

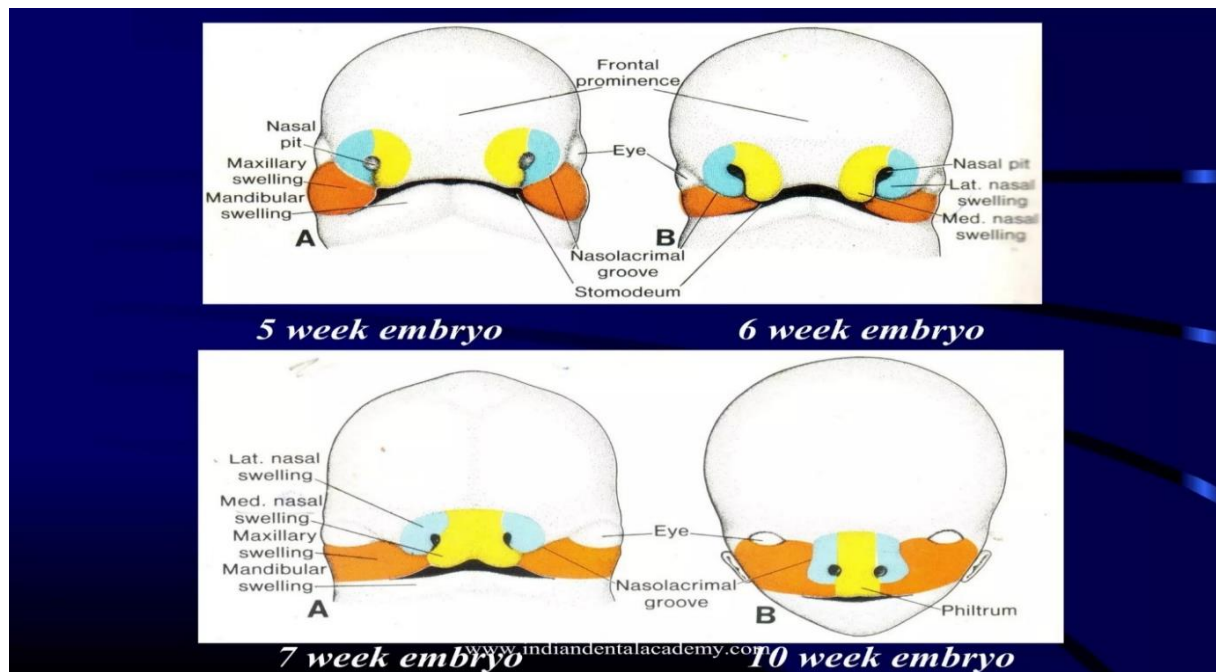
Embryology part 5: Development of the Face and Palate

The human face begins forming during the fourth week of embryonic development, and by the sixth week, the external face is fully shaped. The palate develops during this time, dividing the nasal and oral cavities, with the soft palate being completed by the 12th week. Two key structures in this process are **the pharyngeal arches and neural crest cells**.

By the third week, the oropharyngeal membrane is seen at the site of the future face, positioned between the developing heart and brain. This membrane breaks down in the fourth week, creating an opening between the future oral cavity (stomodeum) and the foregut.

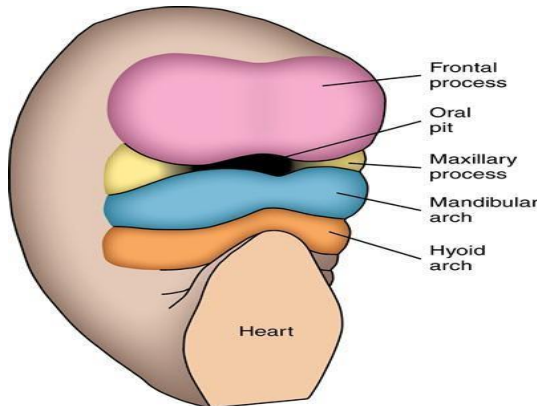
Facial Development:

- **4th week:** The human face begins forming around the centrally located oral pit, surrounded by the frontal and maxillary processes and the mandibular arch.
- **5th week:** Nasal pits develop on the sides of the face, and the frontal process becomes the frontonasal process.
- **6th week:** The nasal pits move centrally due to lateral facial growth, drawing the eyes closer to the front. The maxillary processes grow near the medial nasal process.

