The Branchial Arches

Professor Alfred Cuschieri
Department of Anatomy
University of Malta
In the 4-week embryo, the primitive pharynx is associated with paired arches and pouches

- **Pharyngeal pouches**
  - lateral pockets of endoderm

- **Branchial clefts**
  - corresponding pockets of ectoderm

- **Branchial arches**
  - intervening mesodermal thickenings
Each branchial arch contains:

- A cartilage
- A cranial nerve
- An aortic arch
- Myoblasts

These elements are of neural crest origin
In fish there are 6 pairs of branchial arches, but only four are well developed in humans

- The fifth branchial arch fails to develop
- The sixth branchial arch is rudimentary
The first two arches and their cartilages are named:

1\textsuperscript{st} - Mandibular arch & its maxillary process
- containsMeckel’s cartilage

2\textsuperscript{nd} - Hyoid arch
- contains Reichert’s cartilage
Derivatives of the first, second and third arch cartilages

1st arch (Meckel’s) cartilage forms the:
- Incus
- Malleus
- Sphenomandibular ligament
- Lingula of mandible

2nd arch (Reichert’s) cartilage forms the:
- Stapes
- Styloid process
- Stylohyoid ligament
- Lesser cornu & part of body of hyoid bone.

3rd arch cartilage forms the:
- Greater cornu & part of body of hyoid bone

4th arch cartilage forms the:
- Laryngeal cartilages

The mandible ossifies in membrane from the mesoderm around Meckel’s cartilage
Each Branchial Arch Is Supplied by a Cranial Nerve.

1\textsuperscript{st} arch
Mandibular nerve
• Muscles of mastication
• Tensor veli palatini
• Tensor tympani
• Mylohyoid
• Anterior belly of digastric

2\textsuperscript{nd} arch
Facial nerve
• Muscles of facial expression
• Stapedius
• Stylohyoid
• Posterior belly of digastric

3\textsuperscript{rd} arch
- Glossopharyngeal n.

4\textsuperscript{th} arch
- Vagus nerve
• Stylopharyngeus
• Pharyngeal & laryngeal m.
The nerves of the 1st & 2nd arches give a sensory branch to the preceding arch.

- Maxillary nerve - sensory
- Mandibular nerve - motor
- Chorda tympani n -sensory
- Facial nerve - motor
- Glossopharyngeal nerve - motor
- Vagus nerve - motor
Derivatives of branchial clefts and pharyngeal pouches

1st cleft - external auditory meatus

2nd arch overgrows all other arches

Branchial sinus

Pouches

1st – pharyngotympanic tube

2nd – tonsil

3rd – thymus and inferior parathyroid

4th – superior parathyroid

- ultimobranchial body

C-cells of thyroid
Development of Tongue

1st arch
Mandibular nerve

Anterior 2/3

Posterior 1/3

3rd arch
Glossopharyngeal n
Overgrows other arches

Tuberculum impar

Thyroid diverticulum
(foramen caecum)

Cupola

Aryepiglottic swelling
The head develops in relation to the special sense placodes

- Otic placode
- Lens placode
- Olfactory placode
Development of the eye

- Optic vesicle
- Lens placode
- Pigmented epithelium
- Neurosensory epithelium
- Iris & Ciliary body
- Lens