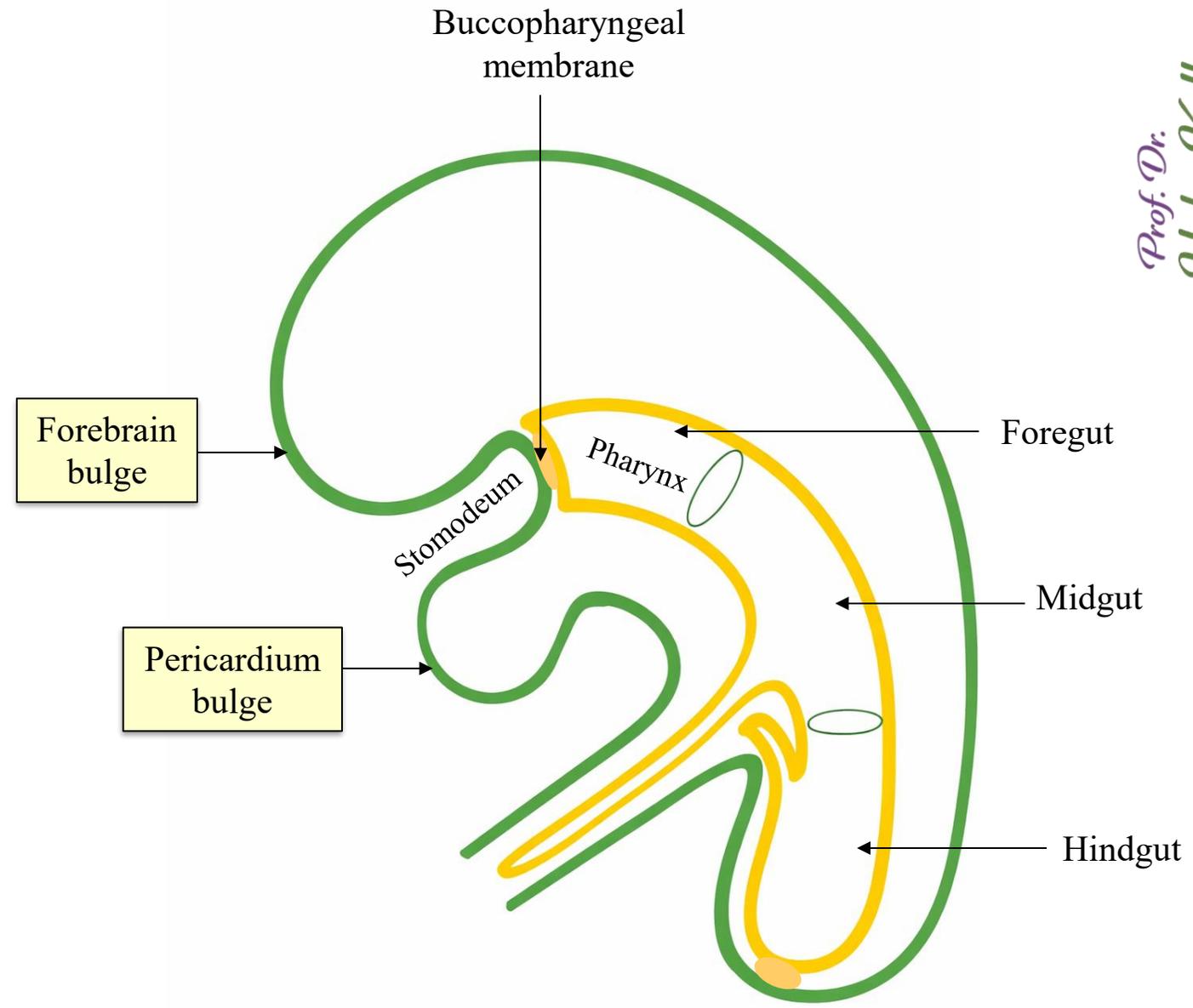
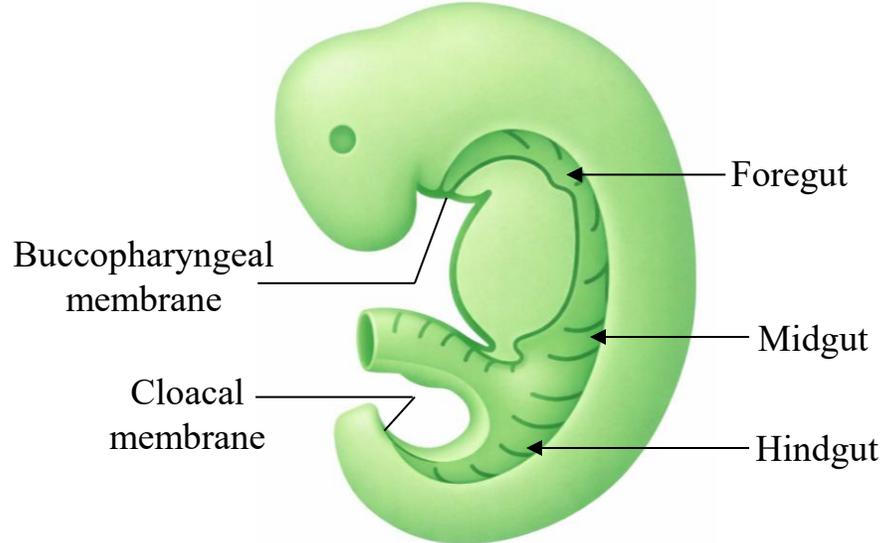
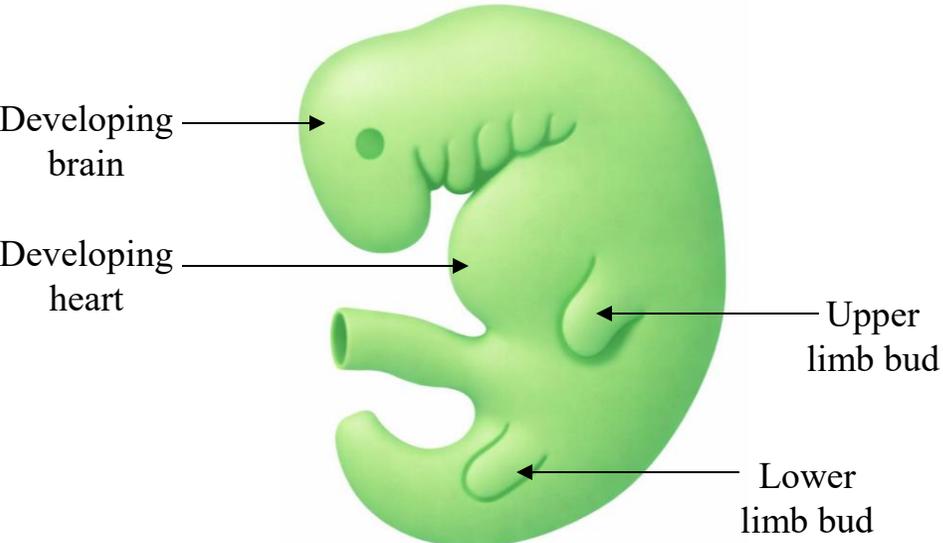




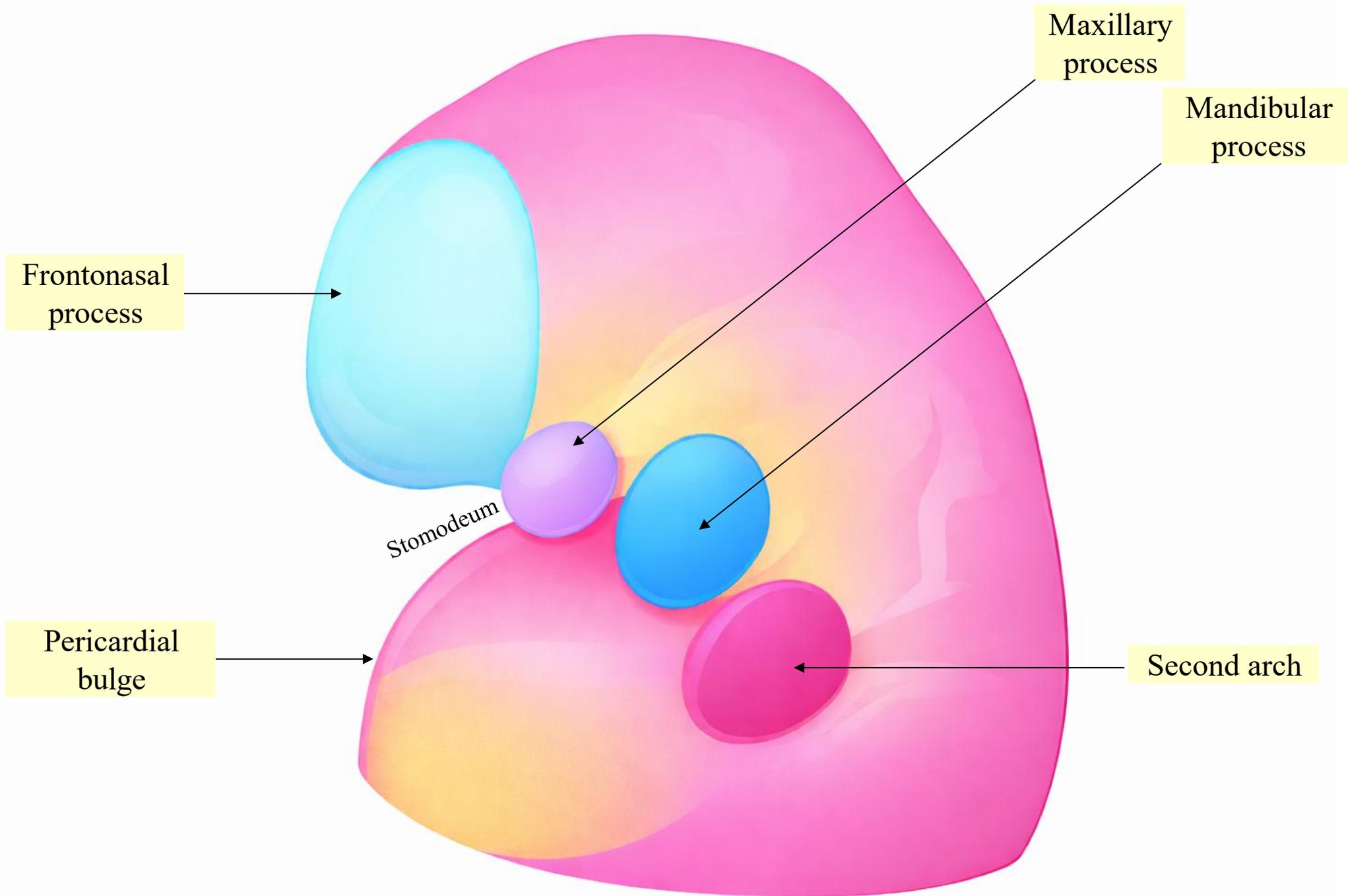
Development of Face and Palate

Dr. Heba Kalbouneh
DDS, MSc, DMD/PhD
Professor of Anatomy, Histology and Embryology

*Prepared and adapted for teaching by Prof. Dr. Heba Kalbouneh.
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Lateral view



Forebrain bulge

Frontonasal process

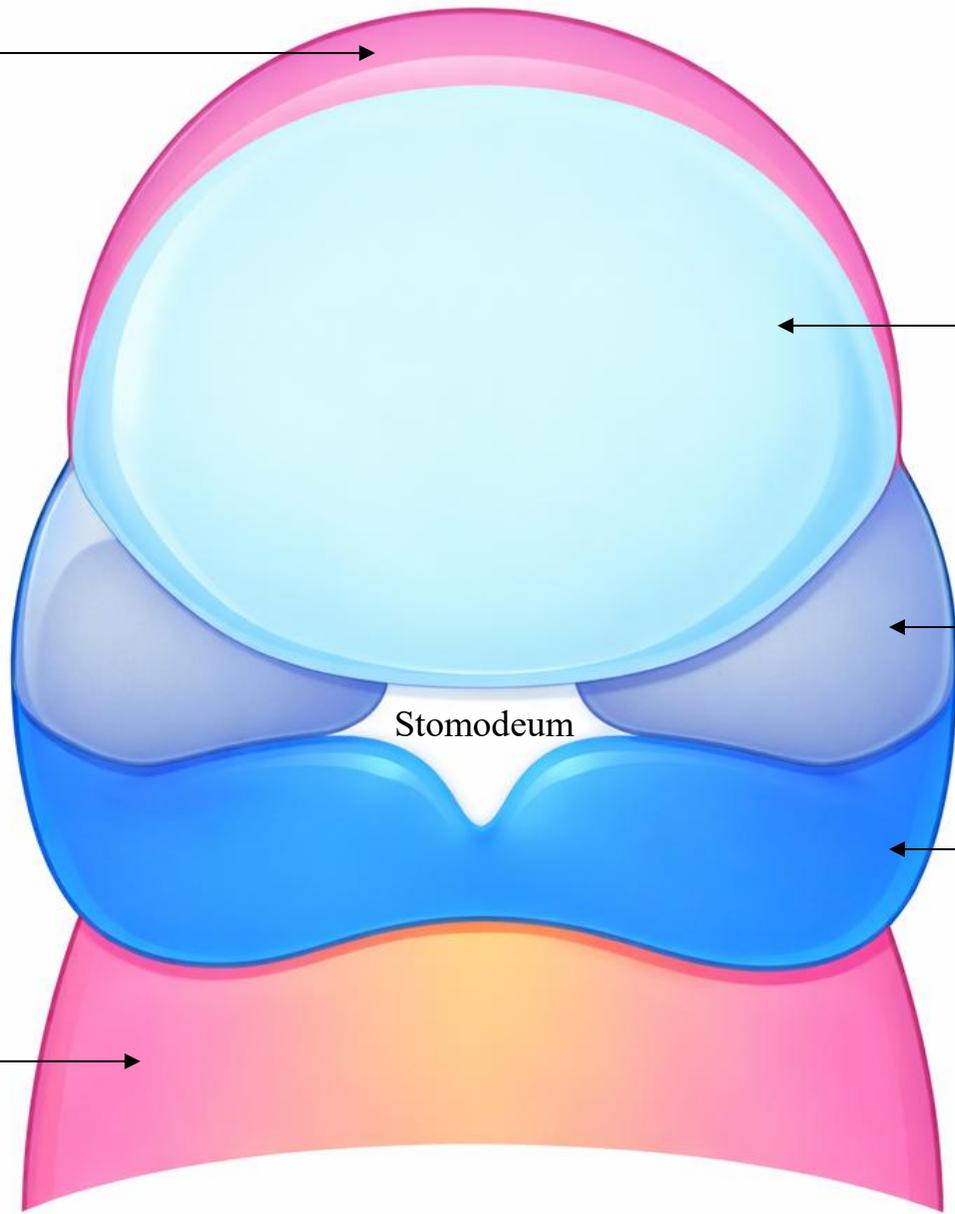
Maxillary process

Mandibular process

Stomodeum is the primitive nasal and oral cavities.