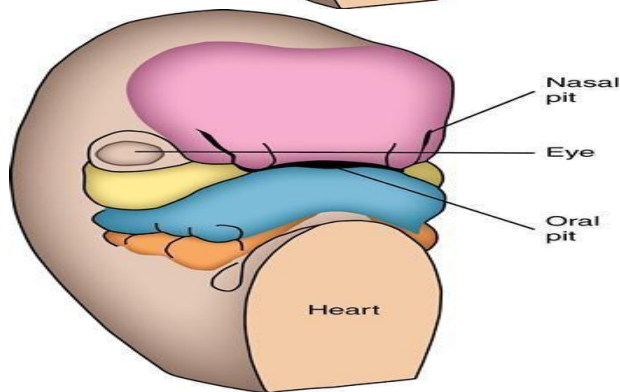


The center of the face, called the stomodeum, is framed by the first pair of pharyngeal arches, which form five mesenchymal prominences:

- Two mandibular prominences (right and left from 1st arch neural crest mesenchyme)
- Two maxillary prominences (right and left from 1st arch neural crest mesenchyme)
- One frontonasal prominence (from cranial neural crest mesenchyme)

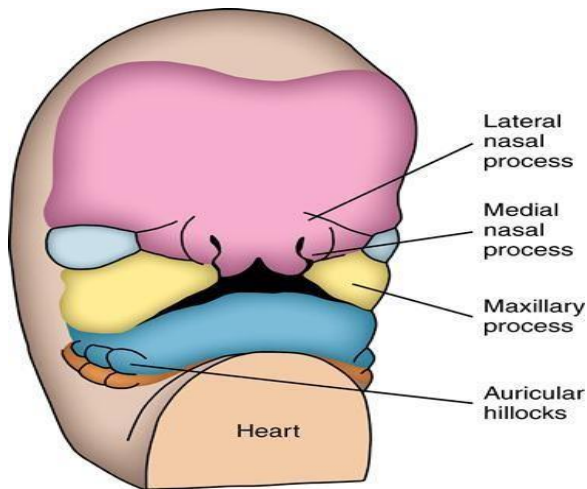


Human face during the 4th prenatal week. Around the centrally located oral pit are grouped the frontal and maxillary processes and the mandibular arch.



Human face during the 5th prenatal week. The nasal pits develop and appear on the sides of the face. The frontal process now becomes the frontonasal process

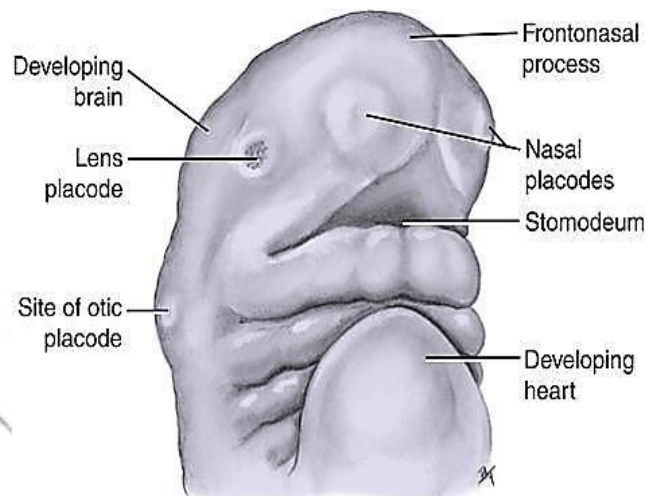
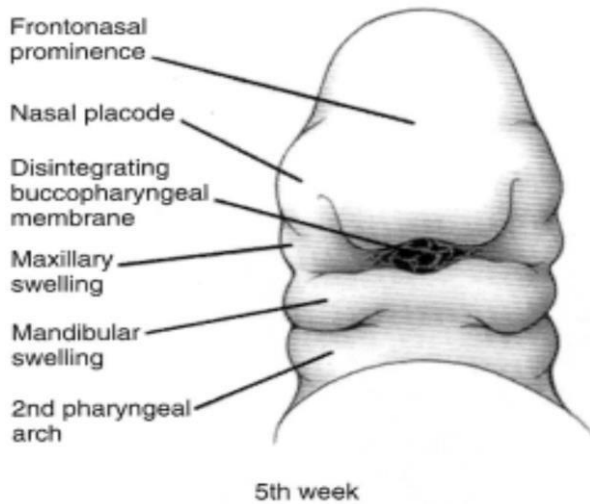
Nasal placodes arise on the frontonasal prominence from ectodermal tissue, thickening and sinking to form nasal pits. As the maxillary prominences grow, they merge with the mandibular prominences to form the cheeks. The fusion of the medial nasal prominences with the maxillary prominences forms the upper lip, upper jaw (with four incisors), and the primary palate.



