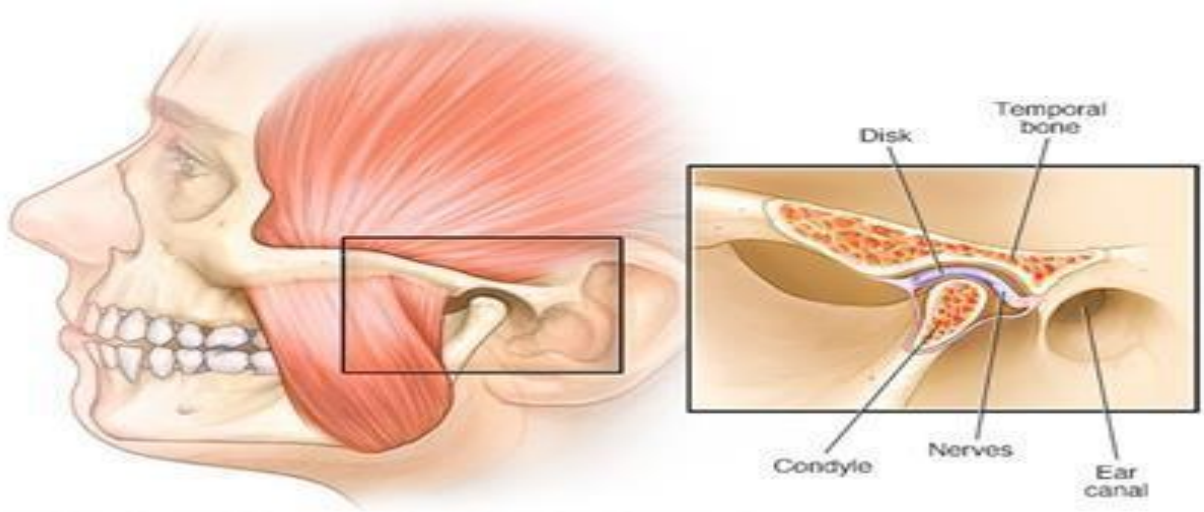
Lecture 11 **Prosthodontics** **د.محمد عبد الحميد**

TMJ & Mandibular Movement

Temporomandibular joint (TMJ): Is the articulation of the condyloid process of the mandible and the inter-articular disk with the mandibular (glenoid fossa) of the temporal bone.

The TMJ consists of the following parts:

1. The mandibular or glenoid fossa (cranial part).
2. The condyle or head of the mandible (mandibular part).
3. The articular disc or "Meniscus" which is found between the condyle and the glenoid fossa. It divides the synovial joint or TMJ into upper (superior) and lower (inferior) compartments.
4. Synovial cavity.



The muscles that control the movement of the mandible may be considered in 3 groups:

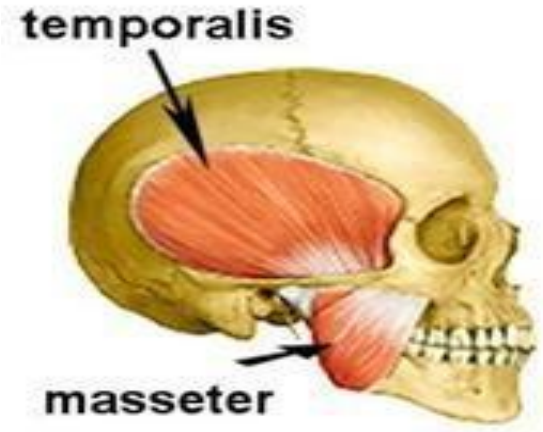
1. Closing muscles.
2. Gliding muscles.
3. Opening muscle.

