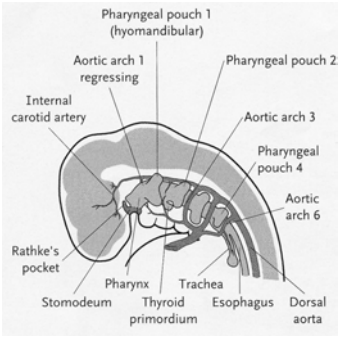
Pharyngeal Apparatus

Pouches – Endoderm

Grooves – Ectoderm

Arch – Neural Crest
Somitomeres

Aortic Arch - Vessel



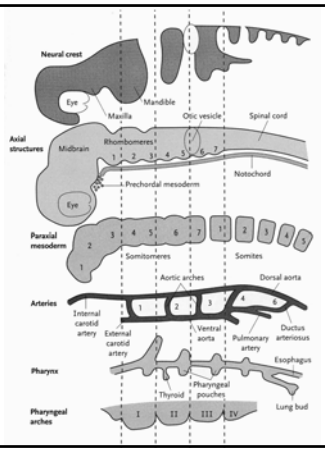
Segmental Organization

Humans:

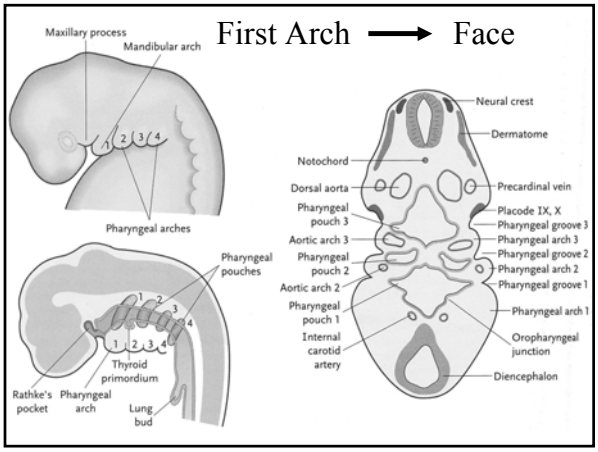
Arch 1-4 –prominent

Arch 5 – absent

Arch 6 - transient



First Arch → Face



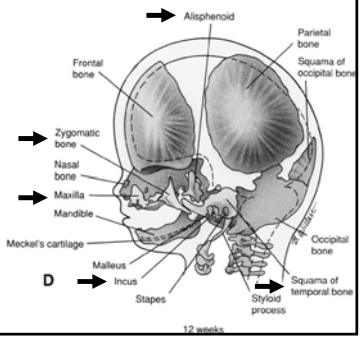
#1 = Mandibular Arch

2 prominences: Maxillary and Mandibular

Maxillary Process:
Cranial - upper jaw

Cartilages (endochondrial):
alisphenoid
incus

Bone (intramembranous):
maxilla
zygomatic bone
squamous part of the temporal bone

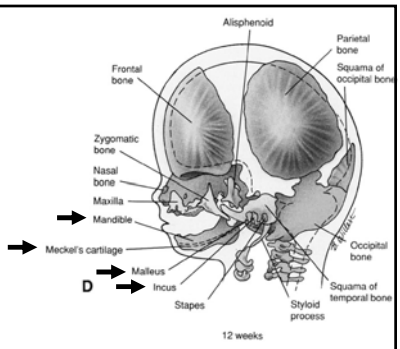


Manidibular Process

Caudal - lower jaw

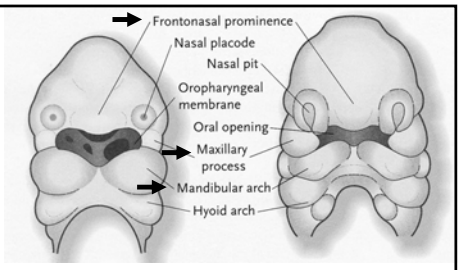
Cartilages
Meckel's cartilage
Malleus
Incus

Bone
Mandible



Maxillilary and Mandibular processes are important for Face formation

Face



Face is formed from 7 primordia surrounding the stomodeum

1 frontonasal prominence - cranial boundary of the stomodeum

Paired nasomedial process

Paired maxillary process

Paired of mandibular process

Frontonasal prominence forms the forehead
Horseshoe-shaped nasal process forms the nasal pit with the nasal placode in the depression.

