

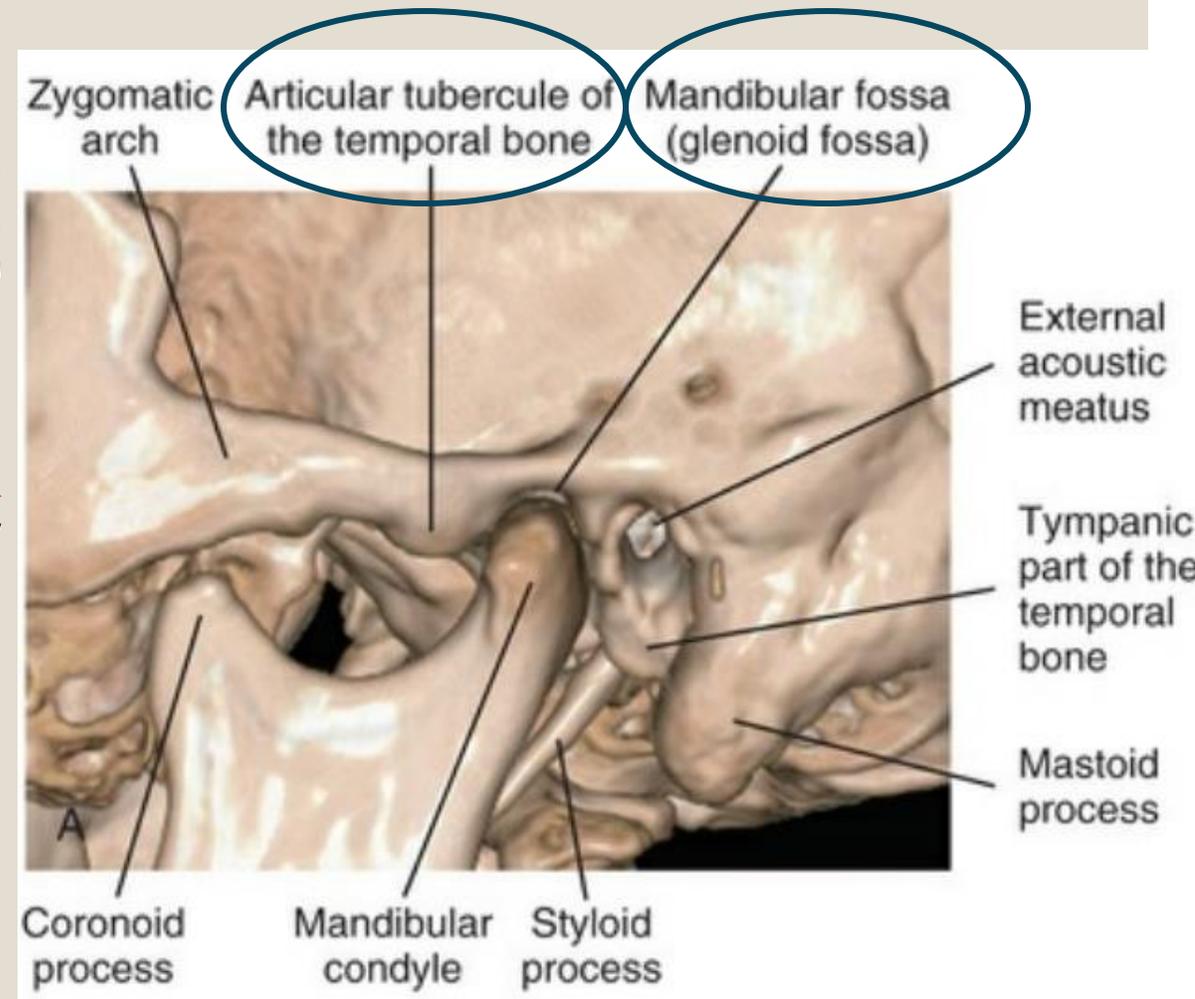


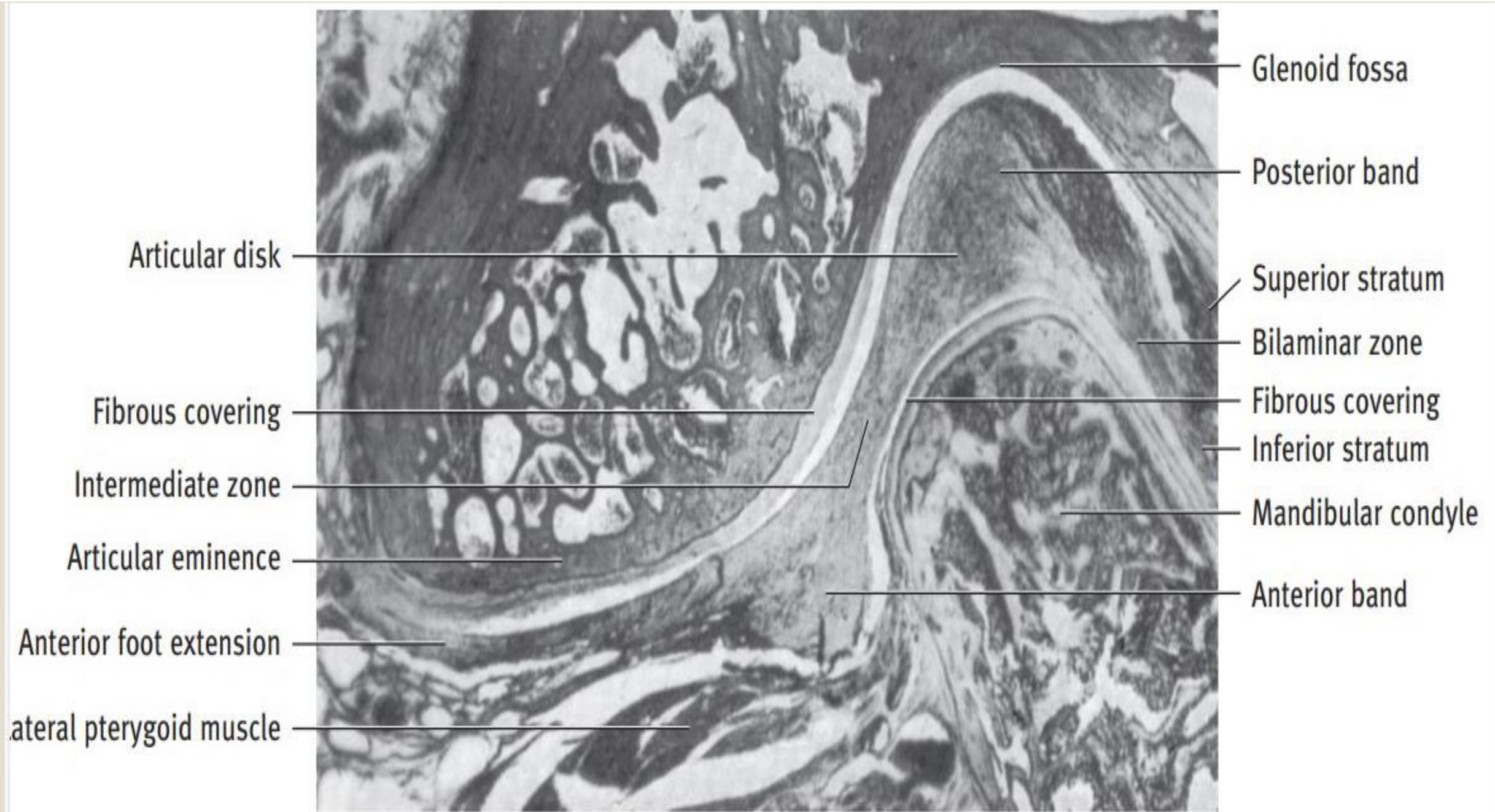
TEMPOROMANDIBULAR JOINT

Omya meabed

ANATOMY

- The temporomandibular joint (TMJ) is a bilateral synovial movable joint.
- formed by the articulation between **the articular eminence** and the anterior part of **the glenoid fossa** of the squamous part of temporal bone above and the **condylar head of the mandible below**
- the TMJ contains a fibrous intra-articular **disk** that is interposed between the articular surfaces and functions as a shock absorber
- The disk is an oval, fibrous, **avascular, noninnervated plate**
- The disk is biconcave in sagittal section, with a thin intermediate zone, a thick anterior band, and a thick posterior band