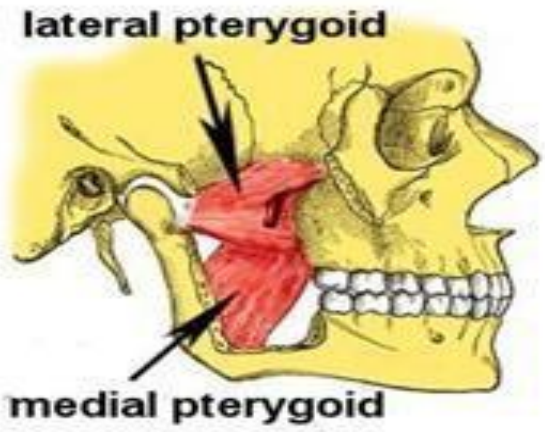
Closing muscles

The temporalis, masseter and medial pterygoid muscles supply the power for pulling the mandible against the maxilla (elevating and closing the mandible).

Gliding muscles

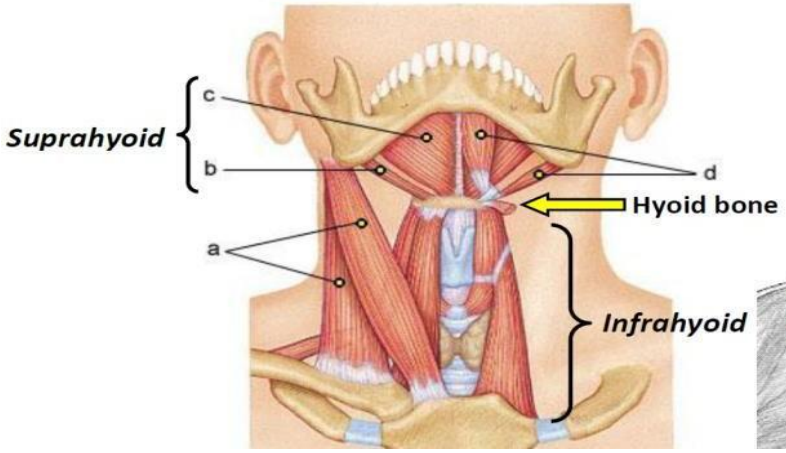
The lateral pterygoid muscle connects the mandible to the lateral pterygoid plate in such a way as to act as the steering mechanism for the mandible and act to protrude the jaw or to move it laterally.

