
INTERNATIONAL SURGICAL
ANATOMY TEACHING
SERIES



ISATS
HANDOUT
2024/25

ENT & Neck

High Yield | Surgical Relevance | CPD Accredited

ENT ANATOMY

Objectives: Explain the gross anatomy of the ear, nose and oral cavity

The Ear

External ear:

- Consists of auricle, external acoustic meatus and tympanic membrane
- Vasculature: Branches of the external carotid artery—posterior auricular artery, superficial temporal artery, occipital artery and maxillary artery. Venous drainage is via veins following the arteries listed above
- Lymphatic drainage: superficial parotid, mastoid, upper deep cervical and superficial cervical nodes

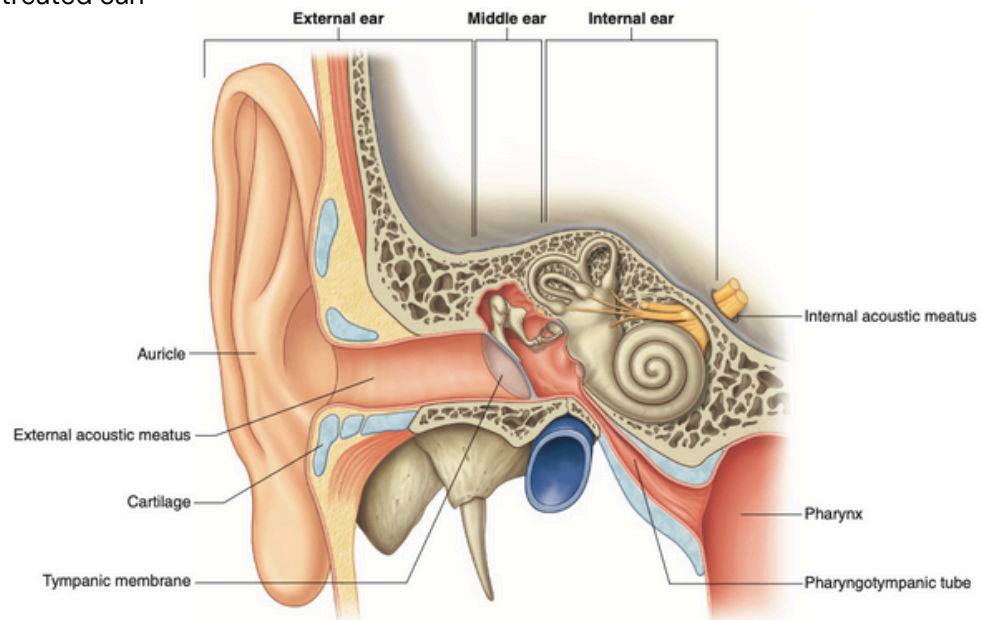
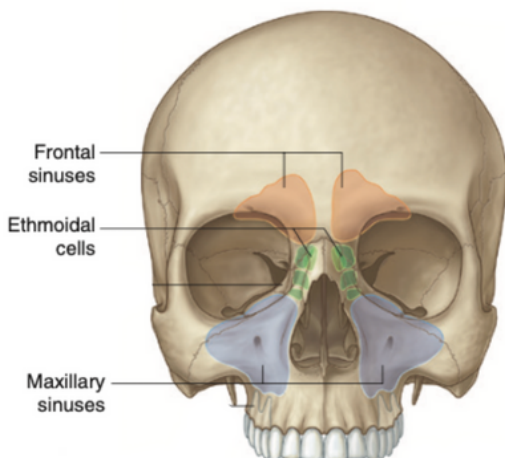
Middle ear:

- Lies within the temporal bone
- Consists of tympanic cavity and epitympanic recess
- Bones: auditory ossicles – malleus, incus, stapes
- **Clinical relevance:** mastoid air cells can get infected following otitis media. If untreated can lead to meningitis

Inner ear:

- **Function:** convert mechanical signals from the middle ear into electrical signals, maintain balance by detecting position and motion.
- Located in the petrous temporal bone
- It consists of: bony labyrinth (contains vestibule, cochlea and three semi-circular canal) and membranous labyrinth (composed of the cochlear duct, three semi-circular ducts, saccule and the utricle)
- Innervation: vestibulocochlear nerve (CNVIII)
- **Note:** Facial nerve (CNVII) passes through the inner ear, but does not innervate any of the structures present.

Nasal sinuses



ENT clinical relevance

Transphenoidal surgery

The pituitary gland can be accessed surgically through the nasal cavity followed by passing instruments through the sphenoid bone. This surgery is done mainly for pituitary adenomas

Sinusitis

Upper respiratory tract infection can spread to the sinuses. The maxillary nerve supplies both the maxillary sinus and teeth, and so inflammation of this sinus can present with toothache

FACE ANATOMY

Objectives: Understand the bony anatomy of the viscerocranium and structure of the TMJ. Explain the gross anatomy of the muscles of facial expression & mastication, salivary glands of the face and important neurovascular structures of the face. Apply anatomical knowledge in context of common procedures within ENT surgery.

