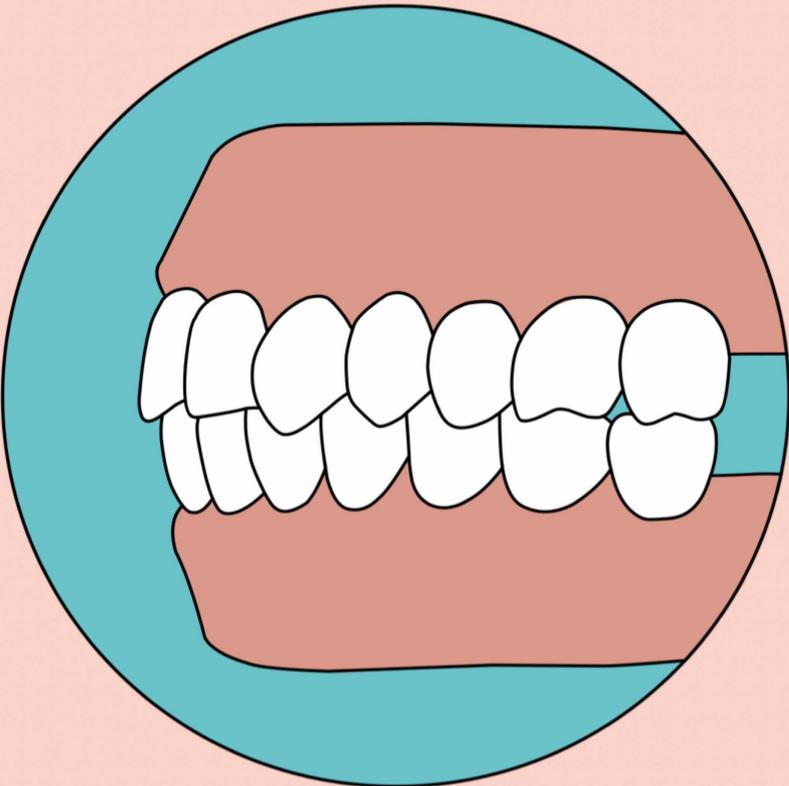


Occlusion



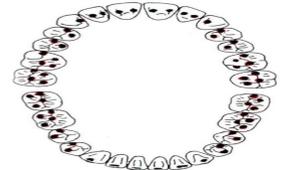
Anatomical Determinant of occlusion: Function and Anatomy of the TMJ

~Determinants of occlusal morphology:

- **Posterior determinant** (Anatomical): Condylar guidance , dentist can not modify.
- **Anterior determinant** (Anterior teeth) : anterior guidance , can be modified.

'Occlusion'
There is no escape
Dentists cannot:
repair, move and
remove teeth
without being
involved
in occlusion

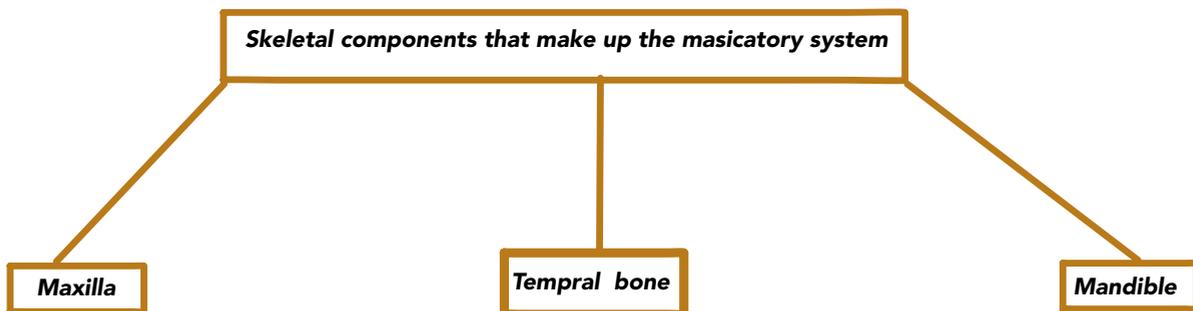
'Occlusion'
There is no escape
OCCLUSAL ANATOMY
of the teeth functions in
harmony
with the structures
controlling
the movement patterns
of the mandible.



