

TMJ Anatomy

Disorders

TMJ

- The temporomandibular joint (TMJ) or jaw joint is a bi-articular hinge joint that allows the complex movements necessary for eating, swallowing, talking and yawning.
- Dysfunction of the TMJ can cause severe pain and lifestyle limitation

TMJ Components

- **TMJ Components**
- **1.Mandibular condyle**
- **2.Articular surface of the temporal bone (mandibular Fossa)**
- **3.Articular disc**
- **4.Capsule**
- **5.Ligaments:**
 - **-Discalligaments**
 - **-Temporomandibular ligaments**
 - **-Accessory ligaments-Oto-malleolar ligaments**
- **6. Masticatory muscles**

Mandibular condyle

- The condyle presents an articular surface for articulation with the articular disk of the temporomandibular joint
- The space between the mandibular condyle and the articular disc is considered inferior TMJ compartment.
- It is convex in sagittal and coronal plane, and extends farther on the posterior than on the anterior surface.

The capsule is a fibrous membrane that surrounds the joint and attaches to the articular eminence, the articular disc and the neck of the mandibular condyle.

Articular surface of Temporal bone

- The mandibular fossa (glenoid fossa) is the depression in the temporal bone that articulates with the mandible
- The mandibular fossa is bounded, in front, by the articular tubercle; behind, by the tympanic part of the bone, which separates it from the external acoustic meatus.
- The space between the mandibular fossa and the articular disc is considered superior TMJ compartment

Articular disc

- The articular disc is a fibrous extension of the capsule that runs between the two articular surfaces of the temporomandibular joint. The disc articulates with the mandibular fossa of the temporal bone above and the condyle of the mandible below.
- The disc divides the joint into two sections, each with its own synovial membrane. The disc is also attached to the condyle medially and laterally by the collateral ligaments.
- The anterior disc attaches to the joint capsule and the superior head of the lateral pterygoid. The posterior portion attaches to the mandibular fossa and is referred to as the retrodiscal tissue.

Articular disc

- **The articular disc is a dense fibrous connective tissue that is positioned between the two articular surfaces of the temporomandibular joint.**
- **The disc divides the joint into two sections, each with its own synovial membrane.**
- **Rotational movement occurs in lower joint compartment and translation movement occurs in upper joint compartment**

Articular Disc

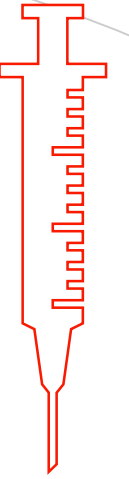
- The central area of the disc is avascular and lacks innervation. The peripheral region has both blood vessels and nerves.
- The disc is also attached to the condyle medially and laterally by the collateral ligaments(also called discalligaments).
- Medial disc ligaments attaches the medial edge of the disc to the medial pole of the condyle.

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Articular disc

- Lateral disc ligaments attaches the lateral edge of the disc to the lateral pole of the condyle.
- The anterior disc attaches to the joint capsule and the superior head of the lateral pterygoid.
- The posterior portion attaches to the mandibular fossa and is referred to as the retrodiscaltissue



Temporomandibular Ligament

- **Temporomandibular Ligament**
- The temporomandibular ligament consists of two portions: an outer oblique portion (OOP) and an inner horizontal portion (IHP).
- Both originate at the outer surface of the articular eminence and zygomatic process.
- The OOP extends posteroinferiorly to the outer surface of the condylar neck
- The IHP extends backward to the lateral pole of the condyle and posterior portion of the disc
- IHP prevents posterior displacement of the condyle
- OOP Prevents excessive dropping of condyle. Limits extent of mouth opening

Stylomandibular Ligament and Sphenomandibular Ligament


- The stylomandibular ligament runs from the styloid process to the angle of the mandible.
- The sphenomandibular ligament runs from the spine of the sphenoid bone to the lingula of mandible.
- These ligaments become accentuated and taut when the mandible is protruded.
- Both ligaments limit the excessive opening of the mandible.

Oto-mandibular ligaments

- Oto-mandibular ligaments
- Discomalleolar ligaments (DML) runs from malleus to the medial retrodiscal tissue of the TMJ.
- Anterior malleolar ligaments (AML) runs from malleus to the lingula of the mandible.
- The oto-mandibular ligaments may be implicated in tinnitus associated with TMD.
- It has been proposed that a TMJ disorder may stretch the DML and AML, thereby affecting middle ear structure equilibrium.

Masticatory Muscles

- **Masseter:**
- Superficial head originates from anterior 2/3 of zygomatic arch and inserts to the mandibular angle and inferior half of the mandibular ramus.
- Deep head originates from posterior 1/3 of zygomatic arch and inserts to the superior half of mandibular ramus. It elevates and protrudes the mandible.
- **Temporalis:** Originates from temporal fossa and inserts to the coronoid process. It elevates and retrudes the mandible.

