INTERNATIONAL SURGICAL ANATOMY TEACHING SERIES

ISATS HANDOUT 2023/24

Face & Dental

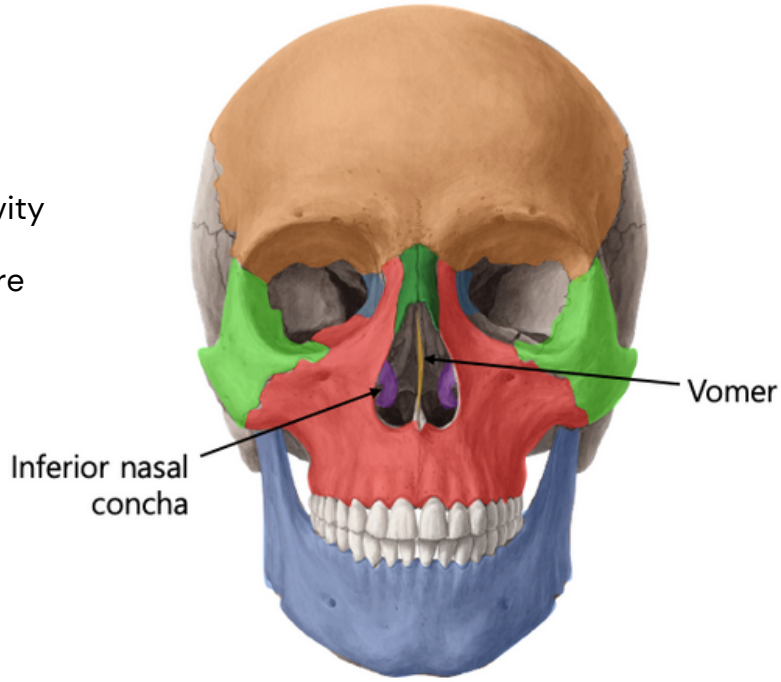
High Yield I Surgical Relevance I CPD Accredited

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.*

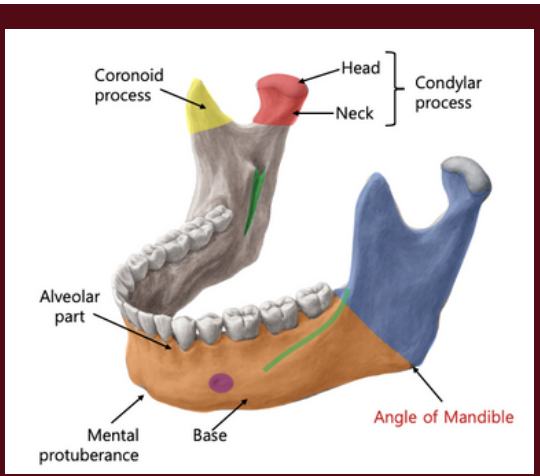
Bony Anatomy of The Face

- **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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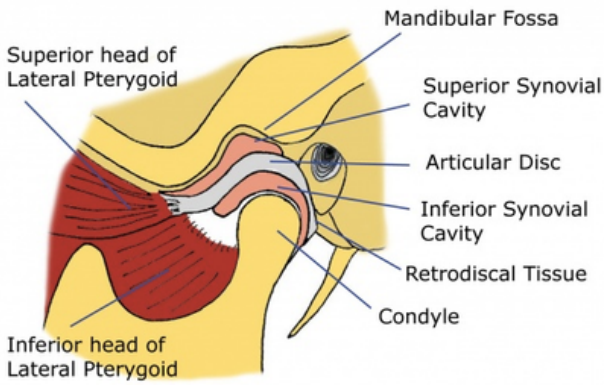
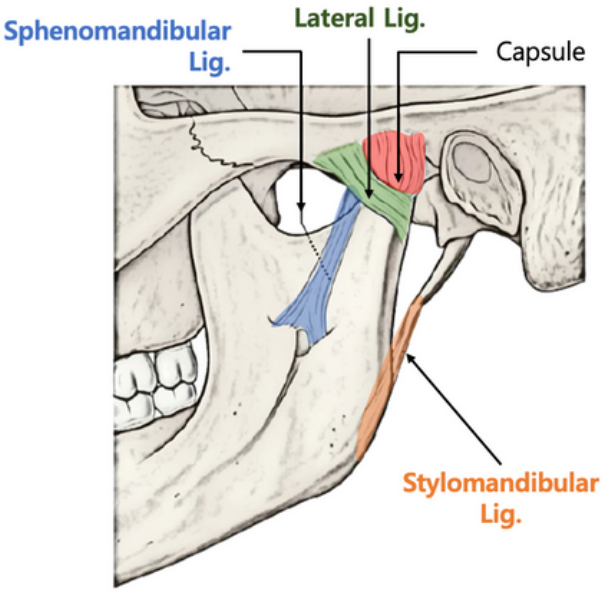
Temporomandibular Joint (TMJ)

