THE MOUTH AND FACE

THE ROOF OF THE MOUTH:

- Palate forms the partition between the mouth and the nose
- Front of the palate has a boney roof the hard palate
- Behind it is entirely muscular soft palate
- Hard palate is bounded in front and at sides by boney alveolar processes of the maxillae
- The maxillary teeth lie in this ridge of supporting bone
- Anterior 2/3 of boney hard palate is formed by the palatine processes of the maxillae
- Posterior 1/3 is made by 2 horizontal plates (of palatine bones)
- Bones are seperated by a midline suture.
- **Greater palatine canal** (running down from pterygopalatine fossa) divides as it approaches the palate:
- One group of nerves passes into palate through greater palatine foramen in palatine bone (just medial to upper 3rd molar)
 - Greater palatine nerves and vessels run <u>anteriorly</u> along sides of hard palate in a groove.
- Other group of nerves pass into palate behind the greater palatine foramen, through the lesser palatine foramen.
 - o Lesser palatine nerves and vessels run posteriorly into the soft palate
- Incisive fossa & canal (behind the incisor teeth) conducts the <u>nasopalatine nerve</u> into the front of the hard palate (having entered the nose through the sphenopalatine foramen).
- Also transports the greater palatine arteries (in the other direction)
- Mucous membrane towards the front of the hard palate is raised into rises rugae
- Rugae are important in speech and eating allow for better taste and distinction of texture.
- Mucous glands and minor salivary glands exist in the palate.



HARD PALATE

- Mucoperiosteum (mucosa + periosteum)
- Sharpey's fibres into pits on bone
- Blood supply: Greater palatine artery
- Venous drainage: Pterygoid plexus
- Lymph: Retropharyngeal and deep cervical nodes
- Nerve supply: Greater palatine and nasopalatine

SOFT PALATE



- Ascending palatine (facial) Palatine branch of ascending
- Palatine branch of ascending pharyngeal (external carotid)
 - Veins: Pharyngeal & pterygoid plexus Lymph: Retropharyngeal & antero-
 - Lymph: Retropharyngeal & anterosuperior deep cervical

Nerve: Secretomotor - Vb via pterygopalatine ganglion Sensation - Vb, lesser palatine + (IX)

Taste - Greater petrosal then

Palatopharyngeus
Muscles of uvula
Mucosa

Consists of:

Aponeurosis

Tensor veli palatini

Levator veli palatini
Palatoglossus

- Mucous & serous glands
- A few taste buds



For more details of palate muscles, please see muscle section in the book -Instant Anatomy, by R H Whitaker & N R Borley. 4th edition. Wiley-Blackwell 2010





Sphenoid Bone:



SOFT PALATE

- Palatine aponeurosis attaches to posterior edge of hard palate
- Muscles of soft palate insert into the palatine aponeurosis
- 5 muscles on each side of the soft palate
- Soft palate is v. mobile (esp. in speech / swallowing)
- Levator palati & tensor palati both arise from base of skull near the auditory tube
- Levator palati:
 - \circ One one each side
 - Passes over top of superior constrictor
 - Spreads out over palatine aponeurosis & inserts into it.
 - o <u>Elevates</u> the palate

• Tensor palati:

- Originates from the **sphenoid bone**:
 - scaphoid fossa in front
 - Spine of the sphenoid behind
- Descends from cranial base as a triangular sheet
- The 2 heads converge on each side as a tendon
- Loop around pterygoid hamulus
- Run horizontally into the palatine aponeurosis
- Contraction flattens the domed soft palate





- Palatoglossus & palatopharyngeus muscles pass from <u>aponeurosis</u> → tongue & pharynx respectively.
- Palatopharyngeus:
 - o Arises as 2 slips, either side of the levator palati on top of soft palate
 - o Decends into pharynx where it attaches to the thyroid lamina
- Palatoglossus:
 - Arises from undersurface of aponeurosis
 - o Inserts into side of the tongue
- The descent of these 2 muscles creates 2 ridges of mucous membrane:
 - Palatoglossal arch
 - Palatopharyngeal arch
- Aka anterior and posterior pillars of the fauces
- Palatoglossal arch forms the posterior boundry of the cavity of the mouth
- Palatopharyngeal acts as a constrictor muscle to the entrace of the oropharynx
- Between the 2 arches is a fossa which contains the **palatine tonsil**.



