Parotid Region

Temporal and Infratemporal Region

Muscles of Mastication and TMJ

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2019 Head and Neck Anatomy Midterm Exam
Mean = 27; SD = 5

Grade Distribution

Scores Out of 35

# of Students

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
2018 Head and Neck Anatomy Midterm Examination
Mean = 28.22; SD=5.00
Learning Objectives:

• Describe the parotid gland and its relationship with the facial nerve. Learn the innervation of parotid gland

• 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

• Identify and relate the mandibular nerve (V3) branches to their target structures, including components that “hitchhike”

• Learn important branches of maxillary artery

• Clinical considerations
Parotid Gland

Largest of 3 paired salivary glands
(submandibular; sublingual)

Ramus of Mandible
Medial pterygoid

Masseter

Parotid Gland

SCM

Mastoid Process
Facial nerve and its branches

Cross section of mandible
Parotid Duct

Parotid Duct

Buccal Branch of the Facial Nerve

Parotid Gland

Masseter

Buccinator

Parotid Duct

Parotid Gland

Buccal Branch of the Facial Nerve

Masseter

Buccinator

Parotid Duct
Parotid Duct

Buccinator

2nd Molar

Transverse Facial Artery

Parotid Duct

Buccal Branch of the Facial Nerve

Retromandibular v.

Parotid Gland

Masseter

3 parallel structures!!
Intraoral opening of the parotid duct (next to the upper second molar)
Innervation of the parotid gland
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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
Boundaries of the Infratemporal Fossa:

- Frontal
- Parietal
- Temporal
- Greater wing of Sphenoid
- Maxilla
- Zygomatic Bone
- Infratemporal fossa
- Lat pterygoid plate
- Styloid Process
- Ext. auditory meatus
Infratemporal Fossa
Contents: Muscles of mastication and their vascular and nerve supply

Boundaries:
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
Continued:

**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:

- Temporal
- Parietal
- Frontal
- Greater wing of Sphenoid
- Maxilla
- Zygomatic process
- Pterygomaxillary fissure
- Inferior orbital fissure
- Foramen ovale
  + Foramen spinosum
Contents of the infratemporal fossa:

- Three (of four) muscles of mastication
- Mandibular nerve ($V_3$) + branches
- Otic ganglion
- Chorda tympani nerve (between facial and lingual nerve)
- Maxillary artery + branches
- Pterygoid plexus of veins
How to gain access into the infratemporal fossa

[Diagram showing surgical approach to the infratemporal fossa]

- Head
- Coronoid process
- To catch on lingula
Muscles of Mastication:

- Masseter
- Temporalis
- Temporalis fascia
- Masseter
- Parotid duct
Muscles of Mastication:

Lateral pterygoid

Articular disk

Head of mandible

Medial pterygoid
Temporalis and Masseter muscles
Temporalsis muscle and its attachment and actions
Tendon of Temporalis muscle and retromolar pad
Muscle actions
Inferior view of the cranial base (highlighting the mandibular condyle and lateral pterygoid plate of the sphenoid bone)
Mandibular block
Jaw opening muscles

- Superior longitudinal muscle of tongue
- Lingual aponeurosis
- Lingual mucosa
- Transverse lingual muscle
- Septum of the tongue
- Foramen cecum
- Lingual tonsil; root of tongue
- Cartilage of epiglottis
- Superior aperture of larynx
- Ventricle of larynx
- Thyroid cartilage
- Hyoid bone
- Mylohyoid muscle
- Genioglossus
- Geniohyoid muscle
- Lower lip
- Vestibule of mouth
- Mandible

Highlight: Geniohyoid muscle
Anterior belly of digastric muscle
Actions of muscles of mastication
Action of muscles of mastication on the mandible:

- **Depression** (open mouth): anterior belly of digastric, geniohyoid, lateral pterygoids (#3), mylohyoid (minor role)
- **Elevation** (close mouth, occlusion): masseter (#2), temporalis (#1), medial pterygoids (#4)
- **Protrusion** (protraction): mostly medial and lateral pterygoids (#3,4) + masseter (#2)
- **Retrusion** (retraction): temporalis (#1)
- **Lateral** (side to side) motion: lateral and medial pterygoids (#3,4)
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- Clinical considerations
**Temporomandibular Joint**: Articulation of condyle of mandible with mandibular fossa plus articular eminence of temporal bone.
TMJ: details of articulation

- Articular disc
- Lateral pterygoid tendon
- Mandibular fossa
- Upper synovial space
- Lower synovial space
- Condyle

Gliding Action
- Upper synovial space

Hinge Action
- Lower synovial space
TMJ movement:

• **Initial** opening of mouth involves **rotation** of the condyle in the **lower compartment** of the TMJ. This is the **HINGE** motion.