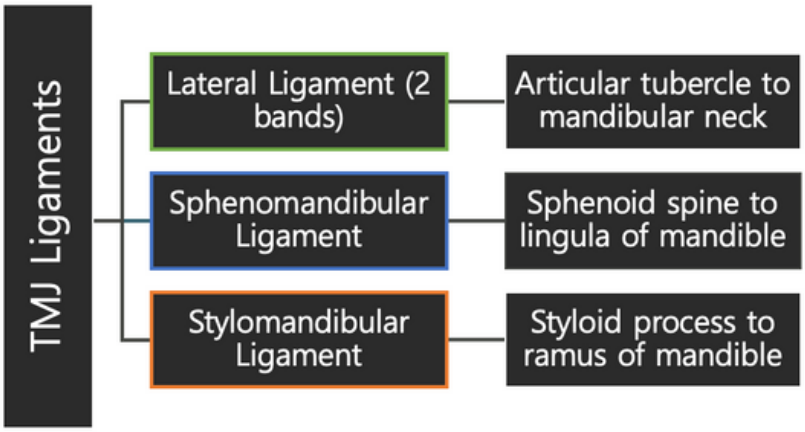
- TMJ - modified hinge synovial joint
- Articulations of mandible & cranium (temporal bone)
  - Mandibular fossa
  - Articular tubercle (temporal bone)
  - Head of mandible (condyle)
- **Movment**: protrusion, retraction, elevation, depression.

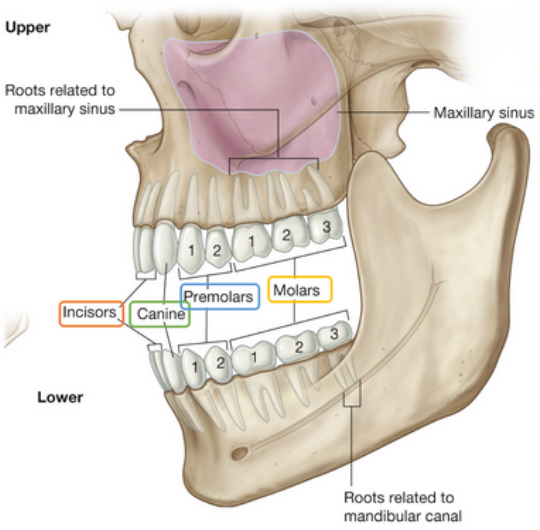


Ligaments:

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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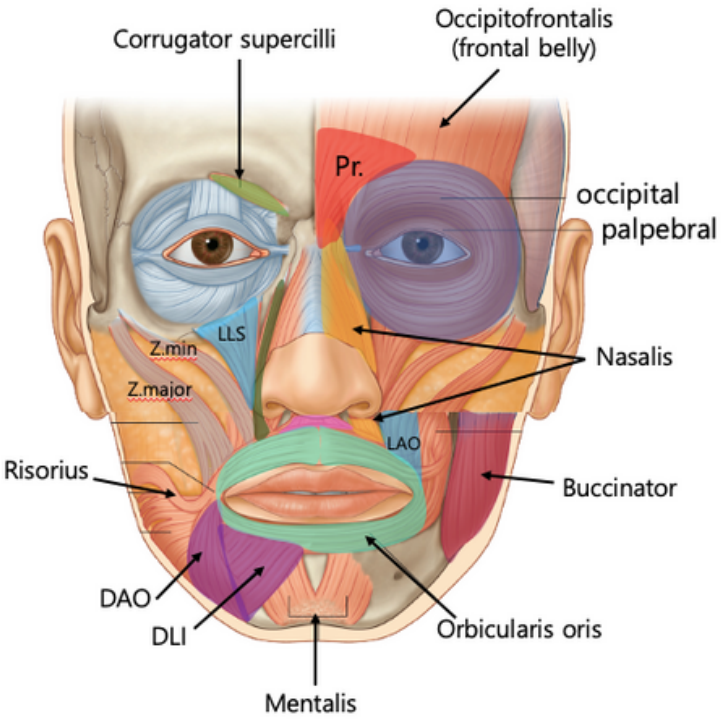
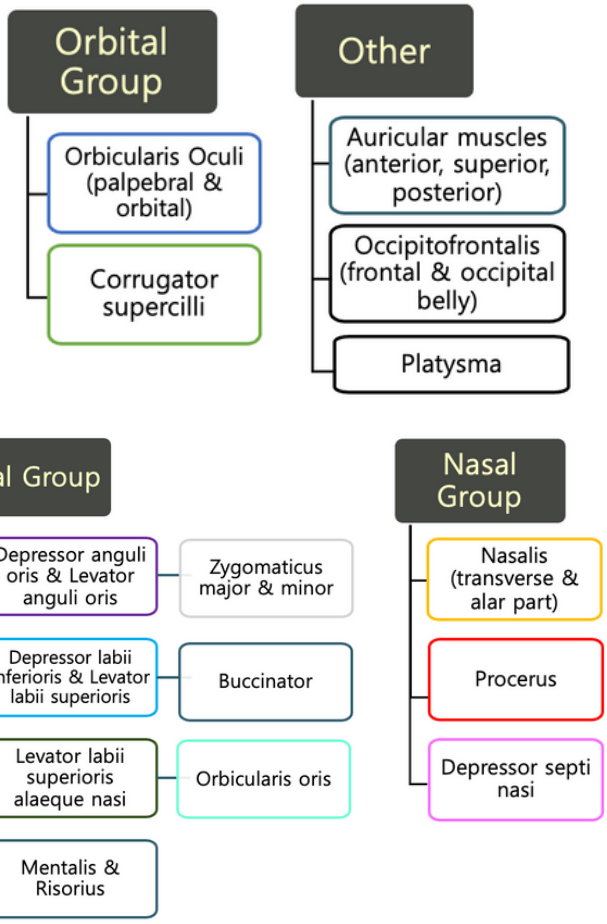
Muscles of Facial Expression

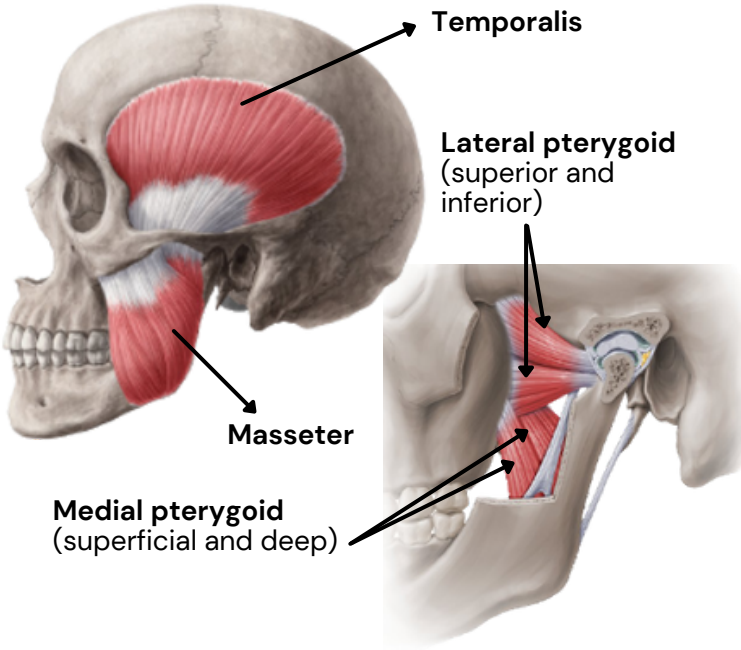
- Originate from bone or fascia
- Insert onto skin
- Innervation: **facial nerve (CNVII)**