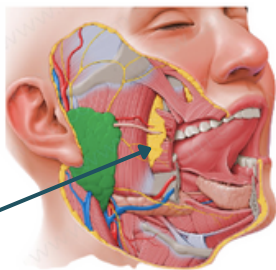
Salivary Glands of The Face

Parotid

Superficial & deep lobes
(parotid region)

Secretions: mostly serous

Duct: Stensen's (parotid) duct



Submandibular

Submandibular triangle (inf & post to mylohyoid muscle)

Secretions: mixed (80% serous, 20% mucous)

Duct: Wharton's duct

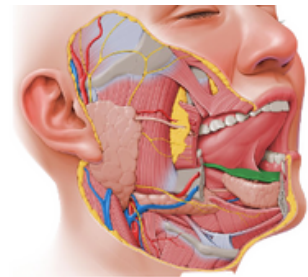


Sublingual

Between the mouth floor and mylohyoid muscle

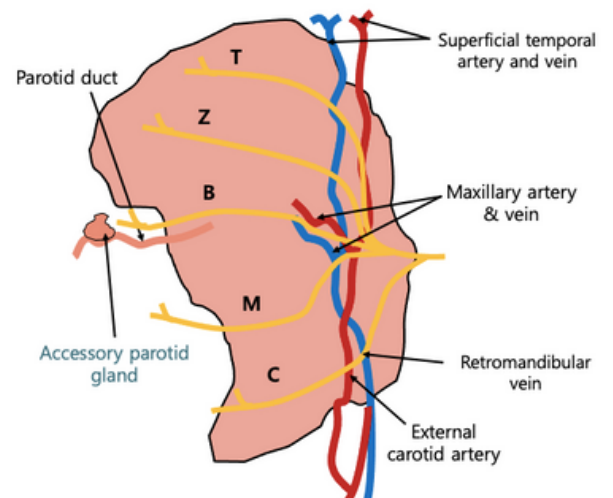
Secretions: mostly mucous

Duct: Bartholin's duct



Parotid Gland

- Largest of 3 salivary gland (lies in buccal region)
- **Structure**
 - Bilateral and lobular
 - Extends from zygomatic arch to inferior border of mandible.
- **Parotid duct course**
 - a. Anterior parotid gland
 - b. Medial border of masseter
 - c. Buccal fat
 - d. Buccinator muscle
 - e. 2nd upper molar



Important Anatomical Relations

External Carotid Artery

- Terminates into superficial temporal & maxillary artery branches

Retromandibular vein

- Formed from superficial temporal & maxillary veins

Facial nerve (CNVII)

- 5 terminal branches within parotid gland; Temporal, Zygomatic, Buccal, Mandibular, Cervical

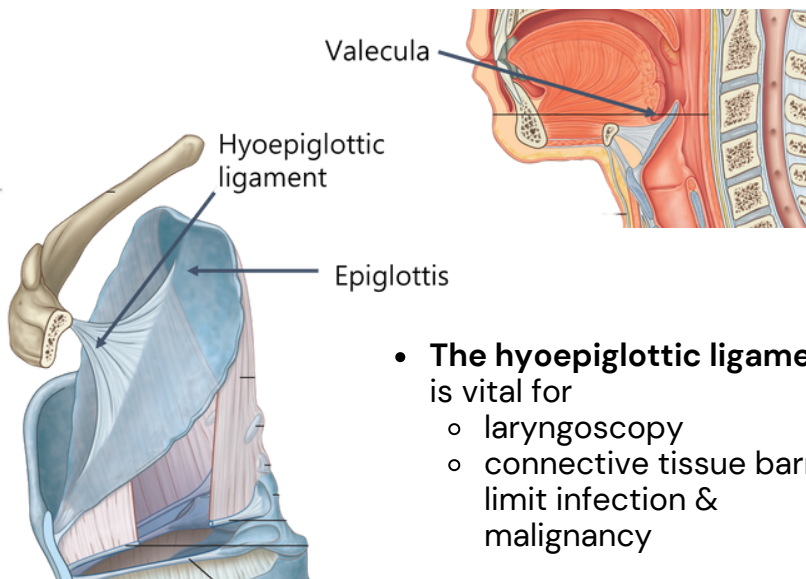
NECK ANATOMY

Objectives: Understand the anatomy of the hyoid bone as well as all of the relevant musculature and neurovasculature in the anterior neck. Appreciate the ultrastructure of the thyroid and parathyroid glands.

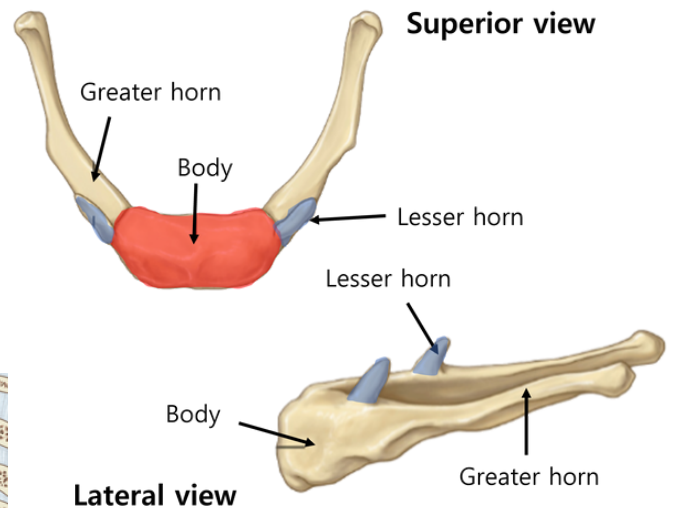
The hyoid bone

Gross anatomy

- The only bone to have no other bony articulations
- **Body**, greater horn and **lesser horn**
- Functions
 - Mobilise for **movements of jaw and tongue**
 - **Attach muscles and ligaments**
 - **Stabilise the airway**