Nasal prominences fuse medially

Midline fusion of the nasomedial processes forms the intermaxillary segment that later forms:
1) philtrum - groove of upper lip
2) Bridge and septum of the nose
3) Part of the maxilla and gum
4) Primary palate

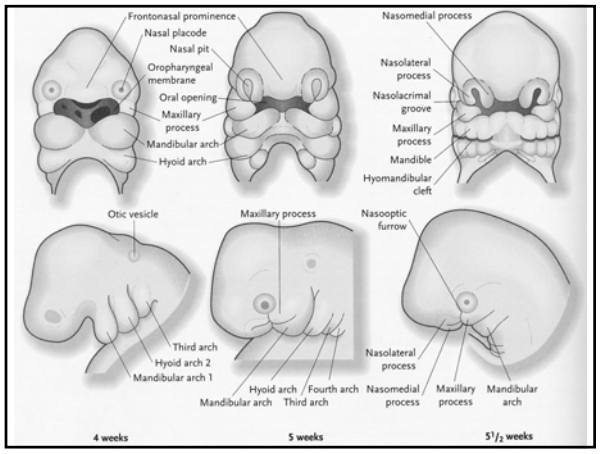
The nasolacrimal groove separates the nasolateral process from the maxillary process – forms the nasolacrimal duct via ectodermal thickening, internalization and canalization

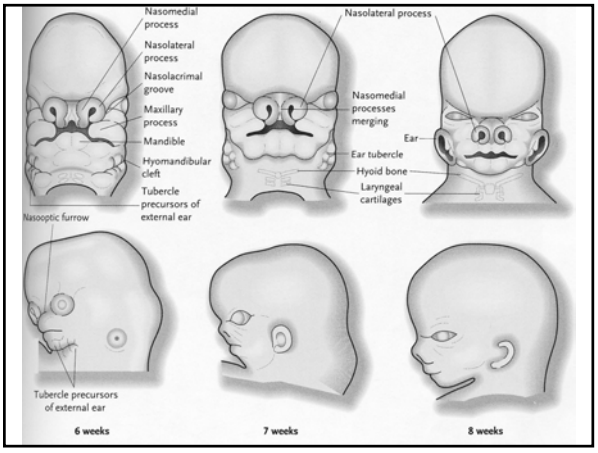
Maxillary process fuses lateral to the nasal process

Maxillary process forms:
Lateral parts of the upper lip
Maxilla
Secondary palate

Medial fusion of mandibular processes forms the lower jaw

Lateral fusion of maxillary and mandibular processes





Palate

Three primordia
Primary palate = median palatine process
Secondary palate = fuses lateral palatine processes

Primary palate - The innermost part of the intermaxillary segment forms a wedge-shaped mesodermal tissue between maxillary processes (median palatine process)

Secondary palate - forms from two projections from the maxillary processes - called lateral palatine processes (palatal shelves)

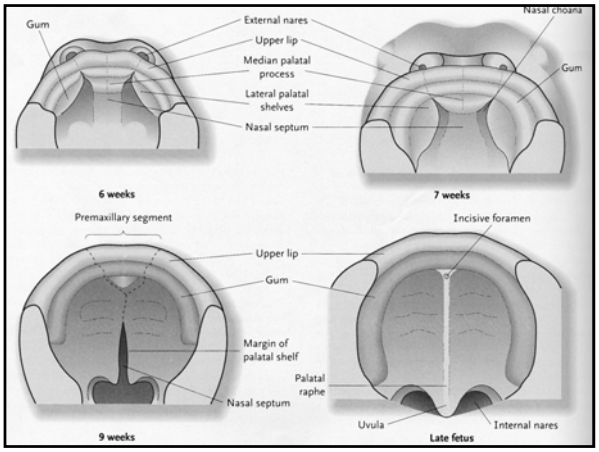
Palate

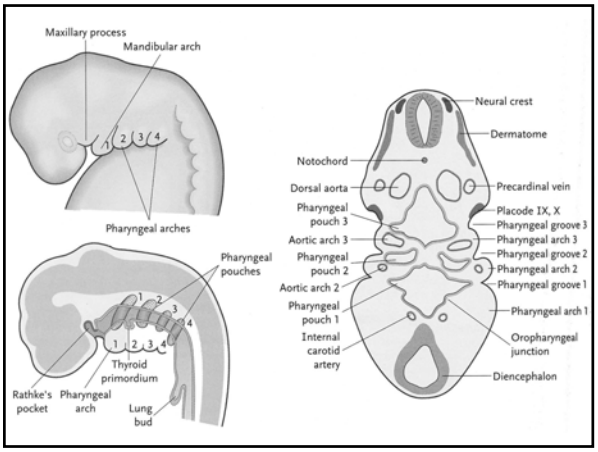
Projection of lateral palatine processes fuses:
Medially with each other
Medially with nasal septum (from the frontonasal prominence)
Rostrally with the medial palatine process

