DEVELOPMENT OF FACE & ORAL CAVITY

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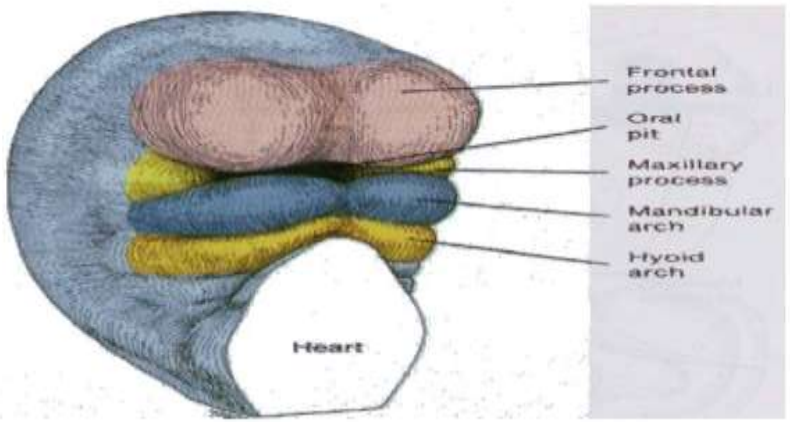
Lec 4

DEVELOPMENT OF FACE

Face with the structures of the oral cavity begin development early in embryonic period.

ALL three embryonic layers are involved in facial development (layers are discussed earlier).

During the **fourth week** there are **five facial processes (prominences)** that form and surround **stomodeum** (primitive mouth).

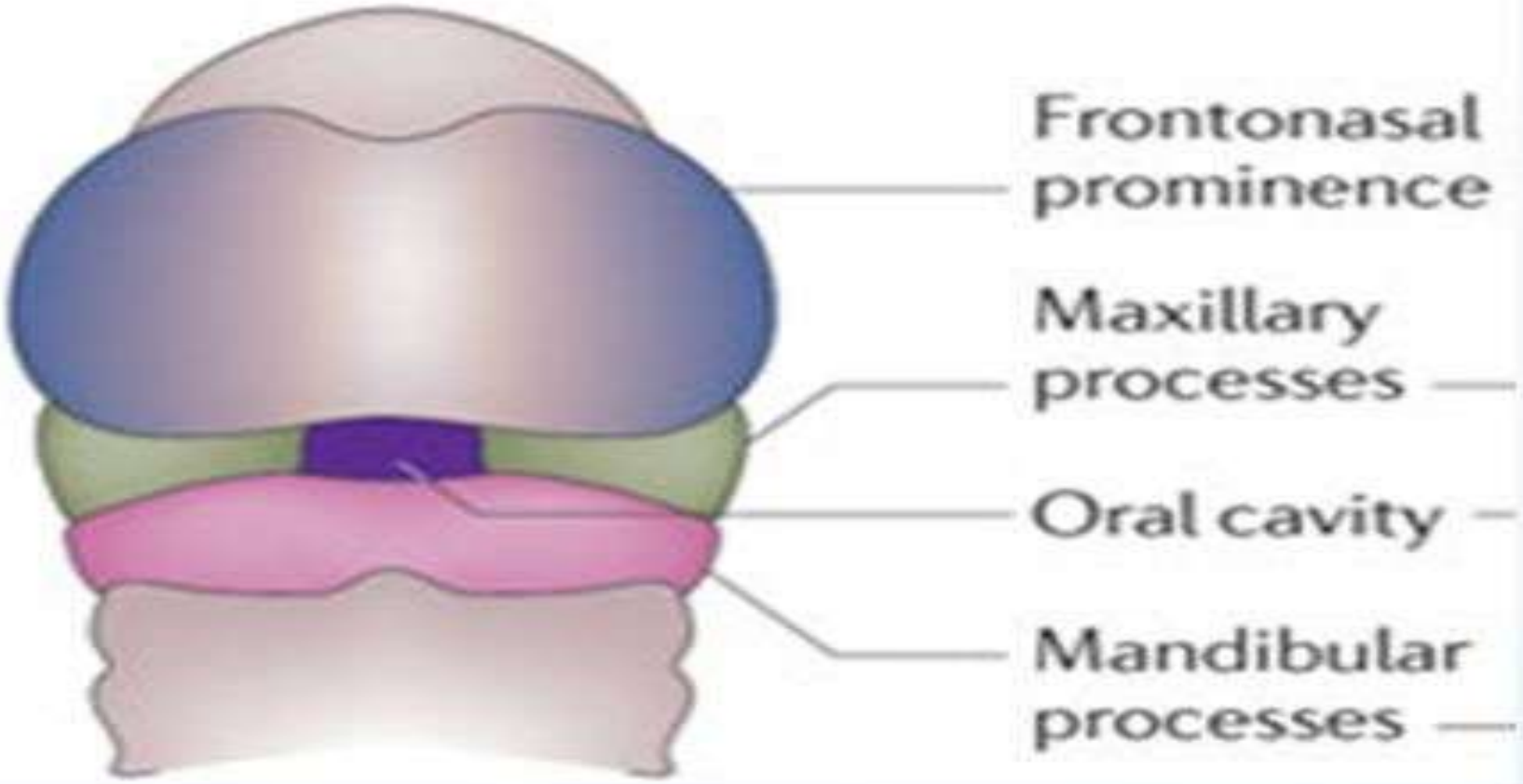


Five facial prominence development of the face :

(1) single frontonasal process.

(2) paired maxillary processes.

(2) paired mandibular processes .


