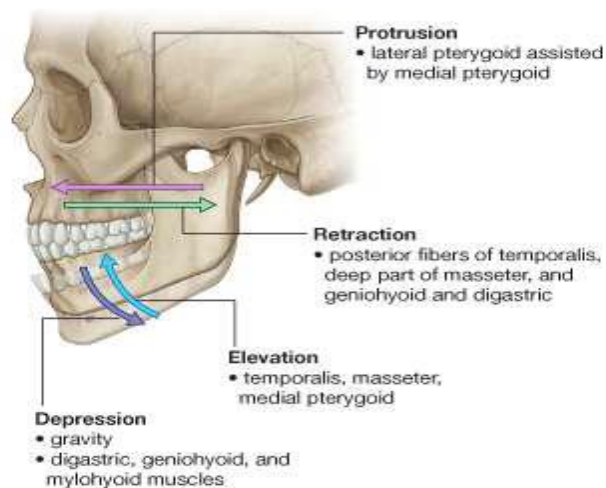


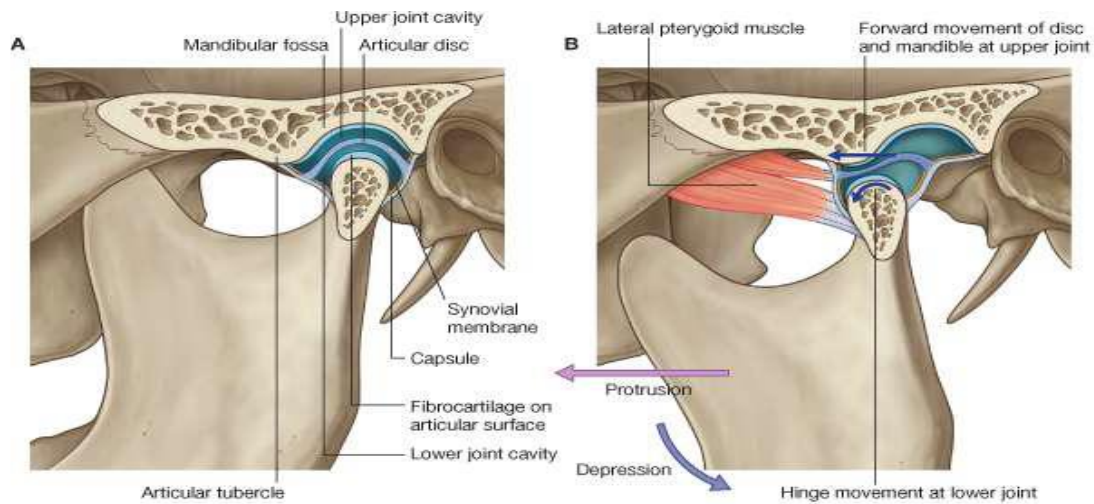
ORAL HISTOLOGY

TEMPROMANDIBULAR JOINT DR.ENAS FADHIL KADHIM

□ The TMJ is a synovial bilateral joint that permits the mandible to move as a unit with 2 functional patterns (gliding and hinge movements).



□ **Translatory movement** – in the superior part of the joint as the disc and the condyle traverse anteriorly along the inclines of the anterior tubercle to provide an anterior and inferior movement of the mandible.



Mouth closed

Mouth open

Hinge movement – the inferior portion of the joint between the head of the condyle and the lower surface of the disc to permit opening of the mandible

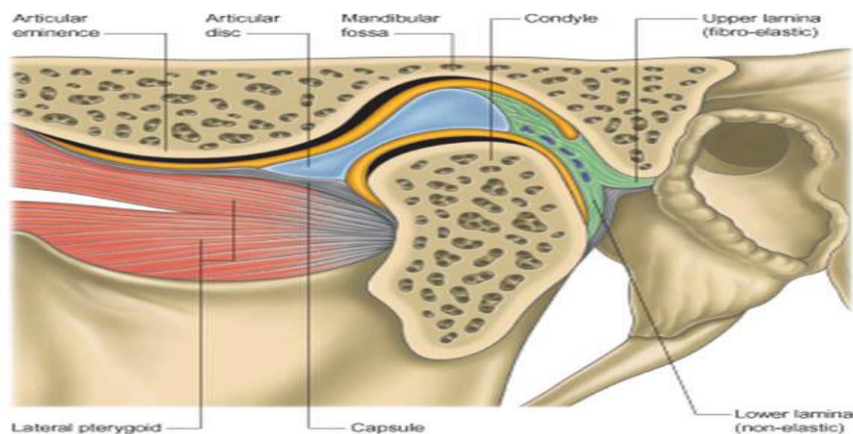
4 anatomical parts concerned with mandibular articulation:

Mandibular condyle

Mandibular fossa and articular eminence

The articular disc

The articular capsule



The mandibular condyle articulates with the glenoid fossa and articular eminence of the temporal bone.

An articular disc separates the articular surfaces so that 2 cavities are present:

Upper compartment between the disc and temporal bone.

- Lower compartment between the condyle and the disc
- The joint capsule is attached below to the articular margin of the head of the condyle, and above to the margins of the glenoid fossa and articular eminence. The inner aspect of the capsule is lined by a synovial membrane.
- At the sides, the capsule is strengthened by collateral ligaments of which the lateral temporomandibular ligament is the strongest.
- The lateral temporo-mandibular ligament is attached above to the zygoma, and below, it is attached to the lateral surfaces and posterior border of the neck of the mandible.
- There are **2 accessory ligaments** associated with the TMJ:
- The stylomandibular ligament attaches to the styloid process and to the posterior border of the ramus.
- The sphenomandibular ligament extends between the spine of the sphenoid bone and the lingula of the mandible.
- These ligaments limit the range of movement of the condyle preventing it from coming in contact with the tympanic plate behind and passing beyond the articular eminence in front.

THE MANDIBULAR CONDYLE

- It's the articulating surface of the mandible.
- It is convex in all directions but wider latero-medially than antero-posteriorly.
- It has lateral and medial poles:
- The medial pole is directed more posteriorly.
- The long axis of the two poles deviate posteriorly and meets at the anterior border of the foramen magnum.

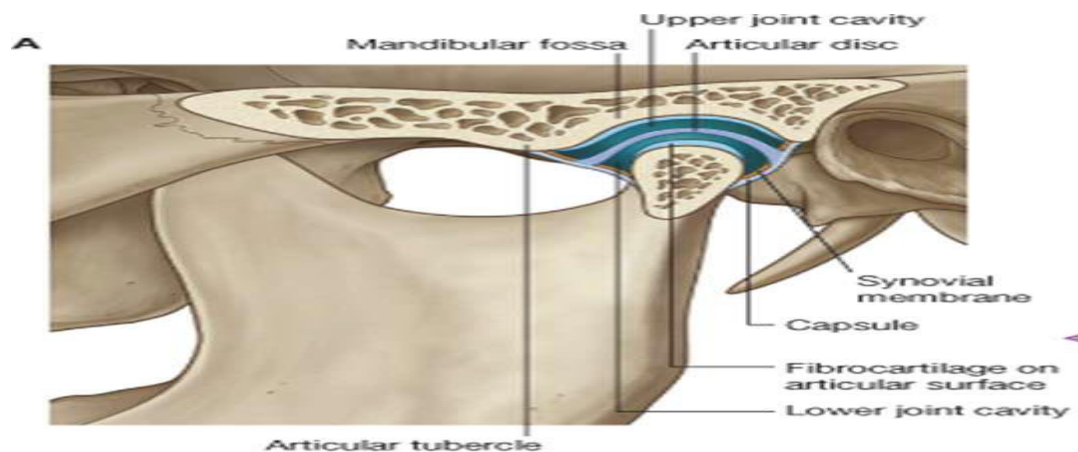
HISTOLOGY

- Composed of cancellous bone covered by a thin layer of compact bone.
- Trabeculae: of the cancellous bone is arranged in a radiating manner from the neck to reach the surface of the condyle at a right angle (to give maximum strength.)
- Bone marrow is of myeloid or cellular type and becomes fatty with age.