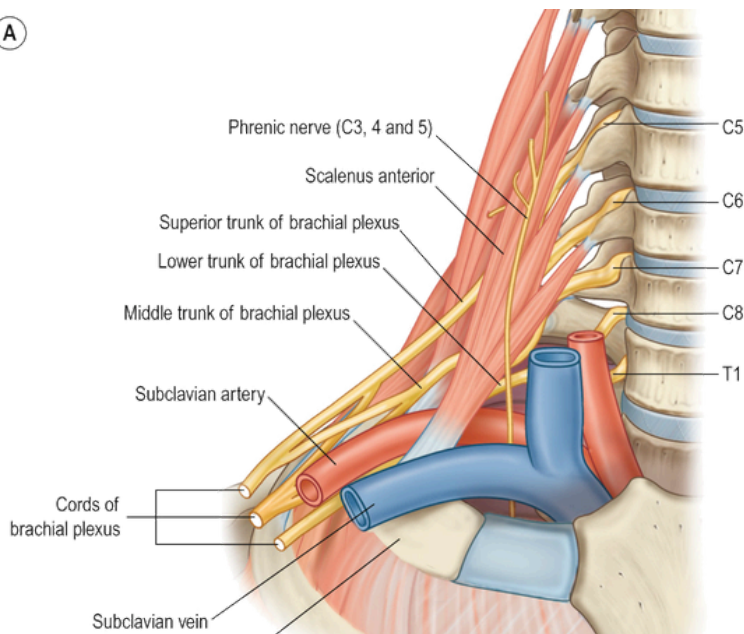
- **The hyoepiglottic ligament** is vital for
 - laryngoscopy
 - connective tissue barrier limit infection & malignancy



- **Attachments: 4 - 2 - 1**
 - **4 groups of muscles**
 - Suprahyoids
 - Infrahyoids
 - Extrinsic muscles of tongue
 - Middle constrictor
 - **2 ligaments**
 - Stylohyoid ligament
 - Hyoepiglottic ligament
 - **1 membrane**
 - Thyroid membrane

Scalenes

- Scalene Actions
 - Cervical flexion – all bilaterally and unilaterally
 - Elevate the 1st rib – anterior and middle scalenes
 - Elevate the 2nd rib – posterior scalene
- Important anatomical relations
 - Between middle and anterior scalenes
 - Trunks of **brachial plexus**
 - **Subclavian artery**
 - Anterior to anterior scalene
 - **Phrenic nerve**
 - **Subclavian vein**



NECK ANATOMY

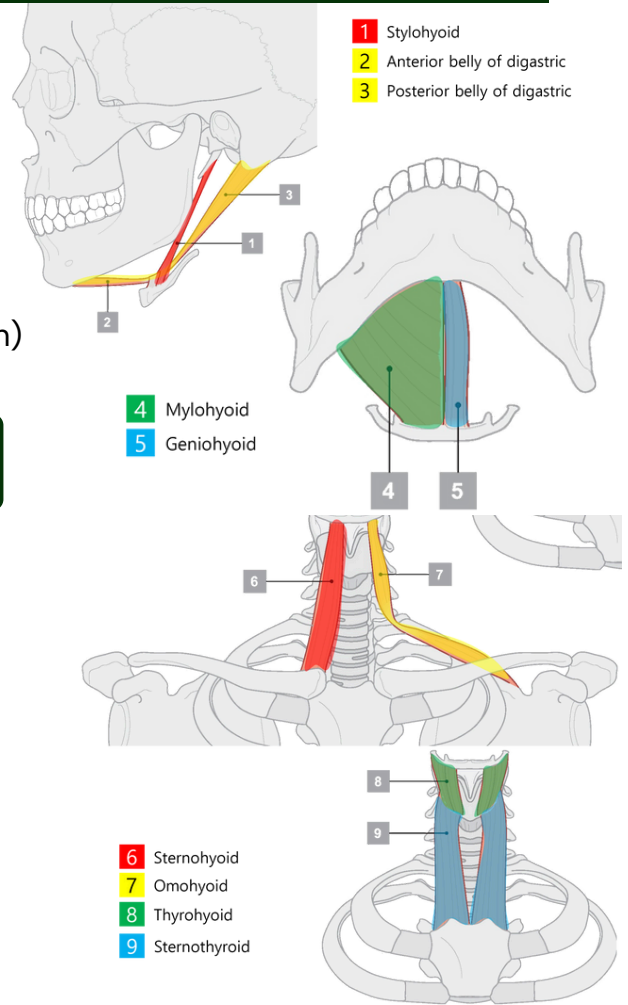
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Suprahyoids

Innervation

- **Stylohyoid:** Facial nerve (CNVII)
- **Digastric**
 - **anterior** belly: Inferior alveolar nerve (mylohyoid branch)
 - **posterior** belly: Facial nerve
- **Mylohyoid:** Inferior alveolar nerve (mylohyoid branch)
- **Geniohyoid:** C1

