

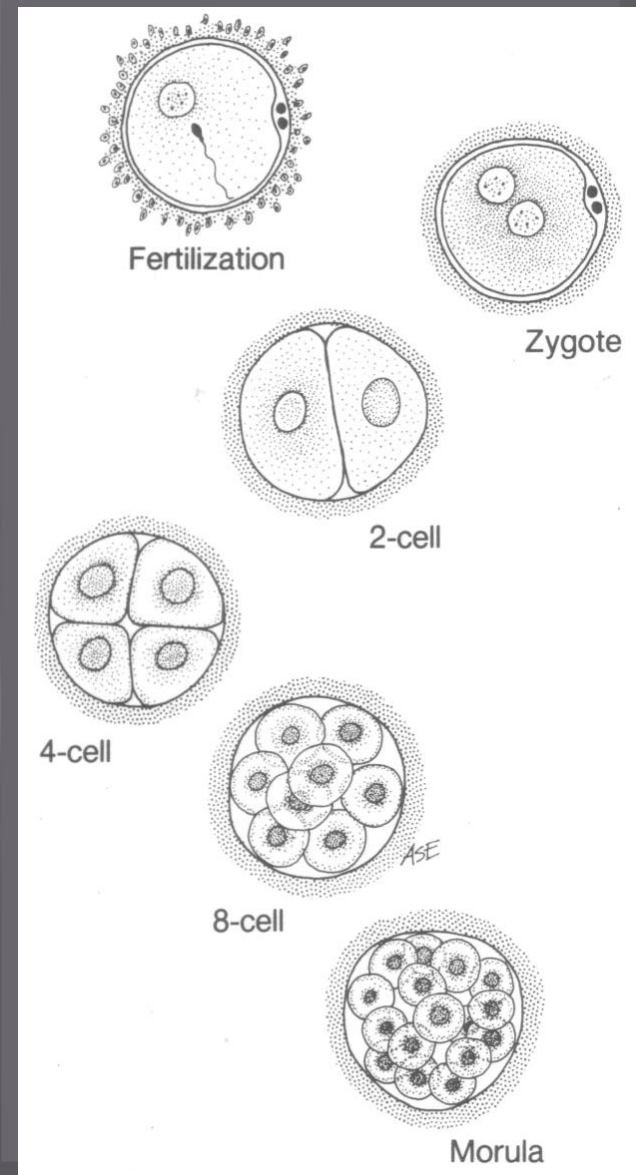
# GROWTH AND DEVELOPMENT IN THE PRENATAL PERIOD

Dr. Aysan KOLEMEN

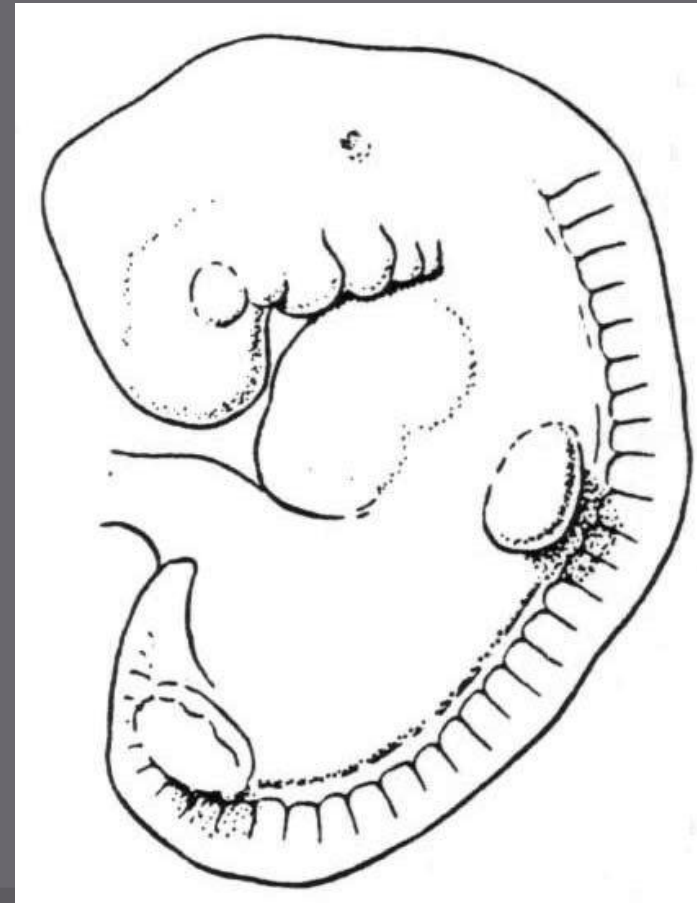
# Growth and development in the prenatal period

- ▣ Intrauterine life period will be divided into three parts:
  1. Period of the ovum into the 0-14 day.
  2. Period of the embryo into the 14-56 day.
  3. Period of the fetus into the 56-280 day.

1. **Ovum Period:** During this period, the single-celled zygote begins to multiply rapidly and forms several dozen cells. This mass of cells differentiates into an inner and outer layer of cells, separated by a hollow cavity.



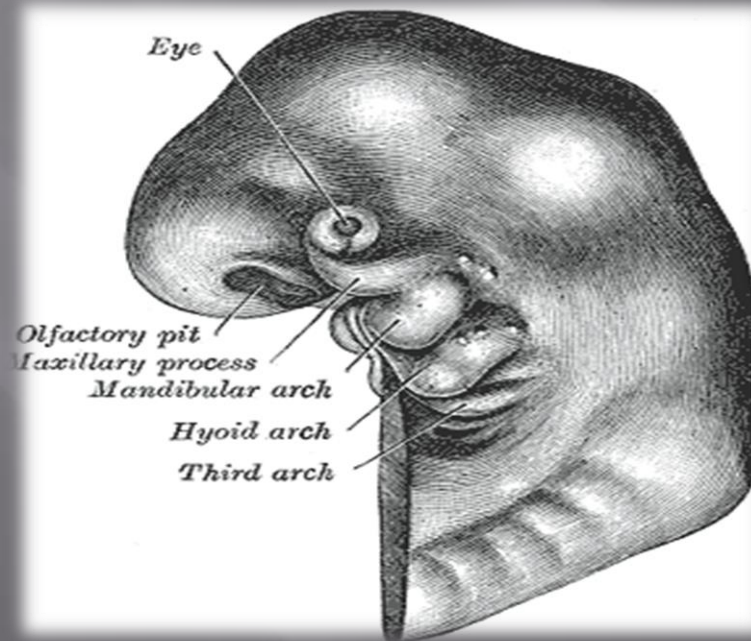
2. **Embryonic period:** begins during the middle of the second week and concludes at the end of the eighth week, at which time the physical appearance of the embryo is clearly human. It is during this time that all the major organs of the body begin to form. It is a time of specialization where cells divide and differentiate to form specific organs, e.g., the heart and lungs.