Stomodeum

Pericardial bulge



24 Days

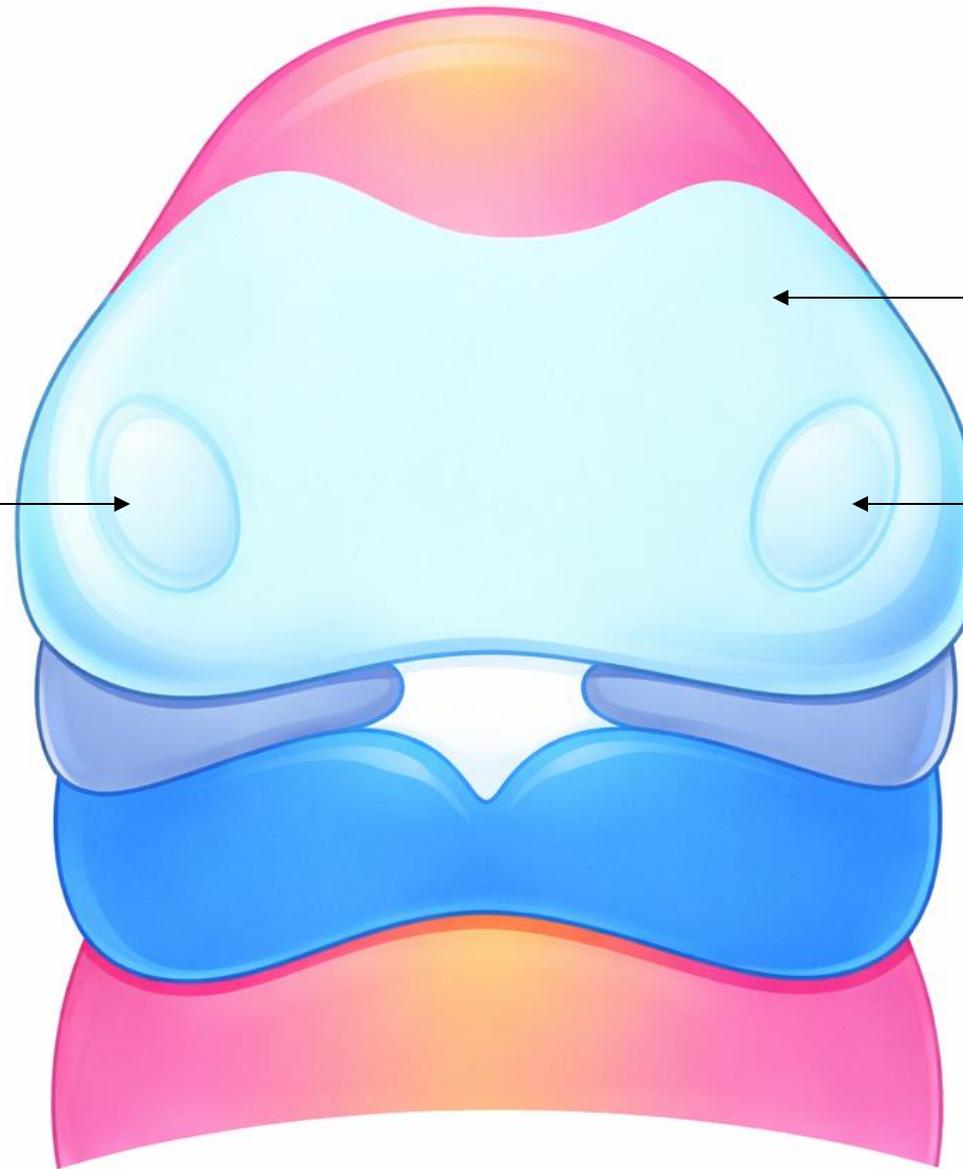
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Nasal placode

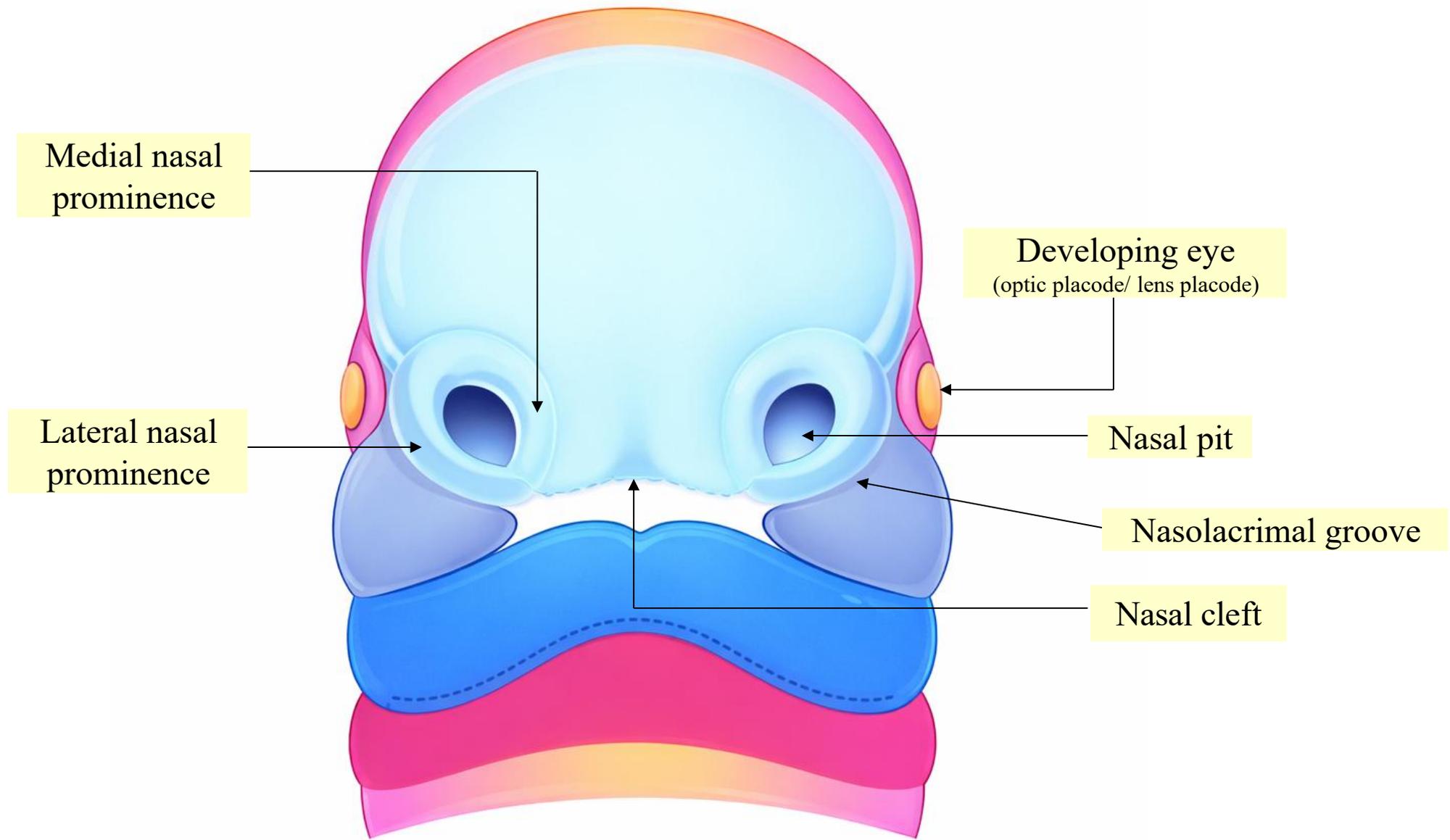
Frontonasal process

Nasal placode

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



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Medial nasal prominence

Lateral nasal prominence

Developing eye
(optic placode/ lens placode)

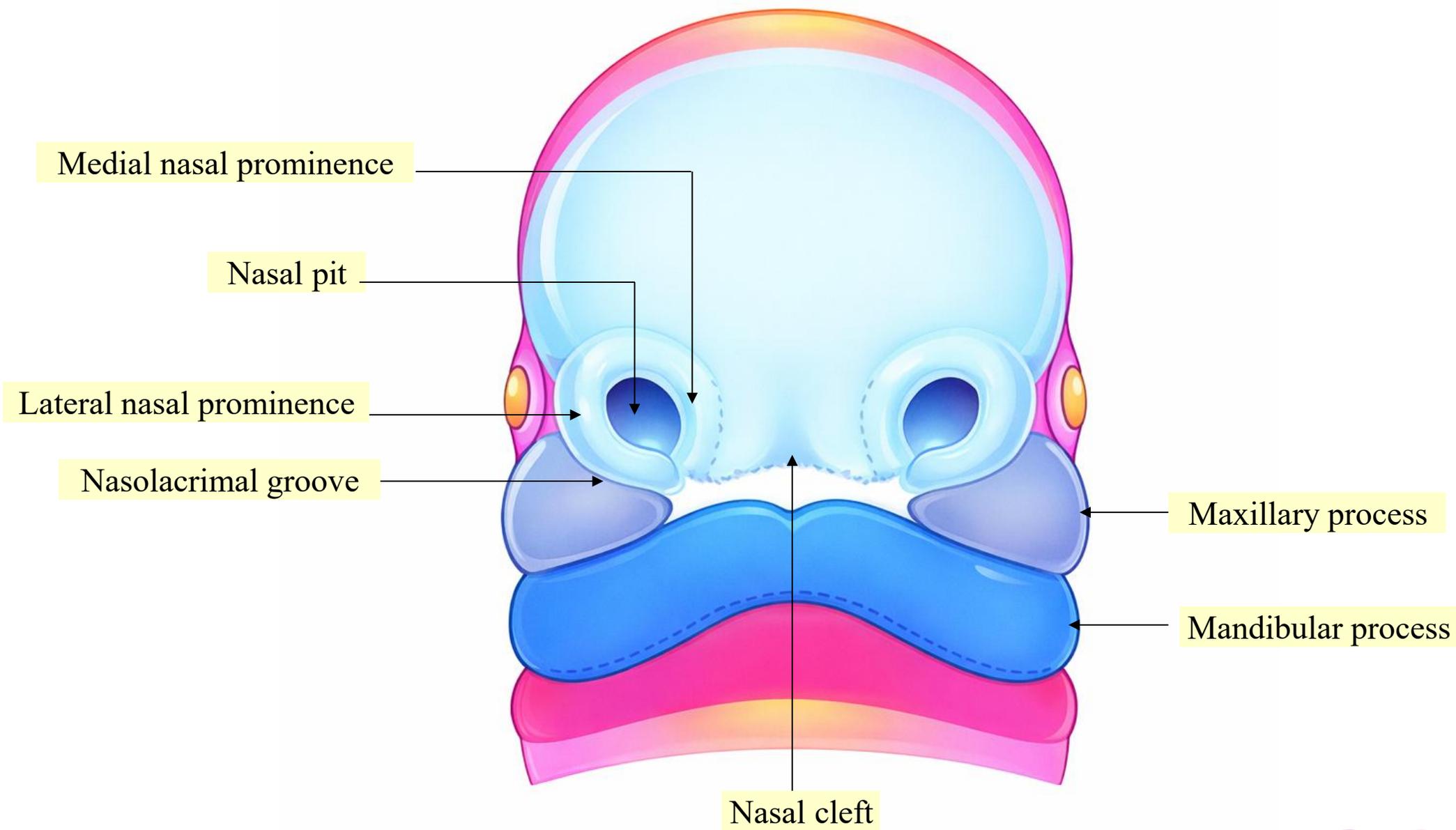
Nasal pit

Nasolacrimal groove

Nasal cleft

31 Days

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33 Days

*Prof. Dr.
Heba Kalbouneh*

Frontonasal prominence



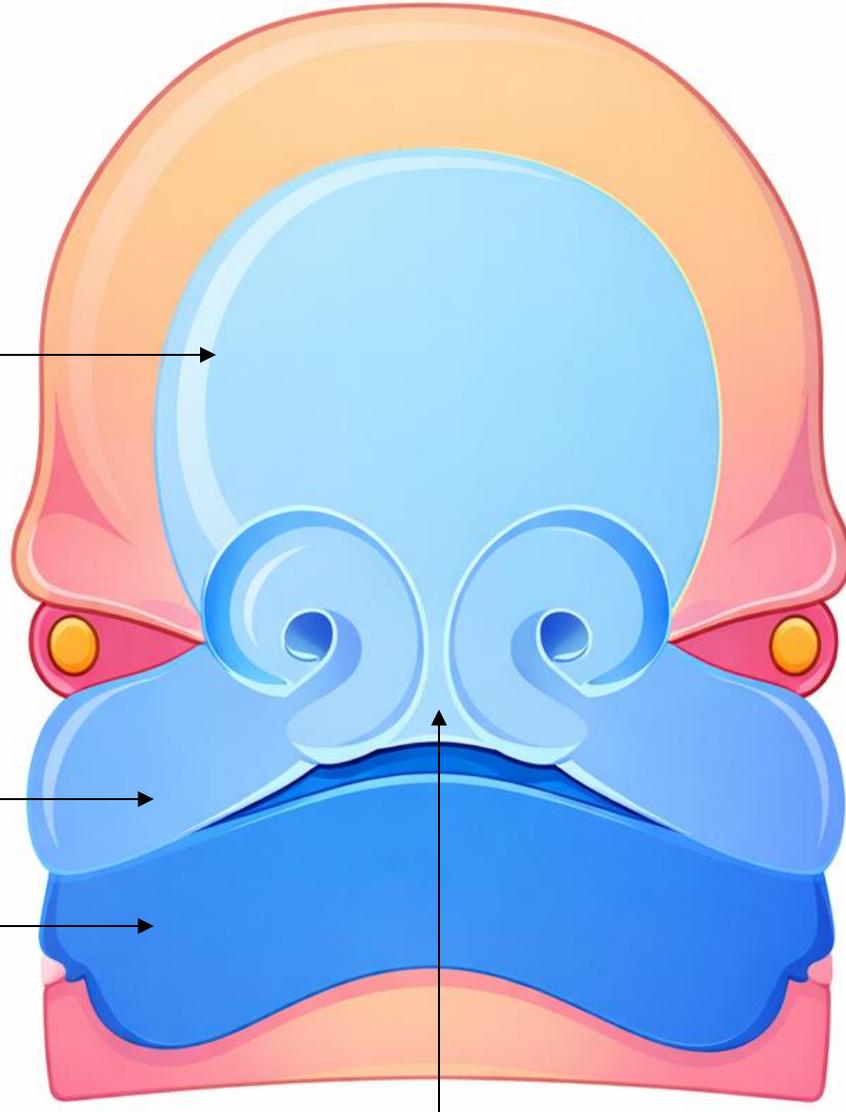
Maxillary process



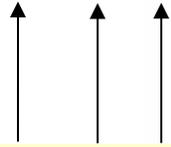
Mandibular process



Nasal cleft

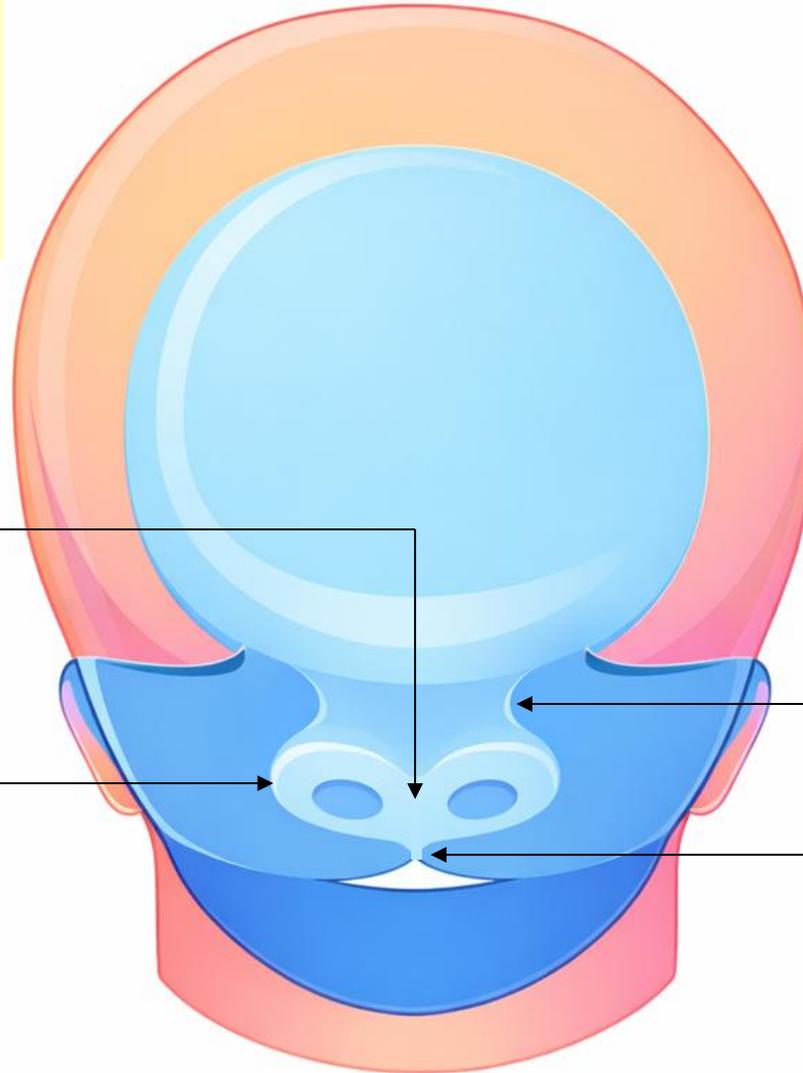


The medial nasal prominences fuse to form the middle part of the nose, including the bridge, tip, nasal septum, and the intermaxillary segment (philtrum, premaxilla, and primary palate).