My God (I'm) So Daft



Infrahyoids

Innervation

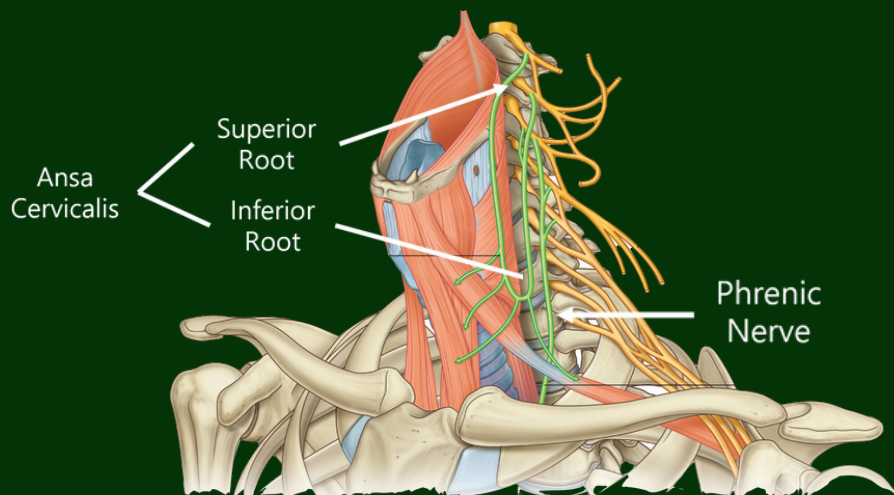
- **Sternohyoid:** Ansa cervicalis
- **Omohyoid:** Ansa cervicalis
- **Sternothyroid:** Ansa cervicalis
- **Thyrohyoid:** C1

Oh Sugar This Sucks

- **Clinical Correlation:** all nerves to infrahyoids enter the muscles in their inferior half. Surgical incisions must be placed superiorly!

Ansa Cervicalis

- In latin *ansa* = handle
- Nerve roots **C1-3**
 - Off of the cervical plexus (C1-4)
- Provides **motor innervation** to the infrahyoids
 - **EXCEPT - thyrohyoid**
- Can be found in the **carotid triangle**
 - overlying the carotid sheath
- The phrenic nerve is not in ansa cervicalis!



NECK ANATOMY

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Triangles of the Neck

Anterior

Submandibular triangle

- Facial artery and vein
- Submandibular gland
- Submandibular lymph nodes
- Hypoglossal n. (CNXII)

Submental triangle

- Submental lymph nodes
- Anterior jugular vein

Muscular triangle

- Infrahyoids
- Thyroid (& parathyroid)
- Larynx, trachea & pharynx

Carotid triangle

- Internal & external carotid arteries
- Vagus n. (CNX)
- Branches of external carotid a.
- Ansa cervicalis
- Spinal accessory n. (CNXI) and Hypoglossal n. (CNXII)

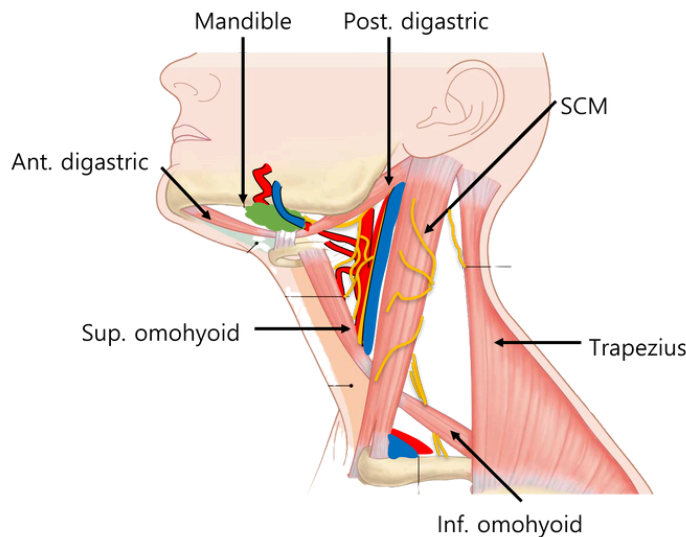
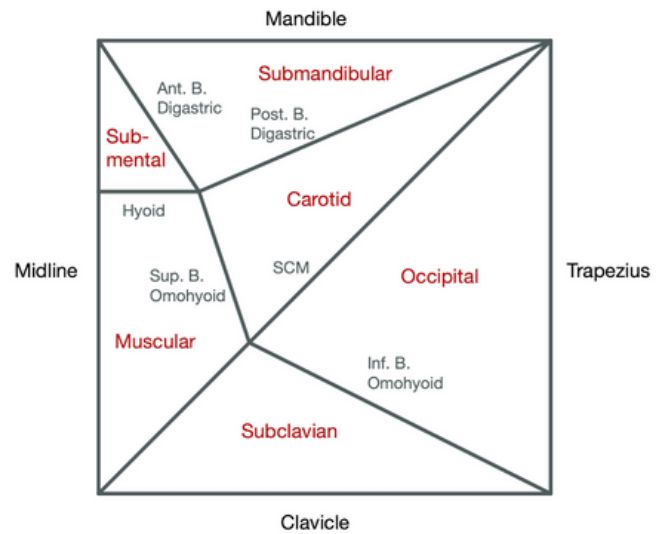
Posterior

