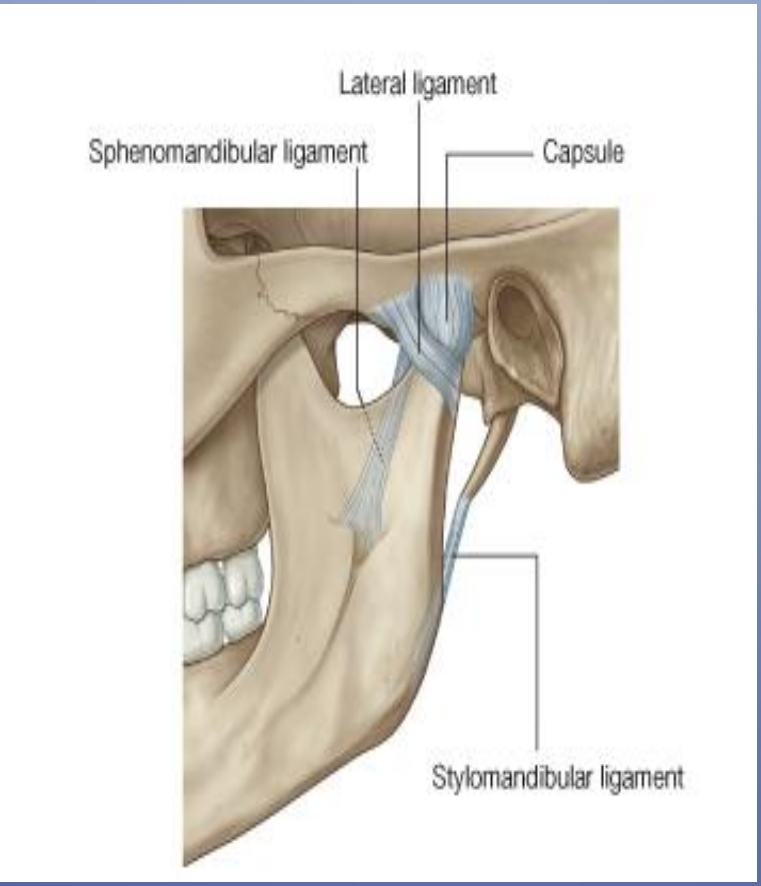


T.M Joint & Muscles of Mastication

Head & Neck Anatomy

Descriptive Anatomy of Temporomandibular joint and its type, ligament and capsule in addition to explaining the movement of this joint in concordance to the muscles of mastication.

Temporomandibular joints

The two temporomandibular joints allow opening and closing of the 'mouth' and complex 'chewing' or 'side-to-side' movements of the lower jaw.

Each joint is synovial in type and is formed between the head of the mandible and the articular fossa and articular tubercle of the temporal bone.

Unlike most other synovial joints where the articular surfaces of the bones are covered by a layer of hyaline cartilage, those of the temporomandibular joint are covered by fibrocartilage. In addition, the joint is completely divided by a fibrous **articular disc** into two parts:

- the lower part of the joint allows mainly the hinge-like depression and elevation of the mandible;
- The upper part of the joint allows the head of the mandible to translocate forward (protrusion) onto the articular tubercle and backward (retraction) into the mandibular fossa.

Opening the mouth involves both depression and protrusion.

The forward or protrusive movement allows greater depression of the mandible by preventing backward movement of the angle of the mandible into structures in the neck.