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- **Medial pterygoid:**
 - Superficial head originates from the medial surface of lateral pterygoid plate.
 - Deep head originates from maxillary tuberosity and pyramid process of palatine bone.
 - Both insert to the medial surface of ramus and angle of the mandible. It elevates and assist on lateral excursion.
 - **Lateral pterygoid:**
 - Superior head originates from infratemporal surface and infratemporal crest of sphenoid bone and inserts to the articular disc and fibrous capsule.
 - Deep head originates from lateral surface of lateral Pterygoid plate and inserts to the neck of the mandibular condyle.

Lateral Pterygoid

- The superior part is essential in pulling the capsule and disc forward during mouth opening, thereby maintaining normal relationship between the condyle of the mandible and the TMJ disc.
- The inferior part is responsible for opening of the mouth, protrusion and contralateral jaw movement


Arthrokinematics of opening the mouth

- The TMJ functions uniquely in that the condyle both rotates within the fossa and translates anteriorly along the articular eminence.
- Because of the condyle's ability to translate, the mandible can have a much higher maximal incisal opening than would be possible with rotation alone
- The joint is thus referred to as “gynglimoidarthrodial”: a combination of the terms ginglymoid (rotation) and arthrodial (translation)

Early Phase (Rotation)

Early phase, constituting the first 35% to 50% of the range of motion, involves primarily rotation of the mandible relative to the cranium.

- The condyle rolls posteriorly within the concave inferior surface of the disc. (The direction of the roll is described relative to the rotation of a point on the ramus of the mandible.)
- The rolling motion swings the body of the mandible inferiorly and posteriorly.

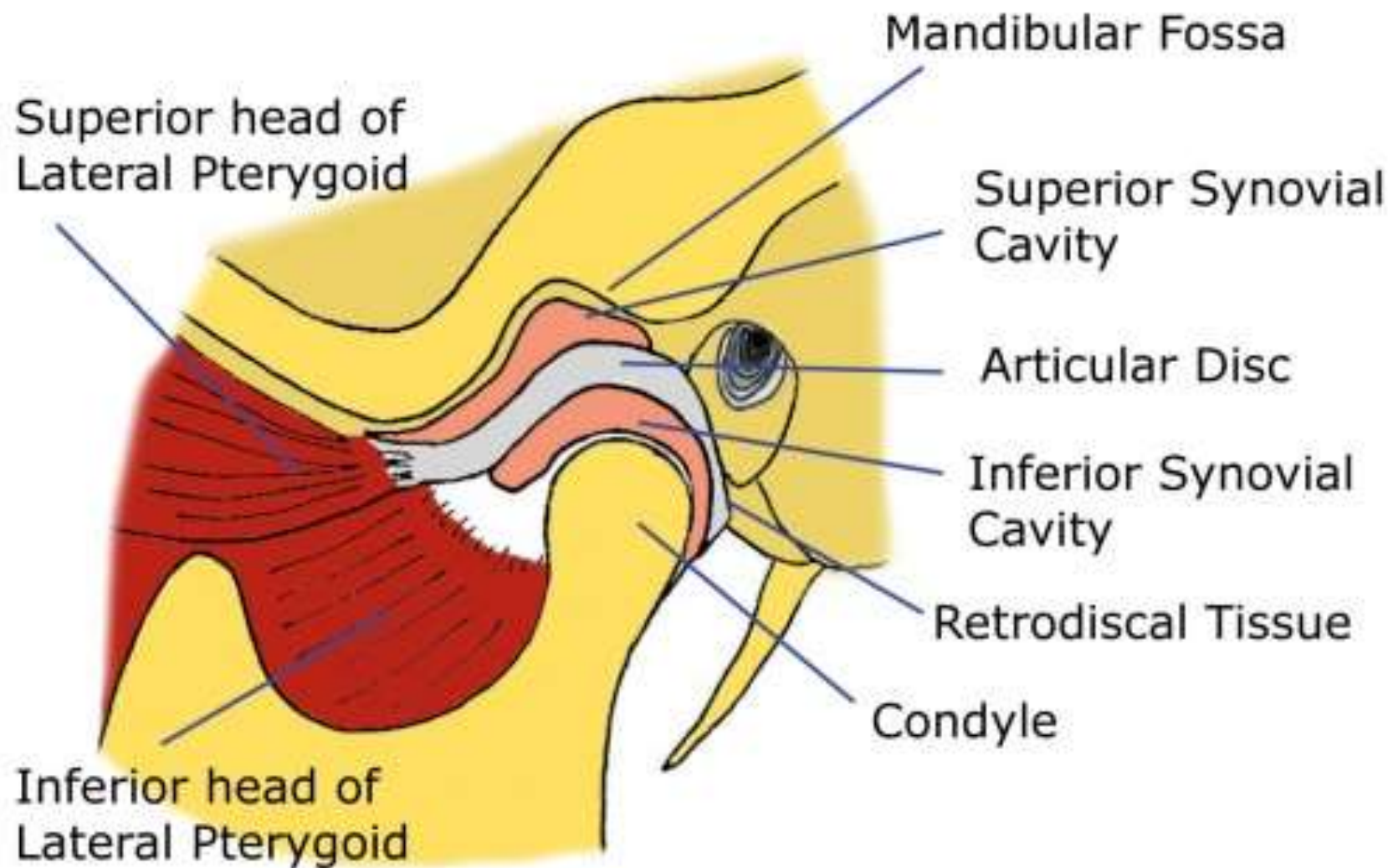
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- The rolling motion of the condyle stretches the oblique portion of the TMJ ligament. The increased tension in the ligament helps to initiate the late phase of the mouth's opening