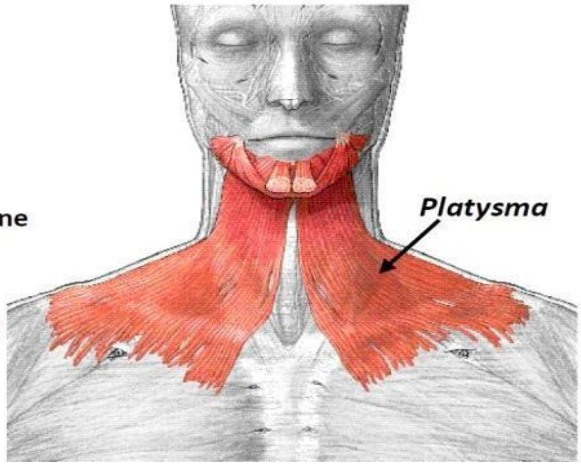




Opening muscles

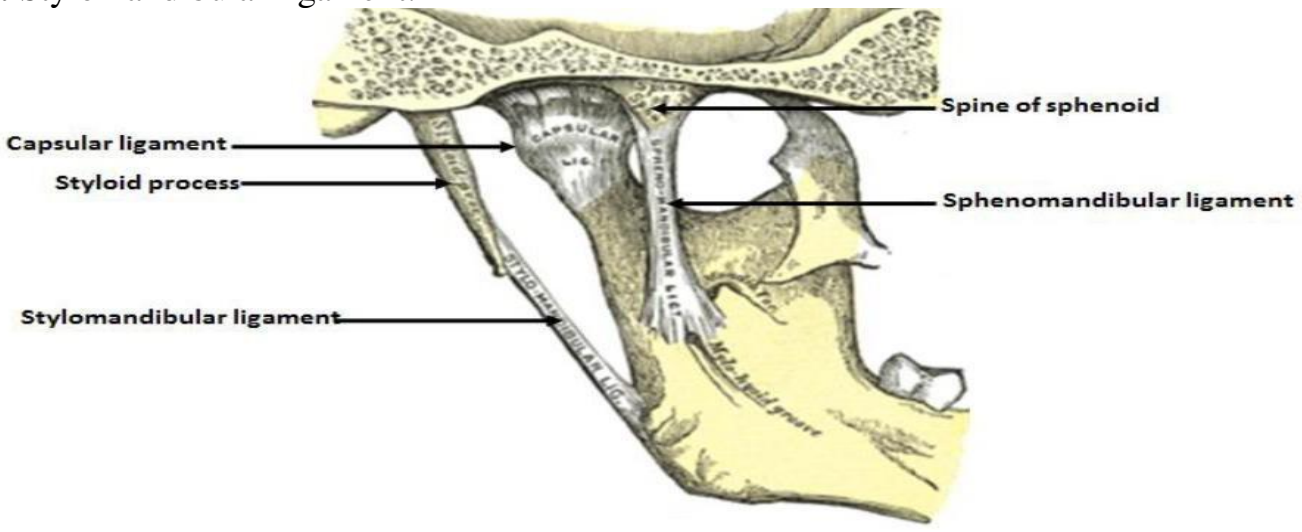
The muscles that depress (open) mandible consist of three groups, suprahyoid muscles, infrahyoid muscles, and platysma.





The ligaments that affect the movement of the mandible consist of:

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



Basic Manndibular Movements

1-Opening and Closing:-

From a position of centric relation, pure hinge movements are possible in opening and closing. In a hinge movement, the condyles rotate **within the glenoid fossa.**

Opening and closing movements, where the measured distance between **maxillary and mandibular incisors is between 20-25mm and is called rotation** ,more than 25mm, result in combined rotation and translation of the condyles.

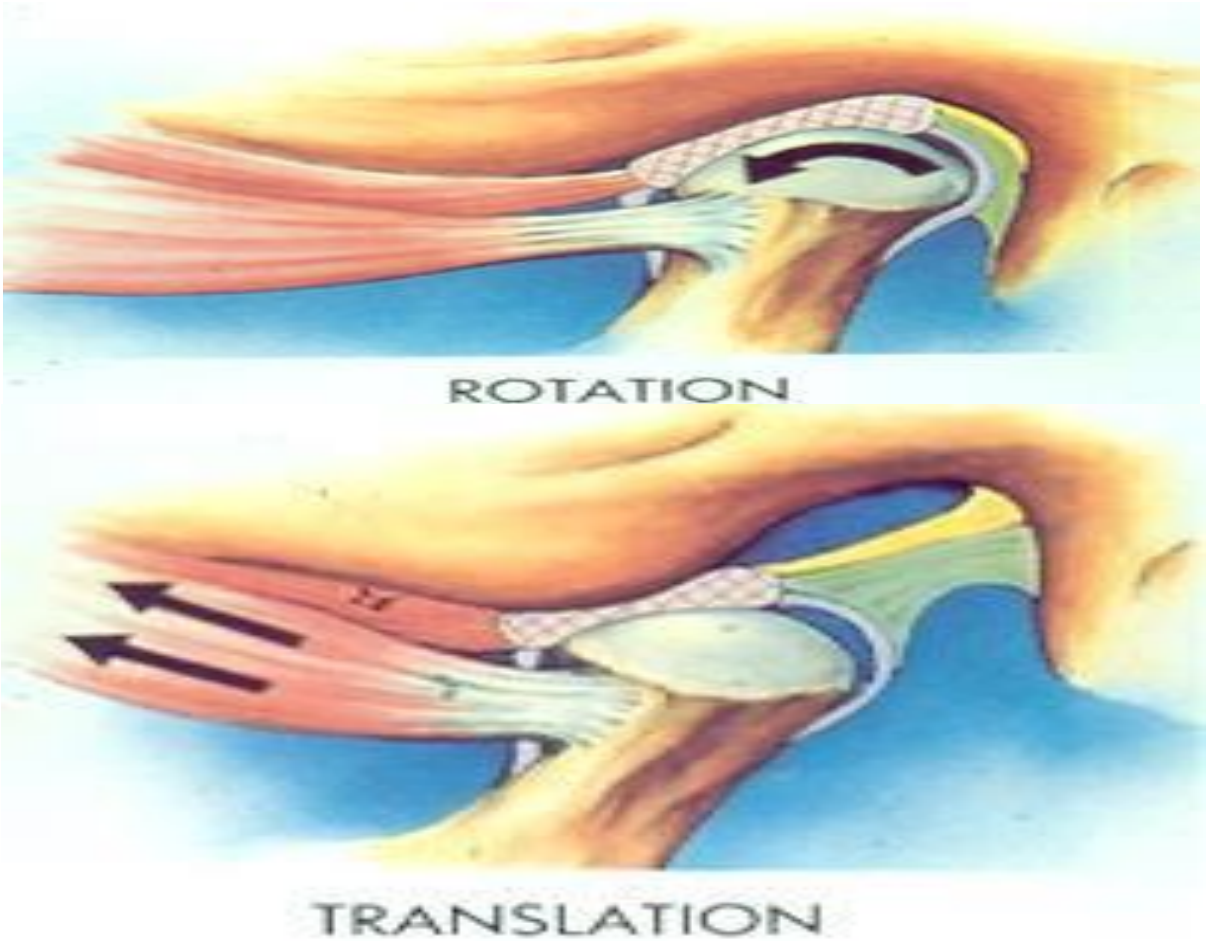
(Rotational movement=hinge movement).

