بسم الله الرحمن الرحيم

Development of Face and Palate

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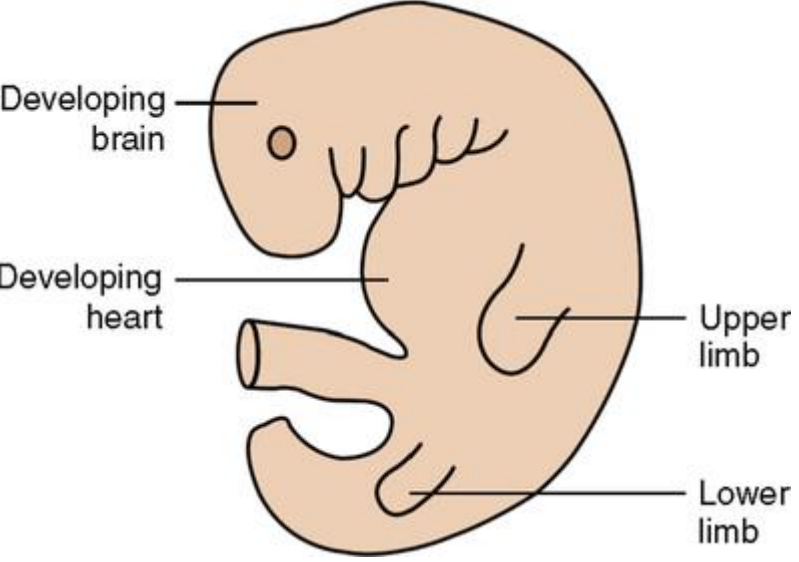
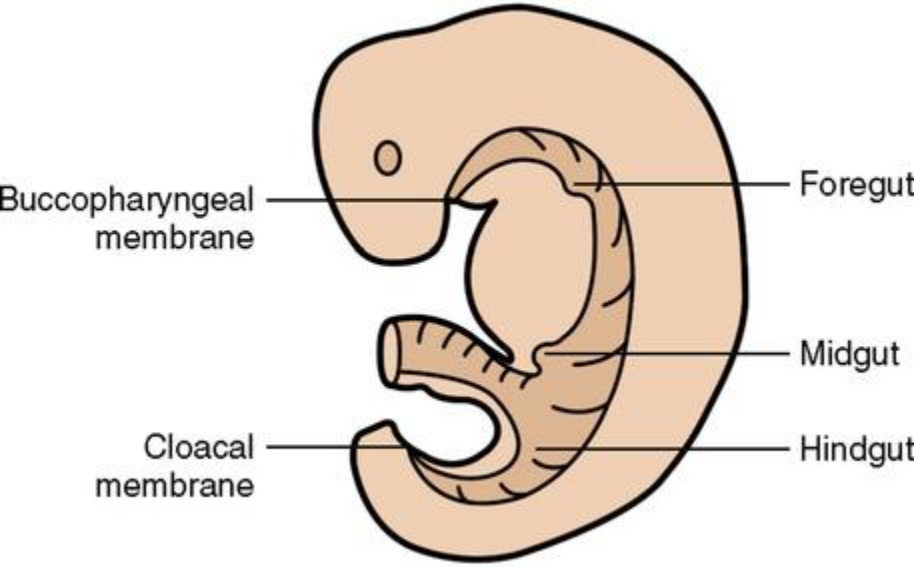
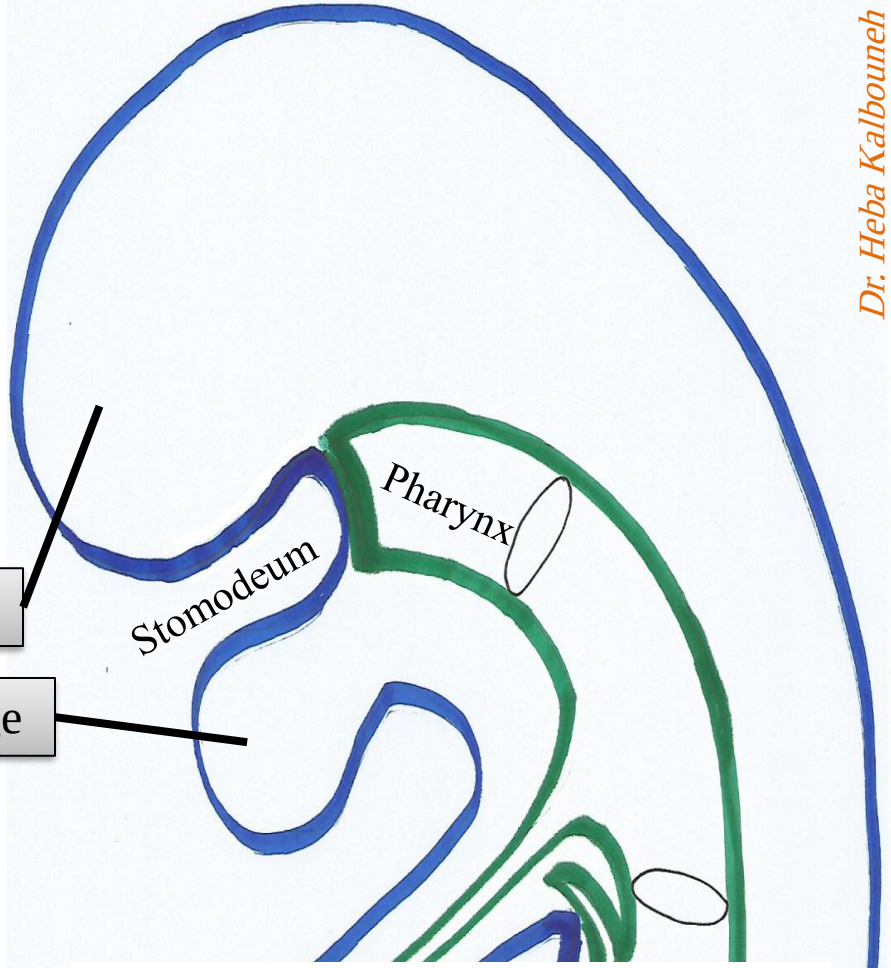
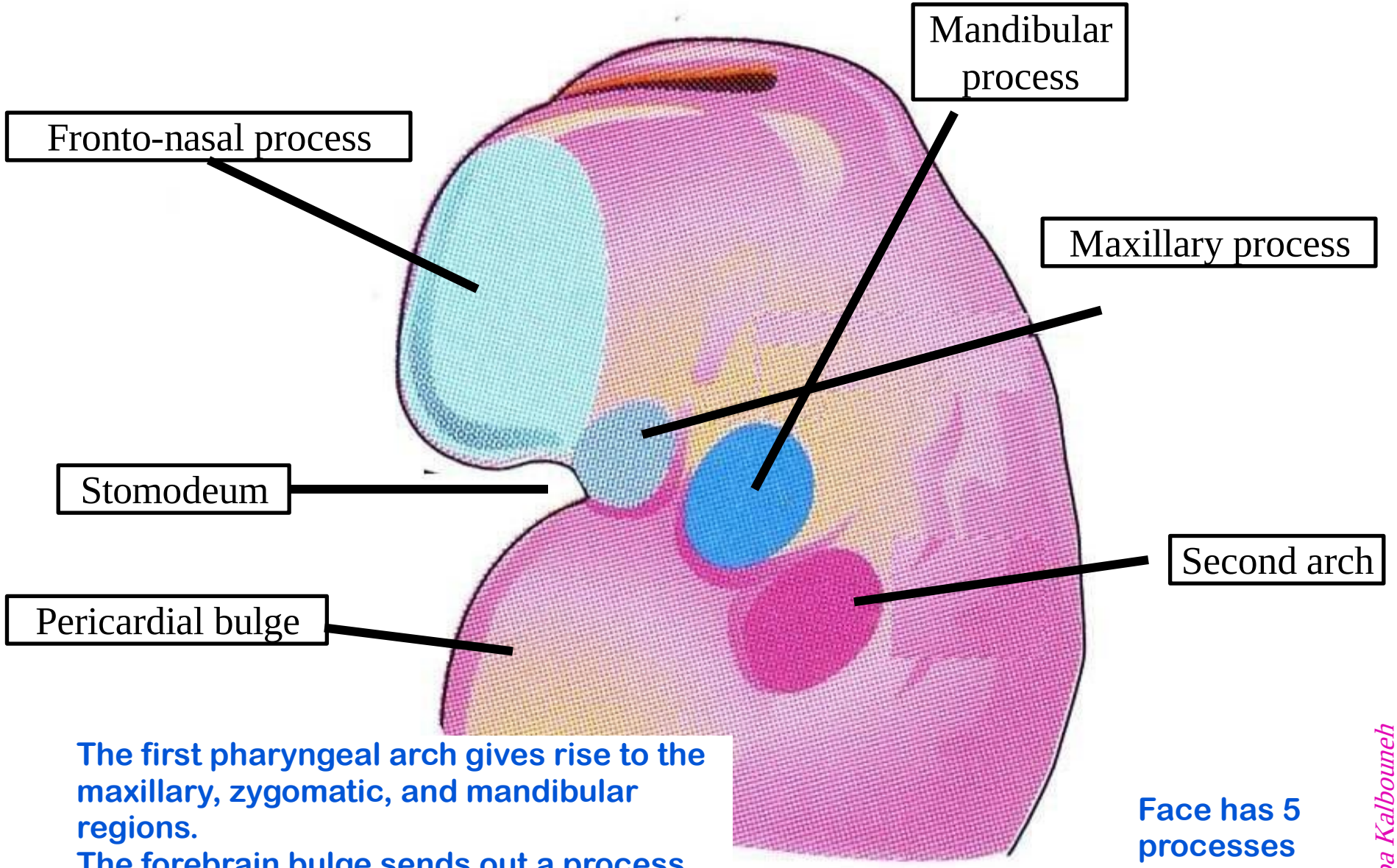


The pharynx is the most cranial part of the foregut, where the six pharyngeal arches are formed.



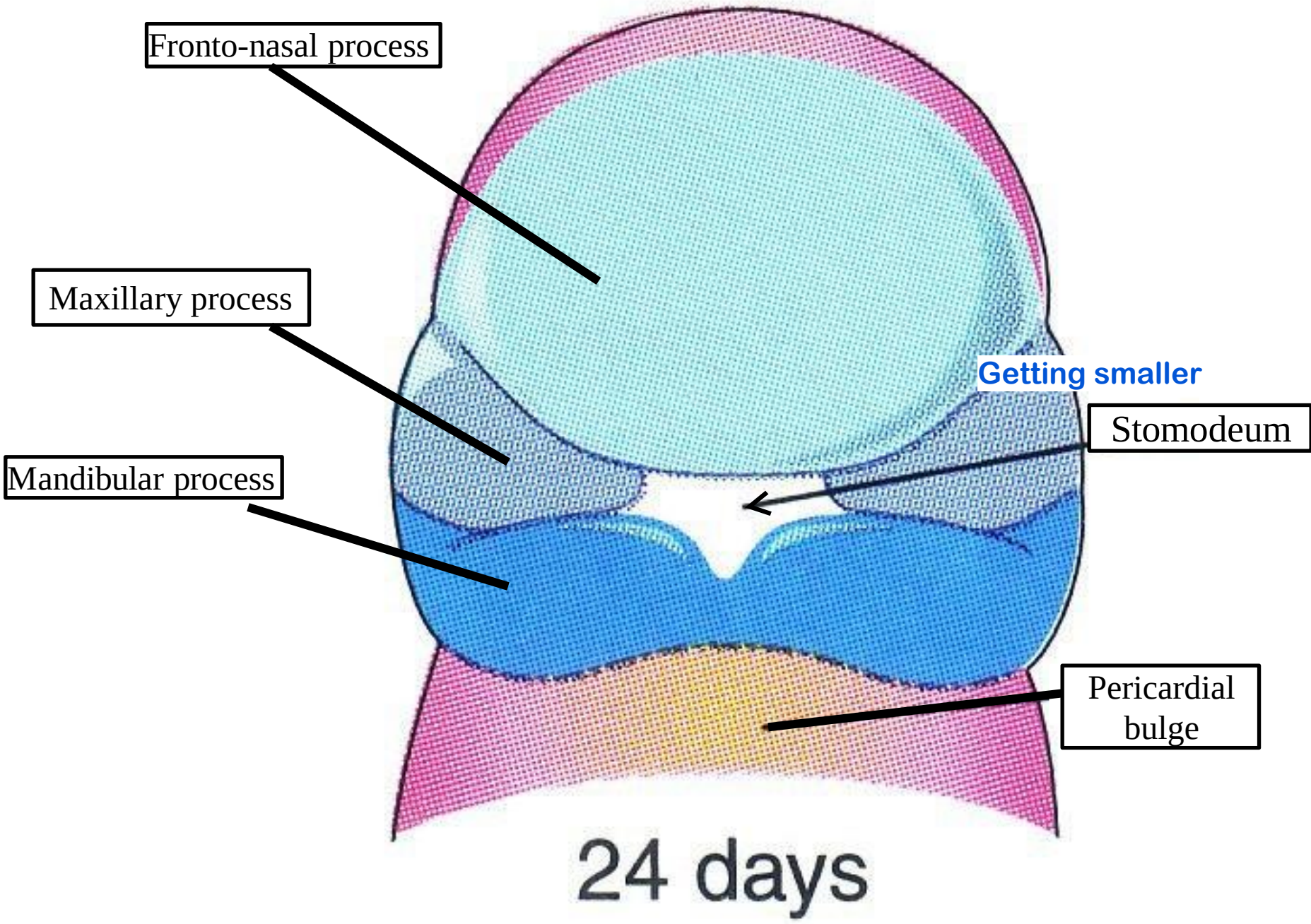


The boundaries of the face lie between the forebrain bulge and the pericardial bulge.
At the floor of the pharynx, the tongue begins to appear, and it moves outward when the buccopharyngeal membrane breaks.



The first pharyngeal arch gives rise to the maxillary, zygomatic, and mandibular regions.
The forebrain bulge sends out a process called the frontonasal process.

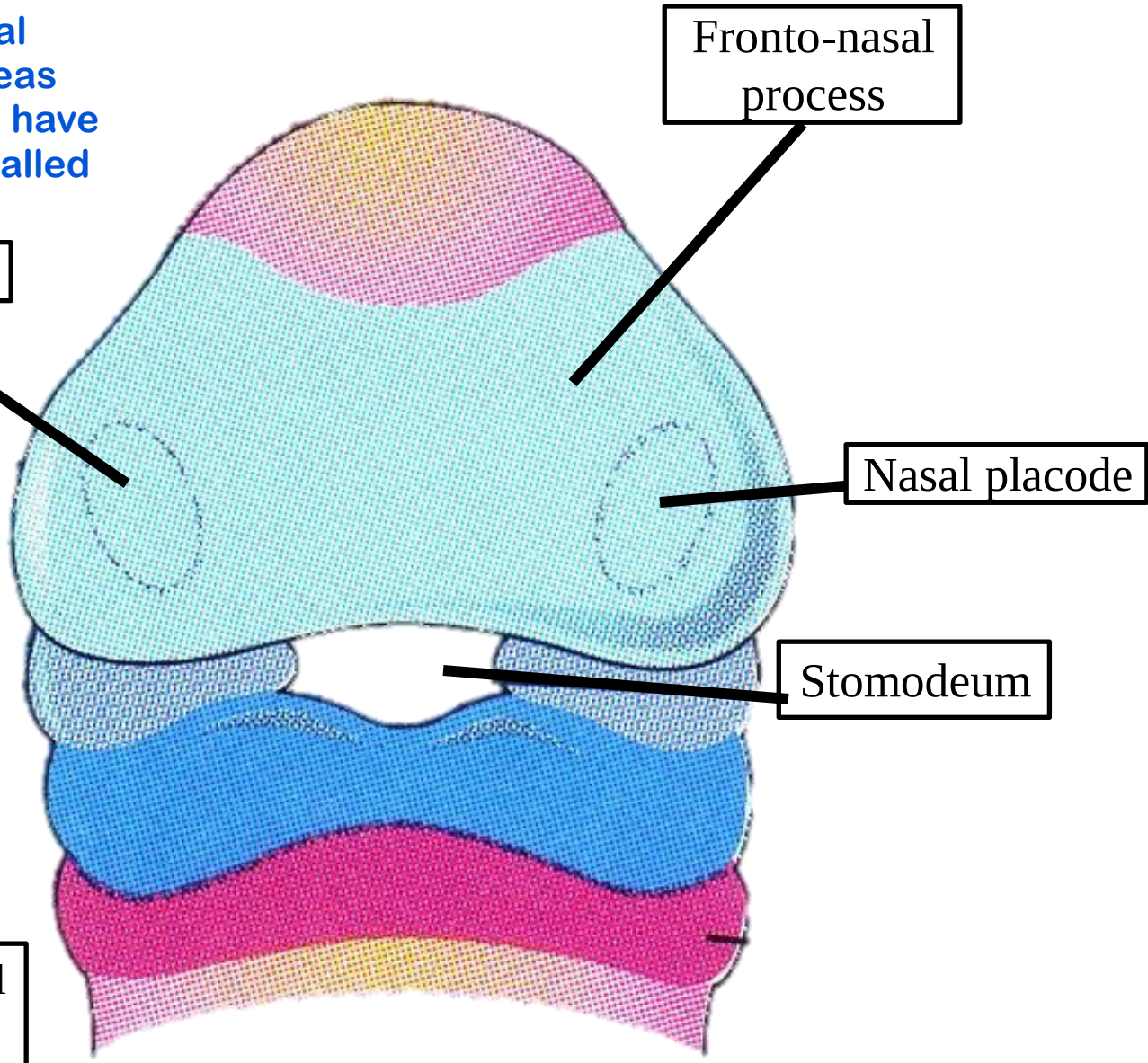
Face has 5 processes


Fronto-nasal process
Maxillary process
Mandibular process
Getting smaller
Stomodeum
Pericardial bulge
24 days