Late Phase (Translation)

- The late phase of opening the mouth consists of the final 50% to 65% of the total range of motion.
- This phase is marked by a gradual transition from primary rotation to primary translation.
- The transition can be readily appreciated by palpating the condyle of the mandible during the full opening of the mouth. During the translation the condyle and disc slide together in a forward and inferior direction against the slope of the articular eminence.

Retrodiscal tissue

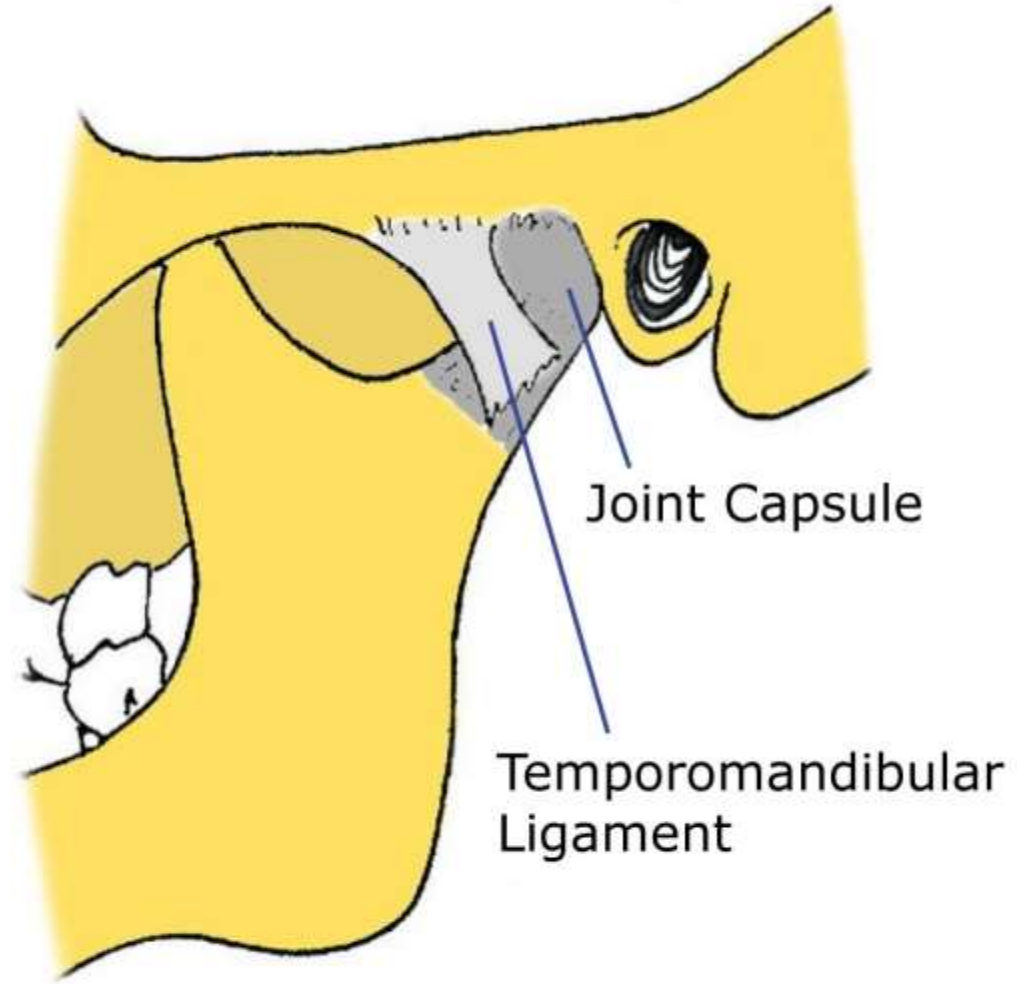
- Unlike the disc itself, the retrodiscal tissue is vascular and highly innervated.
- As a result, the retrodiscal tissue is often a major contributor to the pain of Temporomandibular Disorder (TMD), particularly when there is inflammation or compression within the joint



The Temporomandibular Joint

The temporomandi bular ligament

- is the thickened lateral portion of the capsule, and it has two parts, an outer oblique portion and an **inner horizontal** portion.



