Anterior aspect of face and skull

Muscles of facial expression

Interior of skull July 1



Learning objectives

- 1. To learn the development and osteology of facial and cranial bones
- 2. To describe the superficial face, the muscles of facial expression, blood supply, innervation (cranial nerve V and VII) and other structures
- 3. To study osteology, interior of skull, cranial fossa, neurocranium and venous sinuses
- 4. To describe all 12 pairs of cranial nerves. To be able to deduce and anticipate symptoms from lesions to an area. Conversely, given the symptoms, to be able to locate the probable area of lesion
- 5. To describe the blood supply to the brain (Circle of Willis)
- 6. To learn the meninges that envelop the brain, dural venous sinuses, epidural, subdural space and blood supply in the area
- 7. To learn relevant anatomy and clinical significance of the cavernous sinus

Development of the face















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Craniofacial development and malformations



Cleft lip with cleft palate

Treacher Collins Syndrome







Neural crest cells



Neural crest cells



Neural crest cells and their derivatives



Human facial development



Rhombomeres and neural crest cell migration



Pharyngeal arches and their associated cranial nerves



Pharyngeal arches



In humans = pharyngeal arches In fish = branchial arches



Ectoderm separating arches on outside = pharyngeal cleft (or groove) Endoderm separating grooves on inside = pharyngeal pouch



Pharyngeal arches



In humans = pharyngeal arches In fish = branchial arches



Ectoderm separating arches on outside = pharyngeal cleft (or groove) Endoderm separating grooves on inside # pharyngeal pouch





Pharyngeal arches



Structures derived from pharyngeal arch components

Table 10-1 = Strue	ctures Derived From Phary	ngeal Arch Components*		
Arch	Nerve	Muscles	Skeletal Structures	Ligaments
First (mandibular)	Trigeminal†(CN V)	Muscles of mastication‡ Mylohyoid and anterior belly of digastric Tensor tympani Tensor veli palatini	Malleus Incus	Anterior ligament of malleus Sphenomandibular ligament
Second (hyoid)	Facial (CN VII)	Muscles of facial expression§ Stapedius Stylohyoid Posterior belly of digastric	Stapes Styloid process Lesser cornu of hyoid Upper part of body of hyoid bone	Stylohyoid ligament
Third	Glossopharyngeal (CN IX)	Stylopharyngeus	Greater cornu of hyoid Lower part of body of hyoid bone	
Fourth and sixth	Superior laryngeal branch of vagus (CN X) Recurrent laryngeal branch of vagus (CN X)	Cricothyroid Levator veli palatini Constrictors of pharynx Intrinsic muscles of larynx Striated muscles of esophagus	Thyroid cartilage Cricoid cartilage Arytenoid cartilage Corniculate cartilage Cunciform cartilage	

*The derivatives of the aortic arch arteries are described in Chapter 14.

† The ophthalmic division does not supply any pharyngeal arch components.

‡ Temporalis, masseter, medial and lateral pterygoids.

§ Buccinator, auricularis, frontalis, platysma, orbicularis oris and orbicularis oculi.

The fifth pharyngeal arch is often absent. When present, it is rudimentary and usually has no recognizable cartilage bar. The cartilaginous components of the fourth and sixth arches fuse to form the cartilages of the larynx.

Development of the human face





Development of the human face



Cleft lip with or without cleft palate





Unilateral cleft lip—partial



Partial cleft of palate



Unilateral cleft of primary palate complete, involving lip and alveolar ridge





Complete cleft of secondary palate and unilateral cleft of primary palate



Various types of facial clefts and malformations



Human palatogenesis



The human skull







Mandible



Mandible – outer aspect



Mandible – inner aspect



Mandible (top view)



The long axes of the mandibular condyle intersect at the foramen magnum, which indicates that these axes are directed posteromedially



3D motion of mandible



Sensory innervation to the face

Trigeminal Nerve CN V





Trigeminal Nerve (CN V): Overview

Somatosensory nerves from V₁ (red), V₂ (blue) and V₃ (green)



Keck School of Medicine



V1 Supraorbital Foramen/Notch

Supraorbital <u>nerve, artery & vein</u> (from Frontal n. and Superior opthalmic artery and vein)

V2 <u>Infraorbital Foramen</u> Infraorbital nerve, artery & vein

V3 <u>Mental Foramen</u> Mental nerve, artery & vein (from Inferior Alveolar n.a.v.)

Trigeminal Nerve (CN V): Overview

Nerve components

*<u>Somatomotor</u> to <u>muscles of mastication</u> (temporalis, masseter, medial pterygoid, lateral pterygoid) and <u>associated muscles around the mouth</u> (anterior belly of digastric, mylohyoid, tensor veil palatini) and middle ear (tensor tympani).

<u>Somatosensory</u> from the skin of the face, *anterior 2/3 tongue, and *elsewhere (e.g., teeth, mucosa).

Trigeminal (Gasserian, semilunar) Ganglion (cell bodies for somatosensory axons: equivalent to a DRG; middle cranial fossa)





Trigeminal Nerve (CN V): Overview
V₂ Maxillary Division (nerve)
Leaves the skull through the <u>foramen rotundum</u> to enter the <u>pterygopalatine fossa</u>









Cranial nerves innervate front of skull

Spinal nerves innervate posterior side (dorsal and ventral rami)







Muscles of facial expression



Occipitofrontalis







Procerus + transverse part of nasalis



Orbicularis oculi



alar part of nasalis



Buccinator + orbicularis oris



Zygomaticus major + minor



Risorius



Risorius + depressor labii inferioris



Levator labii superioris + depressor labii



Dilators of mouth: totus plus levator labii superioris + depressor labil inferioris



Orbicularis oris



Depressor anguli oris



Mentalis



Platysma













Muscles of facial expression, facial nerve (CN VII), parotid gland



Facial Nerve (CN VII)



Facial Nerve (CN VII): Overview

<u>External</u> Acoustic Meatus Squamosal Part of the Temporal Bone

Petrous Part of the Temporal Bone Internal Acoustic Meatus (exit for CN VII)

*Facial Canal (not shown) is inside petrous temporal



Facial Nerve (CN VII): Somatomotor Branches



Facial Nerve (CN VII): Somatomotor Branches

Along squamosal part of temporal bone

Helps you wiggle your ears

Posterior Auricular (P)

Hard to find Cervical (C) Platysma



Don't call this "mandibular nerve" b/c that's V3

*<u>Tiny Zebra Bite My Cheek (Please)</u>

Facial nerve and its branches





Autonomic nervous system

- 1. Peripheral nervous system
- 2. Influences the function of internal organs
- 3. Control of respiration, cardiac regulation, vasomotor, and reflex actions (coughing, sneezing, etc.)
- 4. ANS is divided into sympathetic (T1-L2) and parasympathetic [craniosacral, (CN3, 7, 9 &10, S2-4)] nervous system.
- 5. Sequential two-neuron efferent pathway







Facial nerve (all components)







Muscles of facial expression

