Dr. Al-Hussein Ali

Second stage - Al Ameed University

College of Dentistry 2024-2025

Temporomandibular joint (TMJ)

The TMJ is the synovial articulation between the mandible and cranium. It is bilateral movable joint between temporal bone and the condyles of the mandible.

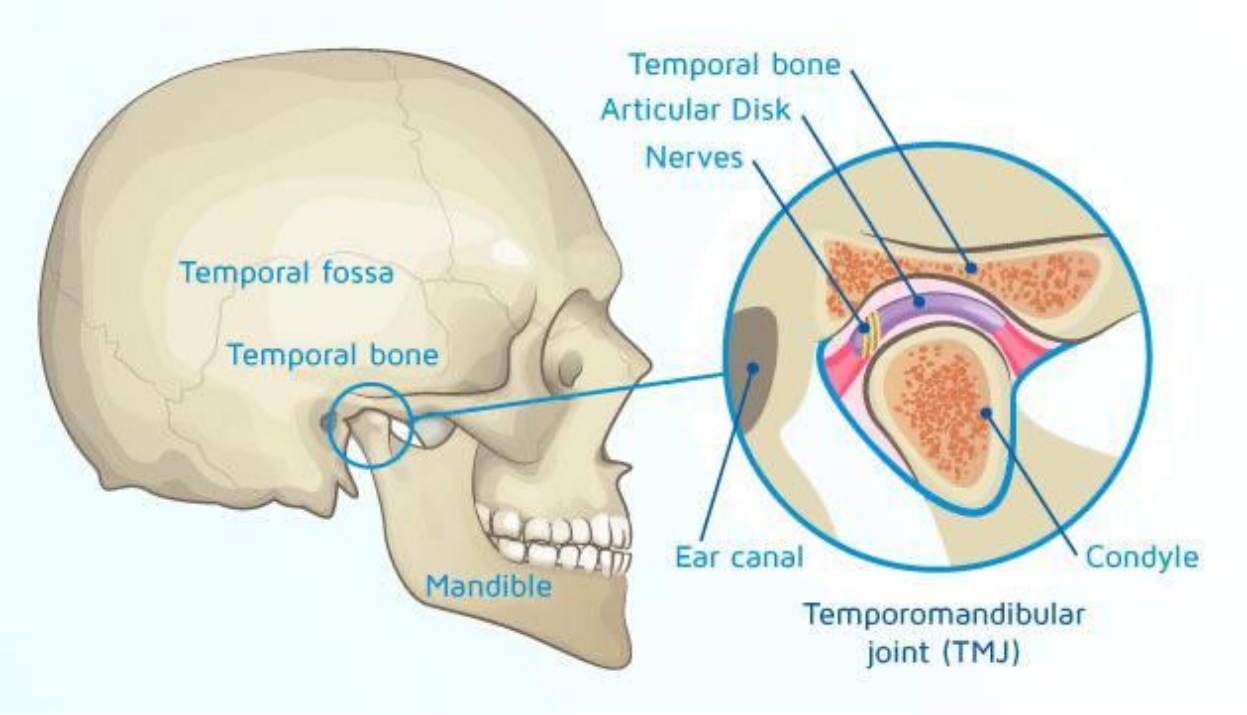
The TMJ involves two separate joints. It is important to know that these two joints function in unison and independent movements are not possible. The two joints are separated from each other by movable articular disc.

The gross anatomy and histology of the TMJ permits necessary movements associated with mastication.

Two functional movement patterns are related to TMJ:

a. Sliding movements.

b. Rotatory (hinge) movement.



