Outline

General overview of prenatal development
Embryonic period phase 1
  • Formation of bilaminar disk
  • Formation of trilaminar disk (gastrulation)
Embryonic period phase 2
  • Formation of neural tube
  • Differentiation of mesoderm
  • Folding of embryo
  • Formation of pharyngeal arches

Development of head, face and oral cavity
  • Face (bones and muscles)
  • Pituitary gland
  • Palate
  • Tongue
  • Thyroid
  • Jaw bones

Embryology Part 2 Lecture Objectives

• In what week do the arches form?
• Which germ cell layers contribute to the arches?
• Which neural crest cells (next to which part of the developing neural tube) supply each arch?
• What are the sensory and motor nerves associated with each arch?
• What muscles and cartilages arise from each arch?
• What happens to the grooves and pouches?
• What structures do the internal and external carotid arteries supply in week 5 vs. week 7?
Arches are composed of:
- a core of mesoderm and neural crest cells
- an external surface lined by ectoderm
- an internal surface lined by endoderm

* except the internal surface of the 1st arch, which is lined by ectoderm!
Know this!

<table>
<thead>
<tr>
<th>Arch</th>
<th>Nerve</th>
<th>Muscles</th>
<th>Skeleton</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V (trigeminal)</td>
<td>Maxillary, anterior digastic Tensor tympani and veli palatini</td>
<td>Meckel's cartilage (malleus, incus)</td>
</tr>
<tr>
<td>2</td>
<td>VII (facial)</td>
<td>Facial expression** Posterior digastic Stylohyoid Stapedius</td>
<td>Neurenter's cartilage- stomates, styloid, lesser hyoid</td>
</tr>
<tr>
<td>3</td>
<td>IX (glossopharyngeal)</td>
<td>Stylohyoid</td>
<td>Greater hyoid</td>
</tr>
<tr>
<td>4-6</td>
<td>X (vagus)</td>
<td>Cricothyroid Levator veli palatini Constrictors of pharynx Laryngeal cartilages</td>
<td>Laryngeal cartilages</td>
</tr>
</tbody>
</table>

* Temporal, masseter, and medial & lateral pterygoids  
** Buccinator, auricularis, frontalis, platysma, orbicularis oris and oculi.

Important!  Meckel's cartilage indicates where the mandible will develop – but it does not turn into the mandible!

Know this too!

<table>
<thead>
<tr>
<th>Arch</th>
<th>Nerve</th>
<th>Branches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V (trigeminal)</td>
<td>Ophthalmic: Moeller and Mandibular</td>
</tr>
<tr>
<td>2</td>
<td>VII (facial)</td>
<td>Chorda tympani (taste)</td>
</tr>
<tr>
<td>3</td>
<td>IX (glossopharyngeal)</td>
<td>Sensation of pharynx, middle ear, root of tongue and taste</td>
</tr>
<tr>
<td>4-6</td>
<td>X (vagus)</td>
<td>Parasympathetic innervation</td>
</tr>
</tbody>
</table>
**Cartilage and Bone Derived from Pharyngeal Arches**

- **Arch 1**: Meckel’s cartilage, malleus and incus
- **Arch 2**: Reichert’s cartilage, stapes, styloid and lesser hyoid
- **Arch 3**: Greater hyoid
- **Arch 4 and 6**: Laryngeal cartilages

**What happens to the pouches and grooves?**

- 1st cleft/pouch -> External auditory meatus/Tympanic cavity, Eustachian tube
- Rest of grooves disappear (see A)
- 2nd pouch obliterated by tonsil
- 3rd pouch -> inferior parathyroid, thymus
- 4th and 5th pouches -> superior parathyroid, ultimobranchial body (C cells thyroid)

**Head and Neck Anomalies From Improper Groove Closure**

- Pharyngeal cyst (Second pharyngeal cleft)
- Congenital auricular sinus (Second arch or cleft)

**Congenital Auricular Sinus**

This little boy belongs to a student from a previous year!

**Aortic Supply of the Arches**

At 4 weeks each arch has its own vascular supply.

At 5 weeks the 3rd pharyngeal arch vessel becomes the common carotid, which supplies the face, neck and brain by means of the internal carotid and stapedial arteries.

**A Weird Shift in Face Vessels**

Face and brain are initially supplied by the internal carotid artery.

By 7 weeks, facial vessels detach from internal carotid and attach to external carotid!

Internal carotid still supplies the brain.
Muscles of Mastication

Muscles of mastication = temporal, masseter, and medial & lateral pterygoids.
In week 5, muscle cells show up in 1st arch. In weeks 6 and 7, they spread to each muscle’s site of origin. These all relate to the developing mandible.

Development of Face Muscles

Muscles of facial expression: Buccinator, auricularis, frontalis, platysma, orbicularis oris and orcul.
By week 7, muscles of 2nd arch grow upward. As they expand, they form sheets over the face, and become the muscles of facial expression.