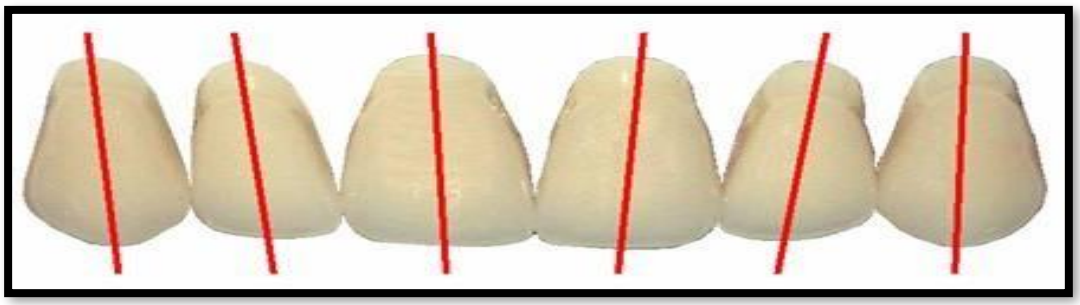
3-MAXILLARY CANINE:

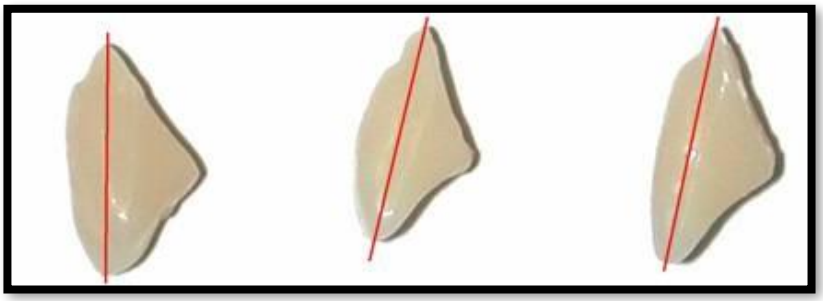
-Mesio -distal inclination The maxillary canine is placed so that the long axis is parallelto the vertical axis when viewed from the front

-Labio -lingual inclination The neck of the maxillary canine is prominent. The tooth axisis vertical (straight)when viewed from the side

-Incisal tip Is in contact with the occlusal plane.

Note: the maxillary canine has two planes on the labial surface, mesial plane should follow the contour of the anterior teeth while the distal plane will be in line with theposterior teeth





SAGITTAL VIEW

FRONTAL VIEW

Arrangement of mandibular anterior teeth

Notes:

1. The midline of the maxillary central incisor should be followed while placing the mandibular central incisor.

2. The imaginary roots of the mandibular anterior teeth should be directed towards the residual ridge. this will often place the mandibular teeth labial to the residual ridge.

3. The mandibular anterior teeth should not be in contact with the maxillary anterior teeth.

1-Mandibular central incisor

Mesio-distal inclination: The long axis is perpendicular to the occlusal plane (verticallyupright).

Labio-lingual inclination:

The central incisor is placed with its neck depressed and the tooth will show that it's labially inclined when viewed from one side.

The incisal edge: Are 1-2 mm above the occlusal plane.

2-Mandibular lateral incisor

Mesio-distal inclination: The mandibular lateral incisor is placed with its long axis showing aslight distal inclination.

Labio-lingual inclination: The labial surface is perpendicular to the occlusal plane.

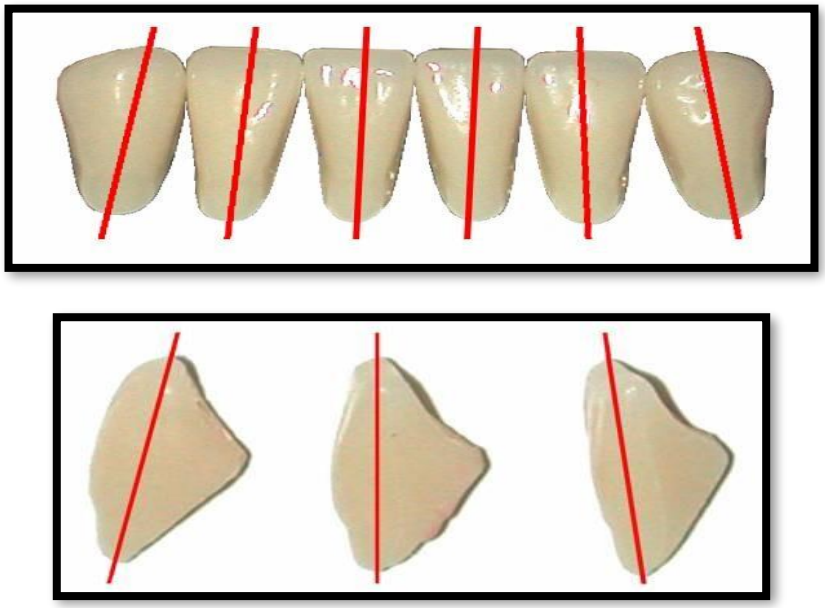
The incisal edge: Are 1-2 mm above the occlusal plane

3-Mandibular canine

Mesio-distal inclination: The mandibular canines are placed with a more distal inclination (neckdistally placed) than the mandibular lateral incisors.

Labio-lingual inclination: The neck of the tooth is placed prominently. The tooth shows a slightlingual inclination (at the incisal edge) when viewed from the side

The incisal tip: Lies 1-2 mm above the occlusal plane.

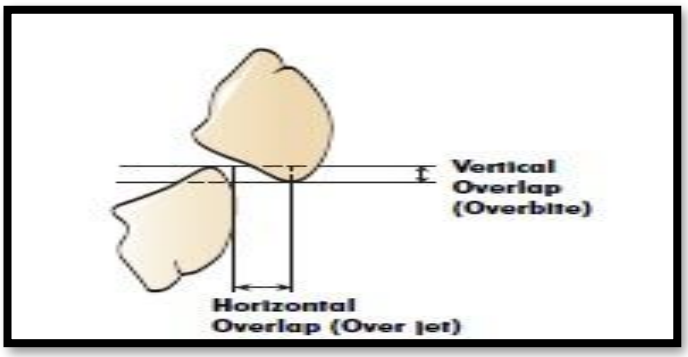


Horizontal overlap (over jet):

This the horizontal distance between the incisal edge of the maxillary central incisor and the labial surface of the mandibular central incisor.

Vertical overlap (overbite):

The maxillary anterior teeth overlap the mandibular anterior teeth and this overlap on the vertical axis is called the vertical overlap.



end