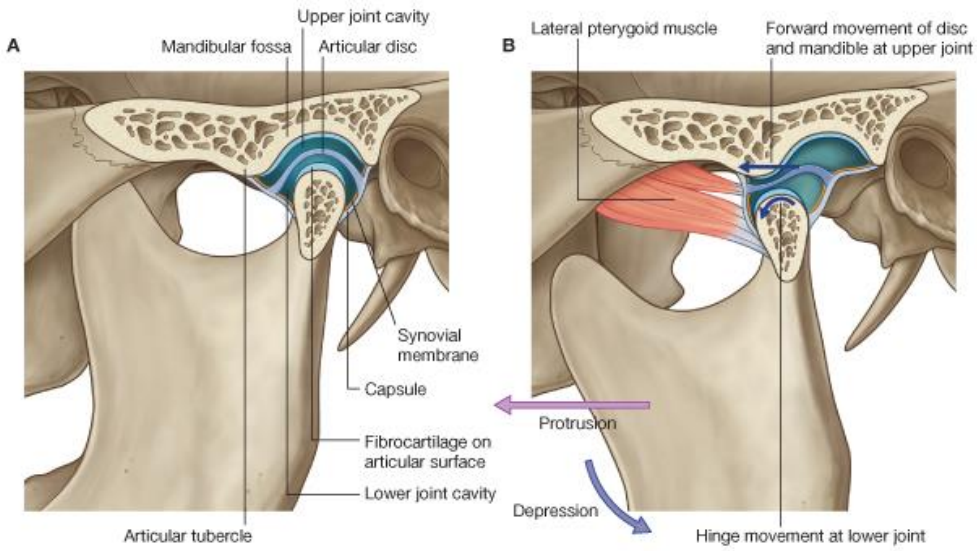
Joint capsule

The **synovial membrane** of the joint capsule lines all nonarticular surfaces of the upper and lower compartments of the joint and is attached to the margins of the articular disc.

The **fibrous membrane** of the joint capsule encloses the temporomandibular joint complex and is attached:

- above along the anterior margin of the articular tubercle;
- laterally and medially along the margins of the articular fossa;
- posteriorly to the region of the tympanosquamous suture;
- below around the upper part of the neck of the mandible.

The articular disc attaches around its periphery to the inner aspect of the fibrous



membrane.

Figure 1: temporomandibular joint and its capsule

Extracapsular ligaments

Three extracapsular ligaments are associated with the temporomandibular joint–the lateral, sphenomandibular, and the stylomandibular ligaments.

- the **lateral ligament** is closest to the joint, is just lateral to the capsule, and runs diagonally backwards from the margin of the articular tubercle to the neck of the mandible;
- the **sphenomandibular ligament** is medial to the temporomandibular joint, runs from the spine of the sphenoid bone at the base of the skull to the lingula on the medial side of the ramus of the mandible;
- the **stylomandibular ligament** passes from the styloid process of the temporal bone to the posterior margin and angle of the mandible

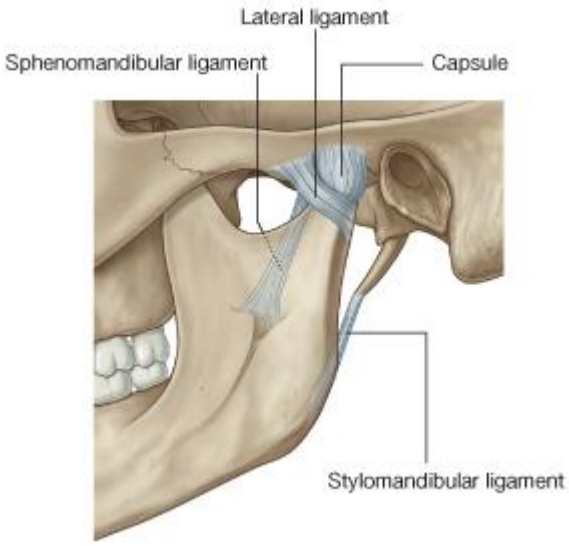


figure 2: extracapsular ligaments

Movements of the mandible

A chewing or grinding motion occurs when the movements at the temporomandibular joint on one side are coordinated with a reciprocal set of movements at the joint on the other side. Movements of the mandible include depression, elevation, protrusion, and retraction:

- depression is generated by the digastric, geniohyoid, and mylohyoid muscles on both sides, is normally assisted by gravity and, because it involves forward movement of the head of the mandible onto the articular tubercle, the lateral pterygoid muscles are also involved;
- elevation is a very powerful movement generated by the temporalis, masseter, and medial pterygoid muscles and also involves movement of the head of the mandible into the mandibular fossa;
- protraction is mainly achieved by the lateral pterygoid muscle, with some assistance by the medial pterygoid;
- retraction is carried out by the geniohyoid and digastric muscles, and by the posterior and deep fibers of the temporalis and masseter muscles, respectively.

Except for the geniohyoid muscle, which is innervated by the C1 spinal nerve, all muscles that move the temporomandibular joints are innervated by the mandibular nerve [V_3] by branches that originate in the infratemporal fossa.

