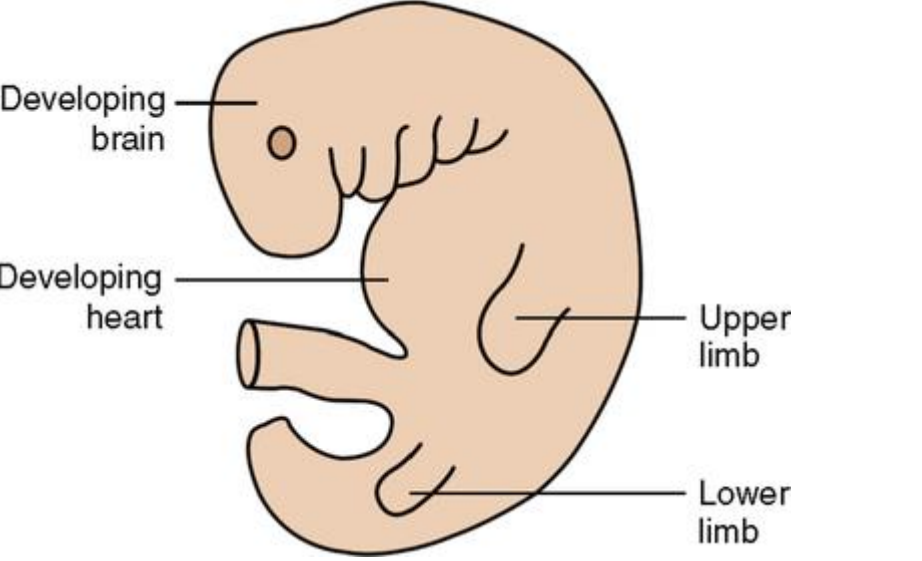




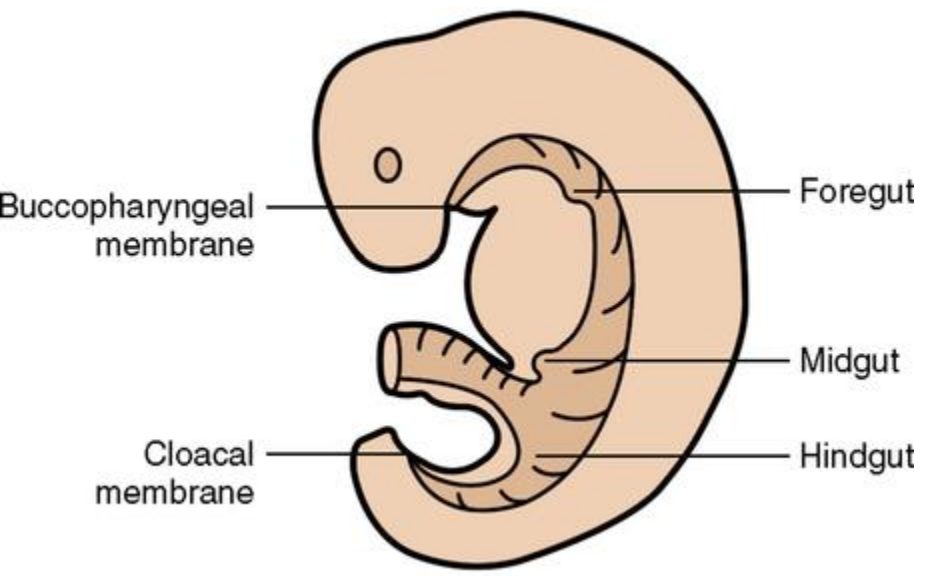
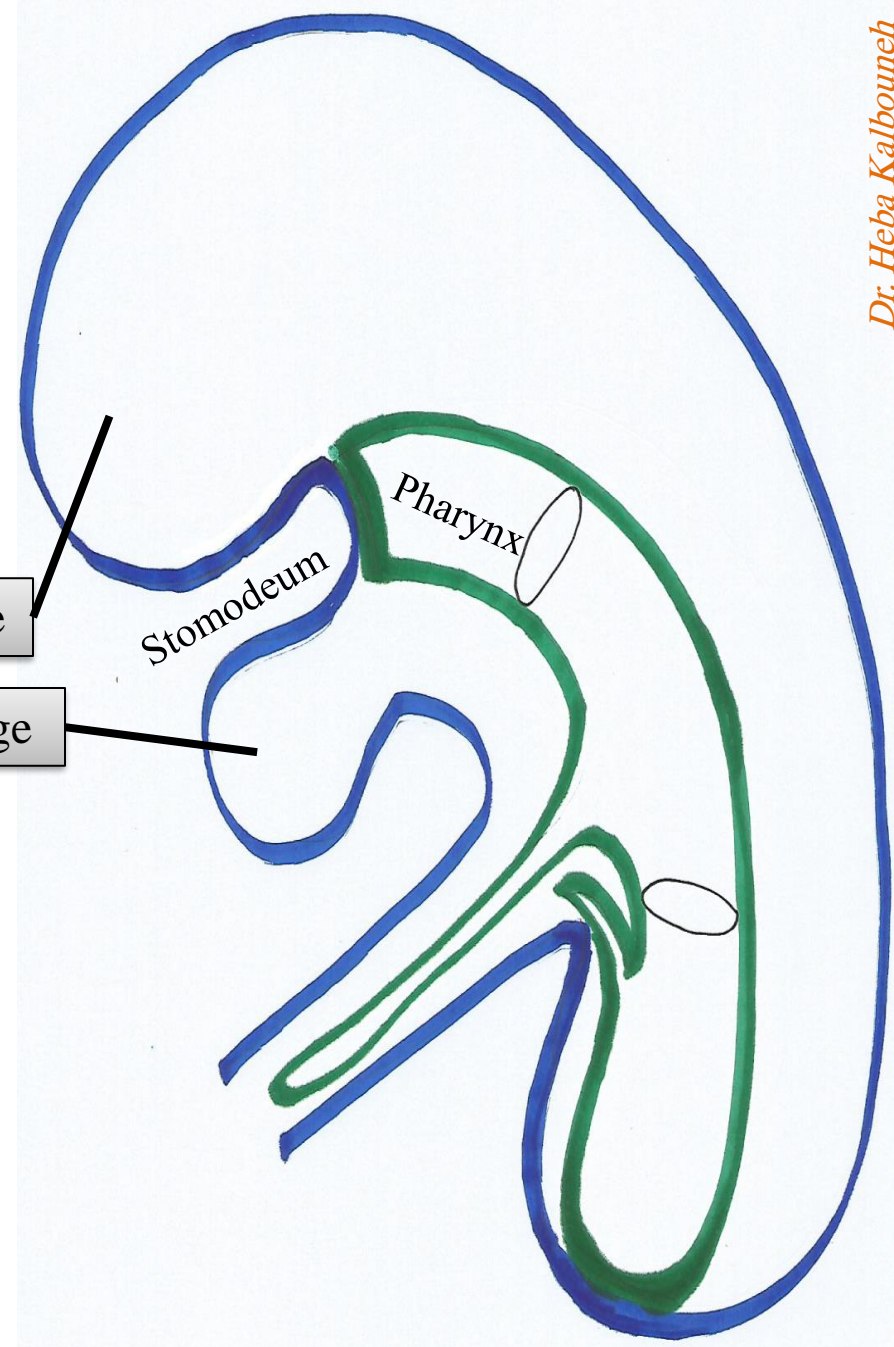
Development of Face and Palate

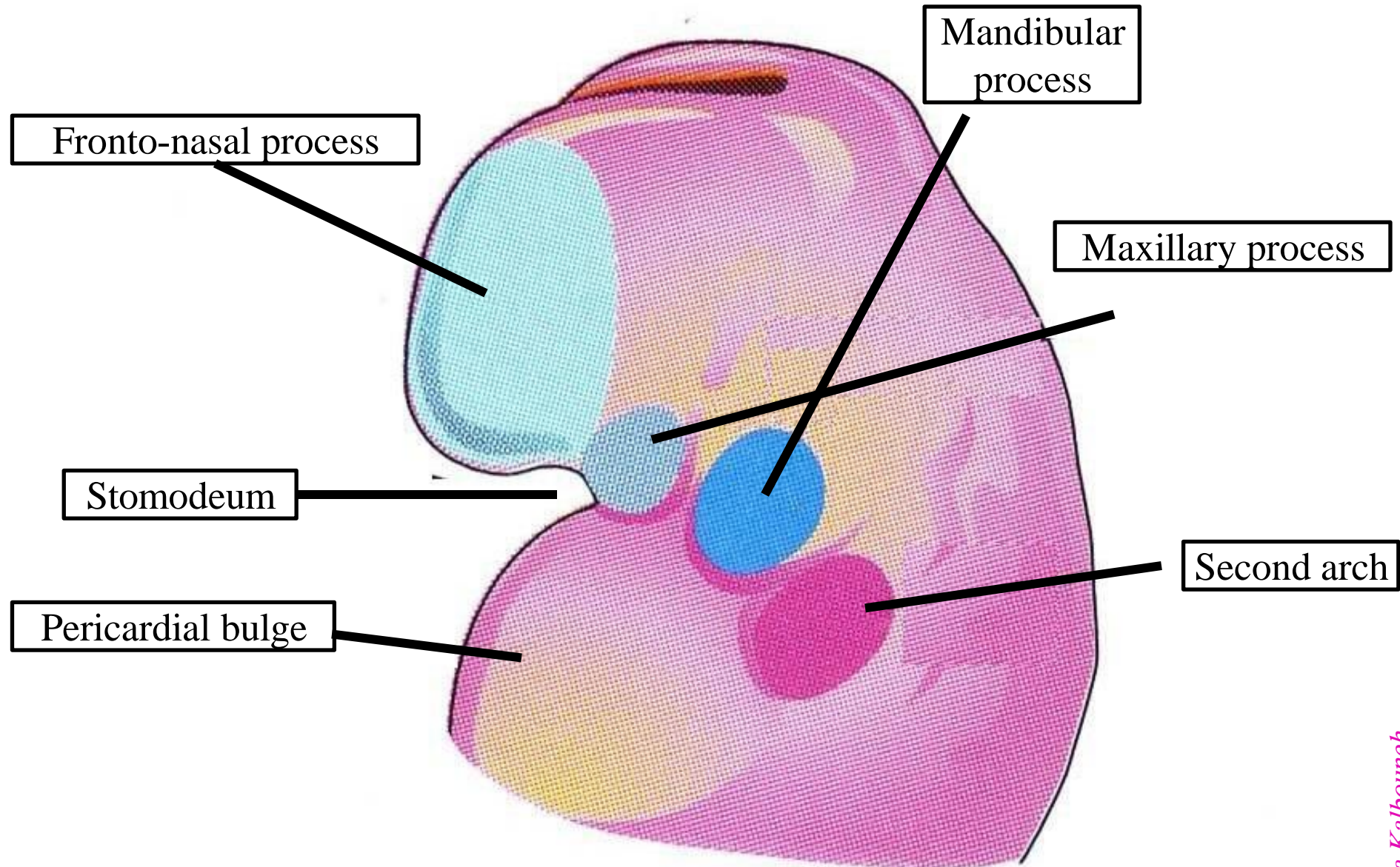
Dr. Heba Kalbouneh
Professor of Anatomy and Histology