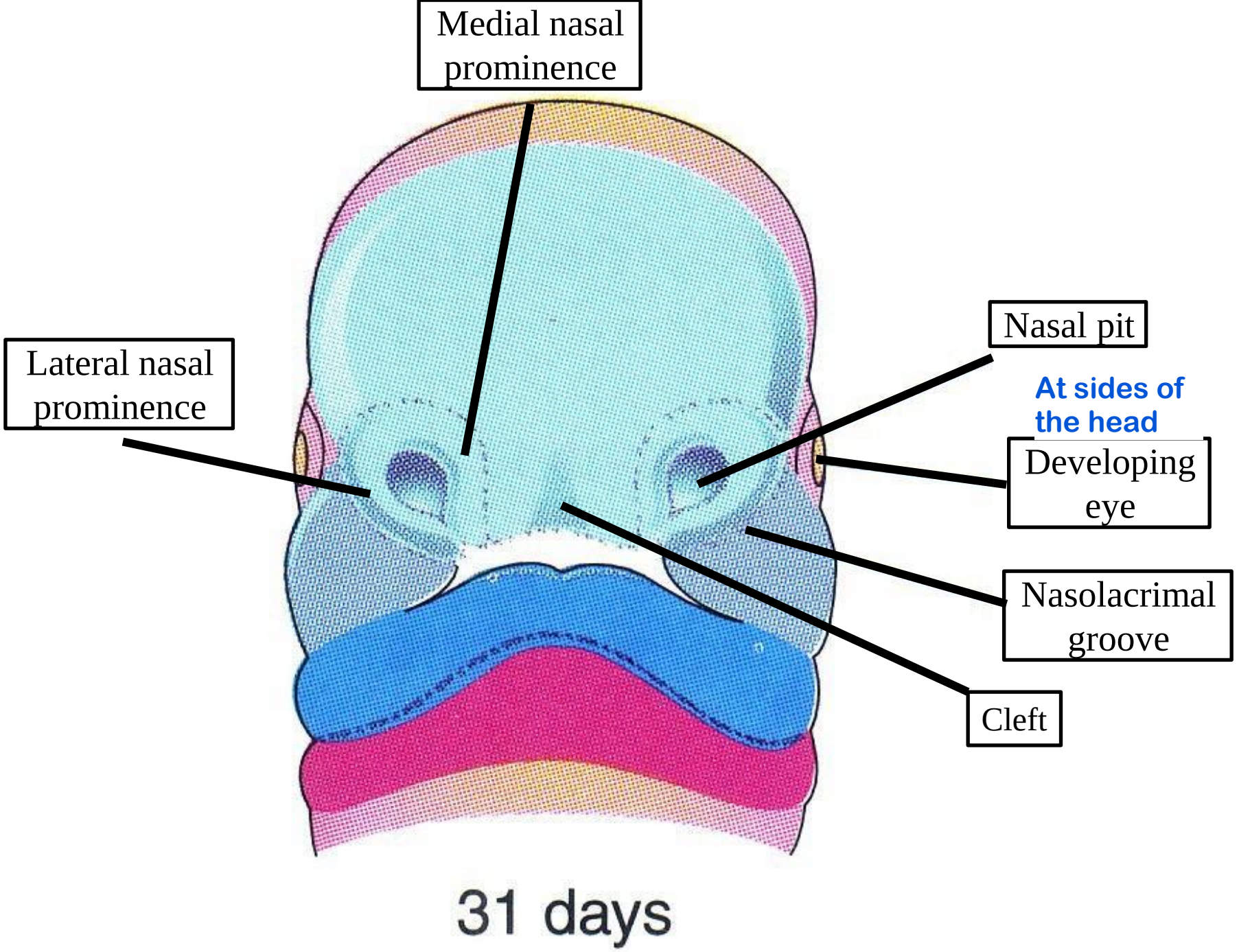
At the sides of the frontonasal bone, there are thickened areas called nasal placodes, which have a central depressed region called the nasal pit.

The nasal pit is surrounded by elevated areas named the medial and lateral nasal prominences.

Between the nasal placodes, there is a nasal cleft, which eventually disappears.



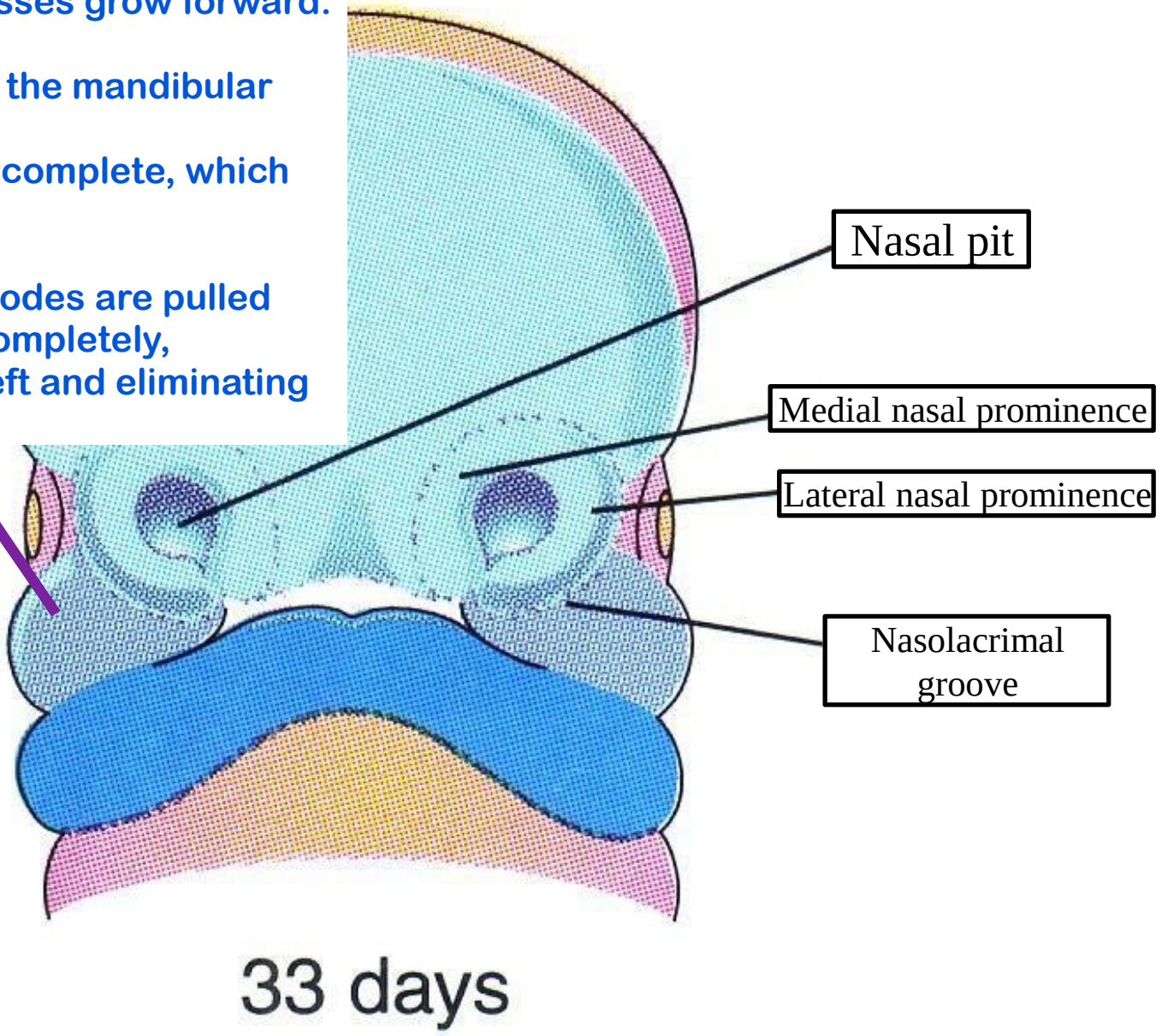
On both sides of the frontonasal prominence, local thickenings of the surface ectoderm will be formed, the **nasal placodes**

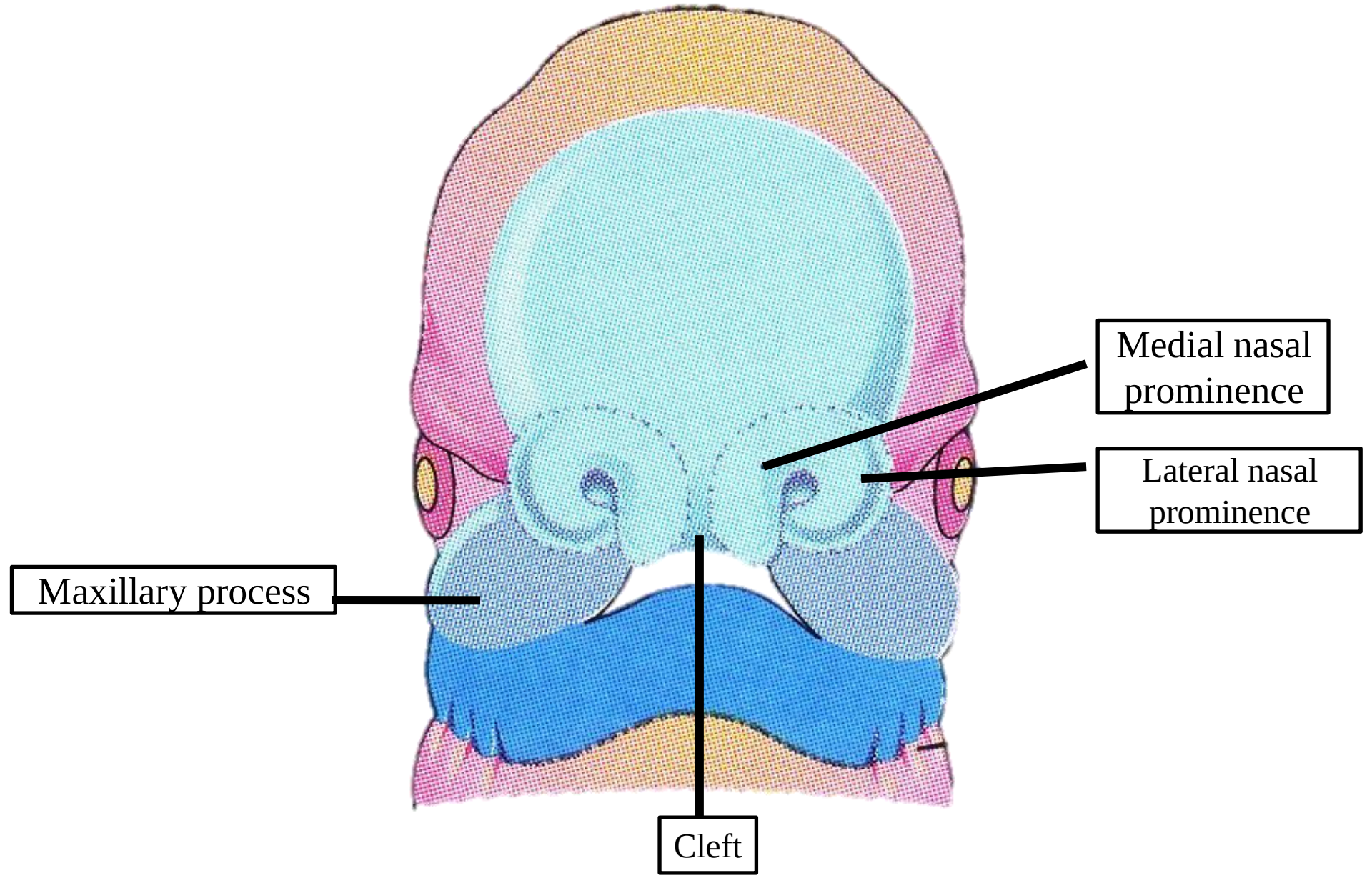

Medial nasal prominence
Lateral nasal prominence
Nasal pit
At sides of the head
Developing eye
Nasolacrimal groove
Cleft
31 days

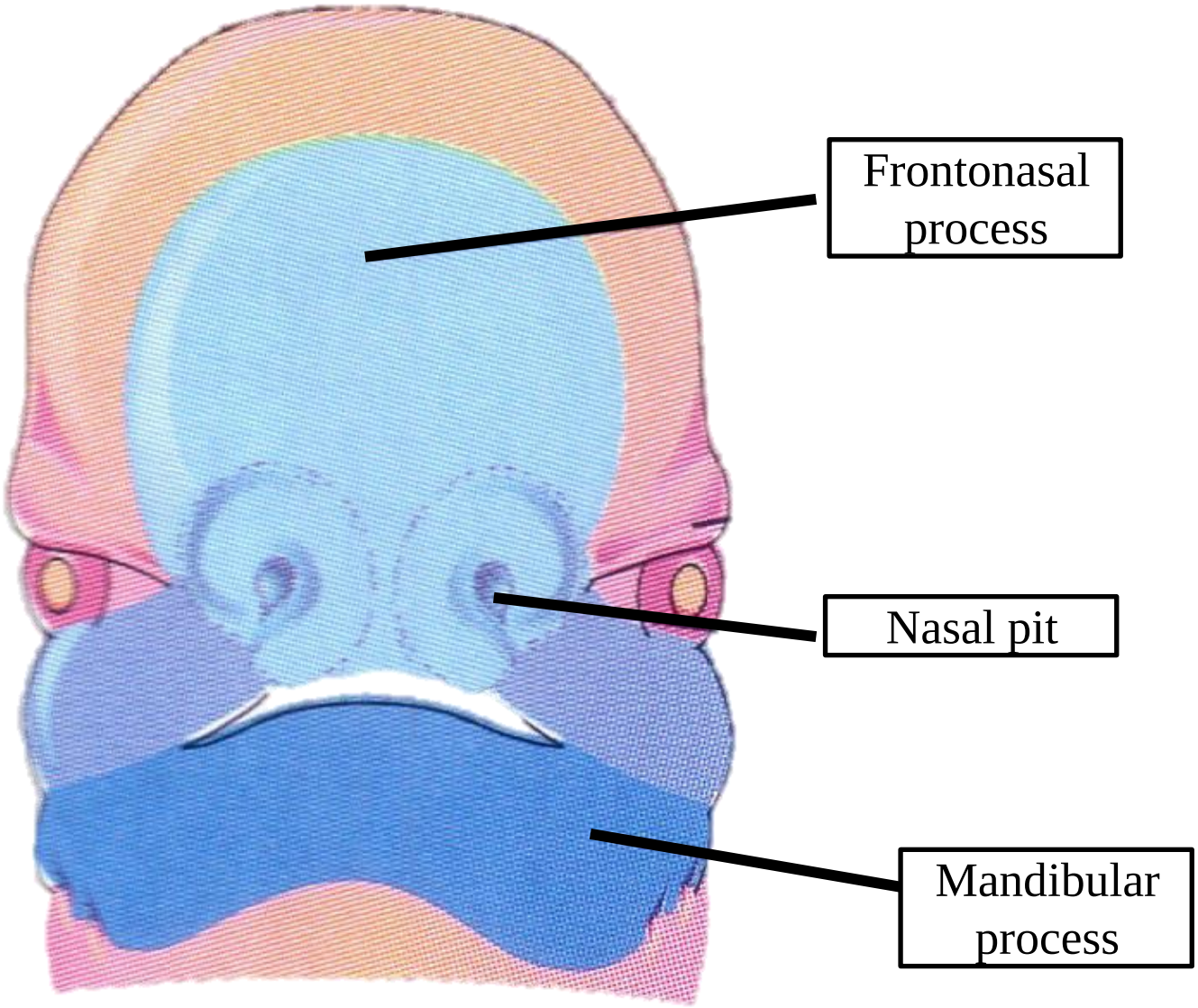
The maxillary processes grow forward:

1.They fuse with the mandibular processes,
but the fusion is not complete, which forms the lips.

2.The nasal placodes are pulled together and fuse completely, closing the nasal cleft and eliminating any gap.