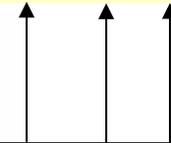


Medial nasal prominences fuse to form the middle part of the nose

Lateral nasal prominence forms the ala of the nose



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

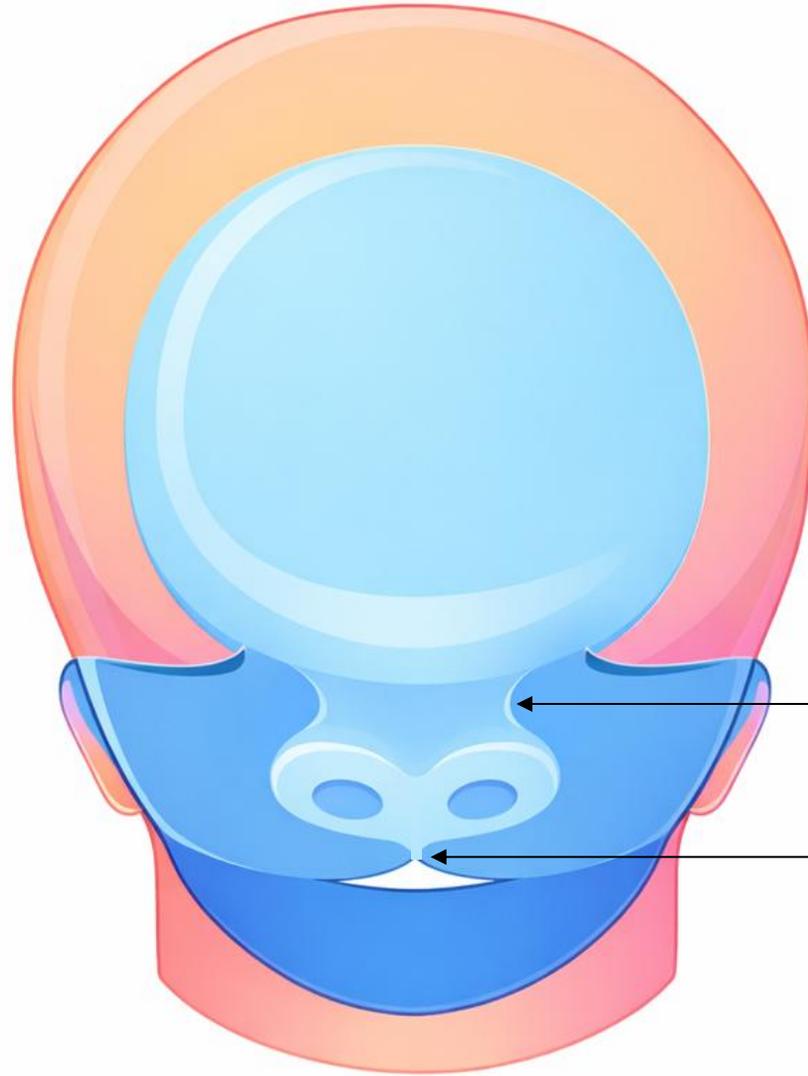
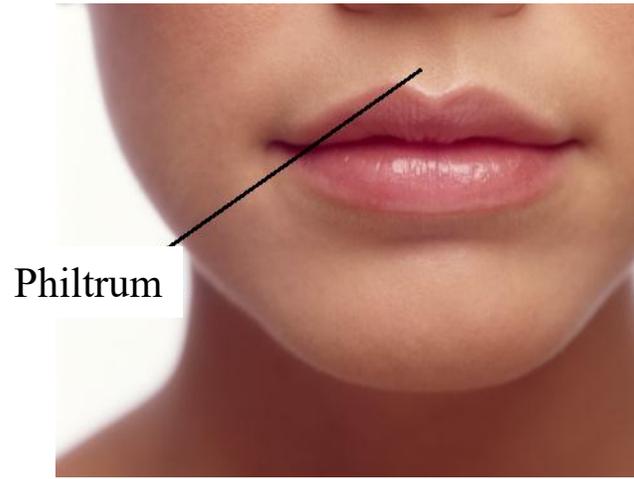


Nasolacrimal groove

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

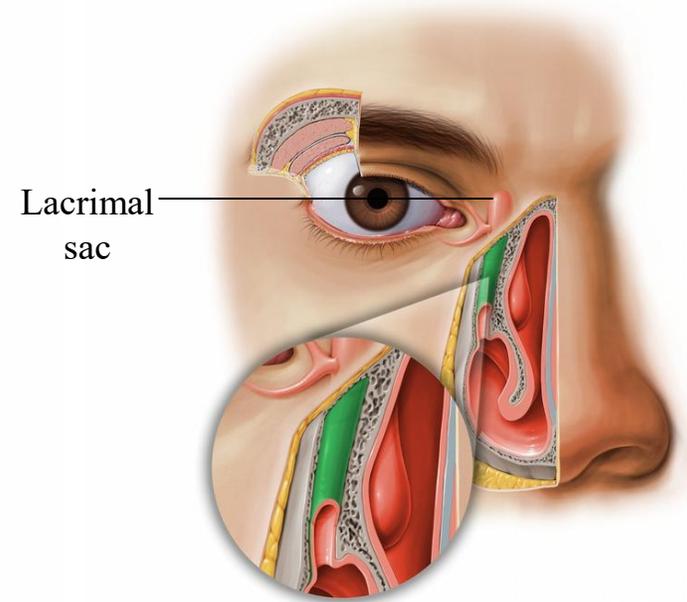
The **medial nasal prominences** → central structures

The **lateral nasal prominences** → alae (sides) of the nose

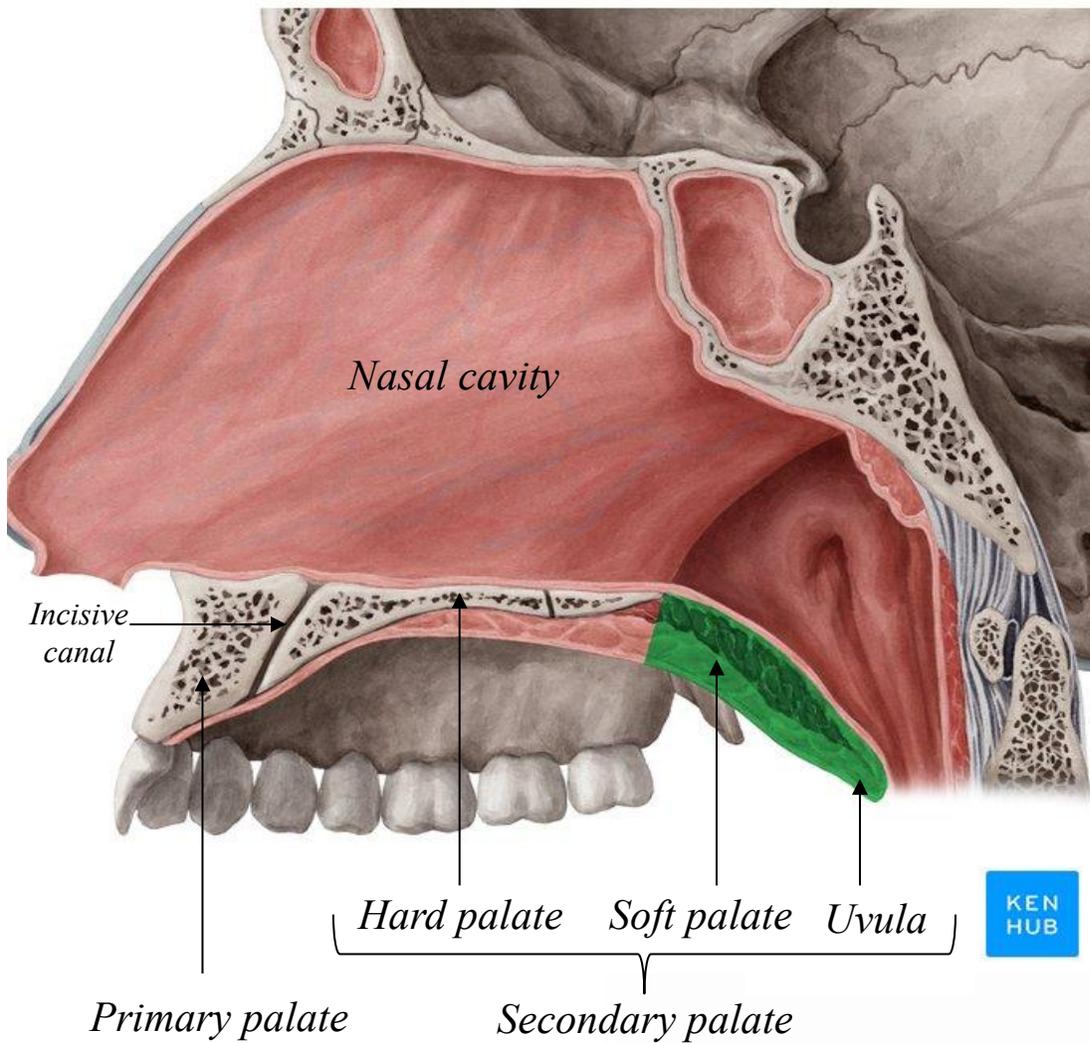


Intermaxillary segment:
from fused medial nasal prominences. It forms philtrum, premaxilla and primary palate.

Nasolacrimal canal



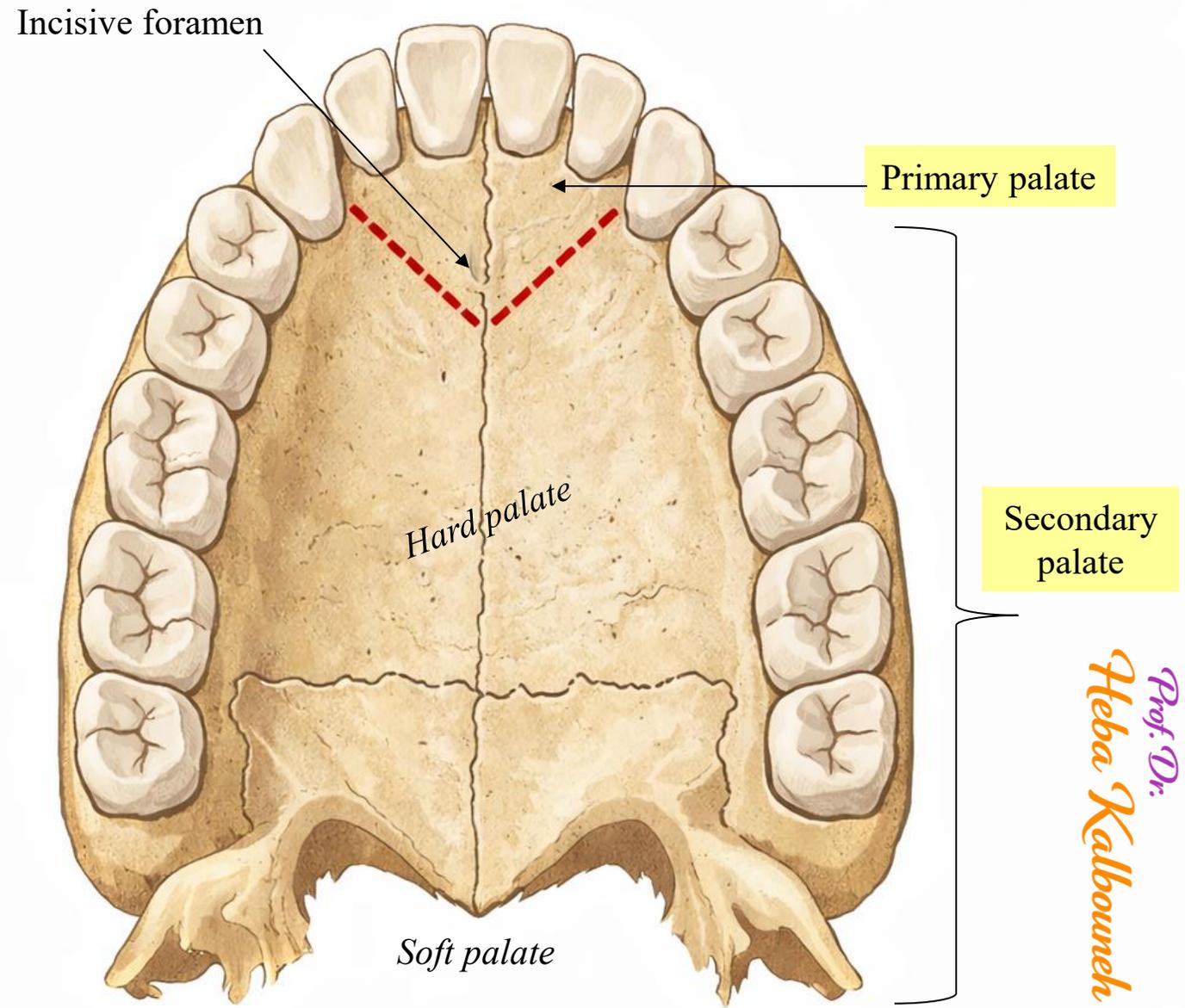
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The premaxilla is the anterior part of the maxilla that carries the upper incisors.

Primary palate is the anterior triangular part of the palate, located anterior to the incisive foramen.

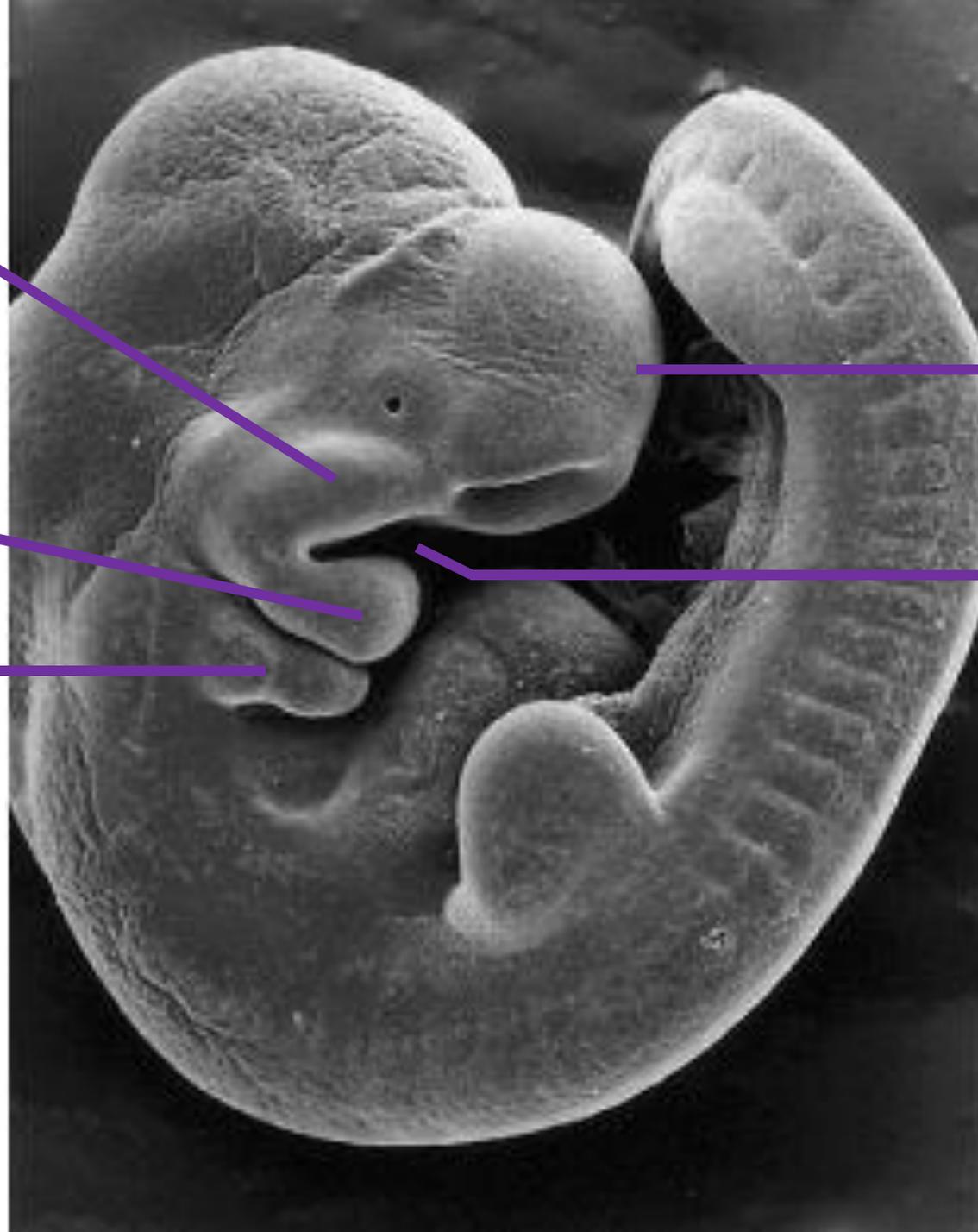
Intermaxillary segment: Primary palate
Palatine shelves of the maxillary processes: Secondary palate