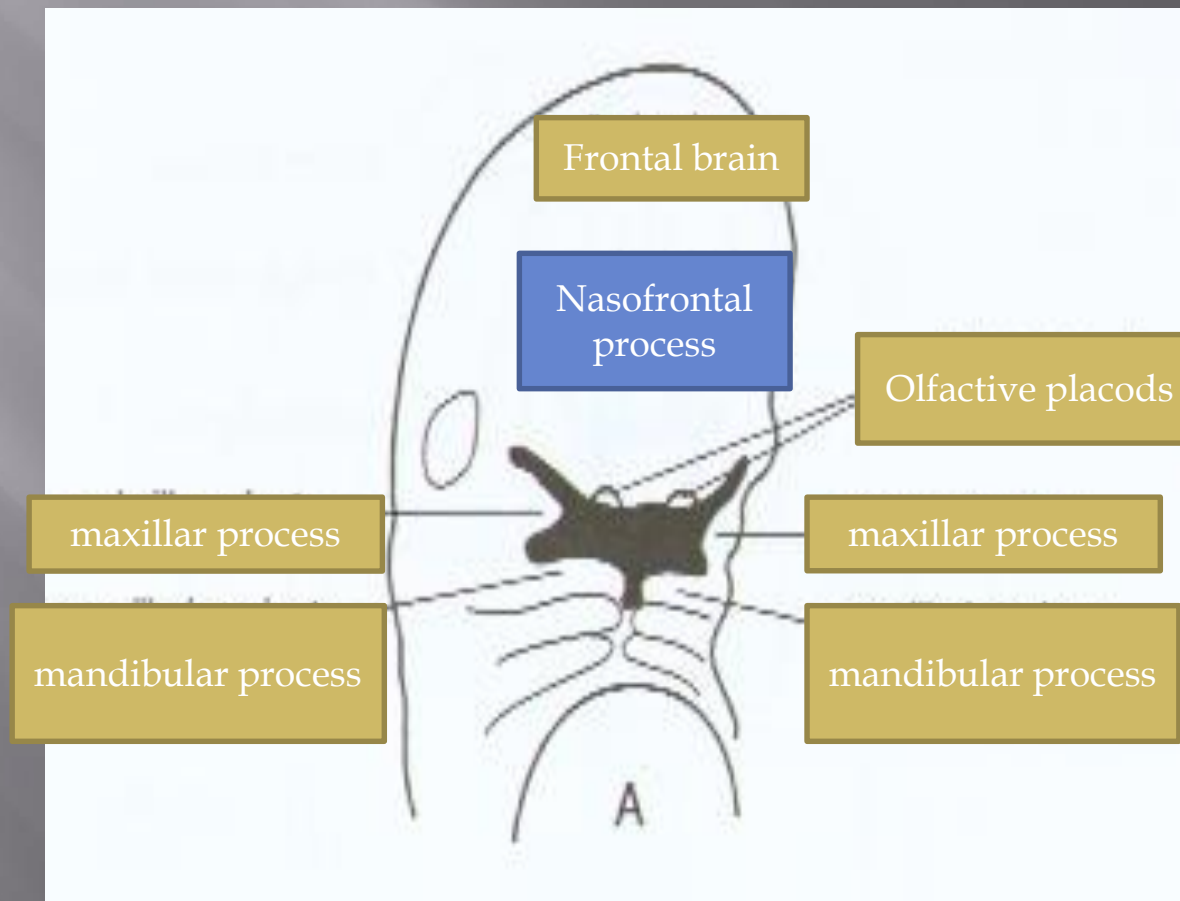
3. **Period of the Foetus:** growth and development of the craniofacial system will start in 4 weeks. In this period the face of the embryo 1.5 mm in thick and with paper width. Here jaws, eyes, ears and mouth rapidly developed.



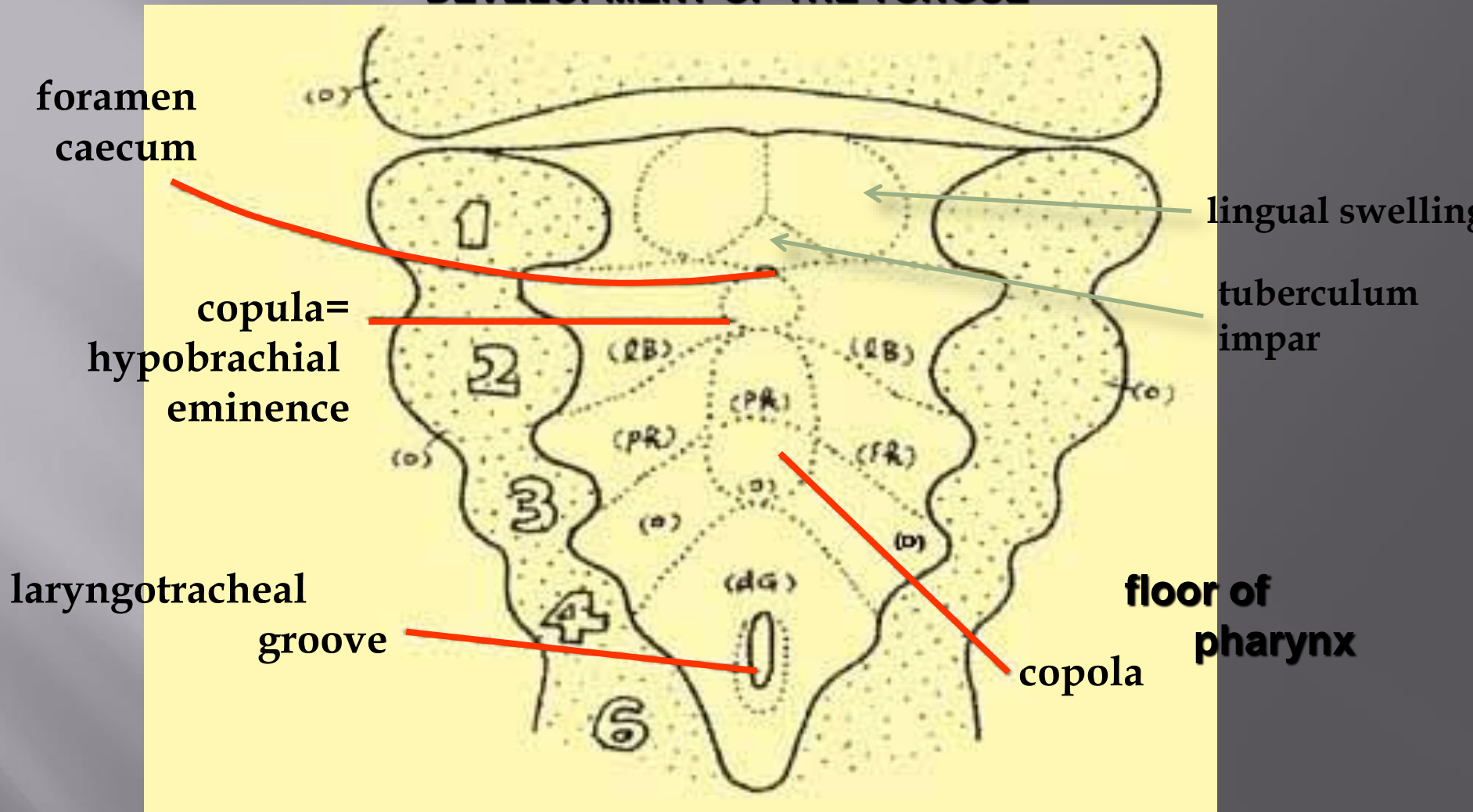
- Between the primitive brain and the tabs on cardiac an indent ectodermal consisting stomodeum of the mouth that primeval being done. Stomodeum, bordered from above by frontonasal proces and below by 1.bronchial arc (mandibular arch) two proces-derived mandibular.



- Stomodeum from both sides is bordered by two maxillar proces originating from 1.bronchial arc.