Medial nasal prominence
Lateral nasal prominence
Maxillary process
Cleft

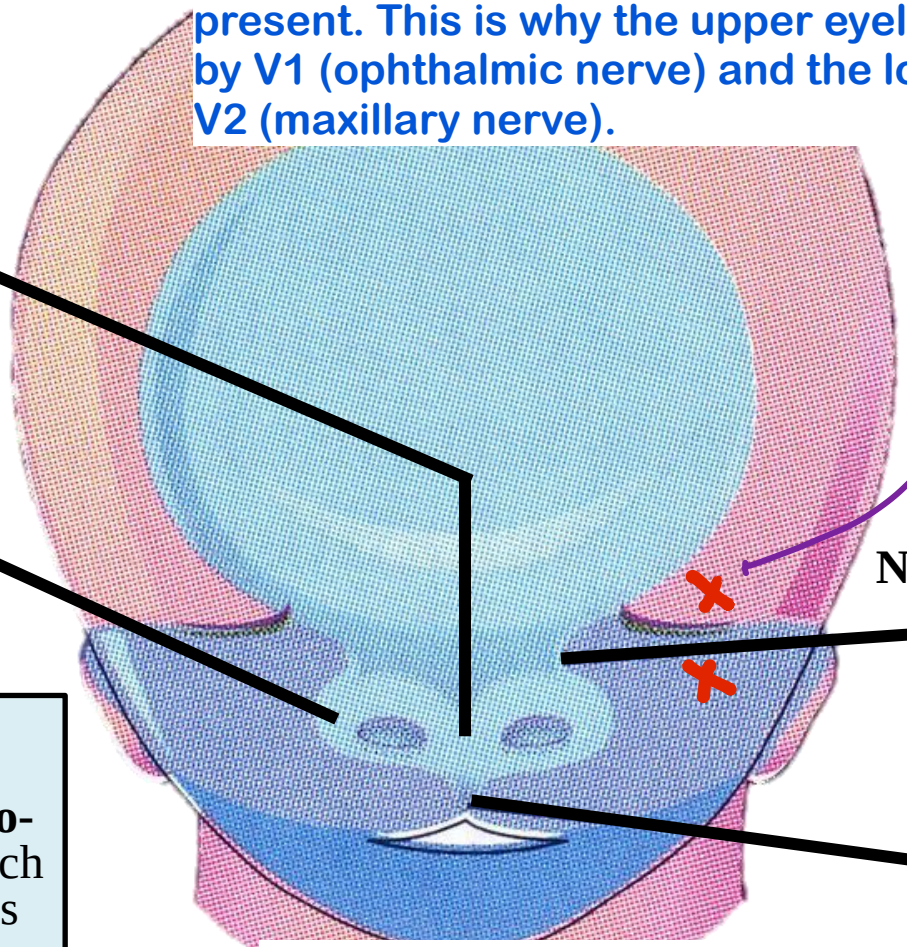

Frontonasal process
Nasal pit
Mandibular process

Complete fusion occurs between the maxillary and frontonasal processes, except at the area of the orbit where the upper and lower eyelids are present. This is why the upper eyelid is supplied by V1 (ophthalmic nerve) and the lower eyelid by V2 (maxillary nerve).

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

Septum

Lateral nasal prominence forms the ala of the nose

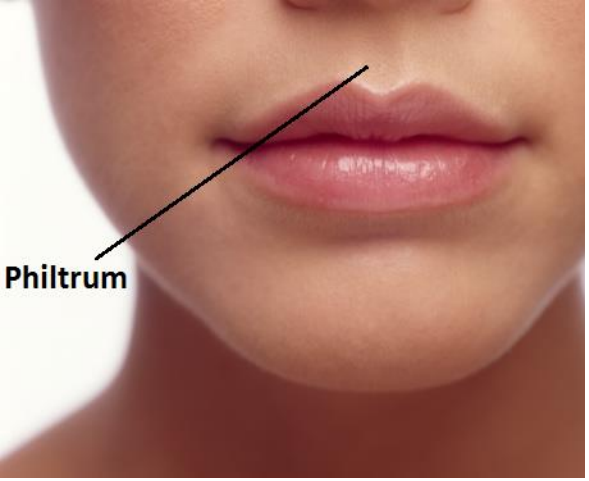


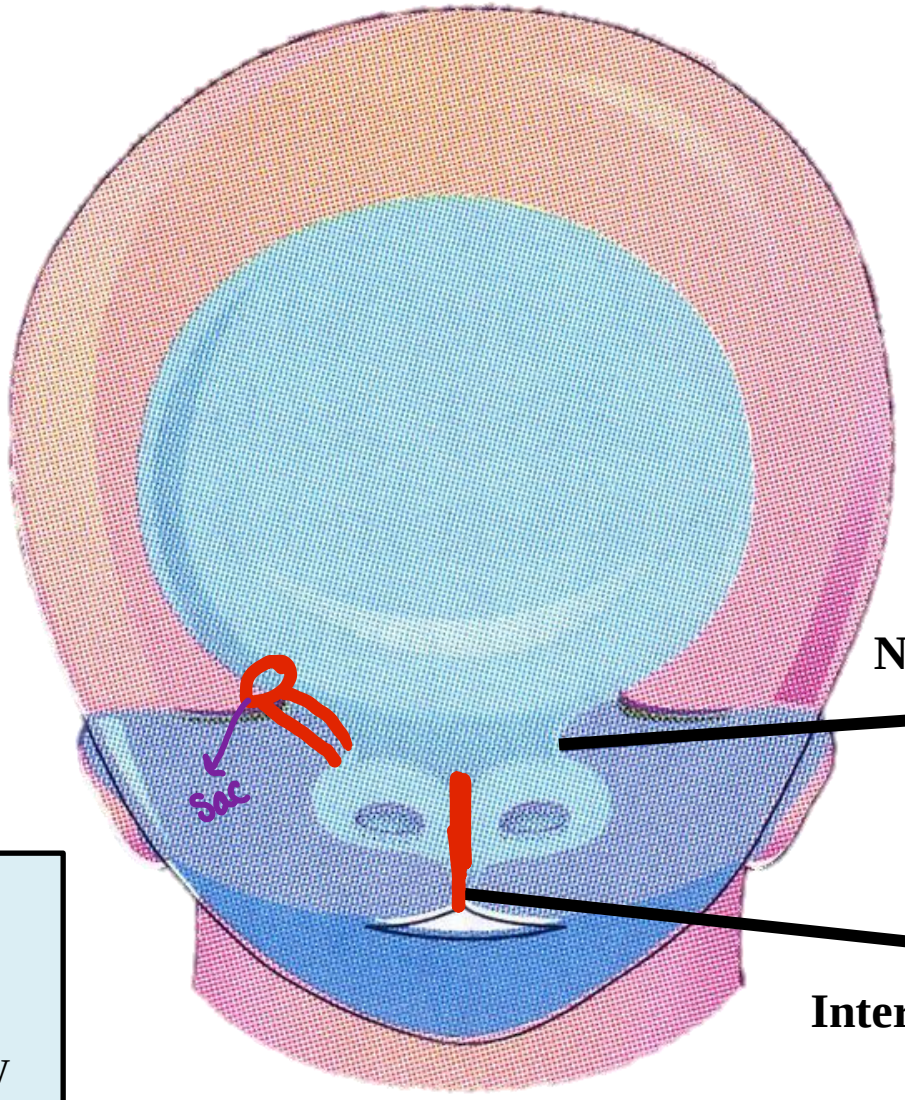
Naso-lacrimal groove

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.

Located between the maxillary processes , prevents complete fusion and forms the middle part of the lip and a portion of the palate.

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

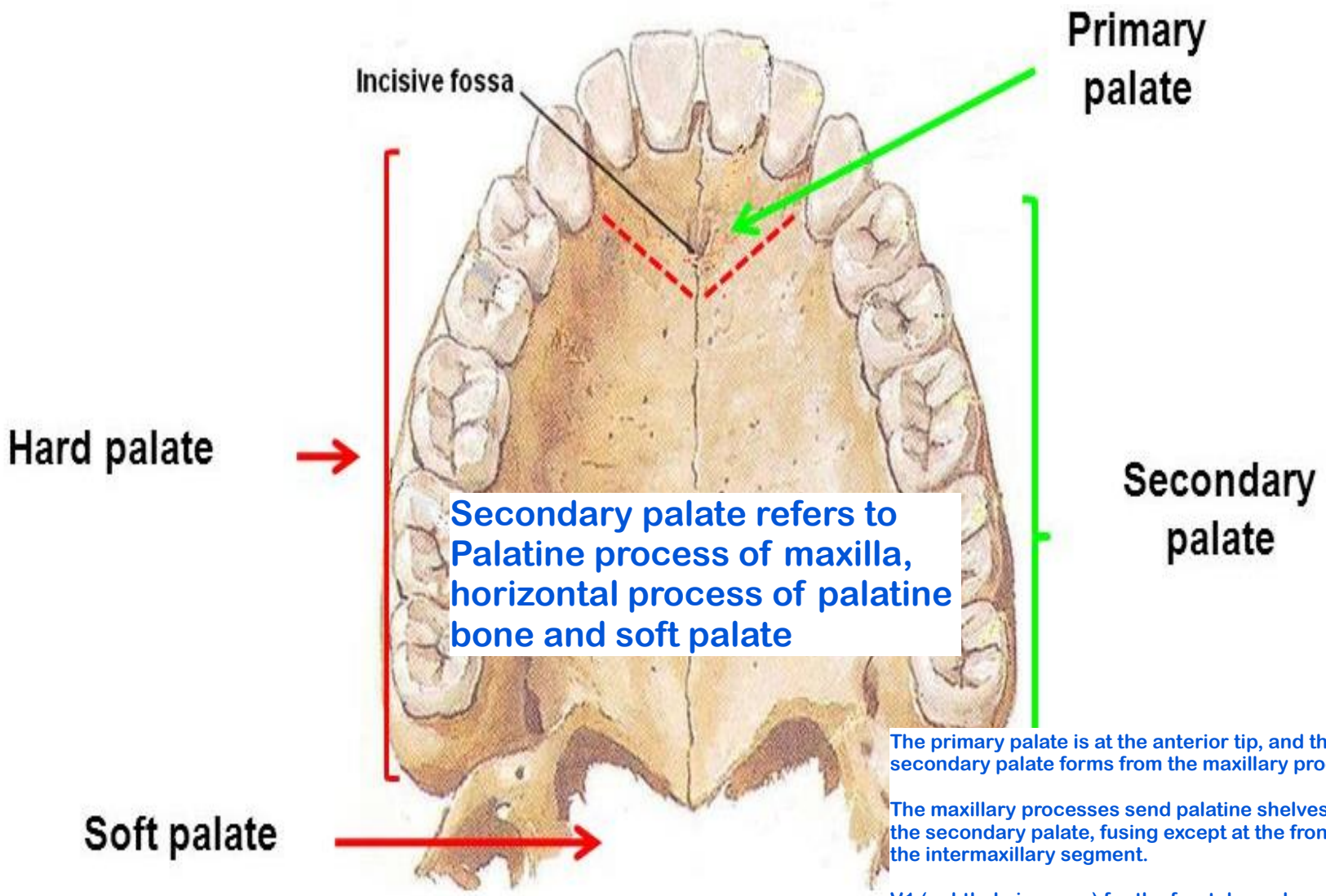




Intermaxillary segment: from fused medial nasal prominences. It forms philtrum, part of upper jaw that carries upper 4 incisors and primary palate

Intermaxillary segment: Primary palate
Palatine shelves of the maxillary processes: Secondary palate

Posterior to inciser teeth

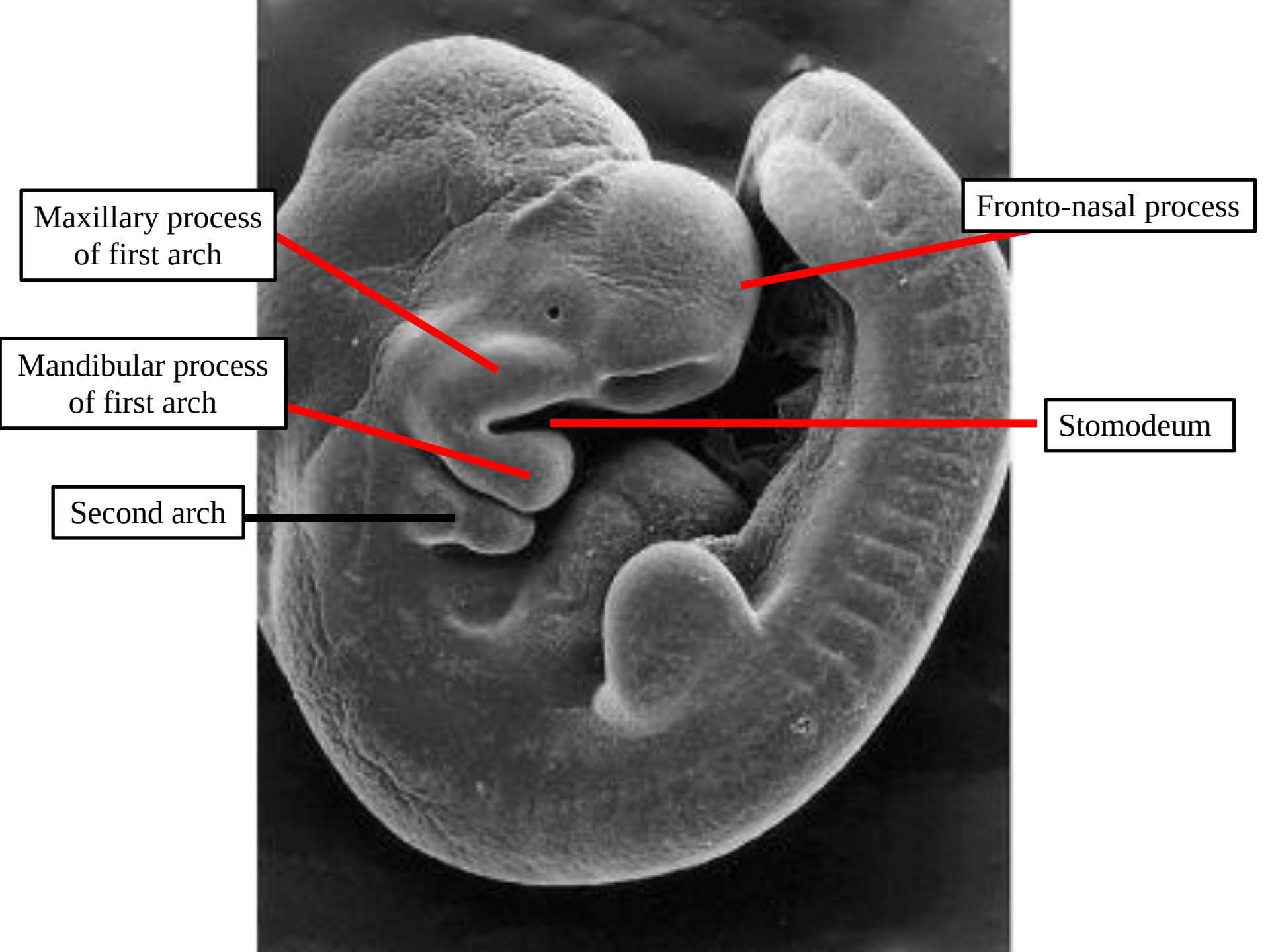


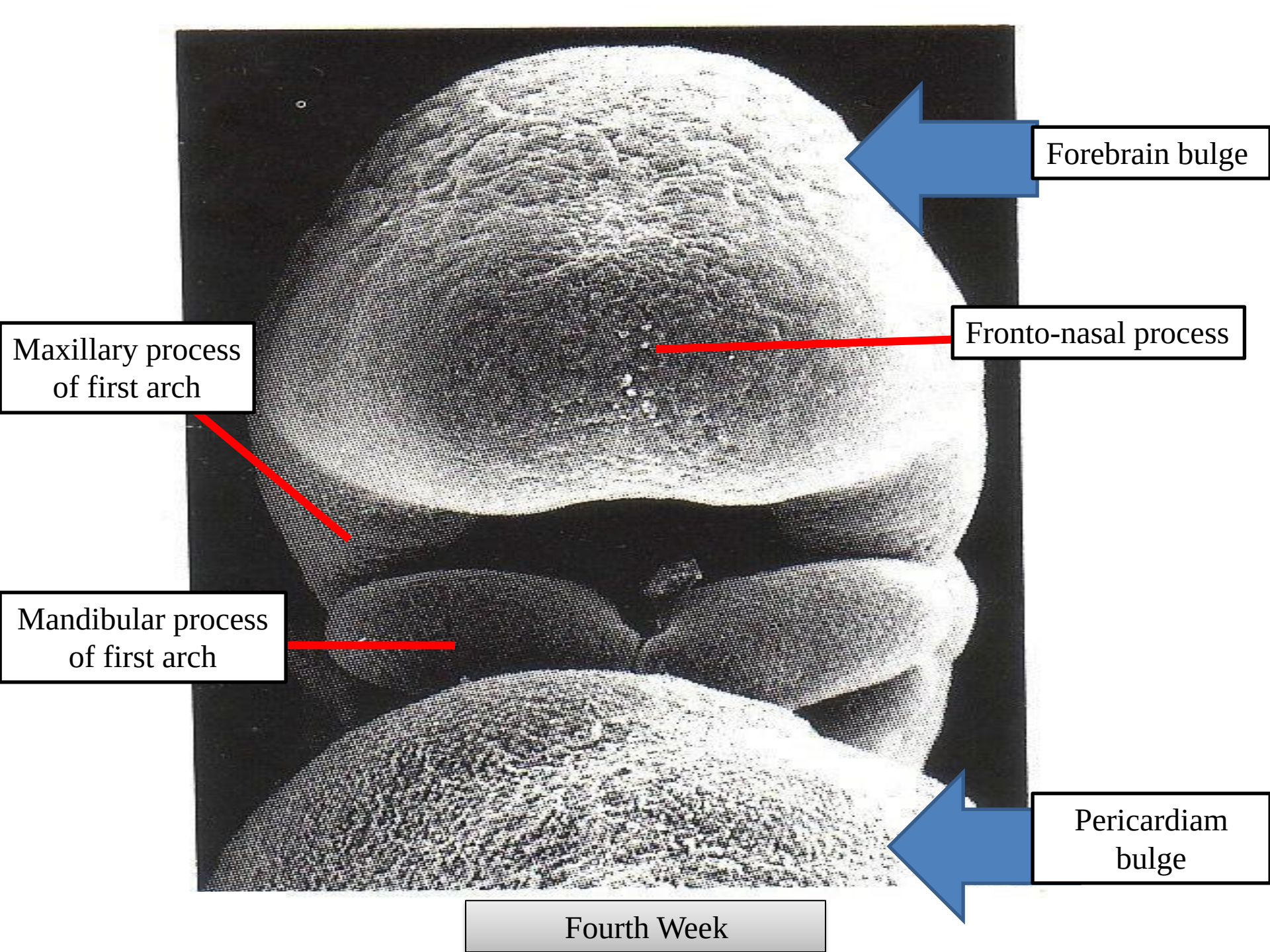
Secondary palate refers to Palatine process of maxilla, horizontal process of palatine bone and soft palate

The primary palate is at the anterior tip, and the secondary palate forms from the maxillary processes.