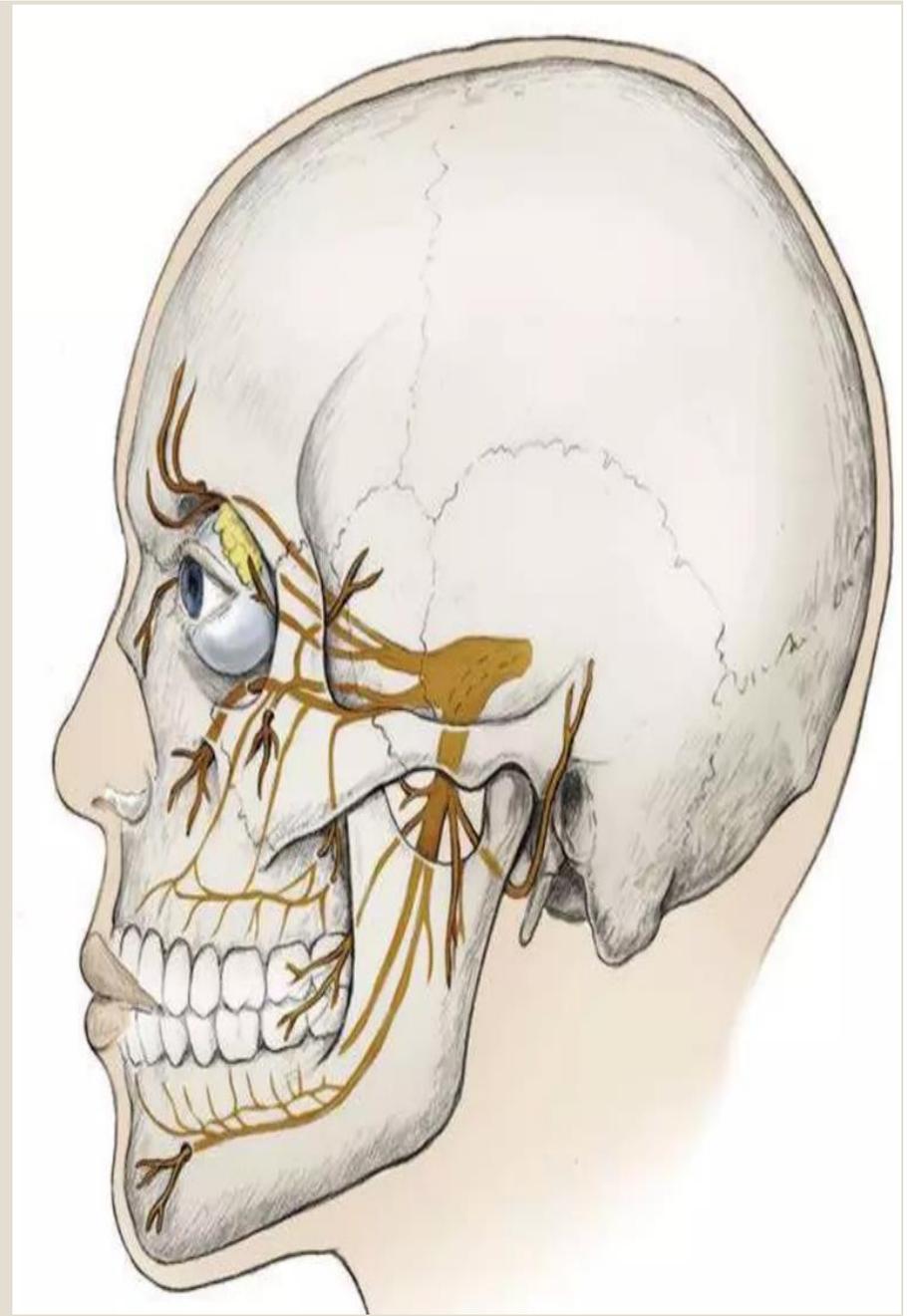
- ❖ The disk divides the joint space into two compartments:
 - **a lower one** between the condyle and the disk (condylodiskal)
 - **an upper one** between the disk and the temporal bone (temporodiskal).
 - The disk provide **a movable articulation for the condyle**
 - In **the lower joint space** permits opening of the jaws; this is designated as a hinge movement.
 - In **the upper joint space**, produce an anterior and inferior movement of the mandible.

❖ TMJ INNERVATION

- ❖ Except for the avascular disk, the joint tissues are innervated by
 - branches of the auriculotemporal branch of the mandibular nerve of the fifth cranial or trigeminal nerve.

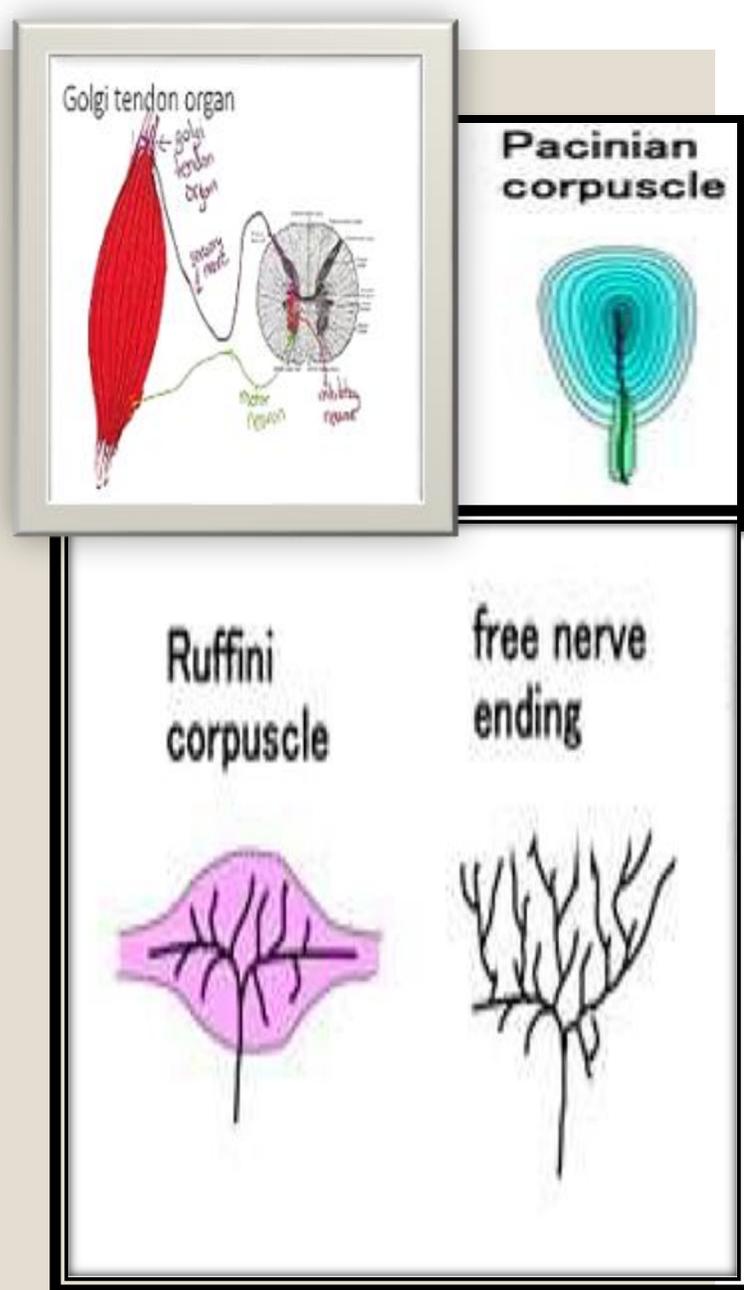
❖ The arterial supply to the joint

is through branches of the maxillary and superficial temporal arteries



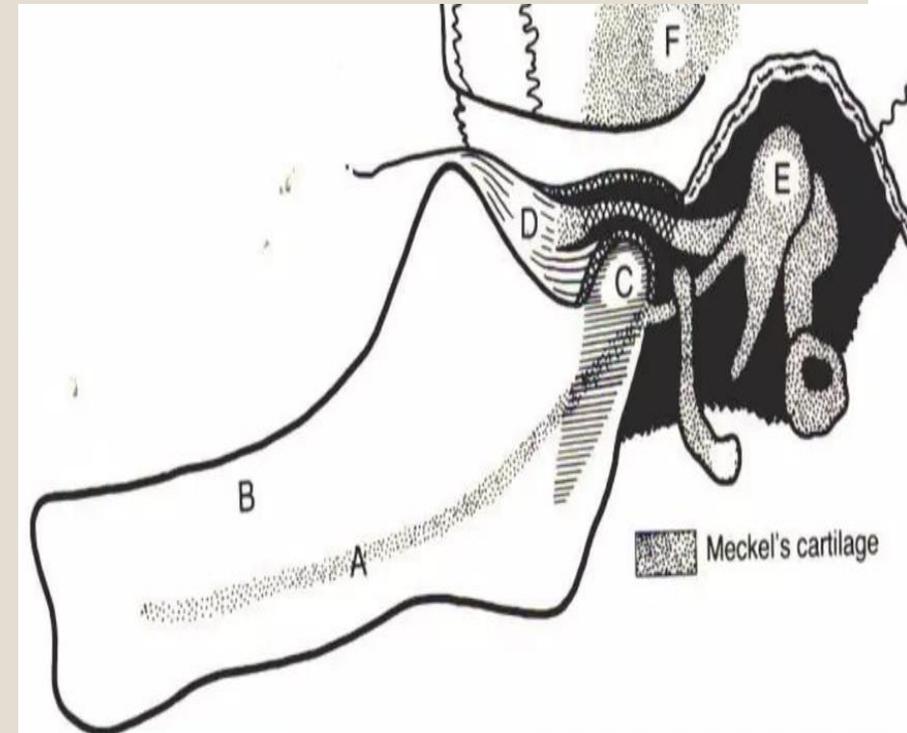
❑ There are four types of nerve endings in the TM joint.