- Musculis uvulae is essentially an intrinsic muscle of the soft palate
- Runs from posterior border of hard palate \rightarrow **uvula** (hangs from posterior edge of soft palate
- Muscle raises a midline bulge in soft palate during swallowing closes off the nasopharynx from the mouth.

Nerve supply to the pharynx:

- <u>Motor</u> supply to both pharyngeal and palantine muscles is via:
 - Vagoaccessory complex (in pharyngeal plexus)
 - Laryngeal nerves
- 2 exceptions to this rule:
 - Tensor palati supplied by the **mandibular division** of trigeminal at the level of the otic ganglion.
 - o Stylopharyngeus supplied by glossopharyngeal (with which it is intimately related)
- <u>Sensory</u>
- Maxillary division of trigeminal nerve (V_{ii}):
 - Nasopharynx
 - o Nose
 - Most of both soft and hard palate (palatine branches)
- Glossopharyngeal nerve (IX):
 - Oropharynx
 - Mucous membrane of auditory tube
 - o **Tonsil**
 - A little of soft palate
- Vagus (X):
 - o Laryngopharynx

HYPOGLOSSAL NERVE (XII)

- <u>Motor</u> innervation to all the muscles of the tongue *except* palatoglossus
- Leaves the skull through the anterior condylar foramen / <u>hypoglossal foramen</u>
- Nerve swings outwards markedly to gain the plane between the internal carotid and IJV.
- At the level of the hyoid bone, the hypoglossal nerve loops around the occipital artery.
- Comes to **run closely with the lingual artery**, just below lower boder of digastric muscle.
- Quite superficial in this part of its course
- Passes on <u>outer aspect of hyoglossus muscle</u> where it breaks up into branches.
- Note that the lingual artery passes <u>deep</u> to the hyoglossus muscle here
- Remember, C1 segments hitch-hike along the hypoglossal nerve to form the superior root of the ansa cervicalis.

LINGUAL NERVE

- Branch of the <u>mandibular division</u> of trigeminal (V_{iii})
- Lies first on the lateral surface of the medial pterygoid muscle
- \rightarrow against the mandible against last molar tooth root
- \rightarrow enters floor of mouth with styloglossus muscle.
- It is the general sensory nerve to:
 - <u>Anterior 2/3 of tongue</u>
 - Floor of mouth
 - o Gingivae on the lingual aspect of the teeth & alveolar bone of mandible

- It also carries <u>special taste sensation</u> (via chorda tympani) from:
 - Anterior 2/3 of tongue
- Carries **parasympathetic neurons** to the submandibular & sublingual glands.
- The **<u>chroda tympani</u>** nerve from the facial nerve travels with the lingual nerve.
- Special taste fibres leave tongue in lingual nerve & pass back through the corda tympani to join the facial nerve (VII) in the middle ear cavity.
- Parasympathetic preganglionic neurons leave the brain in the facial nerve (VII) and pass into the chorda tympani → lingual nerve → submandibular ganglion (hanging from lingual nerve, between submandibular gland and hyoglossus) → synapse → postganglionic parasympathetic fibres → salivary glands & mucous glands in floor of mouth.
- Sympathetic fibres pass directly through the submandibular ganglion without synapse:
 - o Secretomotor activity of salivary & mucous glands



• Vasoconstrictor

GENIOGLOSSUS & GENIOHYOID MUSCLE:

- Genioglossus moves the tongue
- Geniohyoid moves the hyoid bone
- Both arise from the inner aspect of the mandible the genial spines
- Geniohyoid:
 - o Arises from inside of mandible at front near midline
 - Passes back to insert into the hyoid
 - Pulls the hyoid upwards and forwards
 - Opposed by stylohyoid & infrahyoid strap muscle
 - Supplied by C1 fibres which have hitch-hiked along the hypoglossal nerve
- Genioglossus:
 - Forms considerable bulk of the tongue

- o Arises from the inside of the mandible near the midline
- o Spreads to insert into whole undersurface of the tongue
- Supplied by the <u>hypoglossal nerve (XII)</u>