Maxillary process
of first arch

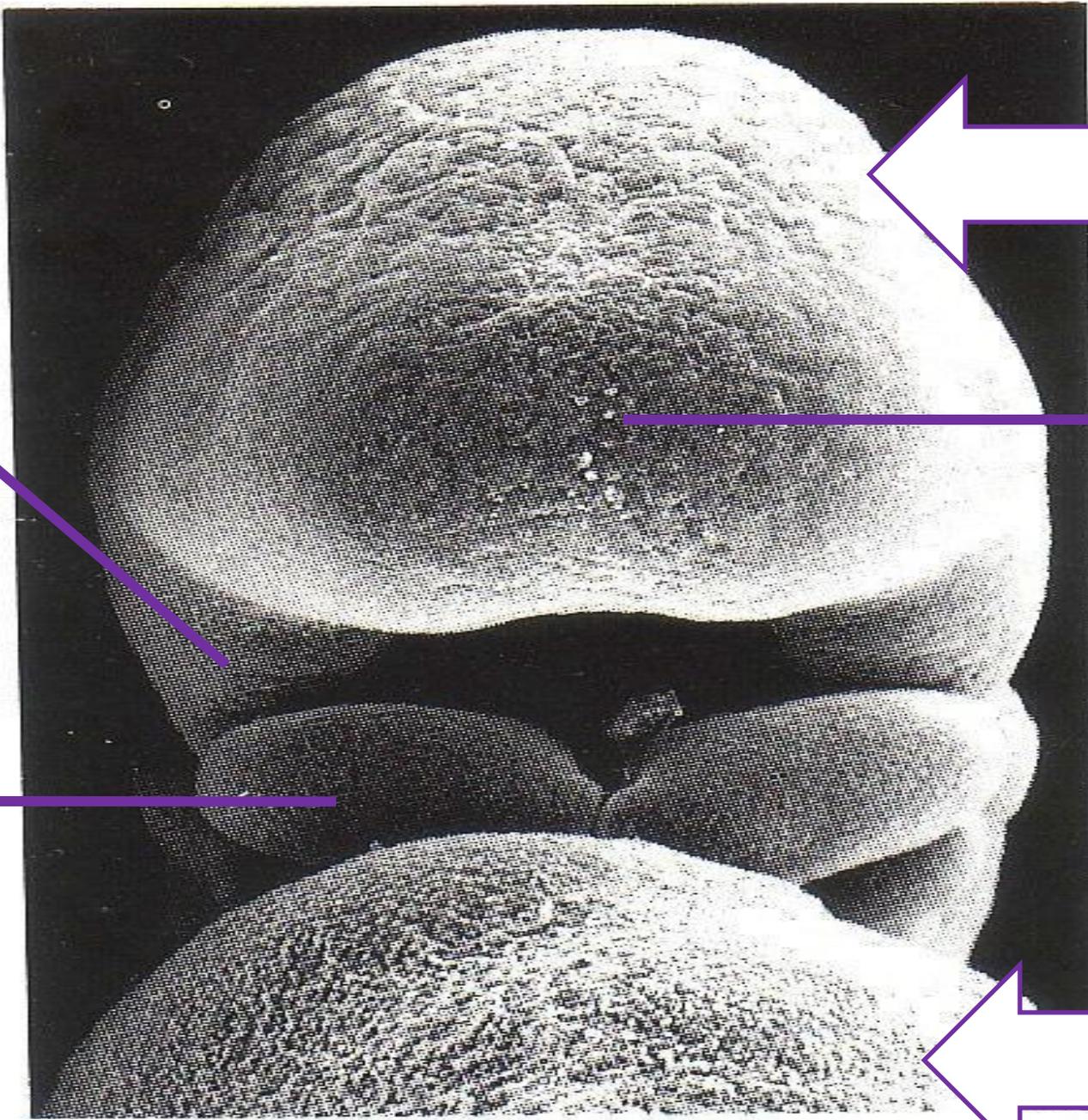
Mandibular process
of first arch

Second arch



Frontonasal process

Stomodeum



Maxillary process
of first arch

Mandibular process
of first arch

Forebrain bulge

Frontonasal process

Pericardial bulge

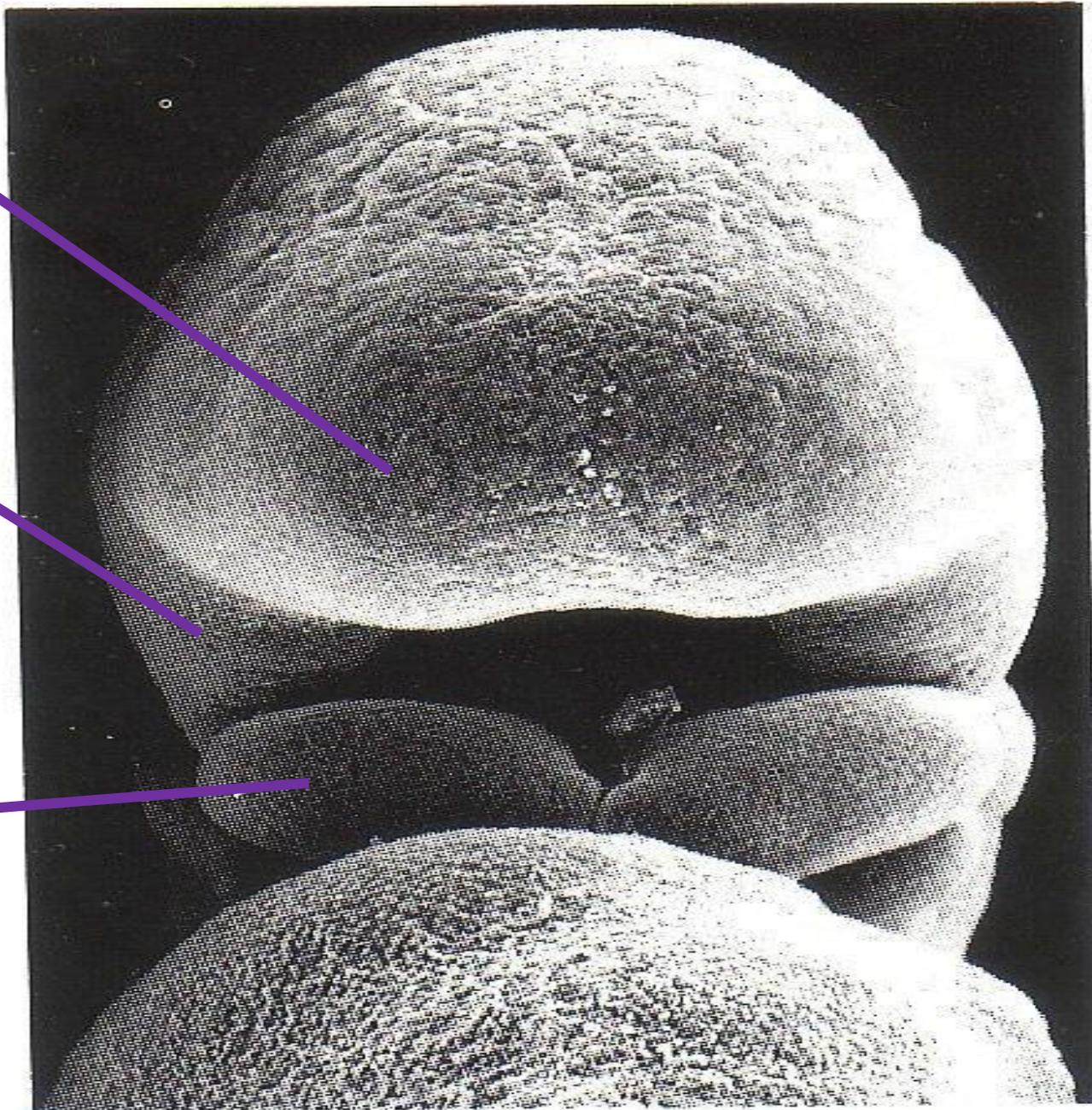
Fourth Week

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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, lower cheek, lower lip and floor of mouth



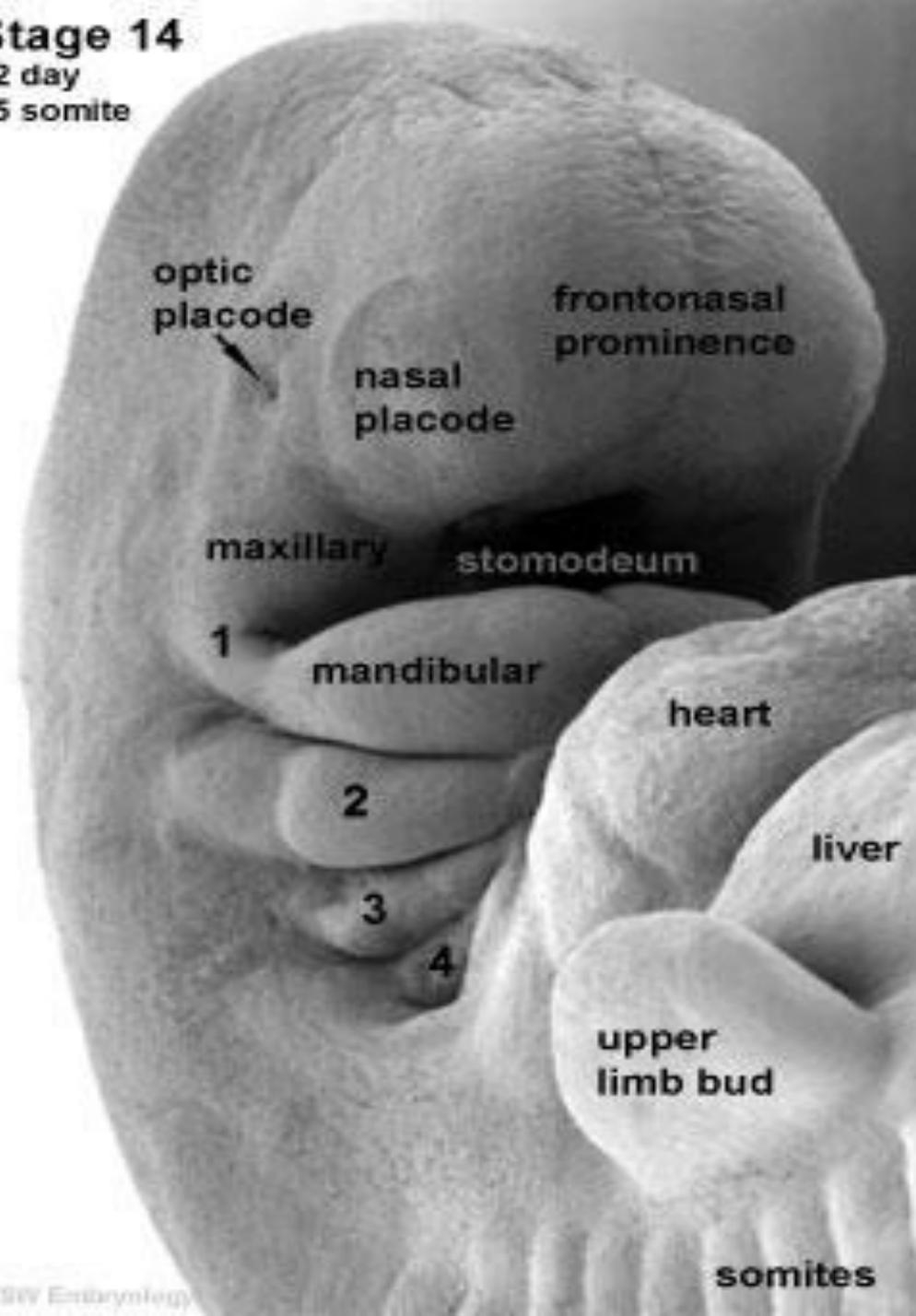
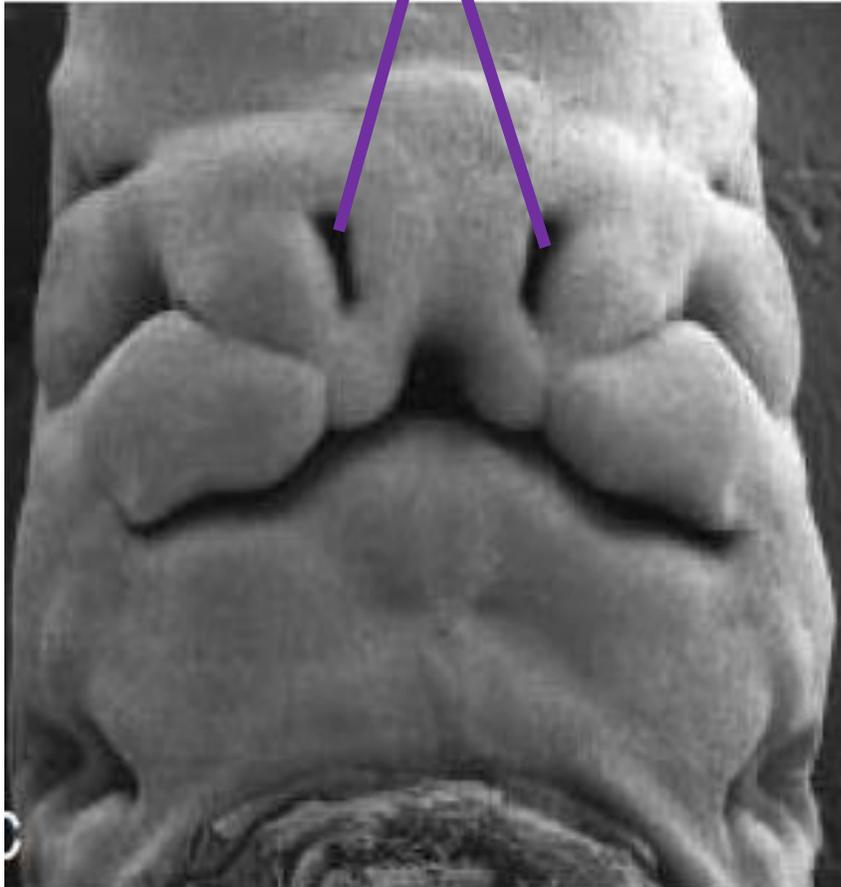
Fourth Week