Subclavian triangle

- Subclavian artery
- Subclavian veins
- Brachial Plexus

Occipital triangle

- Cutaneous cervical plexus
- Spinal accessory n. (CNXI)
- Upper part of brachial plexus

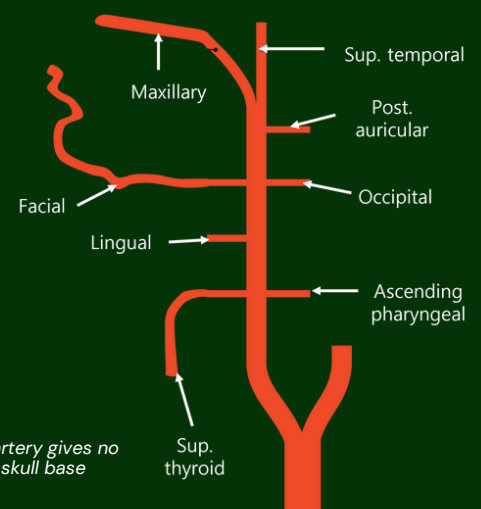


**To subdivide anterior and posterior triangles, the only extra muscles you need are:*

- **Digastric**
- **Omohyoid**

Branches of external carotid artery

- Supply the whole extracranial region of H&N
- Additionally supply the meninges
- 4 anterior branches – 4 posterior branches
- Remember the maxillary artery gives off the middle meningeal artery
 - clinical relevance: **extra-dural haematomas**
- **Mnemonic:** Some Anatomists Like Freaking Out Poor Medical Students



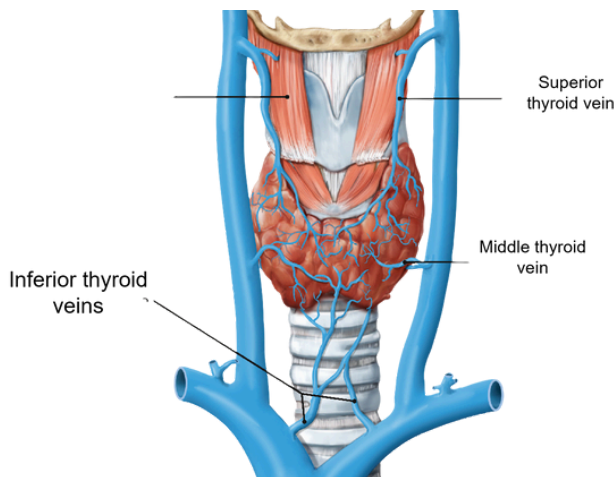
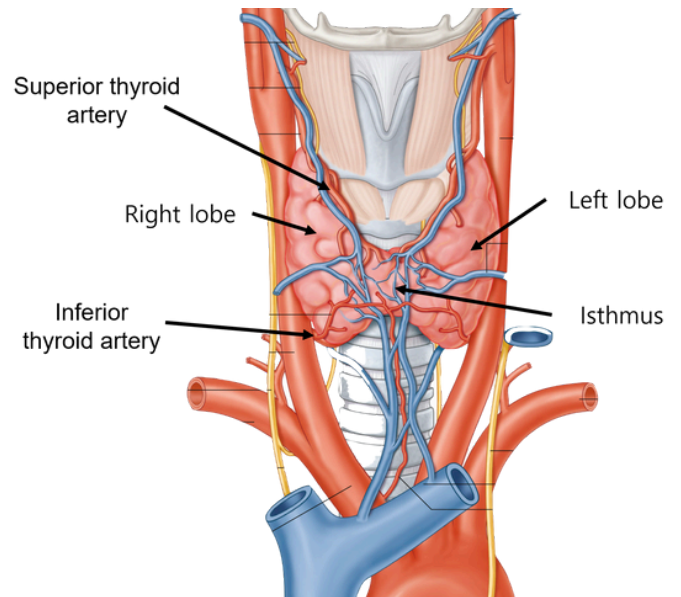
NB - the internal carotid artery gives no branches before entering skull base

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Thyroid Gland

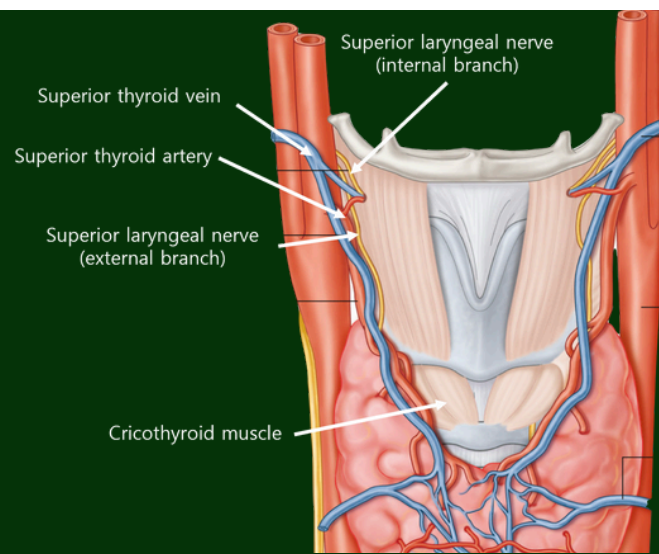
- Right and left lobes connected by a central isthmus
 - Pyramidal lobe in around 50% of people
- C5-T1 vertebral levels but ectopic tissue common
- Attached to cricoid cartilage by Berry's ligament
- **Superior thyroid artery:** anterior, medial and lateral aspects
- **Inferior thyroid artery:** posterior and inferior aspects
 - superior and inferior arteries anastomose posteriorly