- Outer layer of compact bone is covered by thick layers of fibrous tissues composed of:
 - Superficial layer : network of strong collagen fibers, chondrocytes and fibroblasts.
 - Deep layer: thin collagen fibers rich in chondroid cells during growth period (hyaline cartilage).
- Growth occur by apposition from the deepest layer – the deepest surface of the cartilaginous plate is replaced by bone.
 Growth continues till 21 years of age.
 Remnants of cartilage may persist in old age.

MANDIBULAR (GLENOID) FOSSA AND ARTICULAR EMINENCE

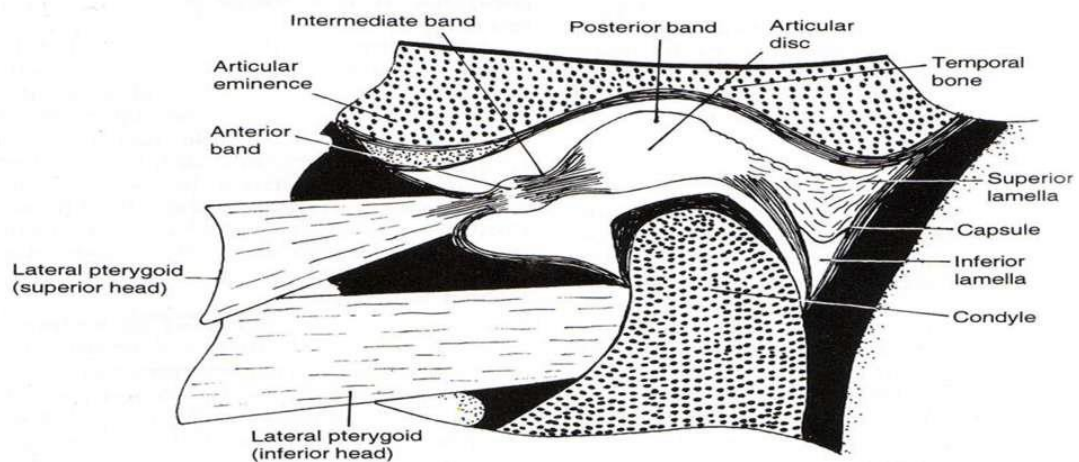
- Glenoid fossa:
 - Posteriorly limited by the squamotympanic fissure.
 - Anteriorly bounded by the articular eminence.
 - Roof: thin layer of compact bone separating the middle cranial fossa.
- Articular eminence:
 - Composed of: Spongy bone covered by thin layer of compact bone.
 - Chondroid tissues commonly seen in the eminence.



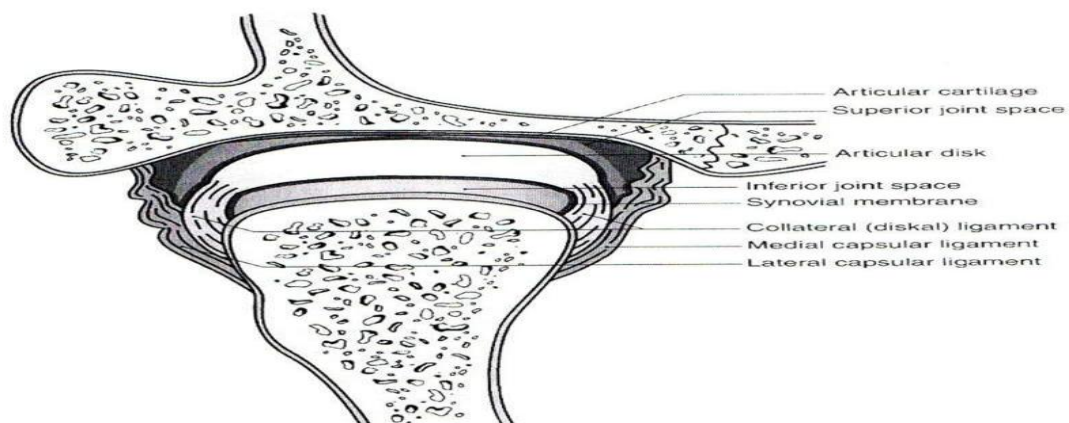
- Fibrous layer covering the articulating surface of temporal bone.
- Thin on the articular fossa and thickens on the posterior slope of the eminence
- Over the eminence the fibrous tissues are arranged in 3 zones:
 - Inner zone – fibers arranged at right angle to surface
 - Outer zone – fibers run parallel to the bone surface
 - Intermediate zone – transitional zone. Fibers are interlaced.