- **The Ruffini's corpuscles**, present in the capsule are the proprioceptors and sense the changes in the joint when the joint is static.
- **The pacinian corpuscles**, also present in the capsule, act as mechanoreceptors to signal the rapidity and slowness of the joint movement.
- **The Golgi tendon**, present in the TMJ ligament, functions as a mechanoreceptor to protect the joint when joint movements become excessive.
- **The free nerve endings** which are nociceptors (receptors for pain), are the most numerous and widely distributed; protect the joint from excessive movements, by causing pain and curtailing the movement.



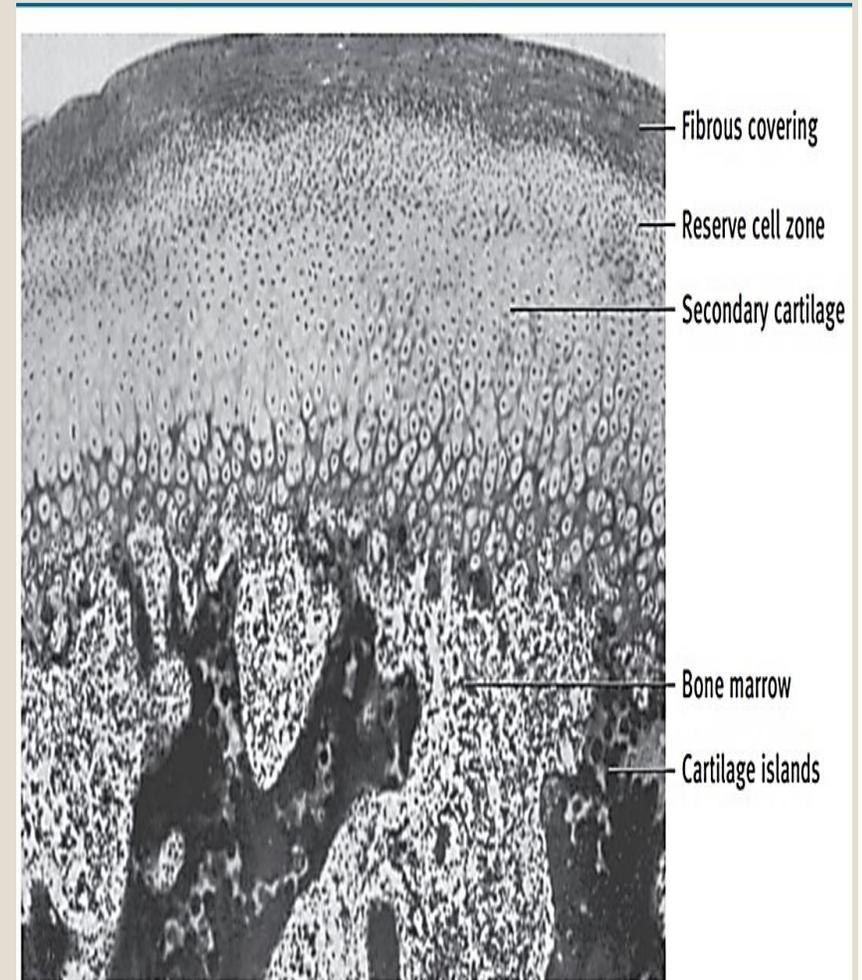
DEVELOPMENT OF THE JOINT

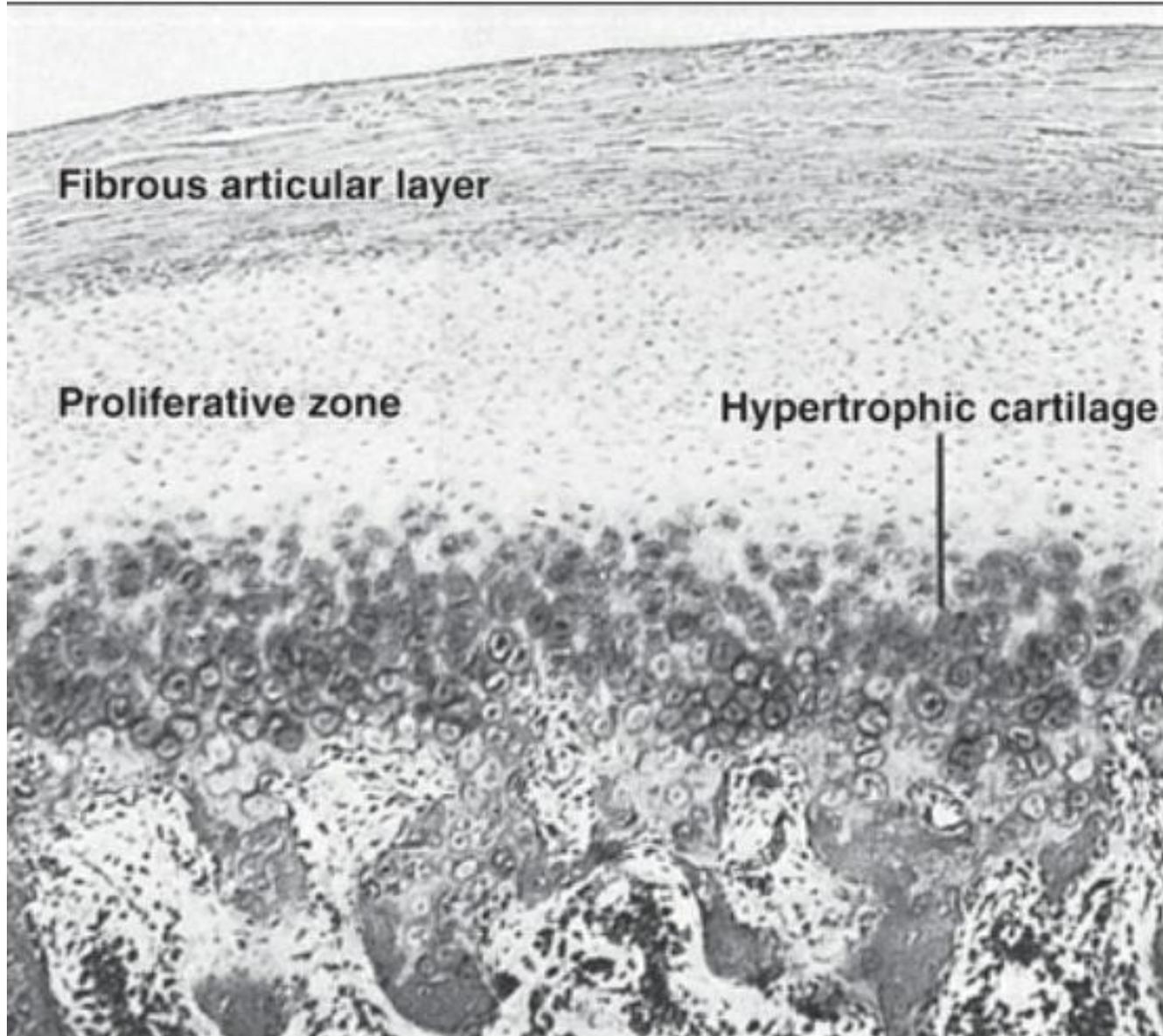
- At approximately **10 wiu** the components of the fetus' future joint become evident in **the mesenchyme** between the condylar cartilage of the mandible and the developing temporal bone.
- **Two slit-like joint cavities** and **an intervening disk** make their appearance in this region by **12 wiu**. The mesenchyme around the joint begins to form the fibrous joint capsule



