## **Temporal and Infratemporal Region**

## **Muscles of Mastication and TMJ**

## V3 and its branches

## Maxillary artery

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#### **Learning Objectives:**

- Describe the osteology and anatomic boundaries of the temporal and infratemporal fossa
- Contents of the infratemporal and pterygopalatine fossa
- Describe the muscles of mastication, their origins, insertions, innervations and actions
- Describe the TMJ and its clinical considerations
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#### **Temporal fossa**

**Boundaries** Anterior: Zygoma & Zygomatic Process of Frontal Bone

**Superior:** Temporal Line

**Posterior:** Temporal Line

**Inferior:** Zygomatic Arch, Infratemporal Crest of the Greater Wing of the Sphenoid

Lateral: Zygomatic Arch

**Medial:** Bone Structure of Skull



#### **Infratemporal Fossa**



Boundaries of Infratemporal Fossa: Anterior: Infratemporal Surface of Maxilla and Deep Surface of Zygomatic Bone

Medial: Lateral Surface of Lateral Pterygoid Plate of sphenoid and Pterygomaxillary Fissure

Superior: Infratemporal Crest of Sphenoid and Infratemporal Surface of the Greater Wing of the Sphenoid

Posterior: Anterior Limits of the Mandibular Fossa (glenoid fossa) Inferior: Open

**Lateral :** Ramus of Mandible





Pterygomaxillary fissure and pterygopalatine fossa

#### **Channels communicating with the infratemporal fossa:**



## **Contents of the infratemporal fossa:**

- Three (of four) muscles of mastication
- Mandibular nerve (V<sub>3</sub>) + branches
- Otic ganglion
- Chorda tympani nerve (between facial and lingual nerve)
- Maxillary artery + branches
- Pterygoid plexus of veins



#### **Muscles of Mastication and their actions:**



## **Muscles of Mastication**



#### Temporalis and Masseter muscles



Temporalis muscle, its attachment and actions



Tendon of Temporalis muscle and retromolar pad



## Posterior view of muscles of mastication (lateral and medial pterygoid muscles)



Posterior view of muscles of mastication (lateral and medial pterygoid muscles)



#### Lateral and medial pterygoid muscles (side view)



#### Inferior view of the cranial base (highlighting the mandibular condyle and lateral pterygoid plate of the sphenoid bone)





## Jaw opening muscles





Actions of muscles of mastication



#### Action of muscles of mastication on the mandible:



- •<u>Depression</u> (open mouth): anterior belly of digastric, geniohyoid, lateral pterygoids (#3), mylohyoid (minor role)
- •<u>Elevation</u> (close mouth, occlusion): masseter (#2), temporalis (#1), medial pterygoids (#4)
- •<u>Protrusion</u> (protraction): mostly medial and lateral pterygoids (#3,4) + masseter (#2)
- •<u>Retrusion</u> (retraction): temporalis (#1)
- •Lateral (side to side) motion: lateral and medial pterygoids (#3,4)

#### 3D motion of TMJ



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#### <u>Temporomandibular Joint (TMJ)</u>: Articulation of condyle of mandible with mandibular fossa plus articular eminence of temporal bone



### TMJ: details of articulation



### TMJ movement



- Initial opening of mouth involves rotation of the condyle in the lower compartment of the TMJ. This is the <u>HINGE motion</u>.
- Further opening (beyond 20 mm.) requires translation of the condyle+articular disc on the articular eminence, which occurs in the upper compartment. This is the <u>GLIDING</u> motion.



## Movements possible at the TMJ: rotation and translation



Functionally, <u>the lower compartment acts as a hinge joint (rotational</u> movement); the <u>upper compartment acts as a gliding joint (translational</u> movement).

#### Anatomy of TMJ



## Extracapsular ligaments (three) of the TMJ

lateral ligament Lateral, sphenomandibular and *\_\_\_\_* stylomandibular ligaments



Functional part of the TMJ disc





#### Motion of TMJ



#### Normal articular disc in TMJ



#### Damaged articular disc in TMJ



#### **Clinical Correlation: Mandibular Dislocation**

- Condyles are displaced anteriorly beyond articular tubercles
- Usually bilateral
- Muscle spasm
- Treatment: judicious (minimal) force needed to reduce dislocation of mandible, by guiding it inferiorly and posteriorly



#### **Clinical correlation: TMJ Disorder**



Primary Symptoms include:

- pronounced joint noises associated with movement (clicking, popping).
- pain and deviation with jaw opening.
- limited range of opening.

### **Clinical correlation: TMJ Ankylosis**



Young patient presents with restricted mouth opening
Hx of fall on chin approximately 1 year prior to visit
Physical exam, images obtained



Coronal CT (above) •normal mandibular condyle on patient's right, articulating with mandibular fossa •Abnormal condyle on patient's left, fusion of mandibular ramus with temporal bone

## **Clinical correlation: TMJ Ankylosis**



The TMJ is approached from a preauricular incision
The joint space is opened and the condyle is recontoured
Mobility of the mandible is checked in the operating room

Post operative view: normal mandibular opening, no deviation from midline

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#### Review: Trigeminal nerve in middle cranial fossa:



#### SS+parapost from MANDIBULAR NERVE (V3) otic ganglia (IX) Auriculotemporal **V**<sub>3</sub> Somatosensory and somatomotor Chorda **SS** tympani\* n **Buccal n** (VII) lo go in and innervate cheek Para pre & Taste (don't get confused with buccal branch of CNVII) SS Inferior Lingual n alveolar n Mylohyoid n SM to mylohyoid & anterior SS, taste, para pre digastric mm Mental n SS

\* Taste & parasympathetic pre-ganglionic

#### Foramen ovale



anterior



Posterior



Posterior

<u>Chorda tympaní</u> Taste Para/pre

Submandibular ganglion

Submandibular gland

#### Sublingual gland



## Parotid gland innervation



#### V3: Mandibular Division of the Trigeminal Nerve:

#### Motor branches:

To muscles of mastication: •Masseter •Deep Temporal •Medial Pterygoid •Lateral Pterygoid

PLUS
Mylohyoid nerve to mylohyoid and anterior belly of digastric
Nerves to tensor tympani and tensor veli palatini

#### **Sensory branches:**

Buccal

•Lingual\*

Auriculotemporal\*

Inferior Alveolar\*\*

#### "Hitchhikers"

•Chorda tympani (*taste* + *para pre*) from CN 7 joins lingual nerve\*

 Fibers from otic ganglion (para post) (CN 9) join auriculotemporal nerve\*
 → parotid gland?





### Maxillary artery I

Maxillary a

Superficial temporal a

Ext carotid a

Inferior alveolar artery and nerve

#### **Maxillary Artery II**



#### Auriculotemporal nerve

EC/



## Maxillary artery entering the pterygopalatine fossa





Veins in the facial region



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## Clinical correlation: *Inferior alveolar nerve* block to anesthetize mandibular teeth:



# Local Anesthesia1. Block injectionMandibular nerve block (inferior alveolar nerve)



#### Inferior alveolar nerve block:





The 2018 lower Puna eruption