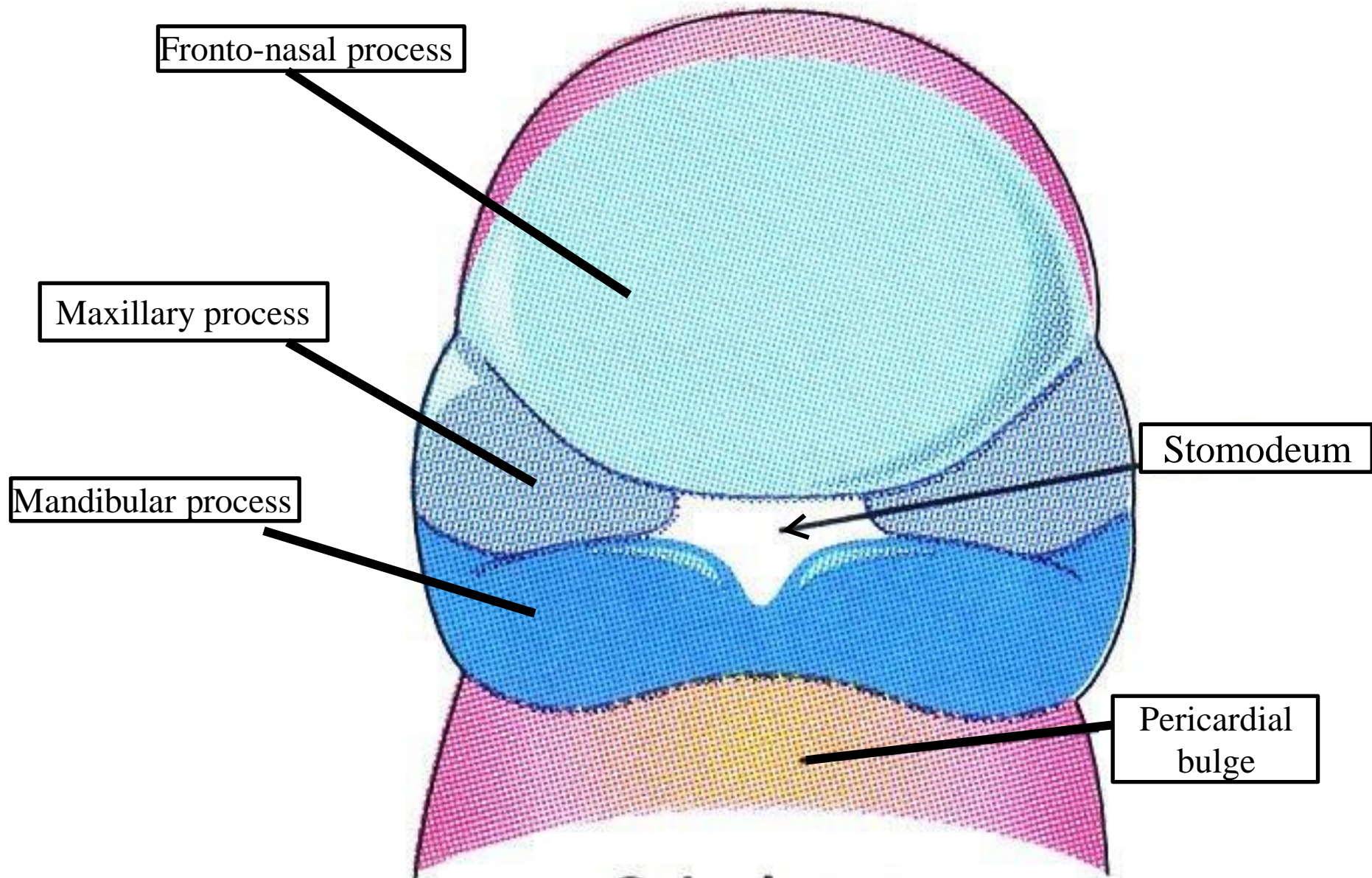


Forebrain bulge

Pericardium bulge







Fronto-nasal process

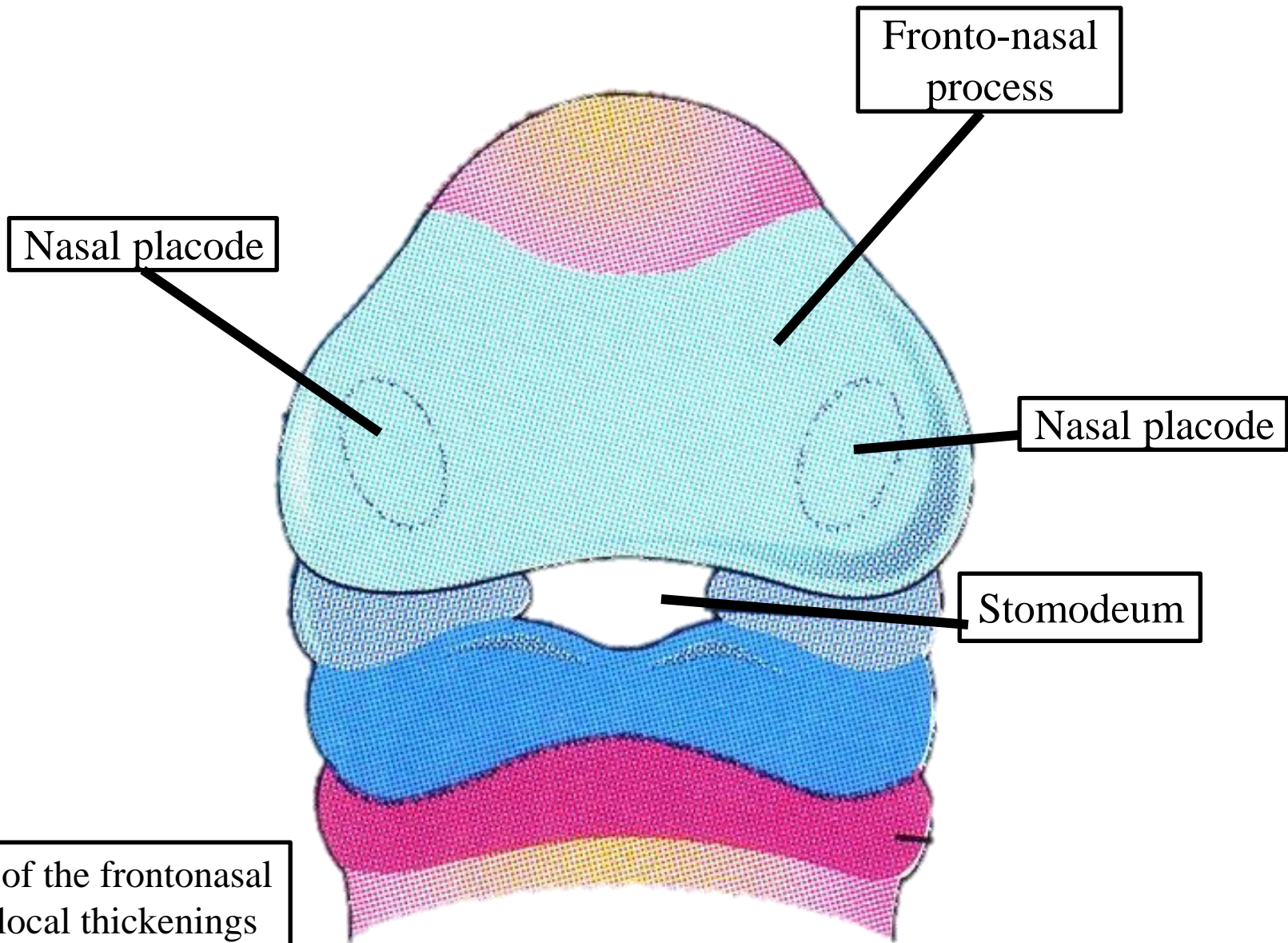
Maxillary process

Mandibular process

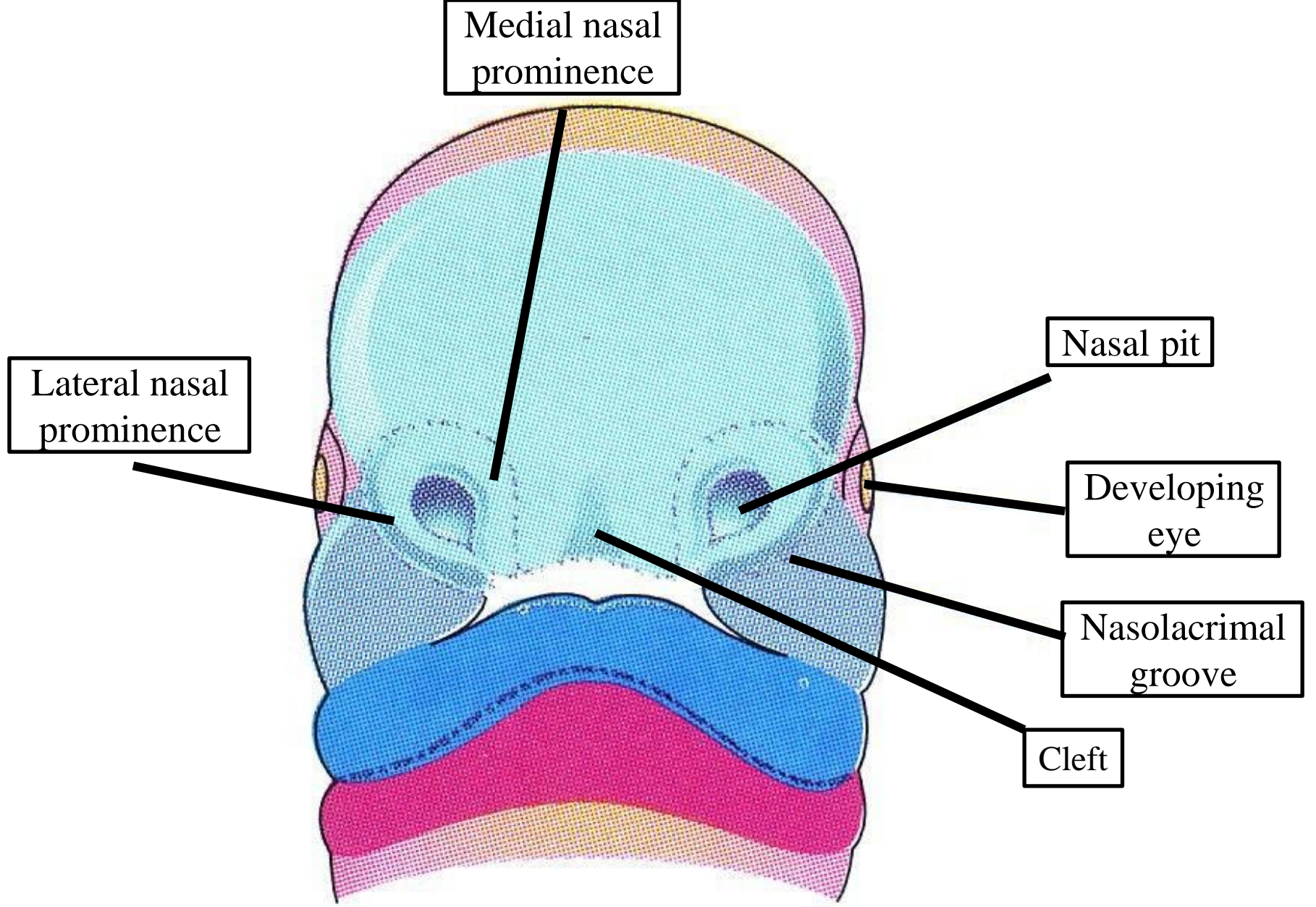
Stomodeum

Pericardial bulge

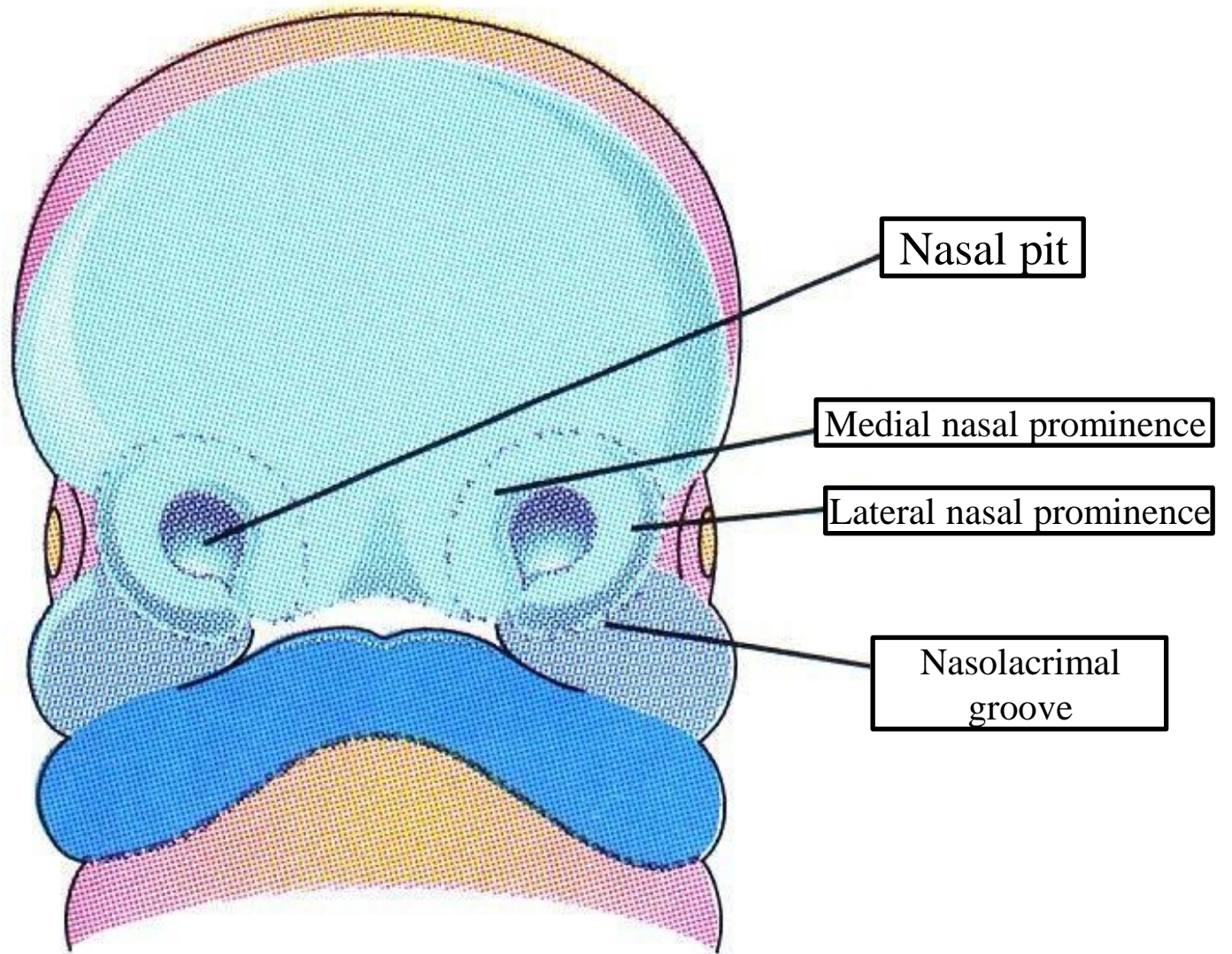
24 days



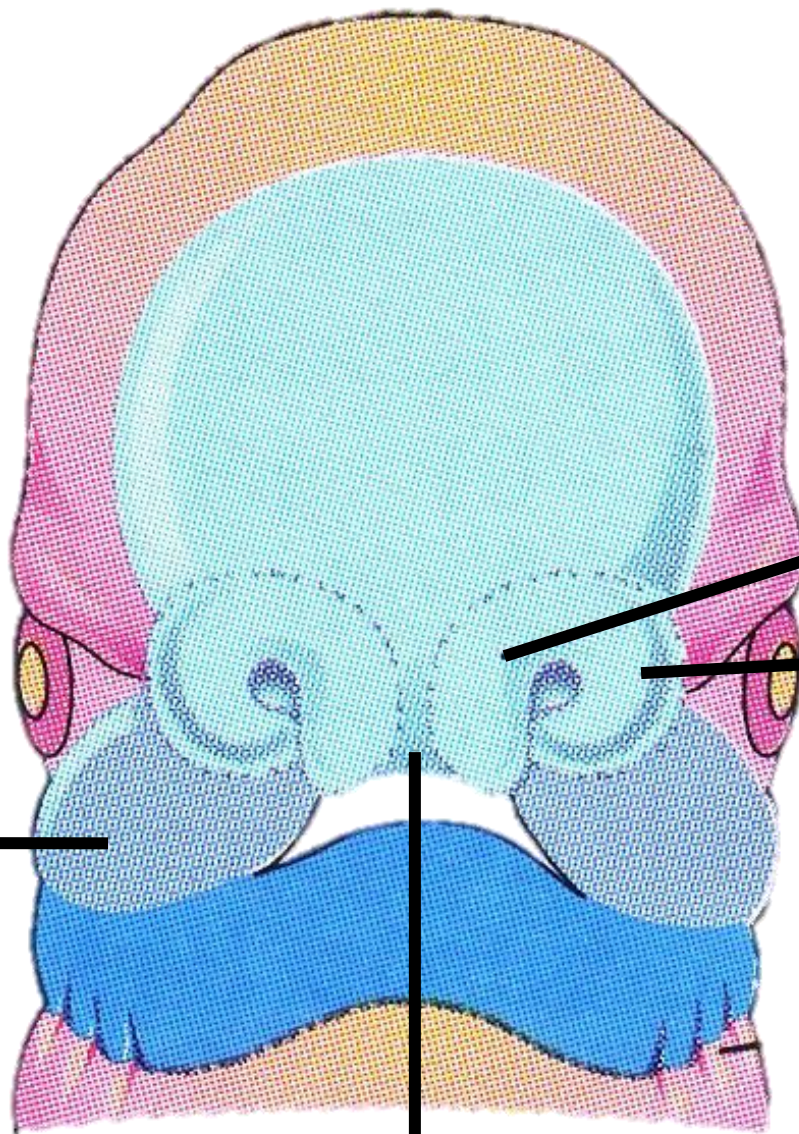
On both sides of the frontonasal prominence, local thickenings of the surface ectoderm will be formed, the **nasal placodes**