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Anatomy and morphology:

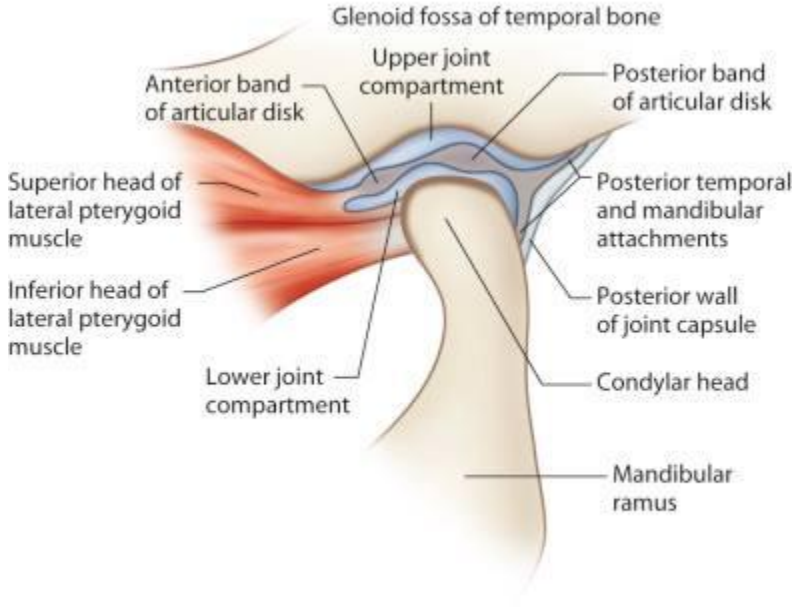
The TMJ is a highly specialized synovial joint which shows a number of unusual features.

a. The articulating surfaces on both the mandibular side and temporal side are not covered by articular cartilage.

b. The joint cavity is divided by articular disc into **two compartments:**

i. Upper compartment (larger compartment): Between the articular disc and temporal bone.

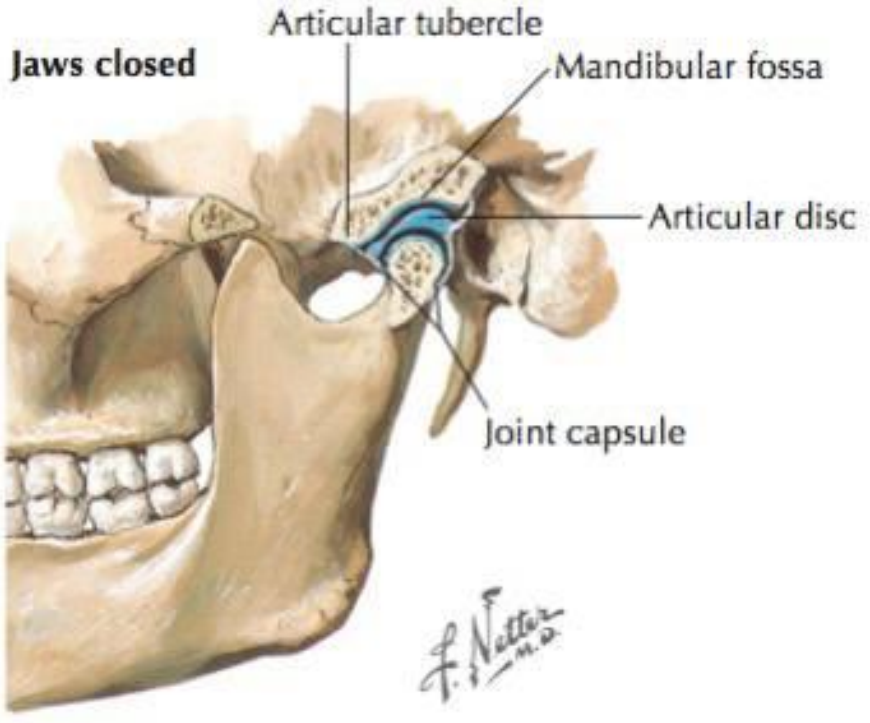
ii. Lower compartment: Between articular disc and condyle of mandible.



The articular surfaces of the joint:

1. Temporal bone: Contains the articular (mandibular) concave fossa posteriorly and the convex articular eminence anteriorly.
2. Condyles of the mandible: They are strongly convex in the anteroposterior direction and slightly convex in the mediolateral direction.