■ The masticatory system is the functional unit of the body that is responsible for chewing, speaking and swallowing. It also plays a role in tasting and breathing.

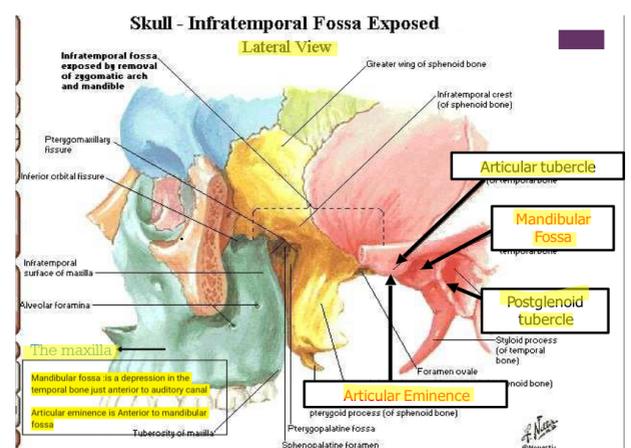
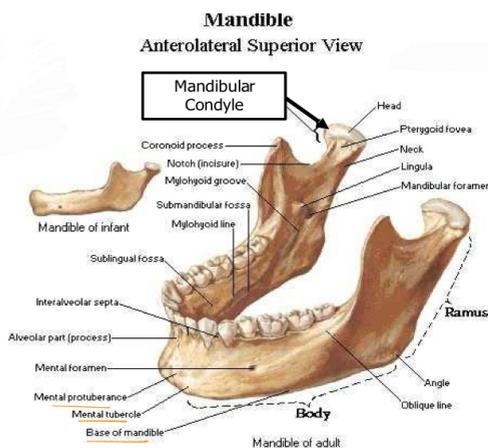
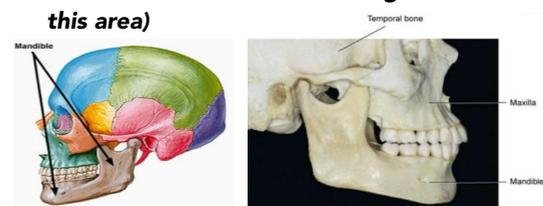
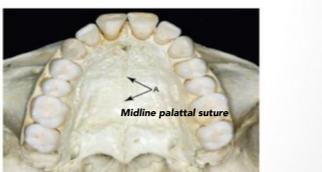
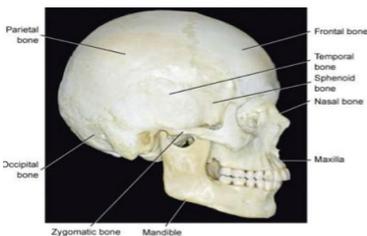
■ The system is made up of bones, , teeth, joints, ligaments, muscles, and neurological controlling system that regulates and coordinates all these structural components

~Masticatory system (bones and teeth):



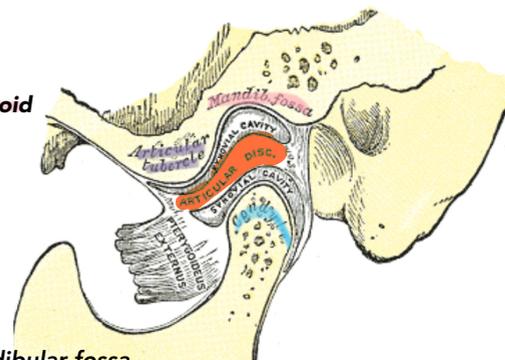
- Two maxillary bones fused at the **mid palatal suture**
- The upper facial skeleton
- Fused with skull (not separated from the skull, unlike the mandible)
- The stationary component of the masticatory system

- The lower facial skeleton
- No bony attachment to the skull (mobile)
- Suspended below the temporal bone and the maxilla by muscles, ligaments and other soft tissues
- A U-shaped bone
- Superior aspect consists of alveolar processes and teeth
- Angle of the mandible
- processes : **coronoid process**
- **Condyles** (it has connection with temporal bone that lies above it, forming the TMJ in this area)



~ Masticatory system (joints) >TMJ :

- Articulation between the **condyle** of the mandible from one side and its reciprocal socket (the **glenoid fossa** or **mandibular fossa**) and the **articular eminence** of the temporal bone from the other side.
- Interposed between these surfaces is the **articular disk**.