Frontonasal prominence
Maxillary processes
Oral cavity
Mandibular processes

Facial processes are centers of growth for the face, In an **adult's face** is divided into **three** these portions roughly correspond to centers of facial growth:

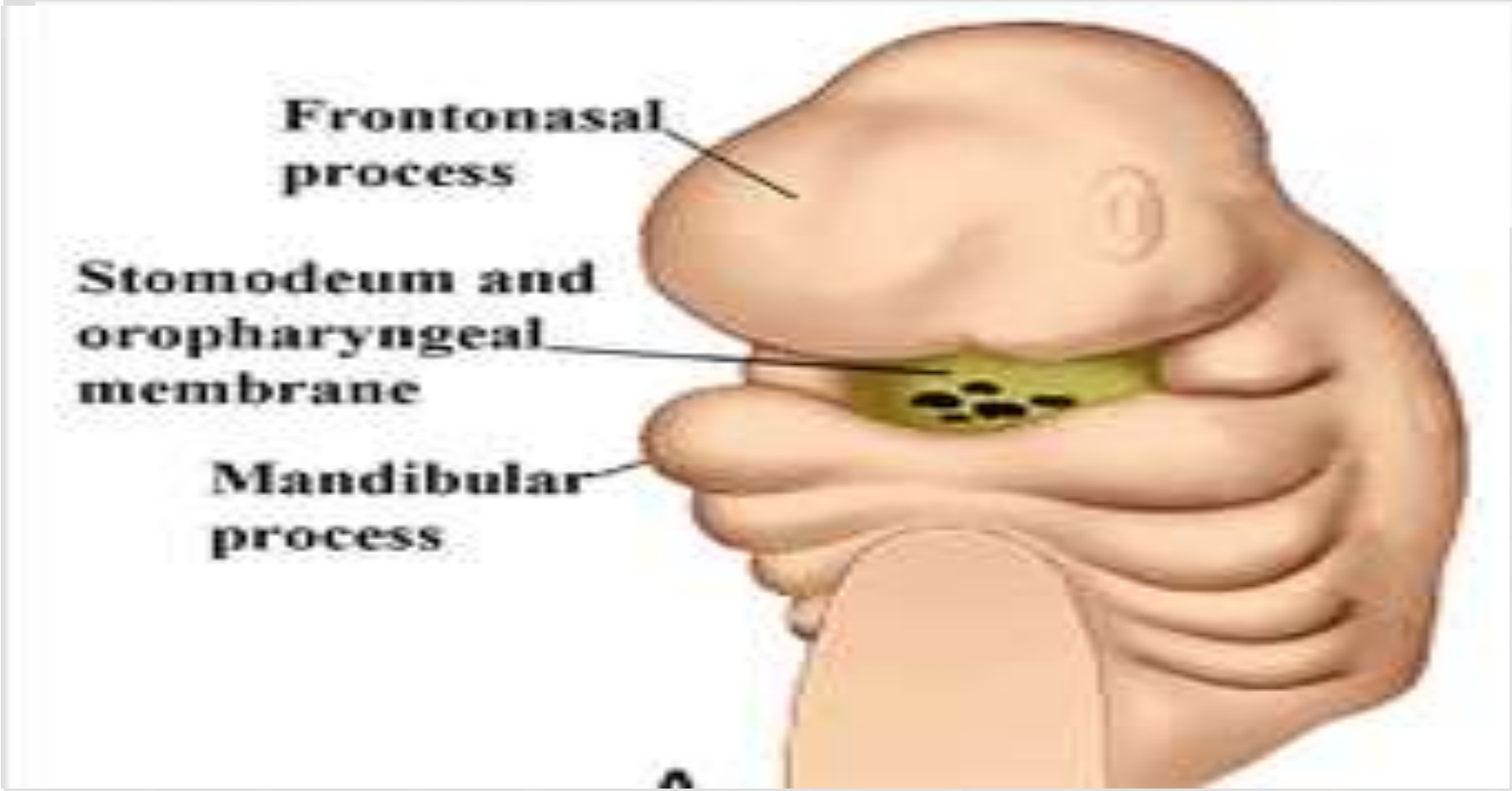
a. Upper face: from frontonasal process.

b. Middle face (midface): from maxillary processes.

c. Lower face: from mandibular processes.

STOMODEUM AND ORAL CAVITY FORMATION

Before fourth week, stomodeum initially appears as a shallow **depression** in embryonic surface ectoderm at cephalic end, limited in depth by **oropharyngeal membrane**. Stomodeum is increased in depth, enlarging it to become oral cavity and lined by oral epithelium, which is derived from **ectoderm**, as a result of embryonic folding.