3. Articular disc: Interposed between the articular surfaces and acts as a shock absorber. The disc is accommodating the sliding movement made by the head of condyles. Its lower surface is concave to fit over the condyle like a cap. The central part is thin while the anterior and posterior borders are thick. The disc is fused anteriorly with the fibrous capsule of the joint and posteriorly with the capsular ligament. Laterally the disc is attaching to the lateral pterygoid muscle. The disc is vascular its periphery, but avascular at its central region.
4. Joint capsule: It is a fibrous sac attached posteriorly to the temporal bone around the margin of temporal fossa and articular eminence and inferiorly to the neck of the condyles. It is also attached at its medial and lateral margins to the articular disc. The posterior part of the capsule is highly vascular.The lateral aspect of the capsule is supported by lateral temporomandibular ligament.

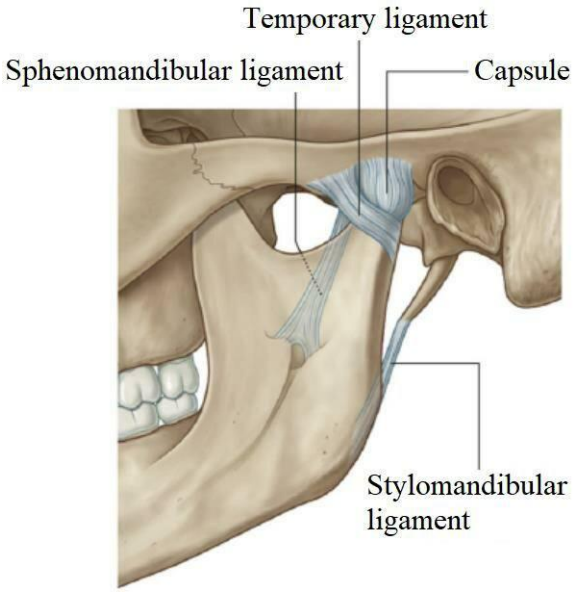


5. Ligaments:

i. Lateral temporomandibular ligament.

ii. Sphenomandibular ligament: It is a remnant of the perichondrium of Meckel's cartilage; it is extending from spine of sphenoid bone to the lingual near the mandibular foramen.

iii. Stylomandibular ligament: Running from styloid process to the angle of mandible.



Histology of the TMJ:

The condyles are formed of cancellous bone covered by a thin layer of compact bone. The trabeculae are grouped in such a way that they radiate from the neck of the mandible and reach the cortex at right angles that will give maximal strength to the condyles. During periods of growth, a layer of hyaline cartilage lies beneath the fibrous covering of the condyles. The articular surface of the condyles is covered by thick cushion like layer of the fibrous tissue which contains elastic fibers.

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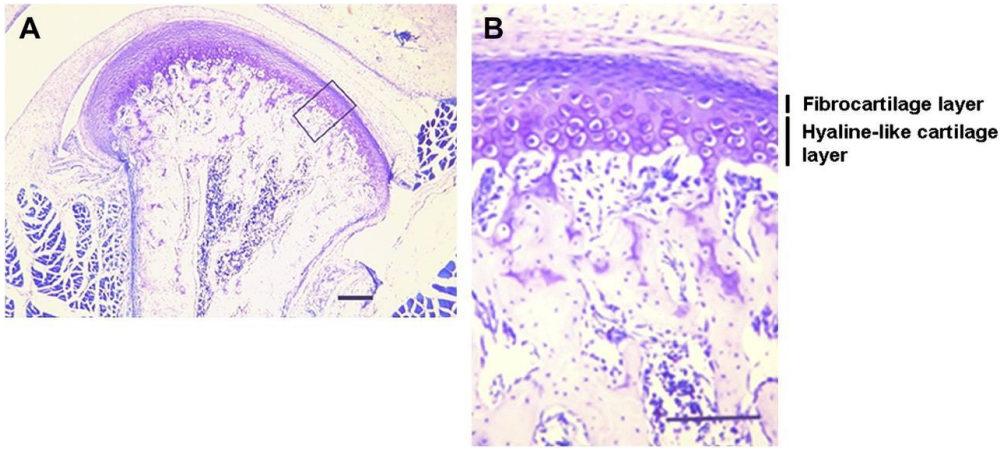


The articular eminence and fossa

The roof of the glenoid fossa consists of thin layer of compact bone which separates it from the middle cranial fossa. The articular eminence is composed of spongy bone covered with a thin layer of compact bone.