Translation occurs whenever a condyle leaves the glenoid fossa.

2-Protrusion and Retrusion

Protrusion is when the mandible moves forward and both condyles leave their respective fossae and move down their eminences.

The opposite process is called Retrusion**. Protrusion and retrusion are translatory movement.**



3-Lateral movement (right and left direction)

a-the side to which the mandible is moving is called the working side

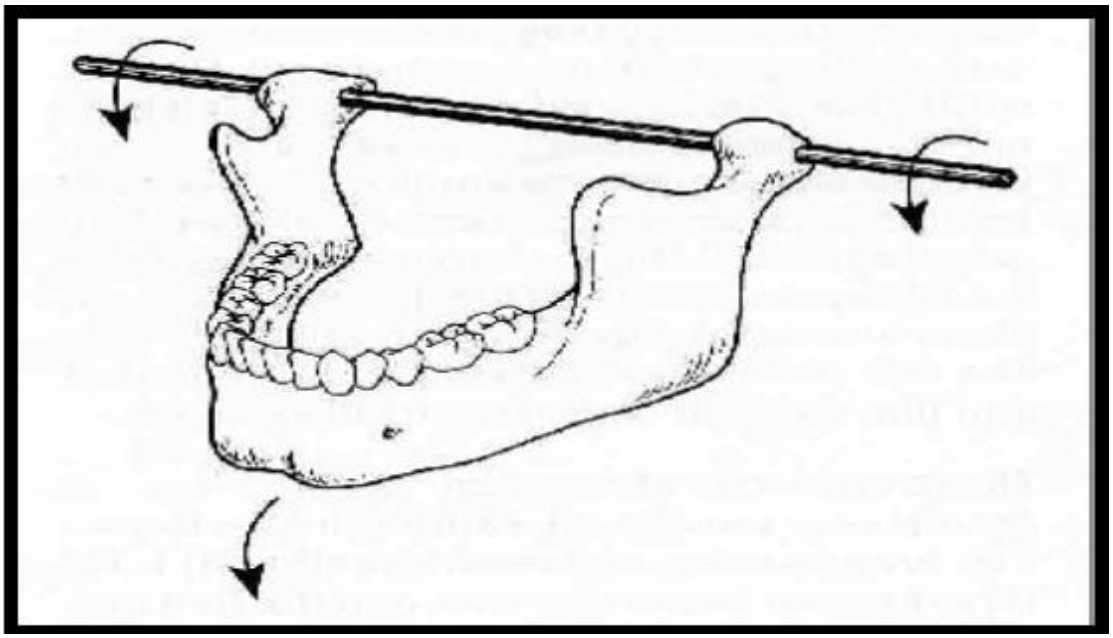
b-the side that is opposite to the working side is called balancing or non working side.