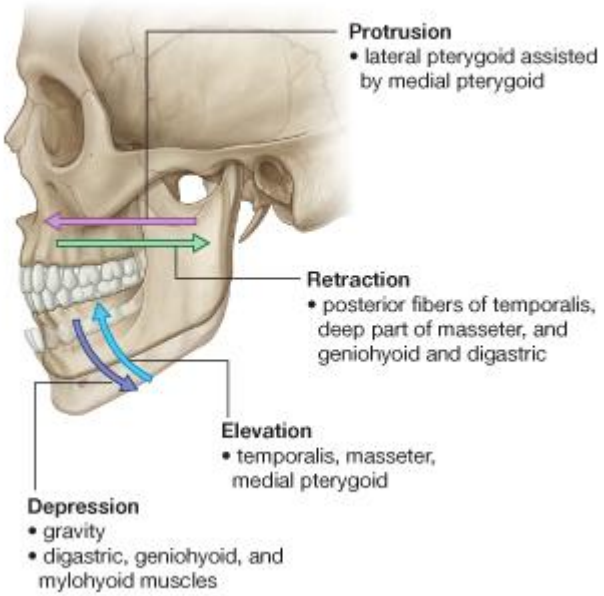


Figure 3: movement of temporomandibular joint

Muscles of mastication

Masseter muscle

The **masseter** muscle is a powerful muscle of mastication that elevates the mandible. It overlies the lateral surface of the ramus of mandible.

The masseter muscle is quadrangular in shape and is anchored above to the zygomatic arch and below to most of the lateral surface of the ramus of mandible.

The more **superficial part** of the masseter originates from the maxillary process of the zygomatic bone and the anterior two-thirds of the zygomatic process of the maxilla. It inserts into the angle of mandible and related posterior part of the lateral surface of the ramus of mandible.

The **deep part** of the masseter originates from the medial aspect of the zygomatic arch and the posterior part of its inferior margin and inserts into the central and upper part of the ramus of mandible as high as the coronoid process.

The masseter is innervated by the masseteric nerve from the mandibular nerve [V_3] and supplied with blood by the masseteric artery from the maxillary artery.

The masseteric nerve and artery originate in the infratemporal fossa and pass

laterally over the margin of the mandibular notch to enter the deep surface of the masseter muscle.

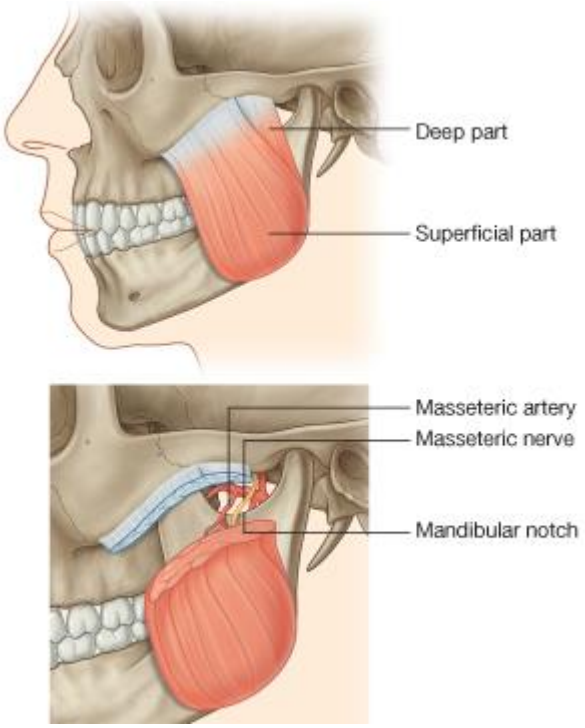


Figure 4: muscles of mastication (masseter muscle)

Temporalis muscle

The **temporalis** muscle is a large fan-shaped muscle that fills much of the temporal fossa. It originates from the bony surfaces of the fossa superiorly to the inferior temporal line and is attached laterally to the surface of the temporal fascia. The more anterior fibers are oriented vertically while the more posterior fibers are oriented horizontally. The fibers converge inferiorly to form a tendon, which passes between the zygomatic arch and the infratemporal crest of the greater wing of the sphenoid to insert on the coronoid process of the mandible.

The temporalis muscle attaches down the anterior surface of the coronoid process and along the related margin of the ramus of mandible, almost to the last molar tooth.

Temporalis is a powerful elevator of the mandible. Because this movement involves posterior translocation of the head of the mandible from the articular tubercle of the temporal bone and back into the mandibular fossa, temporalis also retracts the

mandible or pulls it posteriorly. In addition, temporalis participates in side-to-side movements of the mandible.

