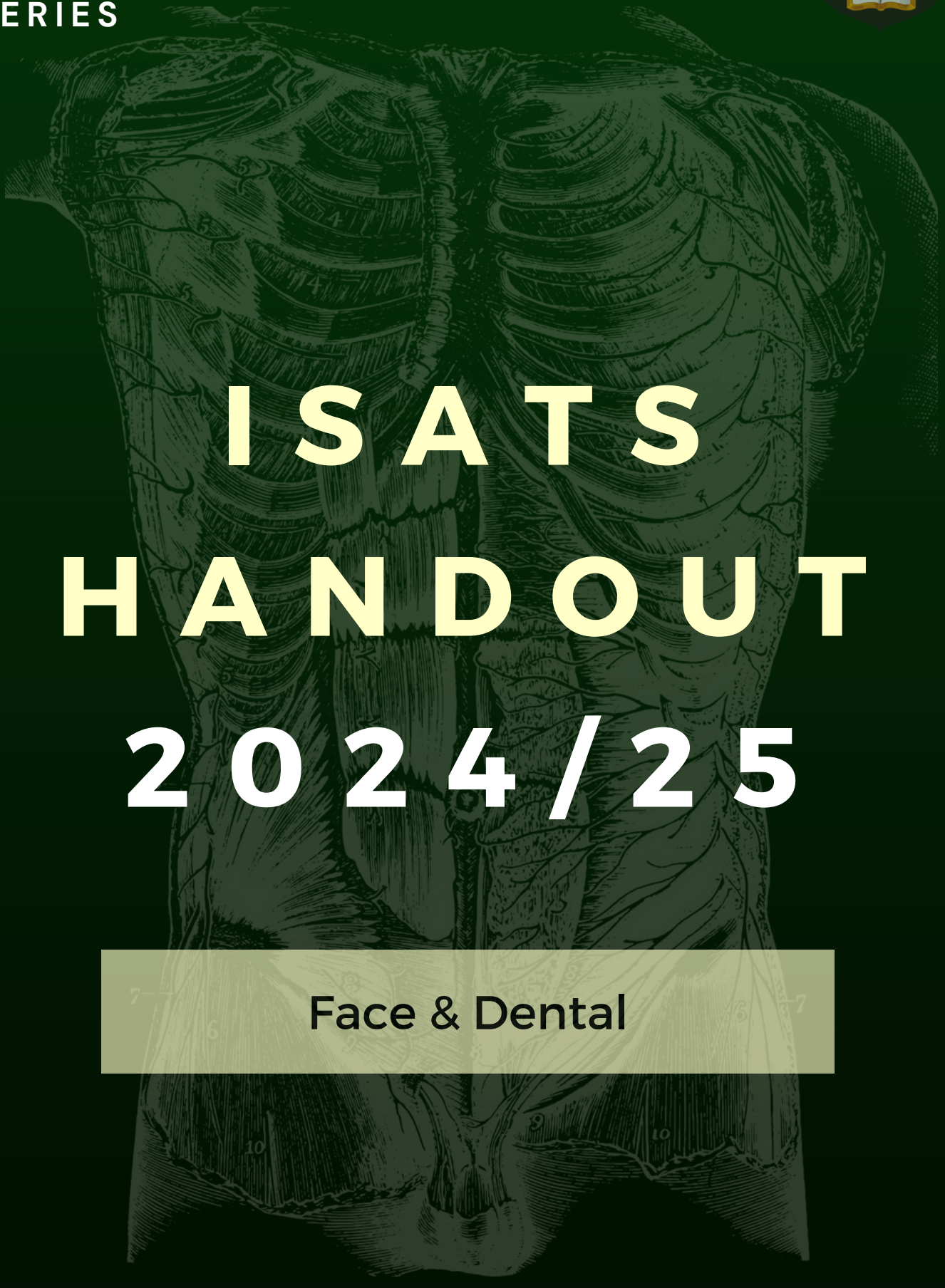
INTERNATIONAL SURGICAL ANATOMY TEACHING SERIES



ISATS HANDOUT 2024/25

Face & Dental

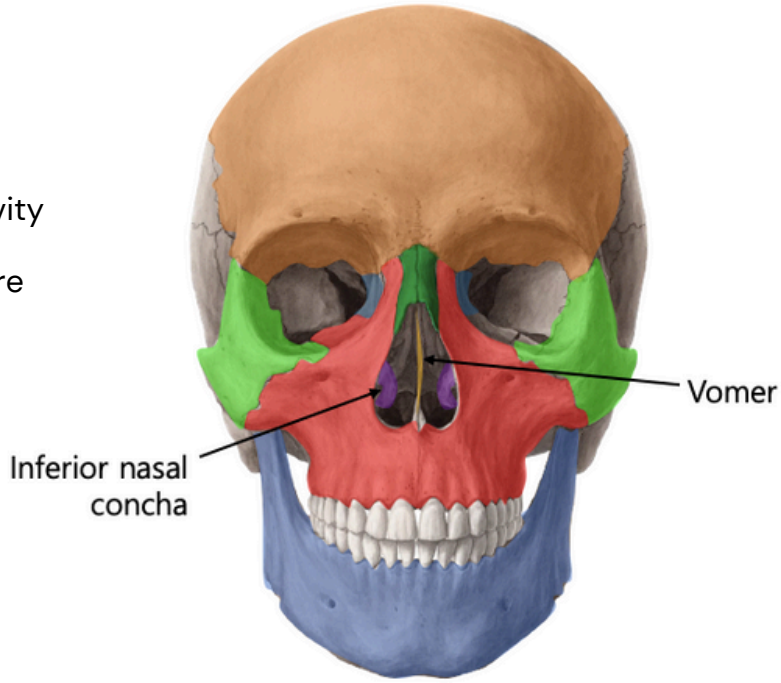
High Yield | Surgical Relevance | CPD Accredited