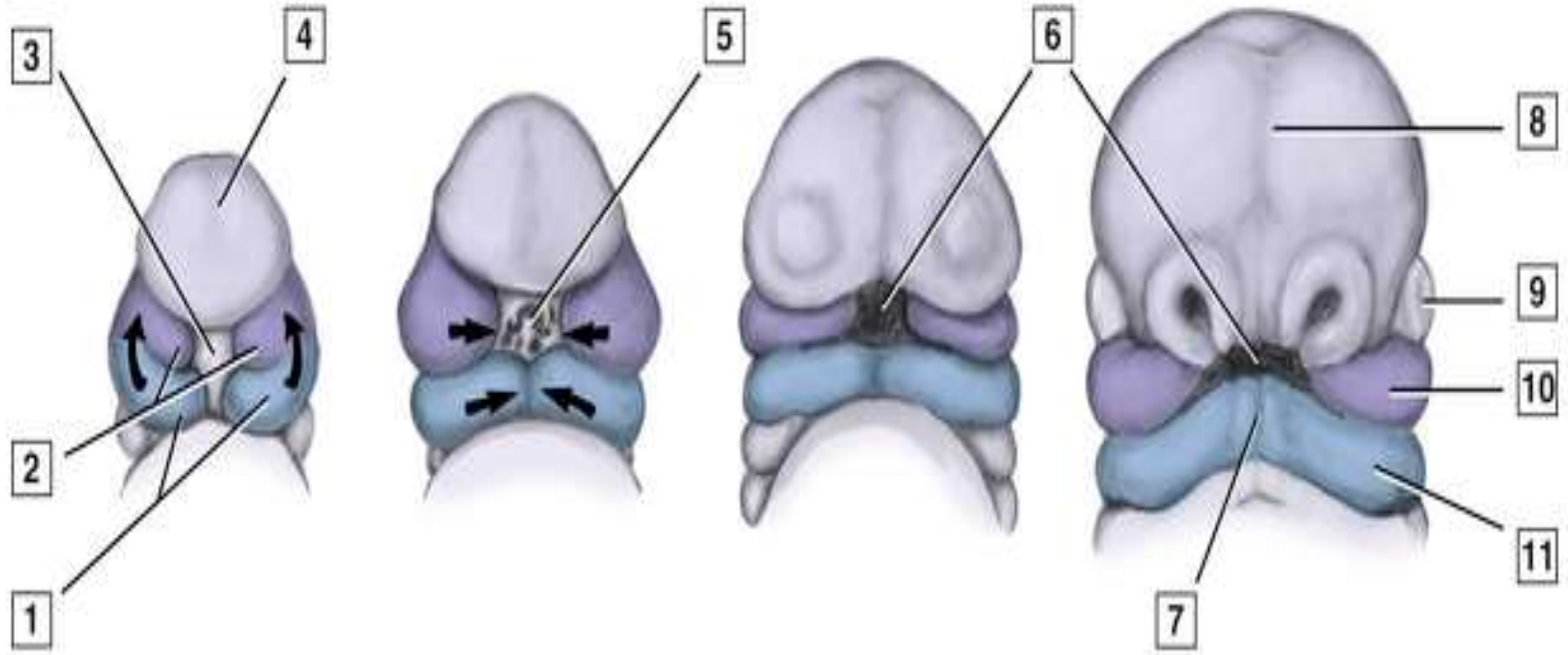

Frontonasal process
Stomodeum and oropharyngeal membrane
Mandibular process

Oropharyngeal membrane disintegrates so that the stomodeum becomes deeper and gradually forms the **oral cavity**, Now there is access by way of stomodeum from internal primitive pharynx to outside fluids of amniotic cavity surrounding embryo.

Oral epithelium and underlying tissues will form **teeth and associated tissues**.

MANDIBULAR ARCH AND LOWER FACE FORMATION

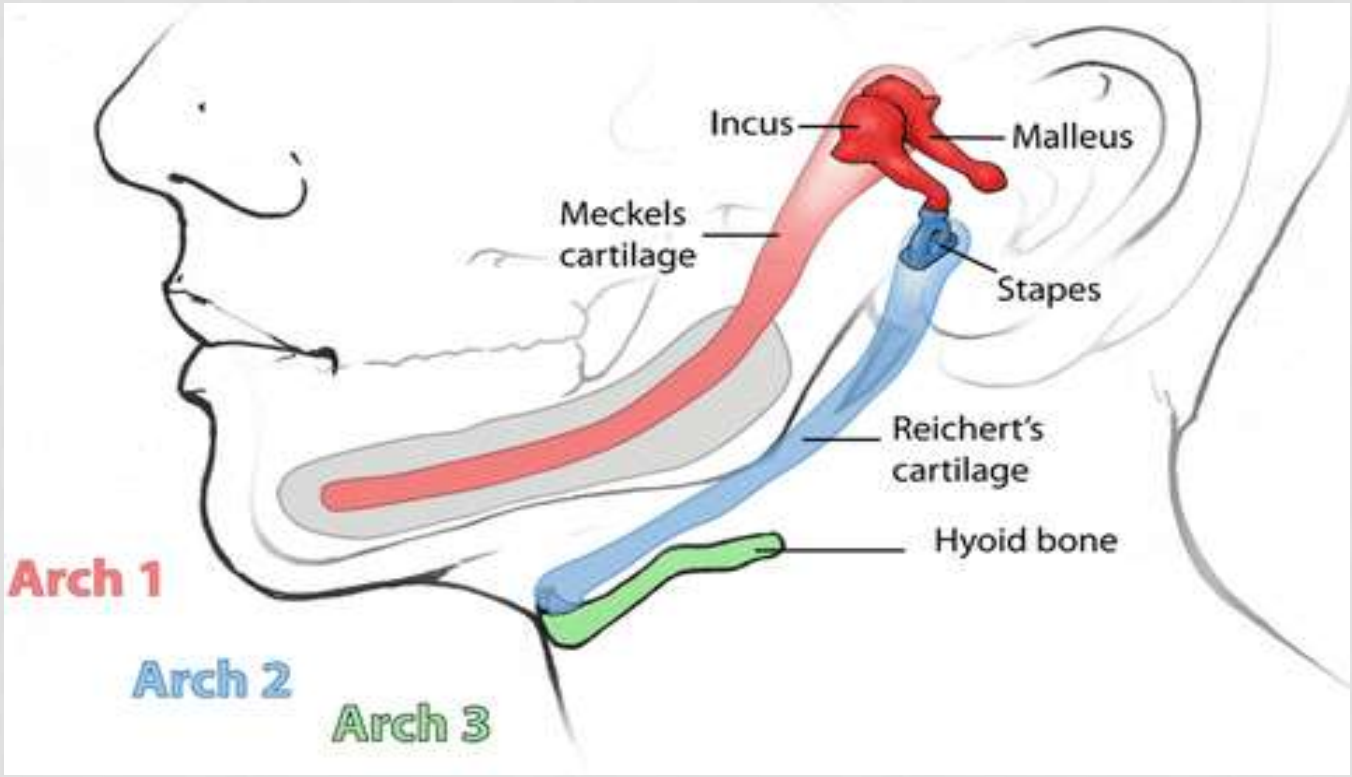
During fourth week, two bulges of tissues appear inferior to stomodeum; these paired mandibular processes are formed in part by neural crest cells that migrated to the facial region, covered externally by ectoderm and internally by endoderm, Paired mandibular processes BOTH fuse at midline to form the lower face .



1 Mandibular processes
2 Maxillary processes
3 Oropharyngeal membrane
4 Frontonasal process
5 Oropharyngeal membrane disintegrating
6 Stomodeum
7 Mandibular symphysis
8 Frontonasal process
9 Lens placode
10 Maxillary process
11 Mandibular arch

Mandibular arch and related tissues are **first** portions of the face to form after creation of stomodeum and directly forms

1. **lower face, including lower lip**
2. **Mandible**
3. **mandibular teeth & associated tissues**
4. **Tongue**
5. **Meckel's cartilage**


Incus
Malleus
Meckels cartilage
Stapes
Reichert's cartilage
Hyoid bone
Arch 1
Arch 2
Arch 3

Meckel's cartilage forms within each side of mandibular arch , IMPORTANT in:

1. **Alveolar bone** development.