Histology of mandibular condyle

- Composed of spongy bone covered by thin layer of compact bone
- The outer surface of condyle is covered by thick layer of fibrous tissue
- Trabeculae of spongy bone is radiating from the neck to reach the cortex at right angle
- ❖ **fibrous layer** covering is composed of two layers:
 - Inner layer: thin collagen fibers arranged perpendicular to condyle bony surface (rich in chondrocytes)
 - Outer layer: strong fibers parallel to condyle bony surface contains fibroblasts and variable number of chondrocytes
 - During growth there is layer of hyaline cartilage under the fibrous layer to serve as growth center till the age of 20 years



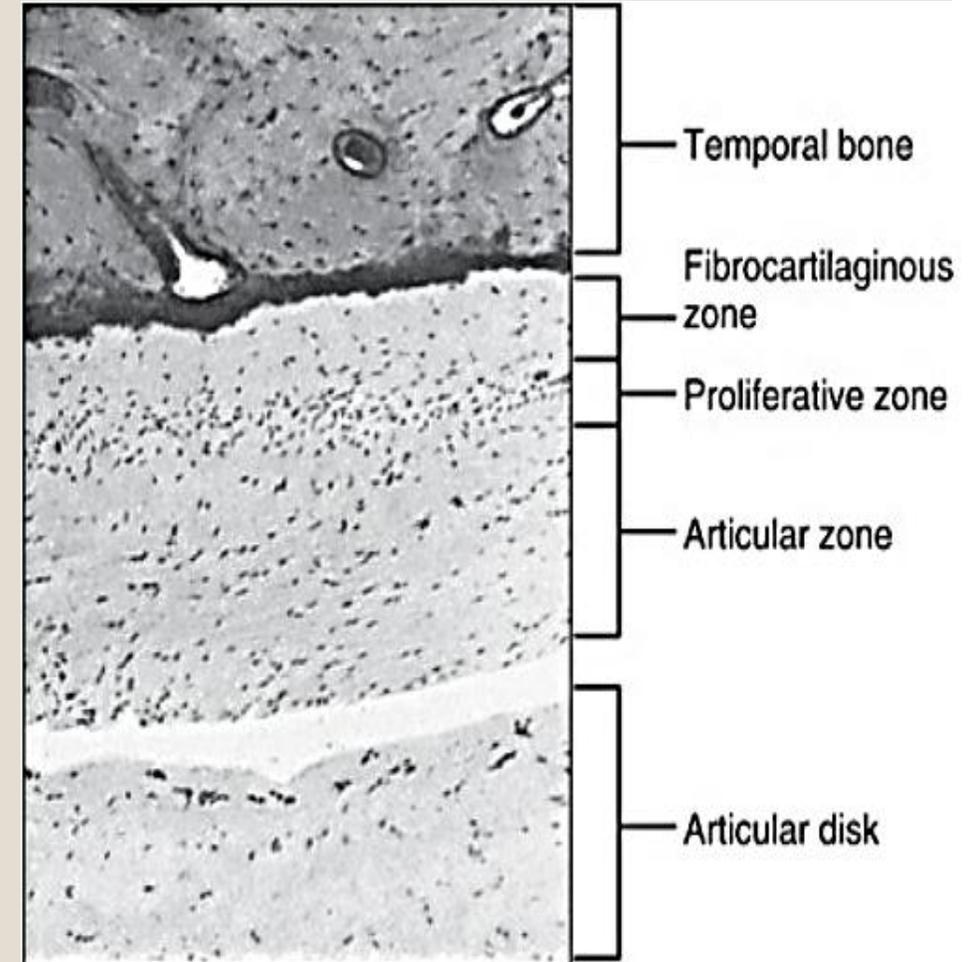


Condylar cartilage

- Is a secondary cartilage
- Multidirectional growth for best anatomic placement of mandible
- Characterized by absence of ordered columns of cartilage cells

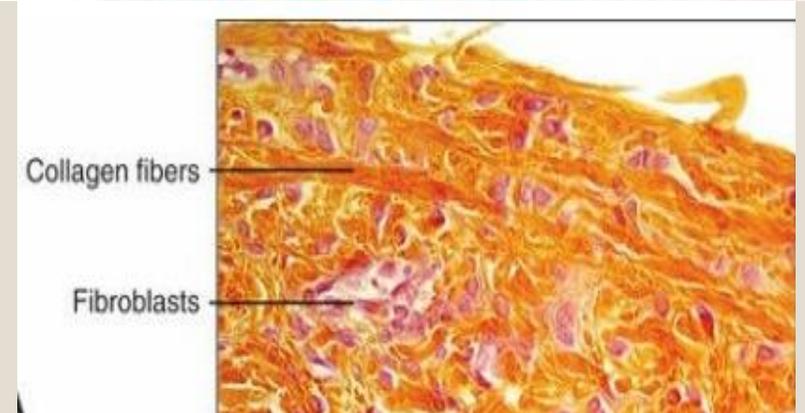
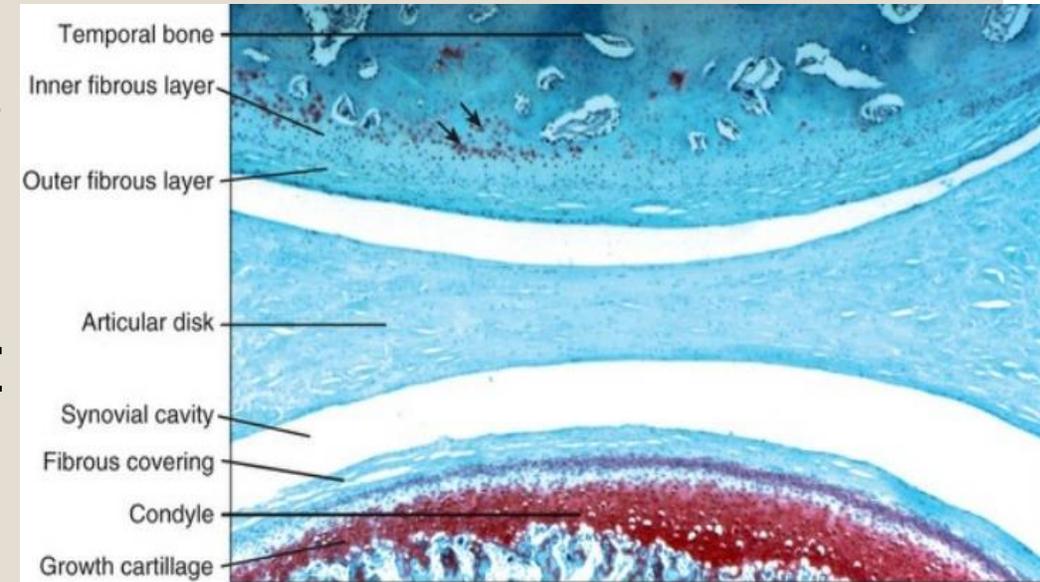
Histology of Articular eminence & glenoid fossa

- The eminence is composed of spongy bone covered by thin layer of compact bone
- The fossa is composed of thin layer of compact bone
- fossa is covered by thin layer of fibrous tissue and eminence is covered by thicker fibrous layer arranged into 3 zones:
- Inner zone fibers are perpendicular at bone surface
- Outer zone: fibers are parallel to bone surface
- Intermediate zone: fibers are in complex fashion
- Variable number of chondrocytes are present in the fibrous tissue covering
- No eminence exists at birth. A layer of secondary cartilage exists for short time that is responsible for its growth



Histology of Articular disc :