FACE & DENTAL ANATOMY

***Objectives**: Understand the bony anatomy of the viscerocranium, mandible and TMJ. Explain the gross anatomy of the muscles of facial expression & mastication. Trace important neurovascular structures in the face. Understand the gross anatomy of the oral cavity and palate. Apply anatomical knowledge in context of common procedures within Maxillofacial surgery.*

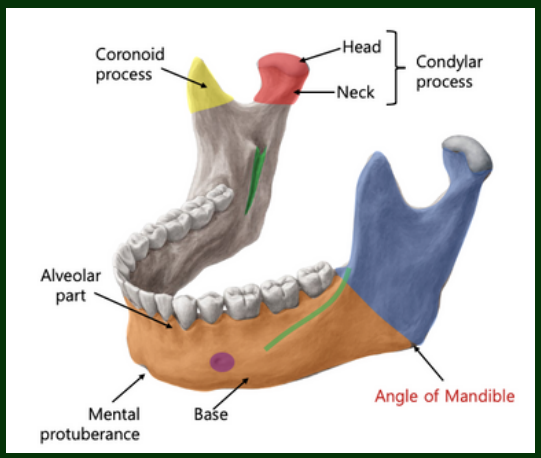
Bony Anatomy of The Face

- **Cranium**
  - **Neurocranium**
    - Calvaria - superior skull cap
    - Cranial base - floor of cranial cavity
  - **Viscerocranium** - facial skeleton
- Bones of the facial skeleton (all bones are paired except for the vomer)
  - Frontal bone
  - Nasal bone
  - Palatine bone
  - Maxilla
  - Zygomatic bone
  - Lacrimal bone
  - Inferior nasal concha
  - Vomer
  - Mandible



Mandible (Lower Jaw)

- **Components:**
  - **Body of mandible**
    - Base of mandible – mental protuberance & tubercles
    - Alveolar part of mandible – contains teeth
  - **Ramus of mandible**
    - Condylar & Coronoid processes
  - Angle of mandible
- **Mental foramen -** Contain mental a, v & n
- **Oblique foramen** – extends from ramus to body of mandible



Maxilla (Upper Jaw)

- Paired maxillae - forms upper jaw (space between orbit and upper teeth)
- **Anatomical relations**
  - Superiorly - rim of orbit
  - Laterally - zygomatic bone
  - Inferiorly - opening of oral cavity
- **Alveolar processes -->** contains arcade and forms upper jaw

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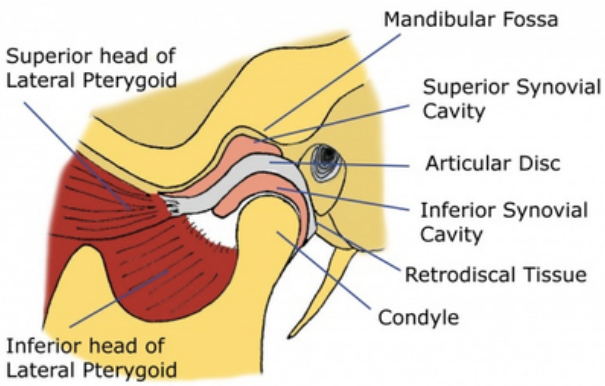
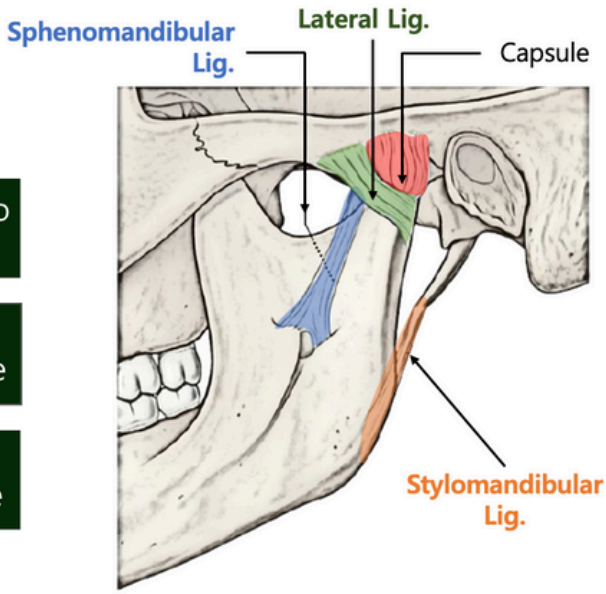
Temporomandibular Joint (TMJ)