Human face during the 6th prenatal week. Nasal pits appear more centrally located in the medial nasal process. This is the result of growth of the lateral face, which also causes the eyes to approach the front of the face. The enlarged maxillary processes are near contact with the medial nasal process.

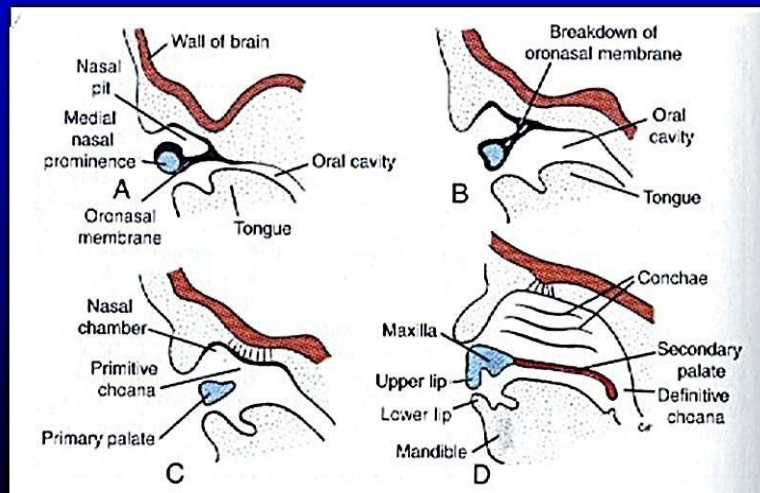
Development of the Nasal Cavity:

By the sixth week, the nasal pits deepen into nasal sacs, which grow toward the forming brain. Initially separated by the oronasal membrane, this membrane disintegrates by the seventh week, connecting the nasal and oral cavities via the primitive choanae. As the secondary palate develops, the choanae shifts to the junction of the nasal cavity and pharynx.



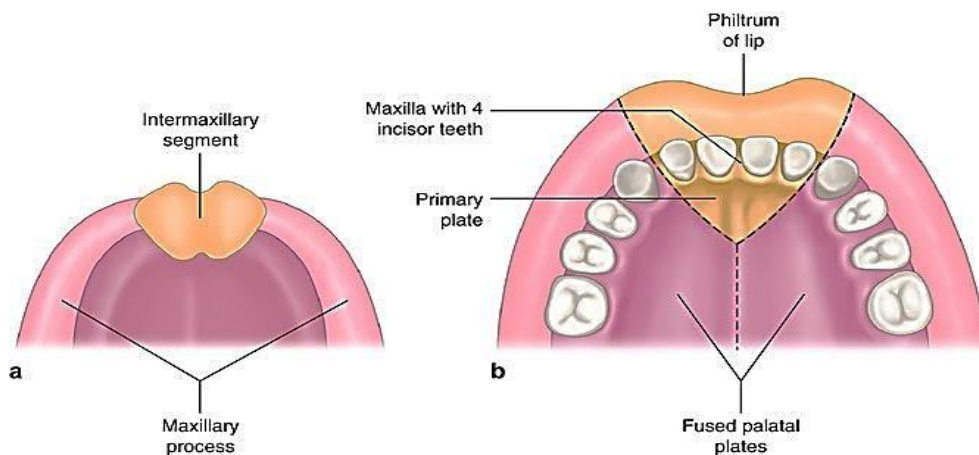
Origin of the human face and mouth. The face develops from five primordia that appear in the fourth week: the frontonasal prominence, the two maxillary swellings, and the two mandibular swellings. The buccopharyngeal membrane breaks down to form the opening to the oral cavity.