Palatal raphe = fusion line of lateral palatine processes

Hard palate – Ossification in the lateral palatine processes

Soft palate - posterior to the hard palate and its projection = uvula





#1 - Mandibular Arch

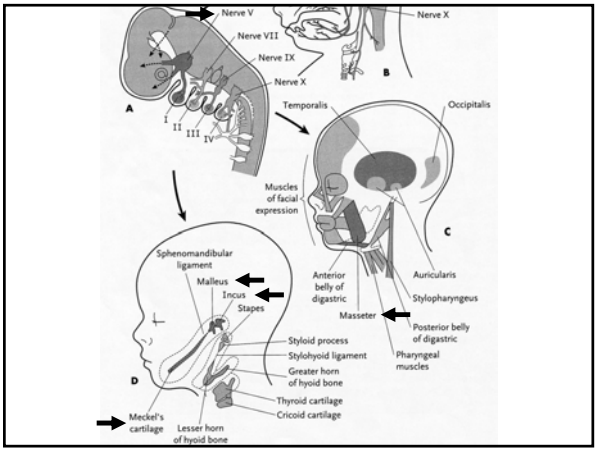
Muscles – from 4th Somitomere
- Muscles of mastication (e.g. masseter)

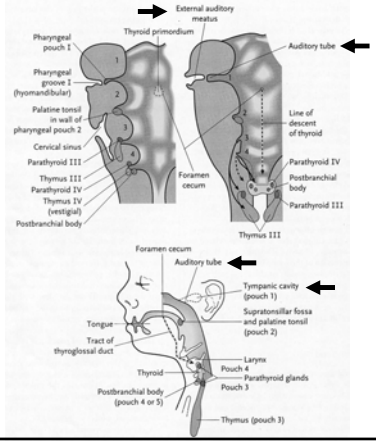
Nerve – Trigeminal (V)

Aortic Arch - Maxillary Artery

1st Pharyngeal Pouch – Auditory tube (eustachian tube) and tympanic cavity (distal end)

1st Pharyngeal Groove – External auditory meatus (exterior ear opening)





#2 – Hyoid Arch

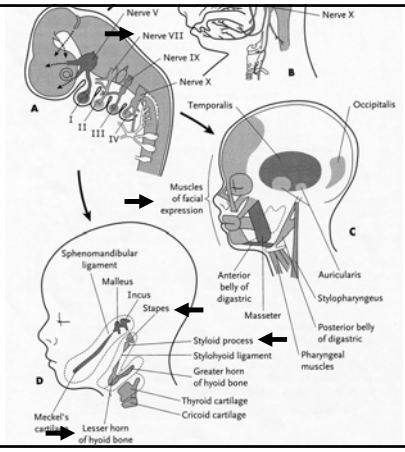
Skeleton
- Stapes
- Styloid process
- Lesser horn of the hyoid bone

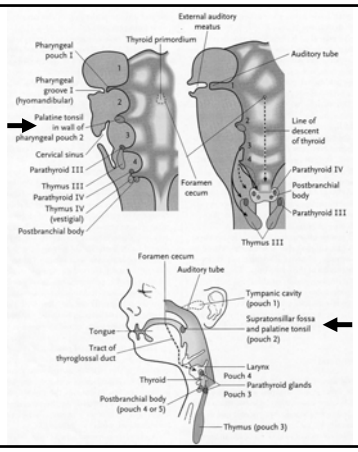
Muscles – from 6th Somitomere
- Muscles of facial expression

Nerve – Facial (VII)

2nd Aortic Arch - Hyoid artery, Stapedial artery

2nd Pharyngeal Pouch
- Supratonsilar fossa –component of the palatine tonsils





3rd Arch

Skeleton
Greater horn of the hyoid bone

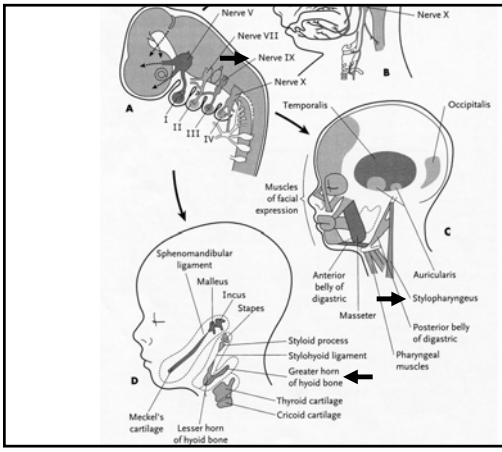
Muscles – from 7th Somitomere
Stylopharyngeus (raises the pharynx during vocalization and swallowing)