31 days



33 days

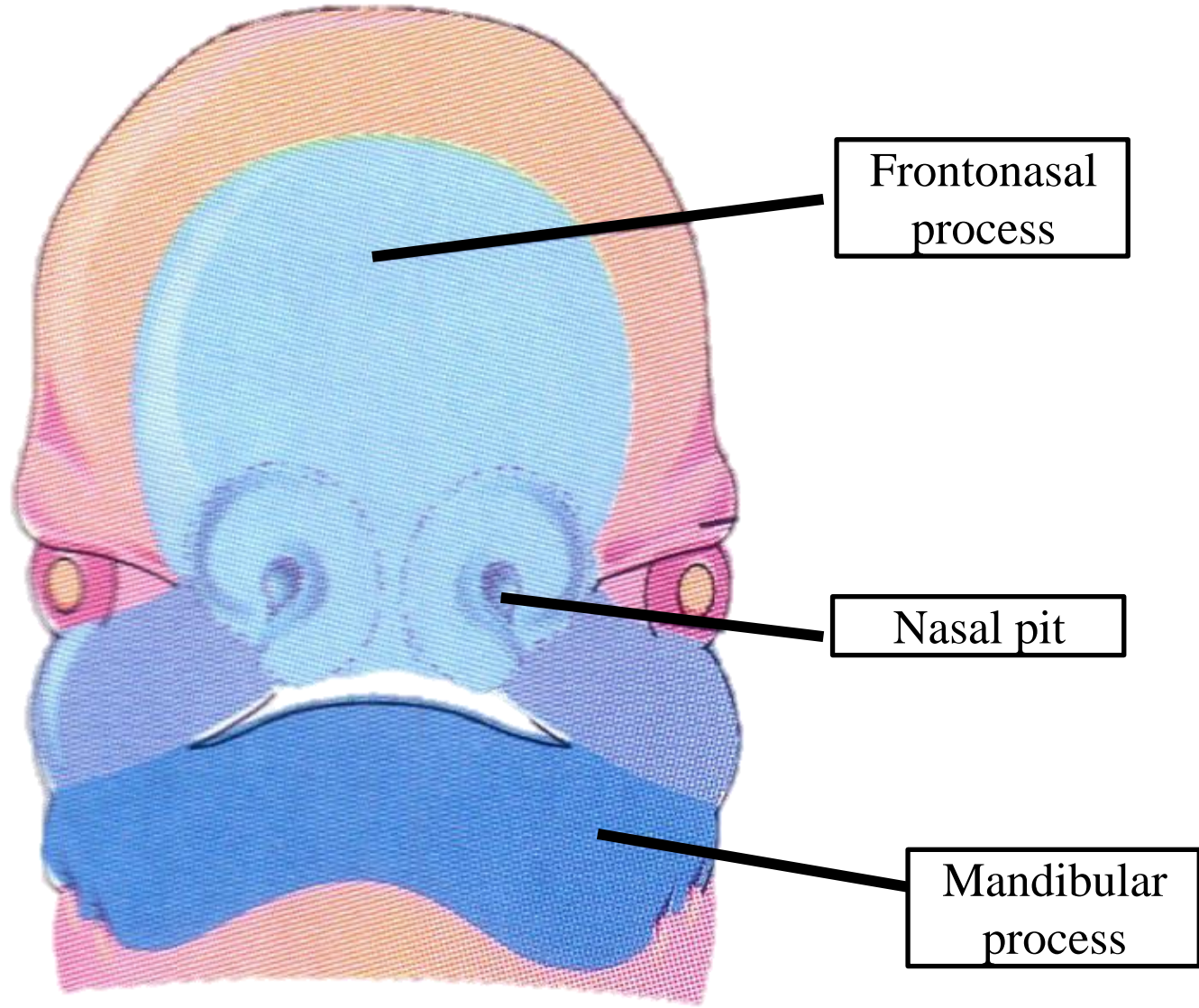


Maxillary process

Medial nasal prominence

Lateral nasal prominence

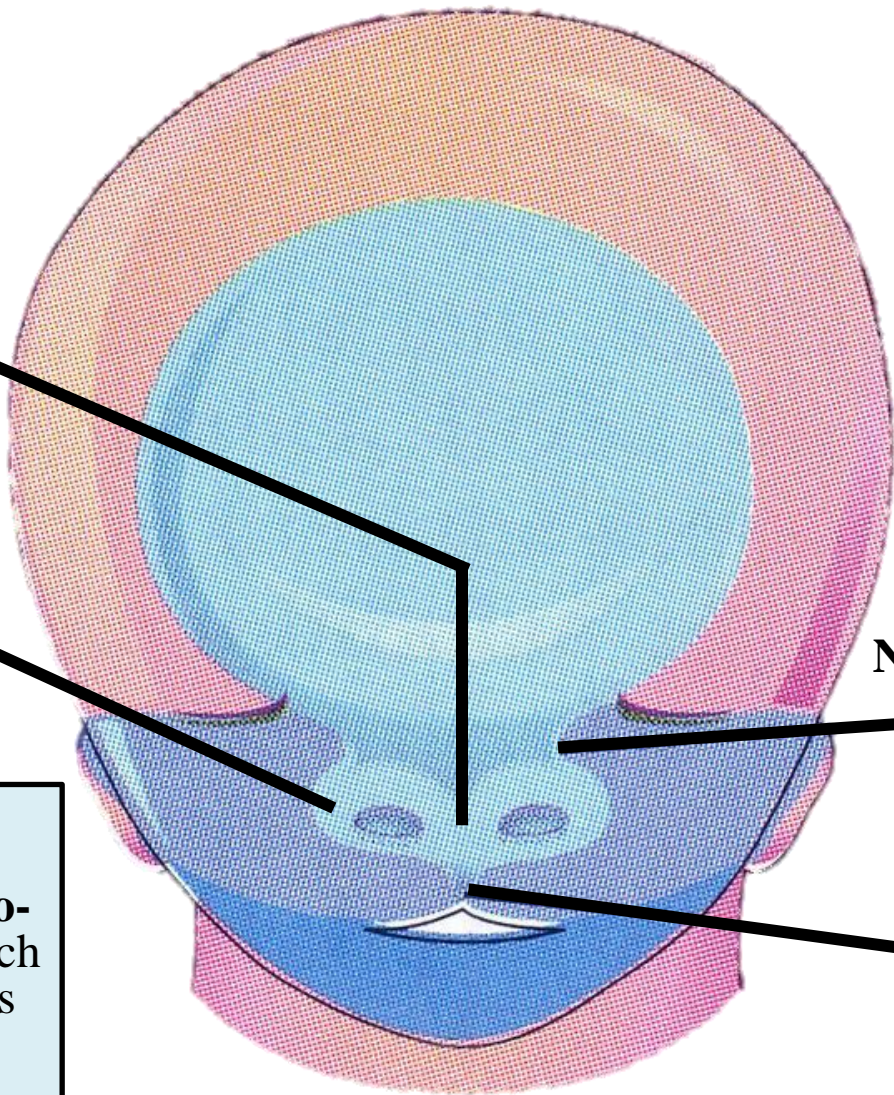
Cleft



Medial nasal prominences fuse and form the middle part of the nose

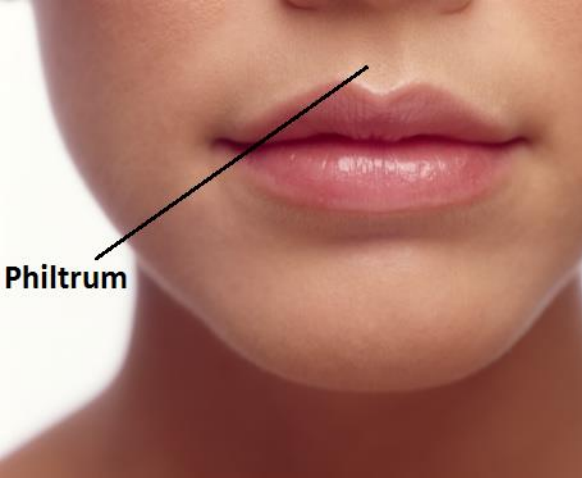
Lateral nasal prominence forms the ala of the nose

The maxillary process is separated from the side of fronto-nasal process by **naso-lacrimal groove**, inside which a cord of ectodermal cells is formed then becomes canalized to form naso-lacrimal duct. Its upper end forms lacrimal sac.

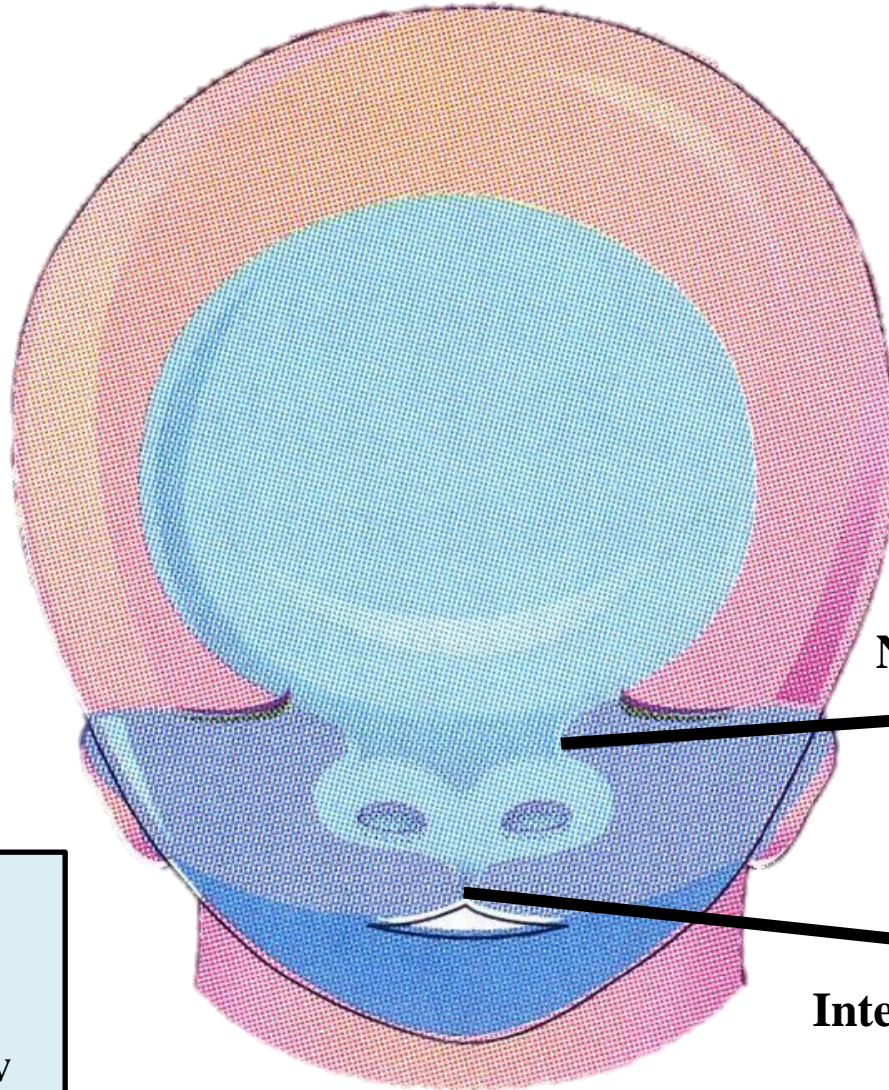


Naso-lacrimal groove

The two medial nasal folds fuse to form the **Intermaxillary segment**



Philtrum



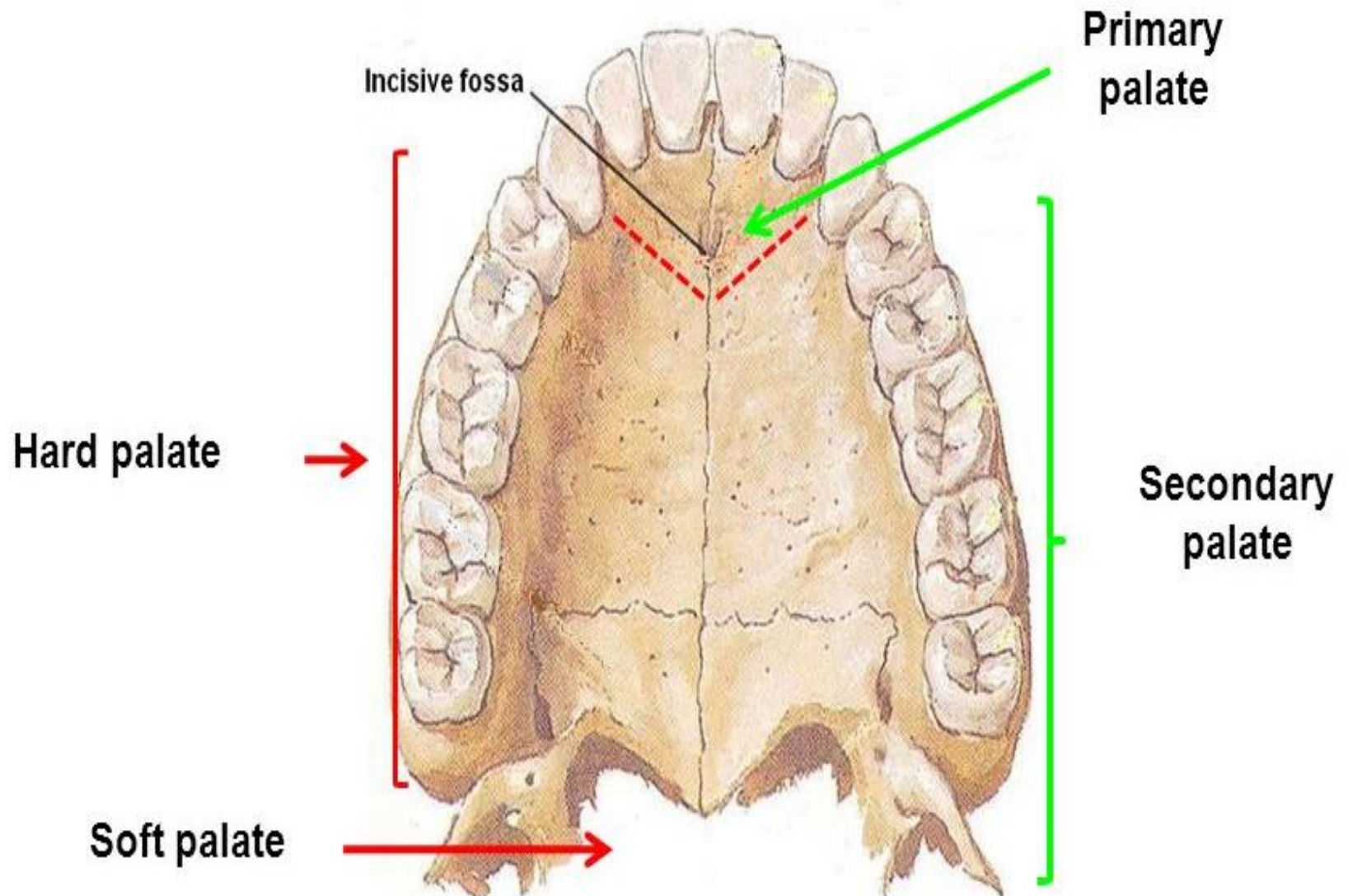
Naso-lacrimal groove

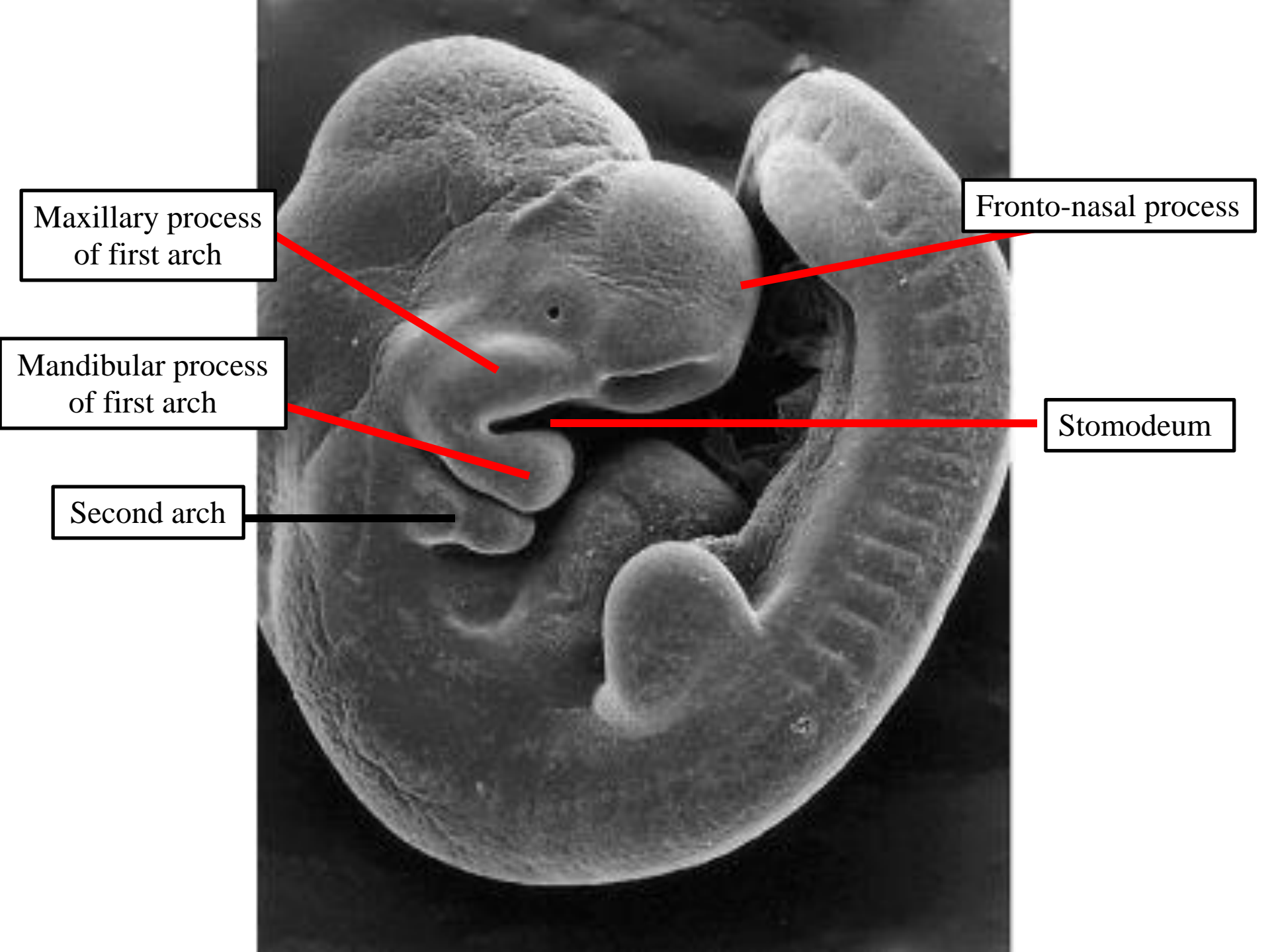
Intermaxillary segment

Intermaxillary segment:
from fused medial nasal prominences. It forms philtrum, part of upper jaw that carries upper 4 incisors and primary palate