Interarticular disc (Meniscus)

- Disk is fibrous, avascular, non inverted plate
- Shape is oval, biconcave in sagittal section. It is thin in central part and thick at posterior borders.



- **Attachment:** Medial and lateral poles of the condyle by medial and lateral ligaments.
- Divide the joint into: Upper (larger) compartment and lower (smaller) compartment.



- Anterior border divides into upper and lower lamellae that run forward.
- The upper lamella fuses with the anterior slope of the articular eminence.

- The lower lamella attaches to the front of the neck of the condyle.
- Fibers of the superior head of the lateral pterygoid muscle is attached to the anterior border
- Posterior border divides into upper and lower lamellae
- The upper lamella is fibrous and elastic and fuses with the capsule and is inserted in the squamotympanic fissure.
- The lower lamella, non elastic, attaches to the back of the condyle.

HISTOLOGY

Composed of dense fibrous tissue containing:

- Straight and tightly packed collagenous fibers
- Few elastic fibers.
- Some chondroid cells appear with age.
- Chondrocytes may be seen.
- The space between upper and lower posterior is filled with highly vascular loose connective tissue.

ARTICULATING CAPSULE AND LIGAMENTS AND SYNOVIAL MEMBRANE

- The whole TMJ is enclosed in a fibrous capsule.
- It is attached to:
 - Articular tubercle (in front)
 - Lips of squamous tympanic fissure (posteriorly)
 - Borders of articulating glenoid fossa
 - Neck of the mandible. (below)
- It is lined by synovial membrane.
- Laterally, the capsule is reinforced by TMJ ligaments.

HISTOLOGY

Consists of 2 layers:

- Outer fibrous **capsule** – strengthen laterally to form the temporomandibular ligament.
- Inner synovial layer – composed of thin connective tissue layer lined with:

□ **Synovial cells**

Type A : secretes hyaluronic acid

Type B : produces protein rich secretion.

- Synovial folds and villi protrude from the surface into the joint cavity.
- Synovial layer of cells line the entire capsule of both upper and lower joint spaces.
- **Synovial membrane** is very rich in blood supply and contains lymphatic vessels

Synovial fluid

- It is clear, straw-colored viscous fluid.
- It diffuses out from the rich capillary network of the synovial membrane.

Contains:

- Hyaluronic acid which is highly viscous
- May also contain some free cells mostly macrophages.

Functions:

- Lubricant for articulating surfaces.
- Carry nutrients to the avascular tissue of the joint.
- Clear the tissue debris caused by normal wear and tear of the articulating surfaces

Blood supply

- 4 arteries supply the joint:
 - *Superficial temporal
 - * Deep auricular
 - *Anterior tympanic
 - *Ascending pharyngeal
- *Branches from the 4 approach the joint and penetrate the capsule.

Nerve supply

- Branches from the mandibular nerve
- Auriculotemporal nerve
- Masseteric nerve
- Deep temporal nerves
- Supply all surfaces of the head, fossa, capsule and part of the disk.

AGE CHANGES

- Condyle:**
 - Becomes more flattened
 - Fibrous capsule becomes thicker.
 - Osteoporosis of underlying bone.
 - Thinning or absence of cartilaginous zone.
- Disk:**
 - Becomes thinner.
 - Shows hyalinization and chondroid changes.
- Synovial fold:
 - Become fibrotic with thick basement membrane.
- Blood vessels and nerves:
 - Walls of blood vessels thickened.
 - Nerves decrease in number

Changes could lead to:

- Dysfunction in old age
- Impairment of motion due to decrease in the extensibility of the disk and the capsule.
- Decrease in the secretion of the synovial fluid.