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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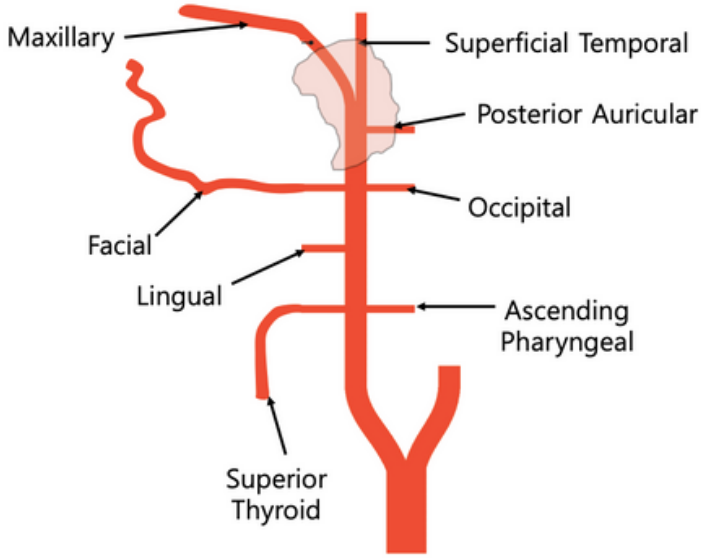
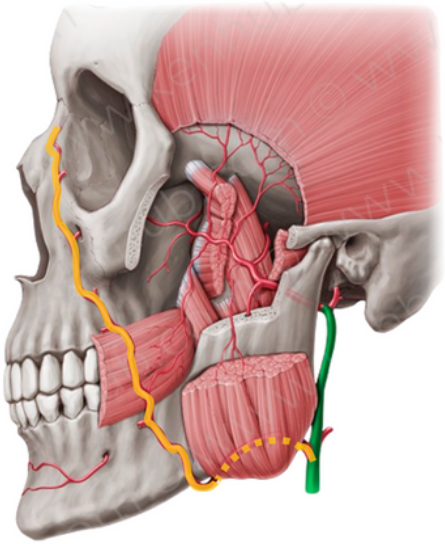
Arterial Supply of the Face - ECA

- 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



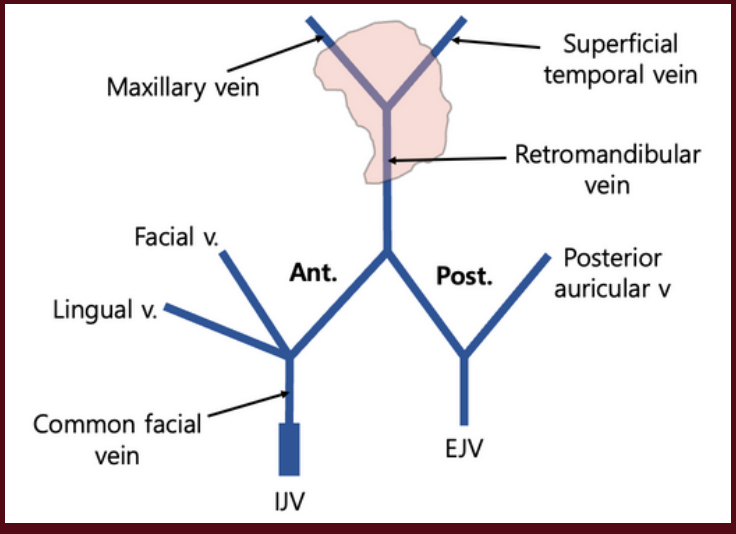


Course of the Facial Artery

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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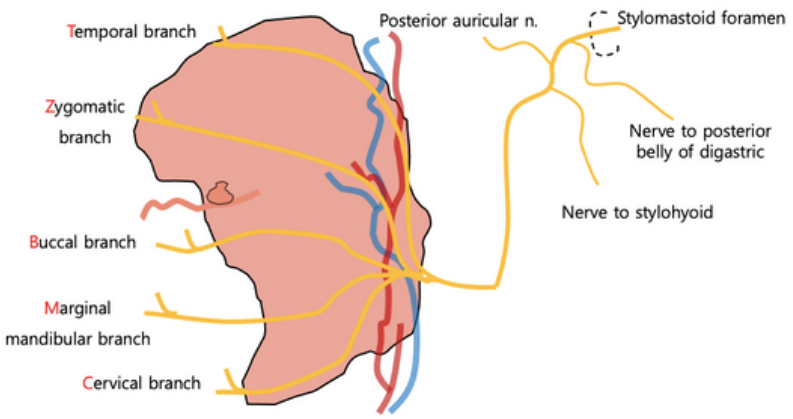
Facial Nerve (CNVII)

- 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)

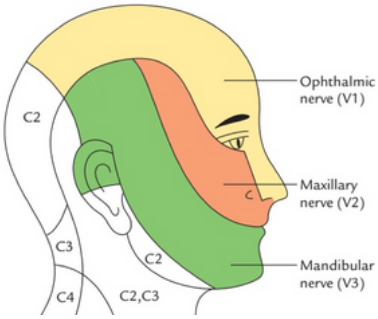
- **Exit skull** - superior orbital fissure
- **Main branches:** frontal, nasociliary, lacrimal
- **Supply**: Orbit, superior eyelids, forehead, scalp and anterior nose