The maxillary processes send palatine shelves to form the secondary palate, fusing except at the front due to the intermaxillary segment.

V1 (ophthalmic nerve) for the frontal nasal area.
V2 (maxillary nerve) for the maxillary area.
V3 (mandibular nerve) for the mandibular area.

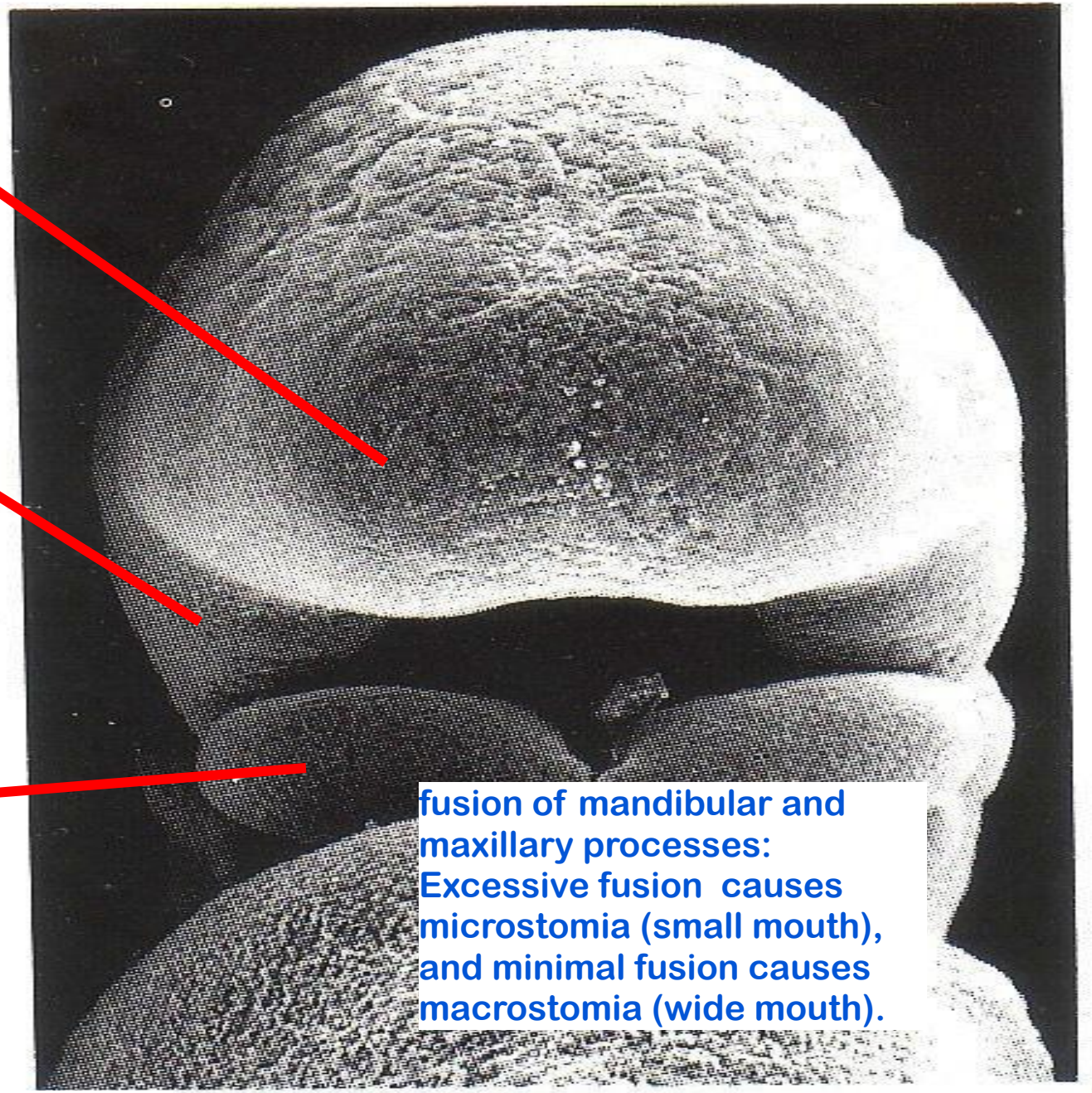

Maxillary process of first arch
Fronto-nasal process
Mandibular process of first arch
Stomodeum
Second arch


Forebrain bulge
Fronto-nasal process
Maxillary process of first arch
Mandibular process of first arch
Pericardiam bulge
Fourth Week

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

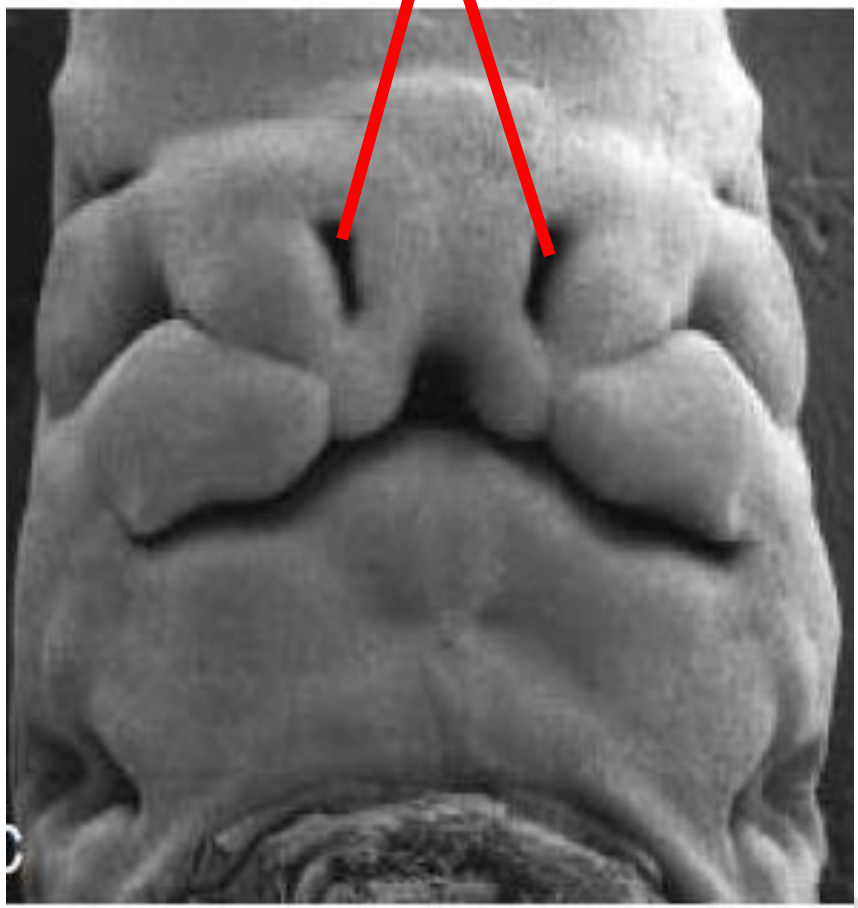
The **maxillary process** grows medially

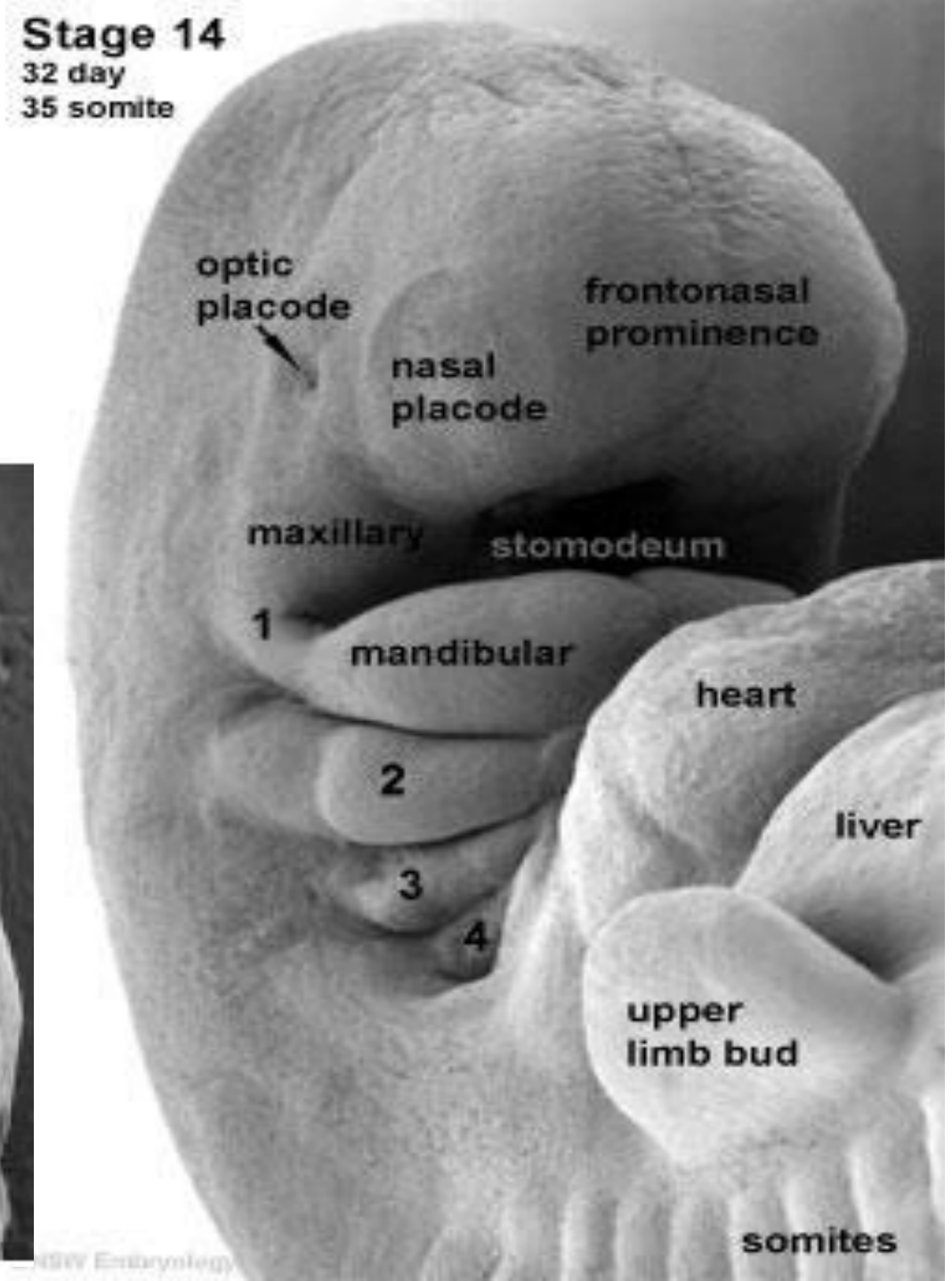
The **mandibular processes** approach one another in the midline below the stomodeum and fuse to form the lower jaw and lower lip

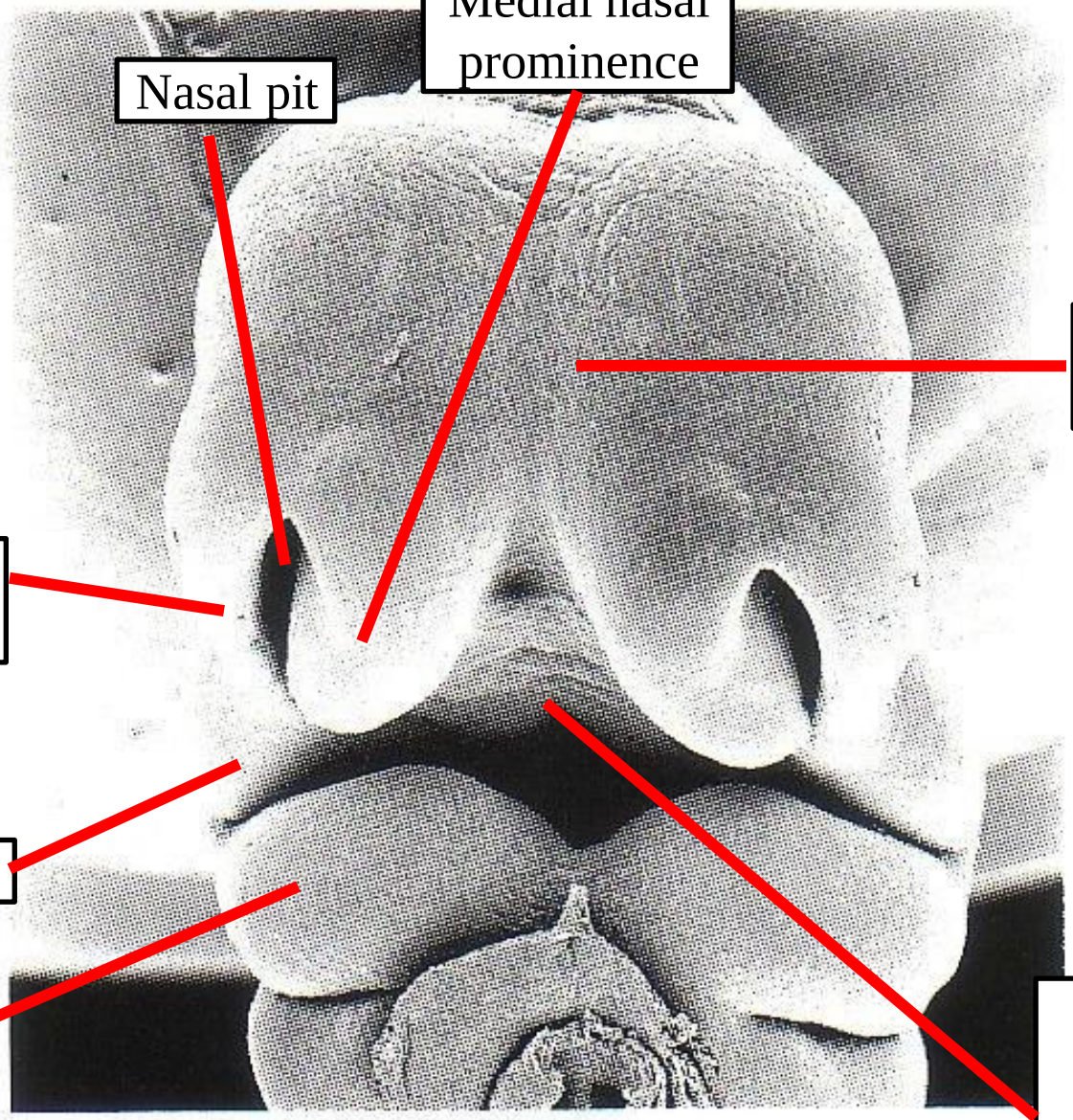


fusion of mandibular and maxillary processes: Excessive fusion causes microstomia (small mouth), and minimal fusion causes macrostomia (wide mouth).