Stage 14

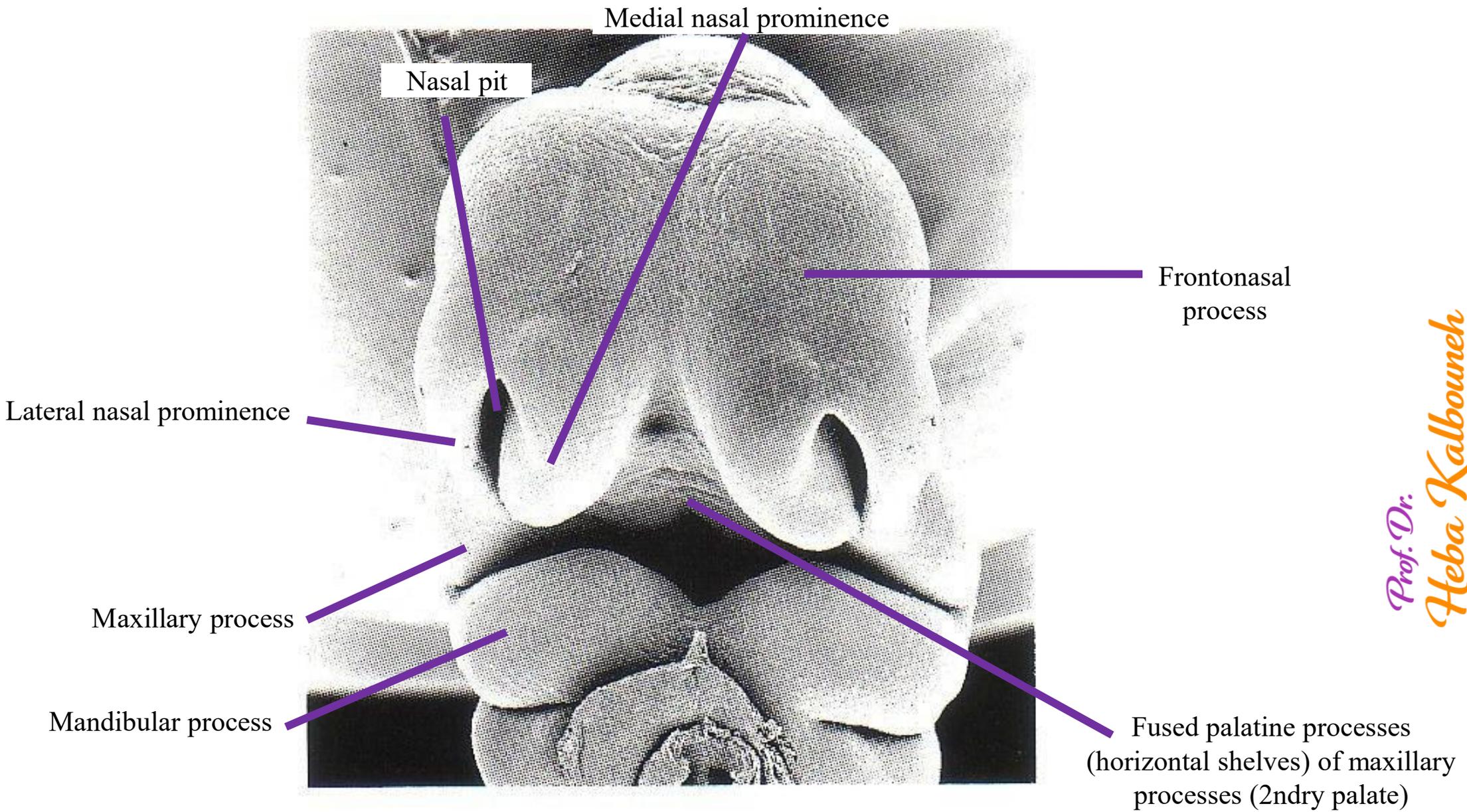
32 day

35 somite

NASAL PITS



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Early 6th week

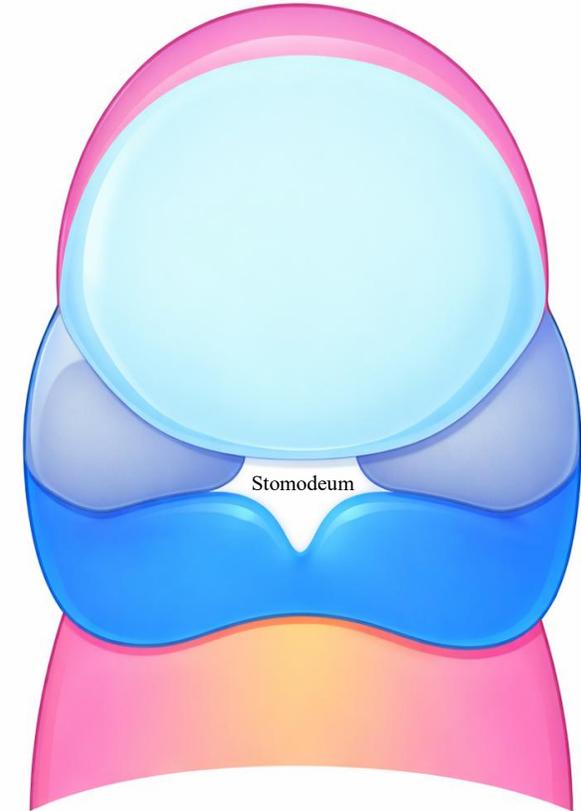
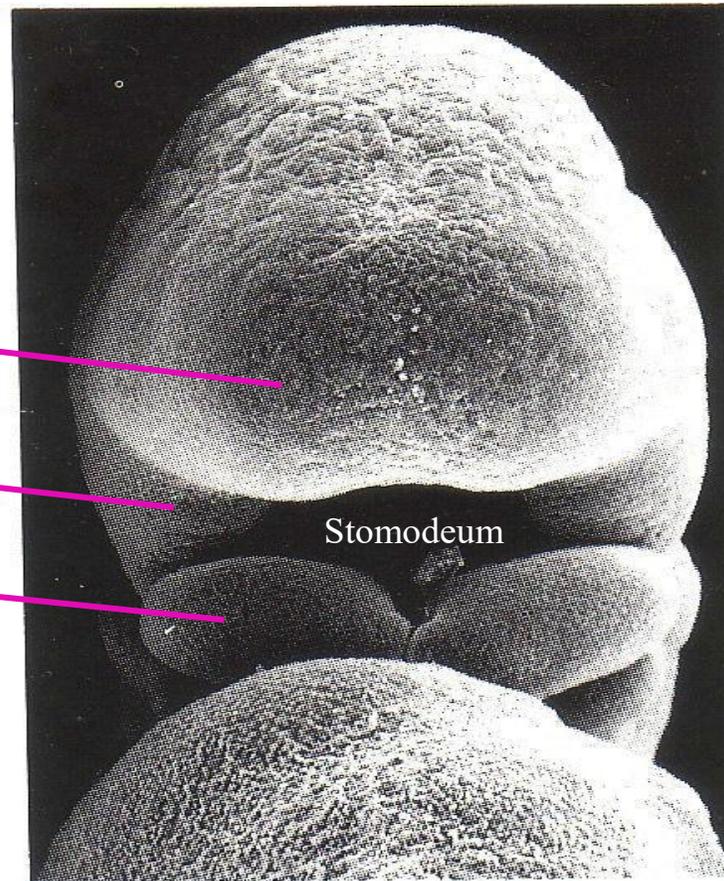
Development of face

Face is developed from 5 processes (prominences):

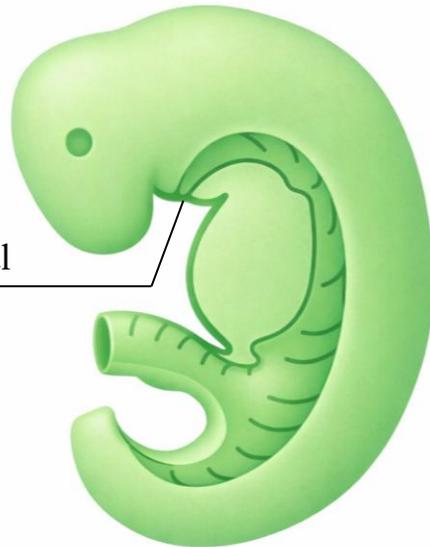
One frontonasal process

Two maxillary processes

Two mandibular processes

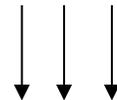


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Maxillary process is a forward growth of **dorsal end of 1st pharyngeal arch**.

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.

Frontonasal process

Nasal placodes:

Rounded ectodermal thickenings appearing on the inferolateral parts of the frontonasal process.

Nasal pits & prominences:

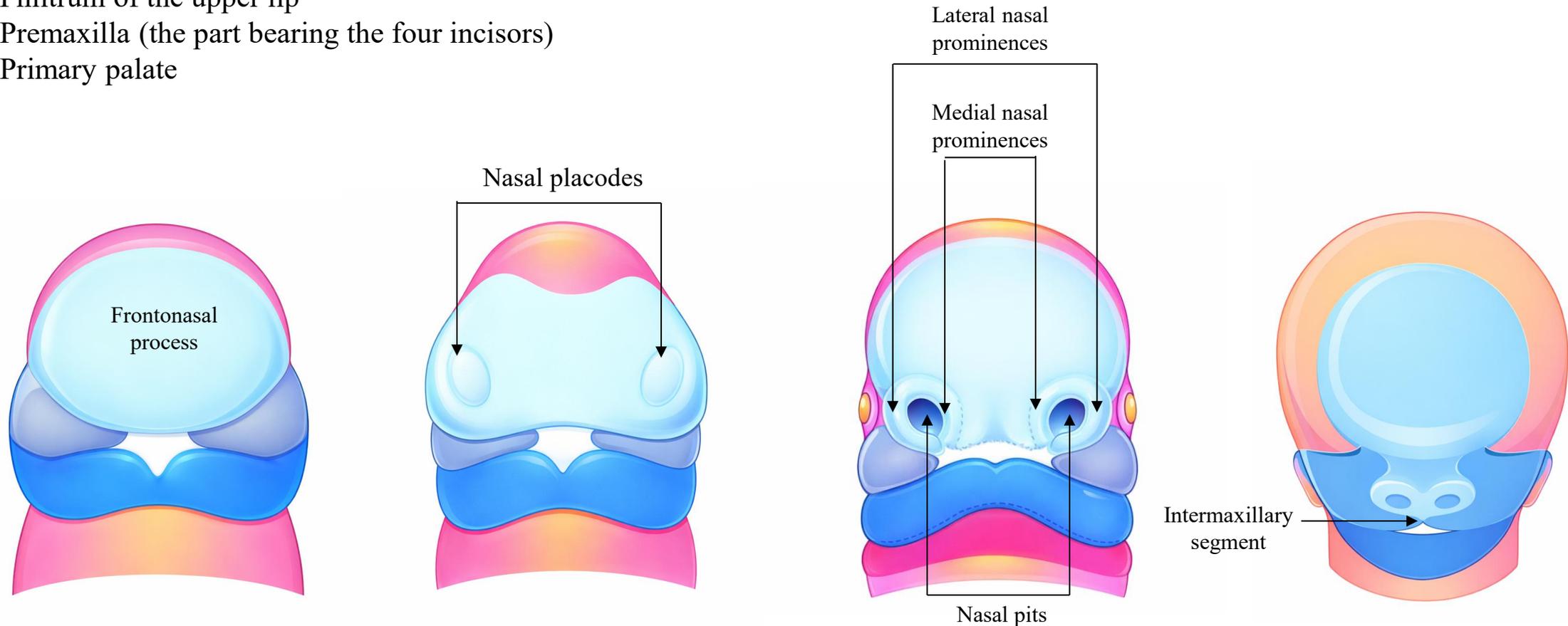
Invagination of the placodes forms nasal pits, which are surrounded by the medial and lateral nasal prominences.

Intermaxillary segment:

Formed by fusion of the two medial nasal prominences.

It forms:

1. Philtrum of the upper lip
2. Premaxilla (the part bearing the four incisors)
3. Primary palate



Maxillary process of 1st pharyngeal arch

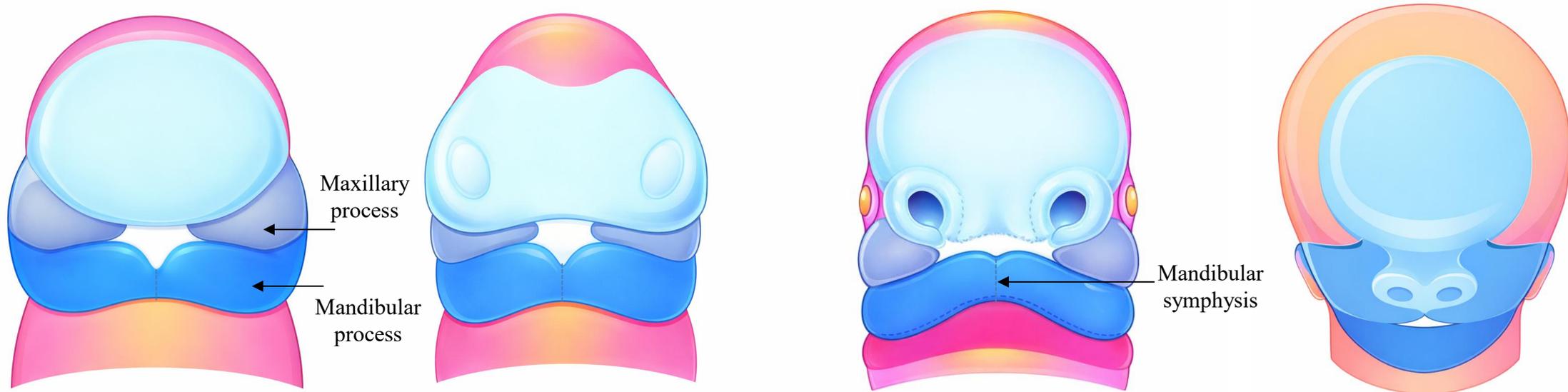
- Located lateral to the stomodeum.
- Grows medially toward the midline.
- It contributes to the cheek and fuses with the mandibular process at the angle of the mouth.
- The palatine processes (horizontal shelves) arise from the maxillary processes and form the secondary palate, separating the nasal and oral cavities.

The maxillary processes form the lower eyelid, upper cheek, upper lip (excluding philtrum), maxilla (except premaxilla), most of the hard palate and soft palate.

Mandibular process of 1st pharyngeal arch

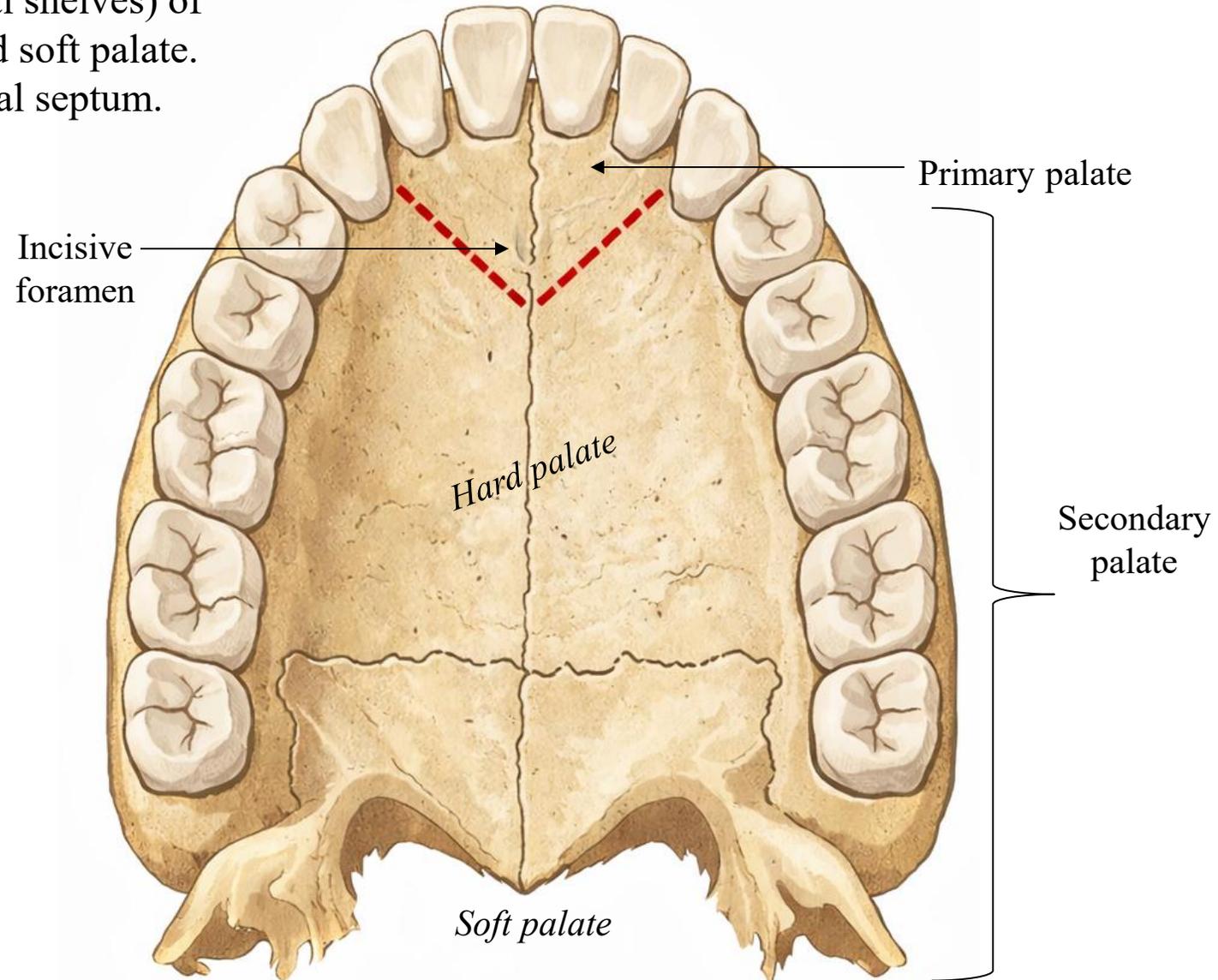
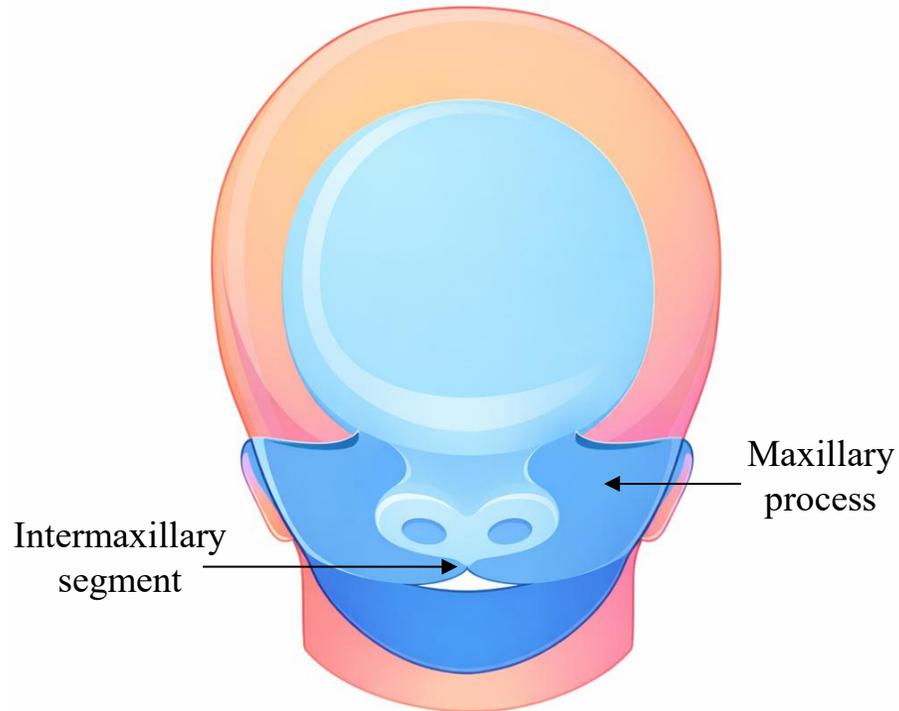
- ✓ The right and left mandibular processes grow toward each other.
- ✓ They fuse in the midline, forming the mandibular symphysis.