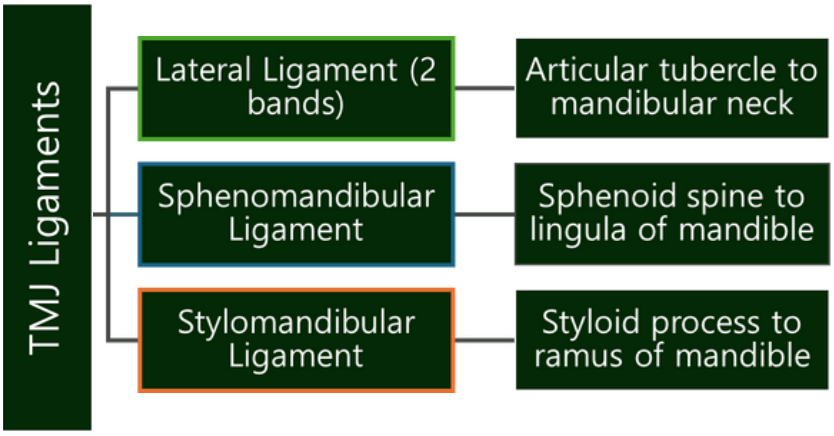
- TMJ - modified hinge synovial joint
- Articulations of mandible & cranium (temporal bone)
  - Mandibular fossa
  - Articular tubercle (temporal bone)
  - Head of mandible (condyle)
- **Movment**: protrusion, retraction, elevation, depression.

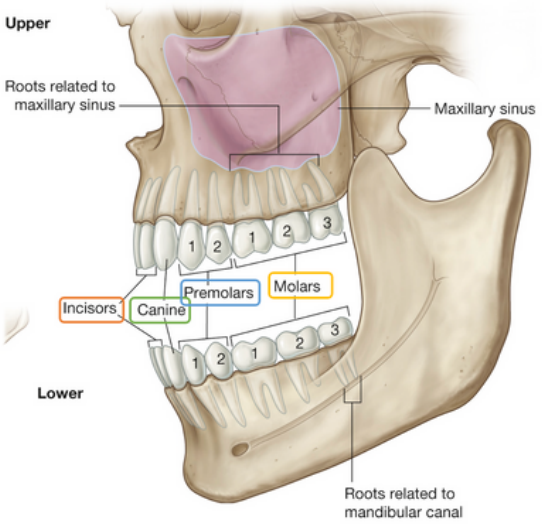


Ligaments:

1. Lateral ligament: articular tubercle to mandible neck
2. Sphenomandibular ligament: sphenoid spine to mandible ramus
3. Stylomandibular ligament: styloid process to angle of mandible







Teeth & Gingivae

- Teeth – attached to alveoli (sockets) of alveolar arches of the mandible & maxilla
- Gingivae (gums) – oral mucosa that surround teeth & cover adjacent regions of alveolar bone
- 32 teeth – 16 upper and lower arcades
  - Incisor - X2
  - Canine - X1
  - Pre-molar - X2
  - Molar - X3

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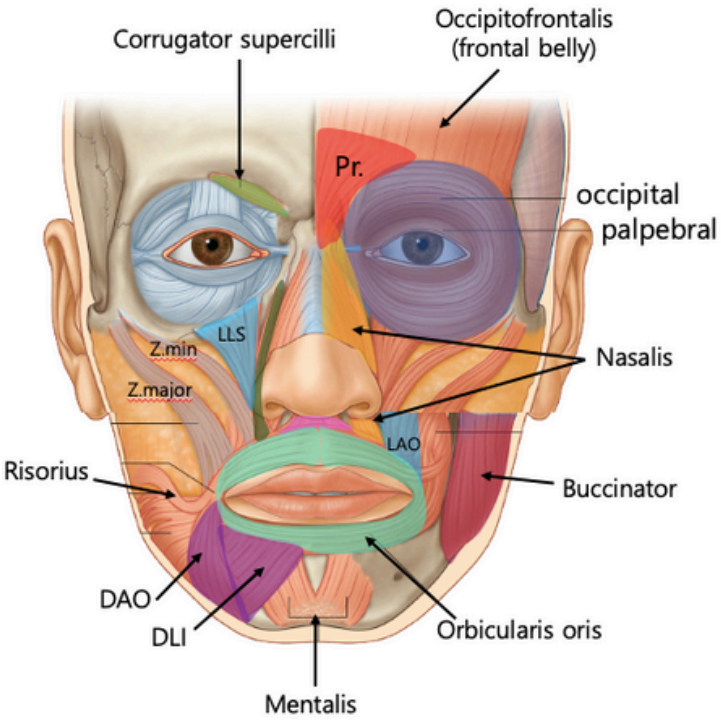
Muscles of Facial Expression

- Originate from bone or fascia
- Insert onto skin
- Innervation: **facial nerve (CNVII)**



Orbital Group

- Orbicularis Oculi (palpebral & orbital)
- Corrugator supercilli

Other Group

- Auricular muscles (anterior, superior, posterior)
- Occipitofrontalis (frontal & occipital belly)
- Platysma