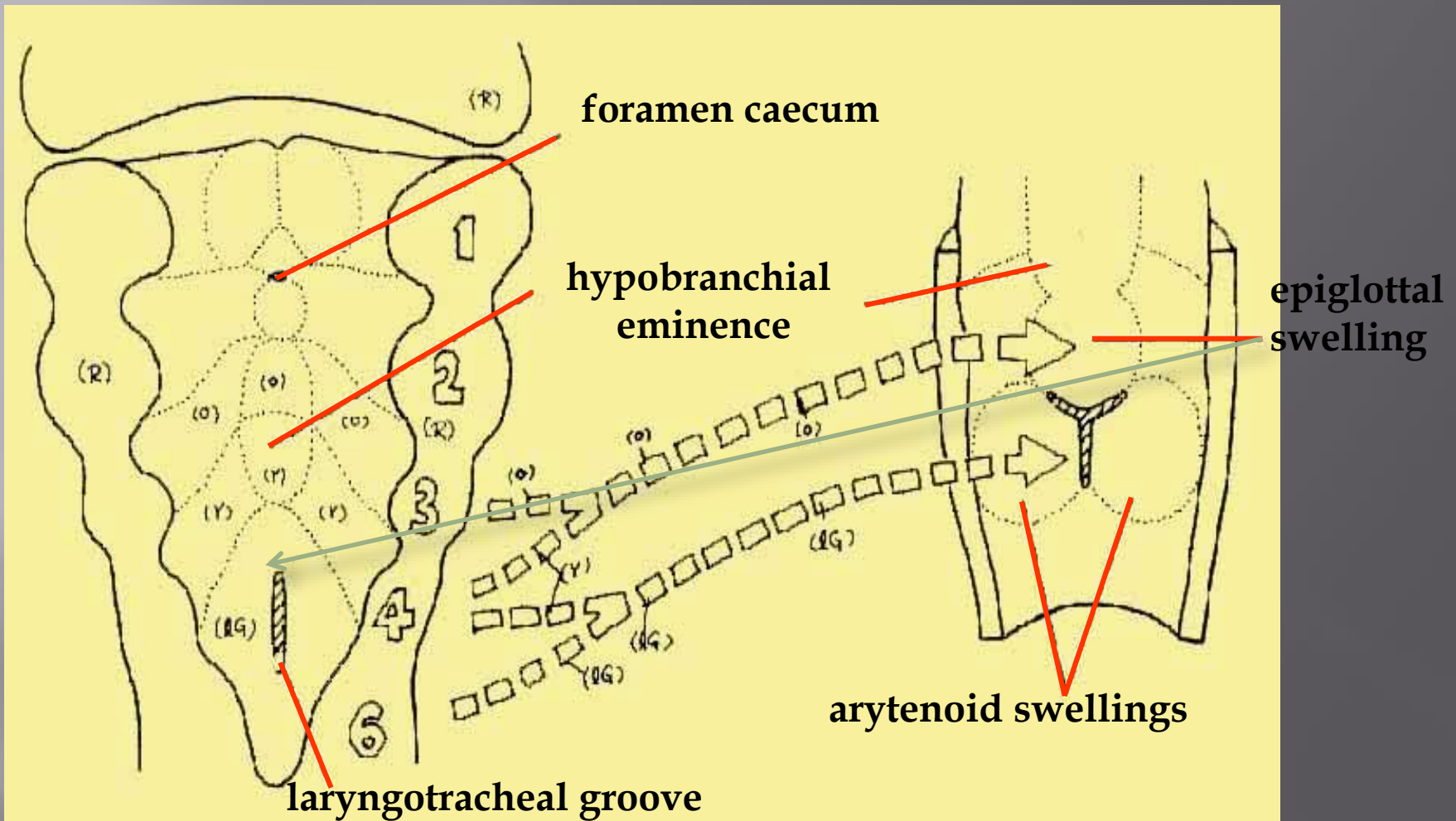
# DEVELOPMENT OF THE TONGUE



The tongue appears in 3 weeks as the two lateral lingual swelling and one medial swelling, the tuberculum impar, all originate from the 1<sup>st</sup> pharyngeal arch. A 2<sup>nd</sup> median swelling - the copola or hypobranchial eminence, is formed by the mesoderm of the 2,3, and part of the 4<sup>th</sup> arch.



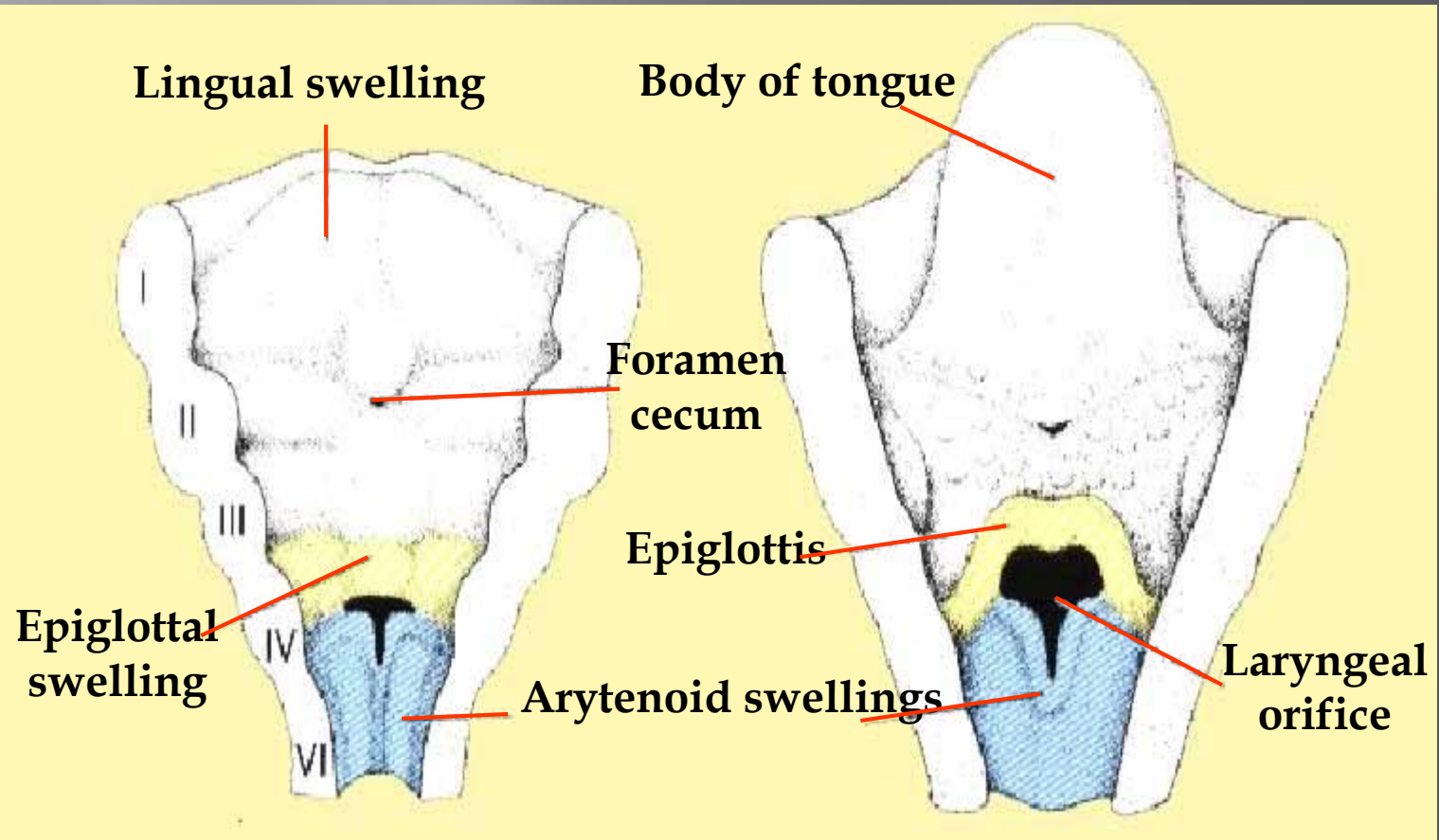
# DEVELOPMENT OF THE TONGUE



The 3<sup>rd</sup> median swelling formed by the posterior part of the 4<sup>th</sup> arch marks development of the epiglottis. Behind this swelling is the laryngeal orifice which is flanked by the arytenoids swelling.