2. Makes contribution to mandible, and portion of cartilage participates in formation of **middle ear bones**.

3. Part of perichondrium surrounding Meckel's cartilage becomes **ligaments of the jaws and middle ear**.

Muscles of face

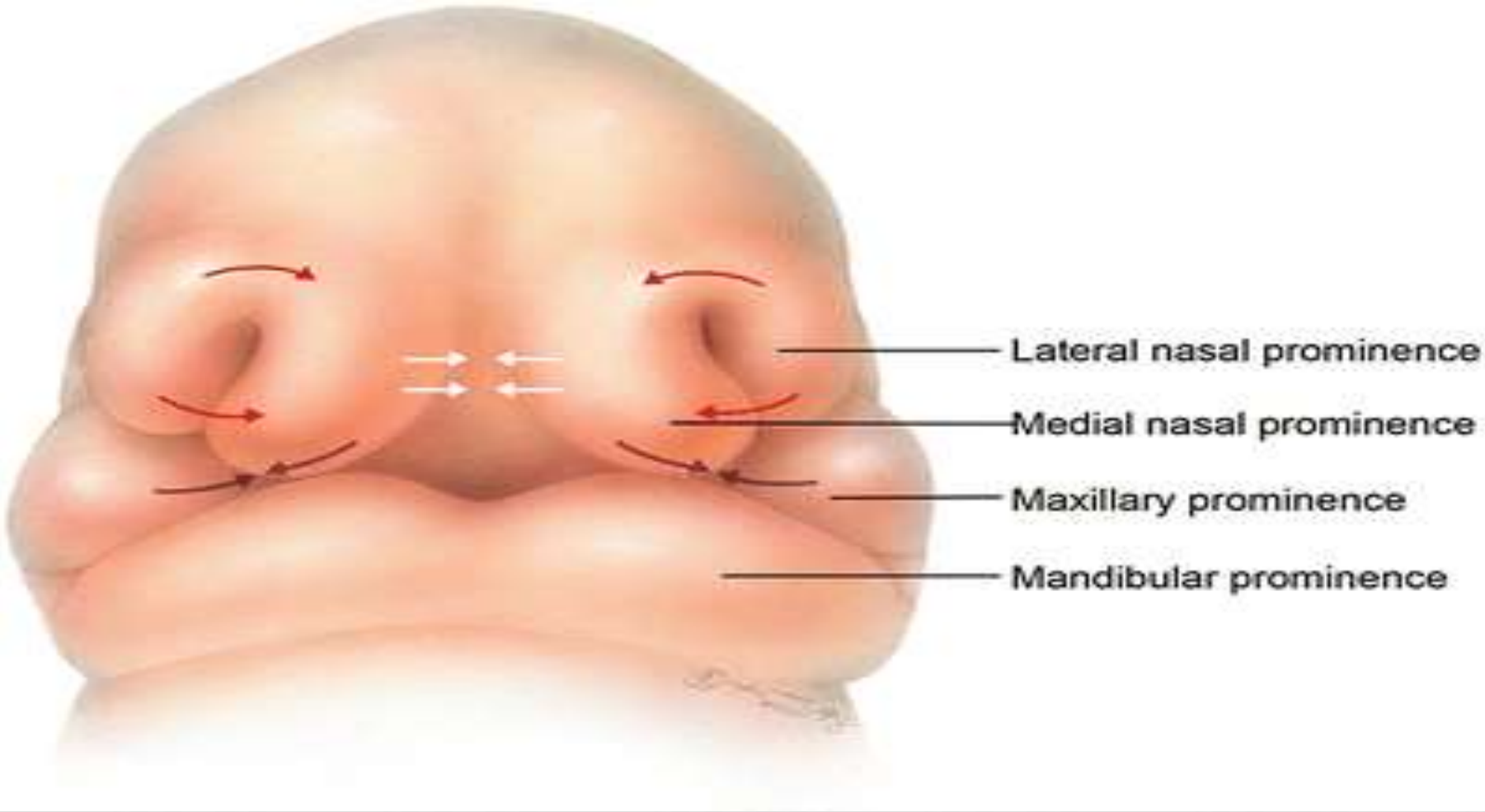
Mesoderm of mandibular arch forms **muscles of mastication, as well as some palatal muscles and suprahyoid muscles**. Because these muscles are derived from mandibular arch, they are innervated by nerve of the first arch, **fifth (V) cranial nerve (trigeminal nerve)**

FRONTONASAL PROCESS AND UPPER FACE FORMATION

During fourth week, frontonasal process is a bulge of tissue in upper facial area, at most cephalic end of embryo, which is also the cranial boundary of the stomodeum.

In the future, frontonasal process will form :

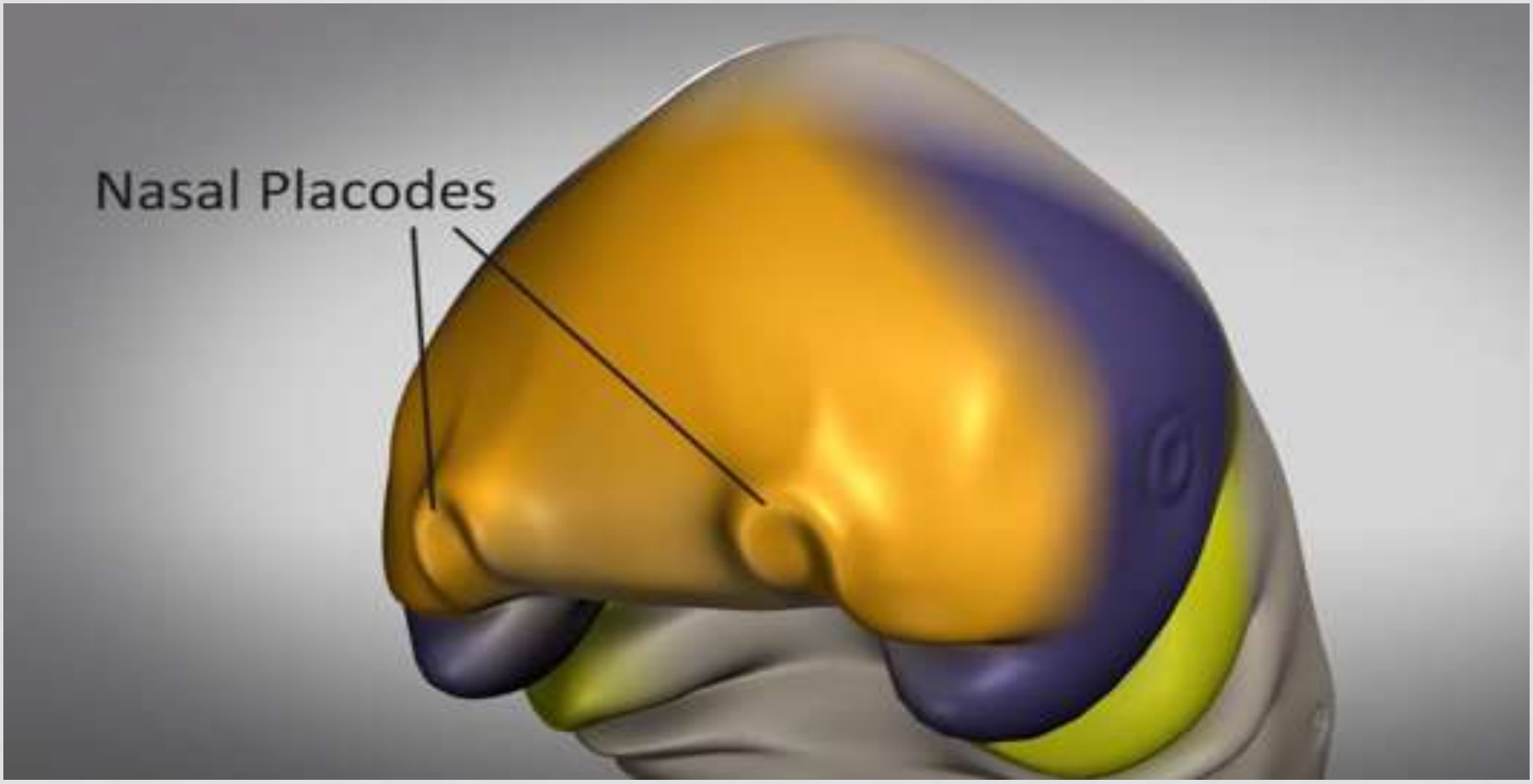
1. upper face, which includes forehead
2. bridge of nose
3. primary palate
4. nasal septum, and all structures related to medial nasal processes (Nasal placodes)