Oral Group

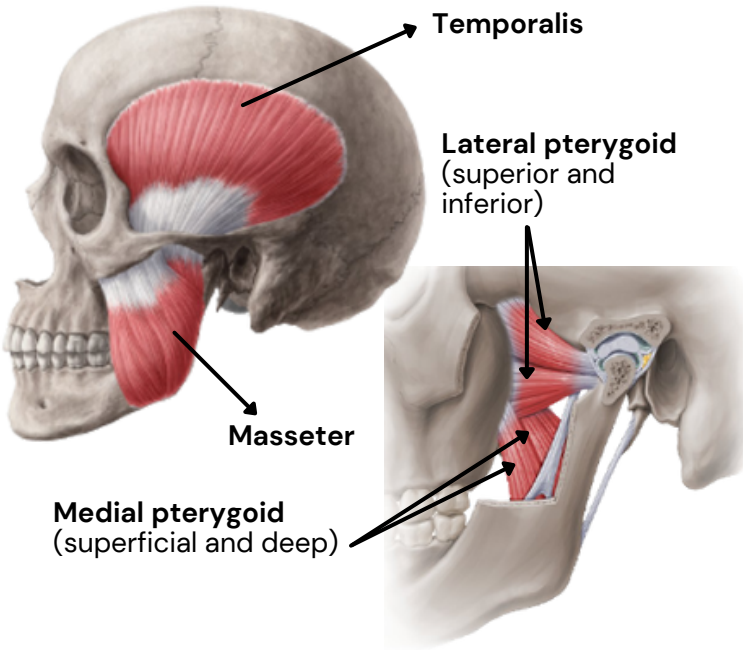
- Depressor anguli oris & Depressor labii inferioris
- Levator anguli oris & Levator labii superioris
- Levator labii superioris alaeque nasi
- Orbicularis oris
- Mentalis & Risorius
- Buccinator
- Zygomaticus major & minor

Nasal Group

- Nasalis (transverse & alar part)
- Procerus
- Depressor septi nasi

Muscles of Mastication

Muscle	Function	Innervation
Masseter	Elevation of mandible	CNV3 (masseteric nerve)
Temporalis	Elevation & retraction of mandible	CNV3 (deep temporal nerves)
Medial Pterygoid	Elevation, side-to-side movement (unilateral), protrusion (bilateral)	CNV3 (nerve to medial pterygoid)
Lateral Pterygoid	Protrusion & side-to-side movements (unilateral),	CNV3 (nerve to lateral pterygoid)



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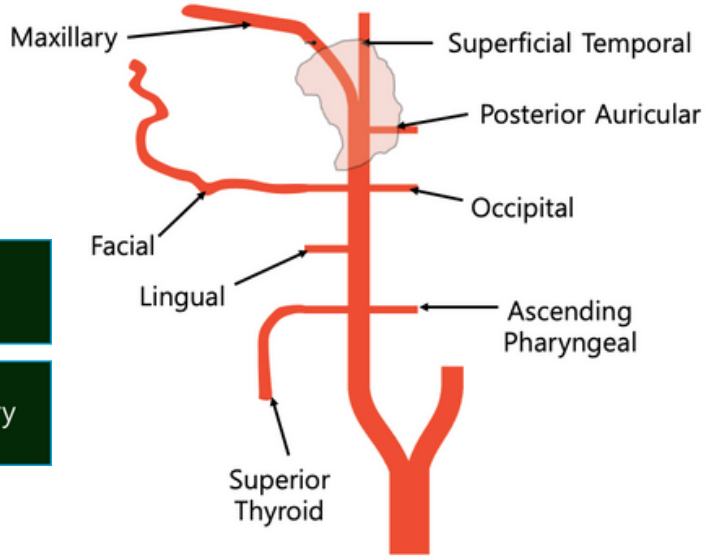
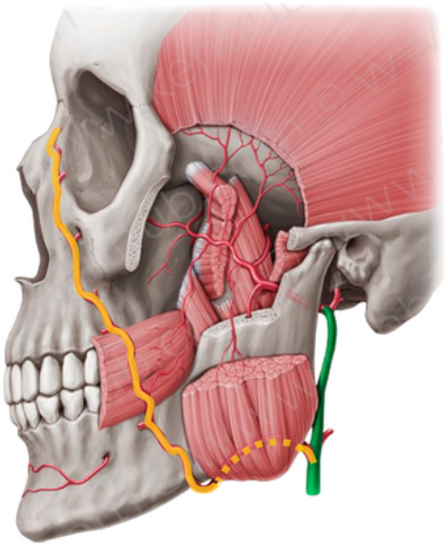
Arterial Supply of the Face - ECA

- 8 branches
- Supply head, face and meninges
- Terminal branches: superficial temporal and maxillary artery (within the parotid gland)

Superior thyroid	Ascending pharyngeal	Lingual	Facial
Occipital	Posterior auricular	Superficial temporal	Maxillary