- **3 veins responsible for drainage**
 - Superior thyroid vein → IJV
 - Middle thyroid vein → IJV
 - Inferior thyroid vein → Brachiocephalic trunk
- Glandular venous plexus superficially
- **The middle thyroid vein is most at risk of injury during neck surgery**
- **Thyroid lymph** drains into
 - Pretracheal nodes
 - Deep cervical nodes
 - Brachiocephalic nodes

Superior Laryngeal Nerve

- Branch of vagus nerve (CNX)
- Divides into internal and external branches
 - **Internal:** sensation to mucosa above vocal cords
 - **External:** motor to cricothyroid + sensory to the associated area
- External branch runs close to superior thyroid artery
 - may be damaged when ligating the vessel
- If damaged:
 - low pitch hoarse voice – will recover with time due to contralateral compensation

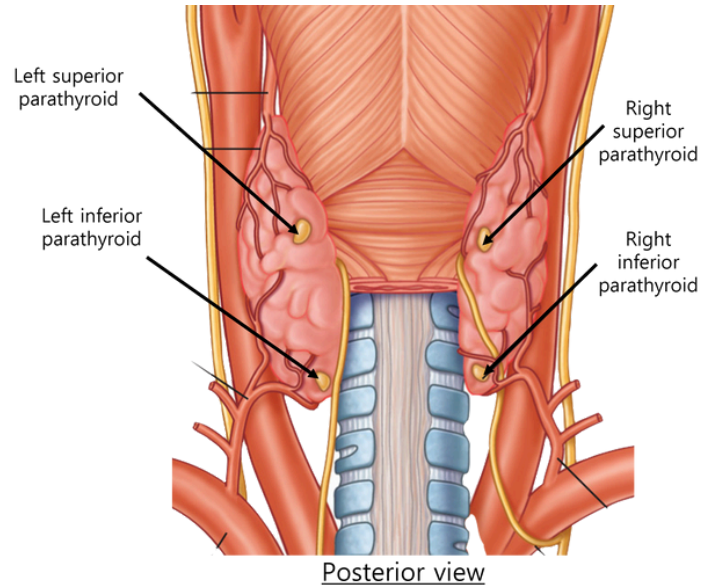
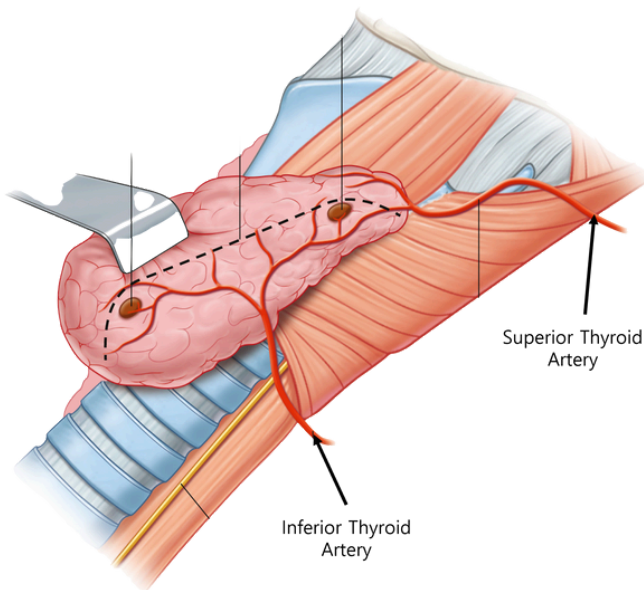


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Parathyroid Glands

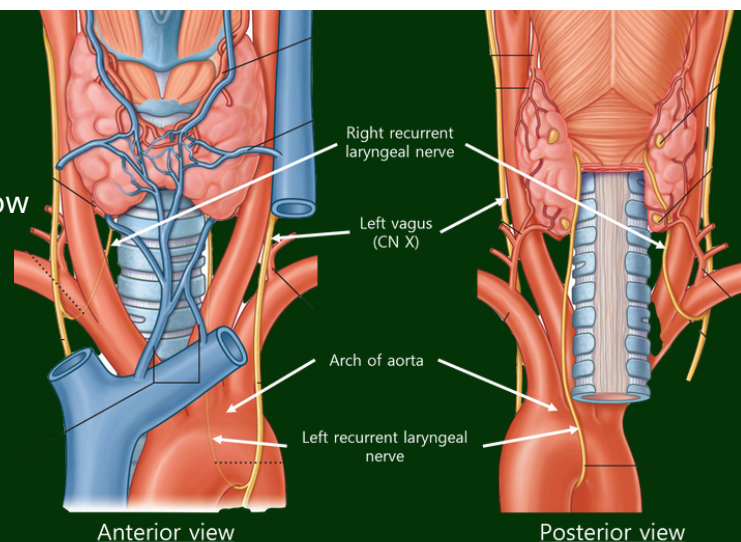
- 4 small ovoid glands on the posterior aspect of the thyroid gland
 - 4% may be intrathyroidal
- Each only 6mm in length
- **Superior parathyroid glands** are almost always in normal anatomical position
- **Inferior parathyroid glands** are quite variable and may be found as far as the thymus