Compartments

1) The Articular Disc:

- The articular disk is a **thin, oval plate**, placed between the condyle of the mandible and the mandibular fossa.
- **Its shape is formed to accommodate the shape of the condyle and the mandibular fossa.** Its upper surface is concavo-convex from before back to accommodate itself to the form of the mandibular fossa and the articular tubercle. Its under surface, in contact with the condyle, is concave.
- Its circumference is connected to the articular capsule; and in front to the tendon of the superior head of the lateral pterygoid.
- The articular disc separates the TMJ into two compartments :
- 1-Superior compartment: that lie between mandibular fossa and articular tubercle of the temporal bone, which contains the synovial fluid.
- 2-Inferior compartment: which is between the articular disc and the head of the condyle.
- Between temporal bone and articular disc there's a cavity called ; synovial cavity that contain synovial fluid , this fluid prevents the friction between the 2 bones , so there will be no pain while moving the bones at this joint.
- It is **thicker at its periphery, especially behind, than at its center.**
- Formed of **dense collagenous connective tissue**, that is in the central part relatively **avascular** 'and so **nourished by synovial fluids**' , **hyalinized and devoid of nerves.** The fibers of which it is composed have a concentric arrangement, more apparent at the circumference than at the center. **It divides the joint into two cavities, each of which is furnished with a synovial membrane**
- All the articular surfaces of the condyle, the fossa, and the eminence are covered with **avascular** layers of dense fibrous connective tissue.

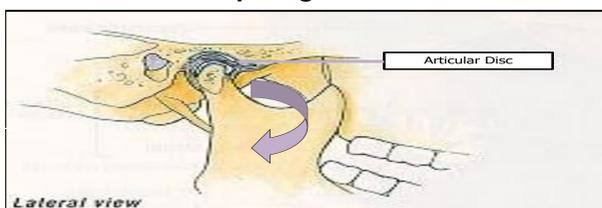
2) Joint Capsule:

- The TMJ is enveloped with a capsule which is attached above to the circumference of the mandibular fossa and the articular eminence immediately in front; below, to the neck of the condyle of the mandible.
- It consists of an **internal synovial layer** and an **outer fibrous layer** containing nerves, veins and collagen fibers.
- **Innervation:** trigeminal nerve.
- **Vascular supply:** maxillary, masseteric and temporal arteries.

Types of TMJ Movement:

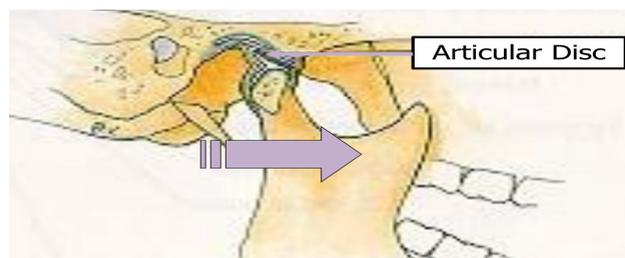
Rotation (hinge) in inferior joint compartment (disc—condyle)

occur in fixed location between disc and condyle , This movement induce the small opening of the mouth.



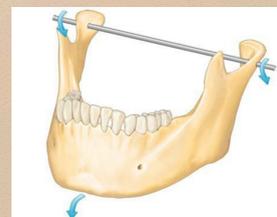
Translation (gliding) in superior joint compartment (disc—eminence)

happens in the maximum opening of the mouth and in the lateral movements , the mandible gets out of its place in the fossa and articulate with the eminence instead of the fossa.



■ One condyle cannot move in any manner without reciprocal movement (2 condyles in the mandible moves together, whether it is a rotation in simple opening or translation in maximum opening or even one rotation and the second translation in lateral and protrusive movement) .