Some **A**natomists **L**ike **F**reaking **O**ut **P**oor **M**edical



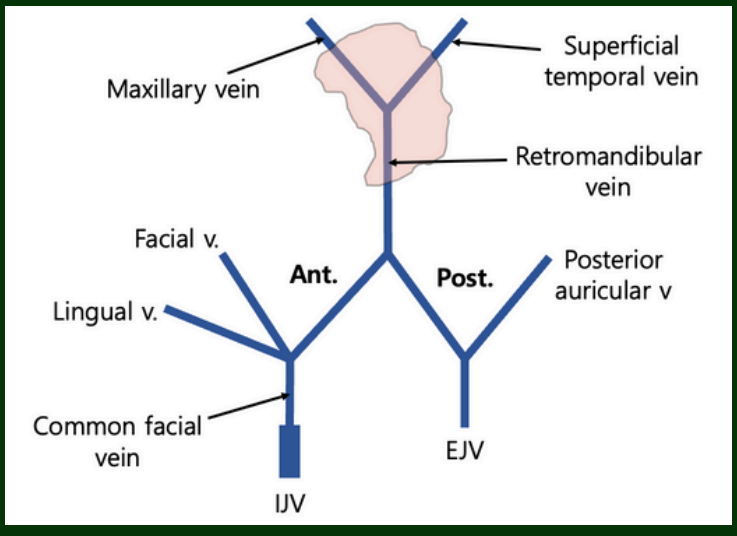


Course of the Facial Artery

Branches from anterior surface of ECA → Passes through deep neck structures → Posterior to submandibular gland → Curves across inferior border of mandible & enters face → Extends upwards and medially – tortuous course → Terminates as **angular artery** at medial corner of eye

Venous Drainage of the Face

- Retromandibular – formed from superficial temporal + maxillary vein
- **Anterior branch**
  - Drain into common facial vein
  - Drains into IJV
- **Posterior branch**
  - Joins with posterior auricular vein
  - Drains into EJV



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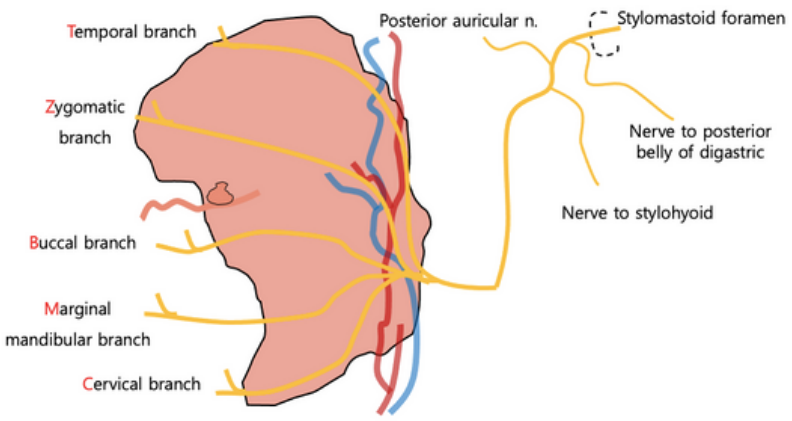
Facial Nerve (CNVII)

- Facial nerve penetrates space between superficial & deep lobes of parotid gland
- Divides into temporofacial branch + cervicofacial branch
- 5 terminal branches
  - Temporal
  - Zygomatic
  - Buccal
  - Marginal mandibular
  - Cervical



Intracranial → Stylomastoid foramen → 3 Extracranial branches → Parotid → 5 terminal branches

Trigeminal Nerve (CNV)

- Trigeminal nerve – provides cutaneous sensory innervation to most of the face

Ophthalmic Nerve (V1)

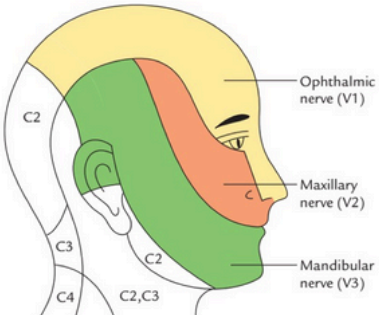
- **Exit skull** - superior orbital fissure
- **Main branches:** frontal, nasociliary, lacrimal
- **Supply**: Orbit, superior eyelids, forehead, scalp and anterior nose

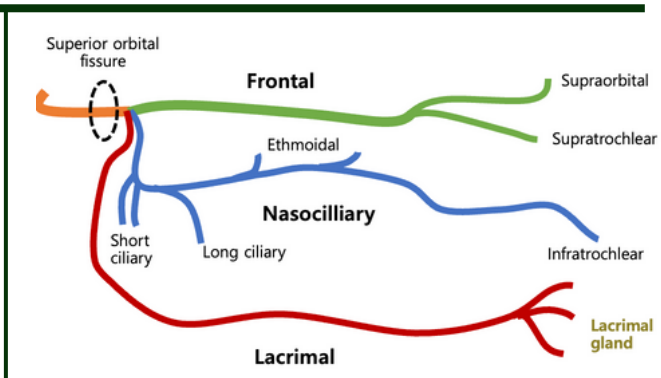
Maxillary Nerve (V2)

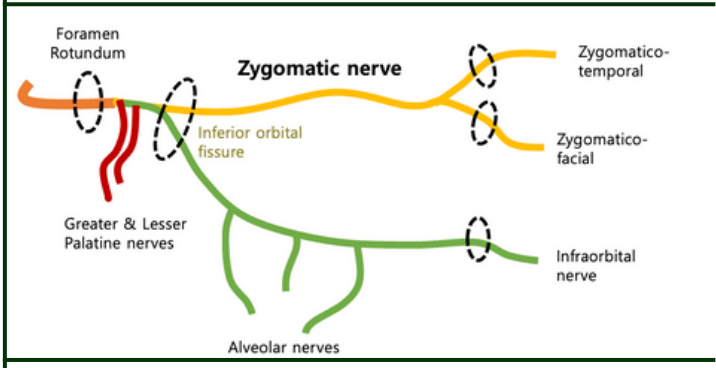
- **Exit skull** - foramen rotundum
- **Main branches:** zygomatic, greater & lesser palatine, infraorbital, alveolar
- **Supply**: temple, lower eyelid, cheek, upper lip