Lateral nasal prominence
Medial nasal prominence
Maxillary prominence
Mandibular prominence

OLFACTORY OR NASAL PLACODES

Nasal placodes become submerged, forming depression in center of each side form **nasal (olfactory) pits**, which develop into nasal cavities.

Deepening of nasal pits produces a nasal sac that grows internally toward developing brain that developing in the future as **nasal cavity** ; separated from the stomodeum by **oronasal membrane**.


Nasal Placodes

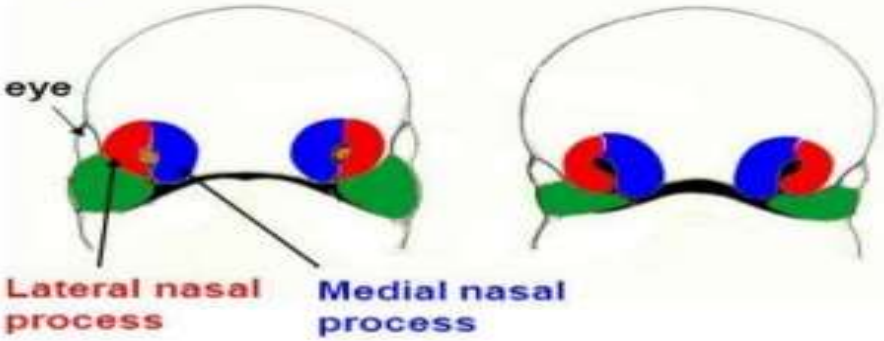
On outer portion of nasal pits are two crescent-shaped swellings, **lateral nasal processes that form the alae (sides of the nose)**.

Middle portion of the tissue growing around nasal placodes appears as **medial nasal processes**.

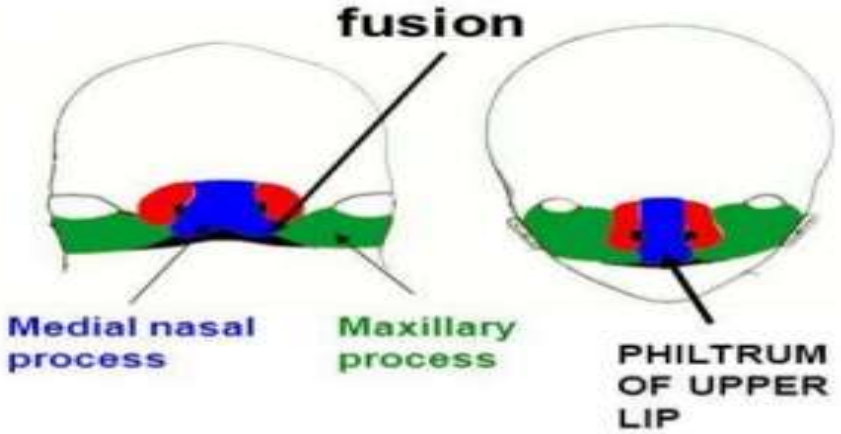
Both fuse together externally to form the middle portion of the nose from **root to apex, and center portion of upper lip (philtrum region)**.