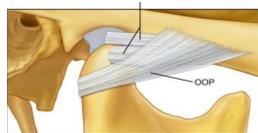
In opening and closing movements the two condyles form a common axis 'the hinge axis'



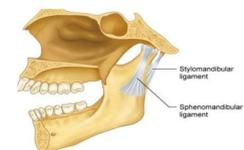
~ Masticatory system (ligaments):

Function: They stabilize the articular system during jaw movement (restrict border movement).

- The tempromandibular ligament
- The capsular ligaments.
- The stylomandibular ligament
- The sphenomandibular ligament
- The collateral discal ligaments.



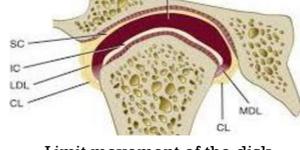
Limit rotational opening
Limit posterior movement



Limit excessive protrusion



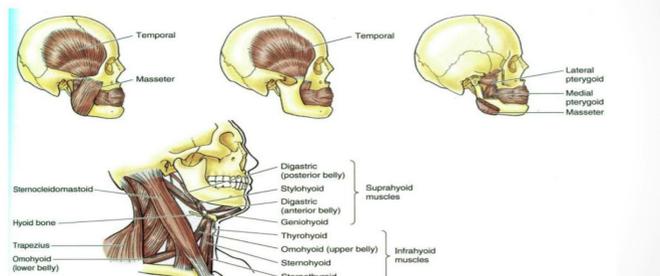
Limit medial, lateral and inferior movement.



Limit movement of the disk away from condyle

~ Masticatory system (muscles):

| Muscle | Origin | Insertion | Description |
|-------------------|---|--|---|
| Masseter | Zygomatic arch | Mandible (external surface) | Closes jaw; flat, thick muscle |
| Temporalis | Temporal bone | Coronoid process at the anterior border of the ramus | Closes jaw; fan-shaped |
| Medial pterygoid | Sphenoid, palatine, and maxillary bones | Inner (medial) surface of the ramus | Closes jaw; parallels masseter muscle |
| Lateral pterygoid | Sphenoid bone | Anterior surface of mandibular condyle | Opens jaw; allows grinding action side to side, and protrudes the |



Mandibular Movements

Elevation of mandible

- Closing the mouth
- Muscles: **Temporalis, Masseter and Medial pterygoid**

Depression of mandible

- Opening the mouth
- Muscles: **Inferior head of the lateral pterygoid and Digastric** (pulls downward and backward on the mandibular symphysis)

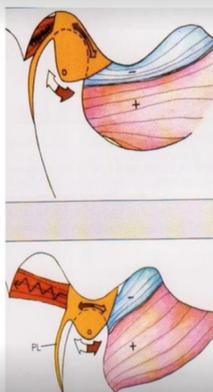
Lateral movements

- Side-to-Side Movement
- Produced by muscles acting unilaterally
- Primary muscles involved are those with pronounced mediolateral orientation or component of pull
- Contralateral excursion: **medial and lateral pterygoids**
- Ipsilateral movement: **masseter and temporalis**

+ Muscle Control of Disk Alignment

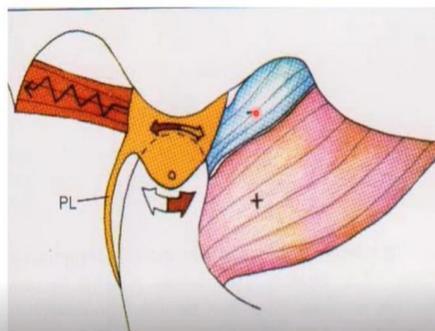
Opening

In centric relation the disk is positioned at the most forward position on top of the condyle. As the inferior lateral pterygoid muscle contracts the superior lateral pterygoid releases contraction to allow the elastic fibers to start pulling the disk more towards the top of the condyle.



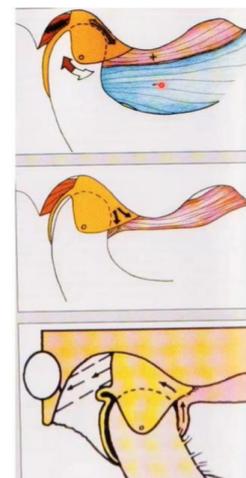
Maximum opening

When the condyle reaches the crest of the eminence the disk is on top of the condyle. At this point the elastic fibers have rotated the disk back because the superior LP is in controlled release.