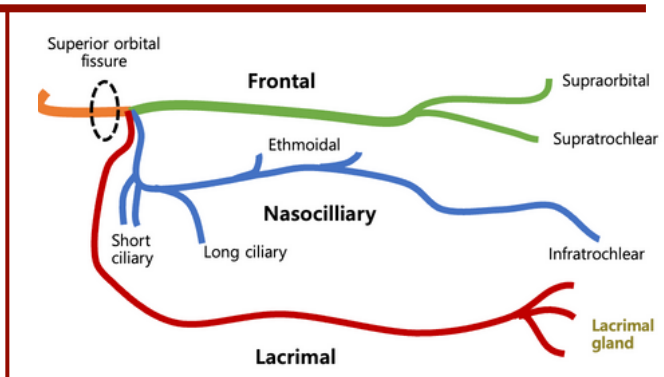
Maxillary Nerve (V2)

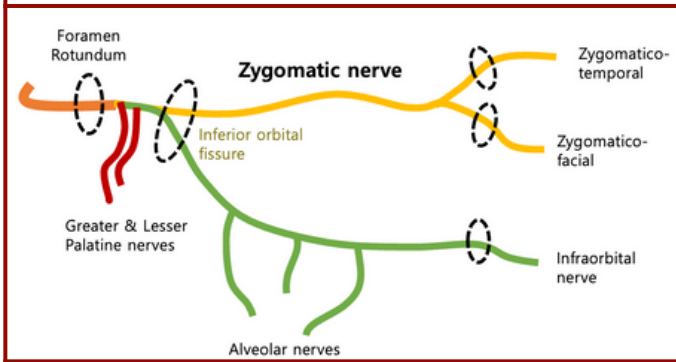
- **Exit skull** - foramen rotundum
- **Main branches:** zygomatic, greater & lesser palatine, infraorbital, alveolar
- **Supply**: temple, lower eyelid, cheek, upper lip

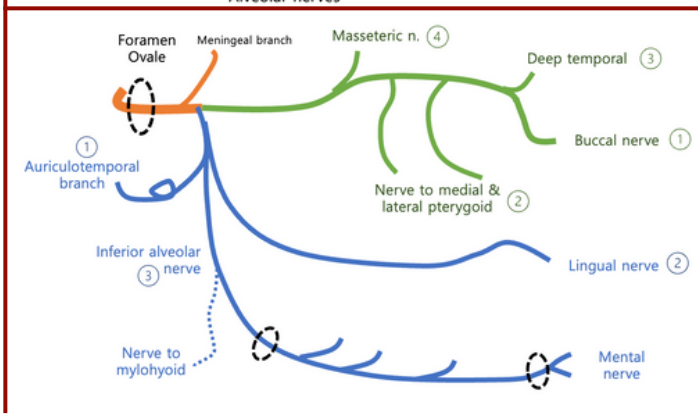
Mandibular Nerve (V3)

- **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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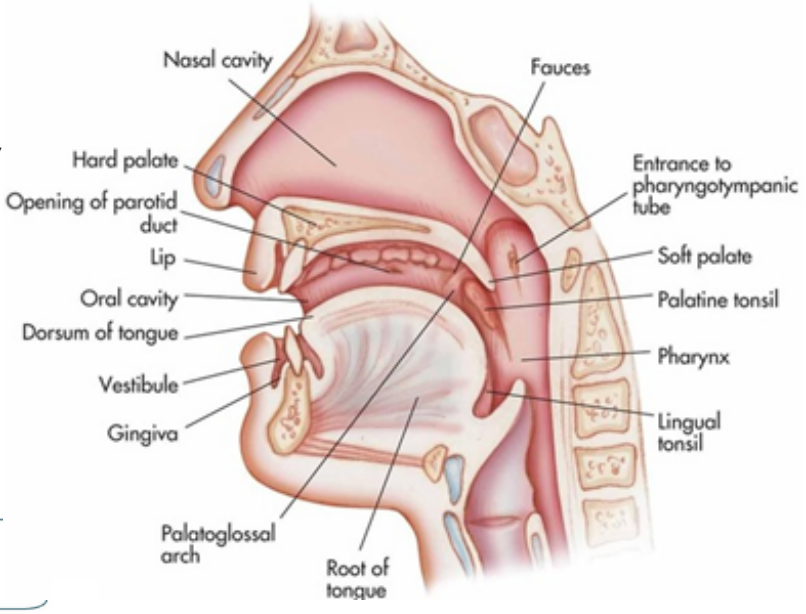
Oral Cavity