Intermaxillary segment: Primary palate

Palatine shelves of the maxillary processes: Secondary palate





Maxillary process
of first arch

Mandibular process
of first arch

Second arch

Fronto-nasal process

Stomodeum

Maxillary process
of first arch

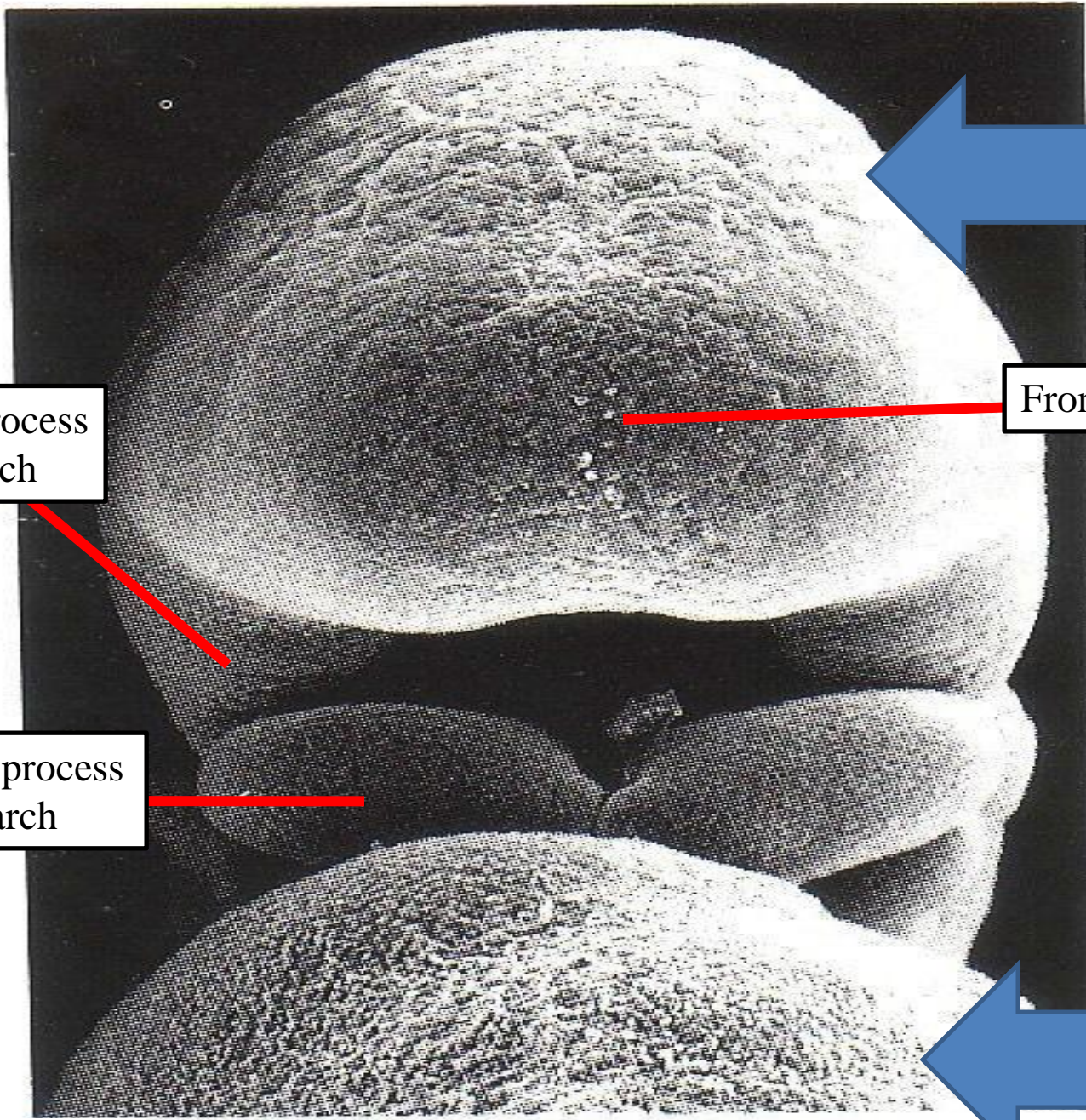
Mandibular process
of first arch

Forebrain bulge

Fronto-nasal process

Pericardium
bulge

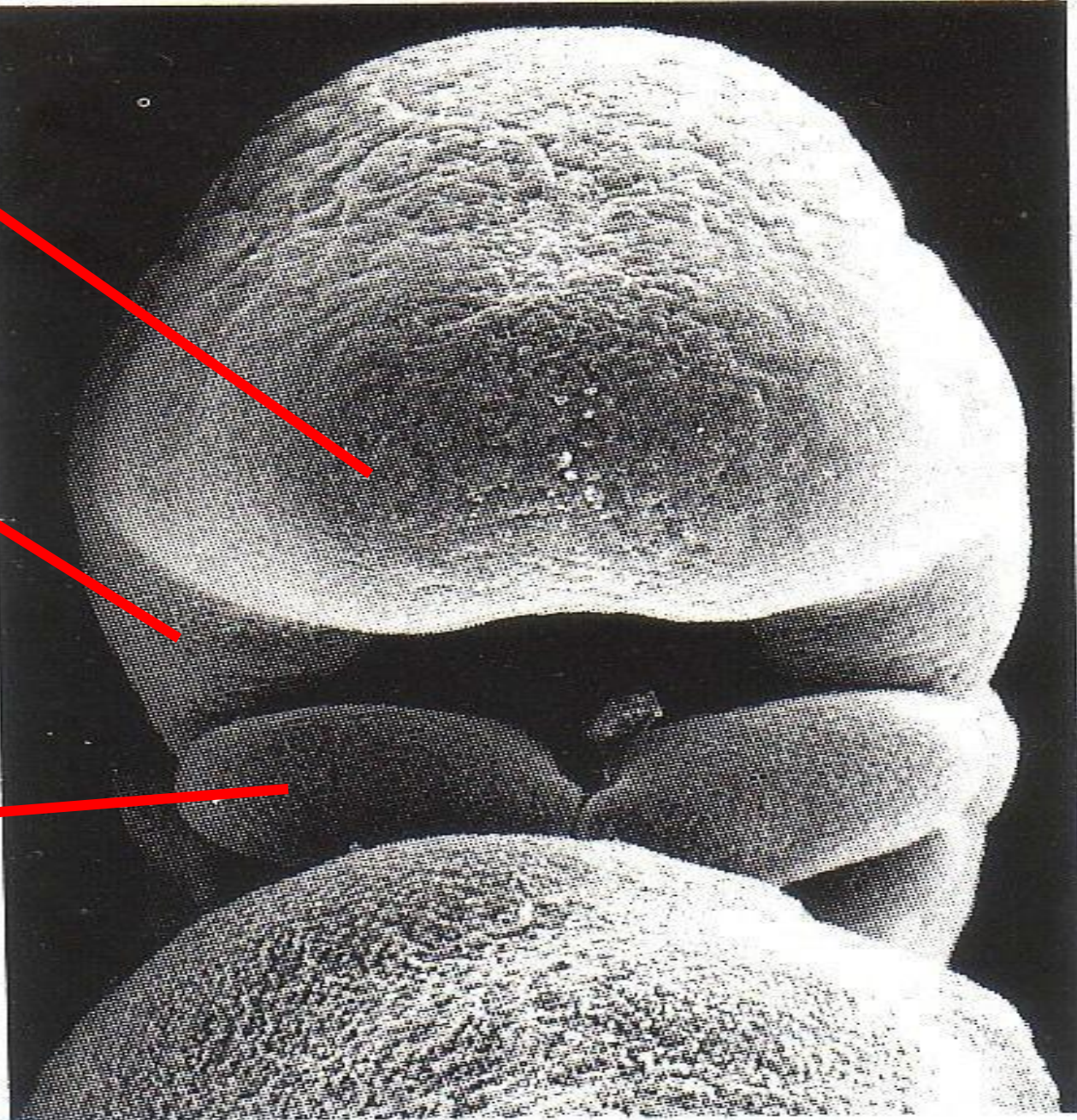
Fourth Week



The **frontonasal process** grows downward toward the stomodeum

The **maxillary process** grows medially

The **mandibular processes** approach one another in the midline below the stomodeum and fuse to form the lower jaw and lower lip



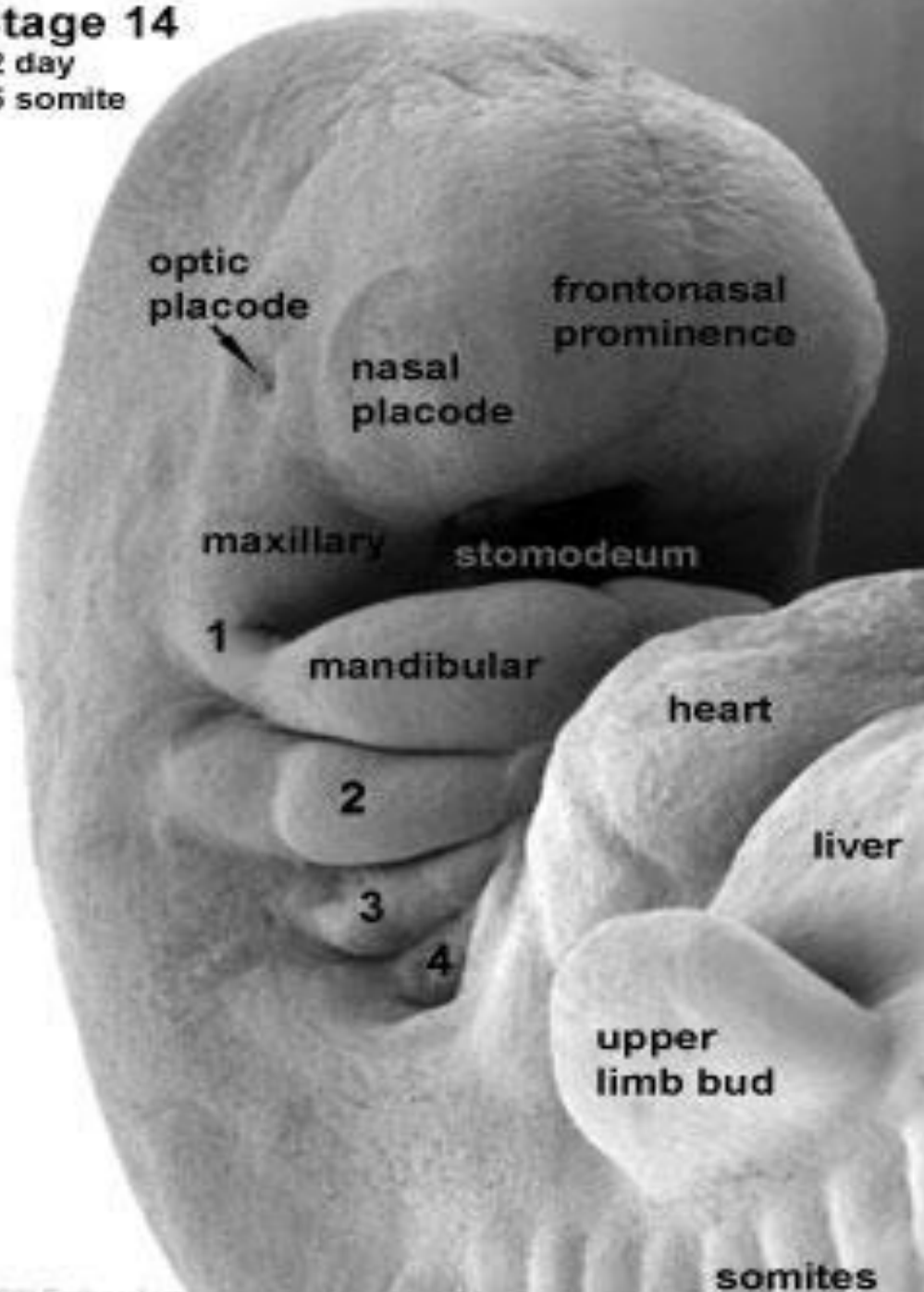
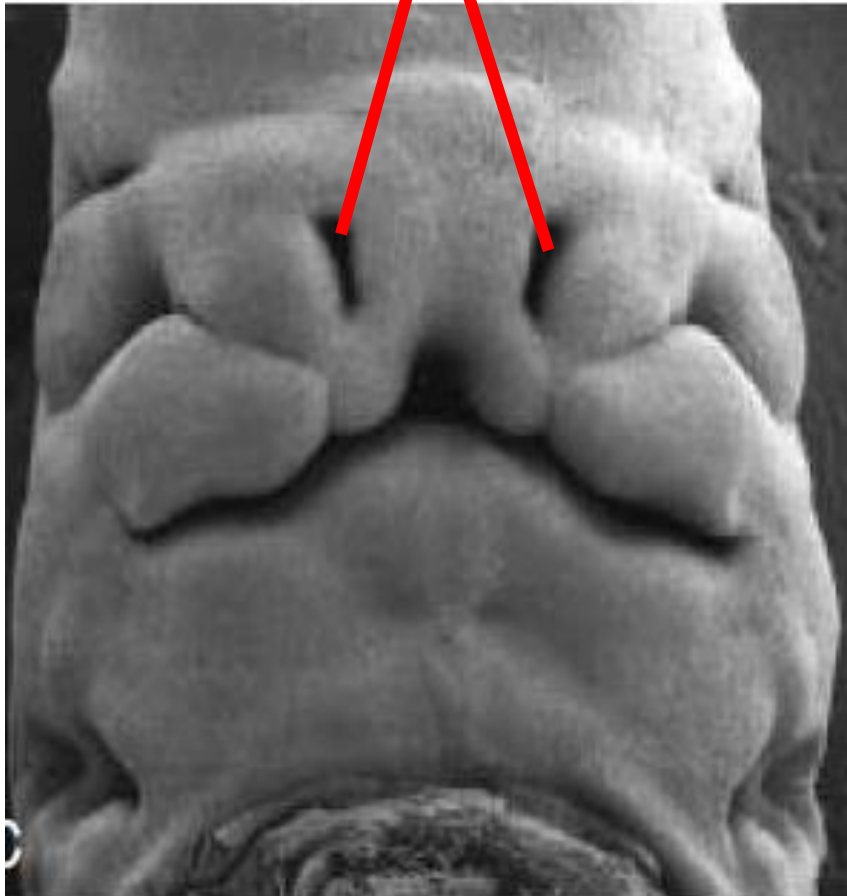
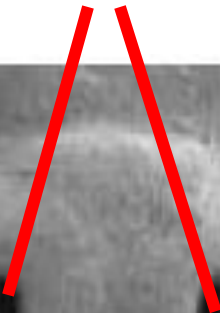
Fourth Week

Stage 14

32 day

35 somite

NASAL PITS



optic placode

frontonasal prominence

nasal placode

maxillary

stomodeum

1

mandibular

heart

liver

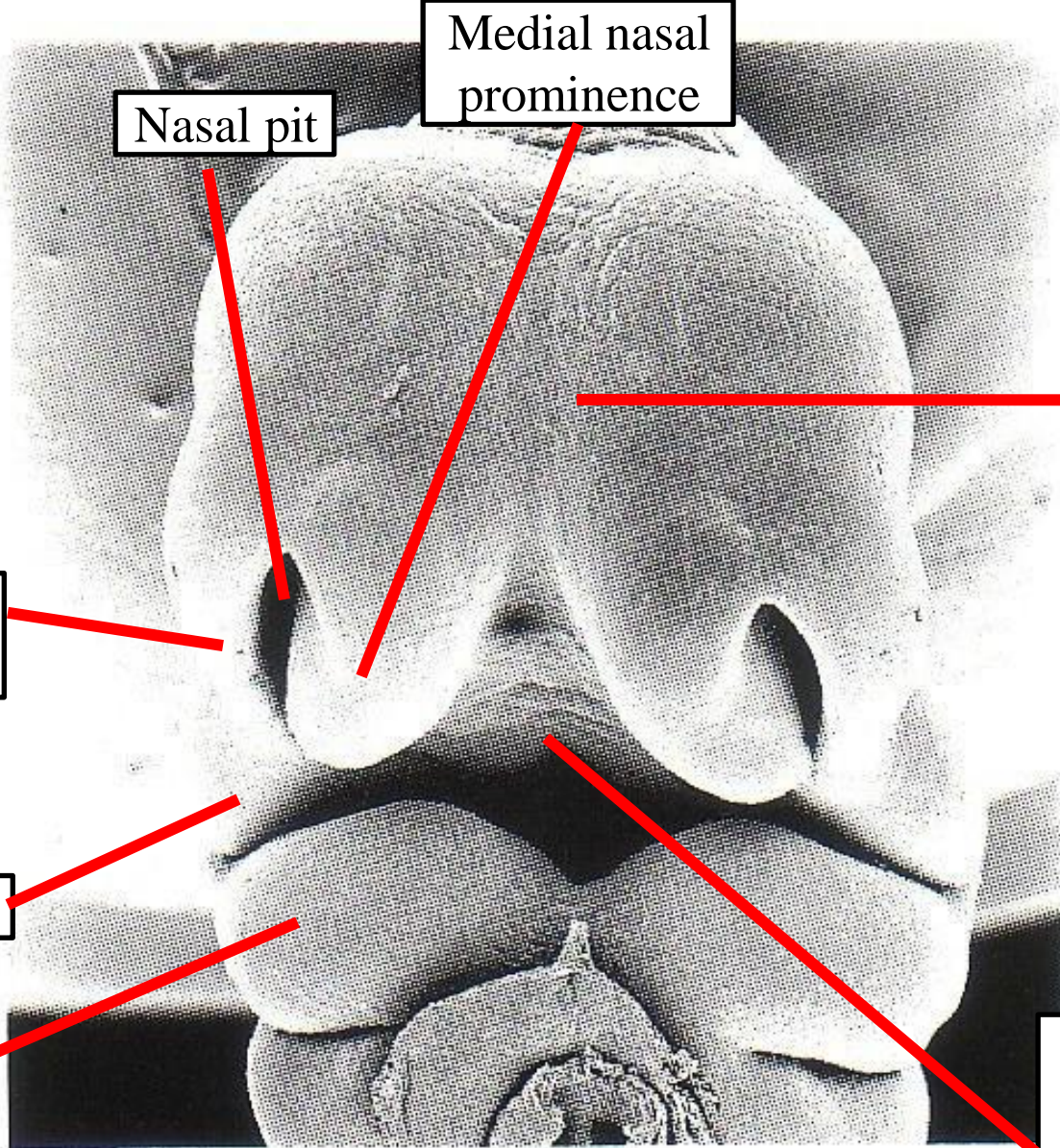
2

3

4

upper limb bud

somites



Nasal pit

Medial nasal prominence

Fronto-nasal process

Lateral nasal prominence

Maxillary process

Mandibular process

Horizontal shelves of maxillary processes (2ndry palate)

Early 6th week

Development of face

Face is developed from 5 processes (prominences):

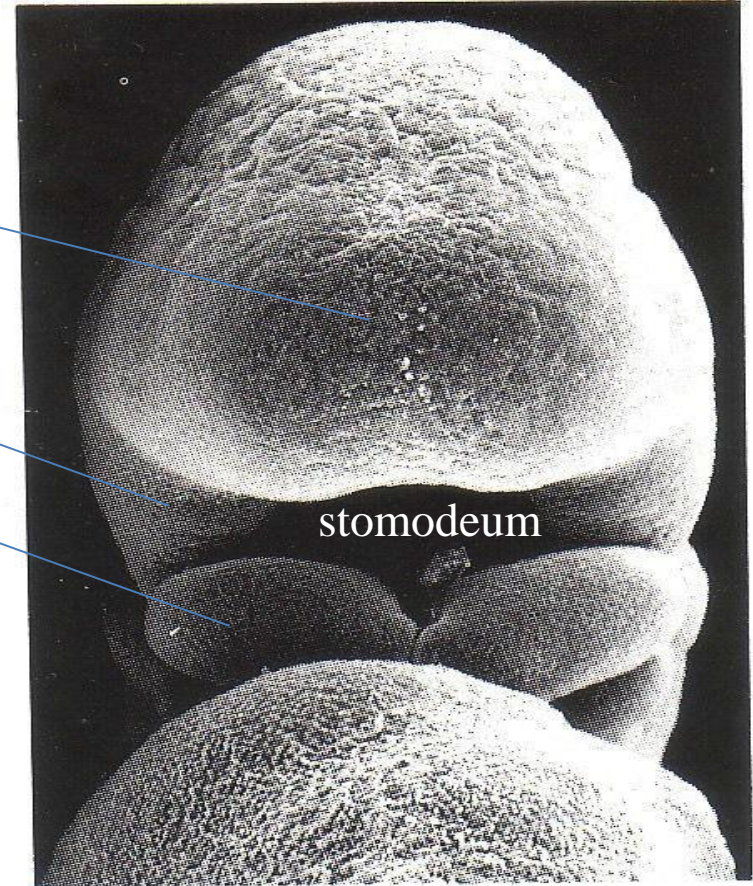
One fronto-nasal process

2 maxillary processes

2 mandibular processes

- ✓ **Maxillary process** is a forward growth of **dorsal end of 1st pharyngeal arch.**
- ✓ **Mandibular process** is a forward growth of **ventral end of 1st pharyngeal arch.**

These processes surround stomodeum (primitive nasal and oral cavities). Bucco-pharyngeal membrane will rupture to allow continuity between oro-nasal and pharyngeal cavities.