NASAL PITS




Stage 14
32 day
35 somite
optic placode
frontonasal prominence
nasal placode
maxillary
stomodeum
1
mandibular
heart
2
liver
3
4
upper limb bud
somites



Early 6th week

Development of face

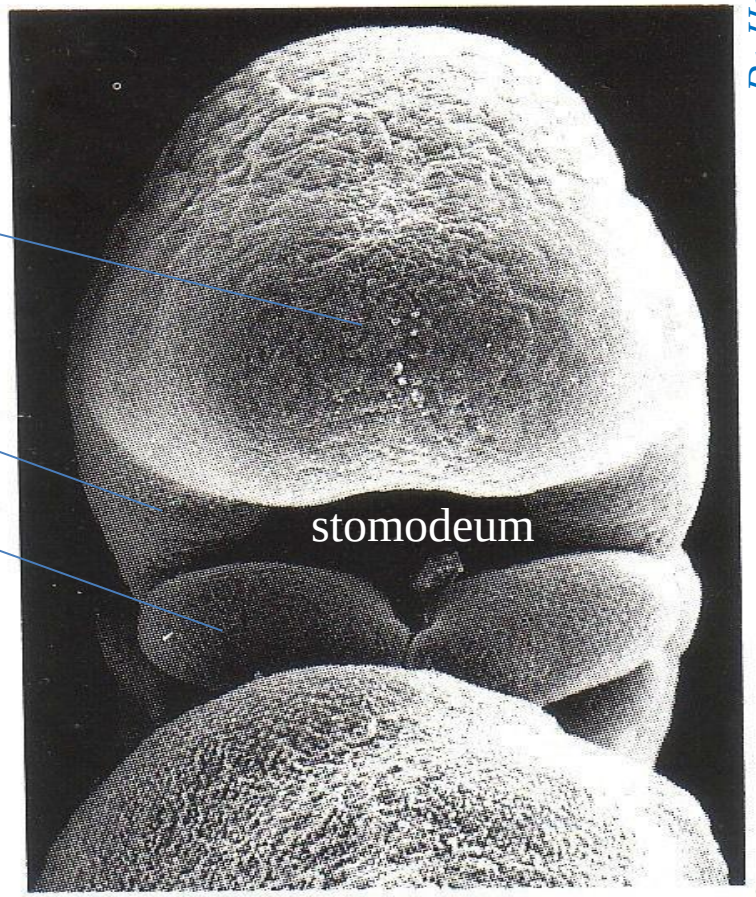
Dr. Heba Kalbouneh

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

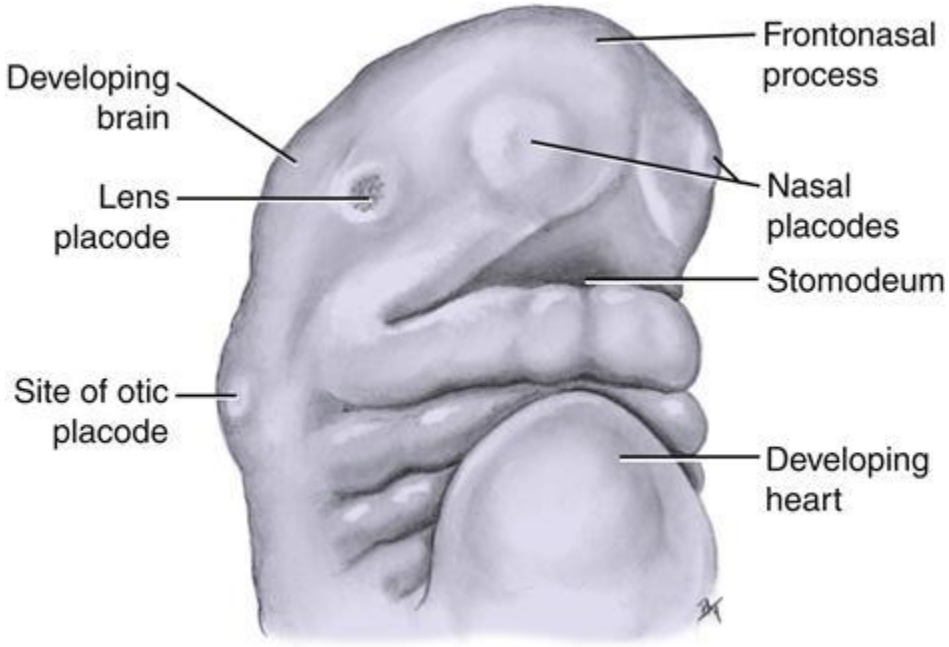
It forms the lower part of cheek, whole lower lip and lower jaw and floor of mouth.

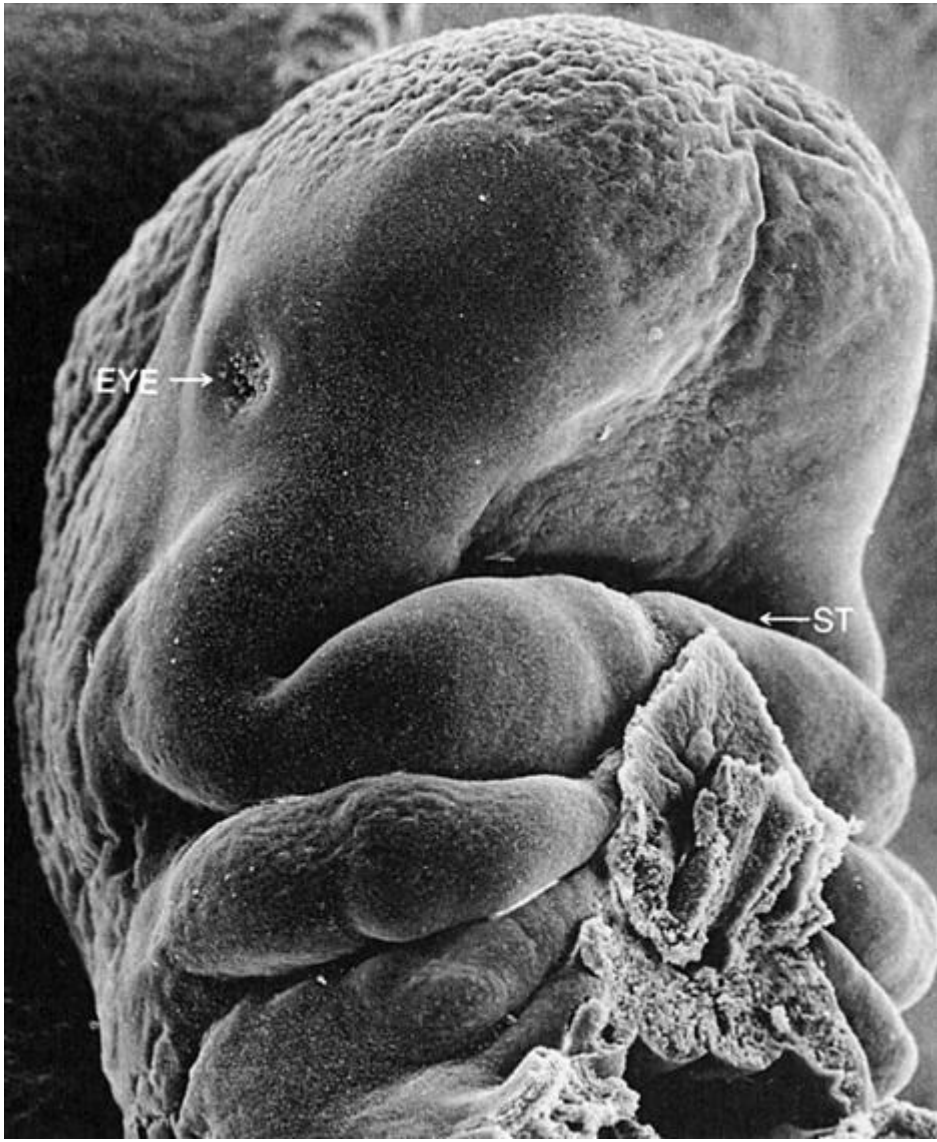
Development of palate:

1- Primary palate: from intermaxillary segment of fronto-nasal process.

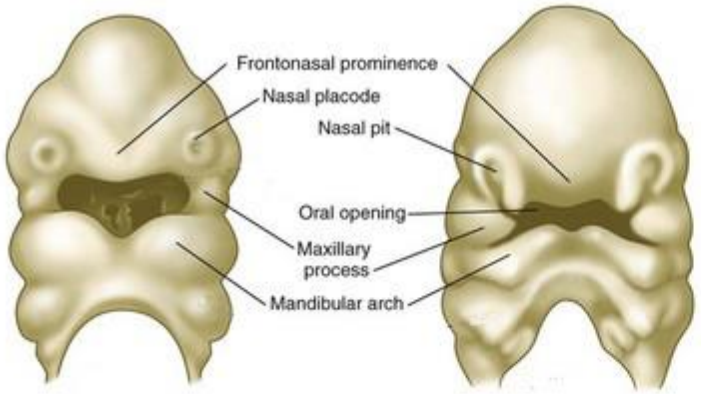
2- Secondary palate: from palatine shelves of maxillary processes that form most of hard palate and soft palate.

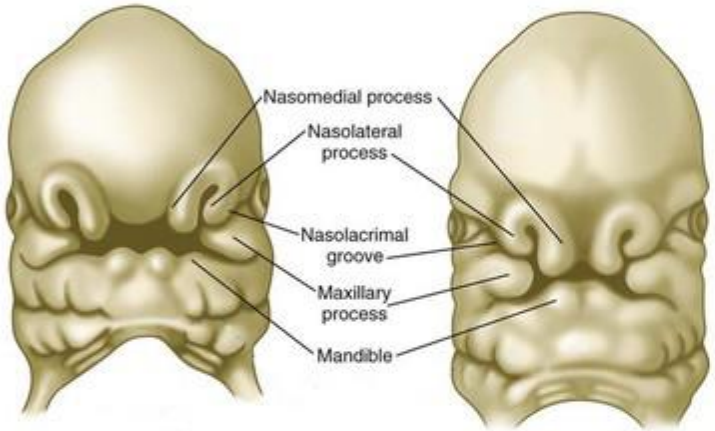
Hard palate receives downward growth of nasal septum

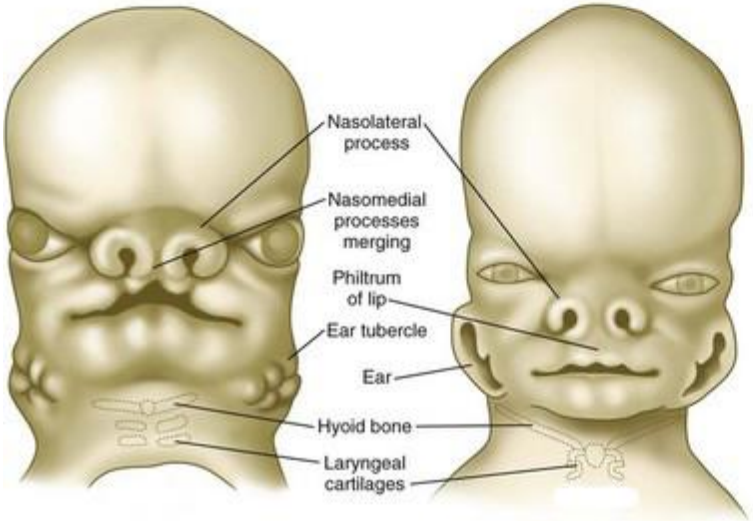

Developing brain
Frontonasal process
Lens placode
Nasal placodes
Stomodeum
Site of otic placode
Developing heart

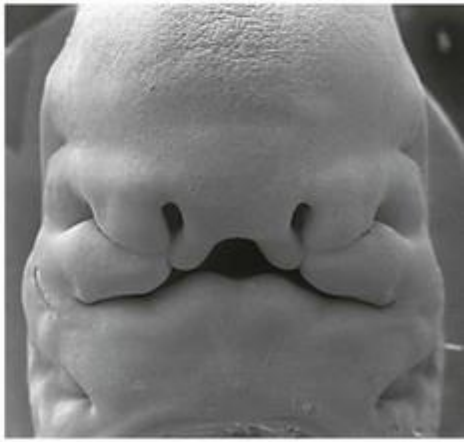

EYE
ST

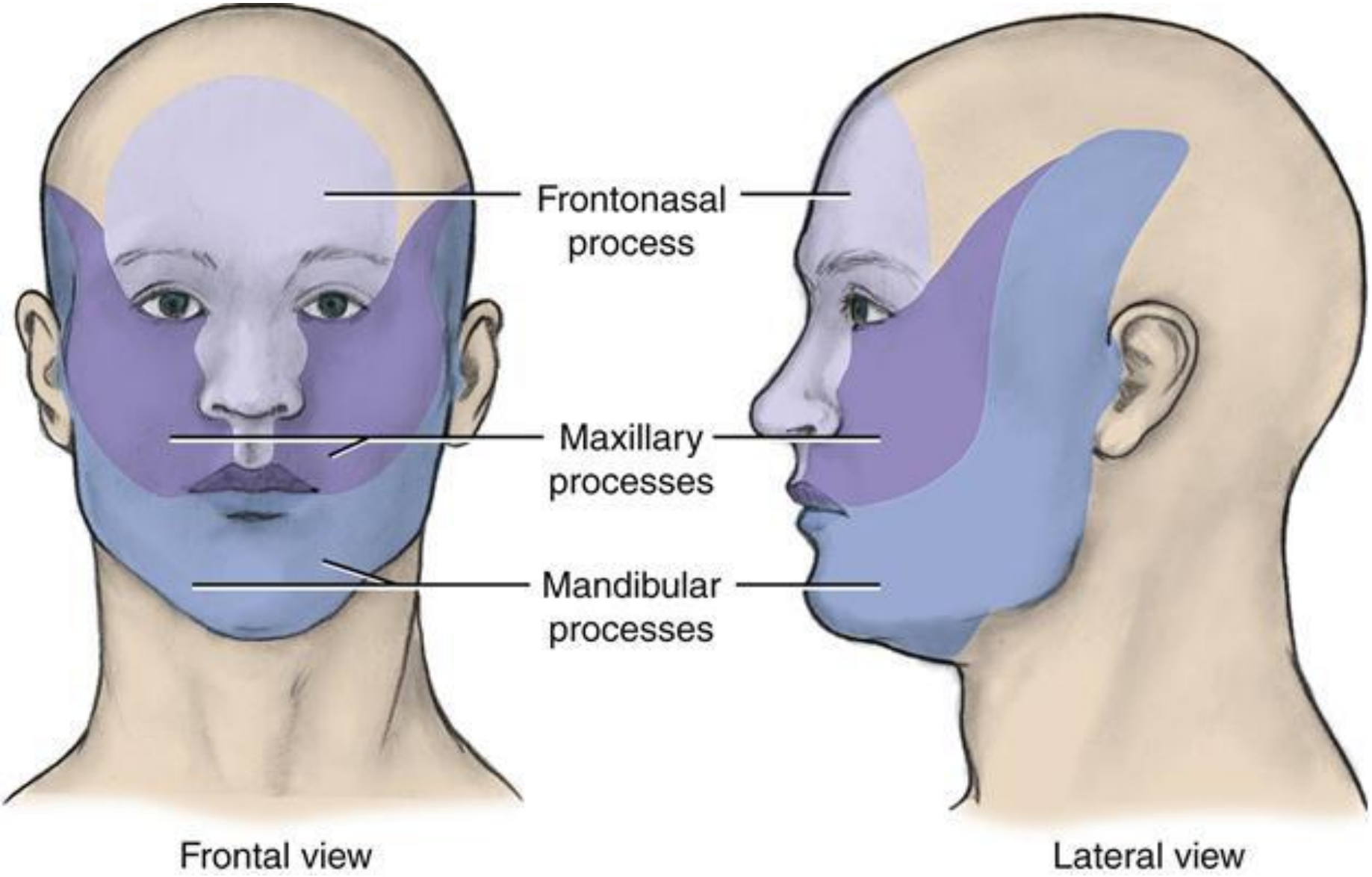
Ectodermal tubercles forming the auricle


Frontonasal prominence
Nasal placode
Nasal pit
Oral opening
Maxillary process
Mandibular arch


Nasomedial process
Nasolateral process
Nasolacrimal groove
Maxillary process
Mandible


Nasolateral process
Nasomedial processes merging
Philtrum of lip
Ear tubercle
Ear
Hyoid bone
Laryngeal cartilages

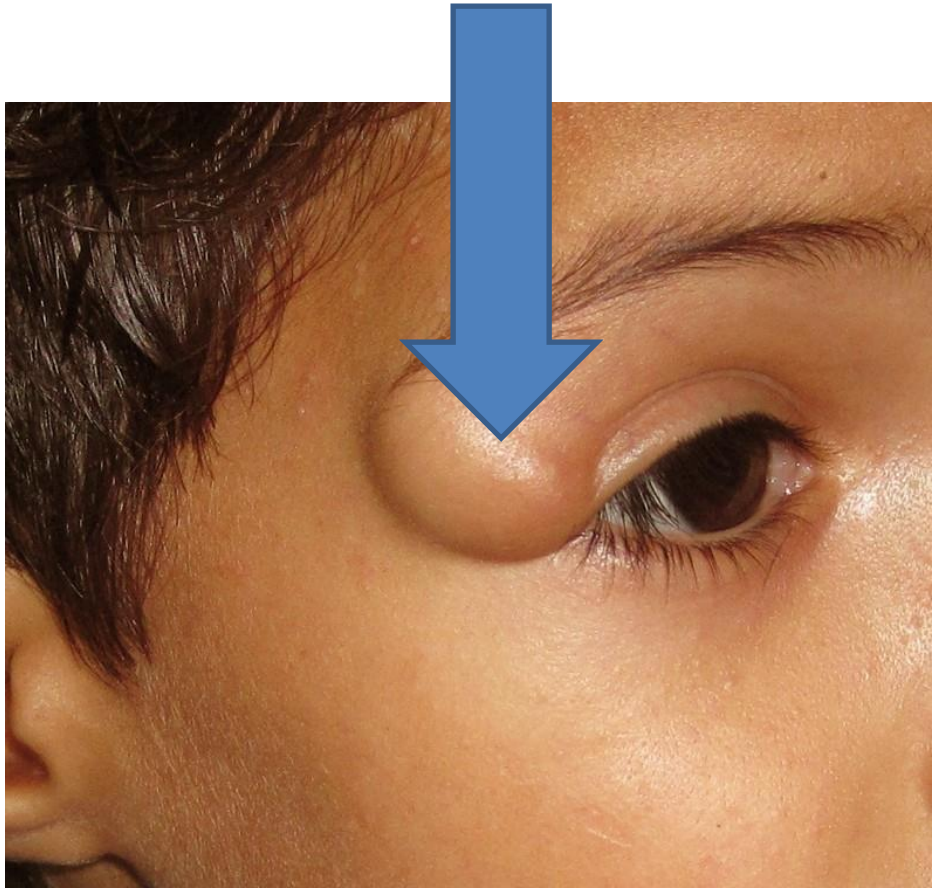



Frontonasal process
Maxillary processes
Mandibular processes
Frontal view
Lateral view