The mandibular processes form the lower cheek, whole lower lip and lower jaw and floor of mouth.

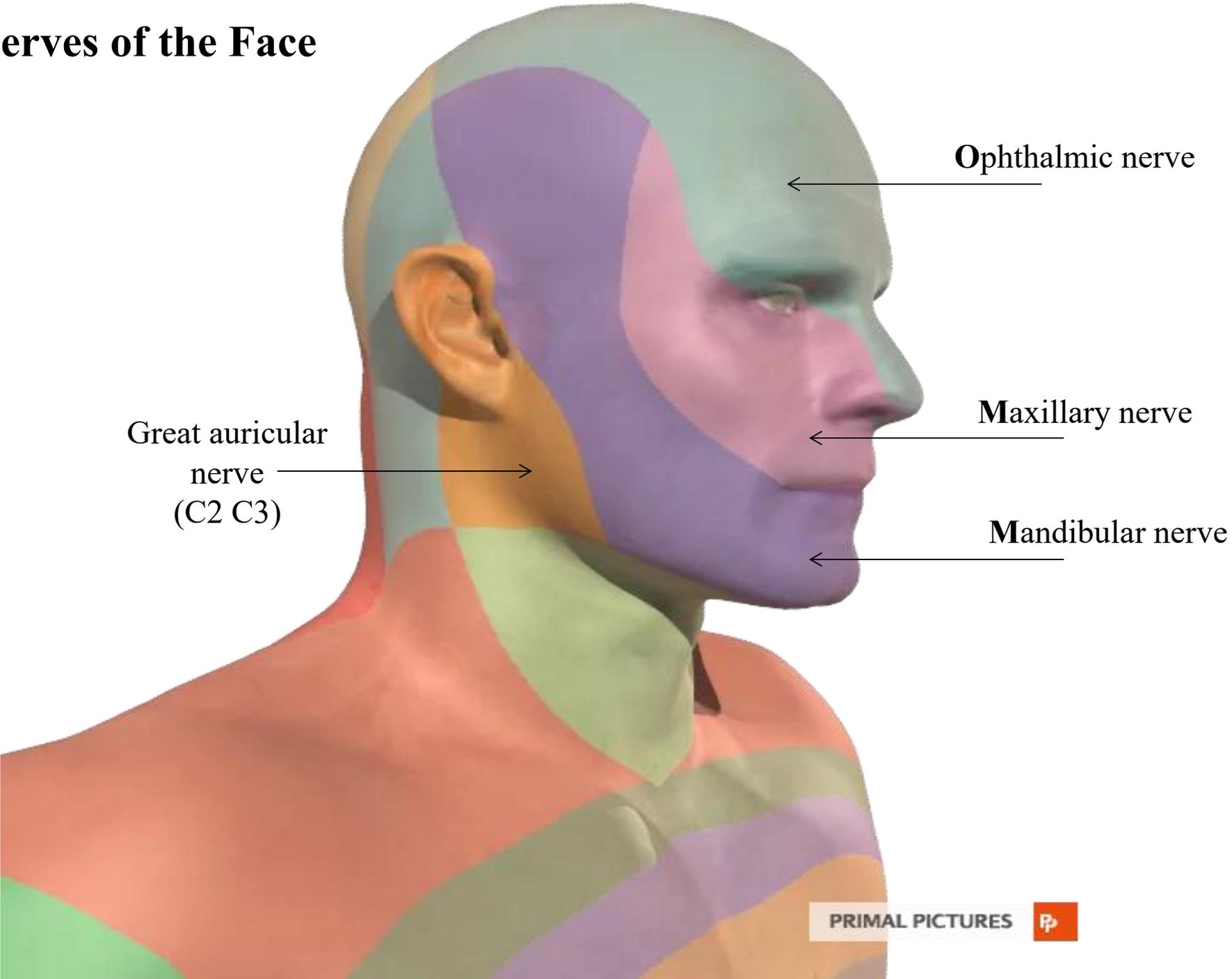


Development of palate:

- 1- **Primary palate:** from intermaxillary segment of frontonasal process.
- 2- **Secondary palate:** from palatine processes (horizontal shelves) of maxillary processes that form most of hard palate and soft palate.
→ Hard palate receives downward growth of nasal septum.



Sensory Nerves of the Face



Ophthalmic nerve

Maxillary nerve

Mandibular nerve

Great auricular
nerve (C2 C3)

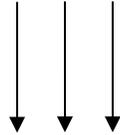
Congenital anomalies

A **dermoid cyst** is a developmental cyst lined by epidermis-like epithelium and containing skin appendages such as hair follicles, sebaceous glands, and sweat glands.

Remember

During facial development, multiple facial processes fuse.

If ectodermal cells become trapped between these fusing processes, they may later proliferate and form a dermoid cyst.

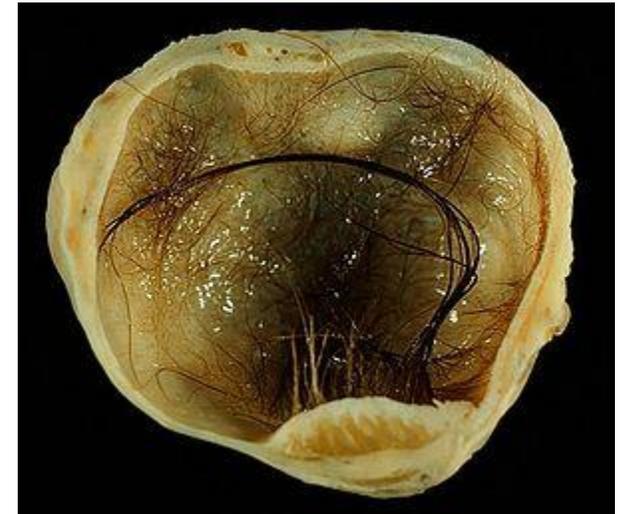
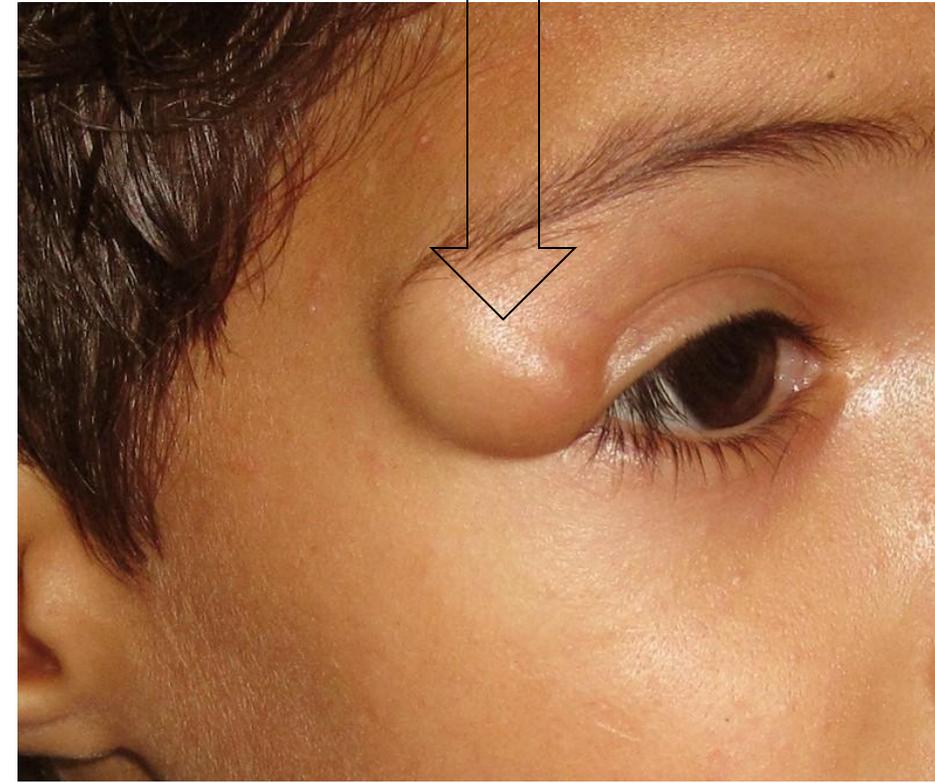


Dermoid cysts typically occur along embryonic fusion lines, especially lateral eyebrow (most common facial site)

The cyst may contain:

- Keratin
- Sebum
- Hair
- Desquamated epithelial debris

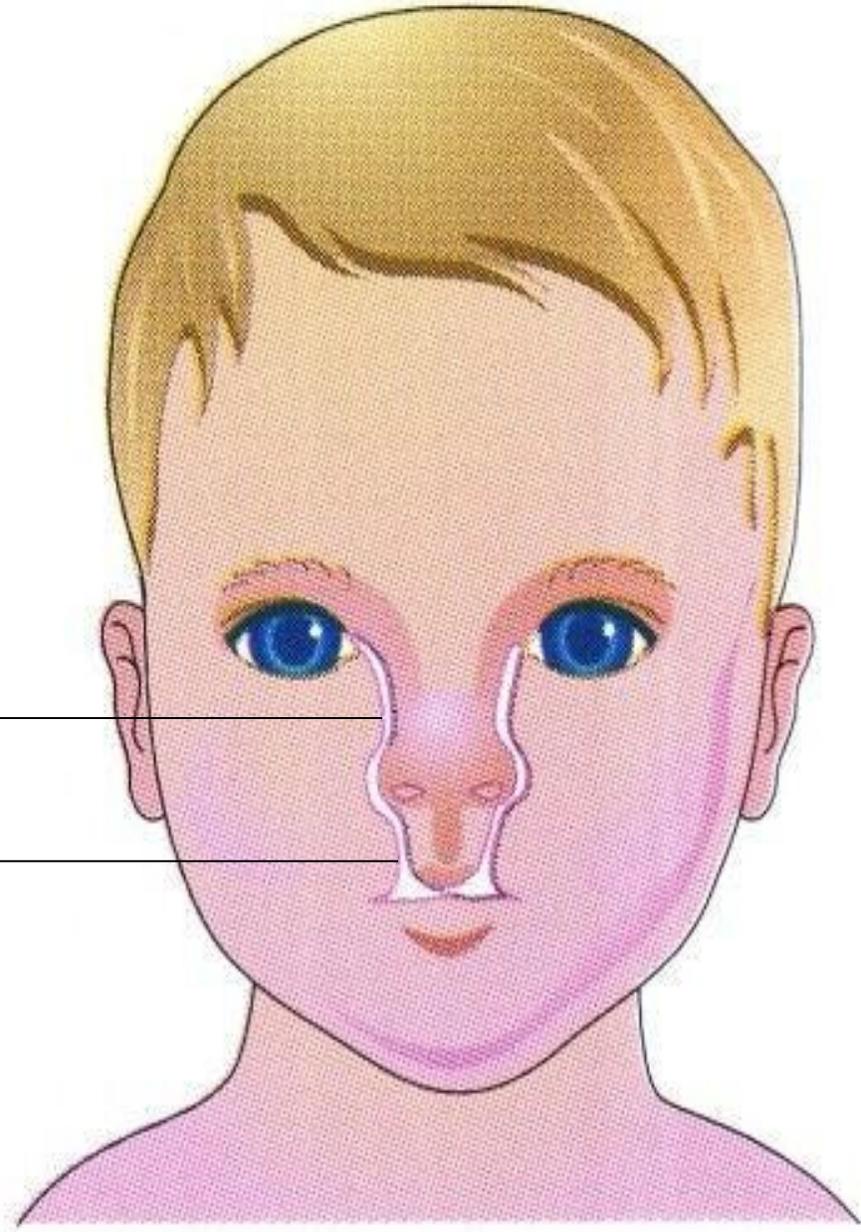
Dermoid cyst



Oblique facial cleft: failure of fusion between maxillary and frontonasal processes.