Fronto-nasal process

- **Nasal placodes:** rounded thickenings of the surface ectoderm in the lower lateral parts of the fronto-nasal process.
- **Nasal pits & prominences:** invagination of placode will form nasal pits which are surrounded by medial & lateral nasal prominences (folds).
- **Intermaxillary segment:** from fused medial nasal prominences. It forms philtrum, part of upper jaw that carries upper 4 incisors and primary palate.

Maxillary process

- ✓ It is separated from other maxillary process by intermaxillary segment.
- ✓ It fuses partially with mandibular process to form the cheek.
- ✓ Palatine process is formed as inward projection of maxillary process to form secondary palate which divides stomodeum into upper nasal and lower oral cavities.

So maxillary process forms lower eyelid, upper part of cheek, upper lip except philtrum, upper jaw except part that carries upper incisors and most of hard palate.

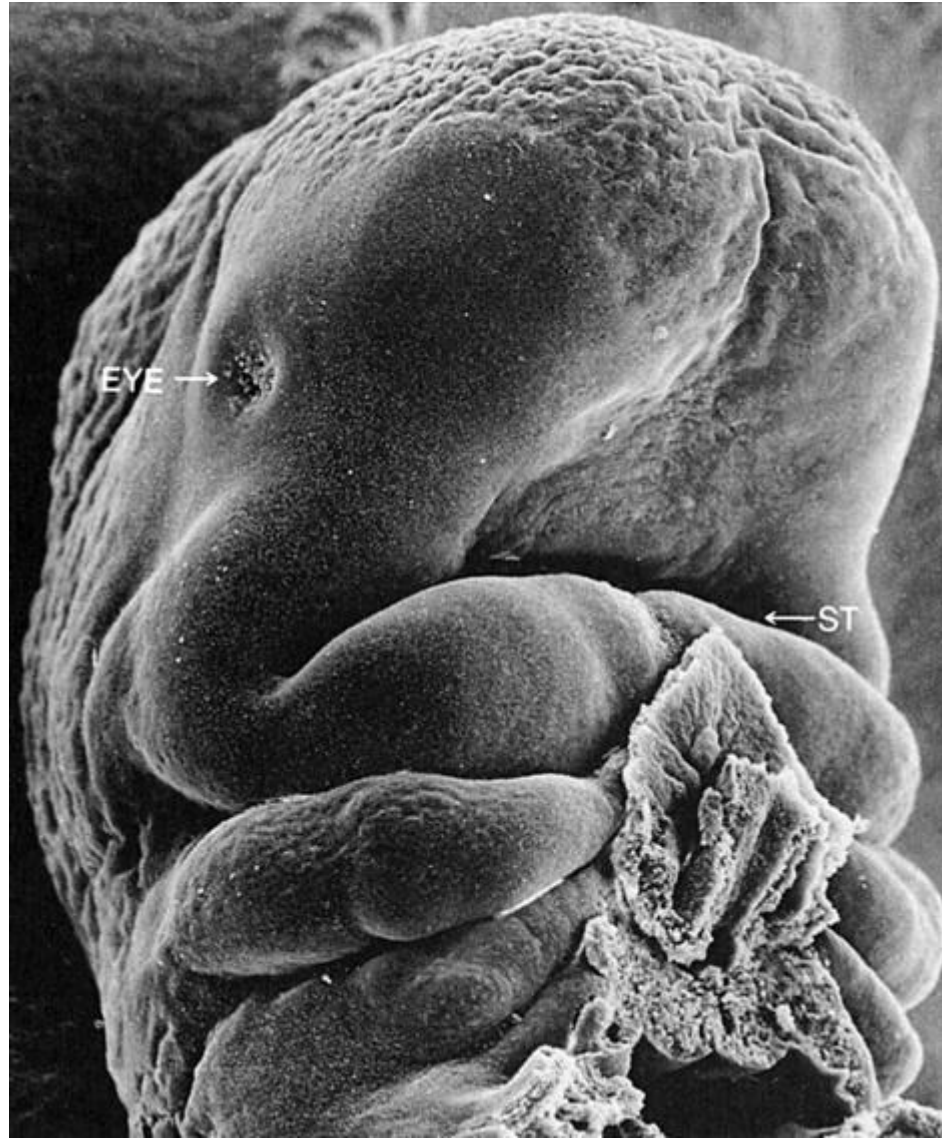
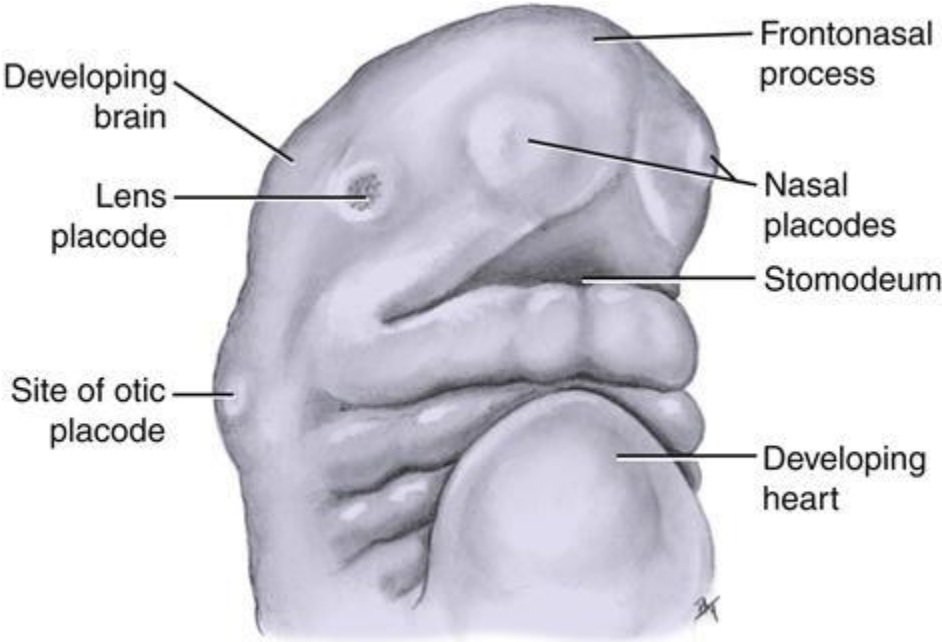
Mandibular process

It forms the lower part of cheek, whole lower lip and lower jaw and floor of mouth.

Development of palate:

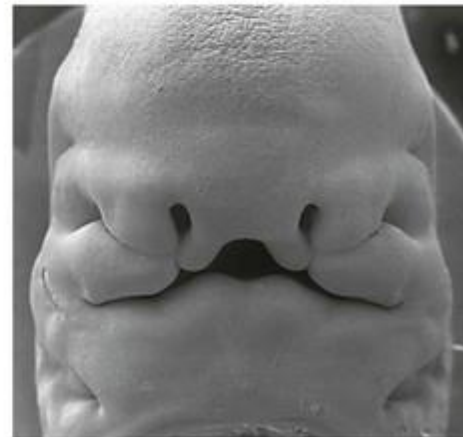
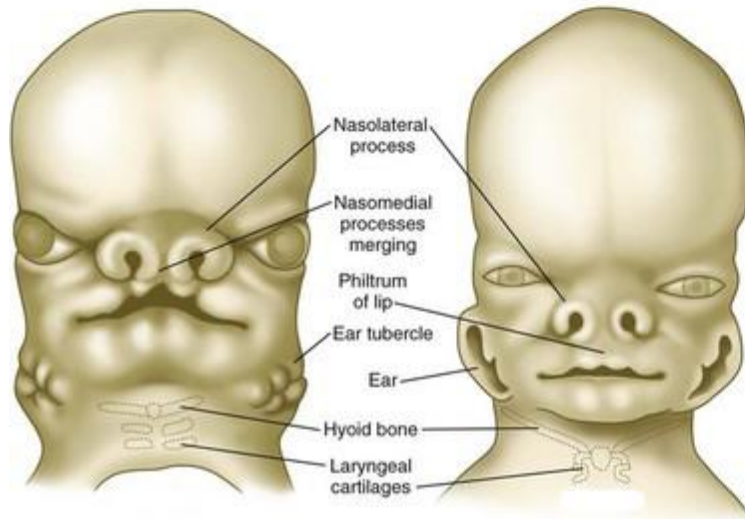
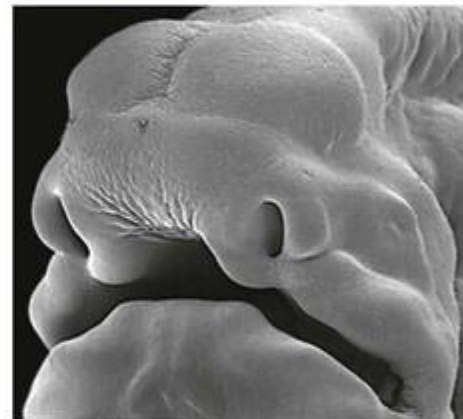
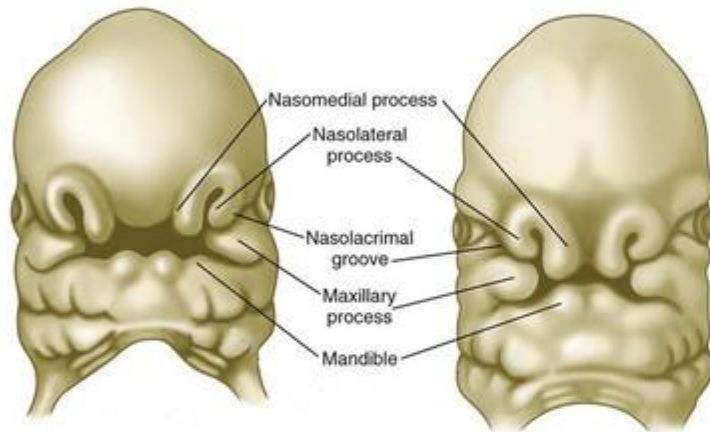
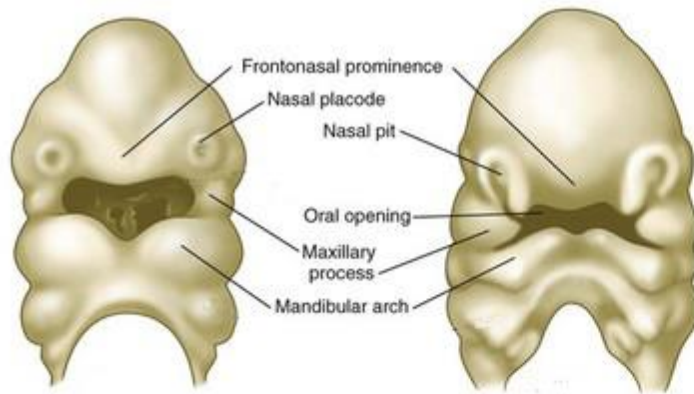
- 1- Primary palate: from intermaxillary segment of fronto-nasal process.
- 2- Secondary palate: from palatine shelves of maxillary processes that form most of hard palate and soft palate.

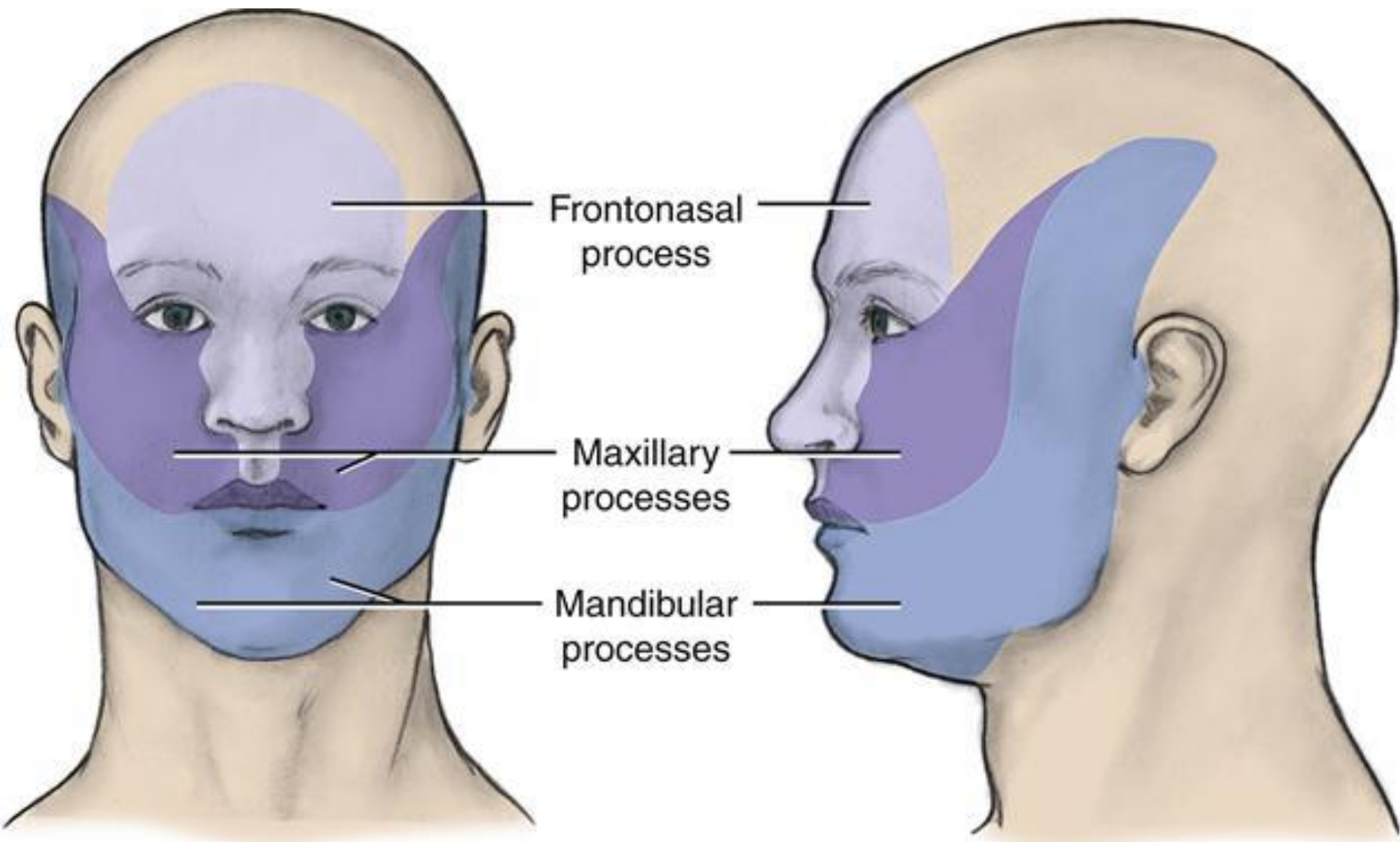
Hard palate receives downward growth of nasal septum



Ectodermal tubercles forming the auricle







Frontonasal process

Maxillary processes

Mandibular processes

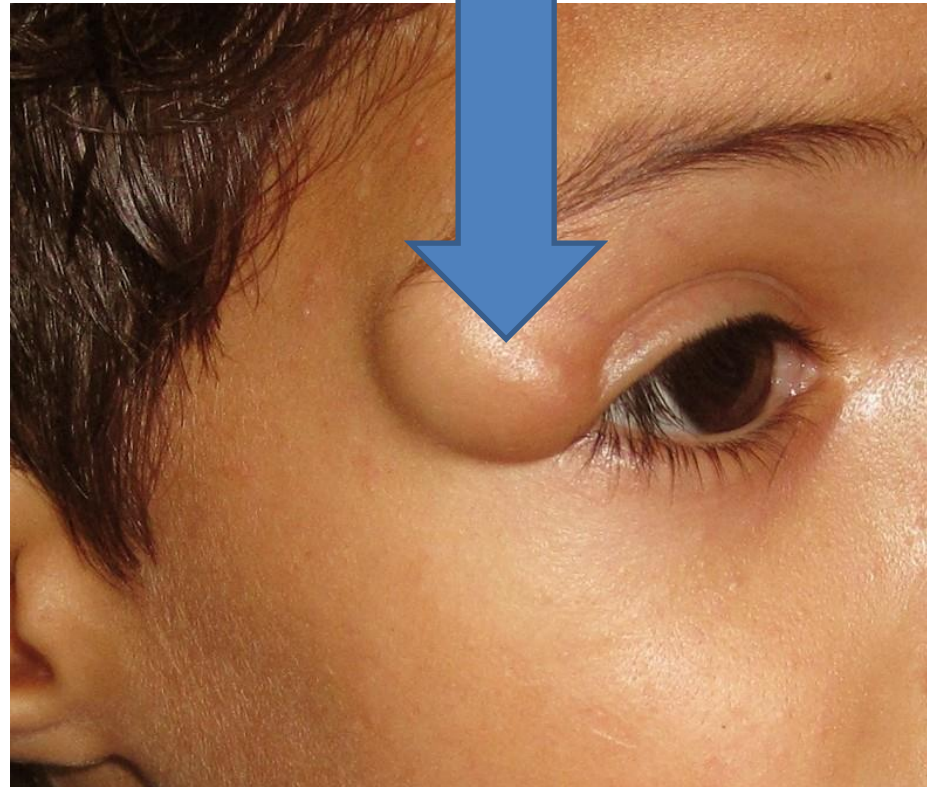
Frontal view

Lateral view

Congenital anomalies

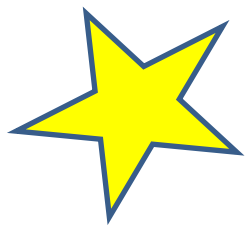
Dermoid cyst: cystic swelling at a line of fusion between processes of the face