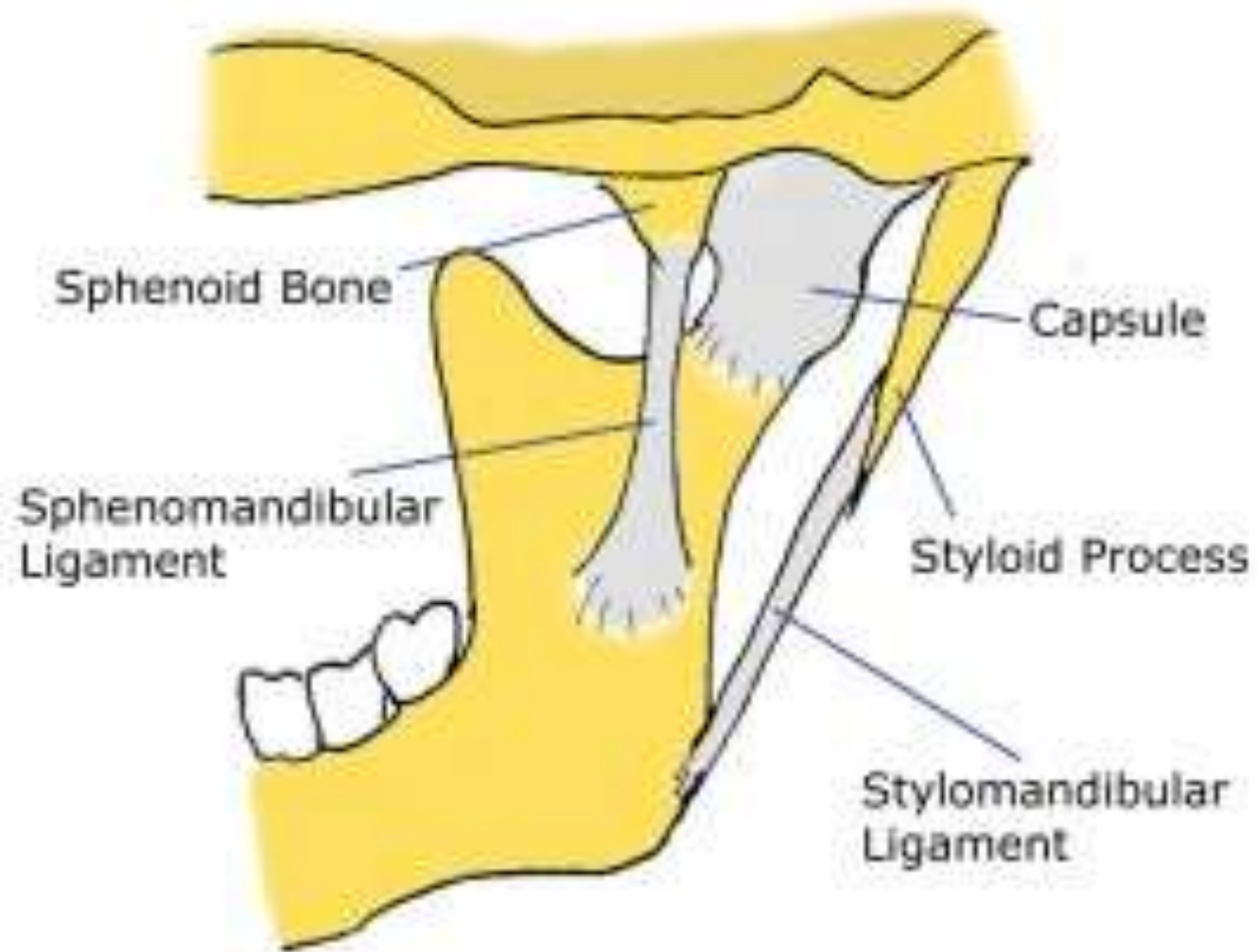
**The Temporomandibular Ligament
and Joint capsule (lateral view)**

The stylomandibular ligament

- runs from the styloid process to the angle of the mandible

The sphenomandibular ligament

- runs from the spine of the sphenoid bone to the lingula of mandible.