Oblique facial cleft

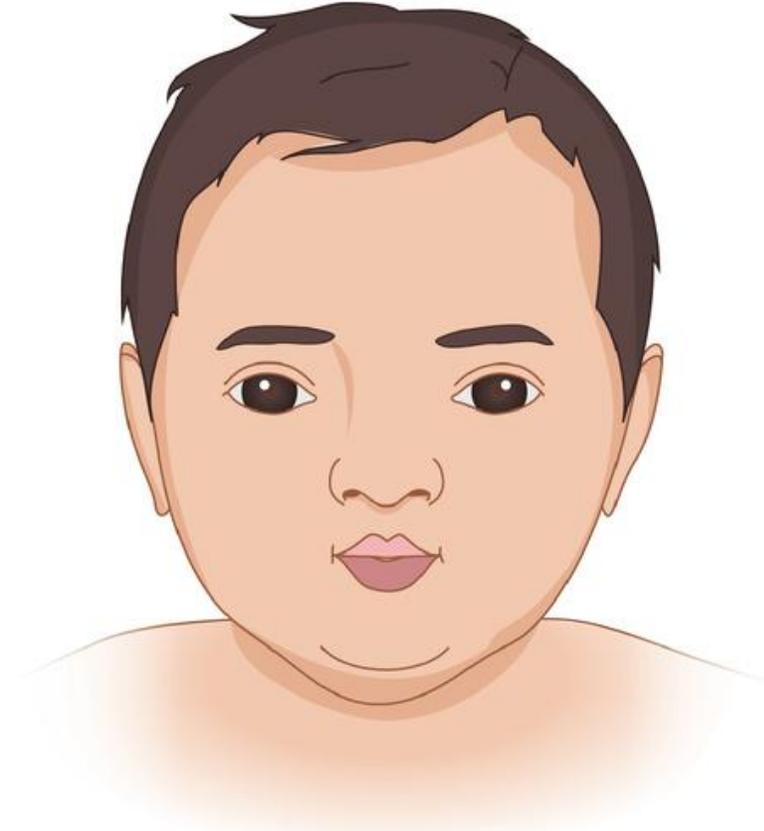
Cleft lip



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



Macrostomia

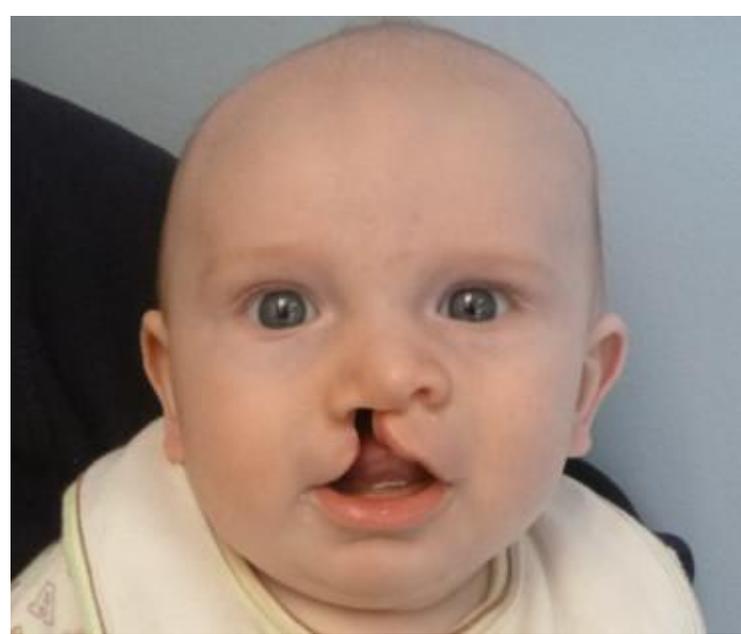


Microstomia



Bilateral Cleft Lip

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



Unilateral Cleft Lip



Cleft Lower Lip

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



Median Cleft Lip

Results from malfusion of the medial nasal prominences

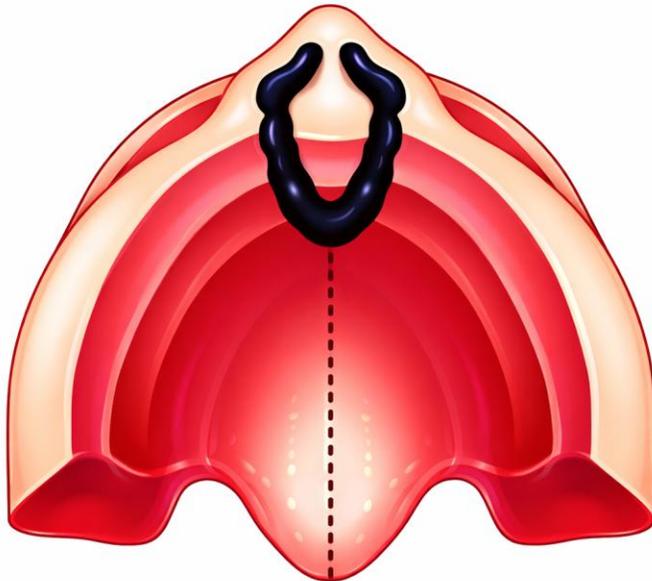
Cleft palate: failure of fusion between different parts that form the palate

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

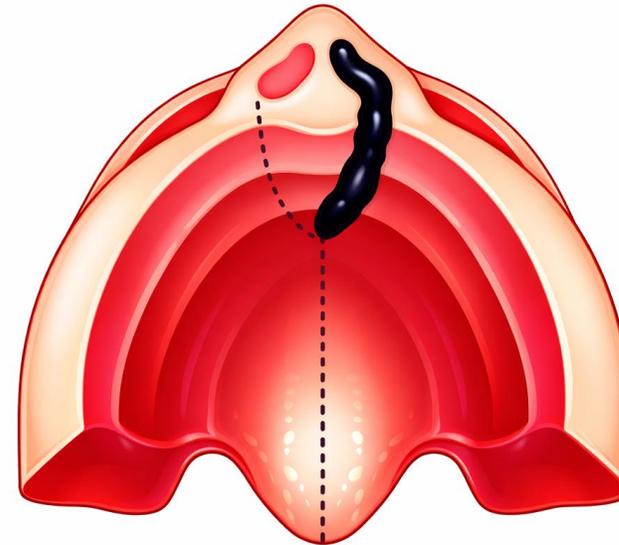
Cleft of the primary palate

- ✓ 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)



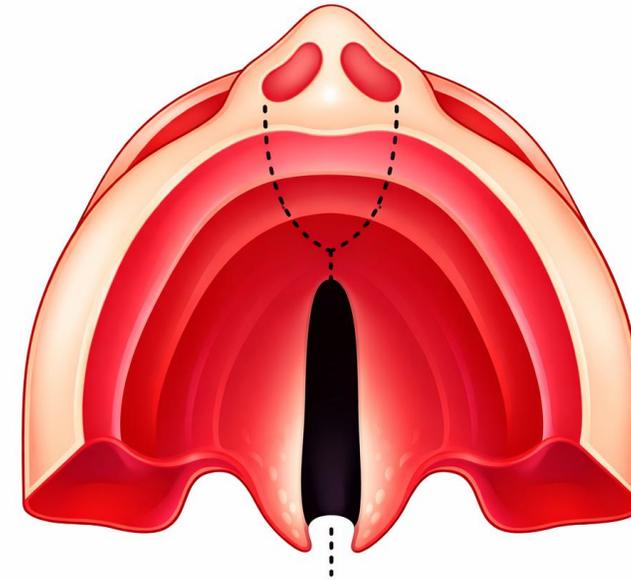
Primary Unilateral Cleft Palate
(combined with unilateral cleft lip)



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**

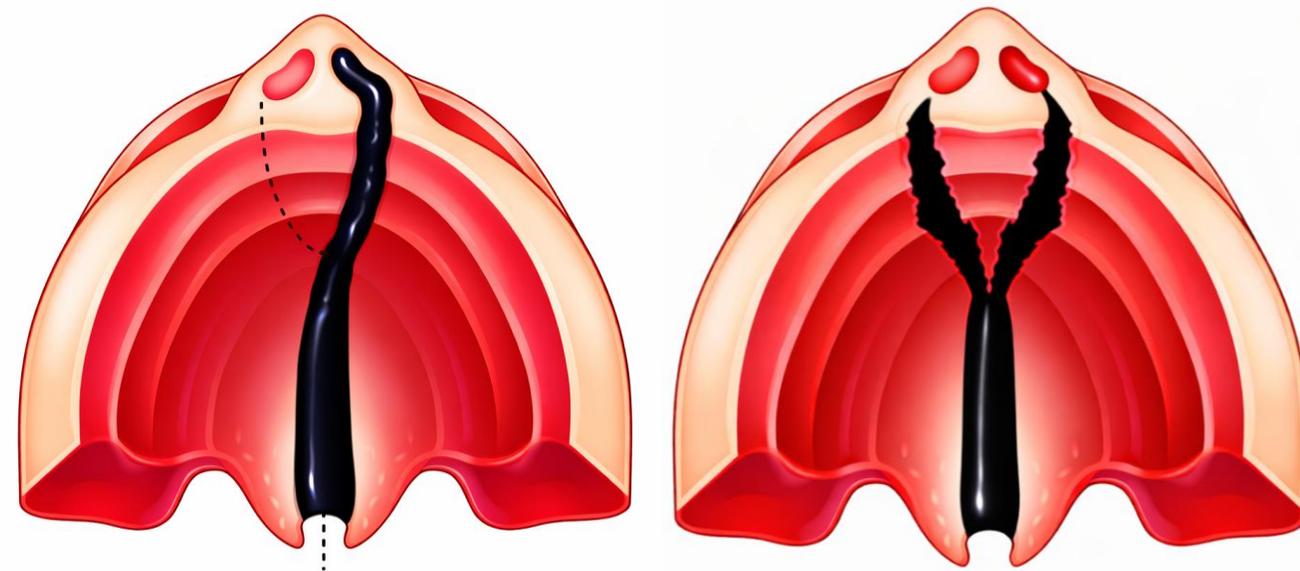
Secondary cleft palate



Cleft of the primary and secondary palate

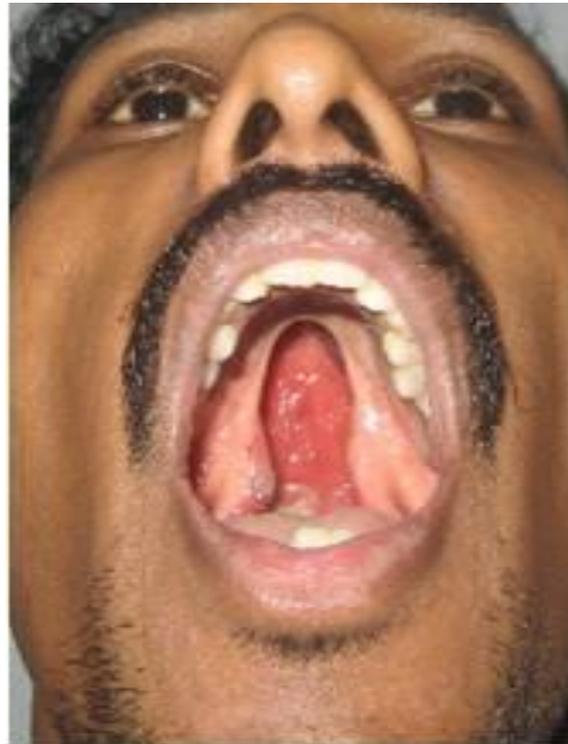
- ✓ Results from failure of the maxillary processes to fuse with each other and with the intermaxillary segment
- ✓ Takes place **anterior and posterior to the incisive foramen**, therefore this type is mixed **anterior and posterior cleft palates**
- ✓ Can be unilateral and bilateral

Primary and secondary cleft palates
(combined with unilateral/bilateral cleft lip)

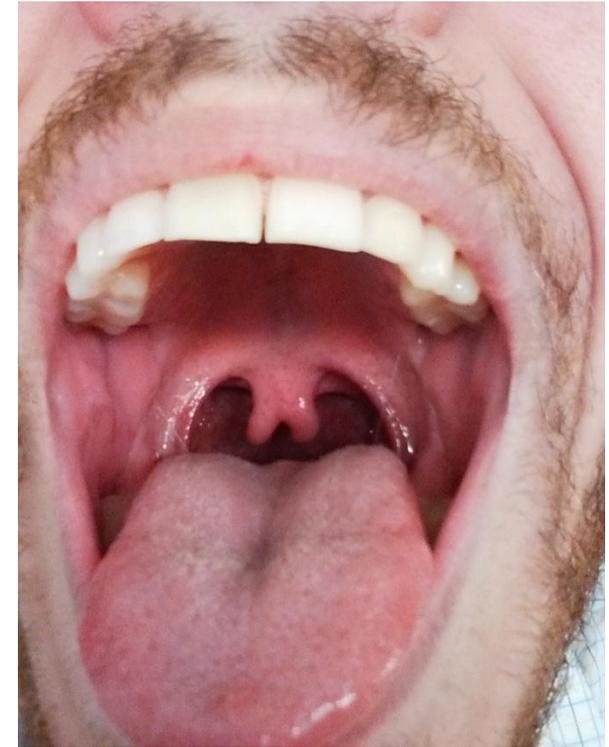




**Primary and secondary Cleft palates
(combined with unilateral cleft lip)**



Secondary cleft palate



Cleft uvula

Try to figure out the embryonic rationale behind the following orofacial anomalies