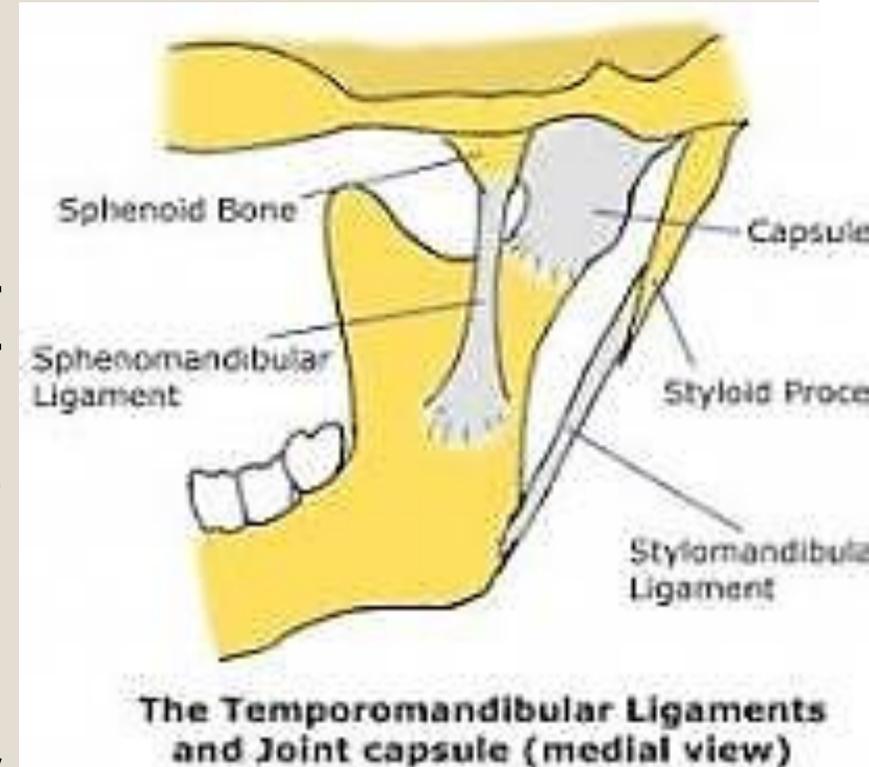
- Composed of **dense fibrous** tissue containing straight and tightly packed **collagen fibers and few elastic fibers**
- Fibroblasts have elongated processes that intertwine with collagen fibers
- Chondrocytes may appear with age



Histology of TMJ capsule

Composed of:

- Outer fibrous connective tissue that is strengthened to form temporomandibular ligament (laterally)
- Inner synovial membrane that lines the entire capsule but **doesn't cover the articulating surfaces** and the disc except its bilaminar posterior region.
- The synovial membrane forms villi protruding into joint cavity.
- Synovial membrane is responsible for production of synovial fluid.
- Synovial membrane is composed of two layers: (Cellular intima & vascular subintima)

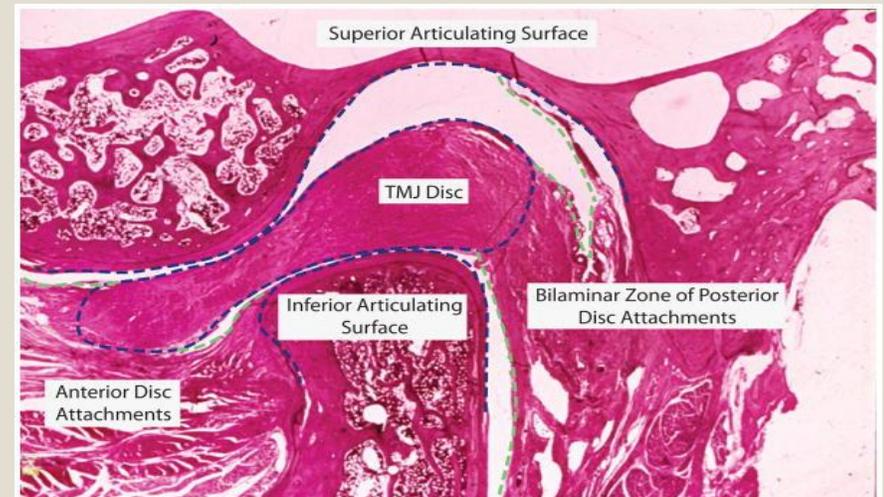


❑ Cellular intima: Composed of one to four discontinuous layers of synovial cells embedded into fiber free intercellular matrix

The cells are not connected by junctional complex and don't rest on basement membrane. They are of two types:

1. TYPE A Macrophage like cells (predominant type): has phagocytic function. Cells contain lysosomes and vesicles.
2. TYPE B Fibroblast like cells synthesize hyaluronate added to synovial fluid and so contain RER.

❑ Vascular subintima: Composed of loose **vascularized CT** containing fibroblasts, macrophages, mast and fat cells and **some elastic fibers** to prevent overfolding of the membrane



Synovial fluid:

□ plasma with proteins and hyaluronate added by synovial cells. It may contain free synovial cells and inflammatory cells.

□ Functions of synovial fluid:

1. Hyaluronate:

- increase viscosity of synovial fluid
- increase elasticity of cartilage cells
- lubricate articular surfaces to reduce erosion

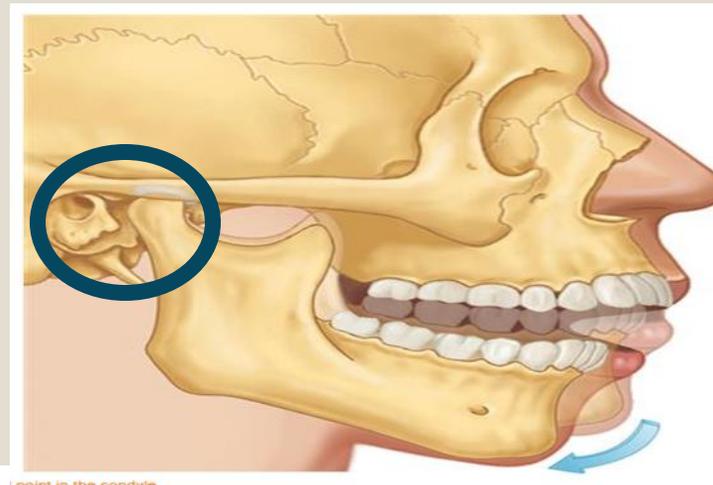
2. Nutrition of avascular tissues covering the articular surfaces and avascular parts of the disc

3. Clear the joint cavity from debris result from normal articulation

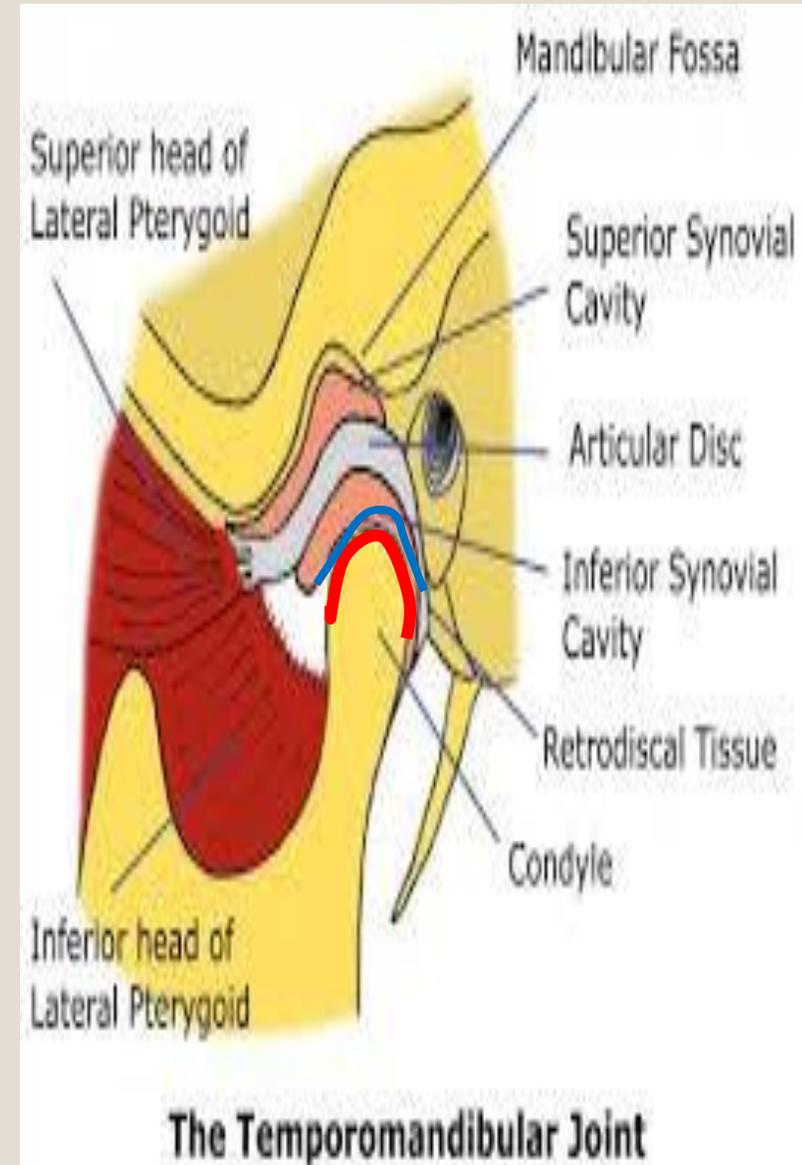
TMJ DYNAMICS

TMJ MOVEMENTS:

- **MANDIBULAR MOVEMENT OCCURS as a complex of rotational and translational movements**
- **Rotation movement is** the process of turning around a fixed axis, movement of a body about its axis.