# Development of the tongue:


As the lateral lingual swellings increase in size they overgrow the tuberculum impar and merge, forming the anterior two-thirds of the tongue. Since mucosa of the body of the tongue originates from the 1<sup>st</sup> arch, sensory innervation is by the mandibular branch of the trigeminal nerve.

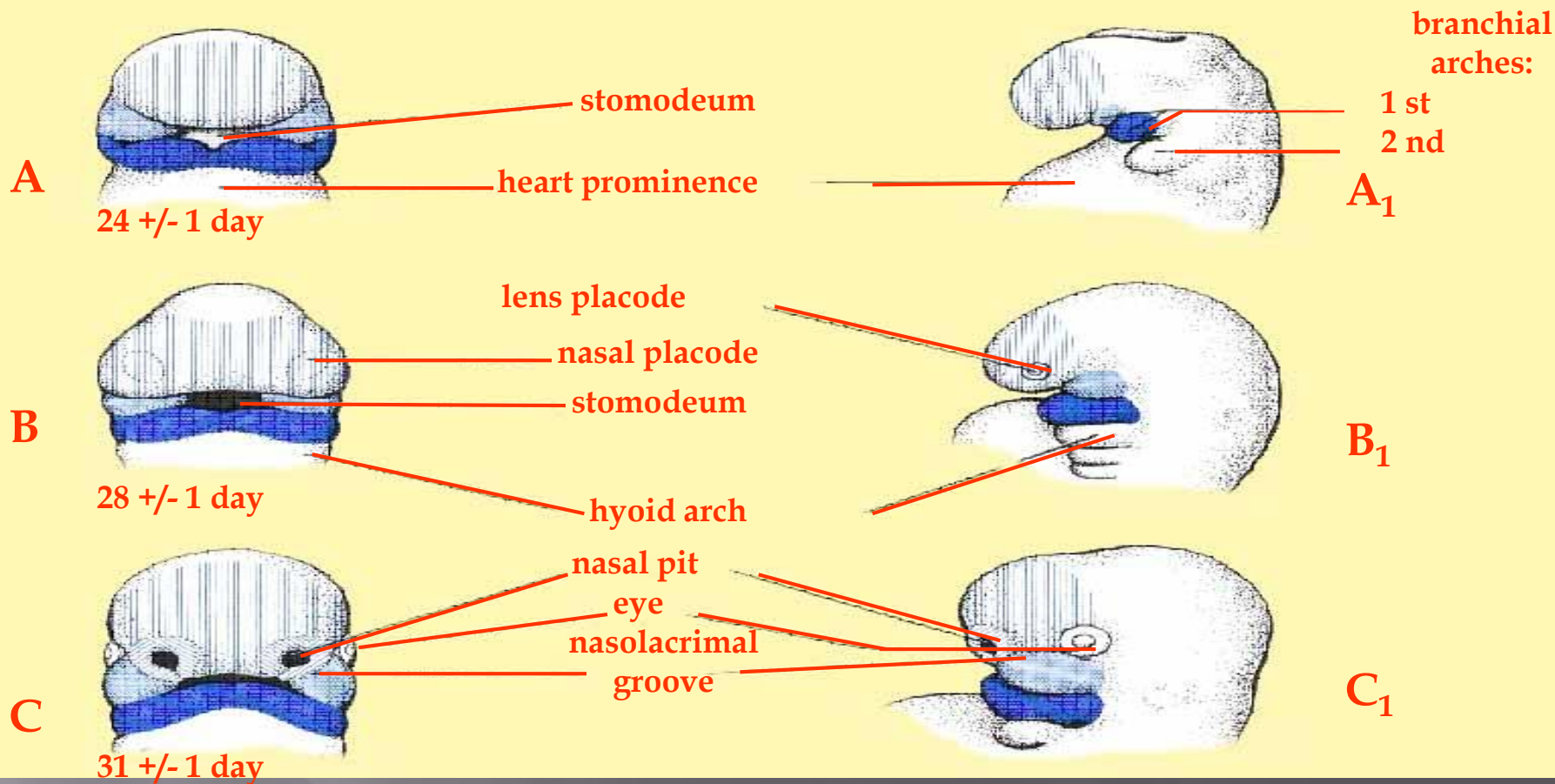


# Development of Nose

 frontonasal prominence

 maxillary prominence

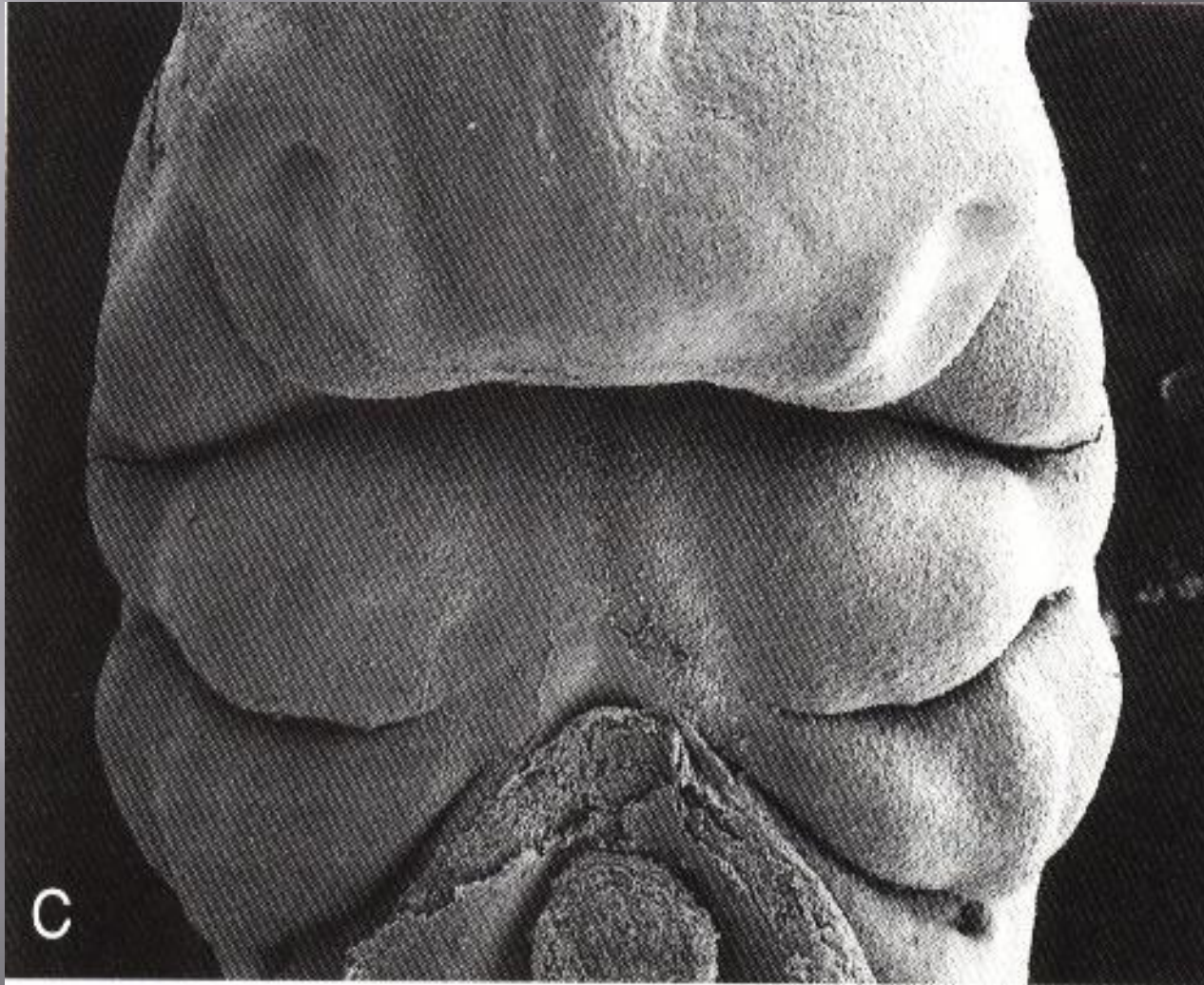
 mandibular prominence



B – on both sides of frontonasal prominence nasal (olfactory) placodes originate under inductive influence of the forebrain,