A



B



C



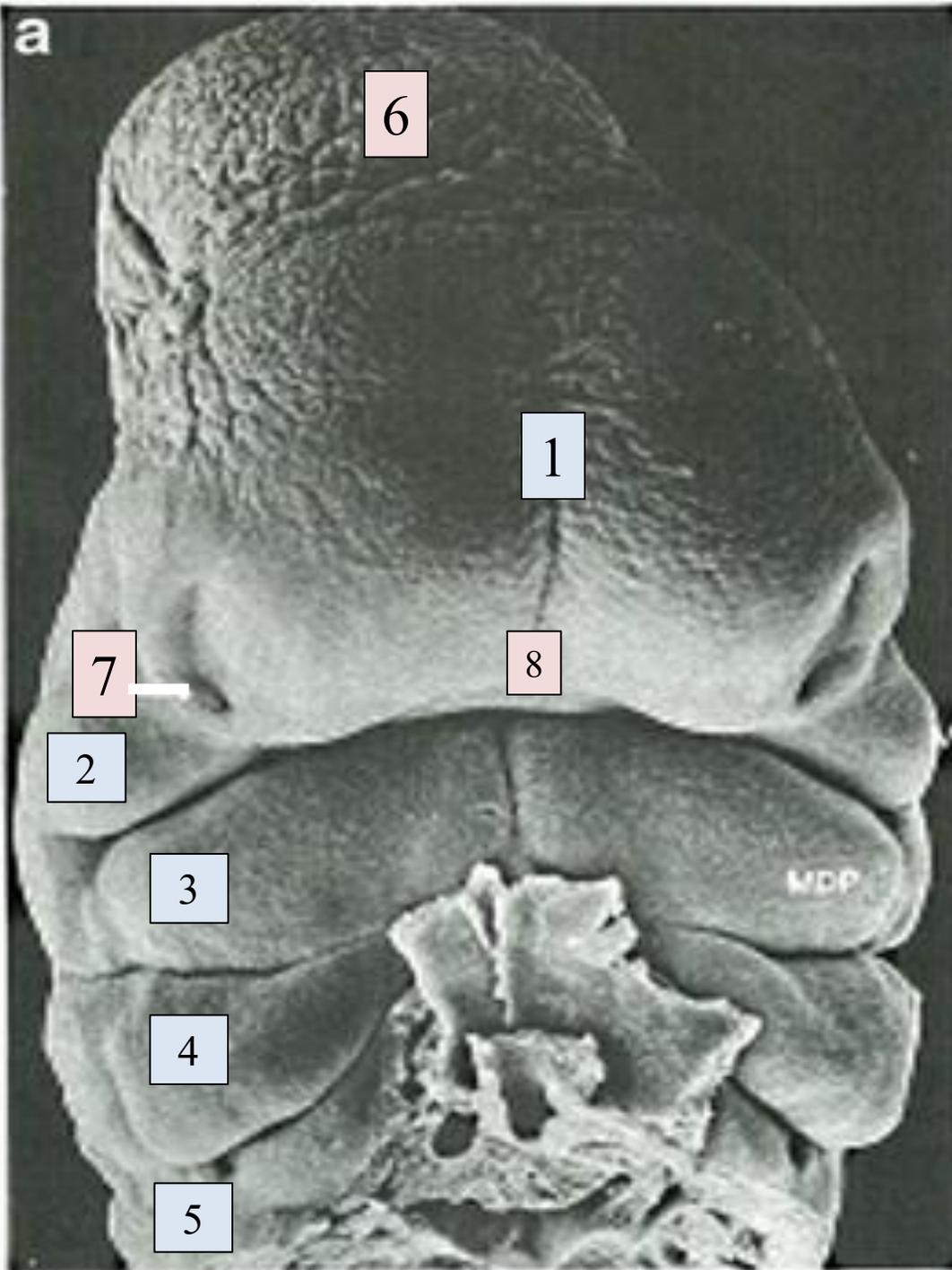
D



E

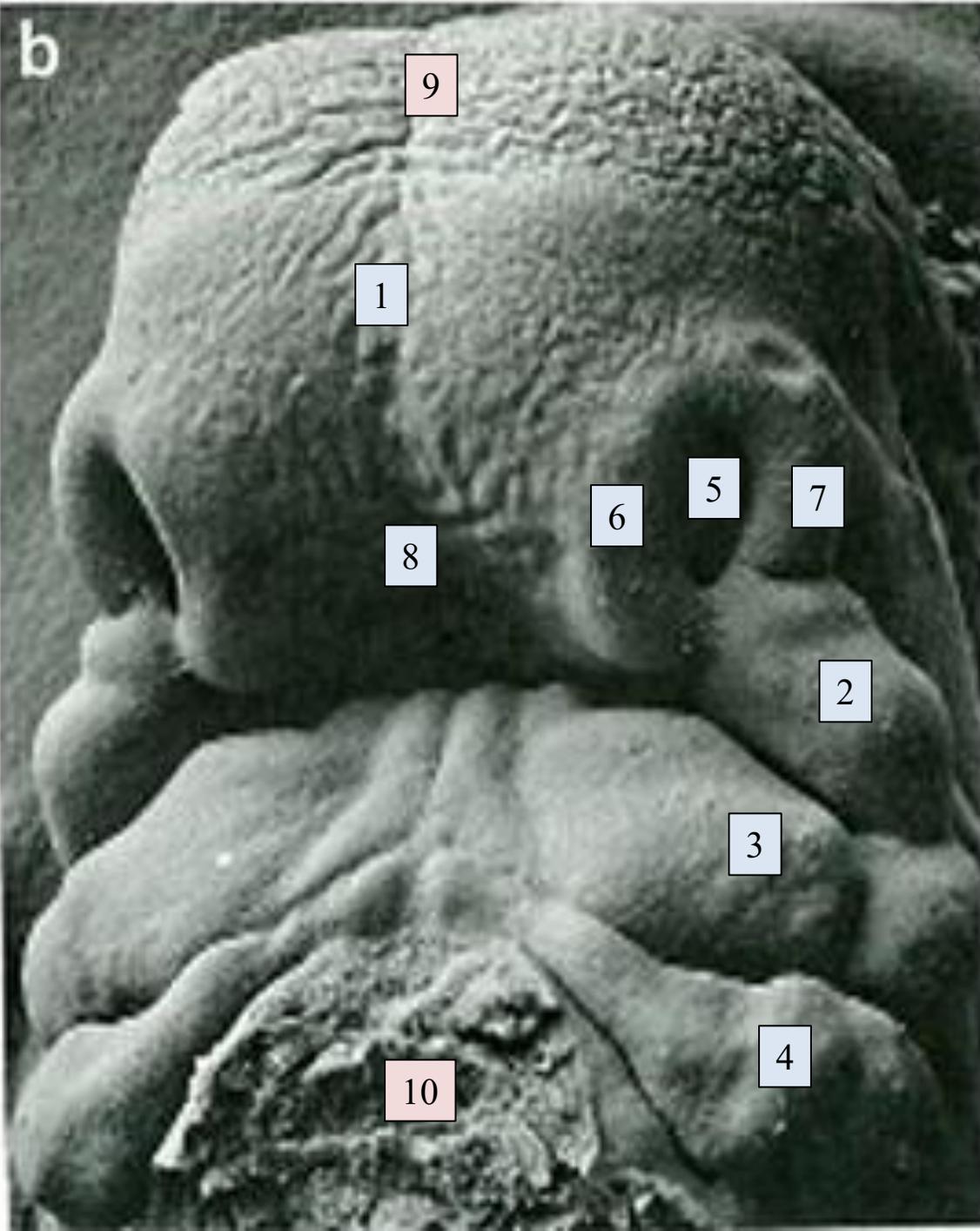


F



- 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

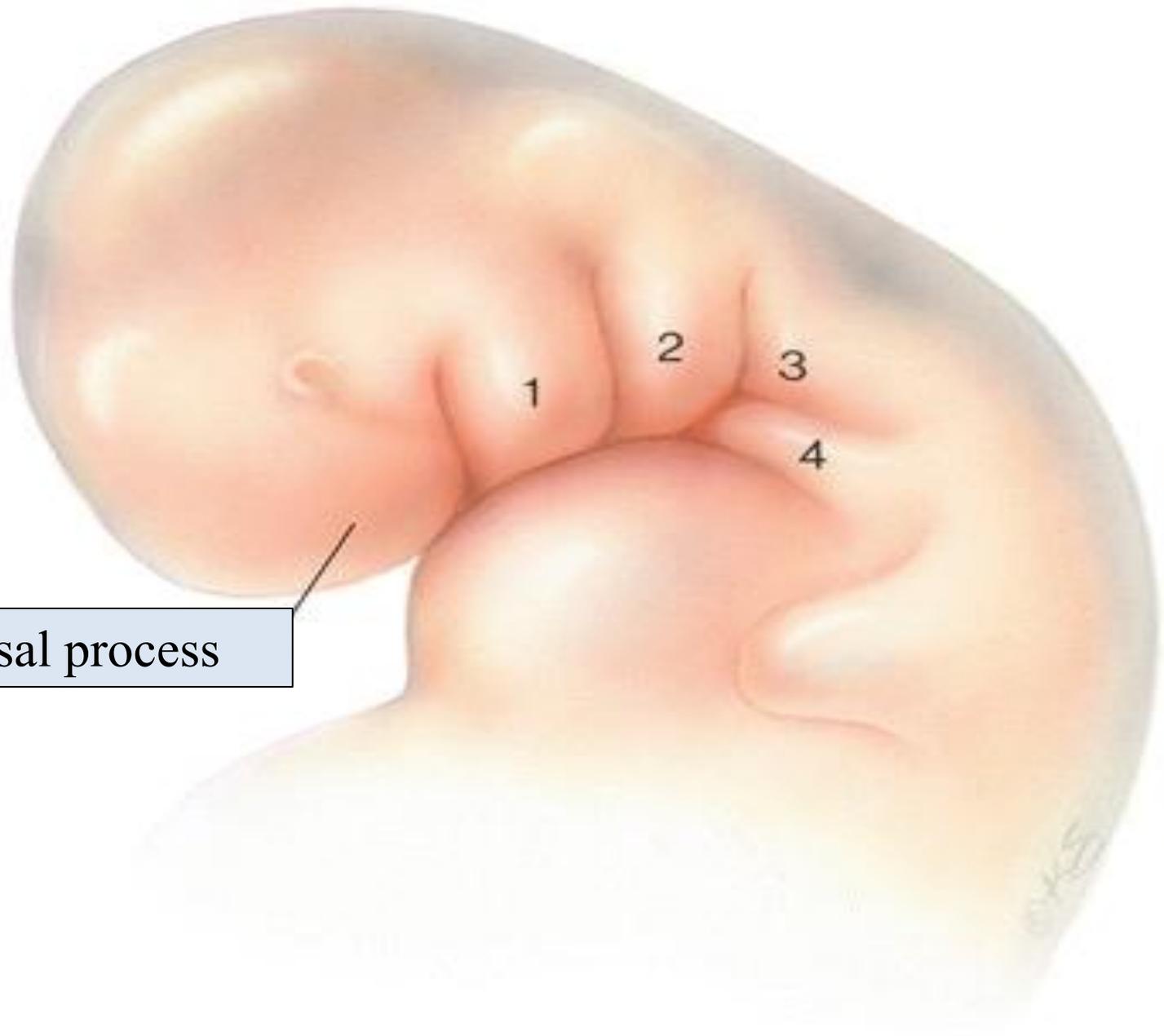
7: Lateral nasal prominence

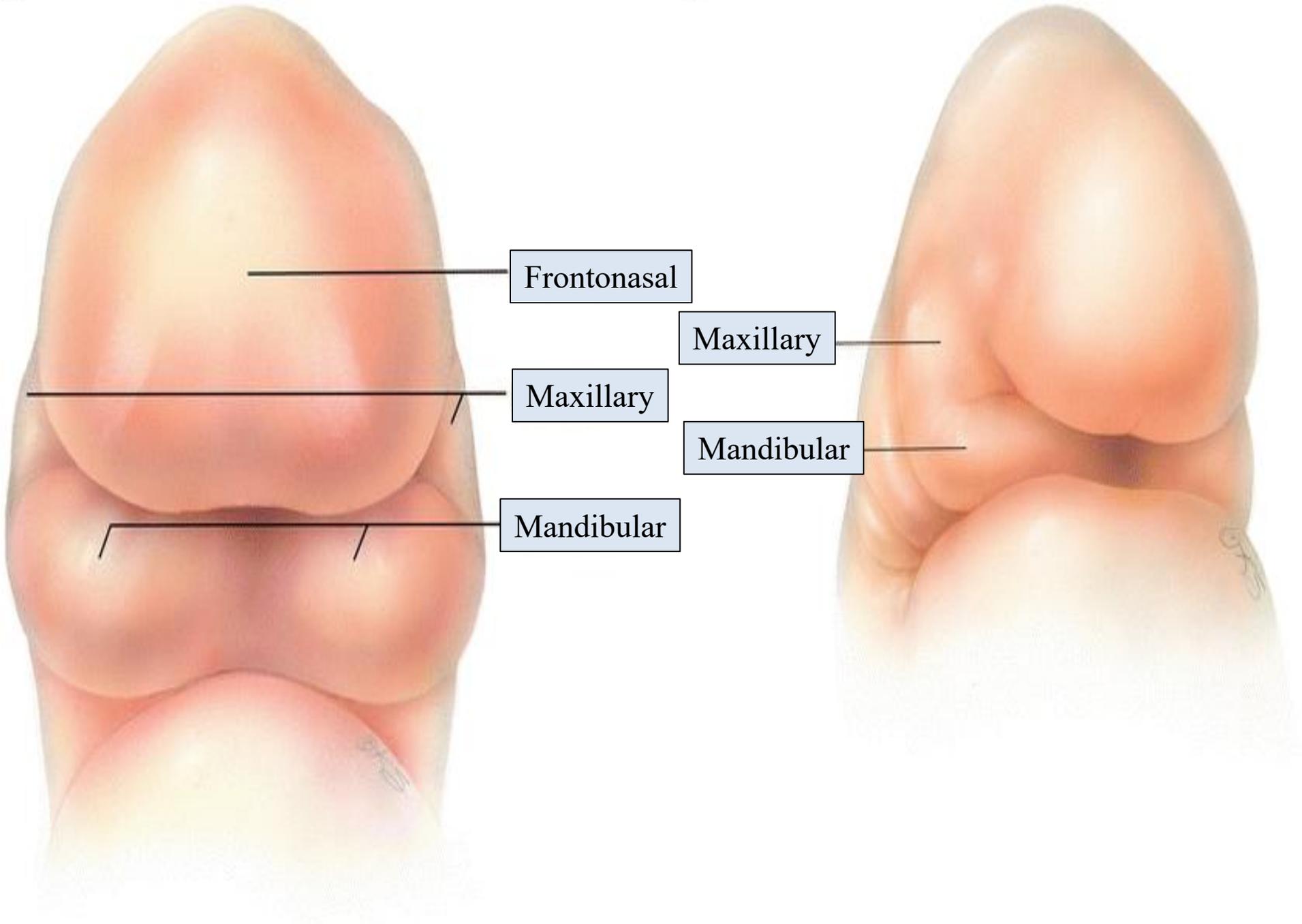
8: Nasal cleft

9: Forebrain bulge

10: Pericardial bulge

Frontonasal process





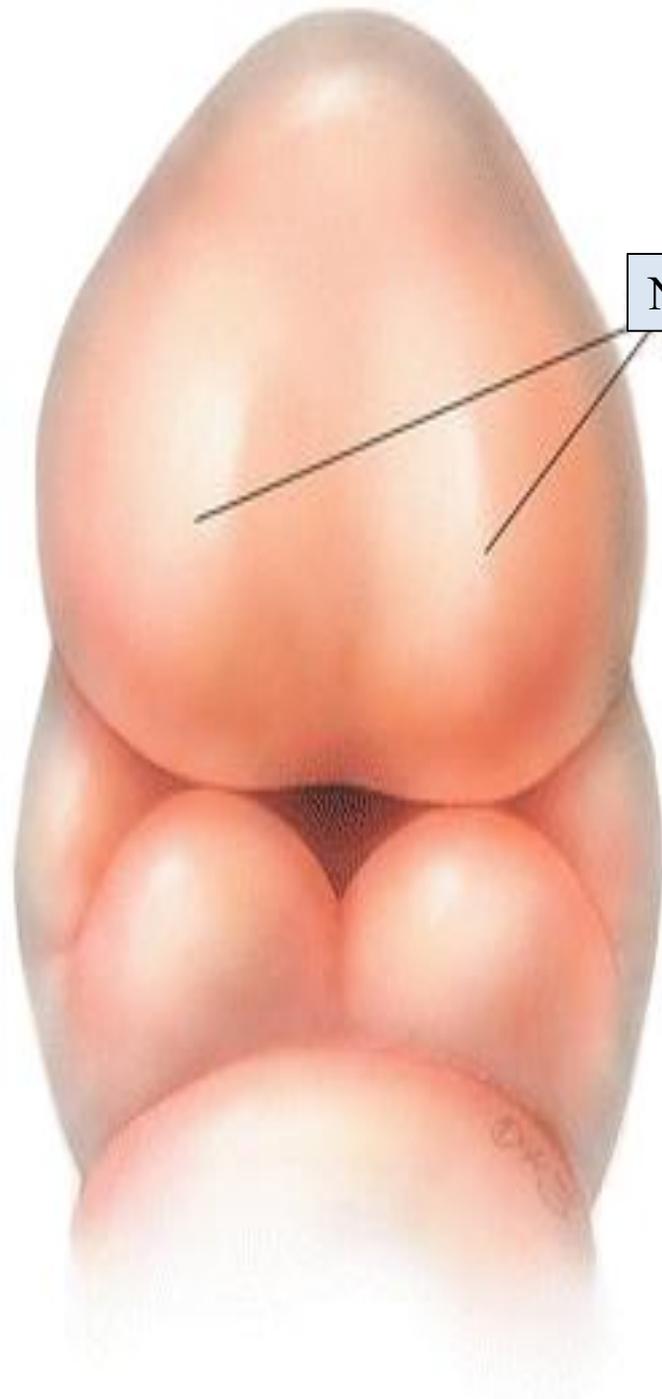
Frontonasal

Maxillary

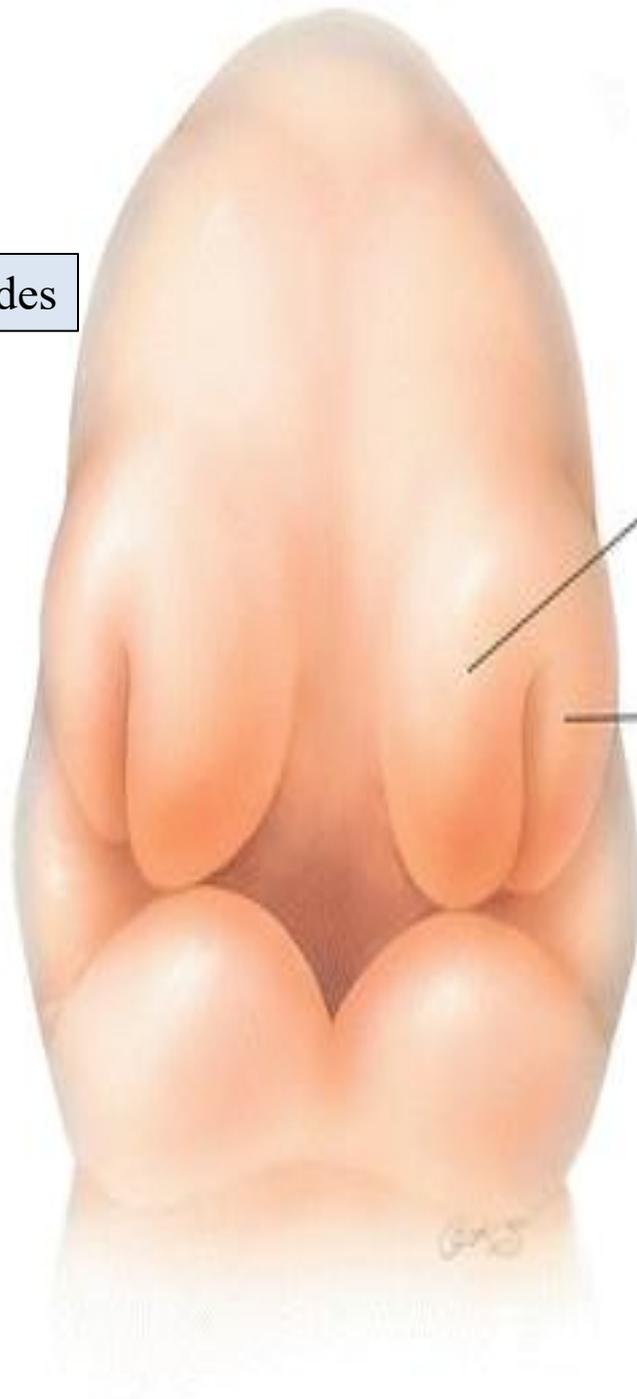
Maxillary

Mandibular

Mandibular



Nasal placodes



Medial nasal prominence

Lateral nasal prominence