Temporalis is innervated by deep temporal nerves that originate from the mandibular nerve [V_3] in the infratemporal fossa and then pass into the temporal fossa. Blood supply of the temporalis is by deep temporal arteries, which travel with the nerves, and the middle temporal artery, which penetrates the temporal fascia at the posterior end of the zygomatic arch.

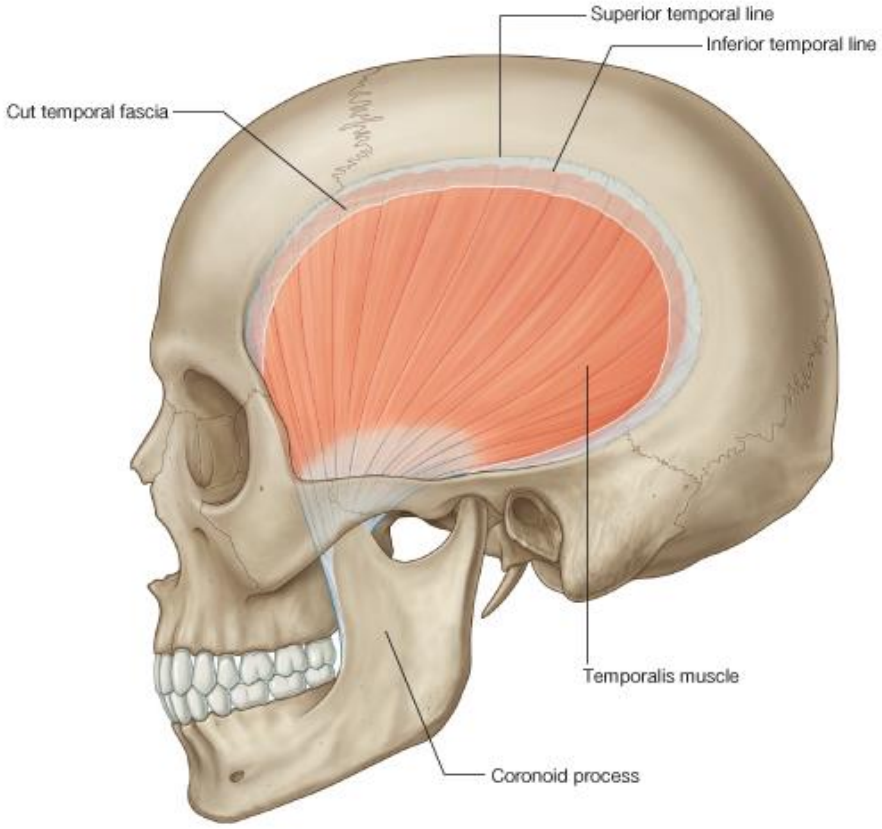


Figure 5: temporalis muscle (muscle of mastication)

Medial pterygoid

The **medial pterygoid** muscle is quadrangular in shape and has deep and superficial heads.

- the **deep head** is attached above to the medial surface of the lateral plate of the pterygoid process and the associated surface of the pyramidal process of

the palatine bone, and descends obliquely downwards, medial to the sphenomandibular ligament, to attach to the roughened medial surface of the ramus of mandible near the angle of mandible;

- the **superficial head** originates from the tuberosity of the maxilla and adjacent pyramidal process of the palatine bone and joins with the deep head to insert on the mandible.

The medial pterygoid mainly elevates the mandible. Because it passes obliquely backwards to insert into the mandible, it also assists the lateral pterygoid muscle in protruding the lower jaw. The medial pterygoid is innervated by the nerve to medial pterygoid from the mandibular nerve [V_3].