THE INTRINSIC MUSCLES AND MUCOUS MEMBRANE OF THE TONGUE

- The tongue has extrinsic muscles which take origin from bone and move it as a whole
- Intrinsic muscles which alter the shape of the tongue.
- Extrinsic muscles of the tongue:
 - Styloglossus
 - \circ Palatoglossus
 - $\circ \quad \text{Hyoglossus}$
 - o Genioglossus
- Intrinsic muscles of the tongue form a weave of longditudinal, transverse & vertical muscle fibres within the substance of the tongue
- Fibrous septa pass between these muscle fibres
- All the extrinsic and intrinsic muscles, except palatoglossus, are supplied by <u>hypoglossal nerve</u> (XII)
- Lesions of the hypoglossal nerve can be tested by asking the patient to stick their tongue out the tongue swings over to the side of the lesion if there is hypoglossal nerve damage.
- Tongue is divided into:
 - o Anterior 2/3
 - Posterior 1/3
- This division is marked on the dorsum of the tongue by a faint 'V-shaped' line called the **sulcus terminalis**.
- In the midline, at the apex of the 'V' sulcus terminalis, there is a shallow pit called the **foramen caecum**.
- Foramen caecum repesents the origin of the thyroid gland in the floor of the primative pharynx.
- Mucous membrane of the surface of the tongue is firmly adherent to the tongue surface called the **gustatory epithelium**
- Beneath the tip of the tongue there is a median fold of mucous membrane the **frenulum**
- This seperates the 2 submandibular duct orifices
- Posteriorly there is a midline fold of mucous membrane median glossoepiglottic fold
- Median glossoepiglottic fold seperates the 2 valleculae

- The gustatory epithelium of the anterior 2/3 of the tongue contains 4 types of papillae:
 - Fungiform papillae
 - Anterior 1/3 of tongue
 - Appear red, as are not ketatinised
 - Filiform papillae
 - Rough and keratinised
 - Circumvallate papillae
 - Large 2mm diameter
 - Arranged along sulcus terminalis
 - **Folite papillae** have deep folds between them on the sides of the tongue, near the sulcus terminalis.
- Posterior 1/3 of the tongue is roughened by collection of lymphoid tissue in the mucus membrane.



LINGUAL ARTERY:

- Major branch of the external carotid
- Arises at level of hyoid bone
- Forms a characteristic loop as it passes forwards onto the middle constrictor
- Travels:
 - Deep to hyoglossus muscle
 - On surface of genioglossus
- Main branches of the lingual arteries are the:
 - o Dorsal lingual arteries supply dorsum of tongue & palatine tonsil
 - Deep lingual arteries tip and undersurface of tongue
- Prominent blue veins on the undersurface of tongue are deep lingual veins (accompanying deep lingual arteries).

INNERVATION OF THE TONGUE

Sensory:

General sensation:

- Anterior 2/3: lingual nerve (from mandibular branch V_{iii})
- Posterior 1/3: glossopharyngeal nerve (IX)

 Small part of back of tongue next to epiglottis & piriform fossa gets general sensation from vagus nerve (X)

Taste:

- Anterior 2/3: chorda tympani (via the lingual nerve to the facial nerve in the petrous temporal)
- Posterior 1/3: glossopharyngeal nerve (IX)



THE FACE:

- Superficial musculature of the face surrounds the ear, nose, orbit and mouth
- These muscles are known as the muscles of facial expression
- Facial muscles form sphincters and dilators around each of these orifices.
- All of the muscles of facial expression are supplied by the facial nerve (VII).
- Travels through internal acoustic meatus and middle ear & petrous temporal bone
- Emerges in <u>infratemporal fossa</u> through the **stylomastoid foramen**
- The 3 key muscles to learn are the:
 - Orbicularis oculi
 - Orbicularis oris
 - Buccinator
- Orbicularis oculi surrounds the eye
- Forms a sphincter around the eye
- Has palpebral and orbital components
- Frontalis attached to epicranial aponeurosis superiorly (on the front of the vault)
- Occipitalis attached to epicranial aponeurosis posteriorly (at back of vault)
- Together, the frontalis, epicranial aponeurosis, and occipitalis, form the occipitofrontalis
- Orbicularis oris is a large sphincter muscle surrounding the mouth
- Orbicularis oris has no boney origin
- Arrnaged in a radial manner around the orbicularis oris are muscles which:
 - o Raise upper lip
 - o Depress lower lip
 - Control corners of mouth

- Buccinator muscle lies on a deeper plane on the side of the cheek
- There is no sphincter muscle around the nose
- There are some small dilators around the nostrils which act as accessory muscles of respiration (although much more important in other animals).
- Some small muscles around the ear.
- Platysma muscle in the neck is also a muscle of facial expression and is supplied by the facial nerve.