TYPES OF MANDIBULAR MOVEMENT

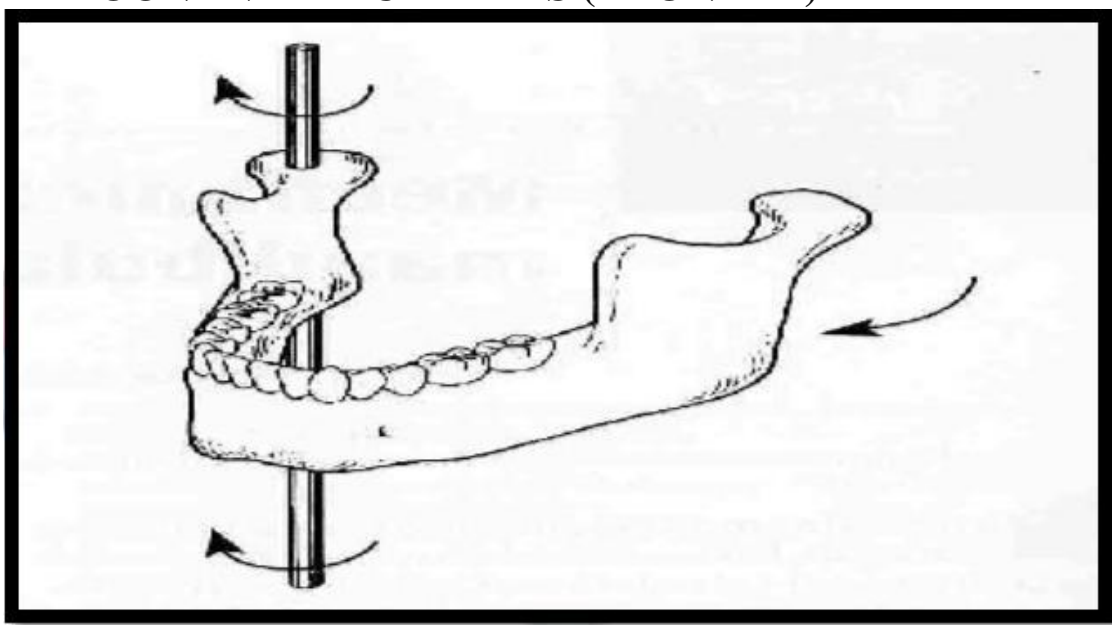
a- ROTATIONAL:- when an opening of 20-25mm measured at the central incisors.

1-Horizontal axis of rotation(HINGE AXIS)

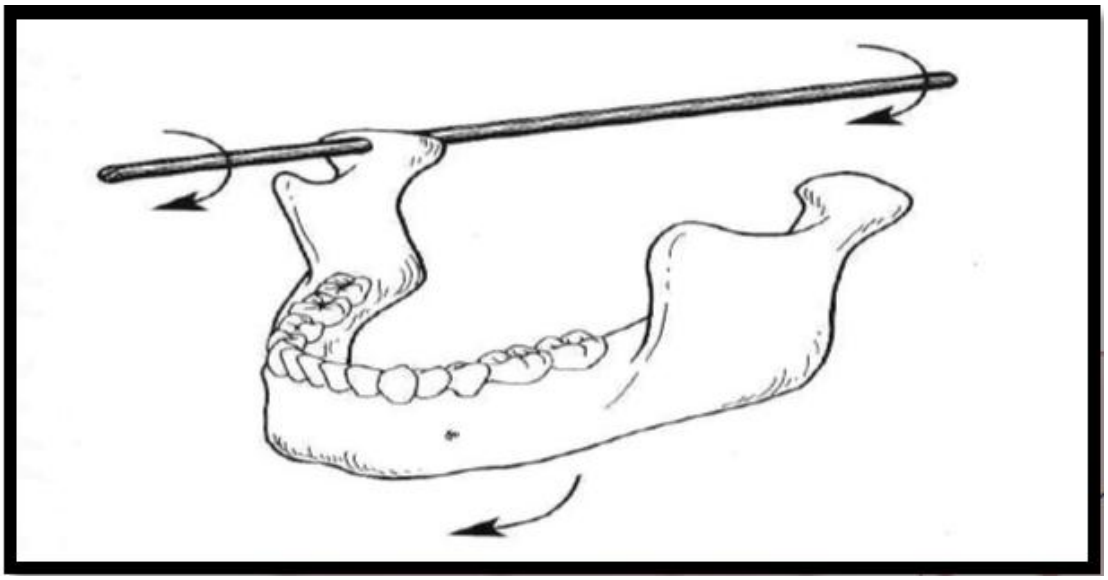
Hinge axis:-defined as an imaginary line passsing through the two mandibular condyles around which the mandible rotates without translatory movement.