Dermoid cyst

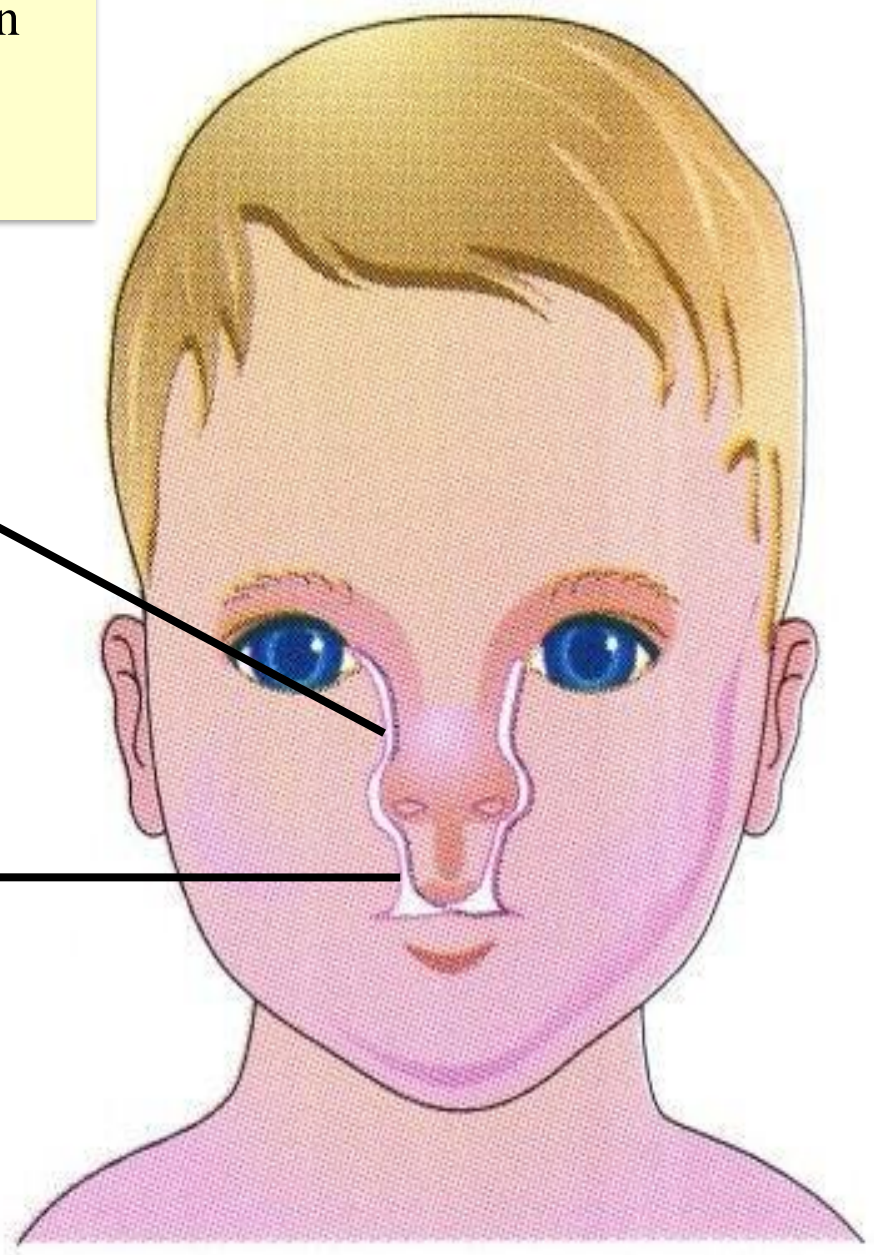


Oblique facial cleft: failure of fusion between maxillary and fronto-nasal processes.

Oblique facial cleft



Cleft lip

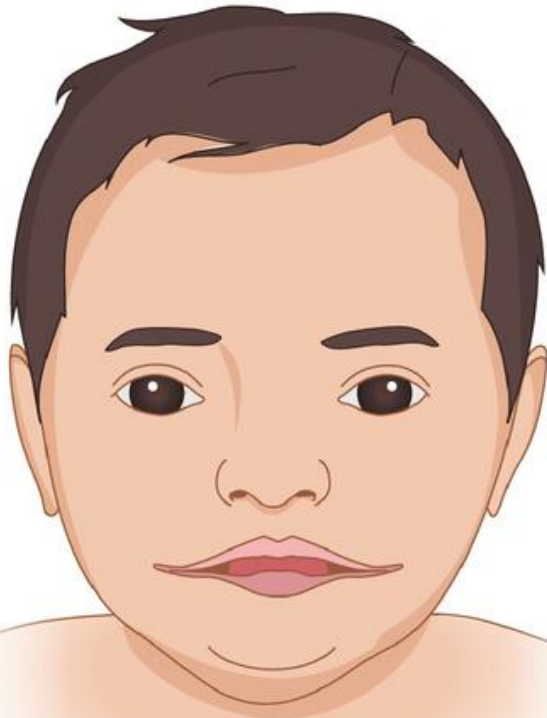


C



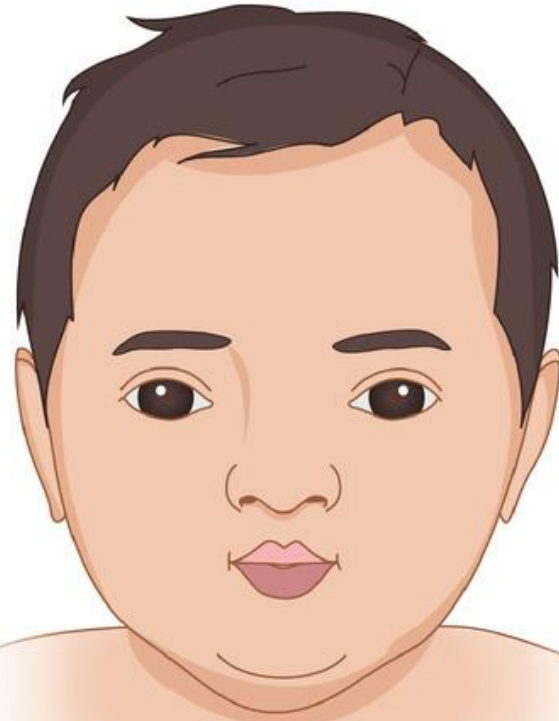
Macrostomia or Microstomia: defective or marked fusion between maxillary and mandibular processes

b



Macrostomia

c



Microstomia

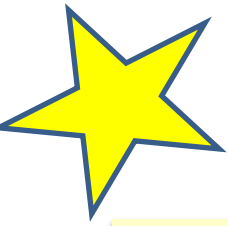
Unilateral Cleft lip



Cleft (hare) lip: cleft lip due to failure of fusion between maxillary process and intermaxillary segment.



Bilateral Cleft lip



Median cleft lip:

Results from malfusion of the medial nasal prominences



Cleft Lower Lip

The cleft is exactly central and is caused by incomplete fusion of the mandibular processes



Cleft palate

Cleft palate: failure of fusion between different parts that form palate

The incisive foramen is considered the dividing landmark between the anterior and posterior cleft deformities

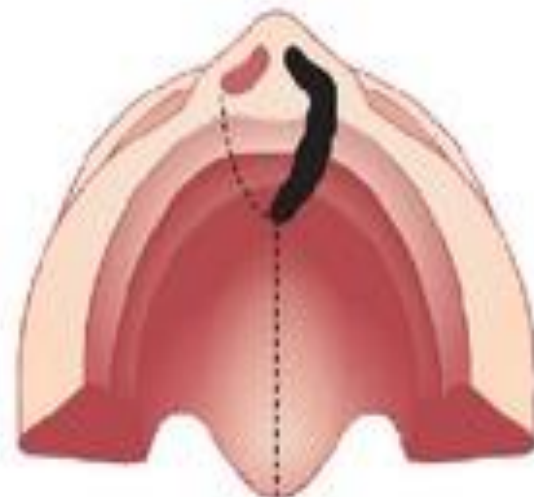
Cleft of the primary palate

- ✓ Results from failure of the maxillary process to fuse with the intermaxillary segment
- ✓ Takes place **anterior to the incisive foramen**, therefore this type is Anterior cleft palate
- ✓ Note: that cleft of the primary palate is always **anterior**
- ✓ Can be unilateral and bilateral

Primary Bilateral Cleft Palate
(combined with bilateral cleft lip)



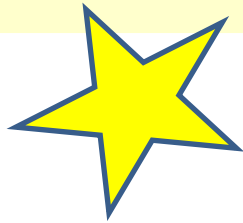
Primary Unilateral Cleft Palate
(combined with unilateral cleft lip)



Secondary cleft palate

Cleft of the secondary palate

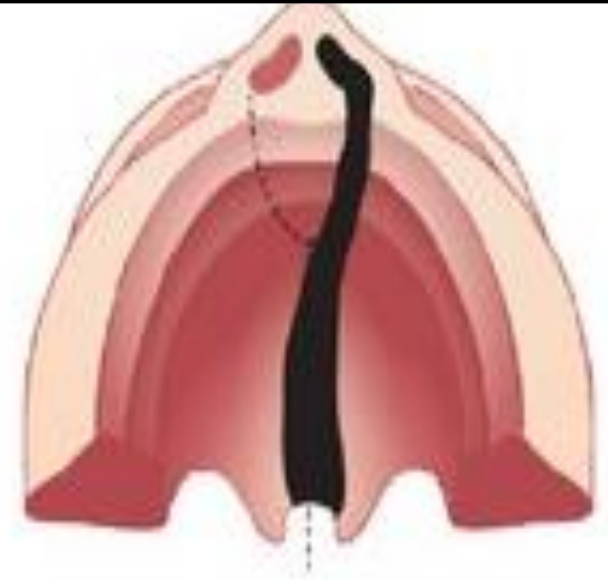
- ✓ Results from failure of the maxillary processes to fuse with each other
- ✓ Takes place **posterior to the incisive foramen**, therefore this type is Posterior cleft palate
- ✓ Note that cleft of the secondary palate is always **posterior**



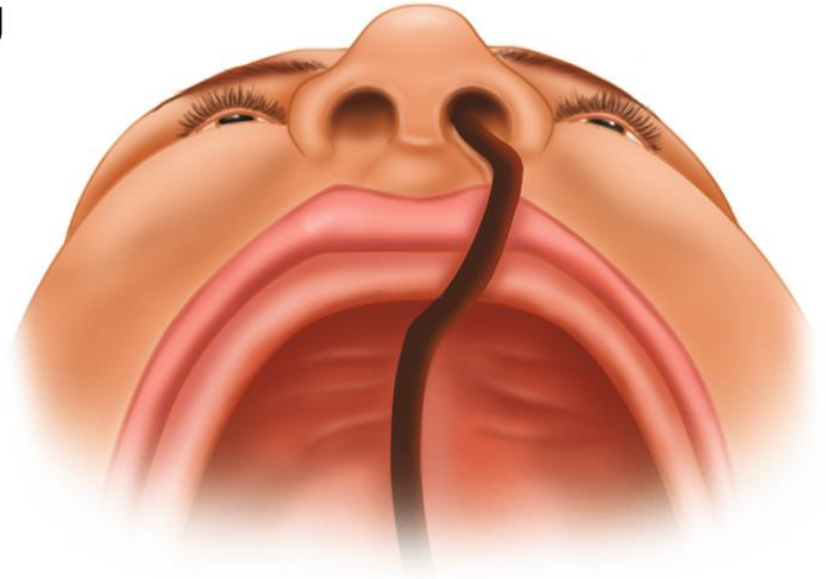
**Primary and secondary Cleft palates
(combined with unilateral cleft lip)**

Cleft of the primary and secondary palate

- ✓ Results from failure of the maxillary processes to fuse with each other and with the intermaxillary segment
- ✓ Takes place **anterior and posterior to the incisive foramen**, therefore this type is mixed anterior and posterior cleft palates