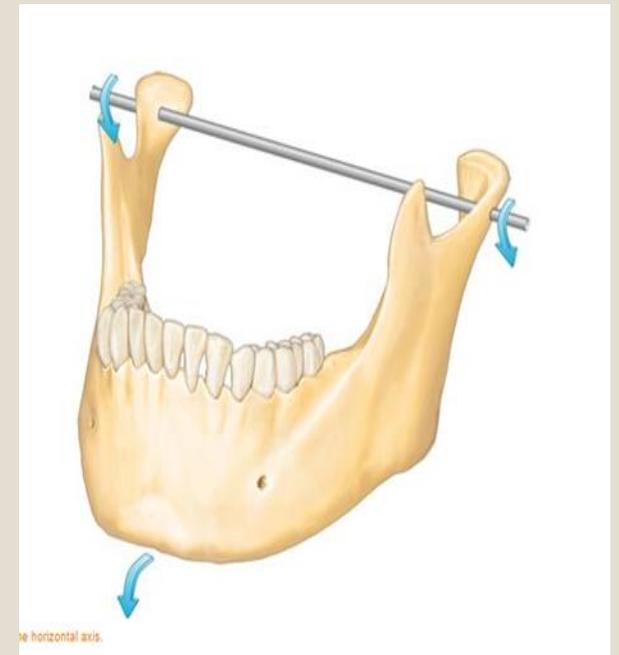


- In the masticatory system, rotation occurs when the mouth **opens and closes** around a **fixed point or axis within the condyles**.
- In the TMJ, rotation occurs as movement within the **inferior cavity of the joint**
- movement **between the superior surface of the condyle and the inferior surface of the articular disc.**



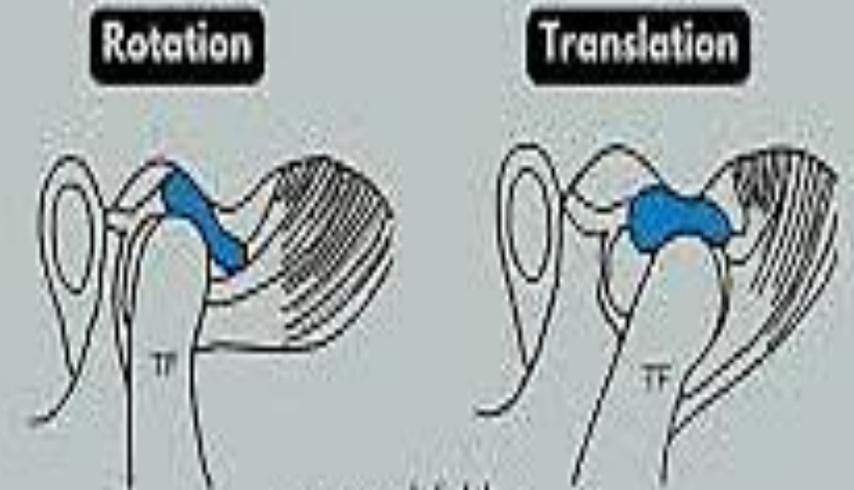
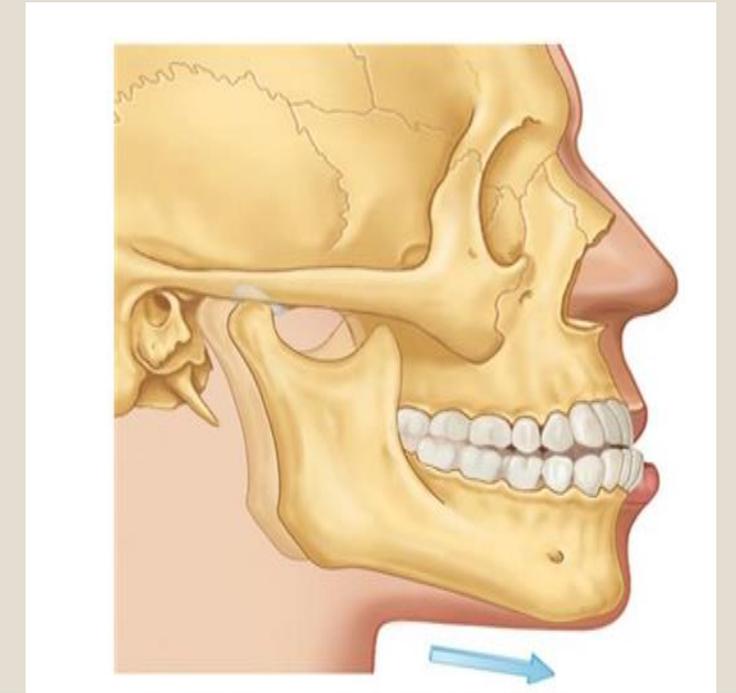
Horizontal axis of rotation:

- Mandibular movement around the horizontal axis is an opening and closing motion (for short distance nearly 2 cm)
- It is referred to as a hinge movement.
- The hinge movement is probably the only example of mandibular activity in which a “pure” rotational movement occurs.
- In all other movements rotation around the axis is accompanied by translation of the axis.
- When the condyles are in their most superior position in the articular fossae and the mouth is purely rotated open, the axis around which movement occurs is called the terminal hinge axis

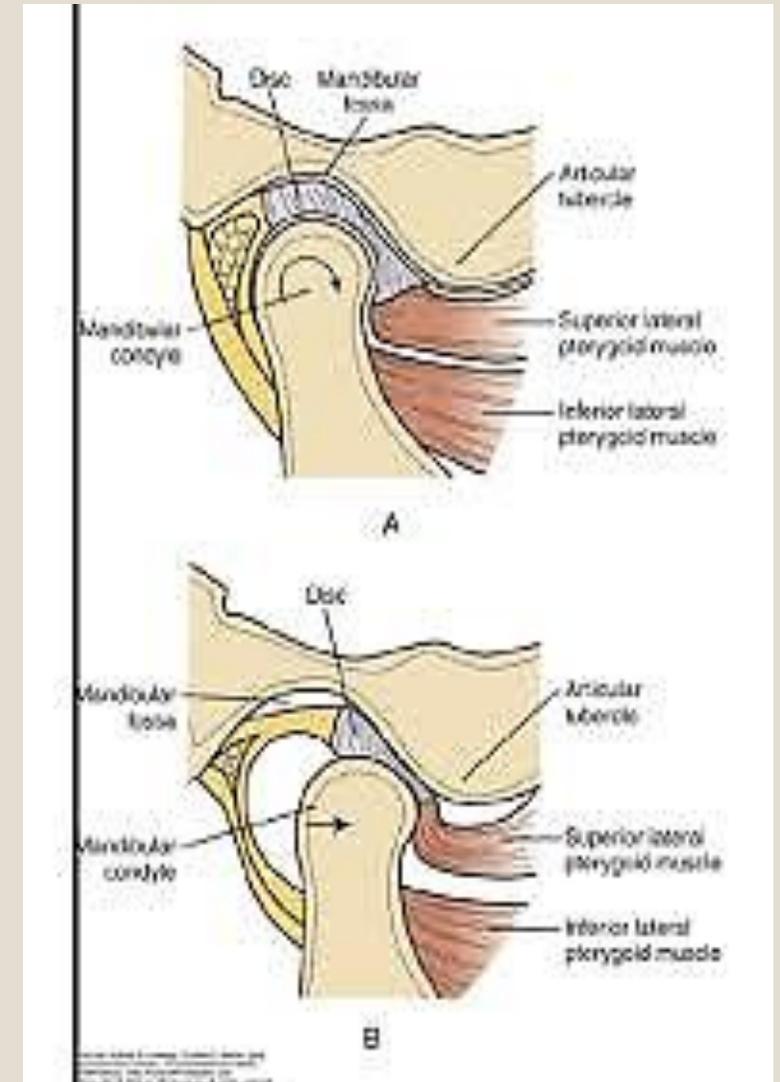


Translational Movement

- **Translation** can be defined as a movement in which every point of the moving object simultaneously has the same direction and velocity.
- In the masticatory system, it may occur in protrusion the mandible moves downward forward
- The teeth, condyles, and rami all move in the same direction and to the same degree



- **Translation** occurs within **the superior cavity of the joint between the superior surface of the articular disc and the inferior surface of the articular fossa**
- During most normal movements of the mandible, both **rotation and translation occur simultaneously.**
- That is, while the mandible is rotating around one or more of the axes, each of the axes is translating (changing its orientation in space).