**The Temporomandibular Ligaments
and Joint capsule (medial view)**

The oto- mandibular ligaments

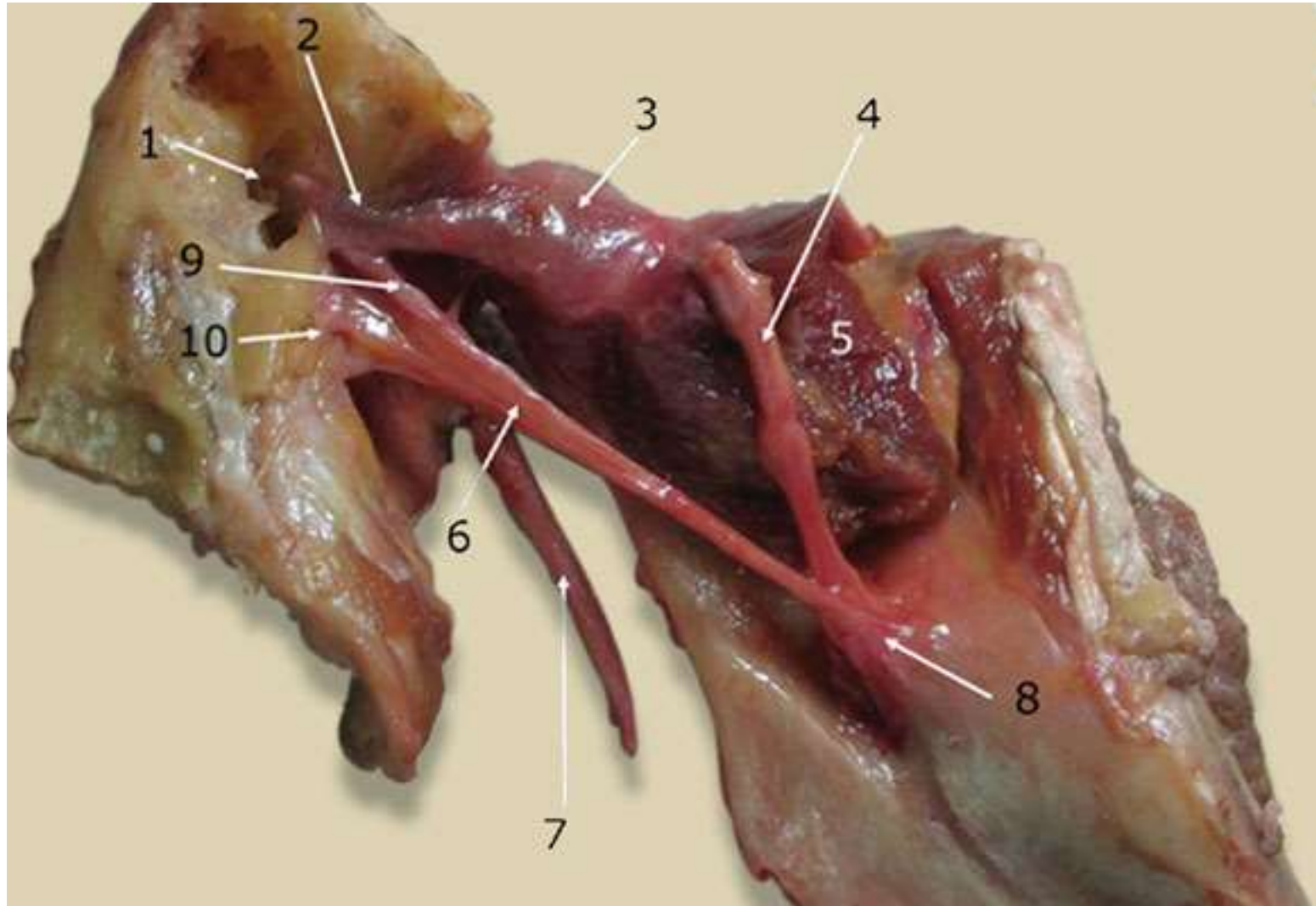
- discomalleolar ligament (DML)
- anterior malleolar ligament (AML)
- DML: which arises from the malleus (one of the ossicles of the middle ear) and runs to the medial retrodiscal tissue of the TMJ
- AML: which arises from the malleus and connects with the lingula of the mandible via the sphenomandibular ligament

The oto-mandibular ligaments may be implicated in:
tinnitus associated with TMD.!!!

A positive correlation has been found between tinnitus and ipsilateral TMJ disorder.