Congenital anomalies

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

Dermoid cyst



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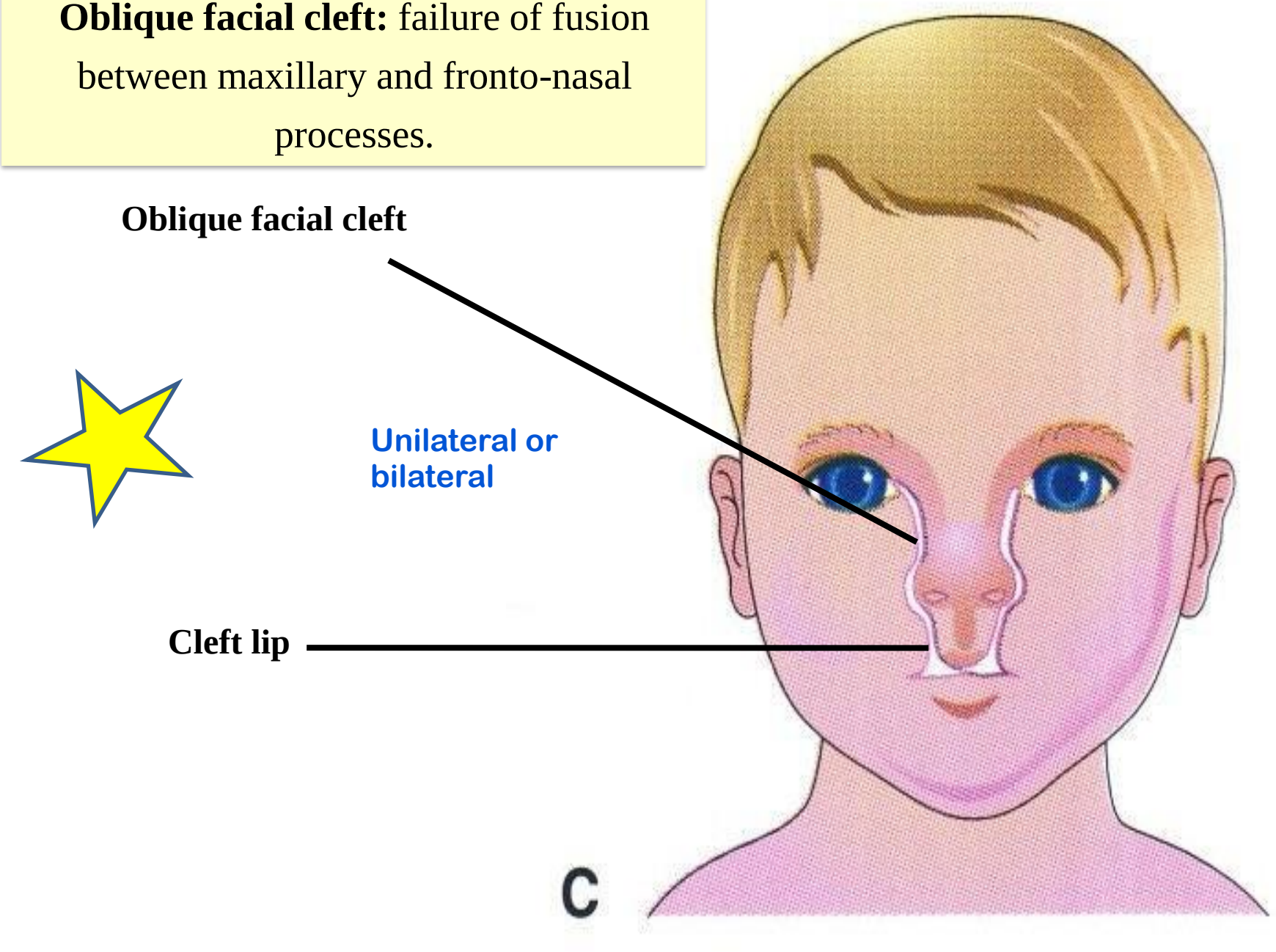
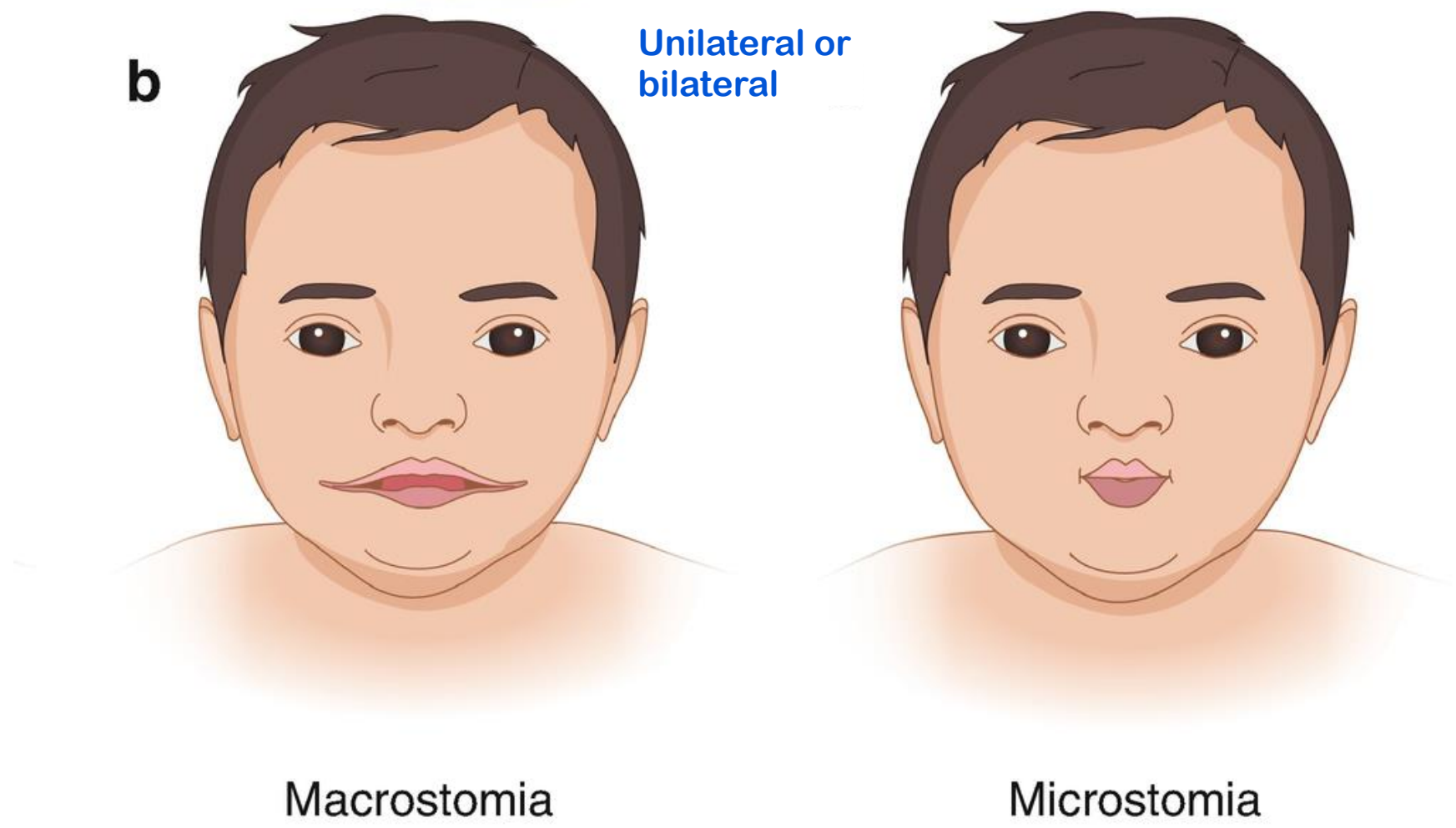
Oblique facial cleft: failure of fusion between maxillary and fronto-nasal processes.



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



Unilateral Cleft lip

COMMON CASE

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

Bilateral Cleft lip

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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

Extremely rare

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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

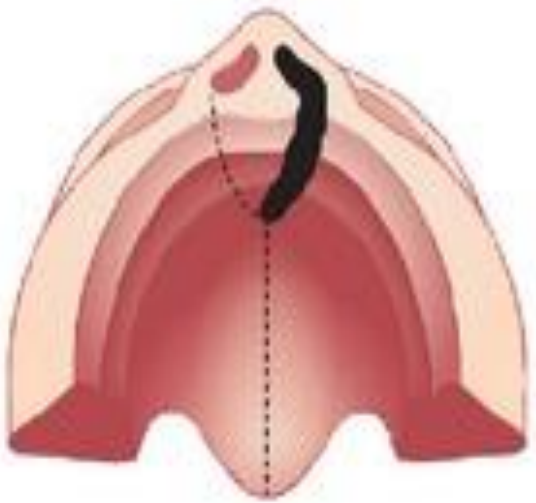
✓Takes place **anterior to the incisive foramen,** therefore this type is Anterior cleft palate

✓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)



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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**

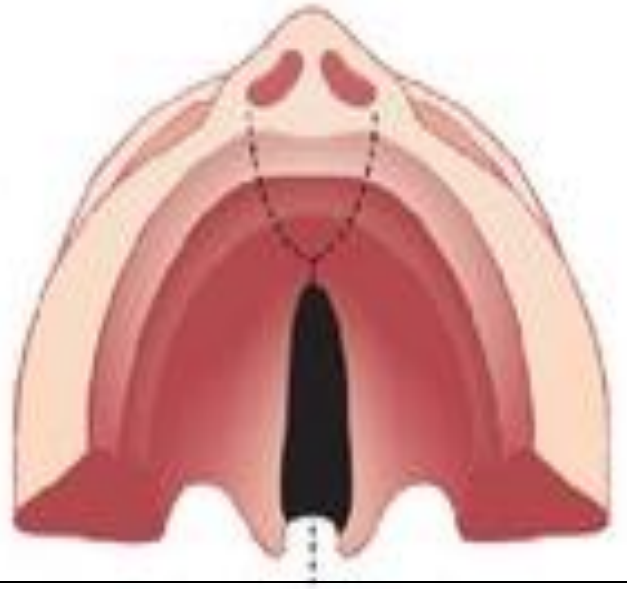
Secondary clefts are more dangerous than primary clefts. (Primary palate clefts usually cosmetic)

Cleft of the primary and secondary palate

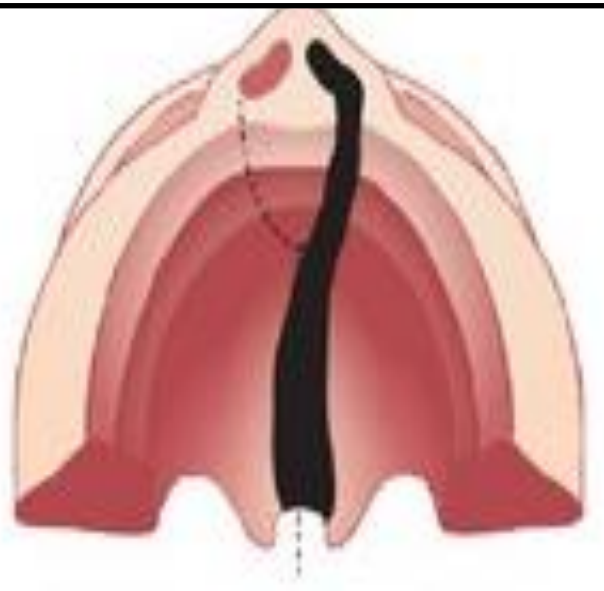
✓Results from failure of the maxillary processes to fuse with each other and with the intermaxillary segment

✓ Takes place **anterior and posterior to the incisive foramen,** therefore this type is mixed anterior and posterior cleft palates

Secondary cleft palate



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



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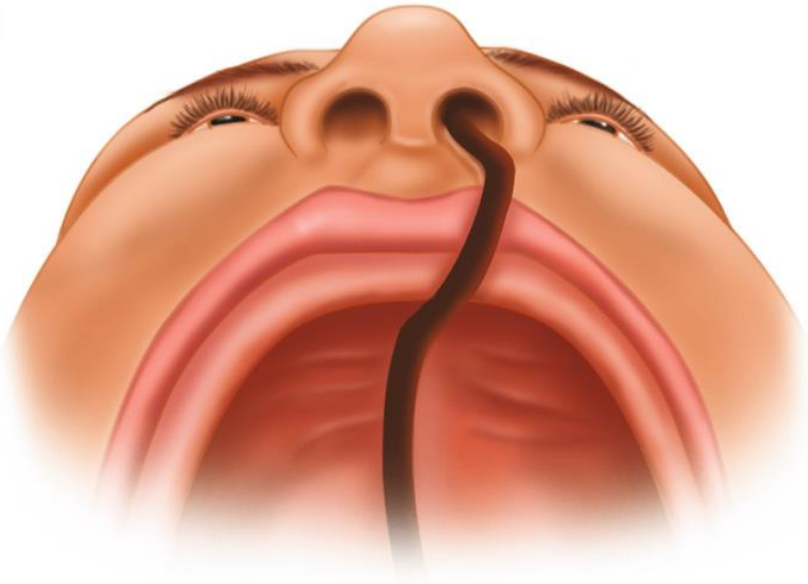

Unilateral complete cleft lip and palate

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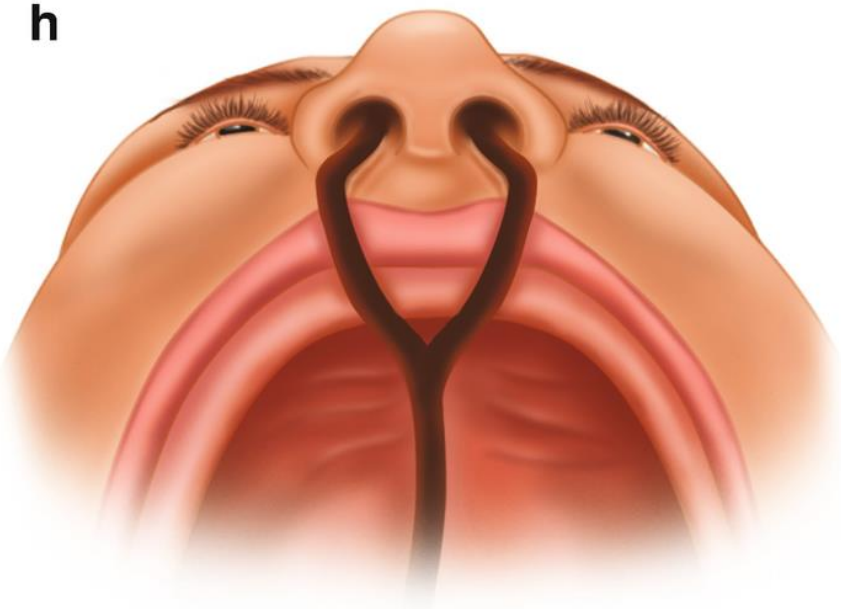
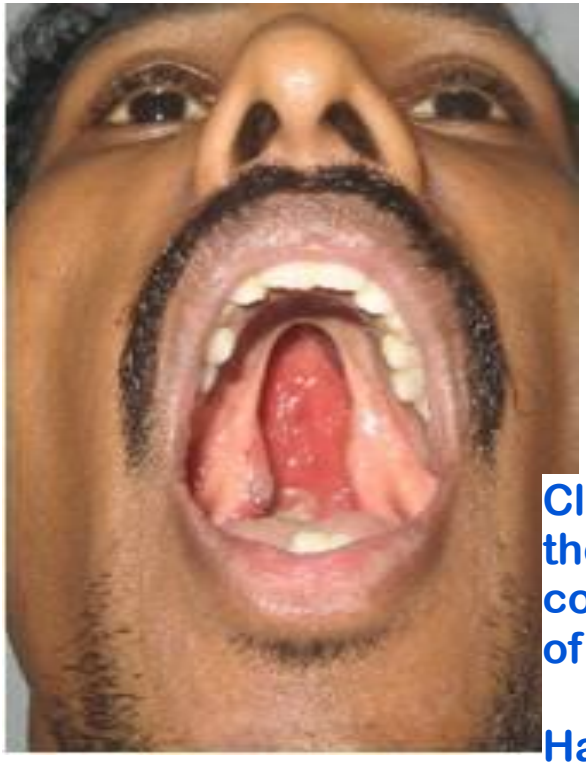
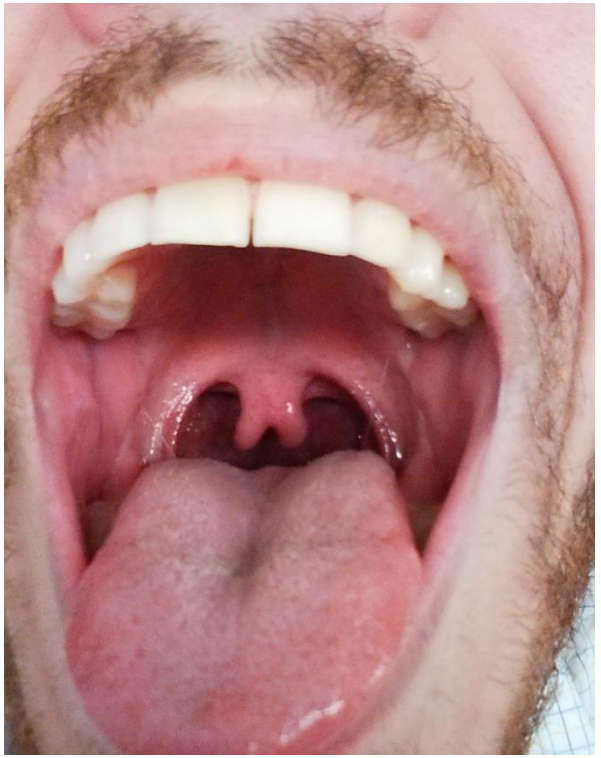