DEVELOPMENT OF UPPER LIP

Medial & Lateral Nasal Processes - form at margins of nasal placodes

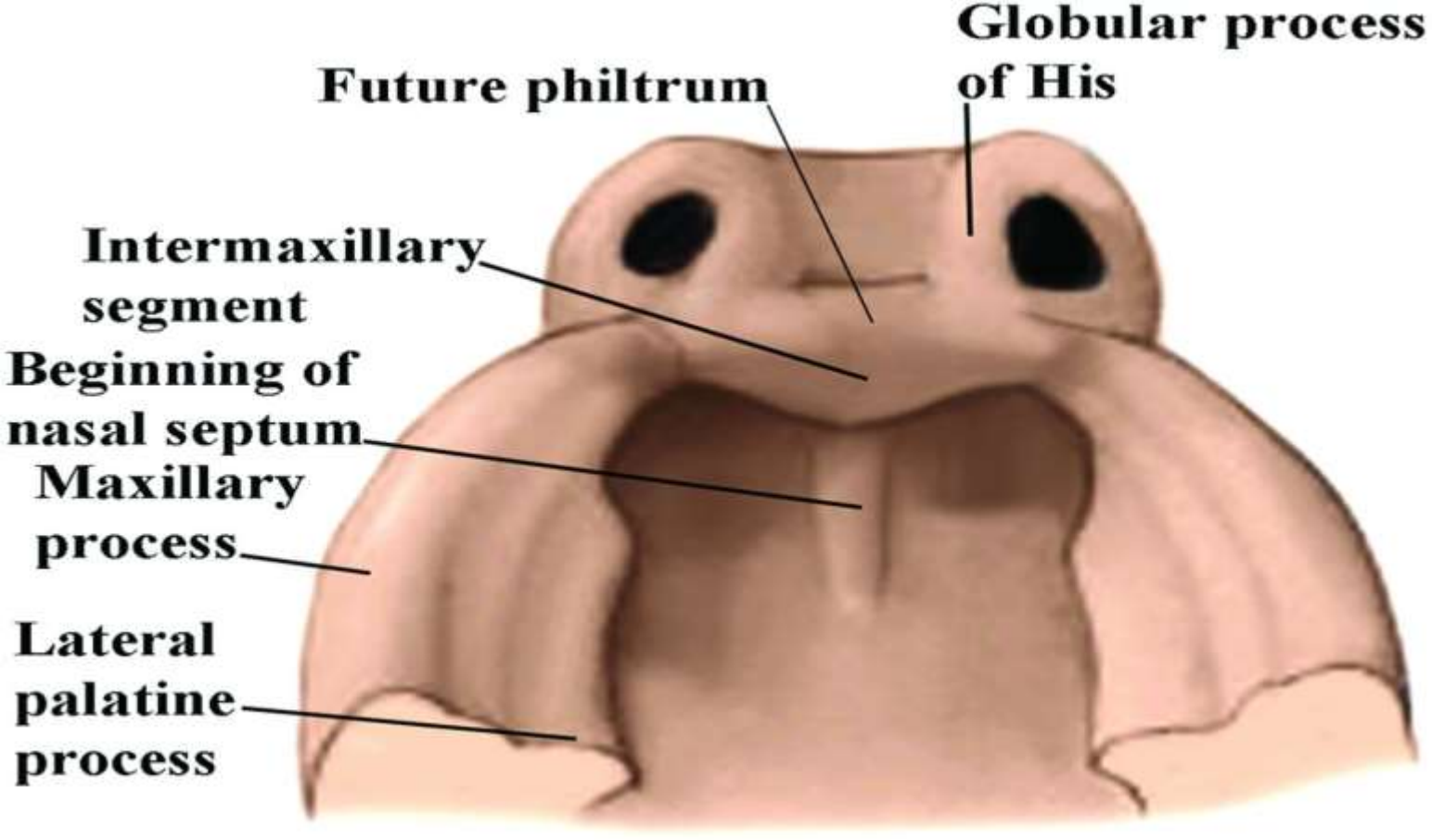


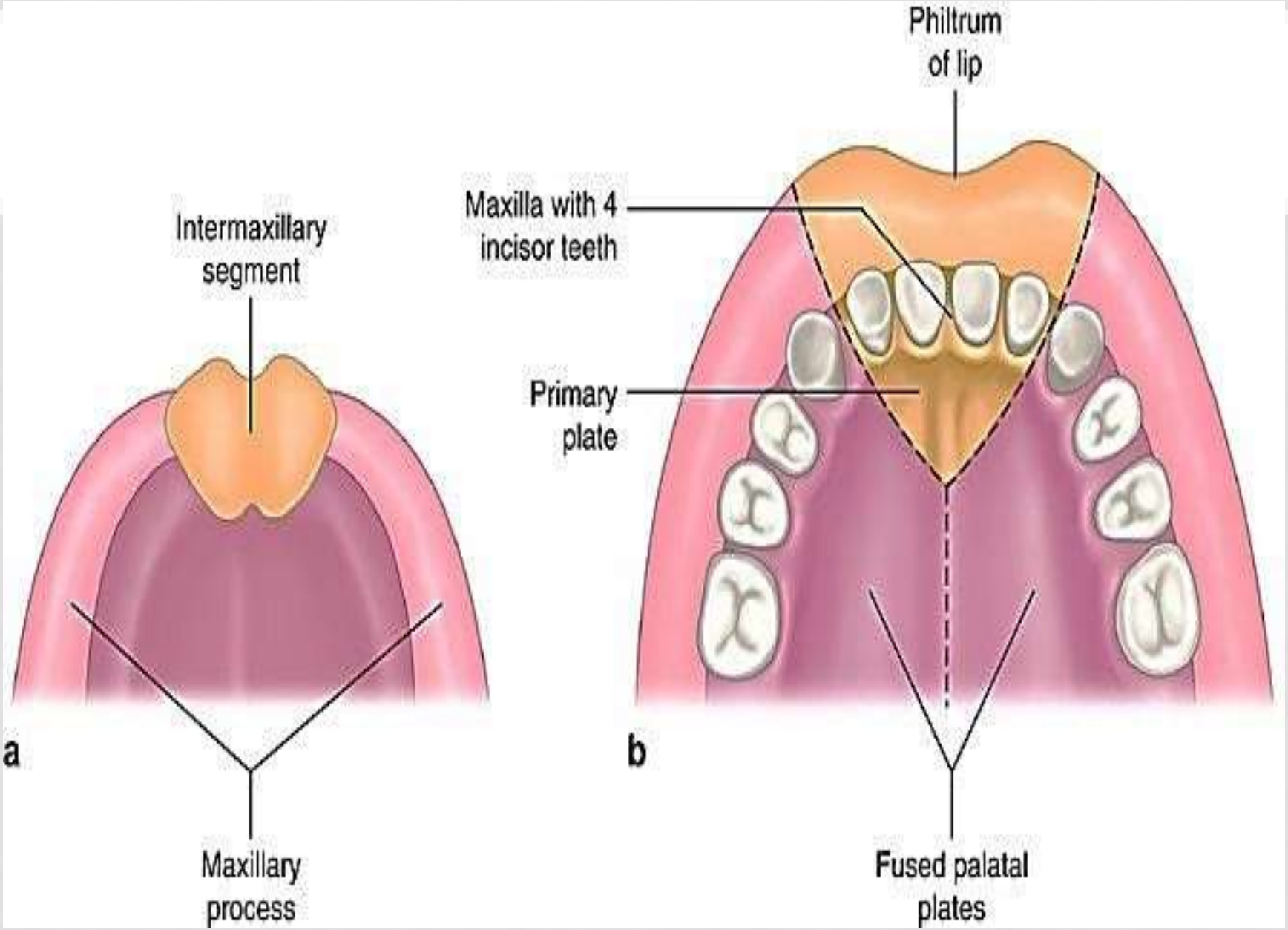
Medial nasal processes and Maxillary Processes - fuse at philtrum to form upper lip



Medial nasal processes fuse
Terminology: process = prominence

Both paired medial nasal processes also fuse internally and grow inferiorly on inside of stomodeum to form **intermaxillary (premaxillary) segment**, most anterior portion of the tissues and involved in formation of **maxillary incisor teeth and associated tissues, primary palate, nasal septum**.