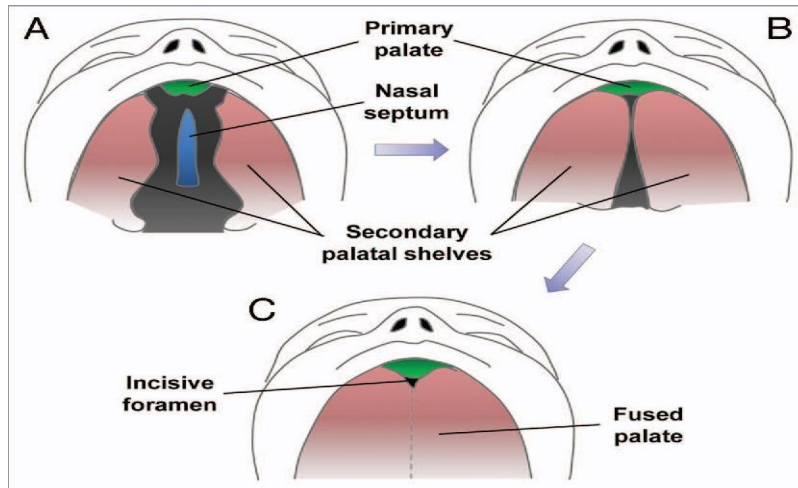
DEVELOPMENT OF NASAL CAVITIES



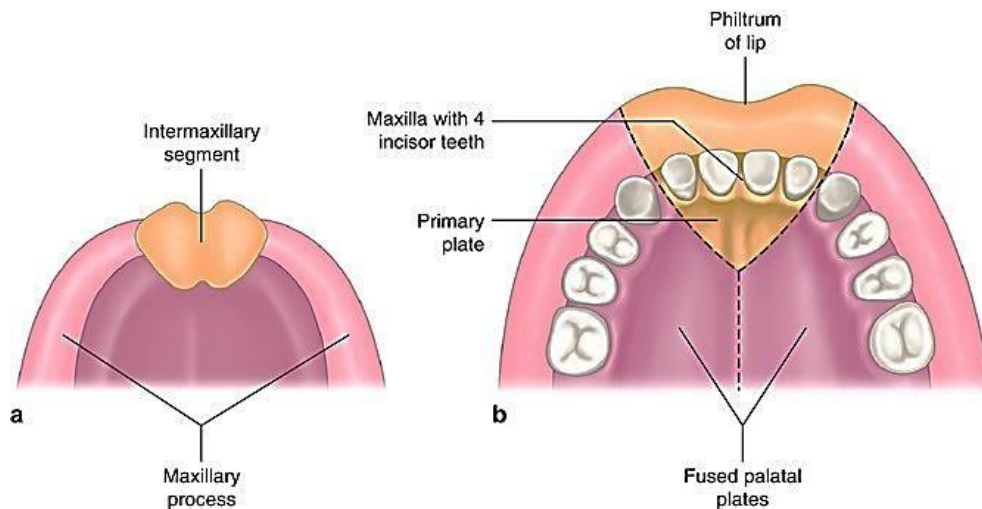
Palate Formation (Palatogenesis)

The palate forms the tissue between the nasal and oral cavities. By the sixth week, the primary palate develops, followed by the secondary palate between the sixth and eighth weeks. The primary and secondary palates merge to form the definitive palate, which fully separates the nasal and oral cavities. Complete fusion of the primary and secondary palate is a complex process involving growth of the component tissues, epithelial to mesenchymal transformation, cell migration, and programmed cell death at fusion sites –disruption of any part of this process can result in cleft palate. Disruption in this complex fusion process can result in cleft palate, which is often (though not always) accompanied by a cleft lip.



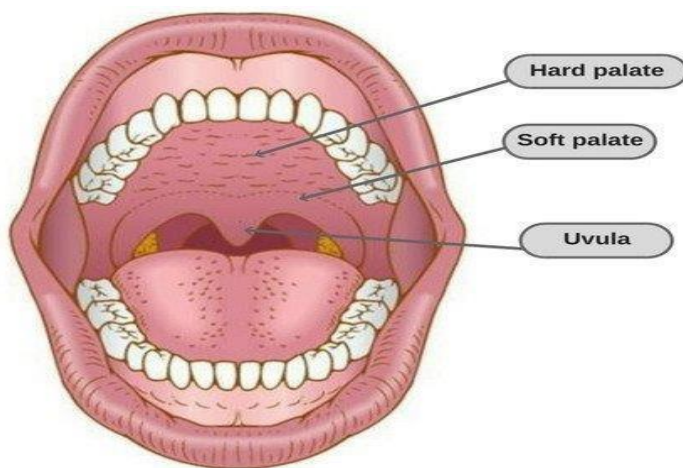


Development of the primary palate : Around the 5th week, the intermaxillary segment arises . The intermaxillary segment gives rise to the primary palate. The primary palate will form the premaxillary portion of the maxilla. This small portion is anterior to the incisive foramen and will contain the maxillary incisors.