Bilateral Cleft Lip & Palate

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



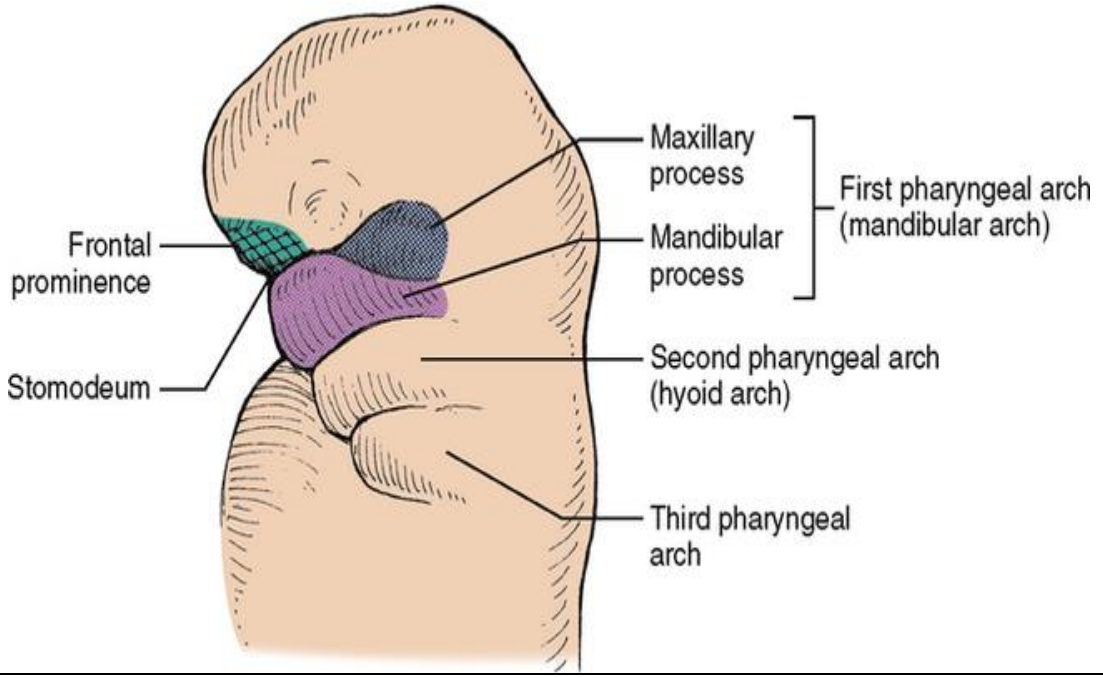
Secondary cleft palate

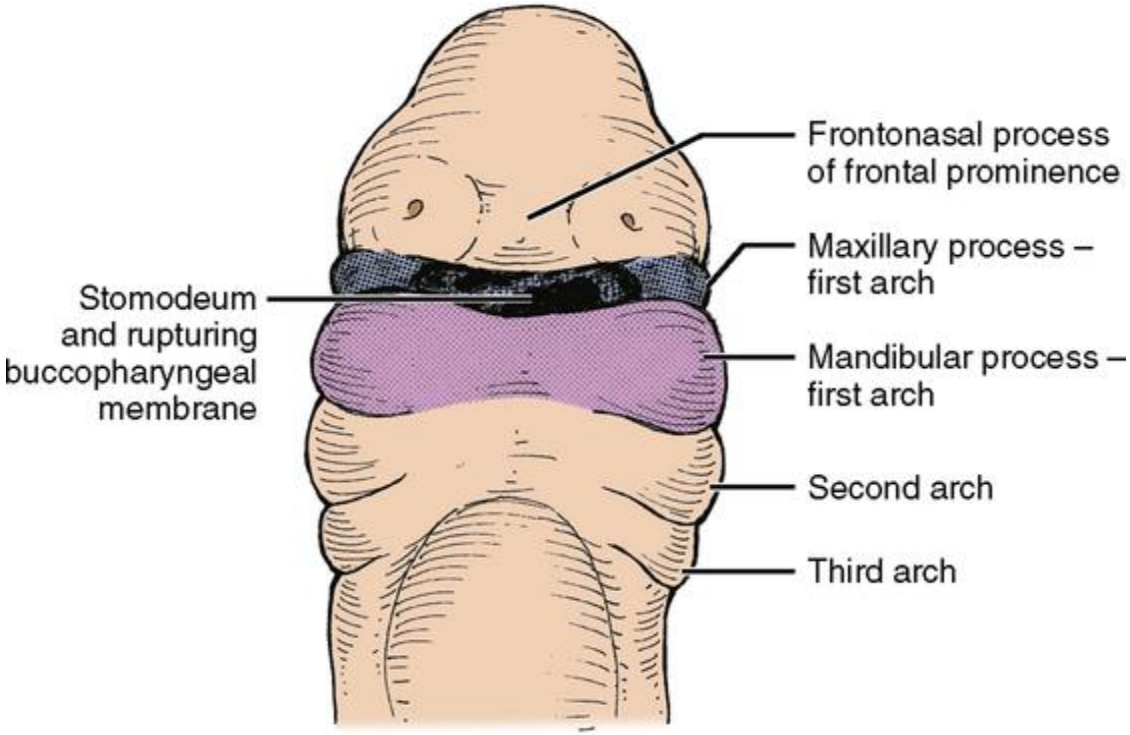


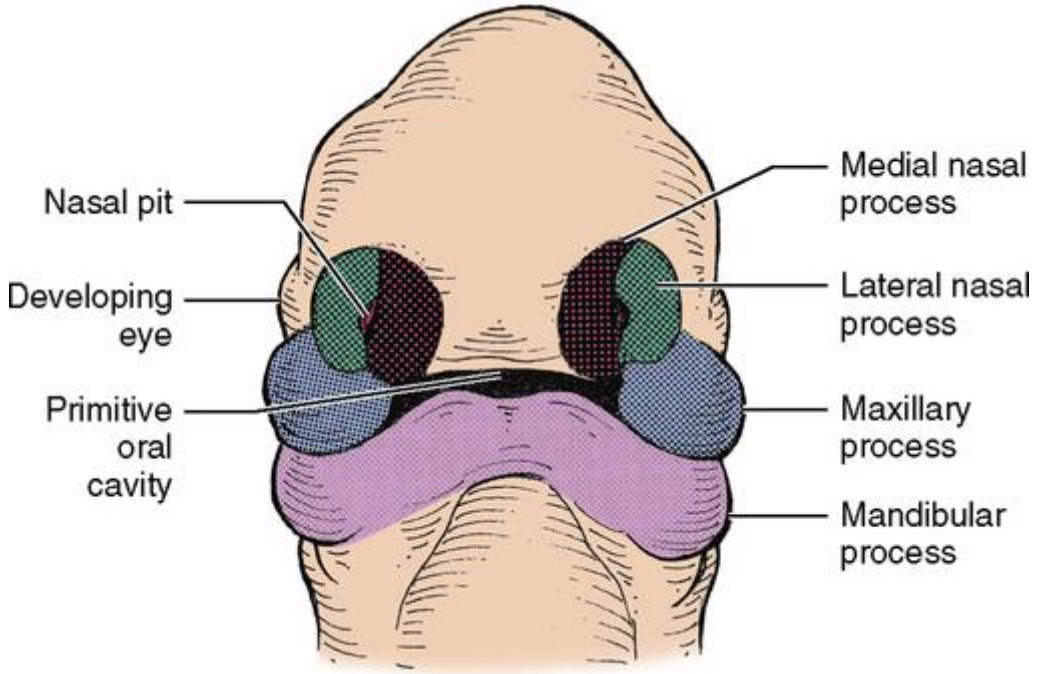
Cleft uvula

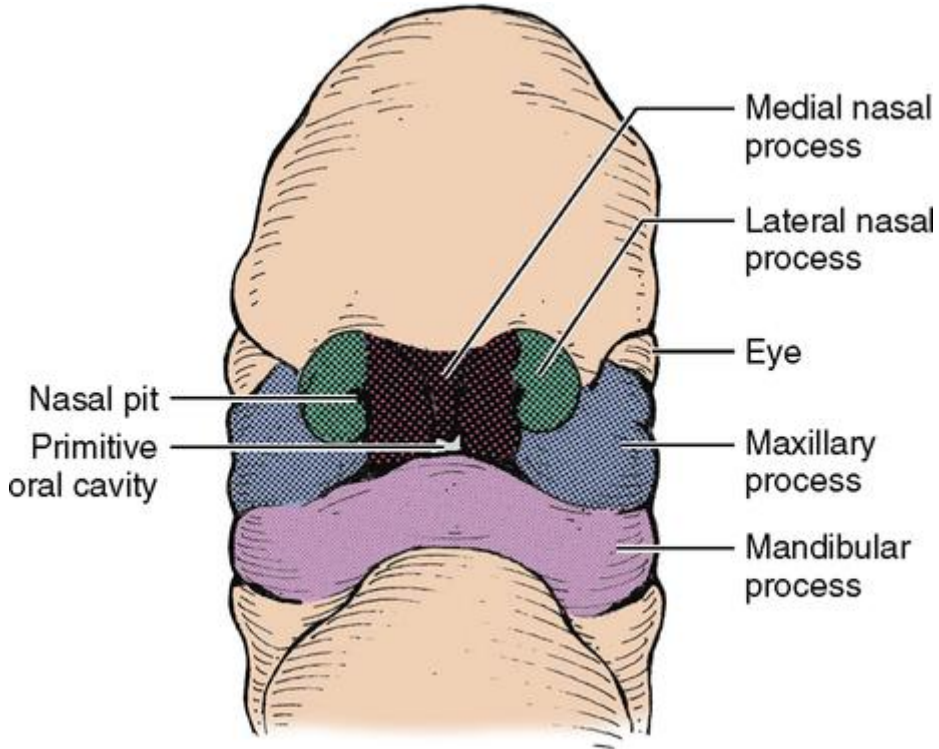
Cleft uvula happens when the soft palate fails to fuse completely, even if the rest of the palate fused properly.

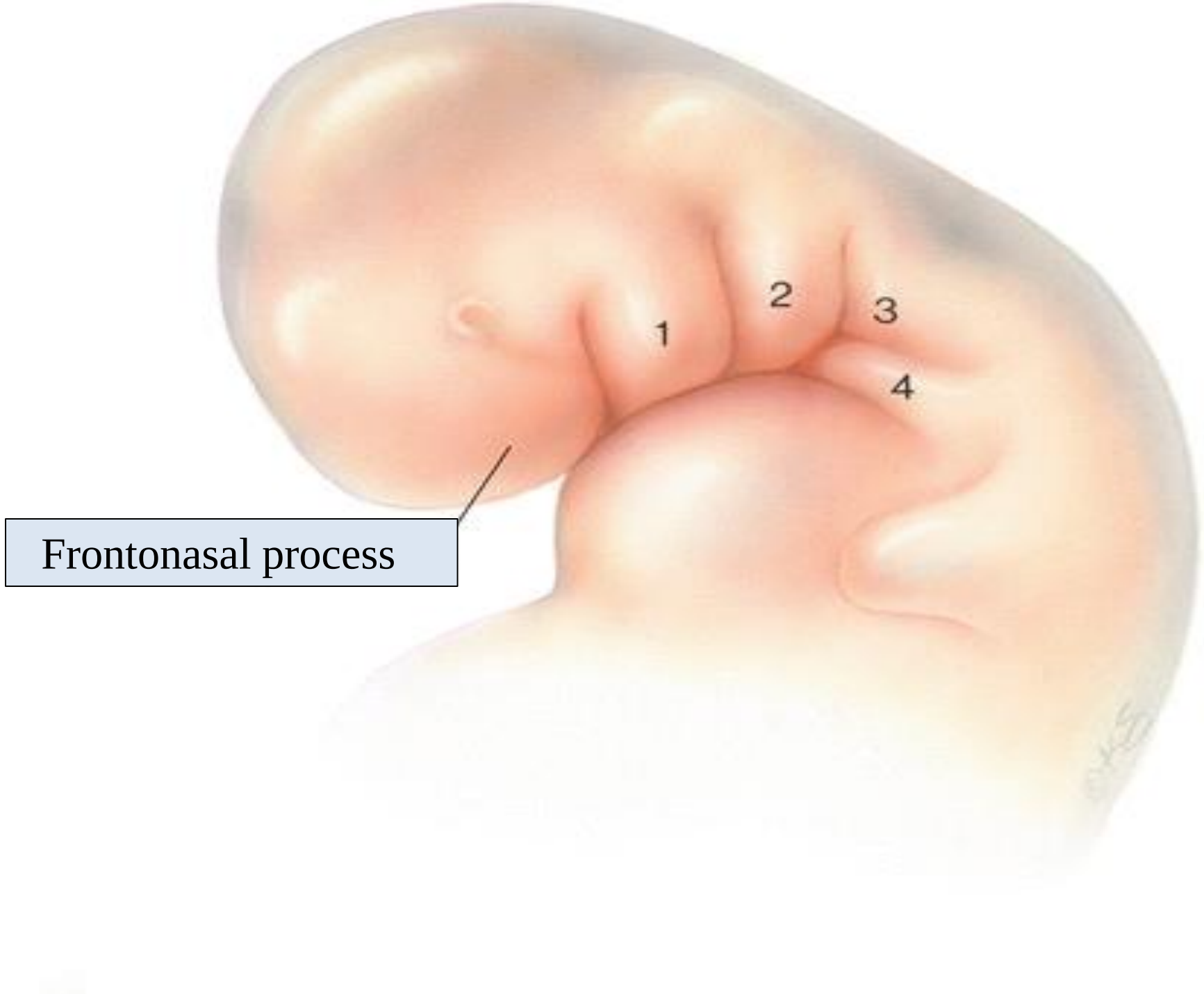
Has no clinical consequences

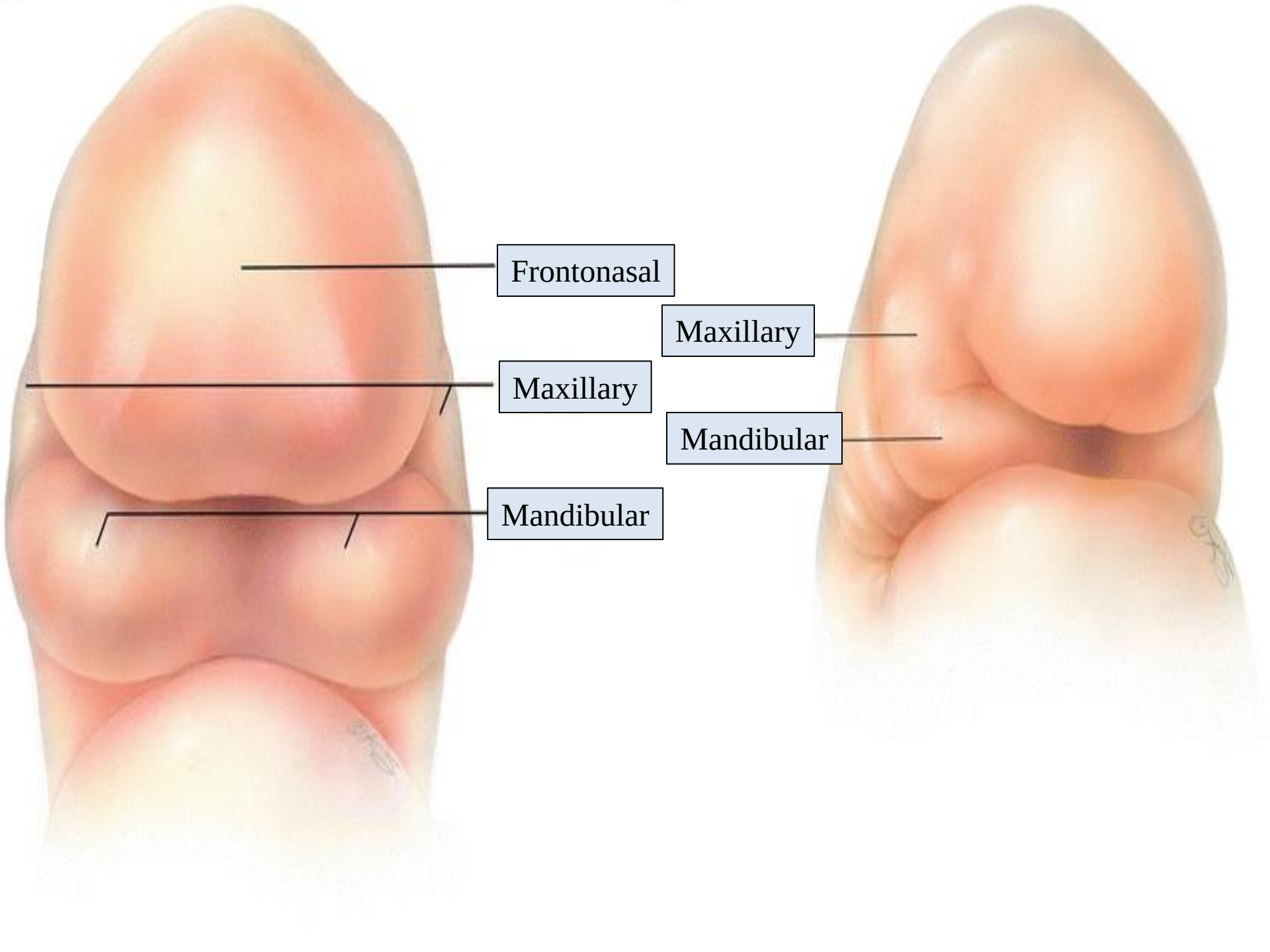

Maxillary process
Mandibular process
First pharyngeal arch (mandibular arch)
Frontal prominence
Stomodeum
Second pharyngeal arch (hyoid arch)
Third pharyngeal arch