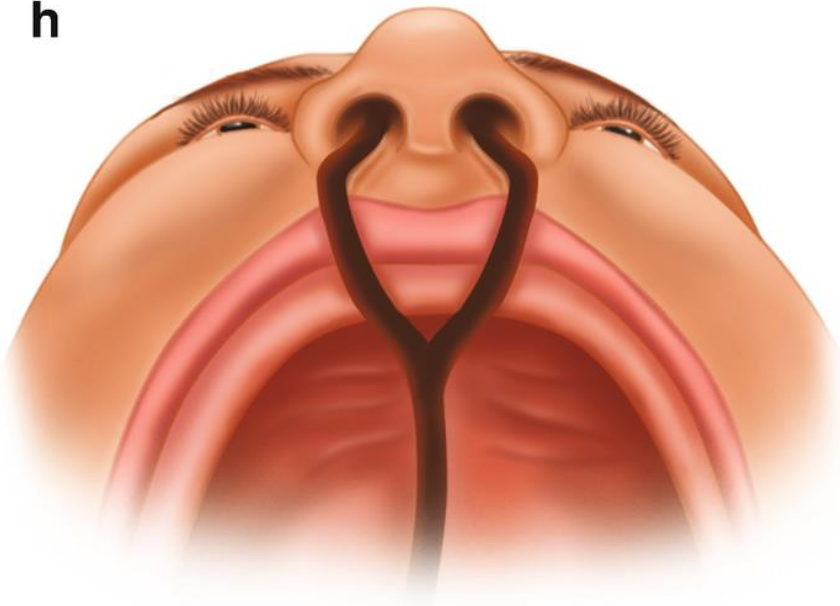


g



Unilateral complete cleft lip and palate

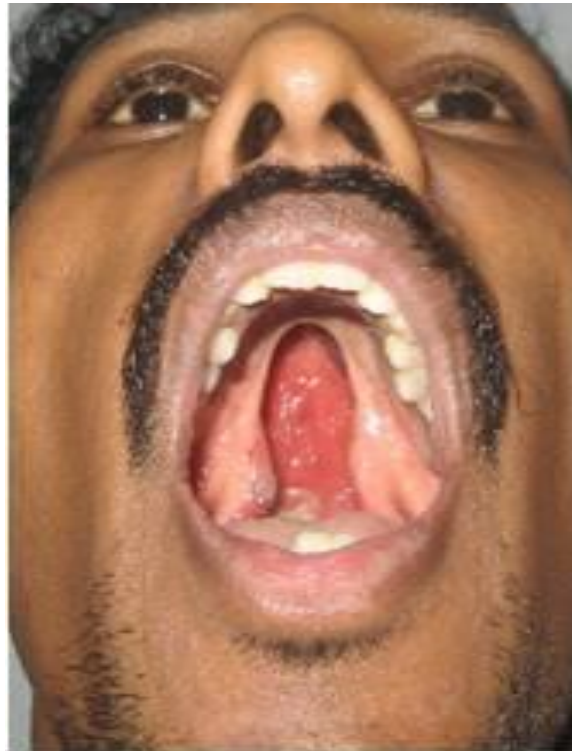
h



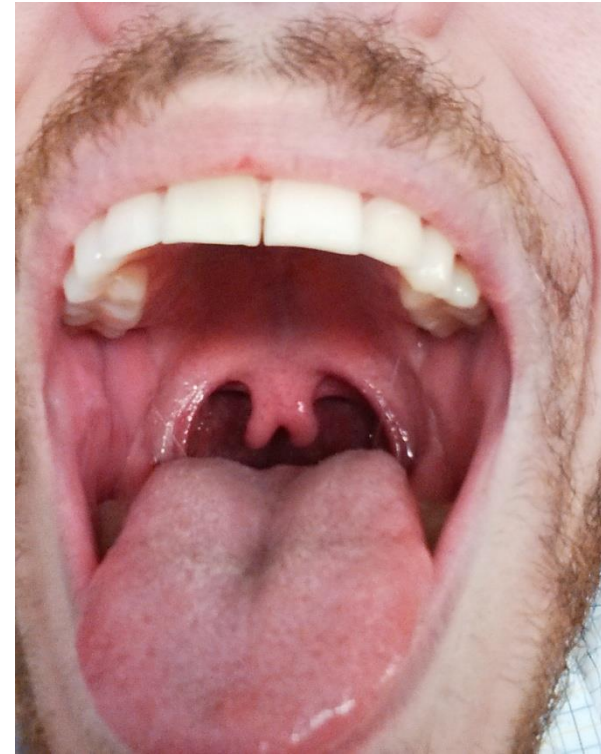
Bilateral Cleft Lip & Palate



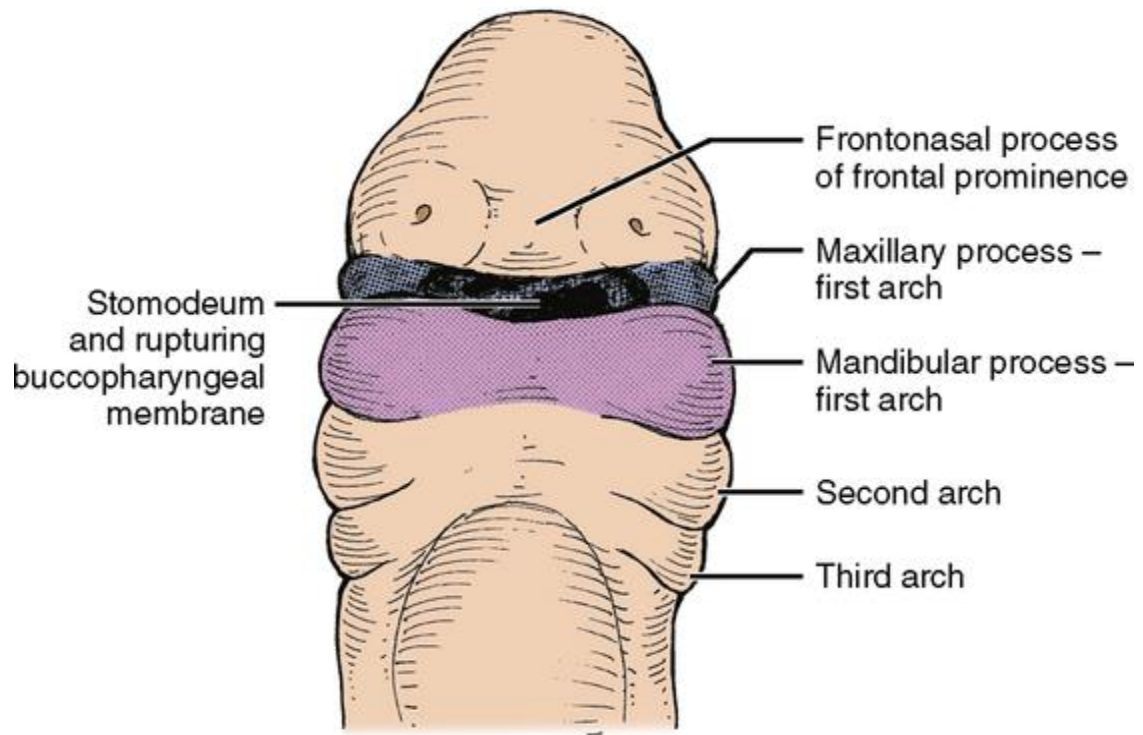
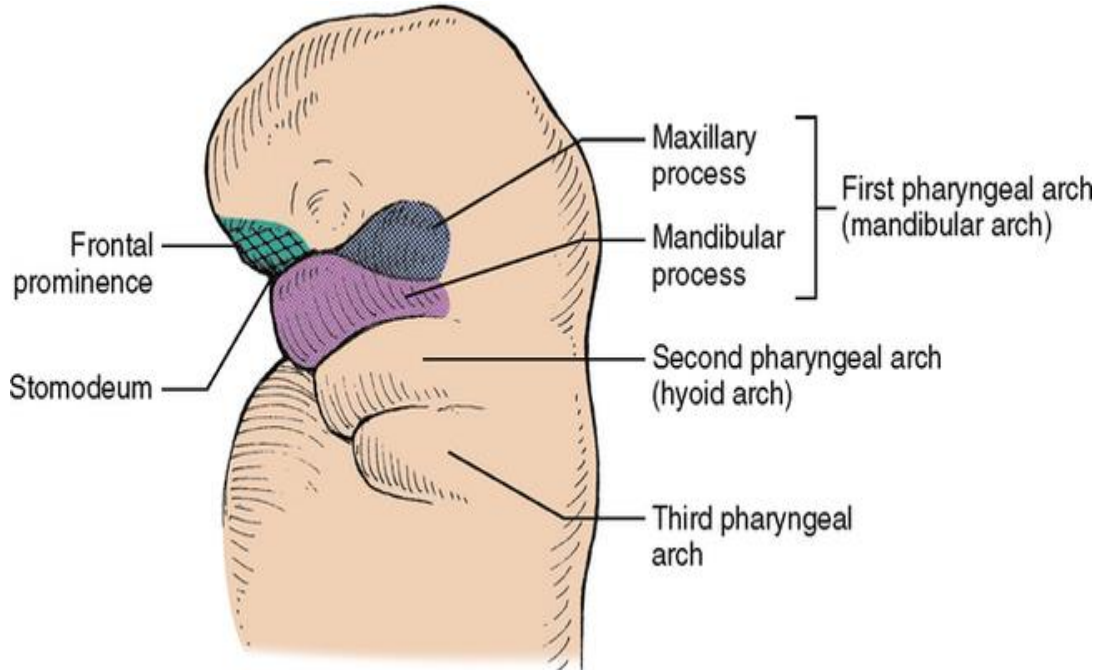
Primary and secondary Cleft palates
(combined with unilateral cleft lip)

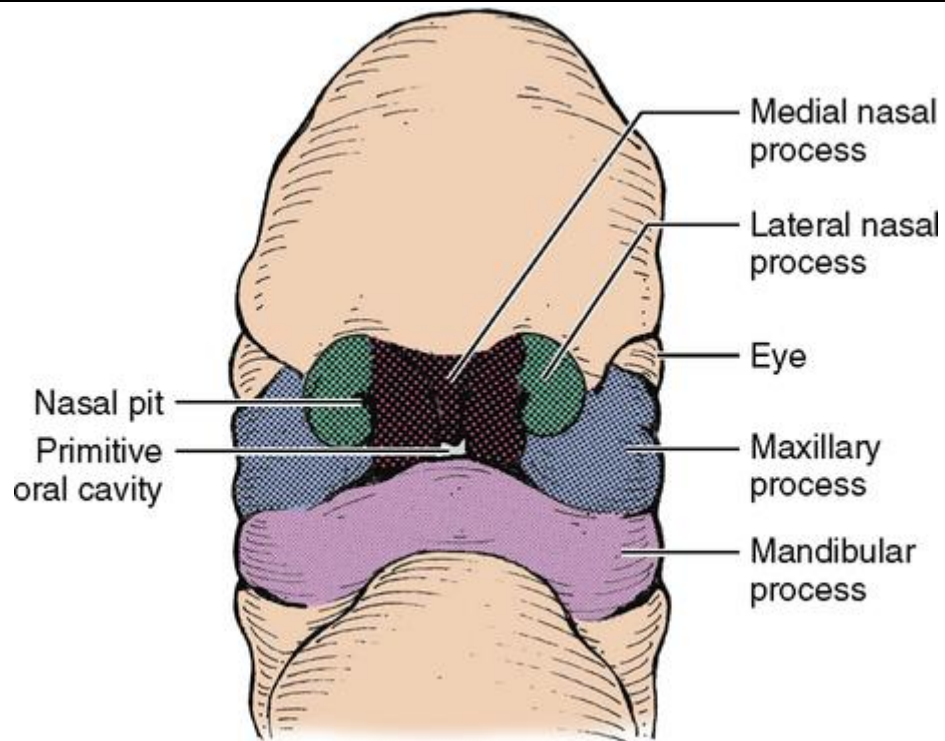
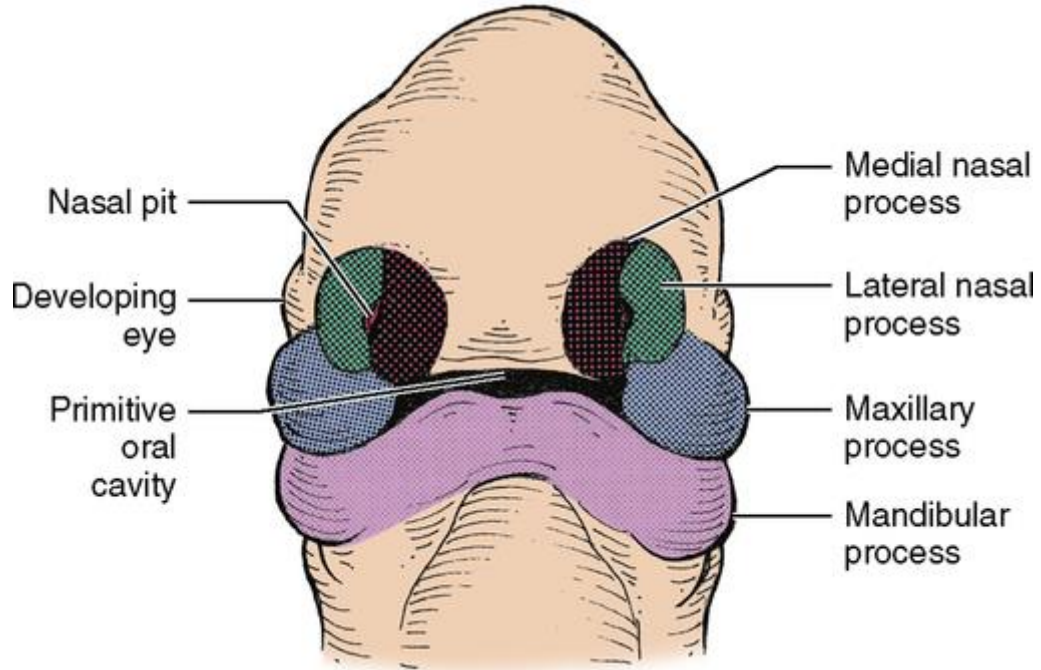


