The Skull and Temporomandibular joint II

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Temporal fossa

The temporal fossa is a depression on the temporal region. The bones contribute to its concave wall are the temporal bone, sphenoid bone, parietal bone and the frontal bone. It is superior to the infratemporal fossa which lies beneath the zygomatic arch.

The temporal fossa has the following borders:
Superiorly and posteriorly - superior temporal line (attachment of temporal fascia)
 Inferiorly - zygomatic arch
 Anteriorly - frontal process of the zygoma and zygomatic process of the frontal bone

Contents of the temporal fossa
Temporal muscle, Superficial temporal artery and vein, the anterior and posterior temporal nerves, the auriculotemporal nerve and the temporal branches of the facial nerve
**Infratemporal fossa**

The infratemporal fossa is a space located below the temporal fossa.

**Borders**

Superiorly - greater wing of the sphenoid bone

Inferiorly - medial pterygoid muscle attaching to the mandible

Anteriorly – maxilla

Posteriorly - styloid process and condylar processes of the mandible

Medially - the lateral pterygoid plate

Laterally - ramus and coronoid process of the mandible

**Structures passing through the infratemporal fossa**

- Temporalis muscle
- Lateral pterygoid muscle
- Medial pterygoid muscle
- Maxillary artery
Infratemporal fossa

- Greater wing of the sphenoid
- Pterygomaxillary fissure
- Styloid process
- Lateral pterygoid plate
- Zygomatic arch (cut)
- Maxilla

Temporals
- Temporalis m. (cut)
- Lateral and medial pterygoid mm.
- (Long) buccal n.
- Lingual n.
- Mental n.
- Nerve to the mylohyoid m.
- Submandibular ganglion
- Mylohyoid and anterior digastric mm.

Auriculotemporal n. branching around the middle meningeal a.

Chorda tympani n. (CN VII)

Inferior alveolar n.

Tongue

Main trunk of CN V-3 entering the infratemporal fossa via the foramen ovale

A
The pterygoid venous plexus
the mandibular nerve
the posterior superior alveolar nerve
the chorda tympani
the otic ganglion
the lesser petrosal nerve

**Vascular supply** of this fossa
Comes from the maxillary artery.

**Innervation** of the area is via the branches of the mandibular and maxillary nerves.
Temromandibular joint

The temporomandibular joints (TMJ) are the two joints connecting the mandible to the skull. They are a bilateral synovial articulation between the temporal bone above and the mandible below.

The articular surface of each temporal bone is concavoconvex from behind forwards; it includes the articular eminence and the mandibular fossa (glenoid fossa).

The articular surface of the mandible is a hemicylindrical condyle directed medially and slightly backwards.

The articular bony surfaces are covered with fibrocartilage.

The joint contains articular disc composed of dense fibrocartilagenous tissue that is positioned between the mandibular condyle and the mandibular fossa of the temporal bone.
The disc divides each joint into an upper and lower compartments. These two compartments are synovial cavities.

The central area of the disc is avascular and lacks innervation, thus getting its nutrients from the surrounding synovial fluid. The **central area** of the disc is thin but of **denser consistency** than the peripheral region, which is thicker but has a more cushioned consistency.

The disc margins are attached to the capsule, and anteriorly the disc is also attached to the superior head of the lateral pterygoid muscle.

**Capsule** - The capsule is a fibrous membrane that surrounds the joint and attaches to the articular margins on the temporal bone, the articular disc and the neck of the mandible.
Ligaments: They give passive stability to the TMJ.
1- The lateral ligament is the thickened lateral portion of the capsule, passing downwards and backwards to the back of the neck of the mandible. It limits backward movement
2- The stylomandibular ligament runs from the styloid process to the angle of the mandible
3- The sphenomandibular ligament runs from the spine of the sphenoid bone to the lingula of mandible
Articular disc
Fibrocartilage
Mandibular fossa

Squamo-tympanic fissure

Neck of the mandible

Articular tubercle

Temporal Bone
Lateral View

Glennoid
Mandibular fossa

Articular tubercle

Squamotympanic fissure

Tympanic plate

External auditory canal
Capsule and ligaments of the TM joint
Muscles of Mastication