- **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 vestibule
- Roof: hard and soft palate
  Cheeks: buccinator
  Floor: mylohyoids, geniohyoids
  Content: tongue & salivary glands

Hard & Soft Palate

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

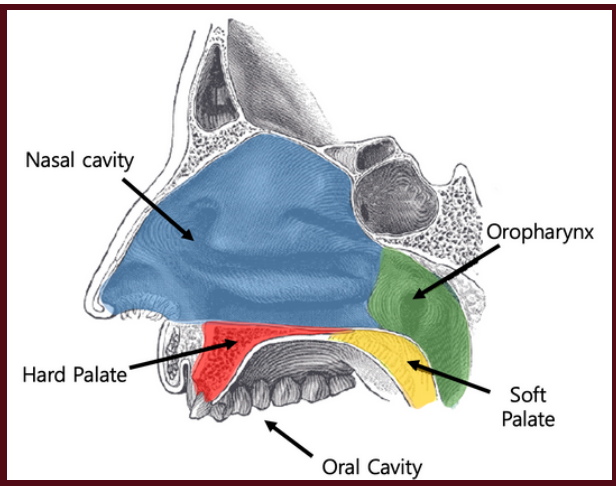
Hard Palate

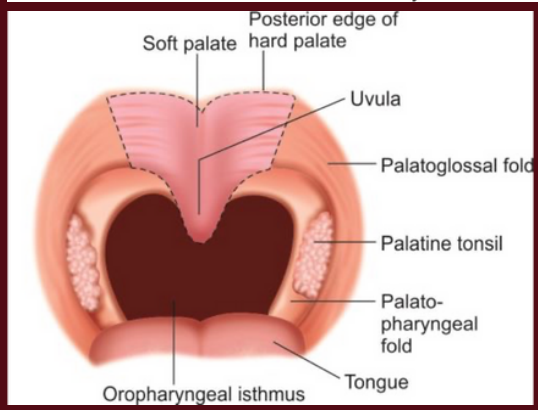
- Separates oral cavity from nasal cavity
- Bony structures: palatine process of maxilla, horizontal plate of palatine bones
- Mucosa of hard palate – contain **palatine rugae**

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 arterial branches of the face on the following diagram?

A)

B)

C)

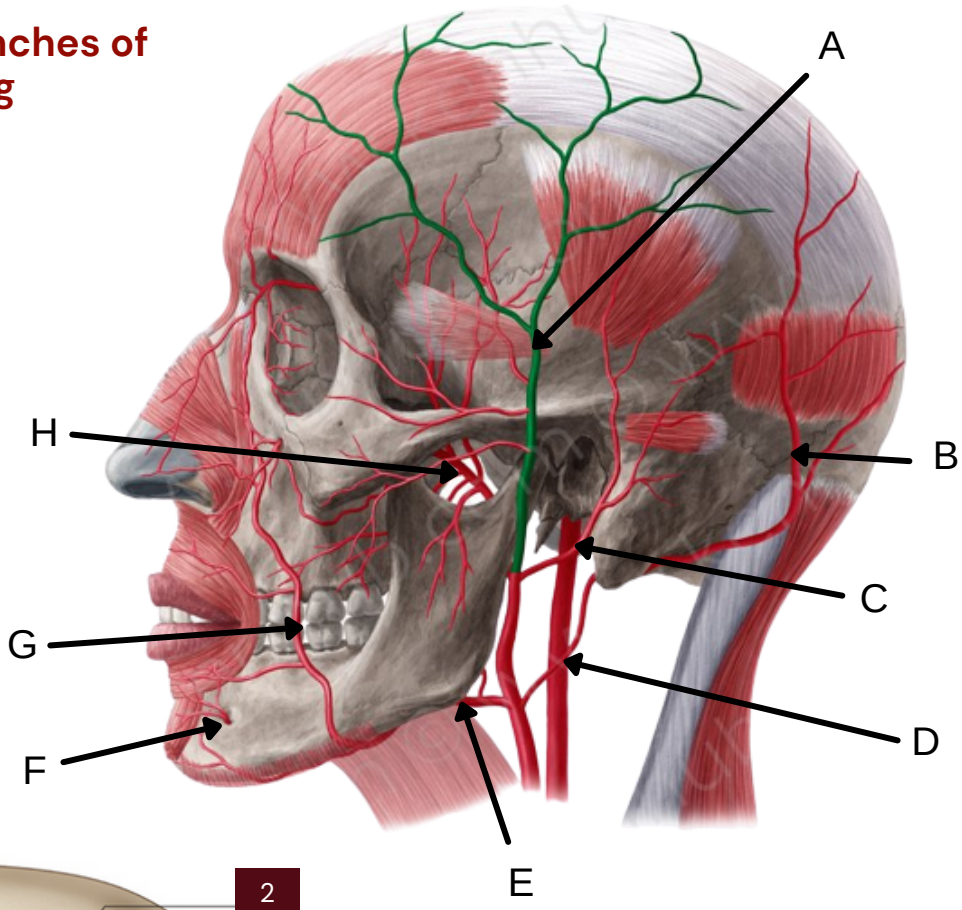
D)

