Anterior aspect of face and skull

Muscles of facial expression

Interior of skull
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, nerve 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. Cavernous sinus, relevant anatomy and clinical significance
Development of face
Craniofacial development and malformations
Treacher Collins Syndrome
Cranial neural crest cells and craniofacial development
Craniofacial development

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48 ± 1 day

medial nasal prominences merging with each other and the maxillary prominences

10 weeks

intermaxillary segment

14 weeks

philtrum of lip
Different components of the pharyngeal arches
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 Structures derived from different pharyngeal arches

<table>
<thead>
<tr>
<th>ARCH</th>
<th>NERVE</th>
<th>MUSCLES</th>
<th>SKELETAL STRUCTURES</th>
<th>LIGAMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>First (mandibular)</td>
<td>Trigeminal* (CN V)</td>
<td>Muscles of mastication†</td>
<td>Malleus</td>
<td>Anterior ligament of malleus</td>
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<tr>
<td></td>
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<td>Mylohyoid and anterior belly of digastric</td>
<td>Incus</td>
<td>Sphenomandibular ligament</td>
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<td></td>
<td></td>
<td>Tensor tympani</td>
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<td>Tensor veli palatini</td>
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<td>Second (hyoid)</td>
<td>Facial (CN VII)</td>
<td>Muscles of facial expression‡</td>
<td>Stapes</td>
<td>Stylohyoid ligament</td>
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<tr>
<td></td>
<td></td>
<td>Stapedius</td>
<td>Styloid process</td>
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<td></td>
<td></td>
<td>Stylohyoid</td>
<td>Lesser cornu of hyoid bone</td>
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<tr>
<td></td>
<td></td>
<td>Posterior belly of digastric</td>
<td>Upper part of body of hyoid bone</td>
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<tr>
<td>Third</td>
<td>Glossopharyngeal (CN IX)</td>
<td>Stylopharyngeus</td>
<td>Greater cornu of hyoid bone</td>
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</tr>
<tr>
<td>Fourth and sixth†</td>
<td>Superior laryngeal branch of vagus (CN X)</td>
<td>Cricothyroid</td>
<td>Thyroid cartilage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recurrent laryngeal branch of vagus (CN X)</td>
<td>Levator veli palatini</td>
<td>Cricoid cartilage</td>
<td></td>
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<td></td>
<td></td>
<td>Constrictors of pharynx</td>
<td>Arytenoid cartilage</td>
<td></td>
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<td>Intrinsic muscles of larynx</td>
<td>Corniculate cartilage</td>
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<td></td>
<td></td>
<td>Striated muscles of esophagus</td>
<td>Cuneiform cartilage</td>
<td></td>
</tr>
</tbody>
</table>

*The derivatives of the aortic arch arteries are described in Chapter 13.
†The ophthalmic division fifth cranial nerve (CN V) does not supply any pharyngeal arch components.
‡Temporals, 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.

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Etiology of Cleft Lip and/or Cleft Palate

1. Teratogenic Factors
2. Genetic Factors
3. Combination of both 1 and 2.
A. Normal

B. Ectoderm
   - Medial nasal elevations
   - Groove or furrow
   - Mesenchyme

C. Normal
   - Persistent labial groove
   - Maxillary process

D. Abnormal
   - Groove filling in
   - Persistent labial groove
   - Merging medial nasal elevations

E. Persistent labial groove
   - Level of section F

F. Groove almost smoothed out
   - Persistent labial groove
   - Epithelium
   - Merged maxillary process and medial nasal elevations
   - Site of subsequent tissue collapse

G. Complete unilateral cleft lip
   - Level of section H
   - Muscle
   - Philtrum of lip
   - Separate lateral part of lip
Human palatogenesis

6 wks

12 wks
Fig. 752: Anterior Aspect of the Skull
145° - 160°
Sensory innervation to the face
Figure 7.07. Skin incisions.
Trigeminal Nerve (CN V): Overview

Somatosensory nerves from $V_1$ (red), $V_2$ (blue) and $V_3$ (green)

Keck School of Medicine
Cutaneous Innervation of the Face

**V₁** Supraorbital Foramen/Notch
Supraorbital nerve, artery & vein
(from Frontal n. and Superior ophthalmic artery and vein)

**V₂** Infraorbital Foramen
Infraorbital nerve, artery & vein

**V₃** Mental Foramen
Mental nerve, artery & vein
(from Inferior Alveolar n.a.v.)
Trigeminal Nerve (CN V): Overview

Nerve components

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

Somatosensory 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)

*Keck School of Medicine*
Trigeminal Nerve (CN V): Overview

V₁ Ophthalmic Division (nerve)
Leaves the skull through the superior orbital fissure to enter the orbit
Cutaneous branches of V1

- Supraorbital nerve
- Supratrochlear nerve
- Infratrochlear nerve
- External nasal nerve
Trigeminal Nerve (CN V): Overview