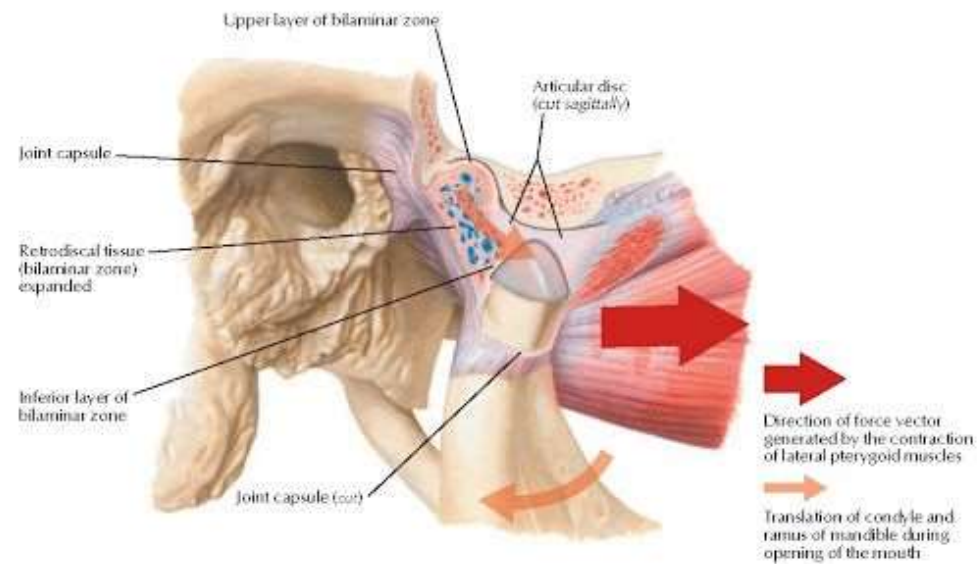
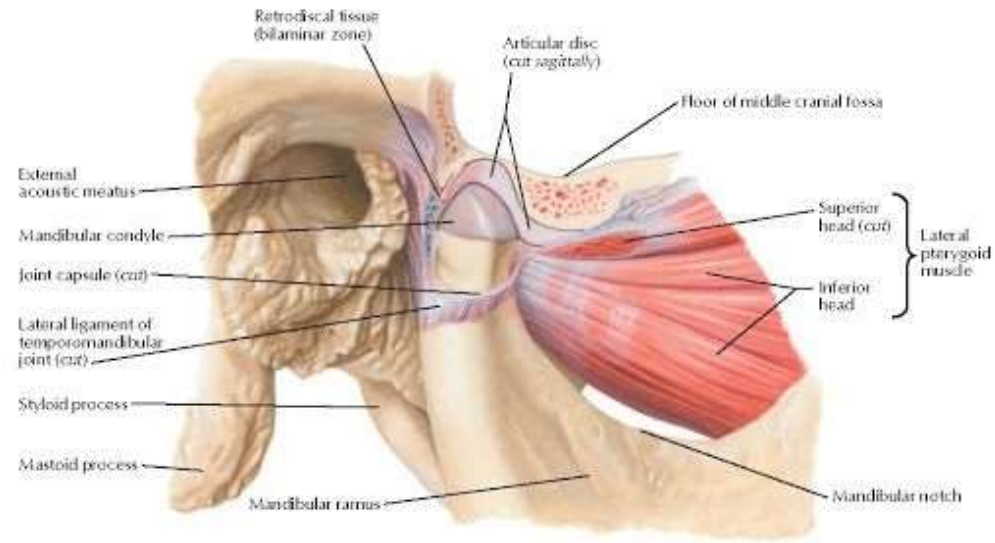
It has been proposed that a TMJ disorder may stretch the DML and AML, thereby affecting middle ear structure equilibrium. !!!

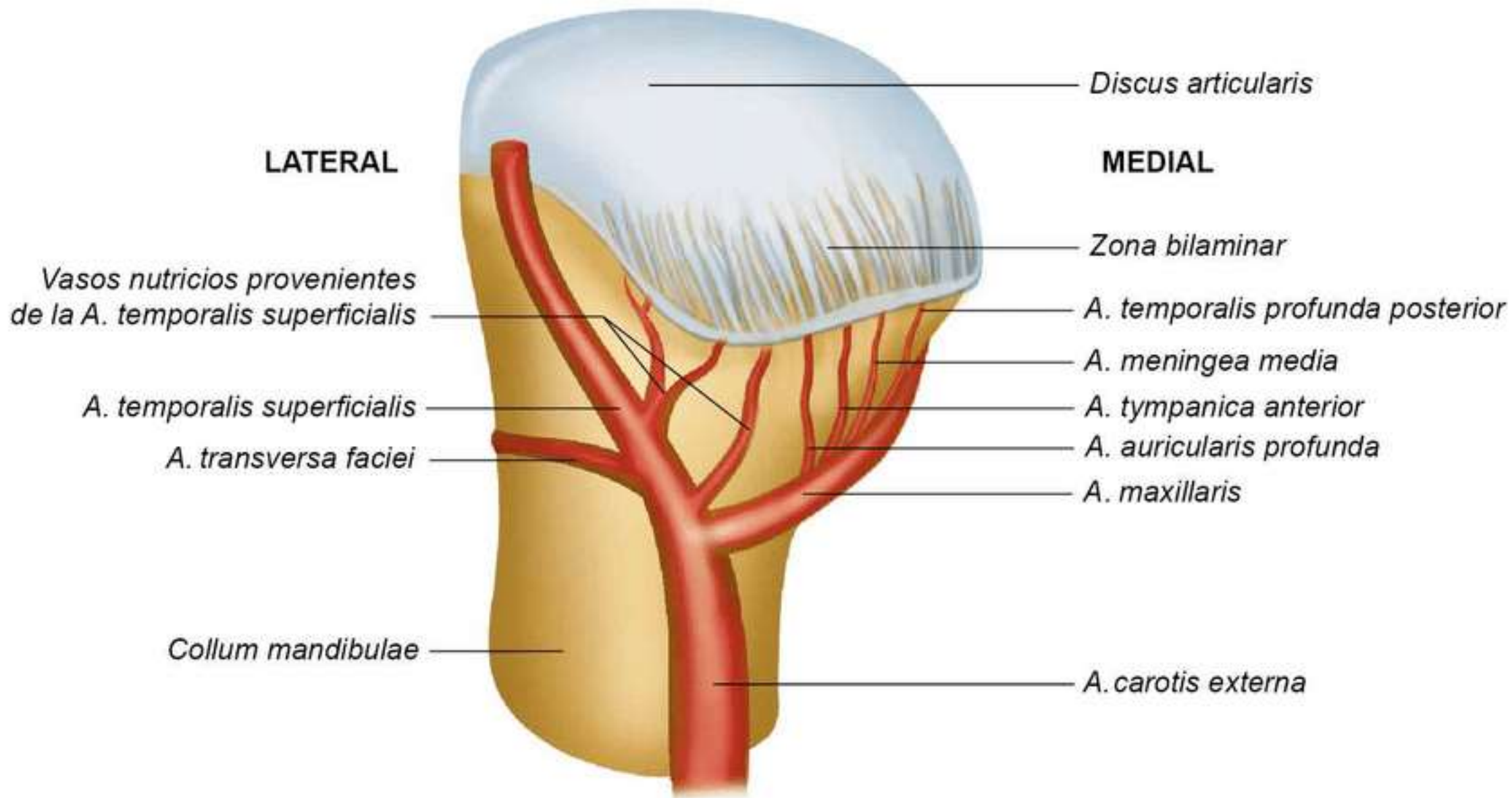
“It thus seems that otic symptoms (tinnitus, otalgia (ear pain), dizziness and hypoacusis) corresponding to altered ossicular spatial relationships (such as conductive middle ear pathologies) can also be produced from masticatory system pathologies.”