• 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 **GLIDING** motion.
Movements possible at the TMJ: rotation and translation

Functionally, the lower compartment acts as a hinge joint (rotational movement); the upper compartment acts as a gliding joint (translational movement).
Ligaments of the temporomandibular joint
Capsular ligament of the TMJ (enclosing the TMJ)
AD

SC

IC

LDL

CL

MDL

CL
Extracapsular ligaments (three) of the TMJ

Lateral, sphenomandibular and stylomandibular ligaments
Two other extracapsular ligaments of the TMJ

- Stylomandibular ligament
- Sphenomandibular ligament
Innervation of the 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 pre-auricular 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:

V1, V2, V3 exits through foramen ovale to enter infratemporal fossa.
MANDIBULAR NERVE (V₃)

Mylohyoid n
SM to mylohyoid & anterior digastric mm

Chorda tympani* n (VII)
Para pre & Taste

Inferior alveolar n

Buccal n
To go in and innervate cheek (don’t get confused with buccal branch of CNVII)

Lingual n
SS, taste, para pre

Mental n SS

* Taste & parasympathetic pre-ganglionic

SS+parapost from otic ganglia (IX)

Somatosensory and somatomotor
Mandible

Foramen ovale

Eye

Ear

Greater wing of sphenoid

Maxilla

V_3

anterior

Posterior

Mandible
Chorda tympani
Anterior
Posterior
Ramus fractured
Chorda tympani

Ramus fractured
**V3: Mandibular Division of the Trigeminal Nerve:**

<table>
<thead>
<tr>
<th>Motor branches:</th>
<th>Sensory branches:</th>
<th>“Hitchhikers”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To muscles of mastication:</strong></td>
<td>• Buccal</td>
<td>• Chorda tympani (taste + para pre) from CN 7 joins lingual nerve*</td>
</tr>
<tr>
<td>• Masseter</td>
<td>• Lingual*</td>
<td>• Fibers from otic ganglion (para post) (CN 9) join auriculotemporal nerve*</td>
</tr>
<tr>
<td>• Deep Temporal</td>
<td>• Auriculotemporal*</td>
<td>➔ parotid gland?</td>
</tr>
<tr>
<td>• Medial Pterygoid</td>
<td>• Inferior Alveolar**</td>
<td></td>
</tr>
<tr>
<td>• Lateral Pterygoid</td>
<td></td>
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</tr>
</tbody>
</table>

PLUS

• **Mylohyoid nerve** to mylohyoid and anterior belly of digastric
• Nerves to tensor tympani and tensor veli palatini
Maxillary artery
Maxillary artery I

- Superficial temporal a
- Maxillary a
- Ext carotid a
- Inferior alveolar artery and nerve
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 Anaesthesia

1. Block injection

Mandibular nerve block (inferior alveolar nerve)
2. Local infiltration

Maxillary injections
Posterior Superior Alveolar Nerve Block (PSA)
Maxilla
Clinical correlation: trigeminal neuralgia

- Characterized by severe pain, paroxysmal, stabbing or burning, along the distribution of the trigeminal nerve
- Can be in the distribution of one or more divisions of the trigeminal nerve (V1, V2 and/or V3), usually unilateral
- Anatomic basis of neuralgia is abnormal activation of CNV
- Treatment options: neuroactive medications, injections, ablation, microvascular surgery and gamma knife (radiation)
Clinical correlation: Mandible fracture

- Commonly fractured facial bone because of prominence
- MUST assess patients with facial trauma for airway issues and head injury
- Mechanisms of injury include assaults, motor vehicle accidents, falls, penetrating trauma, sports
- Treatment involves reducing the fracture and fixating it so it can heal
Patient presents to the emergency department complaining of jaw pain after motor vehicle accident (unbelted driver)
Force applied to mandible + mandibular anatomy = type of fracture
Radiographs and physical exam to assess the injury:

*Note fracture at angle of mandible as well as at the symphysis/body area.
Treatment: open reduction (surgically approximate the bone fragments) and internal fixation (bone plates)

Risks: bleeding, swelling, nerve injury (inferior alveolar, lingual, mental)