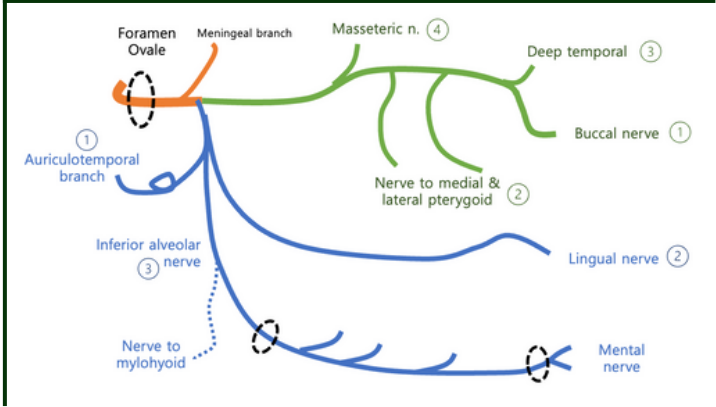
Mandibular Nerve (V3)

- **Exit skull** - foramen ovale
- **Main branches:** auriculotemporal, lingual, inferior alveolar, buccal, nerves to muscles of mastication
- **Supply**: anterior ear, temples, chin & lower lip, muscles of mastication









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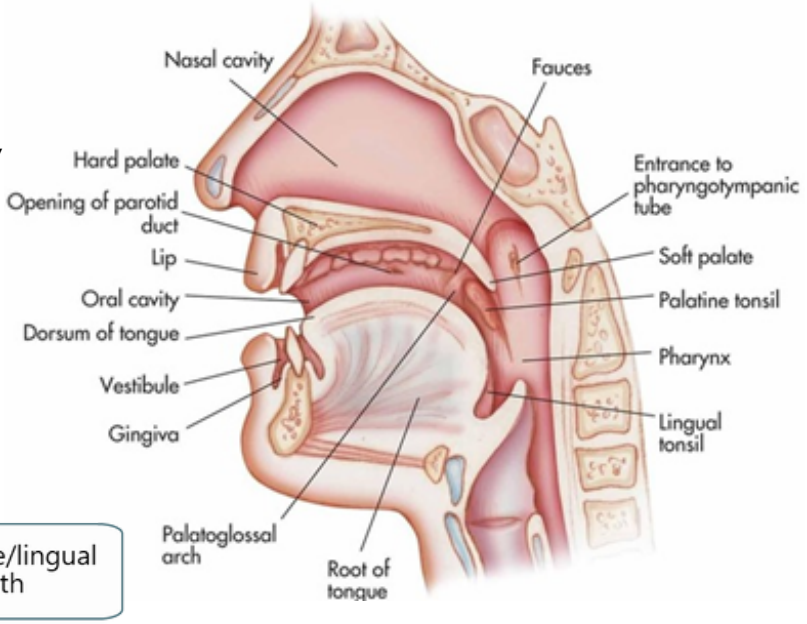
Oral Cavity

- **Oral cavity**
  - Extends between oral fissure anteriorly to oropharyngeal isthmus posteriorly (opening of oropharynx)
- Function: digestion, communication, breathing
- Divisions – communicate via space behind 3rd molar



Vestibule

- Space between lips/cheeks and gums/teeth
- Oral fissure controlled by orbicularis oris

Oral Cavity Proper

- Posterior to palatine/lingual surface of teeth
- Roof: hard and soft palate
  Lateral: cheeks, buccinator
  Floor: mylohyoids, geniohyoids
  Content: tongue & salivary glands

Hard & Soft Palate

- Palate – roof of oral cavity and floor of nasal cavity

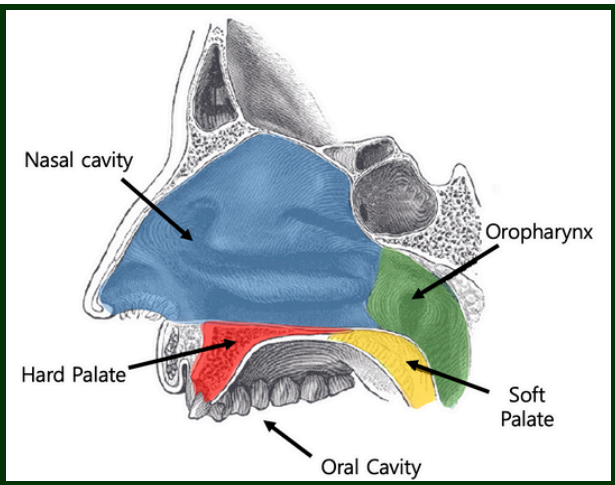
Hard Palate

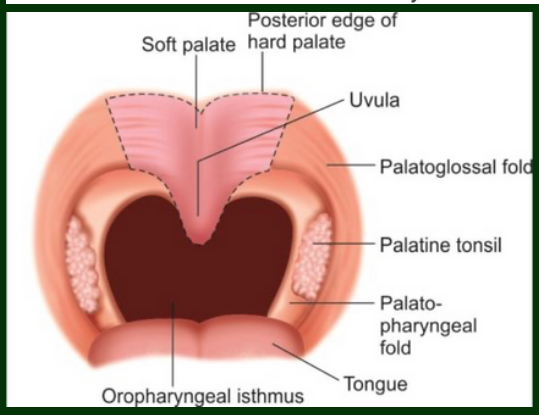
- Separates oral cavity from nasal cavity
- Bony structures: palatine process of maxilla, horizontal plate of palatine bones
- Mucosa of hard palate – contain **palatine rugae**