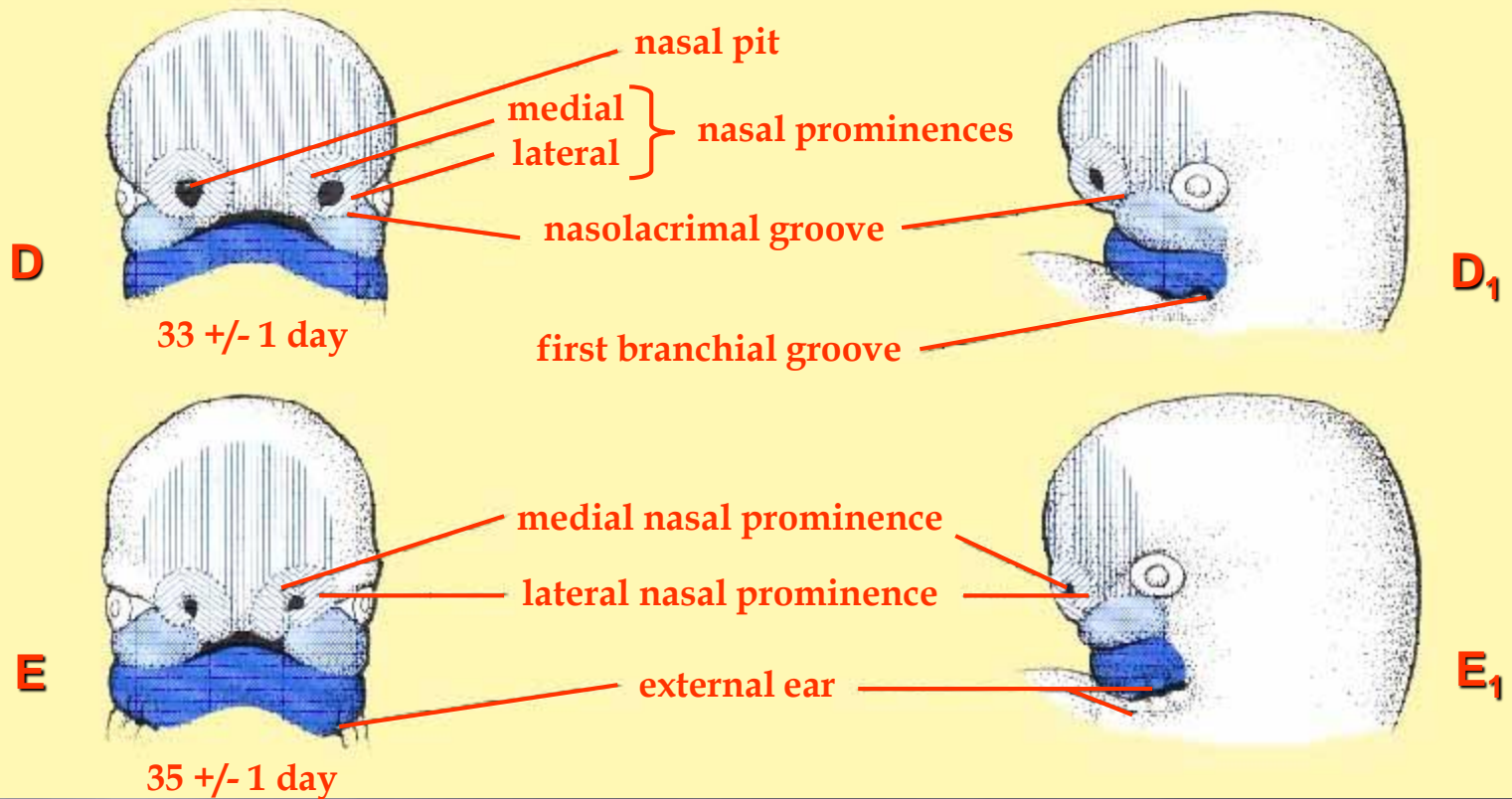
C – during 5<sup>th</sup> week they invaginate to form nasal pits.

## Development of Face in Human Embryo



Frontal view of a 4  $\frac{1}{2}$ -week old embryo. Nasal placodes are visible on either side of the frontonasal prominence.