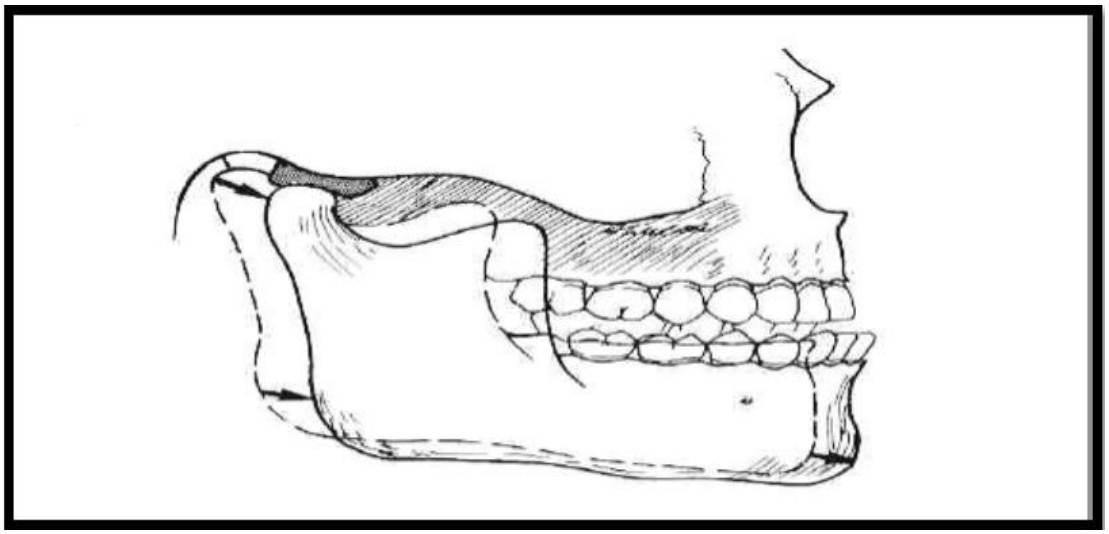
2-AROUND VERTICAL AXIS (FRONTAL)



3-AROUND SAGITTAL AXIS



b-TRANSLATIONAL MOVEMENT:-if the opening of the mandible continues beyond 20-25mm then translation of the mandible occure.The condyle and articular disc leave glenoid fossa anteriorly.



ENVELOPE OF MOTION (Posselt,s motion)

Dr posselt,s in 1952 first described a 3Dimensions concept of mandibular movements
It was a combination of border movements in all 3 planes:-

a-Sagittal

b-Horizontal(Hinge)