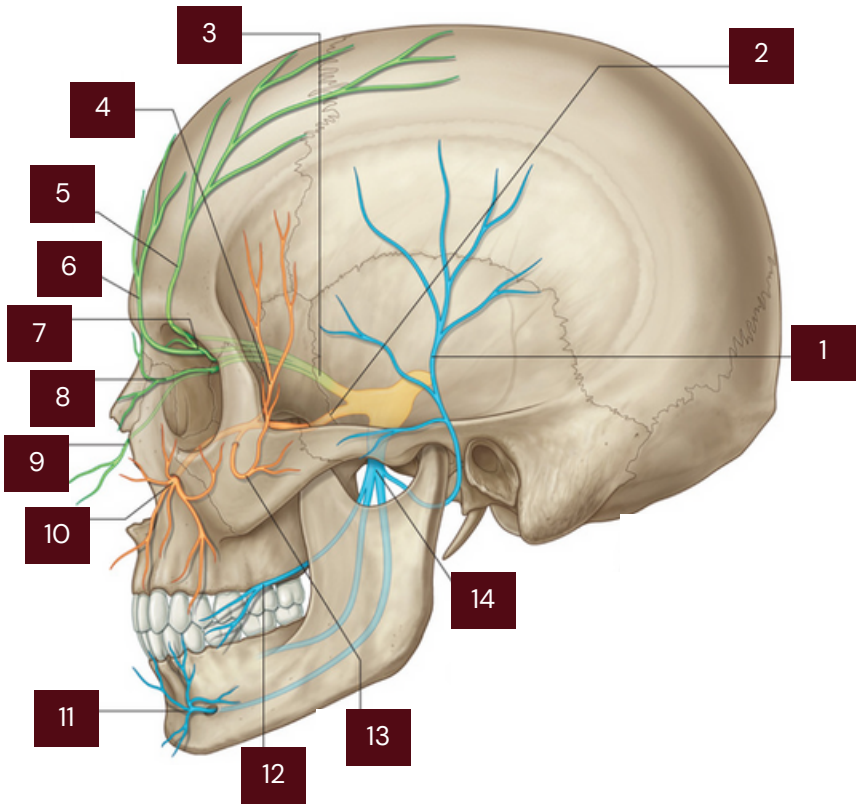
E)

F)

G)

H)





2) Label the branches of the trigeminal nerve on the diagram below:

1)

2)

3)

4)

5)

6)

7)

8)

9)

10)

11)

12)

13)

14)

FACE & DENTAL ANATOMY

Test yourself

MCQ 1

A 30-year-old female presents to the emergency department with knife lacerations to the face. On examination, one laceration is a deep wound to the superior aspect of the chin. Which artery is most likely damaged by this lesion?

A. Superficial temporal artery
B. Facial artery
C. Angular artery
D. Mental artery
E. Buccal artery

MCQ 2

Which ligament of the TMJ provides intrinsic stability to the joint?

A. Lateral ligament
B. Sphenomandibular ligament
C. Stylomandibular ligament
D. TMJ Capsule
E. Mastoid-mandibular ligament

MCQ 3

What is the gold standard investigation for diagnosing Sialolithiasis?

A. Ultrasound
B. CT head with contract
C. MRI
D. CT angiogram
E. X-ray saliogram

MCQ 4

Paralysis of which nerve would result in paralysis of the buccinator muscle and the superior portion of the orbicularis oris muscle?