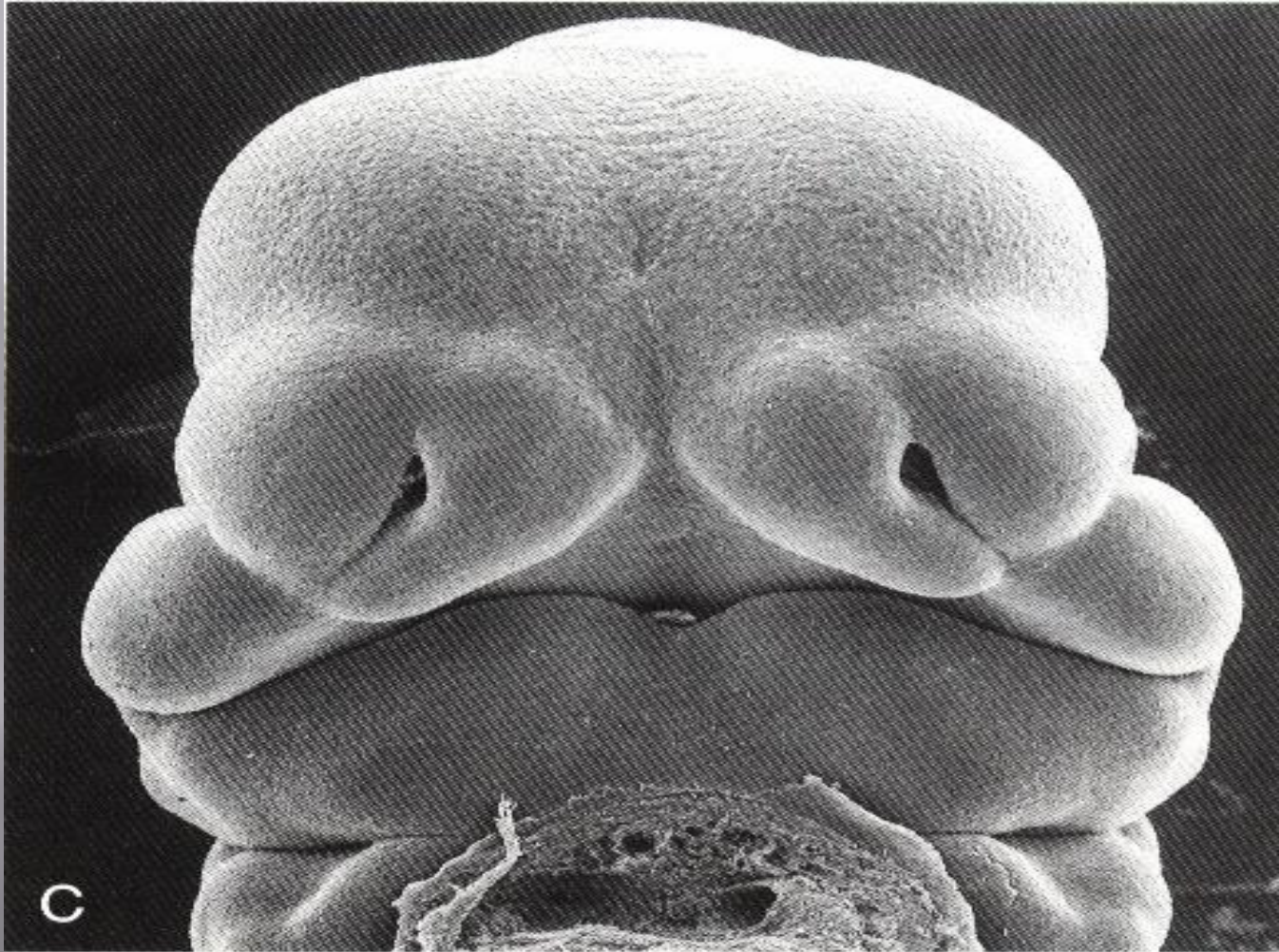
# DEVELOPMENT OF NOSE



D - a ridge of tissue around each nasal pit forms nasal prominences: medial and lateral. Lateral nasal and maxillary prominences are separated by nasolacrimal groove. After detachment of the cord forming naso-lacrimal duct, from the floor of the groove, the maxillary and lateral nasal prominences merge.

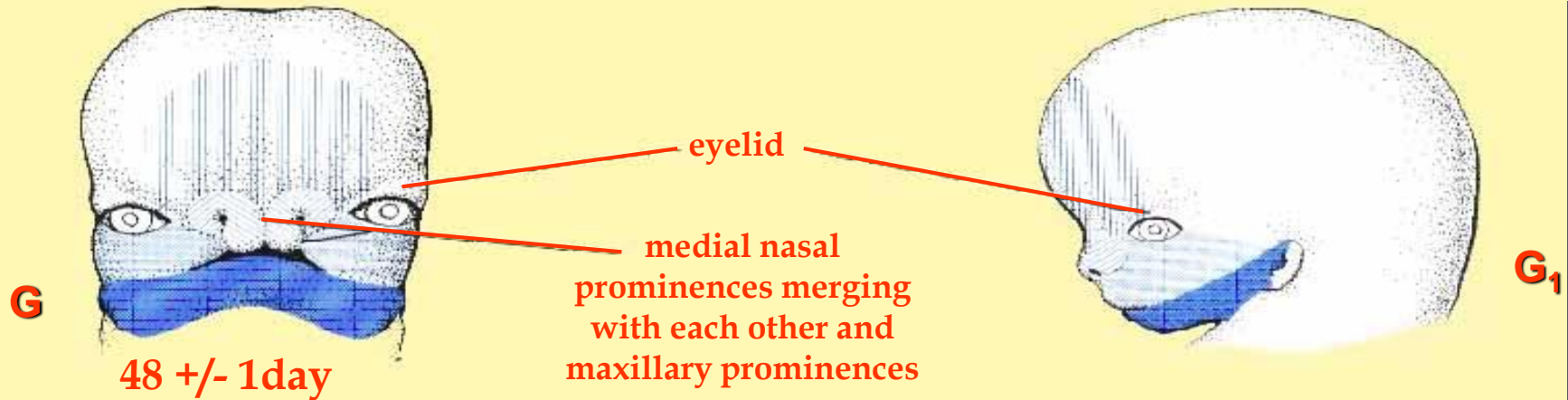
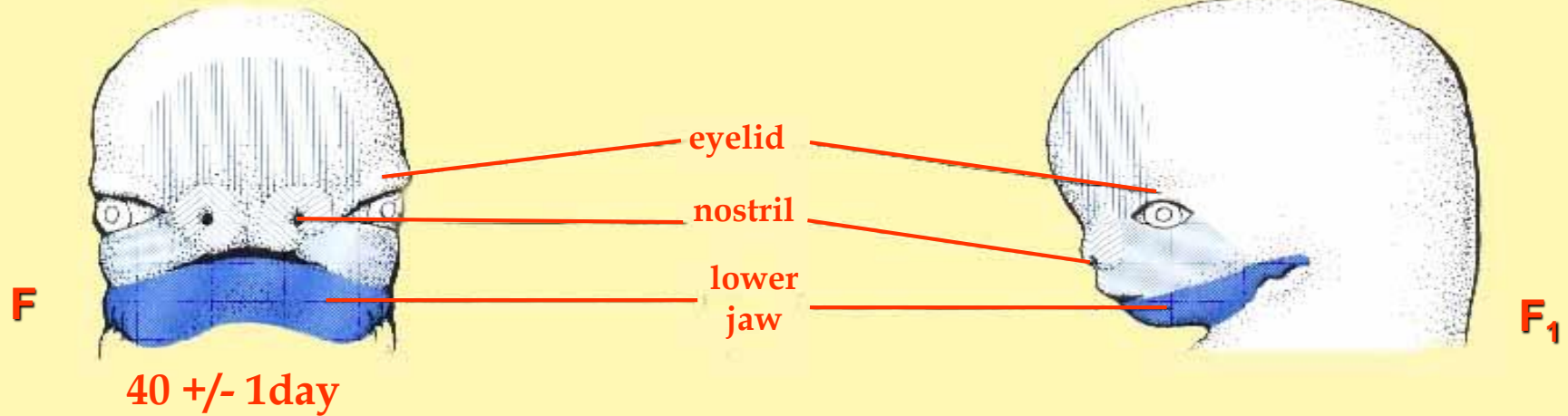
E - nasal pits are still two separate plates, but they rotate to face ventrally as head widens.