- The parathyroids are predominantly supplied by the **inferior thyroid artery**
 - The superior parathyroids may be supplied by the posterior anastomosis between the superior and inferior thyroid arteries
 - The superior parathyroids may even be supplied by superior thyroid artery
- **This supply is delicate!**
- **Venous drainage** via the thyroid glandular venous plexus
- **Lymph drainage** is associated with the thyroid and/or the thymus lymphatic systems

Recurrent Laryngeal Nerve

- Branch of vagus nerve (CNX)
- Supplies all of the intrinsic muscles of the larynx (except cricothyroid) + sensation to mucosa below the vocal cords
 - **nerve palsy** = total paralysis of vocal cords
 - hoarse voice that does not improve with time
- On the left:
 - curves posteriorly under arch of aorta
- On the right
 - curves posteriorly under subclavian artery

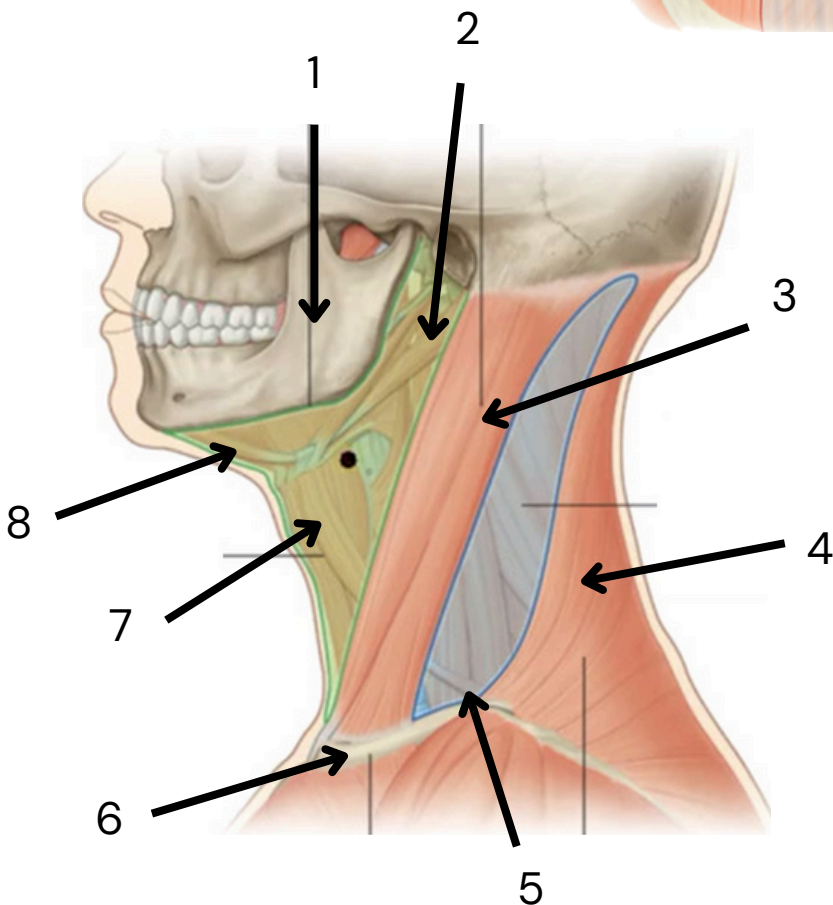
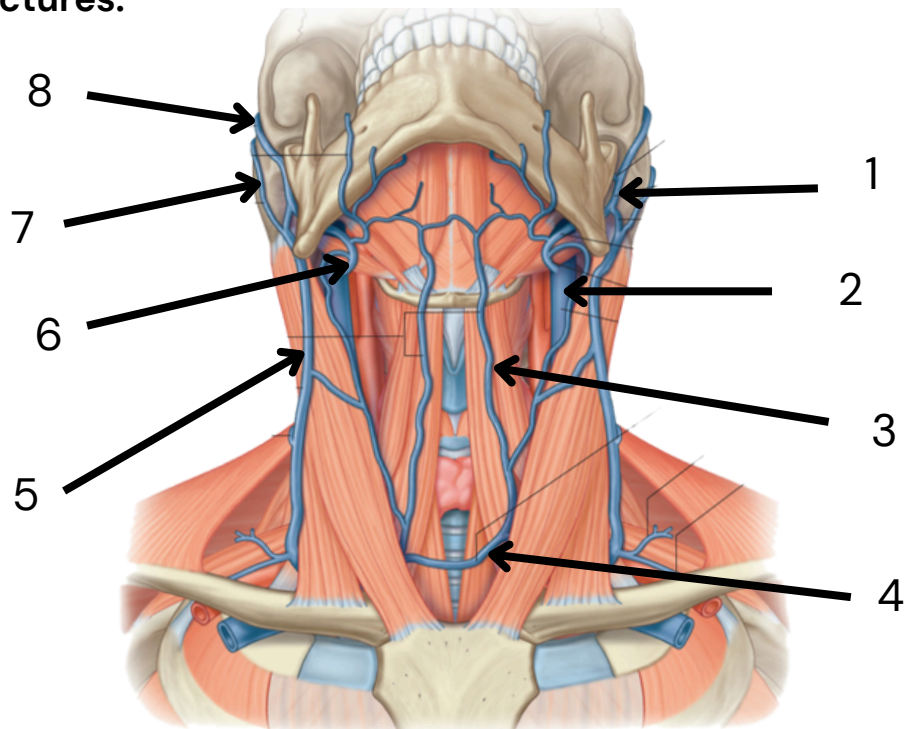


ENT & NECK ANATOMY

Test yourself

A) Label the venous structures:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)



B) Label the structures of the anterior and posterior neck triangles

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)

ENT & NECK ANATOMY

Test yourself

MCQ 1

Which muscle divides the occipital and subclavian triangles in the posterior triangle of the neck?