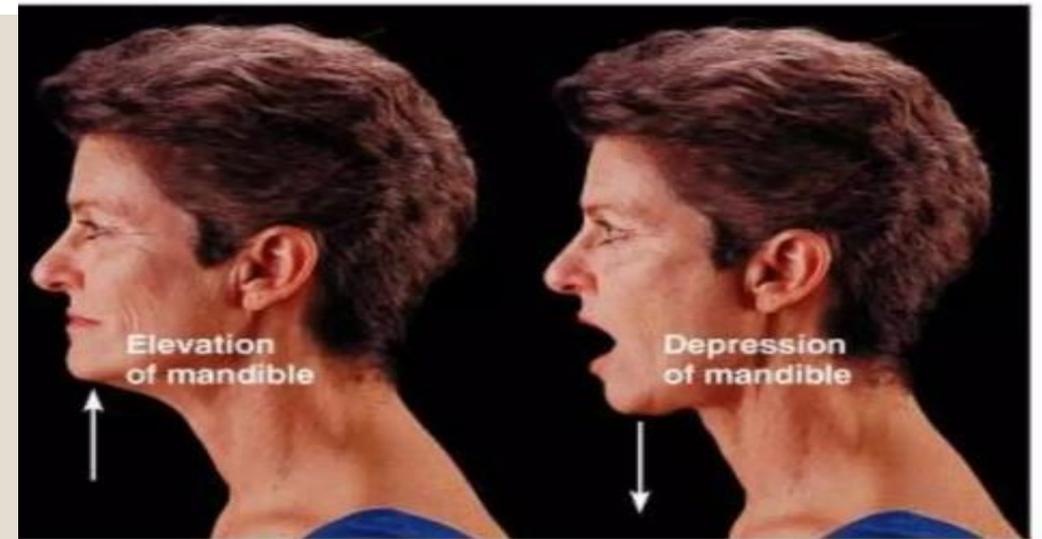


Mandibular movement

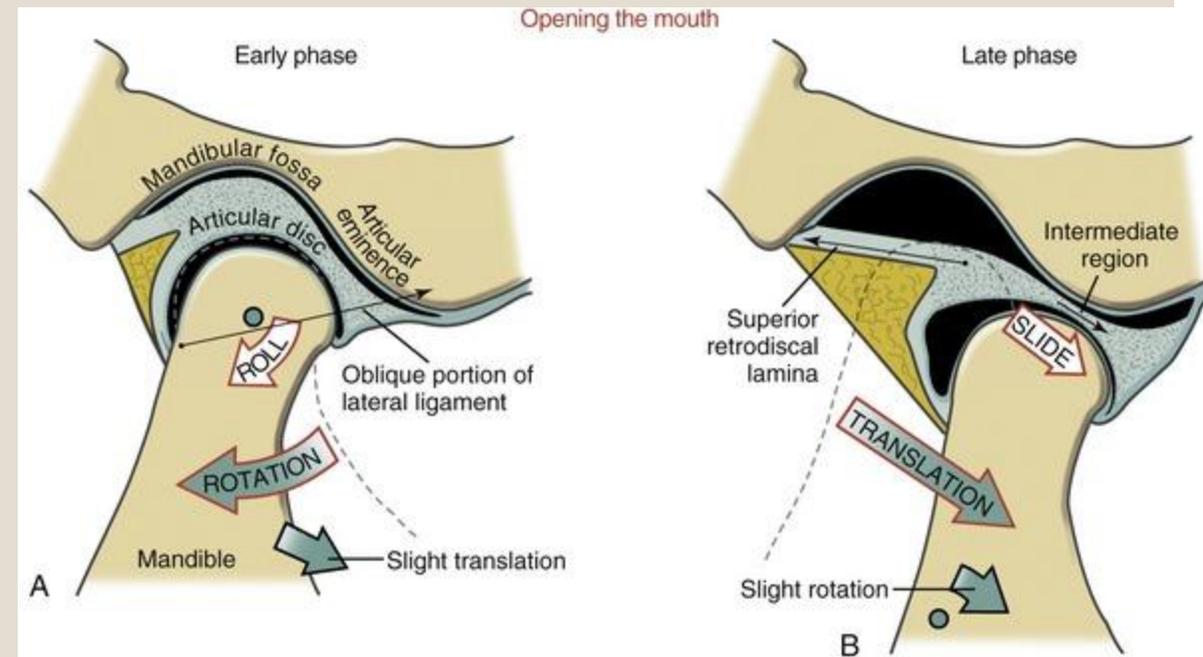
1. **opening and closing**
2. **Protrusion and retrusion**
3. **Lateral movement**

opening and closing

- All muscles of mastication are elevators except lateral pterygoid #lateral pterygoid is responsible for opening



Elevation and depression

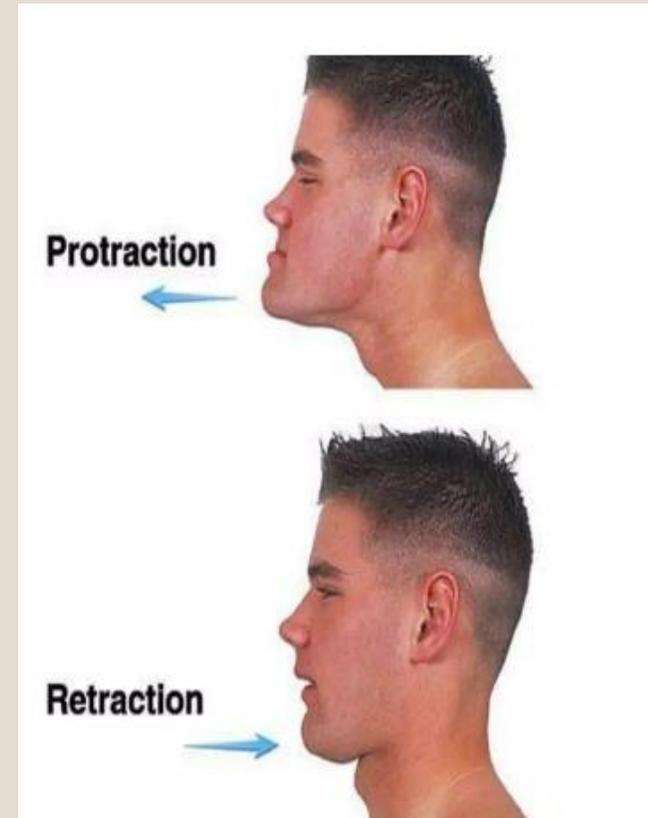


PROTRUSION

:the lower teeth are positioned in front of the upper teeth.

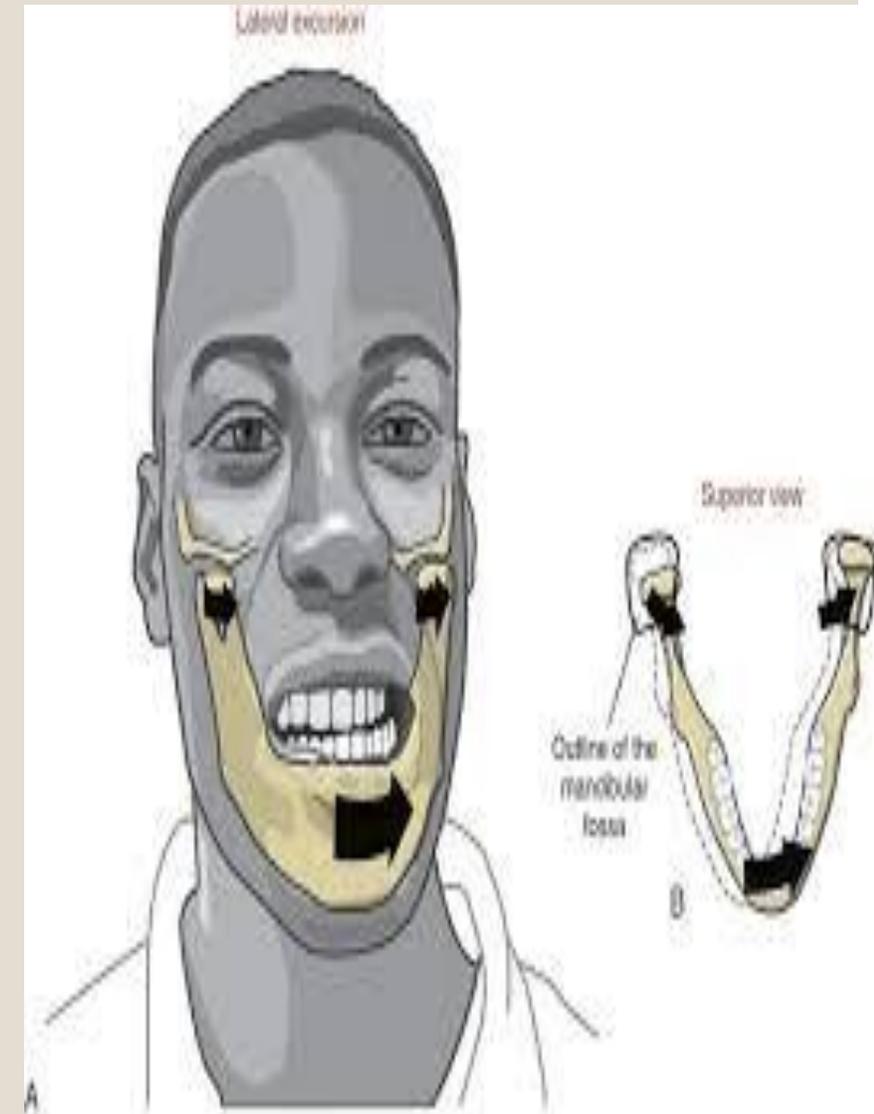
This is achieved by, the downward and forward translation of the condyles