Soft Palate

- Continues posteriorly from hard palate
- Covered by mucosa continuous with pharynx, oral & nasal cavities.
- Formed of 5 muscle covered in mucous membrane (CNX except tensor veli palatini – CNIX)
- Central midline process – **uvula**

A: greater and lesser palatine arteries
V: pterygoid venous plexus
N: sensory (CNV2) – lesser and greater palatine nerves

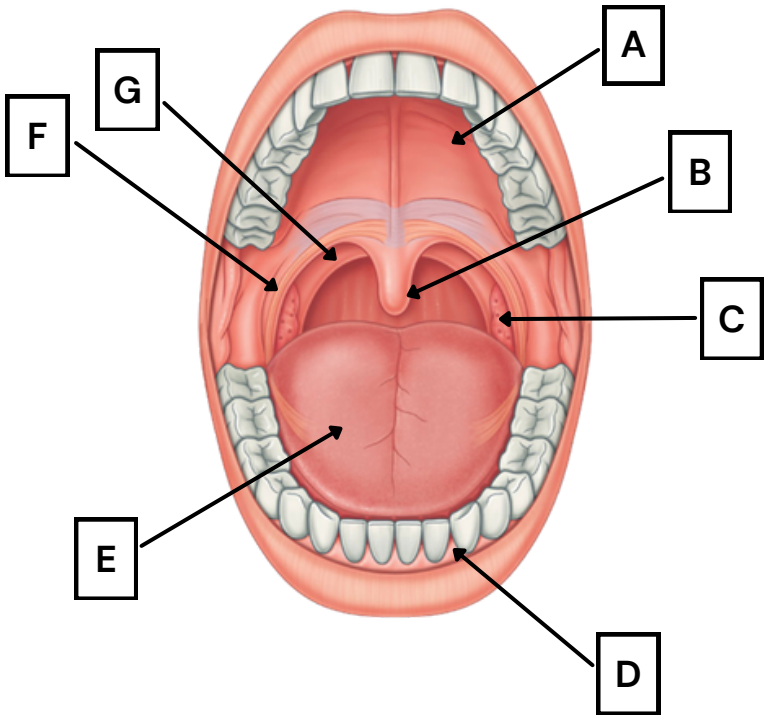




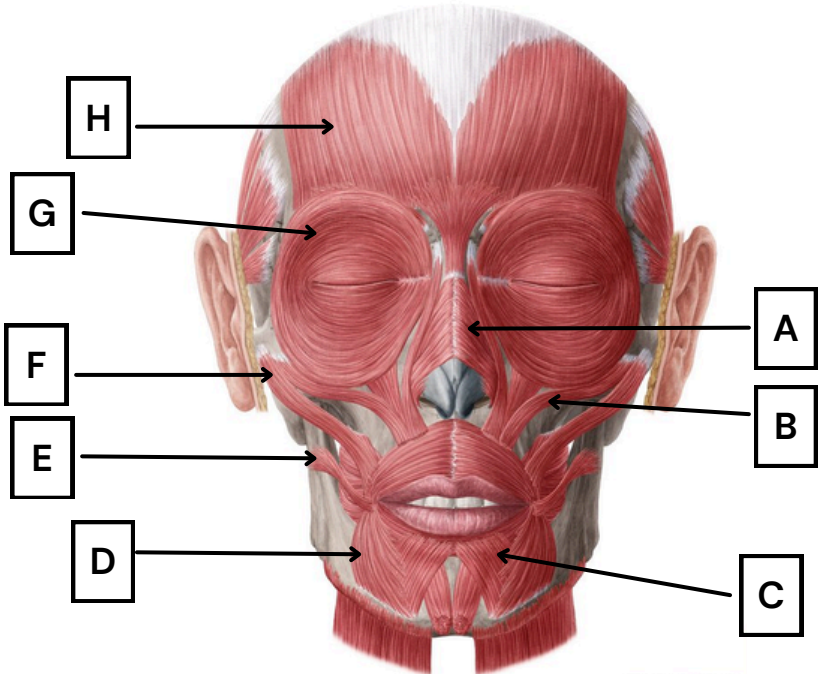
FACE & DENTAL ANATOMY

Test yourself

1) Label the parts of the oral cavity on the following diagram:



2) Label the muscles of facial expression on the following diagram:



FACE & DENTAL ANATOMY

Test yourself

MCQ 1

A 35-year-old man presents to the emergency department after a facial trauma. The patient reports loss of sensation in his upper lip. Further testing reveals damage to the maxillary nerve (V2). Which of the following symptoms would also likely fit this diagnosis?