Muscles and jaw movements

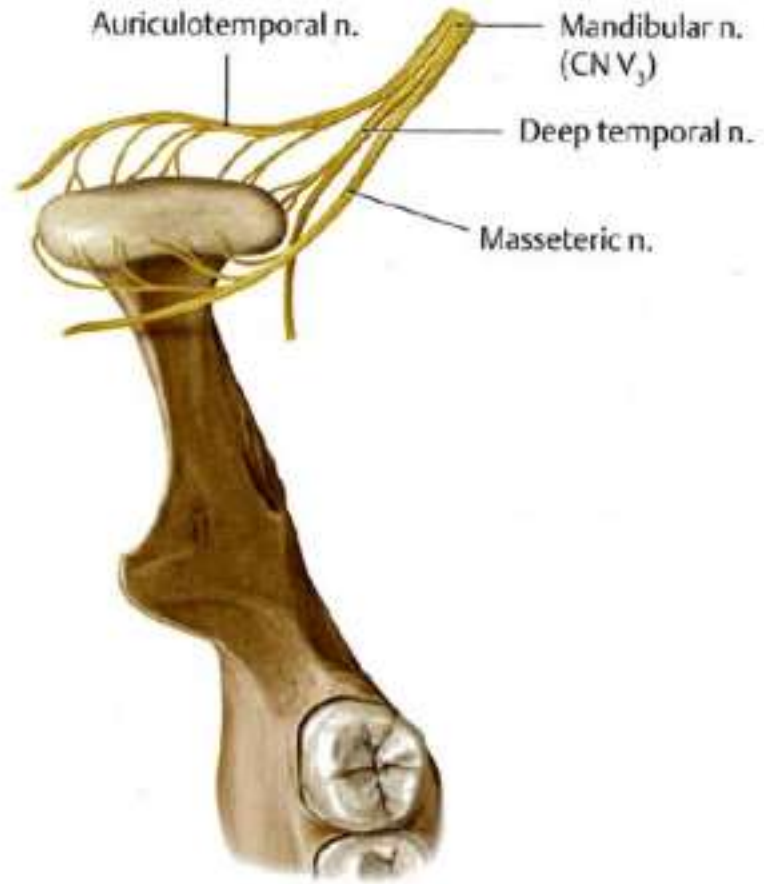
- Opening – inferior head of lateral pterygoid, anterior digastric, mylohyoid. Opening is also controlled by eccentric contraction of the closing muscles against gravity. Opening is a complex movement consisting of an early rotary component in the first 2-3cms of movement with a forward glide towards the end of range. The articular disc moves forward with the condyle as it glides forward, effectively extending the superior articular surface of the mandibular fossa.
- Closing – masseter, anterior and middle temporalis, medial pterygoid, superior head lateral pterygoid.
- Protrusion – bilateral contraction of the lateral pterygoid.
- Retrusion – middle and posterior temporalis, possibly helped by deep posterior portion of masseter
- Laterotrusion (side to side) – ipsilateral middle and posterior temporalis, contralateral inferior head lateral pterygoid.