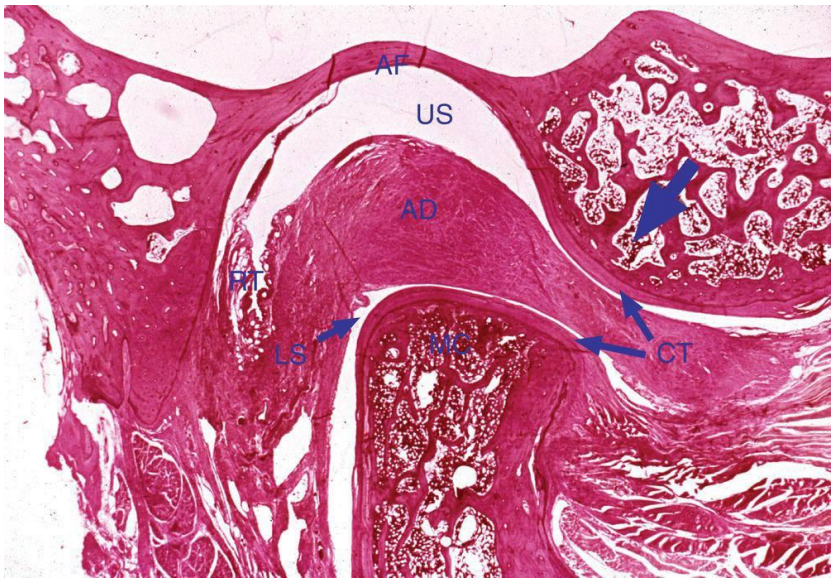
The fibrous layer covering the eminence and fossa is thin in the fossa and thickens in the eminence and is formed of **three layers**.

Inner layer forms right angle with the bone

Outer layer runs parallel

Intermediate layer forms network

The fibrous covering the articulating surface consists of collagen type one.



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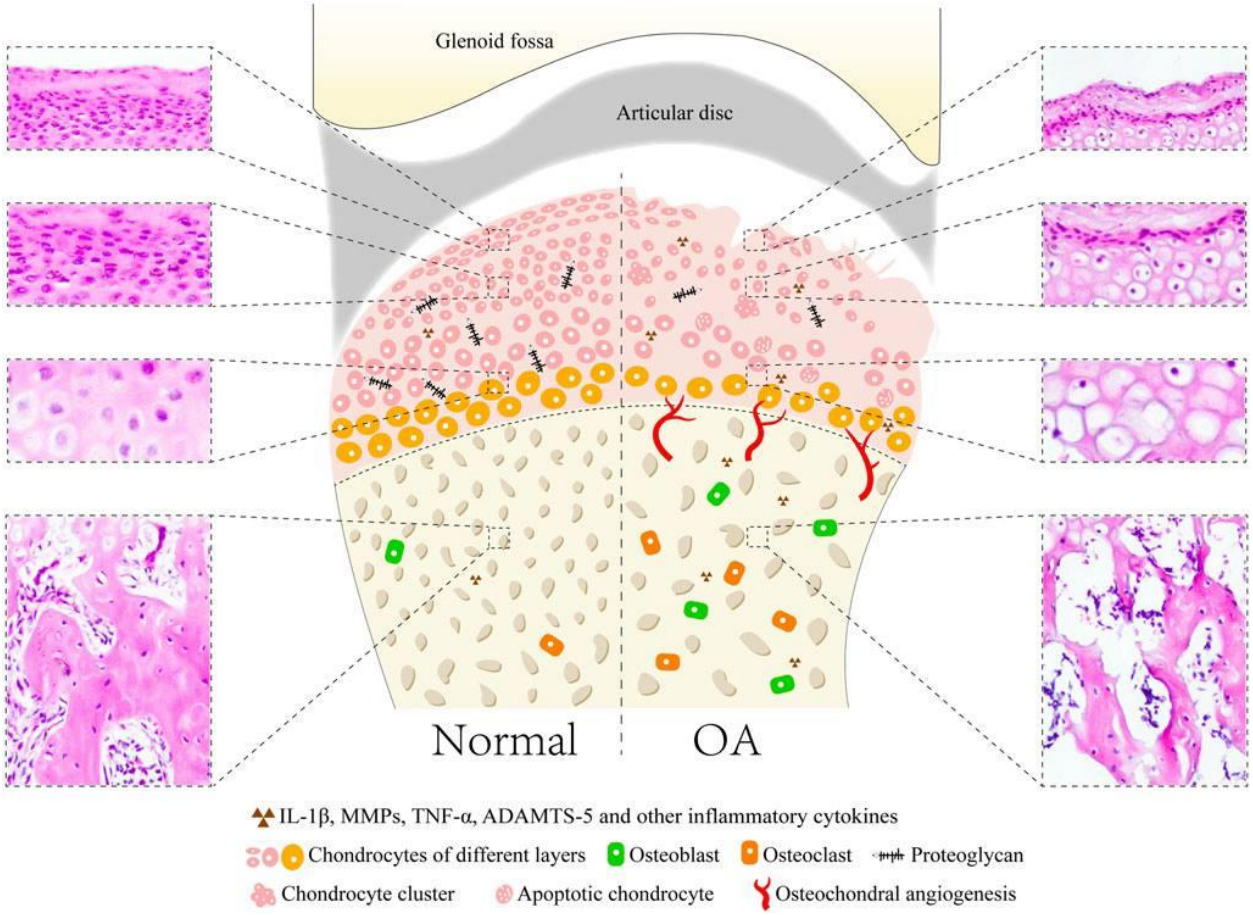
The articular disc