V₂ Maxillary Division (nerve)
Leaves the skull through the foramen rotundum to enter the pterygopalatine fossa
Cutaneous branches of V2

Infraorbital nerve
Zygomaticofacial nerve
Zygomaticotemporal nerve
Trigeminal Nerve (CN V): Overview

V₃ Mandibular Division (nerve)
Leaves the skull through the foramen ovale to enter the infratemporal fossa
Cutaneous branches of V3

- Auriculotemporal nerve
- Buccal nerve
- Mental nerve
Cranial nerves innervate front of skull
Spinal nerves innervate posterior side (dorsal and ventral rami)
Cutaneous Innervation of the Face

- Supraorbital n.
- Infraorbital n.
- Mental n.

[Diagram of the face showing different nerves]
Cutaneous Innervation of the Face
Cutaneous Innervation of the Face

“SHARED ZONES”

1. Conjunctiva of Eyelids
   - Upper eyelid: V₁
   - Lower eyelid: V₂

2. Mucus membrane of Lips
   - Upper lip: V₂
   - Lower lip: V₃
Muscles of facial expression
Facial Nerve (CN VII): Overview

- **Petrous Part of the Temporal Bone**
- **Squamosal Part of the Temporal Bone**
- **Internal Acoustic Meatus** (exit for CN VII)
- **External Acoustic Meatus**

*Facial Canal (not shown) is inside petrous temporal*
Facial Nerve (CN VII): Overview

Stylomastoid Foramen (exit for CN VII)

Styloidy Process

Mastoid Process
Facial Nerve (CN VII): Somatomotor Branches

**Branches of CN VII:**
1. Posterior auricular
2. Temporal
3. Zygomatic
4. Buccal
5. Marginal mandibular
6. Cervical

- Epicranial aponeurosis
- Temporal fascia
- Occipital belly of occipitofrontalis
- Frontal belly of occipitofrontalis
- Orbicularis oculi (orbital and palpebral parts)
- Nasalis
- Levator labii superioris alaeque nasi
- Levator labii superioris
- Zygomaticus minor
- Zygomaticus major
- Orbicularis oris
- Oral fissure
- Risorius (cut)
- Buccinator
- Depressor anguli oris
- Mentalis (cut)
- Depressor labii inferioris
- Platysma (cut)
Facial Nerve (CN VII): Somatomotor Branches

- **Posterior Auricular (P)**
- **Temporal (T)**
  - Frontalis
- **Zygomatic (Z)**
- **Orbicularis oculi**
- **Buccal (B)**
  - Buccinator;
  - Orbicularis oris
- **Cervical (C)**
  - Platysma
- **(Marginal) Mandibular (M)**
  - Don’t call this “mandibular nerve” b/c that’s V3

Along squamosal part of temporal bone

* Tiny Zebra Bite My Cheek (Please)
Nervous System (NS)

Peripheral NS
- Autonomic NS
  - Sympathetic NS
  - Parasympathetic NS
- Somatic NS

Central NS
- Brain
  - Forebrain
    - Telencephalon
      - Cerebral Cortex
      - Basal Ganglia
      - Hippocampus
      - Amygdala
    - Diencephalon
      - Thalamus
      - Hypothalamus
  - Mesencephalon
    - Tectum
  - Metencephalon
    - Pons
    - Cerebellum
  - Myelencephalon
    - Medulla
- Spinal Cord
  - Hindbrain
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, and etc.).
4. ANS is divided into sympathetic (T1-L2) and parasympathetic [craniosacral, (CN3, 7, 9 &10, S2-4)] nervous system.
Where are the cell bodies for different fibers within the lingual nerve??

Somatosensory Semilunar ganglion

Special sensation-taste fibers
Geniculate ganglion

Para- Pre- from Pons to SMG
Figure 7.13. How to reflect the scalp and mark the calvaria for sawing.
Cut the tentorium cerebelli before removing the brain
INTERNAL CRANIAL BASE — FROM BEHIND

- Chiasmatic sulcus
- Optic canal
- Sella turcica
- Foramen rotundum
- Carotid groove
- Foramen ovale
- Foramen spinosum
- Sphenopetrosal fissure
- Arcuate eminence
- Internal acoustic meatus
- Clivus
- Jugular foramen
- Hypoglossal canal
- Parietal bone
- Diploe
- Occipital bone
- Foramen caecum
- Crista galli
- Jugum
- Anterior clinoid process
- Greater wing of sphenoid bone
- Groove for middle meningeal artery
- Squamous part of temporal bone
- Posterior clinoid process
- Foramen lacerum
- Trigeminal impression
- Petrous part of temporal bone
- Groove for superior petrosal sinus
- Groove for inferior petrosal sinus
- Groove for sigmoid sinus
- Foramen magnum