A. CNVII
B. Buccal branch of CNV3
C. Buccal branch of CNVII
D. Zygomaticofacial nerve of CNV2
E. Marginal mandibular branch of CNVII

MCQ 5

The maxillary nerve passes through which foramen of the skull to innervate the temples, lower eye lid, cheek and upper limb?

A. Superior orbital fissure
B. Foramen rotondum
C. Foramen ovale
D. Stylomastoid foramen
E. Jugular foramen

MCQ 6

The anterior branch of the retromandibular vein drains into which of the following veins before eventually draining into the internal jugular vein?

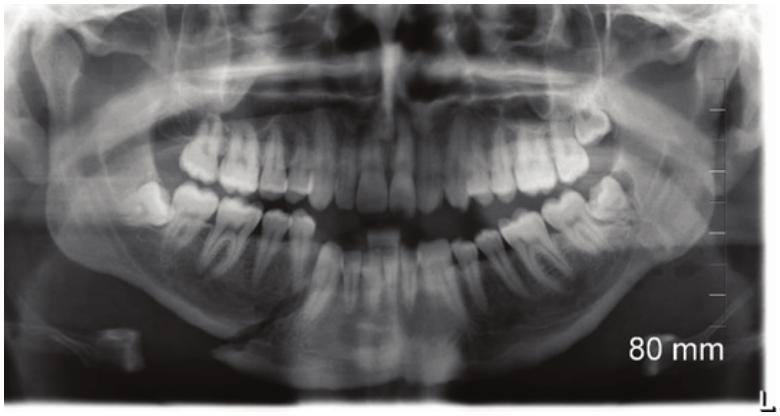
A. Lingual vein
B. Common facial vein
C. Facial vein
D. Posterior auricular vein
E. External jugular vein

FACE & DENTAL ANATOMY

Test yourself

OSCE Station - Case Based Discussion

Ben is a 37 year old patient who is brought into resus via ambulance following an extensive road traffic accident. The patient presents with a deep laceration in the buccal region extending into the oral cavity, contusion around the right orbit, and soft tissue injuries to the nasal region and chin.



On examination, there is paraesthesia along the CNV3 distribution, significant tenderness on palpation of the TMJ with associated crepitus and trismus.

Intra-oral examination showed a broken tooth (second lower lateral incisor) but its location is not visible within the oral cavity. The doctors perform a swift A-E assessment to stabilise the patient, and immediately proceed to contact the maxillofacial registrar on call for urgent review. In the meantime, a orthopantomogram (OPG) is requested (as shown above).

Q1. What are the key injuries this patient has presented with?

Q2. Describe the major structures from superficial to deep that are affected in this patient's laceration to the buccal region.

Q3. Interpret the OPG X-ray film above, what is your diagnosis?

Q4. How would you manage this patient initially?

Q5. Why does this patient need an urgent chest x-ray?

Q6. What would be some of the definitive surgical management options following referral to OMFS (Oral Maxillofacial Surgery)?

Answers
MCQs. **1)** D, **2)** A, **3)** E, **4)** C, **5)** B, **6) B** OSCEs: 1) This trauma patients following a RTA has presented with significant facial trauma with injuries including: deep facial laceration, trauma to the right orbit where imaging is required to exclude a possible orbital fracture, trauma/suspected to the mandible due to tenderness and trismus. 2) A facial laceration in the buccal region would involve passing through the following structures: buccal skin and superficial fascia, buccal fat, masseter muscle, buccal fat pad, buciniator muscle, submucosal layer of the mouth, buccal mucosa of the mouth. This can also damage structures including the buccal branch of the facial nerve, buccal branch of the CNV3, braches of the facial artery, and the facial vein. 3) OPG film shows a parasymphysis mandibular fracture. The most common sites of mandibular fracture include the angle, para-symphysis and condyle. This is associated with recent trauma, extra-oral bruising and swelling, TMJ tenderness, asymmetry, step deformities, crepitus and trismus. 4) This patient requires an A-E assessment to stabilise the patient. Analgesia will be required to manage pain, and antibiotics will be administered for any fracture involving tooth-bearing area. 5) A chest x-ray is required in this patient as it is not possible to ascertain the location of the broken tooth. This may have led to aspiration into the airways and lungs. 6) Undisplaced mandibular fractures can be managed conservatively, displaced or mobile fractures require open reduction internal fixation (ORIF), displaced condyles may be treated with ORIF or intermaxillary fixation, coronoid fractures can be treated conservatively.