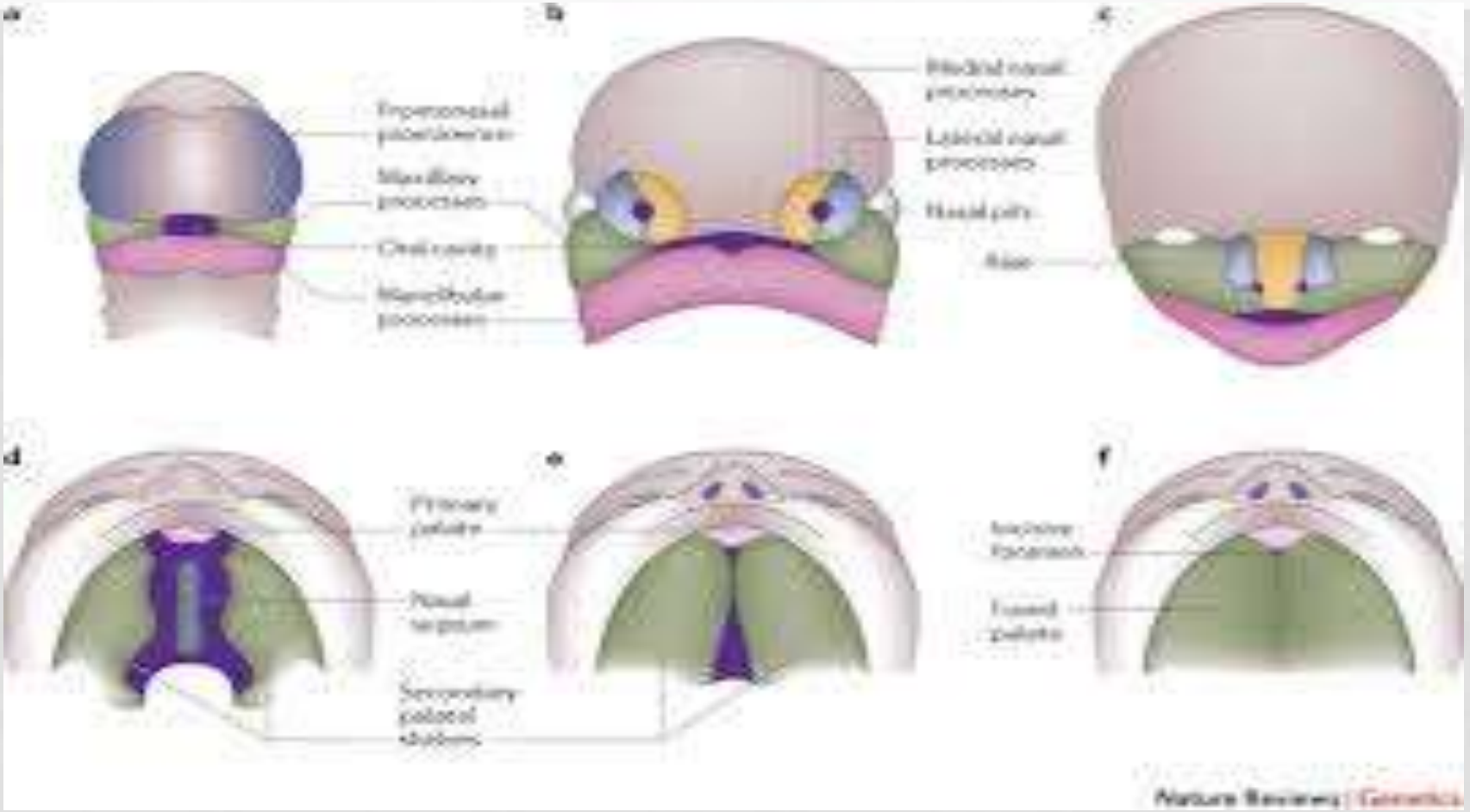

Globular process
of His
Future philtrum
Intermaxillary
segment
Beginning of
nasal septum
Maxillary
process
Lateral
palatine
process


Intermaxillary segment
Maxillary process
a
Philtrum of lip
Maxilla with 4 incisor teeth
Primary plate
Fused palatal plates
b

MAXILLARY PROCESS AND MIDFACE FORMATION

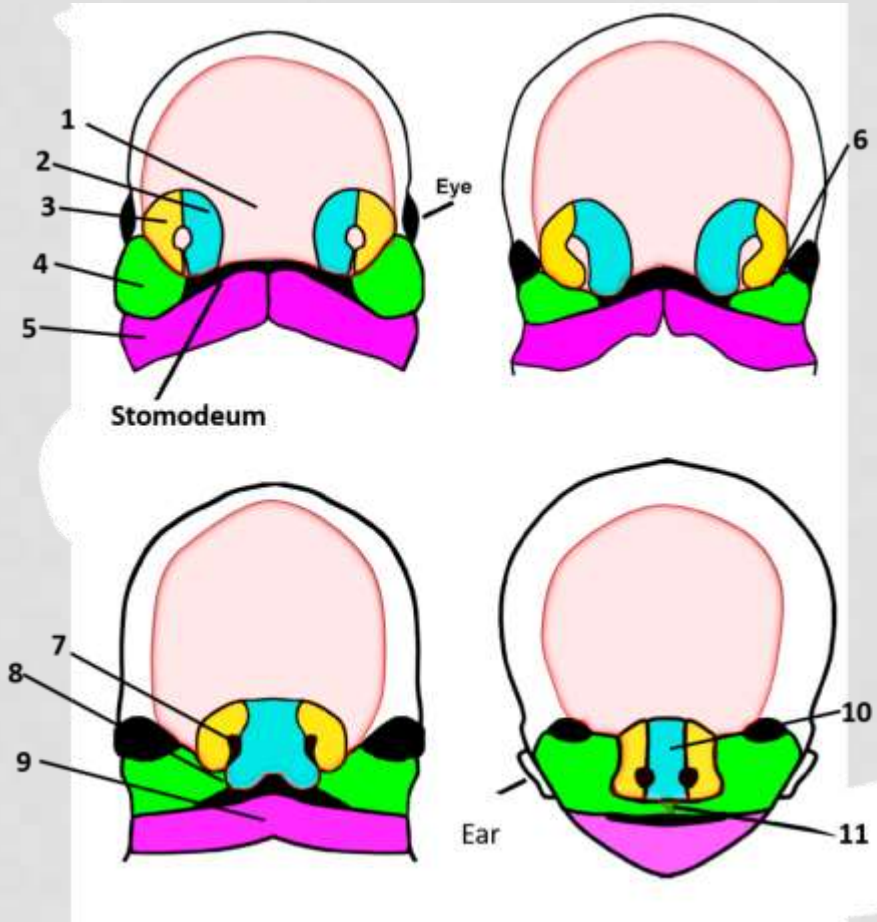
During fourth week, adjacent swellings, the maxillary processes, form from increased growth of mandibular arch.