The secondary palate: it consists anteriorly of the bony hard palate and posteriorly of the muscular soft palate. The hard palate is crucial for normal feeding and speech, whereas the soft palate is movable and closes off the nasal airway during swallowing. The secondary palate fuses anteriorly with the primary palate with the incisive foramen being the landmark between the primary palate and secondary palate and anterodorsally with the nasal septum, to form the intact roof of the oral cavity.

The palatine uvula: is a conic projection from the back edge of the middle of the soft palate, composed of connective tissue containing a number of racemose glands, and some muscular fibers. It also contains many serous glands, which produce thin saliva. during swallowing, the soft palate and the uvula move together to close off the nasopharynx, and prevent food from entering the nasal cavity.



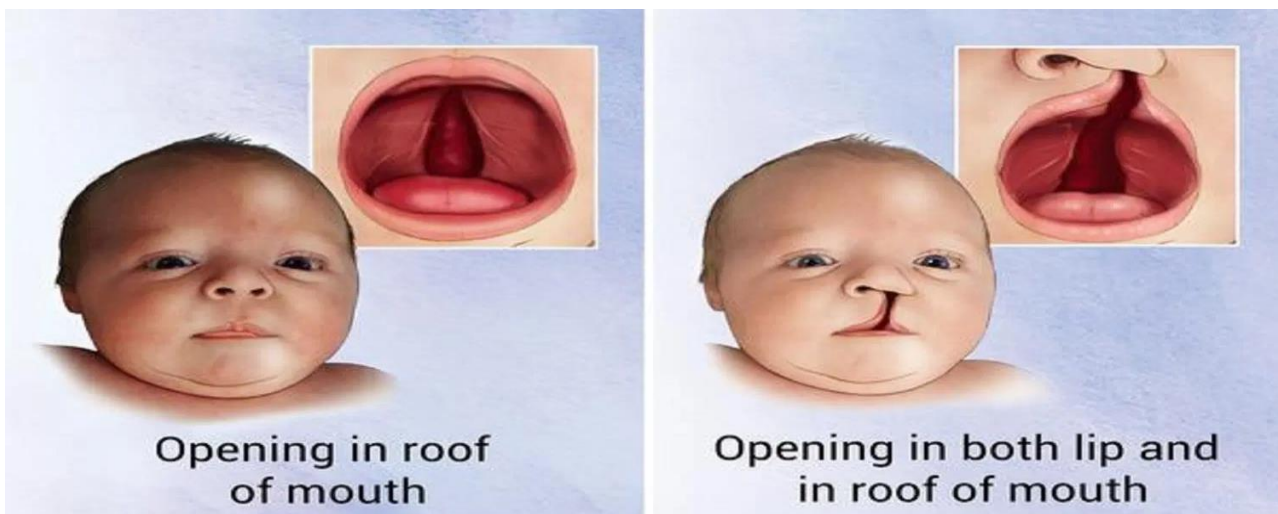
Facial Anomalies

Cleft lip and cleft palate: Cleft lip and cleft palate are facial and oral malformations that occur very early in pregnancy, while the baby is developing inside it's mother. Clefing results when there is not enough tissue in the mouth or lip area, and the tissue that is available does not join together properly.

A **cleft palate** is an opening in the roof of the mouth. A cleft palate can involve the hard palate, and/or the soft palate. Cleft lip and cleft palate can occur on one or both sides of the mouth. Because the lip and the palate develop separately, it is possible to have a cleft lip without a cleft palate, a cleft palate without a cleft lip, or both a cleft lip and cleft palate together.



Cleft lip is a physical separation of the two sides of the upper lip and appears as a gap in the skin of the upper lip. This separation often extends beyond the base of the nose and includes the bones of the upper jaw and/or upper gum.



Hare lip: A congenital cleft or fissure in the midline of the upper lip, resembling the cleft upper lip of a hare, often occurring with cleft palate. Result from bilateral failure of fusion of maxillary and medial nasal prominences to fuse.



Oblique facial cleft: unilateral failure of maxillary and lateral nasal prominences to fuse.

Macrostomia: incomplete lateral merging of maxillary and mandibular processes.

Frontonasal dysplasia: hyperplasia of inferior frontonasal prominence, thus preventing fusion of the medial nasal prominences.



Hypertelorism associated with frontonasal dysplasia