## Development of Face in Human Embryo



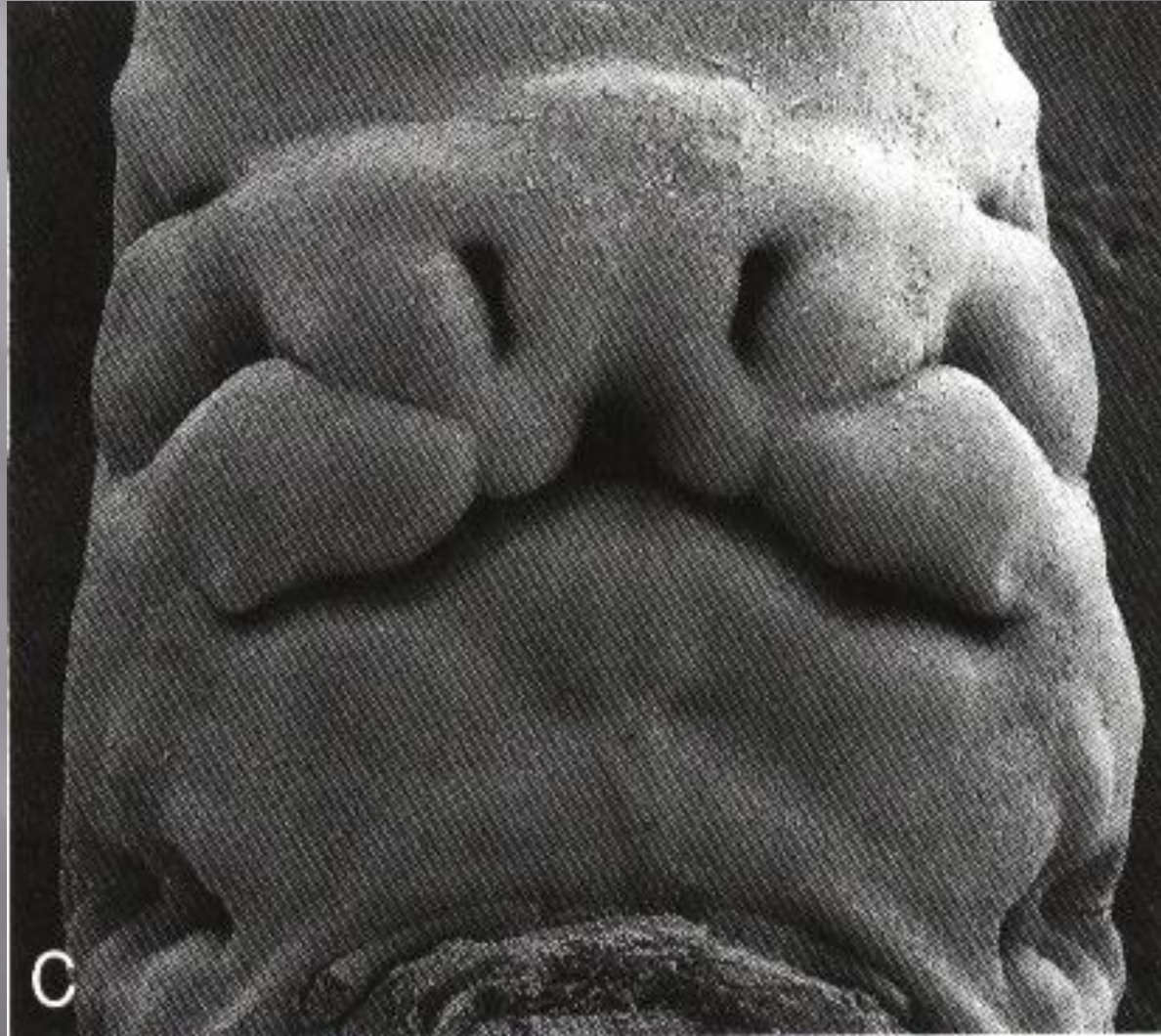
Frontal view of a 6-week old embryo. Nasal prominences are separated from the maxillary prominence by deep furrows.

# Development of Nose



In weeks 5-8 the maxillary prominences increase in size, and the medial nasal prominences move medially and merge to form the intermaxillary segment which includes nasal septum. As a result of medial growth of maxillary prominences the two medial nasal prominences merge not only at a surface but also at deeper level.

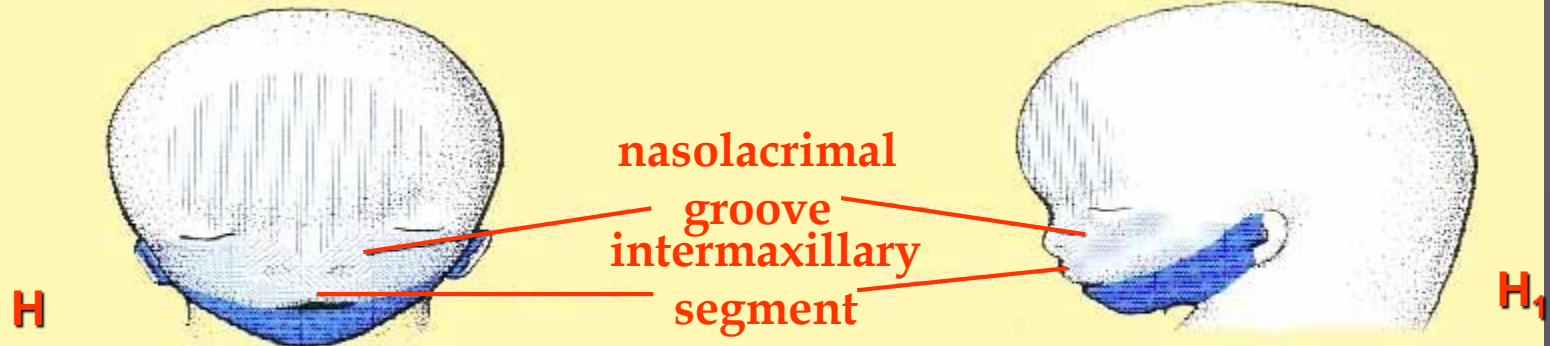
# Development of Face in Human Embryo



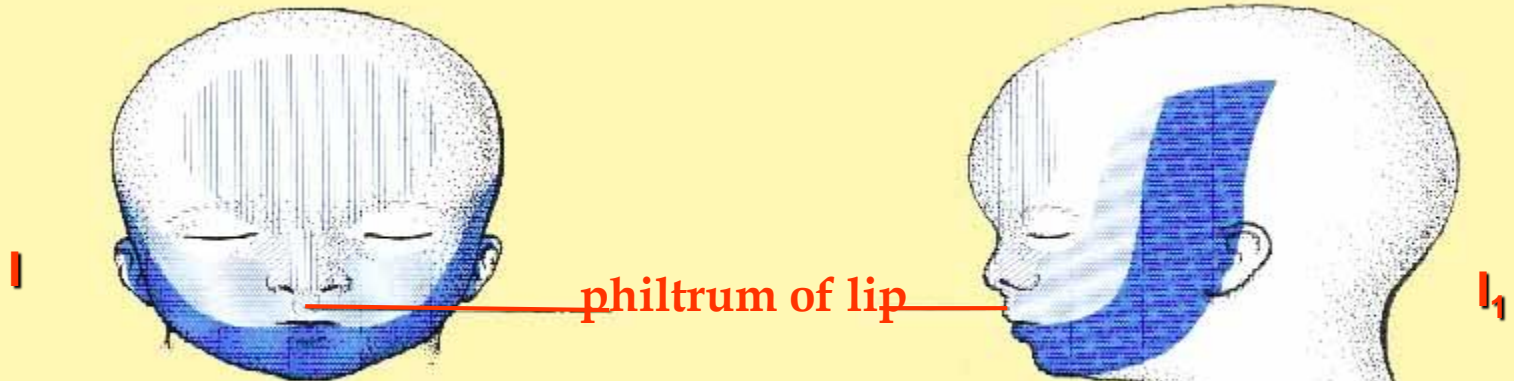
Frontal view of a 7-week old embryo. Maxillary prominences have fused with the medial nasal prominence.