Maxillary processes grow superiorly and anteriorly on each side of stomodeum


a
b
c
d
e
f
Medial nasal processes
Lateral nasal processes
Nasal pits
Nasal septum
Secondary palatal shelves
Nature Reviews | Genetics

Maxillary process will form the **midface** includes

1. Sides of upper lip, cheeks, secondary palate.
2. Posterior portion of maxilla, with maxillary canines and posterior teeth and associated tissues.
3. Zygomatic bones and portions of temporal bones.

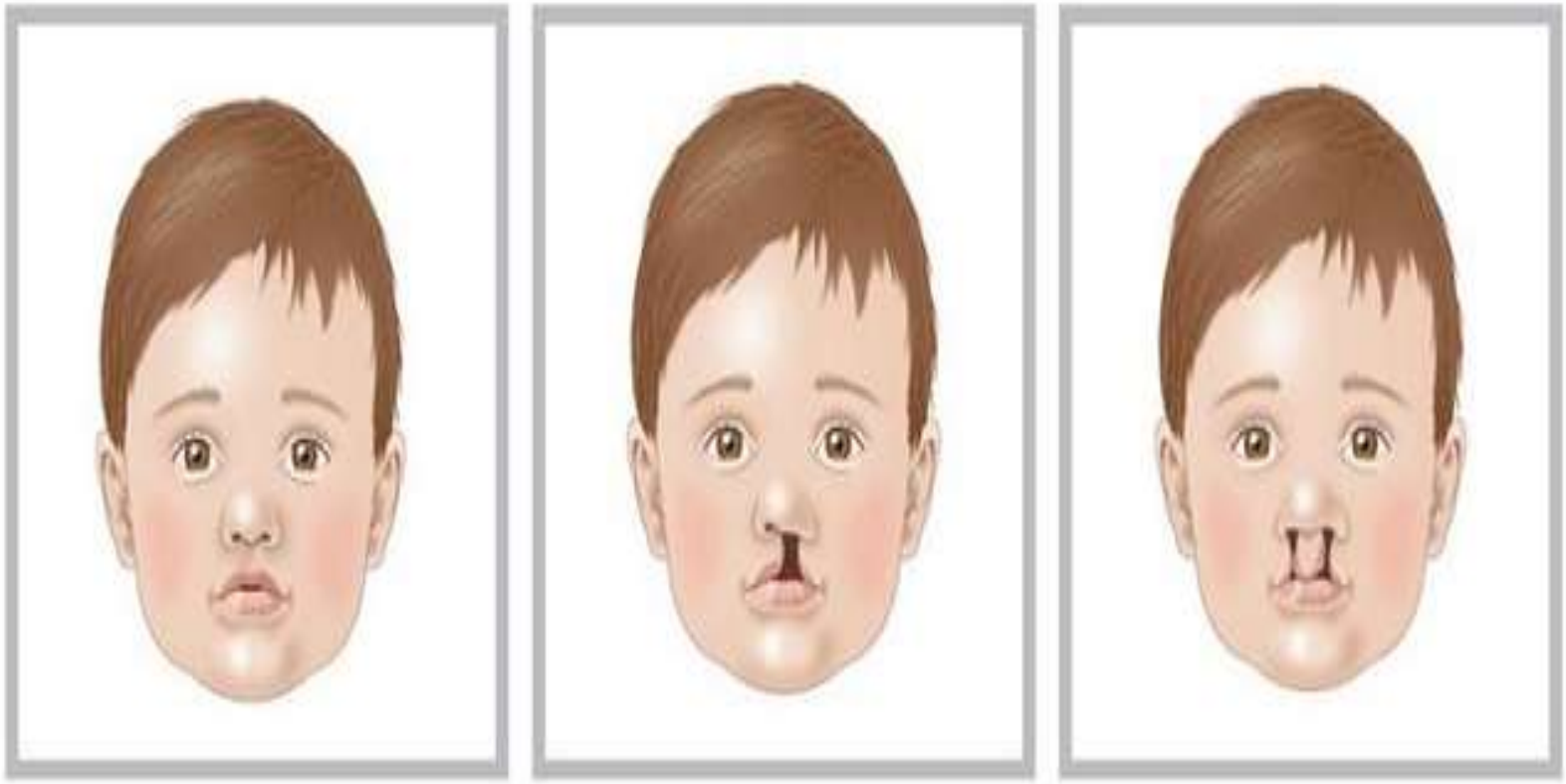


Development of Face

1. Frontonasal process
2. Medial nasal process
3. Lateral nasal process
4. Maxillary process
5. Mandibular process
6. Fusion of lateral process with maxillary process
7. Nasal pit
8. Fusion of maxillary process with medial nasal process
9. Fusion of mandibular processes
10. Intermaxillary process (fused medial nasal processes
11. Philtrum of nose

Each maxillary process fuses with each medial nasal process and contribute to sides of **upper lip, and the two medial nasal processes contribute to middle of upper lip**.

If the maxillary process on each side does NOT fuse with medial nasal process, **cleft lip** can result



1. Normal lip

2. Left unilateral cleft

3. Bilateral cleft

Thanks