Closing

As the jaw closes the condyle starts to move back, and the disk starts to go back to the front of the condyle. The SLP starts its contraction as the ILP releases the condyle to the elevator muscles that pull it back

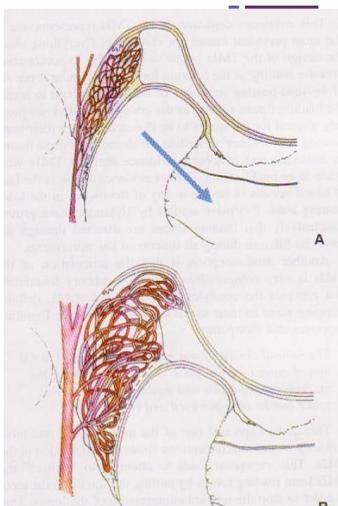


~The Arterio-venous shunt:

- As each condyle disk assembly moves down the articular eminence it evacuates the space up in the fossa. The retro-discal tissue expands to fill this space created. This takes place by a rush of blood into the network of vessels that are spread through the spongy retro-discal tissue.

-When the condyle and the disk return back to their place, the blood flows out of the vessels which contract in size

- This arterio-venous shunt (vascular knee) is an important part of the intra-capsular structure. It makes the retro-discal tissue highly innervated and vascular. If the disk is displaced anteriorly the condyle loads onto the tissue and pain occurs.



When translation movement occur for the head of the condyle it will move inferiorly , and the space stays empty , then the blood enter the vessels and fill it , and when the condyle get back to its location , the blood will be pumped back by the veins to the circulatory system.

~Mandibular Positions:

(1) Centric occlusion or ICP

maximum inter-cuspatation of teeth.

(2) Centric relation

is a position or path of opening and closing

(3) Rest position

postural position of the mandible determined largely by the neuro-muscular activity and to a lesser extent by the visco- elastic properties of the muscles. The rest position of the mandible is not consistent as the tonicity of the muscles may be influenced by the central nervous system as a result of emotional stress and by local peripheral factors such as a sore tooth.

*In the majority of people centric occlusion appears to be anterior to centric relation on the average by 1mm.

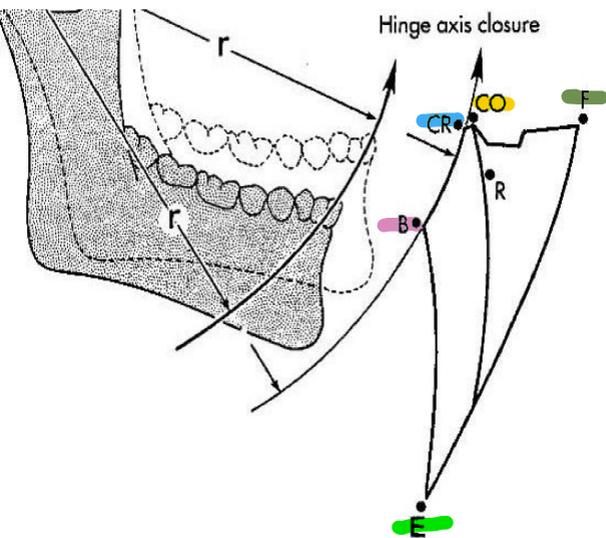
*Centric occlusion is a tooth determined position whereas centric relation is a jaw to jaw relation determined by the condyles in the fossa.

*A coincidence between CO & CR occurs in 10% of the population.