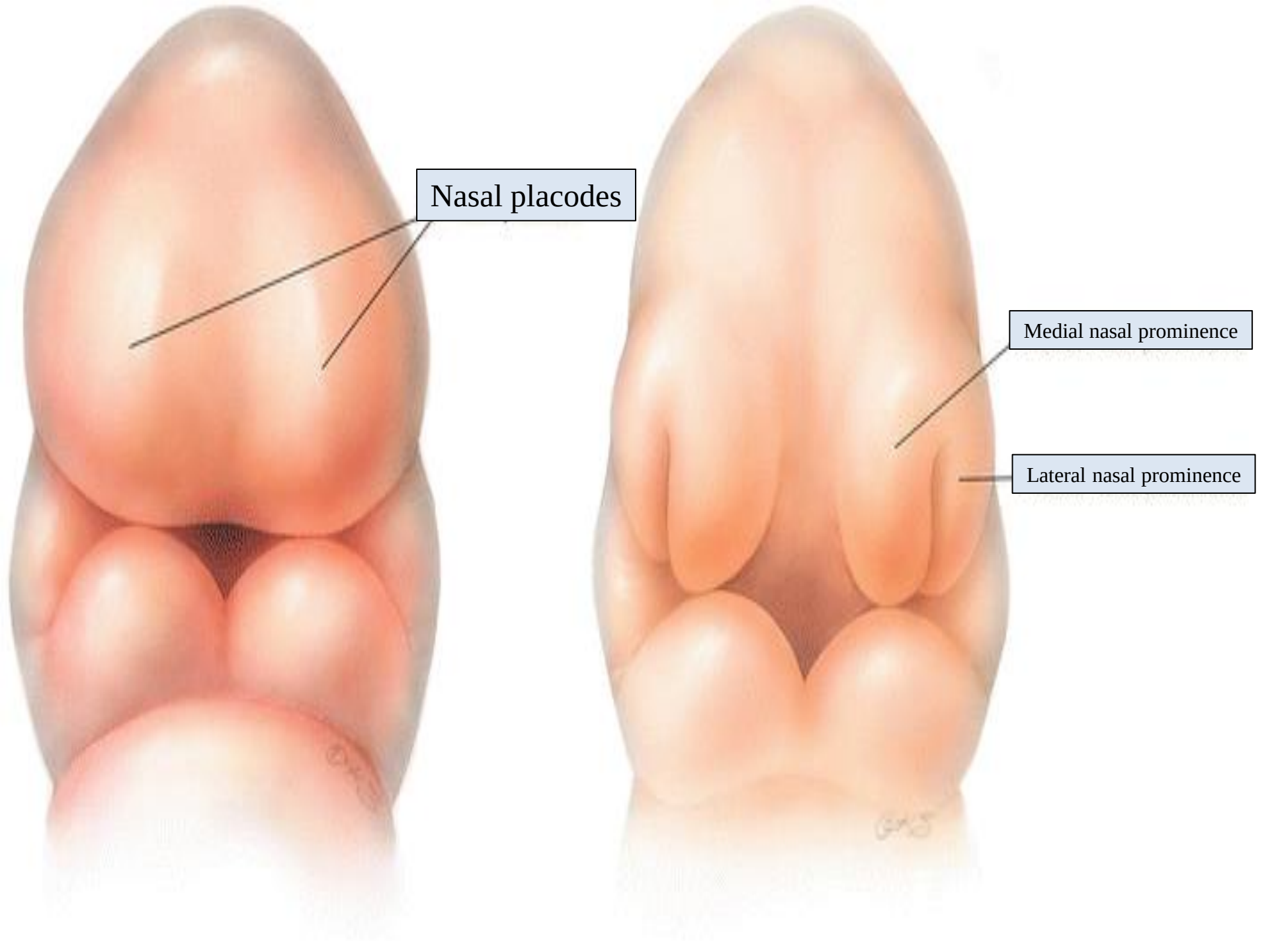

Frontonasal process of frontal prominence
Maxillary process – first arch
Stomodeum and rupturing buccopharyngeal membrane
Mandibular process – first arch
Second arch
Third arch

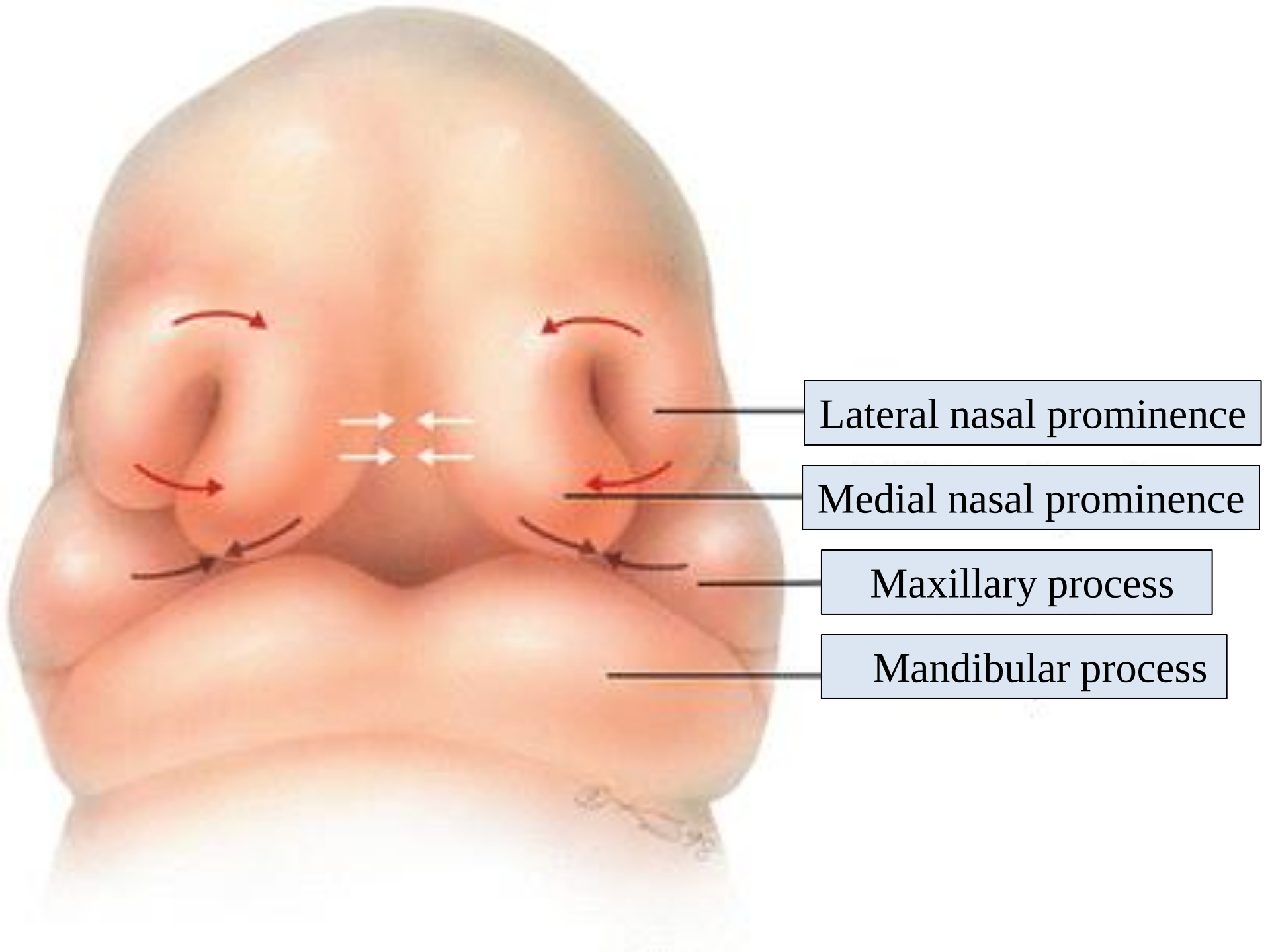

Nasal pit
Developing eye
Primitive oral cavity
Medial nasal process
Lateral nasal process
Maxillary process
Mandibular process

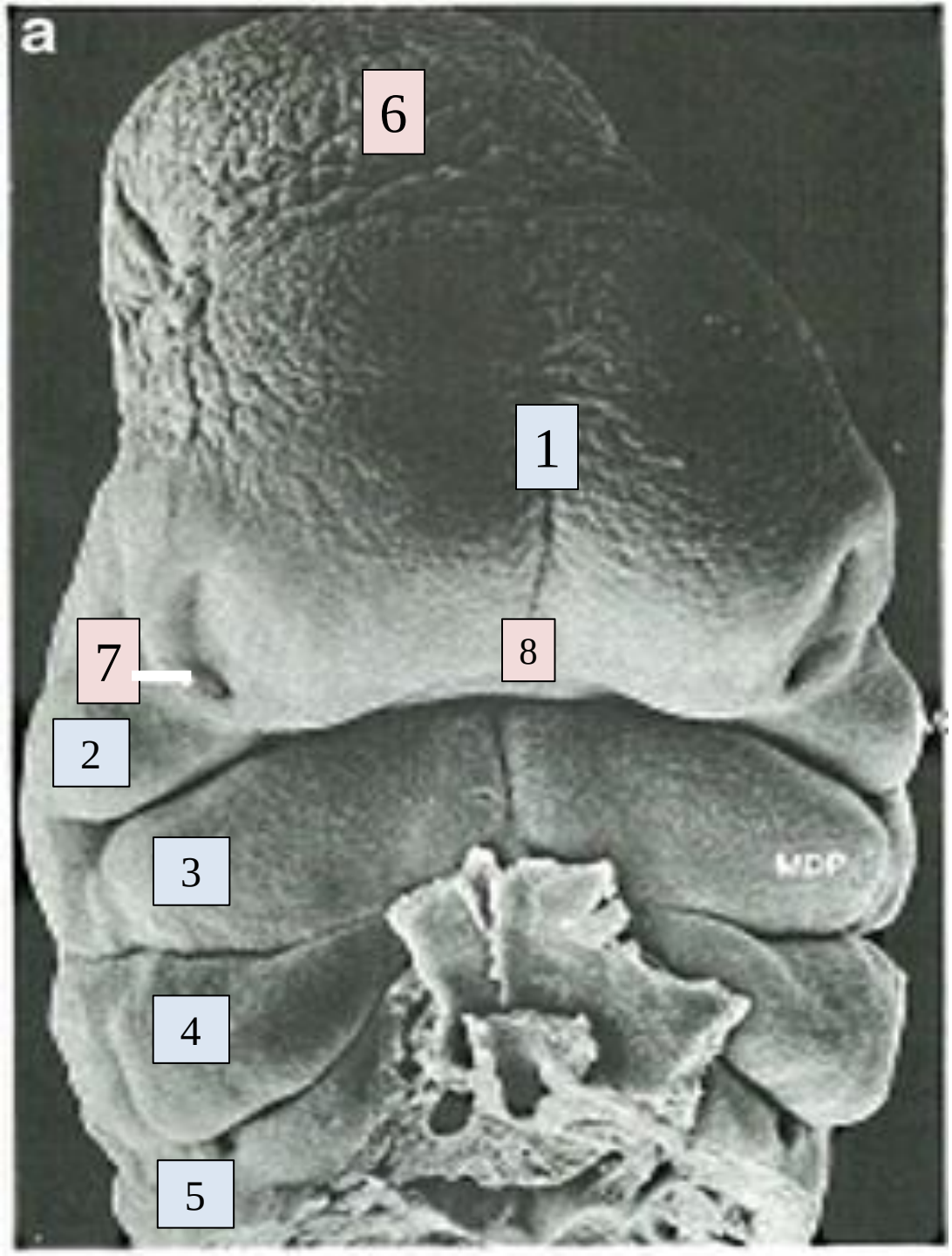

Nasal pit
Primitive oral cavity
Medial nasal process
Lateral nasal process
Eye
Maxillary process
Mandibular process


1
2
3
4
Frontonasal process


Frontonasal
Maxillary
Maxillary
Mandibular
Mandibular

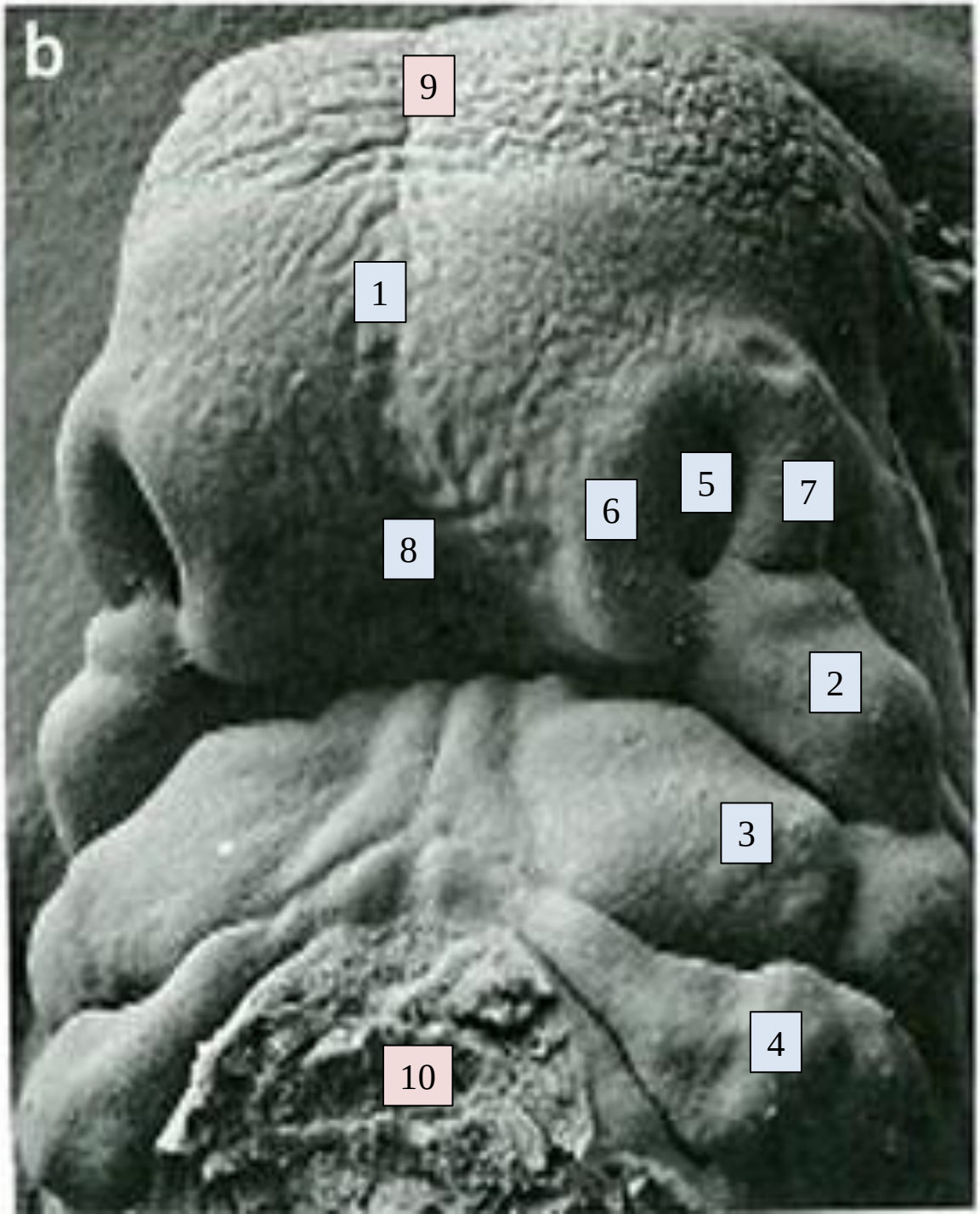

Nasal placodes
Medial nasal prominence
Lateral nasal prominence


Lateral nasal prominence
Medial nasal prominence
Maxillary process
Mandibular process



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

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



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