**Masseter** muscle
It is a quadrilateral muscle which covers lateral surface of the Ramus of the mandible.

**Origin:** It arises from lower border of Zygomatic arch and from Zygomatic process of maxilla.

**Insertion:** The fibres are inserted into coronoid process and lateral surface of Ramus of mandible

**Nerve supply:** Masseteric nerve, a branch of the anterior division of the Mandibular nerve

**Action:** It elevates the mandible to close the mouth and clenches the teeth
**Temporalsis muscle**

**Origin:** Arises from temporal fossa and from temporal fascia.

**Insertion:** The margins and deep surface of the coronoid process and anterior border of the ramus of the mandible.

**Nerve supply:** Deep temporal branches from anterior division of the Mandibular nerve.

**Action:** Retraction & Elevation

1. It elevates the mandible
2. It Retracts the mandible
Lateral pterygoid muscle

The muscle has upper head and lower head.

**Origin:** Upper head arises from the infratemporal surface and crest of the greater wing of sphenoid bone. Lower head: arises from the lateral surface of lateral pterygoid plate

**Insertion:** a- Pterygoid fovea on the anterior surface of the neck of the mandible and 2- the anterior margin of the articular disc and capsule of the TMJ

**Nerve supply:** branch from anterior division of Mandibular nerve

**Action:** 1) Depresses the mandible to open the mouth.
2) The lateral and medial pterygoid acting together protrude the mandible.3) Alternate contraction of lateral and medial pterygoid produces side to side movements.
Medial pterygoid muscle
This is a quadrilateral muscle having small superficial head and a large deep head.

**Origin**: Superficial head: From tuberosity of maxilla and adjoining bone.
Deep head: From medial surface of lateral pterygoid plate and adjoining part of palatine bone

**Insertion**: The fibres are inserted into the medial surface of the angle of the mandible and adjoining part of the ramus of the mandible

**Nerve supply**: is a branch of the main trunk of the Mandibular nerve

**Action**  Protrusion and Elevation of the mandible
Movement of the TM joint

1- Depression: is produced by the lateral pterygoid (pulling on the neck of the mandible) and geniohyoid, digastric and mylohyoid muscles (pulling down on the body of the mandible)

2- Elevation: by masseter, temporalis and medial pterygoid

3- Protrusion: by lateral and medial pterygoid muscles

4- Retraction: is produced by the posterior fibres of temporalis

5- Side to side movement: is produced by protrusion of one side and retraction of the other side at the same time

Depression and elevation (hinge movement) takes place in the lower compartment of the joint. The condyles of the mandible moves under the articular disc along an axis passing through the lingula
Protrusion and retraction (gliding movement) takes place in the upper compartment of the joint. The condyle of the mandible and the articular disc move together over the articular surface. Side to side movement (grinding movement) are composed of alternating protrusion and retraction on the two sides.
The TMJ is where the lower jaw meets the skull.

The socket

The condyle is the round end of the lower jaw.

Jaw muscles open and close the jaw when you chew and talk.

A proper bite allows smooth and effective chewing.

Closed jaw:
- The disk fits in the socket when the jaw is closed.
- Ligament
- The condyle fits in the socket when the jaw is closed.

Open jaw:
- The disk slides forward as the jaw opens.
- The condyle moves forward as the jaw opens.
Nerve supply of the TM joint
Sensory innervation of the temporomandibular joint is derived from the **auriculotemporal and masseteric branches of mandibular nerve**

**Blood supply**
**Superficial temporal and maxillary artery**

**Relation of TM joint**
**Anteriorly:** Lateral pterygoid muscle
**Posteriorly:** Parotid gland, auriculotemporal nerve, tympanic plate of the temporal bone and chorda tympani coming out through the petrotympanic fissure
**Laterally:** Skin and superficial fascia
**Medially:** Sphenomandibular ligament, auriculotemporal nerve and the middle meningeal artery
Thank You