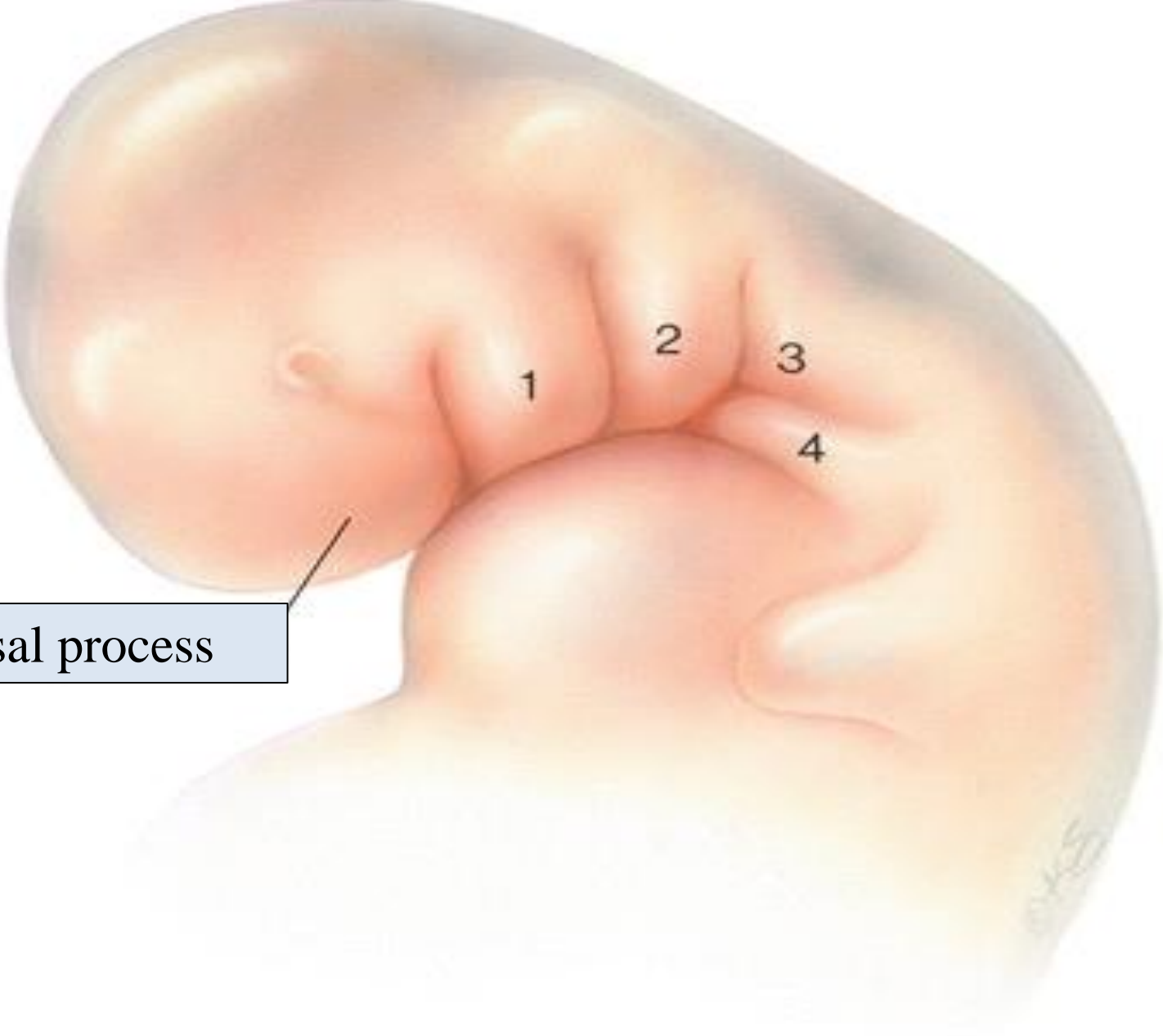
Secondary cleft palate



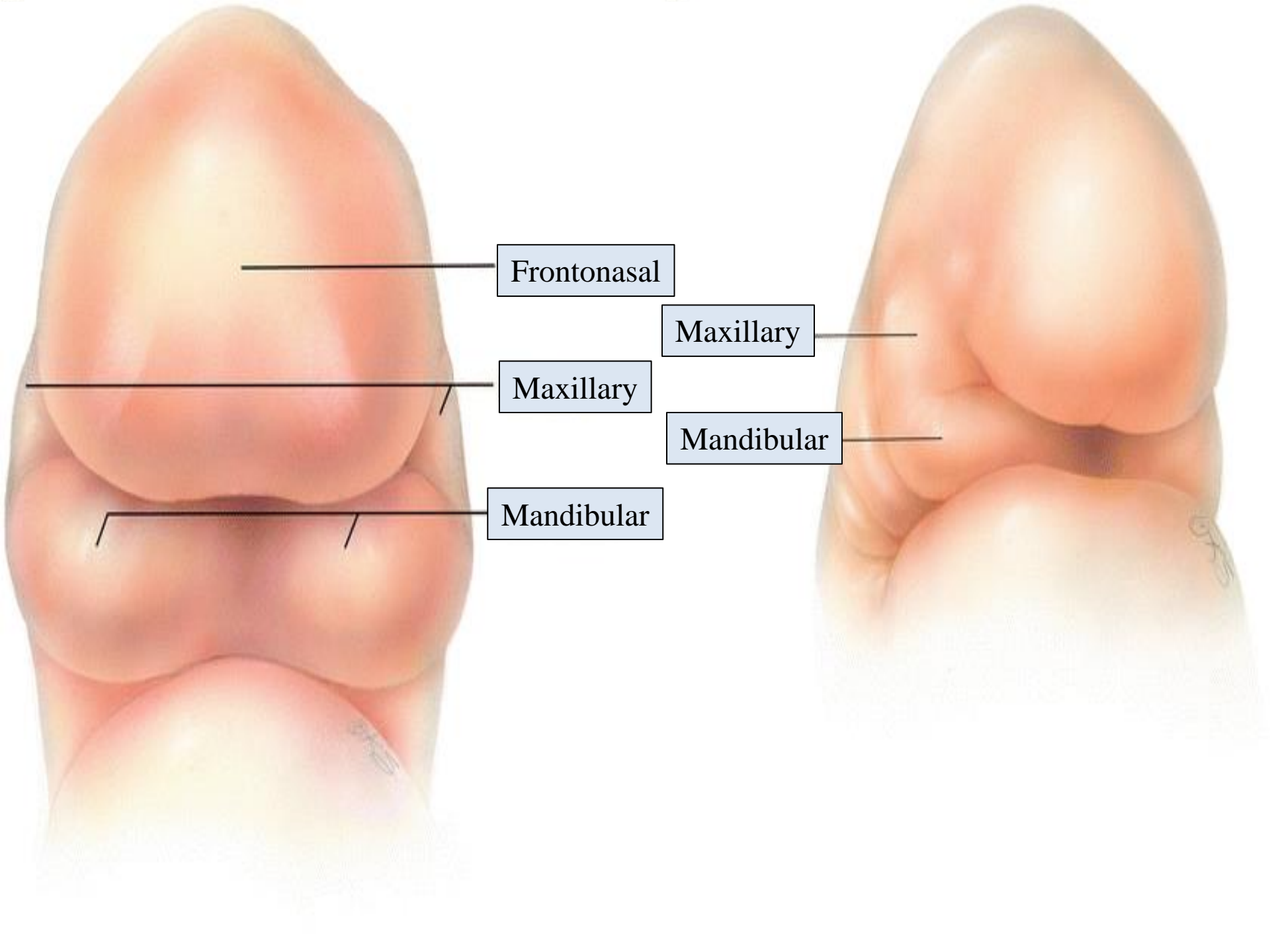
Cleft uvula







Frontonasal process



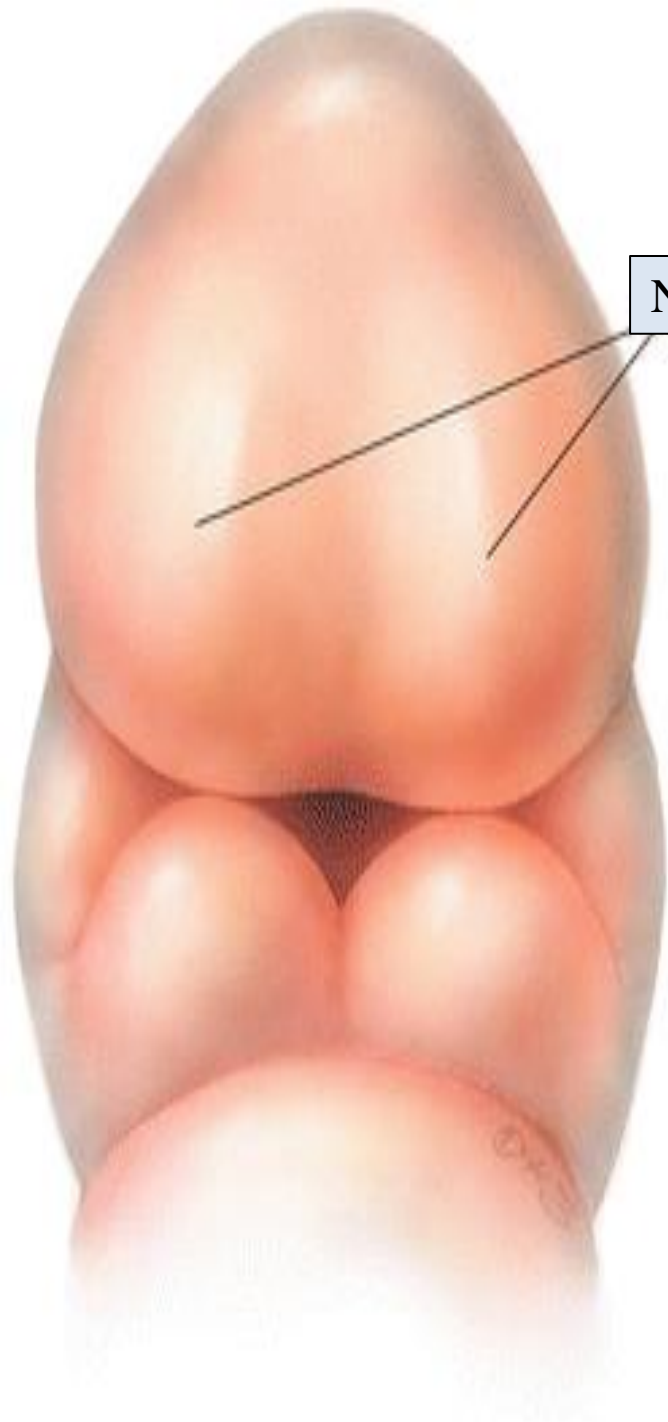
Frontonasal

Maxillary

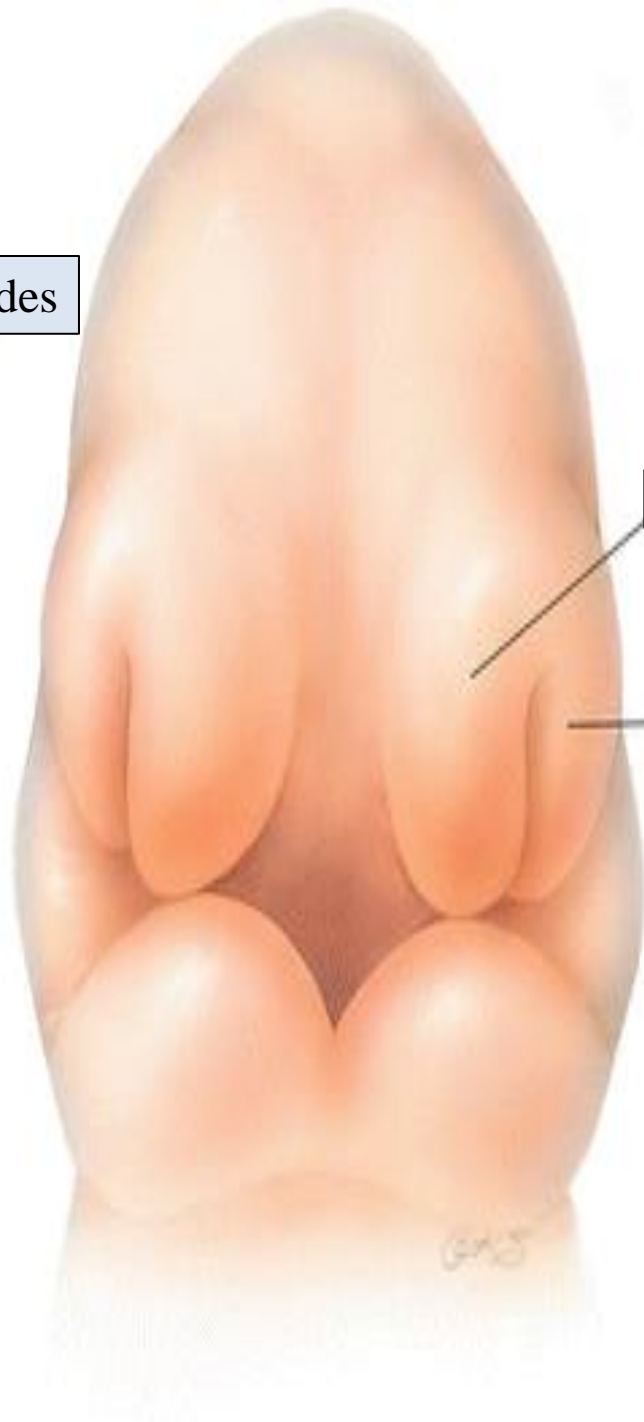
Maxillary

Mandibular

Mandibular

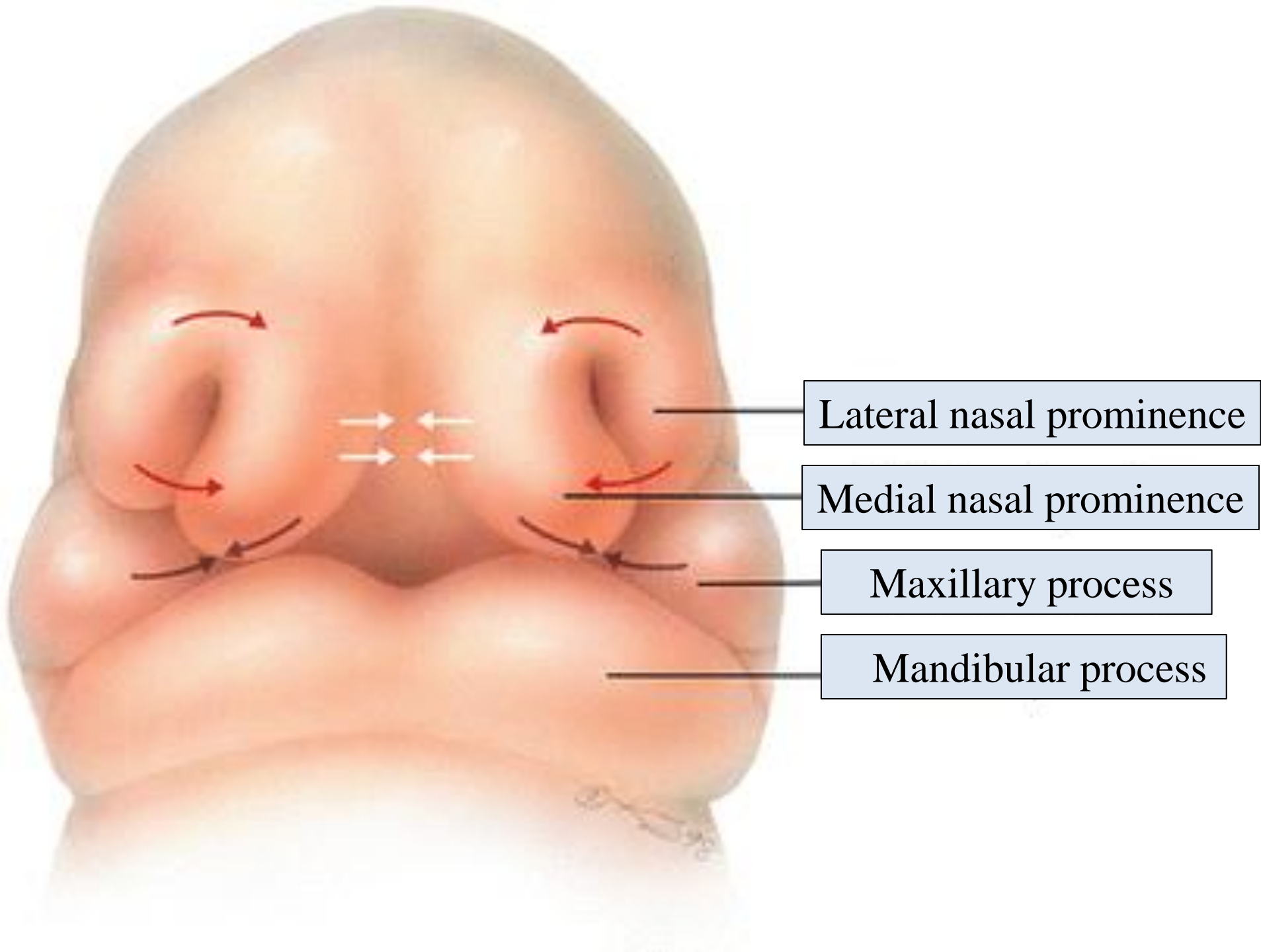


Nasal placodes



Medial nasal prominence

Lateral nasal prominence



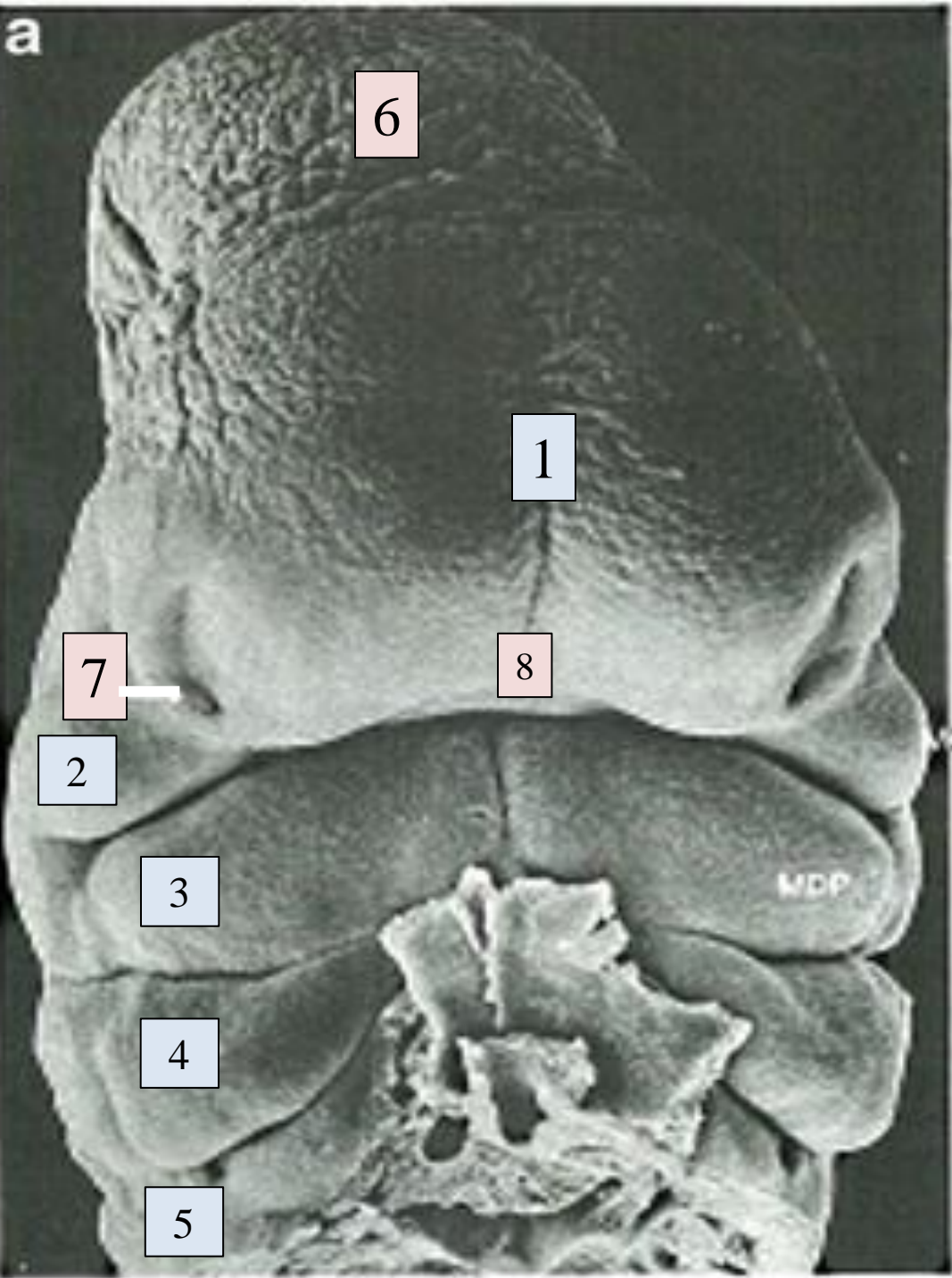
Lateral nasal prominence

Medial nasal prominence

Maxillary process

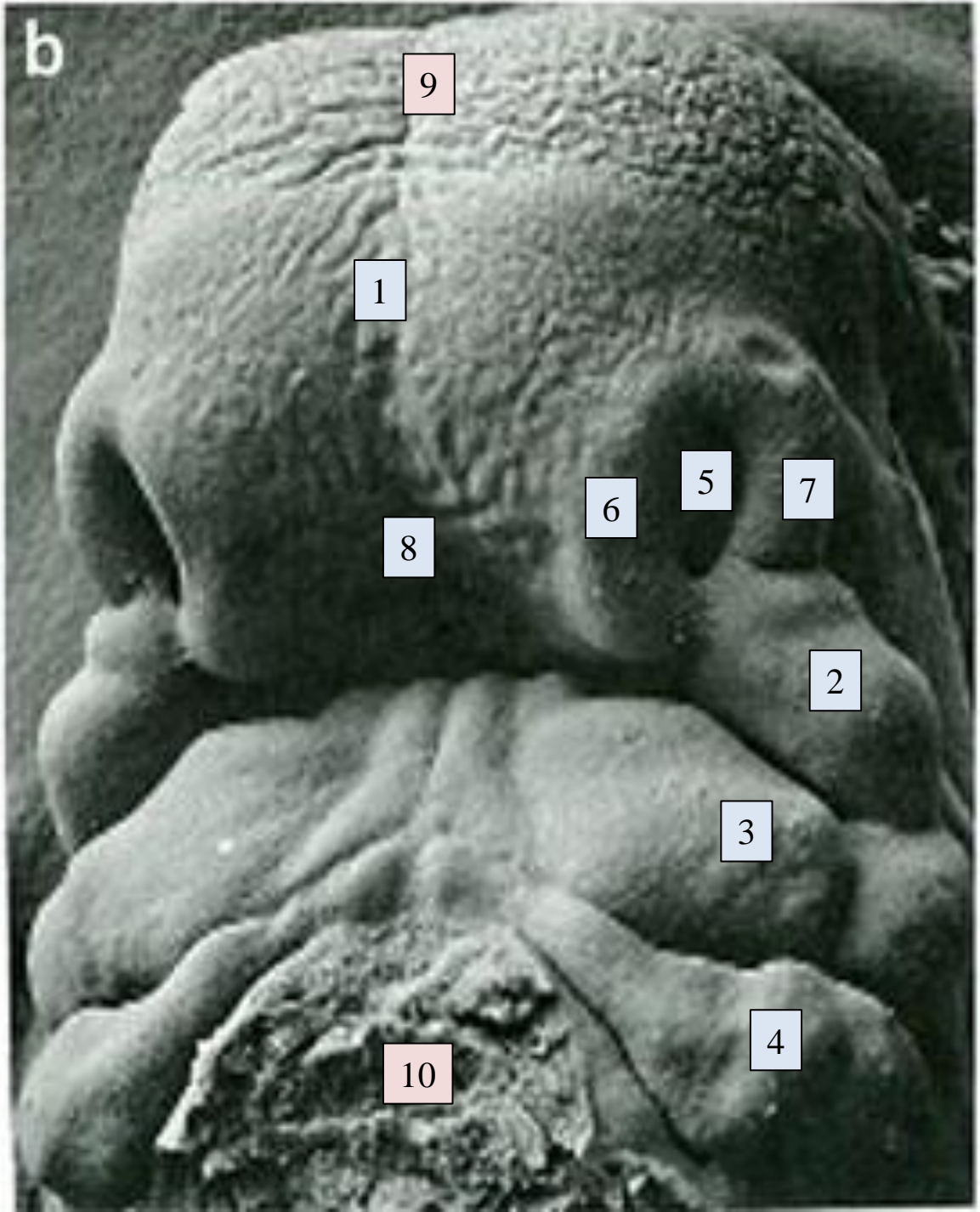
Mandibular process

a



- 1: Frontonasal process
- 2: Maxillary process
- 3: Mandibular process
- 4: Second arch
- 5: Third arch

- 6: Forebrain bulge
- 7: Nasal placode
- 8: Nasal cleft



b

9

1

6

5

7

8

2

3

10

4

1: Frontonasal process

2: Maxillary process

3: Mandibular process

4: Second arch

5: Nasal pit

6: Medial nasal prominence

7: Lateral nasal prominence

8: Nasal cleft

9: Forebrain bulge

10: Pericardial bulge

Refer to

<http://www.indiana.edu/~anat550/hnanim/face/face.swf>

<https://www.youtube.com/watch?v=oz1kJexvEFE>