THE PHARYNGEAL APPARATUS

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MESENCHYME OF HEAD REGION

- Paraxial M
- Lateral plate M
- Neural crest cells
- Ectodermal placodes: cells from ectodermal placodes along with neural crest form neurons of 5th, 7th, 9th, 10th cranial sensory ganglia
- The remaining neck musculature gains contributions from cervical somites.
Figure 15.1. Skeletal structures of the head and face. Mesenchyme for these structures is derived from neural crest (blue), lateral plate mesoderm (yellow), and paraxial mesoderm somites and somitomers (red).
PHARYNX

- Cranial part of foregut cavity, “Arched“ beneath the brain
- Begins at buccopharyngeal membrane and as this ruptures a communication forms between primitive oral cavity and foregut
COMPONENTS OF PHARYNGEAL APPARATUS

1) Pharyngeal arches
2) Pharyngeal pouches
3) Pharyngeal clefts/grooves
4) Pharyngeal membrane
PHARYNGEAL / BRANCHIAL ARCHES

- Most typical feature in development of head and neck
- Bars of mesenchymal tissue separated by deep pharyngeal clefts
- Resemble fish gills (branchia)
- Begin to develop in the 4th & 5th week
- By end of 4th week, four pairs of arches are visible on the surface (not 5th and 6th)
- Contribute in the formation of face and neck.
PHARYNGEAL ARCHES (CONT.)

- Core of mesenchymal tissue covered by surface ectoderm (outside) and by endodermal epithelium (inside)
- Ectoderm – skeletal part
- Mesoderm - muscles with accompanying nerve
- Arterial component (aortic arches)
- Therefore, each arch carries its own nerve, muscle, bone component and blood supply
AORTIC ARCHES

• The 6 aortic arches terminate in the right and left dorsal aortae which later fuse in the caudal region to form single vessel.
DERIVATIVES OF THE AORTIC ARCHES

1. Maxillary arteries
2. Hyoid and stapedial arteries
3. Common carotid and first part of the internal carotid arteries and external carotid arteries
4. Left side - Arch of the aorta from the left common carotid to the left subclavian arteries
   Right side – Right subclavian artery (proximal portion)
5. Left side - Left pulmonary artery and ductus arteriosus
   Right side - Right pulmonary artery
1st PHARYNGEAL ARCH

- **Maxillary process** (dorsal)
  - Premaxilla, maxilla, zygomatic bone, portion of temporal bone
- **Mandibular process** (ventral)
  - Contains *Meckel’s cartilage* which contribute to formation of mandible and bones of middle ear incus & malleus
DERIVATIVES OF FIRST PHARYNGEAL ARCH

• Muscles of mastication, digastric (ant belly), mylohyoid, tensor tympani and tensor palatini
• Motor nerve is the mandibular branch of trigeminal
• Sensory nerves are V1, V2, and V3 (mesenchyme of 1\textsuperscript{st} arch also contributes to the dermis of face)
• 1\textsuperscript{st} aortic arch practically disappears but forms the maxillary artery
SECOND PHARYNGEAL/HYOID ARCH
DERIVATIVES OF SECOND PHARYNGEAL ARCH

- Skeletal component
- Muscles include: Muscles of facial expression, stapedius, stylohyoid, digastric (post belly) and auricular muscles.
- Facial nerve (CN VII)
- 2nd aortic arch – stapedial & hyoid arteries
DERIVATIVES OF THIRD PHARYNGEAL ARCH

- Skeletal component
- Sole muscle: Stylopharyngeus
- CN IX (Glossopharyngeal nerve)
- 3rd aortic arch: common carotid, 1st portion of internal carotid and external carotid arteries
DERIVATIVES OF FOURTH PHARYNGEAL ARCH

- Cartilaginous contributions to larynx derived from fusion: thyroid, cricoid, arytenoid, corniculate, and cuneiform
- **Muscles of 4th:** cricothyroid, levator palatini, and pharyngeal constrictors are innervated by SLN (CN X)
- **4th aortic arch:** L-arch of aorta & R-subclavian artery
DERIVATIVES OF SIXTH PHARYNGEAL ARCH

- **Muscles of 6th:** intrinsic muscles of larynx, Innervated by RLN (CN X)
- **6th aortic arch:** L & R pulmonary arteries with ductus arteriosus on left side
PHARYNGEAL POUCHES

- Simultaneously when arches and clefts form, Pouches appear along the lateral wall of pharyngeal gut. They penetrate the surrounding mesenchyme but never establish an open communication with the external clefts.
PHARYNGEAL POUCHES (4)

Lymphoid tissue: 3rd - 5th month
3rd & 4th POUCHES

- Auditory tube
- Primitive tympanic cavity
- External auditory meatus
- Palatine tonsil
- Superior parathyroid gland (from 4th pouch)
- Inferior parathyroid gland (from 3rd pouch)
- Ultimobranchial body
- Thymus
- Thyroid gland
- Foregut
- Ventral side of pharynx
- Foramen cecum
PHARYNGEAL CLEFTS/GROOVES (4)

Diagram A: Shows the Pharyngeal pouches labeled I, II, III, and IV, with corresponding numbers 1, 2, 3, and 4. Other structures include the Mandibular process, Pharyngeal clefts, and Epicardial ridge.

Diagram B: Illustrates the External auditory meatus and primitive tympanic cavity. It also highlights the Palatine tonsil, Parathyroid gland (inferior), Thymus, Parathyroid gland (superior), Cervical sinus, and Ultimobranchial body.
Congenital malformations
• **Cyst:** refers to a mucosa or epithelium lined structure with no external or visceral openings. (remnants of cervical sinus).

• **Sinus:** refers to a tract with or without a cyst that communicates to either the gut or skin (Epithelium on one side and closed on other side - **when a portion of cleft persists**)

• **Fistula:** is a tract connecting the gut to the skin (connecting two epithelial surfaces)

• **Vestiges:** cartilaginous or bony developmental remnants under skin on side of neck
BRANCHIAL CYSTS & FISTULAS
BRANCHIAL CYST
CRANIOFASCIAL DEFECTS

Neural Crest cells are essential for the formation of craniofacial region, consequently disruption of crest cell results in abnormal development.

- Treacher Collin’s syndrome
- Robbin’s sequence
- Digeorge anomaly
- Goldenhar syndrome
Treacher Collin’s syndrome or Mandibulofacial dysostosis

Malar hypoplasia
Robbin’s sequence: alters first arch structures

Development of mandible affected
Diggeorge anomaly
Goldenhar syndrome
Thank You