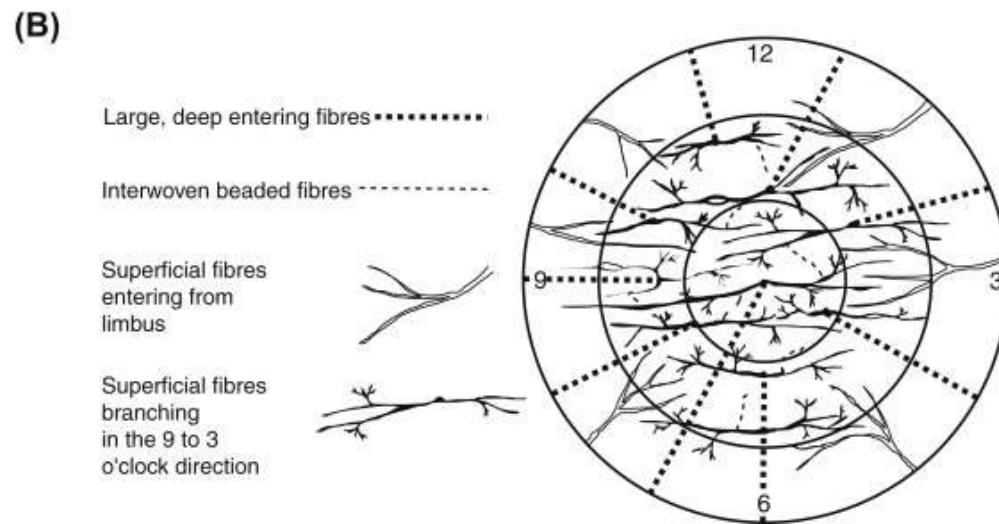
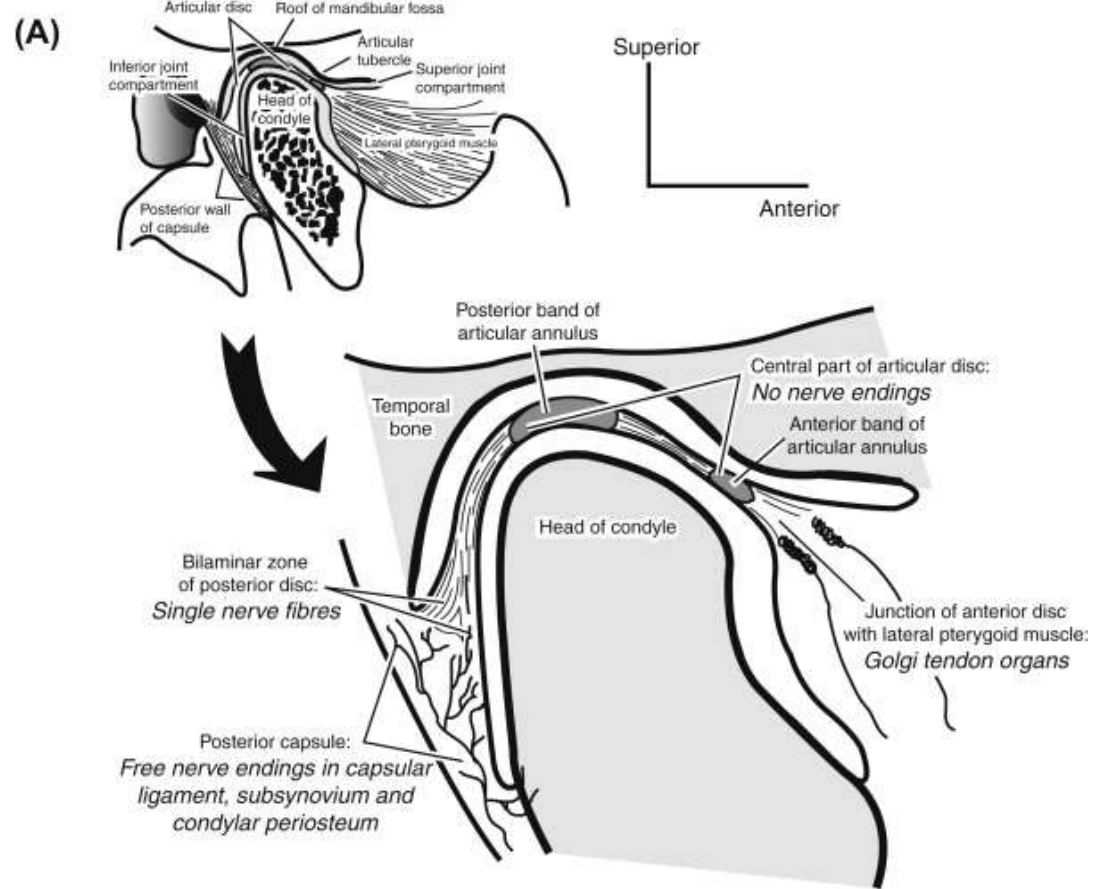




Innervation of the temporomandibular joint capsule

Superior view.





Ramírez, LM; Ballesteros, ALE; Sandoval, OGP. A direct anatomical study of the morphology and functionality of disco-malleolar and anterior malleolar ligaments. *Int. J. Morphol.*, 27(2):367-379, 2009.

Kuttilla, S; Kuttilla, M; Le Bell, BY; Alanen, P; Suonpaa, J. Recurrent tinnitus and associated ear symptoms in adults. *Int. J. Audiol.*, 44:164-70, 2005.

Thank you