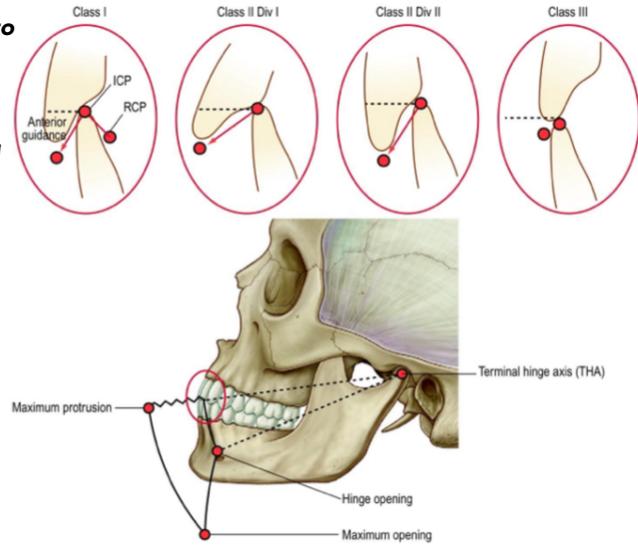
When the head is in upright position the inter-occlusal space is about 1-3mm at the incisors but it has a considerable normal variance up to 8-10 mm without evidence of dysfunction.

In tracing the movement of the mandible using recording equipment such as a pantograph or a kinesiograph it is possible to record mandibular movement in different planes. If we place a point between the mandibular central incisors and it is tracked during maximum lateral, protrusive retrusive and wide opening, such movements take place within a border or envelope of movements.

~ Tracing of mandibular movement in the sagittal plane (posselt's envelope)

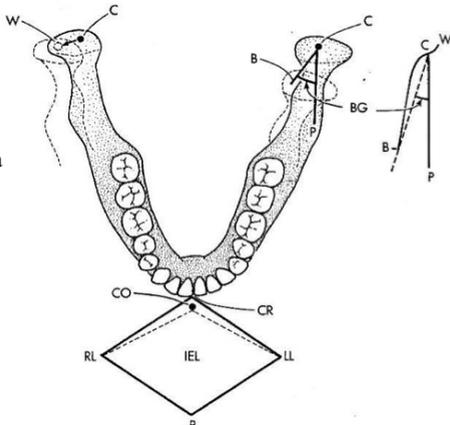


CR → then patient move into maximum intercuspation
(CO) → then closure occur due to overlap between upper and lower teeth →
(F): most protrusive movement → then back the patient to CR position →
 if patient make simple opening: **(B)** → further opening will cause maximum opening (translocation): **(E)**

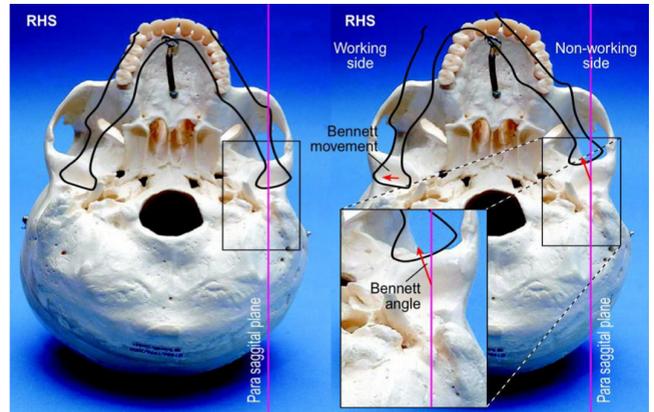


~ Tracing of mandibular movements in the horizontal plane

Benett movement it occurs in lateral movement of the mandible where the condyle rotates with a slight lateral shift in the direction of movement. The shift may be immediate or progressive (occurs slowly during translation).



Benett angle: occurs on the non working side, it is the angle made between the head of the condyle and the vertical plane



- Functional and parafunctional movements take place within this envelope.
- Most functional movements associated with mastication occur chiefly around centric.
- Maximum opening is around 50-60mm depending on the age and size of the individual.
- A lower limit for normal is 40mm.
- The maximum lateral movement in the absence of TMJ problems is 10-12mm
- The maximum protrusive 8-10 mm
- The retrusive range is around 1mm as measured from CO to CR

اللهم أنت ربي، وأنت إلهي، وأنت مولاي تولني برحمتك واهدني سواء السبيل، وارزقني من العلم ما ترضى، وامن علي بالحفظ السريع فلا أنسى ما أحفظ ولا أجهل ما أفهم، أنت الكريم وأنت المعطي وأنت الهادي يا رب