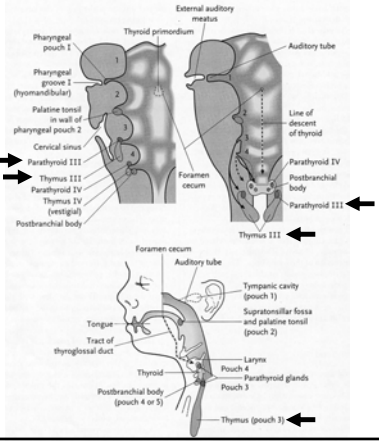
Nerve – Glossopharyngeal (IX)

3rd Aortic Arch – Internal Carotid artery

3rd Pharyngeal Pouch
Dorsal - Paired inferior parathyroid, fuses with thyroid gland (parathyroid hormone, Calcium regulation)

Ventral - hollow and elongate - fuses ventro-medially to form the bilobed thymus, secondarily moves posterior to become posterior to the thyroid gland (lymphocyte production, blood-thymic barrier)





4th Arch

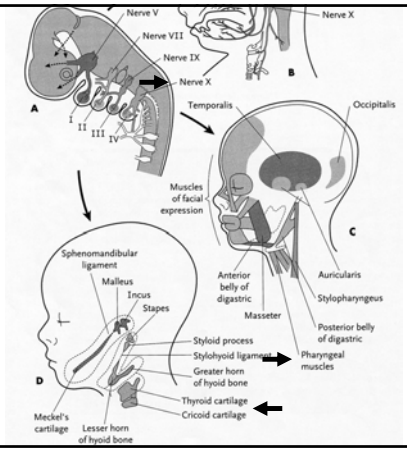
Skeleton
Laryngeal cartilages

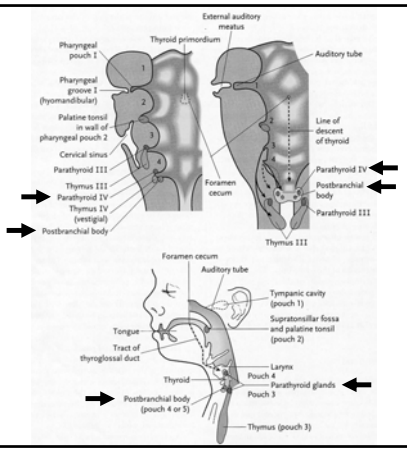
Muscles – from occipital somites 2-4 and cervical somite 1
Pharyngeal and Laryngeal musculature

Nerve – Vagus (X)

4th Aortic Arch – Right Subclavian artery, Aorta

4th Pharyngeal Pouch
Dorsal - forms paired superior parathyroids
Ventral - Postbranchial Body (ultimobranchial body, calcitonin)





Anomalies

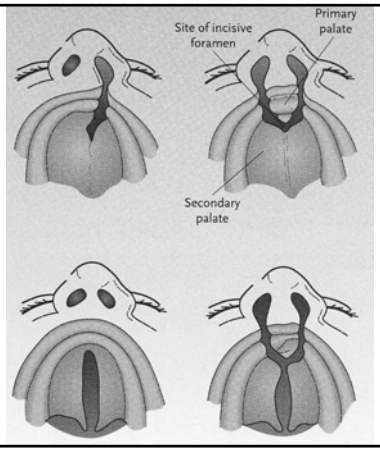
Craniofacial: Mostly defects associated with tissue fusion:

Estimated 1/3 of all congenital defects

Facial Clefts - Anomalies associated with defective fusion of Facial prominences

Cleft lip - failure of maxillary prominence to fuse with intermaxillary process

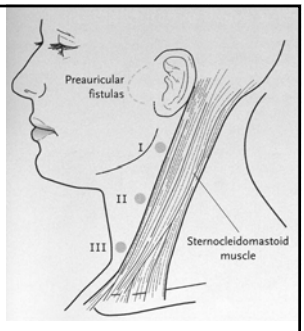
Cleft palate - failure of the lateral palatine processes to fuse



Anomalies

Pharyngeal:

Branchial cysts, sinus or fistula:
opens on the side of the neck
Persistence of the pharyngeal groove and/or pouch



Piriform sinus fistula:
canal is persistant that follows the migration of the postbranchial body from the 4th pouch to the thyroid.