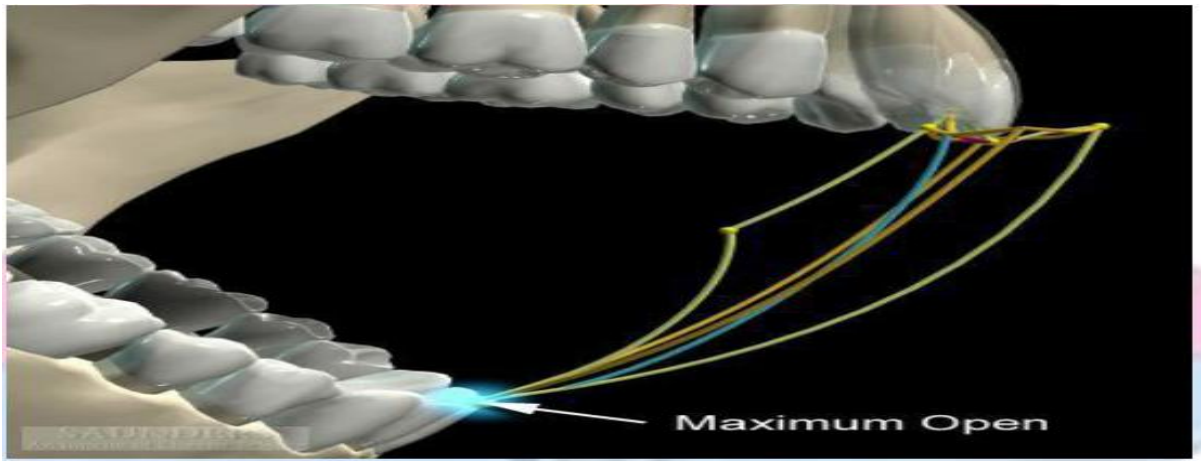
c-Vertical(frontal)

with 3reference positions

1- Centric relation(CR)DISSCUSSED

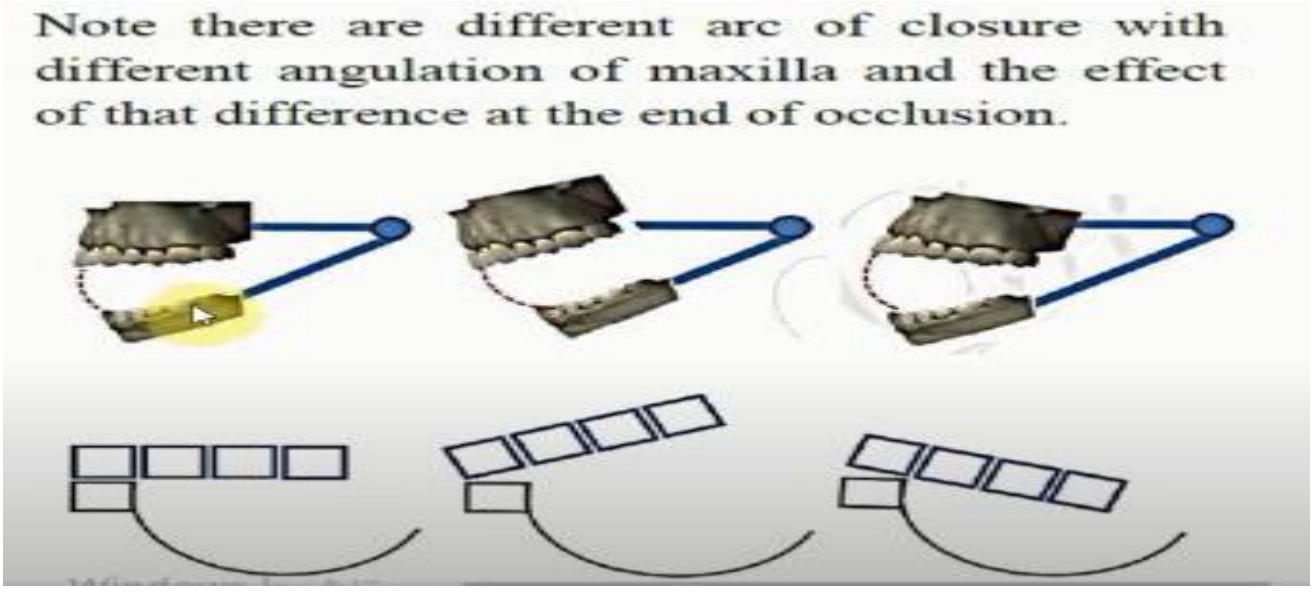
2- Maximum inter cuspal position(MIP):-this is a position in which the maxillary and mandibular teeth make maximum surface contact with each other. The mandible is elevated as superiorly as possible in the sagittal plane.