FACIAL ARTERY IN THE FACE:

- Facial artery leaves the external carotid near the lingual artery
- Reaches the mandible just anterior to the masseter muscle can be felt as a pulse at the lower anterior boder of the masseter muscle.
- Then runs a tortuous course past the angle of mouth and side of nose

- Tortuous arangment allows for movement of the face and jaws allows the artery to be stretched.
- Runs deep to both the zygomaticus major and minor.

Angular artery

- At the side of the nose, the facial artery is renamed the angular artery
- Passes to medial angle of the eye, where it <u>anastomoses with orbital vessels</u>.
- Some terminal branches also continue into scalp.

Labial branches

- To the lips
- Also gives branches to the external nose
- Gives a branch which passes obliquely back across the cheek to anastomose with the **transverse** facial branch of the superficial temporal artery.



- Facial vein accompanies the facial artery
- Both vein and artery pass *deep* to the zygomaticus major
- Only the <u>artery passes deep</u> to the <u>zygomaticus minor</u> on its way to the medial angle of eye (the vein remains more superficial).
- The facial vein communicates with:
 - Orbital veins
 - o Intracranial venous sinuses
- Facial vein joins the anterior branch of the retromandibular vein to form the common facial vein
- Common facial vein drains into the internal jugular vein.

FACIAL NERVE IN THE FACE - MOTOR

- Facial nerve is found superficially in the face
- Entirely MOTOR

- Supplies all the muscle of facial expression, including the buccinator.
- Passes through the superficial substance of the parotid gland, dividing into its terminal branches within the parotid gland.
- These terminal branches are:
 - Temporal branches upwards to temporal region
 - **Zygomatic braches** across the zygomatic arch
 - **Buccal branches** across the cheek
 - Mandibular branches along the mandible
 - Cervical branches into neck
- Ten Zombies Borrowed My Cat
- The cervical branch innervates the platysma muscle.
- A small posterior auricular branch passes back to supply the posterior belly of the digastric muscle and stylohyoid muscle.



SENSORY INNERVATION OF FACE:

- Via cutaneous branches of the <u>3 divisions of the trigeminal nerve (V)</u>
- Sensations of:
 - Light touch
 - Pressure
 - Temperature
 - o Pain
- All conveyed to the <u>trigeminal nuclei</u> in the brain
- Each of these sensations can be tested clinically
- Dermatomes of the face can be mapped out.



APPLIED ANATOMY OF THE MOUTH AND FACE:

SWALLOWING:

- Aka deglutition
- Controlled by reflexes involving cranial nerves IX, X & XI in the brainstem
- Food must be prevented from reaching the nose and airway on swallowing.
- Balbar palsy is a degeneration of the nuclei of cranial nerves IX & X
- **First stage** of swallowing is <u>voluntary</u> and involved movements of the tongue in the mouth:
 - $\circ\quad \text{Tongue is raised to roof of mouth}$
 - \circ $\;$ Bolus of food is moved back towards or opharynx by the tongue
 - Teeth come together to stabilise the mandible provides a stable base for many muscle to act from
- Second stage begins when bolus has entered oropharynx supplied by glossopharyngeal nerve
- Second stage is <u>involuntary</u>
 - Soft palate is raised and tensed against posterior wall of pharynx prevents food entering the nose.
 - Pharynx constricts at pharyngeal isthmus
 - Contractions of the pharyngeal constrictor muscles move the bolus through the oropharynx towards the laryngopharynx.
 - The hyoid bone is move anteriorly then upwards
 - \circ $\;$ The larynx is elevated the equivalent of 2 cervical segments.
 - $\circ~\Delta$ larynx pulled upwards and forwards to the back of base of the tongue.
 - Aryepiglottic muscle have a very important constrictor action around the laryngeal inlet.
 - Helps to guide the food either side of the laryngeal inlet.
- Third stage
 - o Inferior constrictor muscle squeezes the bolus out of laryngopharynx
 - o Bolus moves through cricopharyngeal sphincter into oesophagus

Cleft palate & cleft lip:

- Congenital abnormalities
- Due to incomplete fusion of the maxillary processes of the mandibular arch during development.
- Clefts are either unilateral or bilateral
- Due to failure of fusion of the maxillary processes in the embryo
- Why?
 - If fetus fails to unflex, toungue is unable to drop into developing mouth it remains high and holds apart the maxillary processes.
- Clefts may only involve the lip hare lip
- May involve the lip + alveolar process of the maxilla (+ even the hard & soft palate).
- Clefts of the palate may be as minor as a bifid uvula (little consequence)
- Cleft lips are repaired soon after birth.
- Cleft palates are repaired a little later:
 - \circ $\$ Free mucosa from the bone of the hard palate on each side
 - Bringing the bones together in the midline