- A. Posterior belly of the digastric
- B. Superior belly of the omohyoid
- C. Sternocleidomastoid
- D. Anterior belly of the omohyoid
- E. Inferior belly of the omohyoid

MCQ 3

Which one of the following intrinsic laryngeal muscles is not innervated by the recurrent laryngeal nerve?

- A. Aryepiglottic muscles
- B. Lateral cricoarytenoid
- C. Cricothyroid
- D. Thyroarytenoid
- E. Posterior cricoarytenoid

MCQ 5

A CT Head of a patient who lost consciousness following head trauma showed an extradural haematoma (EDH). The most common source of bleeding in an EDH is the middle meningeal artery, a branch of which artery?

- A. Superficial temporal artery
- B. Occipital artery
- C. Maxillary artery
- D. Internal carotid artery
- E. Posterior auricular artery

MCQ 2

Union of the retromandibular vein with which vein forms the external jugular vein?

- A. Maxillary vein
- B. Posterior auricular vein
- C. Facial vein
- D. Superficial temporal vein
- E. Occipital vein

MCQ 4

Through which foramen does the facial nerve pass through to leave the cranium just before giving off its extracranial branches?

- A. Stylomastoid foramen
- B. Foramen rotundum
- C. Internal acoustic meatus
- D. Jugular foramen
- E. Foramen ovale

MCQ 6

A patient has a history of intermittent facial pain and swelling associated with eating. On sialography, a sialolith in Wharton's duct is identified. Which salivary gland is most likely to be experiencing a blockage to the flow of its excretions?

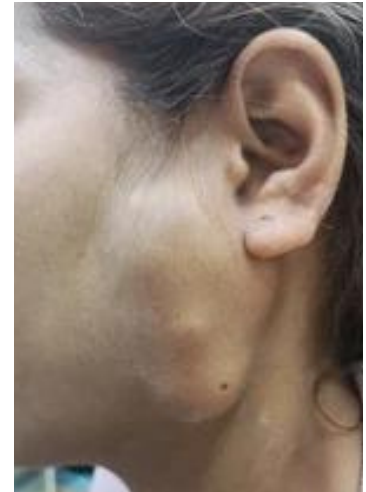
- A. Parotid
- B. Submandibular
- C. Sublingual
- D. Accessory parotid
- E. Minor salivary

ENT & NECK ANATOMY

Test yourself

OSCE Station – Case Based Discussion

A 65-year-old patient presents to her GP with a sudden rapid growth of an existing benign tumour of her left parotid gland. She denies any pain but complains that the left side of her face feels weaker, and she has difficulty closing her left eyelid. On examination, there is a left-sided weakness of the muscles of facial expression, and palpation of her neck reveals cervical lymphadenopathy. She is suspected to have had a malignant change of her benign parotid tumour and is referred to ENT via the two-week wait system for further investigation.



- Q1. What is the most common type of benign parotid tumour?
- Q2. Why is this patient now experiencing paralysis of their facial muscles?
- Q3. What investigations would be useful to confirm the diagnosis?
- Q4. On investigation, if this patient was found to have an accessory parotid gland, what implication could this have?
- Q5. What surgical and non-surgical treatments could this patient receive?
- Q6. State one artery and one vein which if injured intraoperatively can result in haemorrhage.

Answers
Labelling: A: 1) Retromandibular vein, 2) Internal jugular vein, 3) Anterior jugular vein, 4) Jugular arch, 5) External jugular vein, 6) Common facial vein, 7) Posterior auricular vein, 8) Superficial temporal vein; B: 1) Mandible, 2) Posterior belly of digastric, 3) Sternocleidomastoid, 4) Trapezius, 5) Inferior belly of omohyoid, 6) Clavicle, 7) Superior belly of omohyoid, 8) Anterior belly of digastric.
MCQs: 1) E, 2) B, 3) C, 4) A, 5) C, 6) B
OSCEs: 1) Pleomorphic adenoma; 2) Infiltration of malignant cells into the facial nerve – as the facial nerve runs through the substance of the parotid gland; 3) Ultrasound scan of parotid gland with fine needle aspiration cytology; Staging CT Head, Neck and Thorax; 4) Complicate future parotidectomy / Serve as potential site for malignant lesion to arise from; 5) Parotidectomy + selective neck dissection, adjuvant radiotherapy (radiotherapy as monotherapy can be given if tumour is unresectable); 6) Artery: External carotid artery / or one of its terminal branches: superficial temporal artery, maxillary artery, Vein: Retromandibular vein / or one of the two veins that unite to form it: superficial temporal vein, maxillary vein