3- Resting position (Postural position-PP):- is the habitual position of the mandible when the patient is resting comfortably in the upright position and the condyles are in a neutral unstrained position in the glenoid fossa.
In this position, the teeth are apart and there is a wedge space between the teeth. This space is called the (inter occlusal space) and is usually 2-3mm and also called (physiological rest position).



Orientation relation

This record gives the angulation of the **maxilla** in relation to the **base of the skull**. It is necessary to do **orientation jaw relation** ***before*** carrying out other jaw relations , this relation is measured by the ***Face Bow***. The cast on the articulator must relate to the hinge axis of the instruments as nearly as possible to the same relation as that present in the patient mouth. And this orientation relation can be recorded by using the **Face Bow**.



Face-bow

It is a caliper-like device used to **determine** and **record the relationship of the maxillary arch to** the **hinge opening axis** of the **TMJ**, and then **transfer this relationship to the hinge opening axis of the articulator.**

IMPORTANCE OF THE FACE-BOW

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

Parts of face bow

The face-bow basically contains three sections:

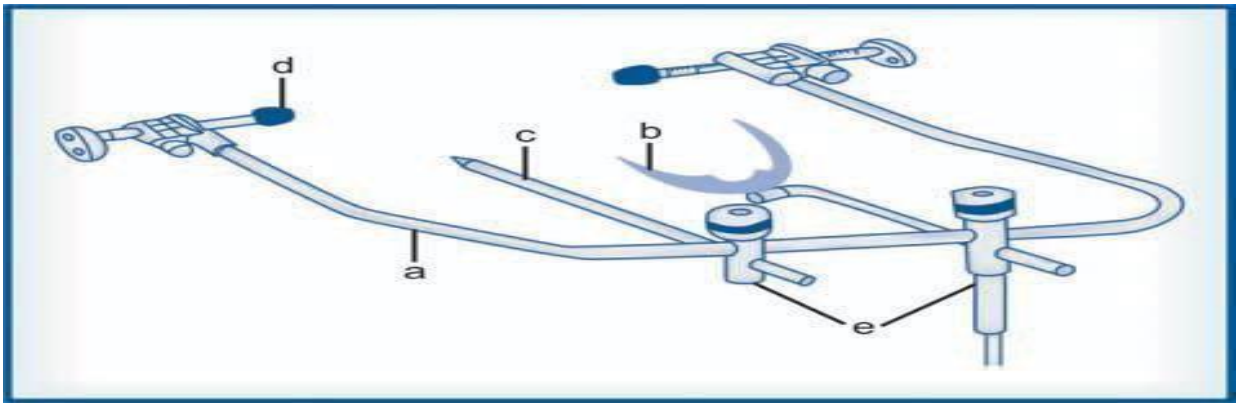
a. U- frame -: ***it represents the plane of the cranium***. It is the **main frame of the face-bow**; all other components are attached to the frame. It should be large and wide enough to avoid contact with the sides of the face.

b. Bite fork-: ***it represents the plane of the maxilla***. It is a U-shaped plate, which is attached to the occlusal rims while recording the orientation relation.

c. Orbital pointer with clamp: It is designed to mark the anterior reference point (infraorbital notch) and can be locked in position with a clamp. It is present only in the arbitrary face- bow.

d. Condyle rods: These are two small rods on either side of the free end of the frame that contacts the skin over the TMJ, over the hinge axis and transverse the hinge axis of TMJ by attaching to the condylar shaft in the articulator.

e. Locking device -: it locks the (a) and (b) sections without altering their Locking device plane.



Types of face bow

1. **Arbitrary face-bow:** It is the most commonly used face-bow in **complete denture construction**. It orients the maxilla to **an arbitrary hinge axis** and transverse it tothe articulator.
2. **Kinematic face-bow:** It orients the maxilla to the **actual hinge axis** and transverse it to the articulator. It is used only for **partial dentures and not for complete dentures.**



Arbitrary Face Bow



Kinematic Face Bow