A. Loss of sensation in the lower lip
B. Difficulty chewing
C. Loss of sensation in the cheeks
D. Inability to close the eye
E. Difficulty swallowing

MCQ 2

The mandible articulates with the temporal bone at the TMJ. Which specific part of the mandible makes this articulation?

A. Mandibular fossa
B. Coronoid process
C. Condylar process
D. Ramus of the mandible
E. Mental protuberance

MCQ 3

The masseter aids with protrusion and which other movement of the mandible?

A. Retraction
B. Side-to-side movement
C. Depression
D. Elevation
E. Rotation

MCQ 4

Which ligament of the temporomandibular joint prevents posterior dislocations?

A. Lateral ligament
B. Stylomandibular ligament
C. Sphenomandibular ligament
D. Medial pterygoid ligament
E. Zygomaticomandibular ligament

MCQ 5

The facial nerve exits the skull through which foramen to supply the muscles of facial expression?

A. Foramen rotundum
B. Foramen ovale
C. Jugular foramen
D. Stylomastoid foramen
E. Hypoglossal canal

MCQ 6

The mandibular nerve (V3) is the only branch of the trigeminal nerve that provides motor innervation to a muscle group. To which facial muscle group does it provide motor innervation?

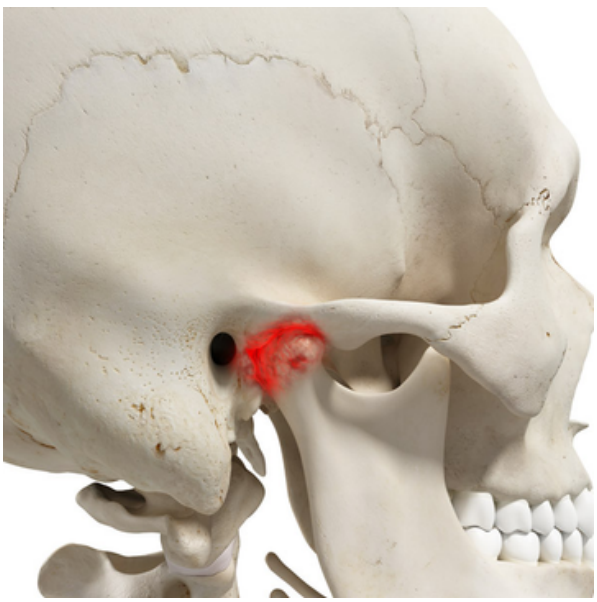
A. Muscles of facial expression
B. Muscles of mastication
C. Tongue muscles
D. Pharyngeal muscles
E. Muscles of the soft palate

FACE & DENTAL ANATOMY

Test yourself

OSCE Station – Case Based Discussion

John, a 28-year-old male, presents to the maxillofacial clinic with a 3-month history of intermittent pain in his jaw, particularly when chewing or yawning. He reports a clicking sound on the right side of his jaw when opening his mouth wide, along with occasional headaches and ear discomfort. There is no history of facial trauma, but he mentions a habit of grinding his teeth at night (bruxism). On examination, there is tenderness over the right temporomandibular joint (TMJ). It was determined that he had TMJ dysfunction.



Q1. What self-management options could be recommended for this patient?

Q2. When would specialist intervention be considered for TMJ dysfunction?

Q3. List two possible specialist management options for TMJ dysfunction.

Q4. What are two potential complications of untreated TMJ dysfunction?

Q5. List four red flag symptoms that need to be ruled out when a patient presents with orofacial pain.

Answers:
Labelling: 1) A: Hard palate, B: Uvula, C: Palatine tonsil, D: Gingivae, E: Tongue, F: Palatoglossal arch, G: Palatopharyngeal arch
2) A: Nasalis, B: Zygomaticus minor, C: Depressor labii inferioris, D: Depressor anguli oris, E: Risorius, F: Zygomaticus major, G: Obicularis oculi, H: Occipitofrontalis
MCQs: 1) C **2)** C **3)** D **4)** A **5)** D **6)** B
OSCEs:
1) Encourage self-management to control symptoms and limit functional impairment. This involves adopting a soft diet and resting the jaw if they are experiencing acute pain, avoiding parafunctional activities that can exacerbate symptoms such as wide yawning, teeth grinding, chewing gum and nail-biting. Using ice packs, heat pads or massaging the affected areas may also be beneficial.
2) For patients with significant functional impairment of the TMJ and/or an intra-articular disorder such as an anterior disc replacement or degenerative joint disease.
3) Intra-articular injection of sodium hyaluronate or corticosteroids for patients with degenerative joint disease and surgical options such as arthrocentesis, arthroplasty (for those with severe TMJ degeneration), eminectomy/eminoplasty (for those with recurrent TMJ dislocation) and total prosthetic TMJ replacement for end-stage degenerative disease.
4) Swallowing and chewing difficulties due to pain and speech problems related to exacerbation of pain when speaking.
5) Facial asymmetry, facial mass or swelling or profound trismus (may indicate a neoplastic, infective or inflammatory cause), pain with exertion, coughing or sneezing (may indicate raised intracranial pressure), history of recent head or neck trauma, history of malignancy.