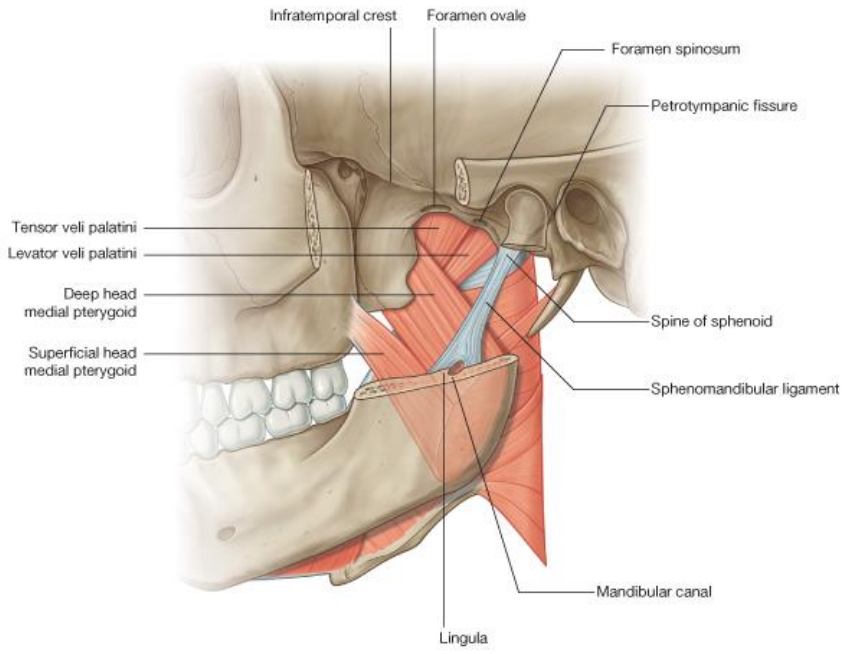


Figure 6: medial pterygoid muscle (muscles of mastication)

Lateral pterygoid

The lateral pterygoid is a thick triangular muscle and like the medial pterygoid muscle has two heads:

- the **upper head** originates from the roof of the infratemporal fossa (inferior

surface of the greater wing of the sphenoid and the infratemporal crest) lateral to the foramen ovale and foramen spinosum;

- the **lower head** is larger than the upper head and originates from the lateral surface of the lateral plate of the pterygoid process, and the inferior part insinuates itself between the cranial attachments of the two heads of the medial pterygoid.

The fibers from both heads of the lateral pterygoid muscle converge to insert into the pterygoid fovea of the neck of mandible and into the capsule of the temporomandibular joint in the region where the capsule is attached internally to the articular disc.

Unlike the medial pterygoid muscle whose fibers tend to be oriented vertically, those of the lateral pterygoid are oriented almost horizontally. As a result, when lateral pterygoid contracts it pulls the articular disc and head of the mandible forward onto the articular tubercle and is therefore the major protruder of the lower jaw.

The lateral pterygoid is innervated by the nerve to lateral pterygoid from the mandibular nerve [V_3].

When lateral and medial pterygoids contract on only one side, the 'chin' moves to the opposite side. When opposite movements at the two temporomandibular joints are coordinated, a 'chewing' movement results.

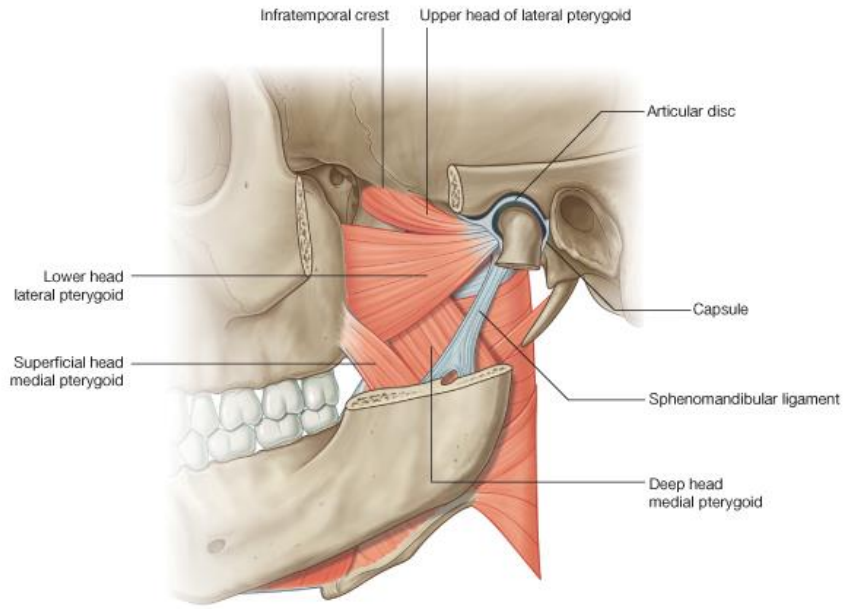


Figure 7: lateral pterygoid muscle