Fractures:

- Fractures of the mandible are common
- Fractures of <u>mandibular condyles</u> are left to remodel without treatment.
- Fracture of the condyles often results from a blow to the chin.
- Fractures to the <u>body / ascending ramus</u> are much more serious and require fixation.
- Direction of the fracture determines if the muscles of mastication will hold the broken mandible together:
 - Unfavourable: the bone pulls apart
 - Favourable: the bone is held together by the muscles.



mental foramen

TESTING THE FACIAL NERVE:

- Ask the patient to skrew up their eyes and show their teeth
- Inability to do this on one or other side of the face indicated facial nerve palsy (Bell's palsy).
- Often follows inflammation of the facial nerve in the facial canal of the petrous temporal bone.
- Bell's palsy →
 - o Inability to blink
 - \circ $\;$ Drooping mouth and inability to smile on that side of the face

- \circ Paralysis of buccinator \rightarrow cannot squeeze food back into mouth when chewing.
- An <u>upper motorneuron lesion</u> of the facial nerve e.g. **stroke** presents differently.
- The orbicularis orbi is supplied by facial nerve fibres from both left and right side of the brain.
- Δ an upper motorneuron lesion on one side of the brain doesn't affect the orbicularis oculi.
- BUT the muscles below the orbicularis oculi only receive innervation from the facial nerve on one side, so these muscles become paralysed.
- Δ patients suffering damage to facial nerve (VII) due to stroke can still voluntarily move the muscles around the eye and forehead, unlike those with Bell's Palsy who cannot.

Herpes zoster virus:

- Can remain latent in satellite cells surrounding the trigeminal ganglion.
- Immunocomprimise → reactivation of the virus which travels down one of the divisions of the trigeminal nerve
- Presents as a vesicular rash in the exact distribution of the dermatome involved.
- Shingles of the mandibular division can present with vesicular rash on inside of mouth, due to tracking of VZV down lingual branch of mandibular division.



NOT WRITTEN UP WHOLE CHAPTER – NEED TO PUT IN THE STUFF ABOUT FLOOR OF MOUTH & salivary glands

SHORT NOTES ON FLOOR OF MOUTH:

- 2 salivary glands submandibular & sublingual
- Digastric muscle:
 - Posterior belly: mastoid process (facial nerve VII)
 - Anterior belly: Lower boder of mandible (mandibular division V_{iii})
 - Fibrous sling: lesser cornu of hyoid bone
 - Action:
 - Opens mouth (with lateral pterygoid)
 - Raises the hyoid when the jaw is clenched.

• Stylohyoid:

- From styloid process → hyoid bone
- \circ $\;$ Insertion splits to allow the intermediate tendon of the digastric through
- Facial nerve (VII) innervation
- o Action: retracts and elevates the hyoid
- Mylohyoid:
 - Diaphragm across the floor of the mouth
 - Arises on both sides from the inner aspect of the mandible the mylohyoid line
 - \circ $\;$ Inserts into the front of the hyoid bone.
 - Has a midline raphe
 - Action: elevate the hyoid
 - Supplied by branch of mandibular division (V_{iii}) the branch which also supplies the anterior belly of digastric.



- Submandibular salivary gland is sandwiched between the muscles of the floor of mouth.
- Protrudes out onto undersurface of mylohyoid.
- Facial grooves the submandibular gland on the undersurface of the mylohyoid.
- Hyoglossus and styloglossus lie deep to the above muscles.
- All these intrinsic and extrinsic muscles of the tongue (except palatoglossus) are supplied by the hypoglossal nerve.

Submandibular gland & sublingual glands:

- Contain both serous and mucous-secreting acini
- Sublingual is mainly mucous-secreting
- Submandibular gland has 2 parts:
 - Deep: surface of hyoglossus
 - Superficial: undersurface of mylohyoid
- Stones can form in the submandibular gland.
- Lingual nerve lies above the submandibular gland
 - Lingual nerve hooks under submandibular duct before rising into the tongue.
- Hypoglossal nerve (XII) lies below it
- Duct of subandibular gland opens into floor of mouth to the side of the lingual frenulum

 Sunlingual gland drains by several ducts, some directly into floor of mouth & some into the submandibular gland.