It presents as a movable surface and demonstrates certain histological features that permit this structure to function in articulation. It composed of fibrous tissue arranged in three layers. In the middle layer, the collagen fibers are interlacing to form a network and in the upper and lower layers the fibers run parallel to the surface. It contains few numbers of elastic fibers.

Small Island of hyaline cartilage may be found in old age.

The fibrous covering of the articular eminence and condyles as well as the central part of the disc are devoid of blood vessels and nerves, so that they are adapted to resist considerable pressure, but they have limited reparative ability.

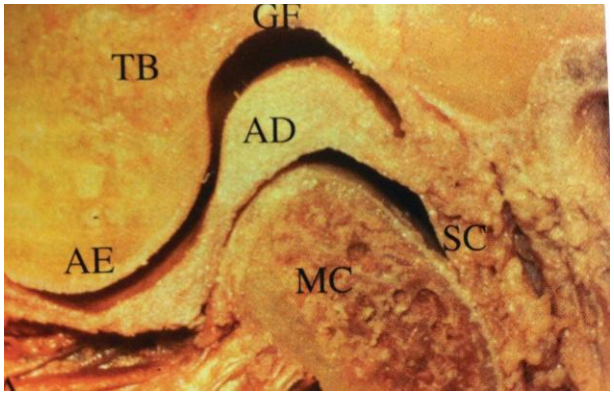


The articular capsule

It consists of an outer fibrous layer which is strengthened on the lateral surface to form temporomandibular ligament. The inner layer of the capsule is thin C.T which has a rich blood supply. From this surface finger like projections or synovial folds or villi protrude into the articular cavity.

The synovial membrane is an incomplete membrane. From the synovial membrane a clear straw- colored viscous fluid containing macrophages and mucin elaborated into the cavity for defensive mechanisms and lubrication (synovial fluid).

It should be remembered that it is not a typical synovial fluid because of the absence of hyaline cartilage in the joint.



Movements at the TMJ:

Two basic types of movements:

- Gliding (translator): Takes place in the upper synovial cavity between the disc and the articular fossa and eminence.
- Hinge (rotational): Takes place in the lower synovial cavity between the disc and the condyles.
- Protrusion.
- Depression (opening of the mouth).
- Elevation (closing of the mouth).

Clinical considerations:

- The most common problem that affects the TMJ is the malocclusion. Malocclusion is leading to joint pain; pain radiating to temporal, infraorbital and posterior auricular region.
- Dislocation with and without impact of external force due to the blow on the head.

In many head injuries because of the thinness of the bone in the mandibular fossa the mandibular condyle can be driven into the fossa by heavy blow. In such cases damage to the dura matter.