RETRUSION: is the opposite of protrusion. It refers to the movement of a structure in a posterior, or backward upward direction



LATERAL MOVEMENT

- **Side-to-Side Movements:** The mandible moves from one side to another.
- allowing grinding actions during mastication.
- These movements are controlled by the medial and lateral pterygoid muscles



Clinical consideration of TMJ

- **TMJ symptoms can appear at any age**
- **the peak incidence occurs in adults aged 20 to 40**
- **Women are much more likely to be affected than men**
- **up to 60 to 70% of the population shows signs of TMJ disorders, only 5% to 12% of people report symptoms and require treatment**

Common Disorders Affecting Jaw Movements

- Temporomandibular Joint Disorders
- Bruxism (Teeth Grinding and Clenching)
- Malocclusion (Improper Bite Alignment)
- Trismus (Lockjaw)
- Impacted tooth

Temporomandibular Joint Disorders

TMJ disc displacement occurs when disc dislocated from its place leading to pain, restricted movement, and clicking sounds during jaw movement

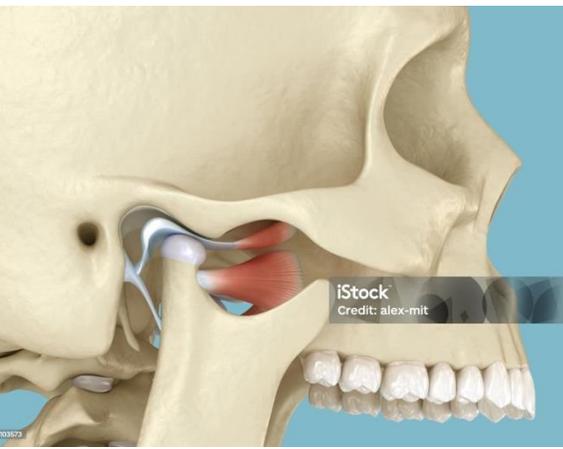
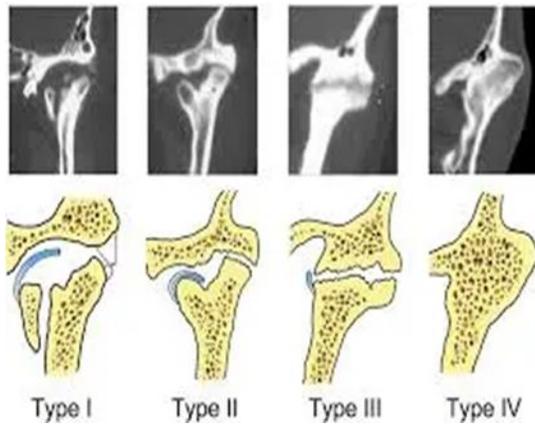
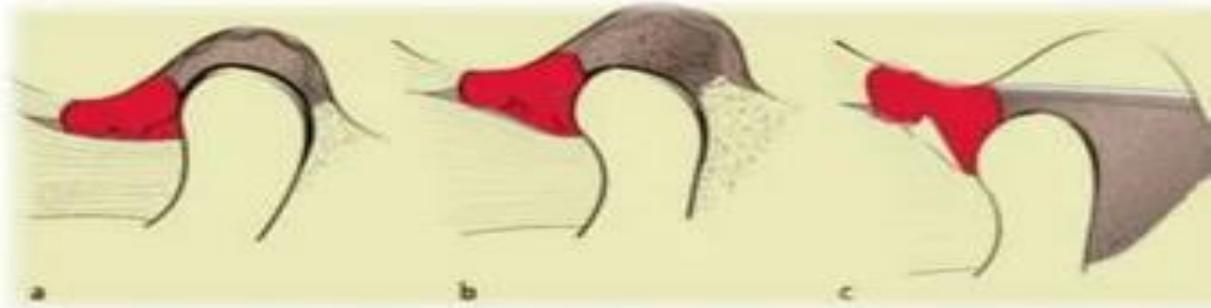
Ankylosis of the TMJ

is a serious condition characterized by fusion of the jawbone to the joint, leading to restricted movement and significant functional impairment.

Anterior condylar dislocations

The condyle displaced and become anterior to the eminence. In normal anterior translation of the condyle in the glenoid fossa

It resulted from acute and forceful opening of the mouth e.g. trauma, long dental procedures(endotreatment, surgery), intubation, it may be chronic condition





Bruxism (Teeth Grinding and Clenching)

- **Bruxism is a condition characterized by involuntary grinding or clenching of the teeth, often during sleep.**

This excessive force can lead to:

- **Jaw pain and tightness**
- **Worn-down enamel and tooth sensitivity**
- **Headaches and facial soreness**
- **TMJ dysfunction over time**

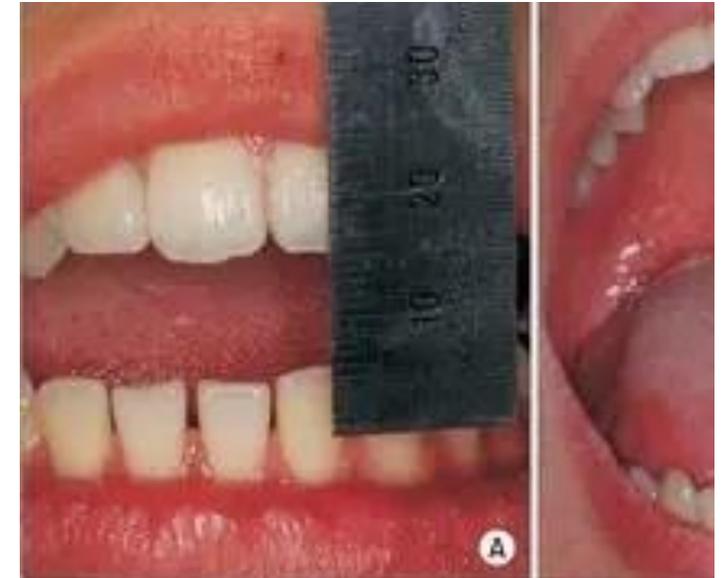
Malocclusion An improper bite can lead to:

- Uneven stress on the jaw
- Chronic jaw pain and discomfort
- Difficulty in chewing and speaking
- Long-term TMJ complications



Trismus (Lockjaw)

- **Trismus is a condition where the jaw becomes restricted in movement, making it difficult to open the mouth fully.**
- It is a painful condition causing jaw muscle spasms



The Connection between Impacted Teeth and TMJ Disorders

- 1- impacted tooth may cause misalignment in the jaw. This misalignment can lead to **tension in the muscles** surrounding the jaw joint, resulting in TMJ pain and discomfort.
- 2- Impacted tooth can also affect jaw function. When a tooth is impacted, it can put pressure on the surrounding teeth, causing them to shift out of alignment and may cause resorption in bone and adjacent teeth
 - Patient with **impacted 8** may suffering from: headache, pain and tenderness in tmj, ear pain, trismus, clicking, difficulty in chewing and speaking.



Thank You