# DEVELOPMENT OF NOSE



10 weeks



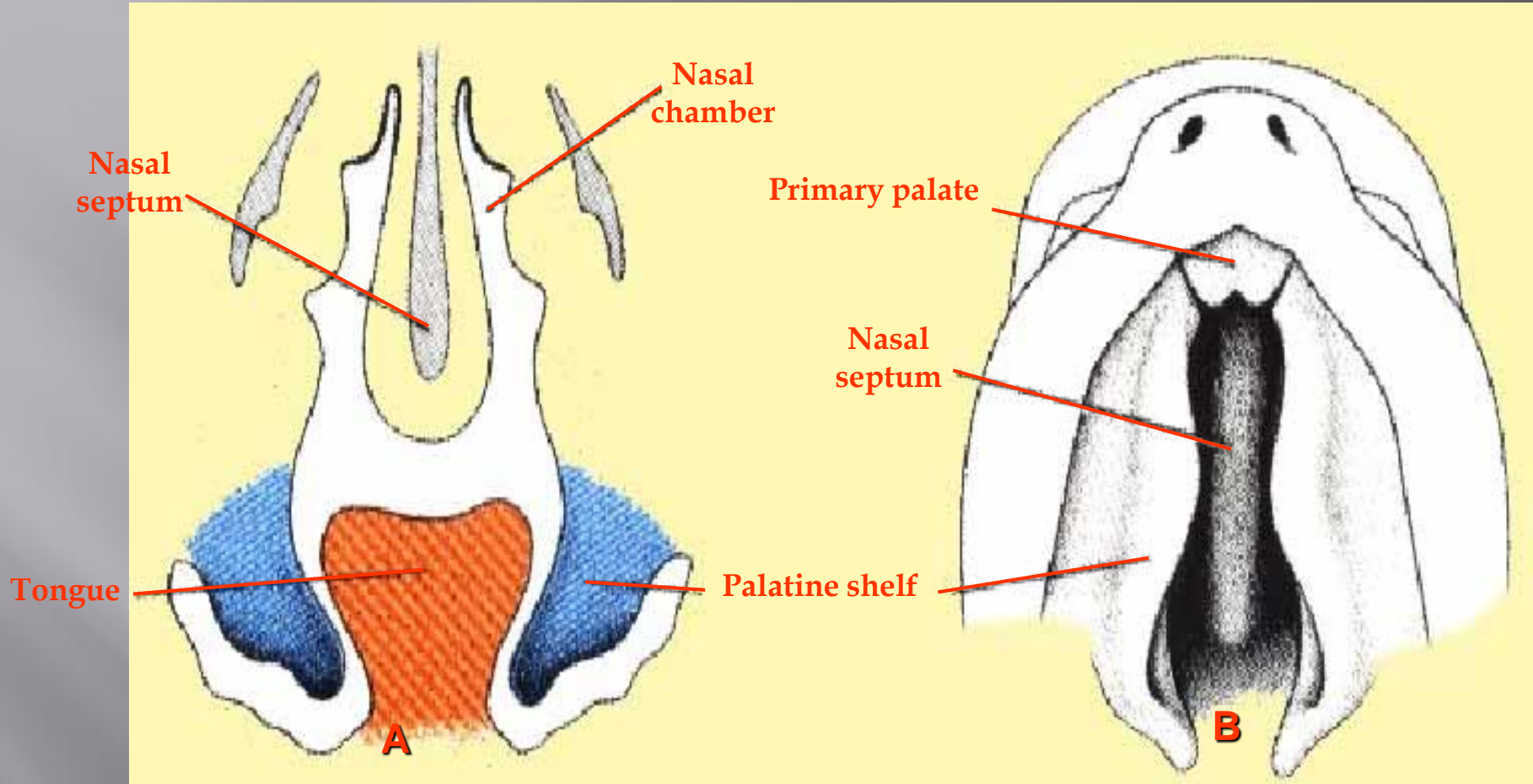
14 weeks

Nose is formed from the 5 facial prominences: the frontal prominence gives rise to the bridge, the merged medial nasal prominences provide crest and tip, the lateral nasal prominences form the sides (alae).

# DEVELOPMENT OF PALATE

- Formation of the palate is one of the last major morphogenetic events to occur (Week 5-12) in embryo and fetus.
- Secondary palate develops after the lateral palatine processes (shelves) fuse with each other and nasal septum.
- It originates from the three primordia - the median palatine process (primary palate) and the two lateral palatine processes.

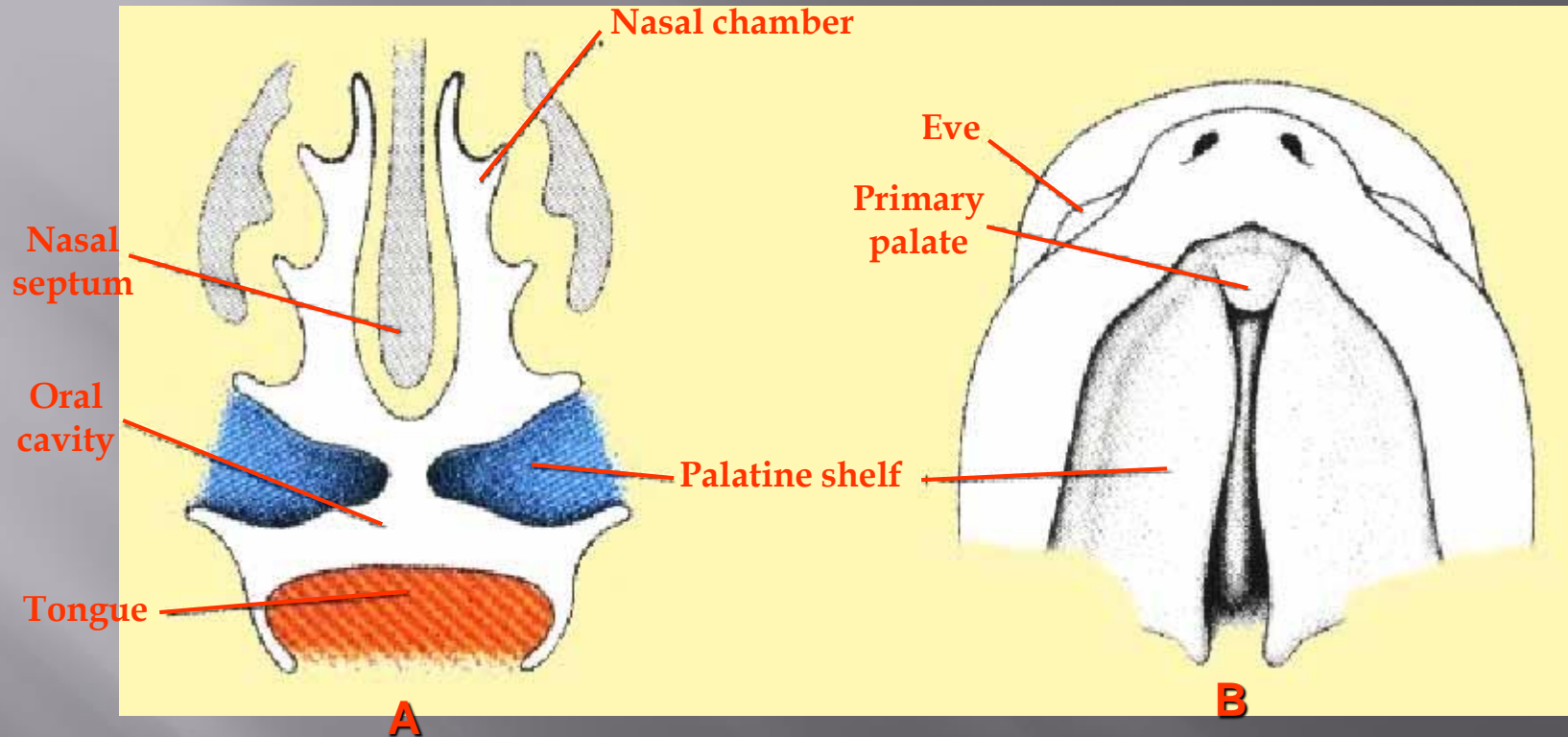
# Development of Secondary Palate



A - in 6-week embryo the two lateral outgrowths appear at the maxillary prominence. They are directed obliquely downward on each side of the tongue.

B - cleft between the primary palate and the palatine shelves.

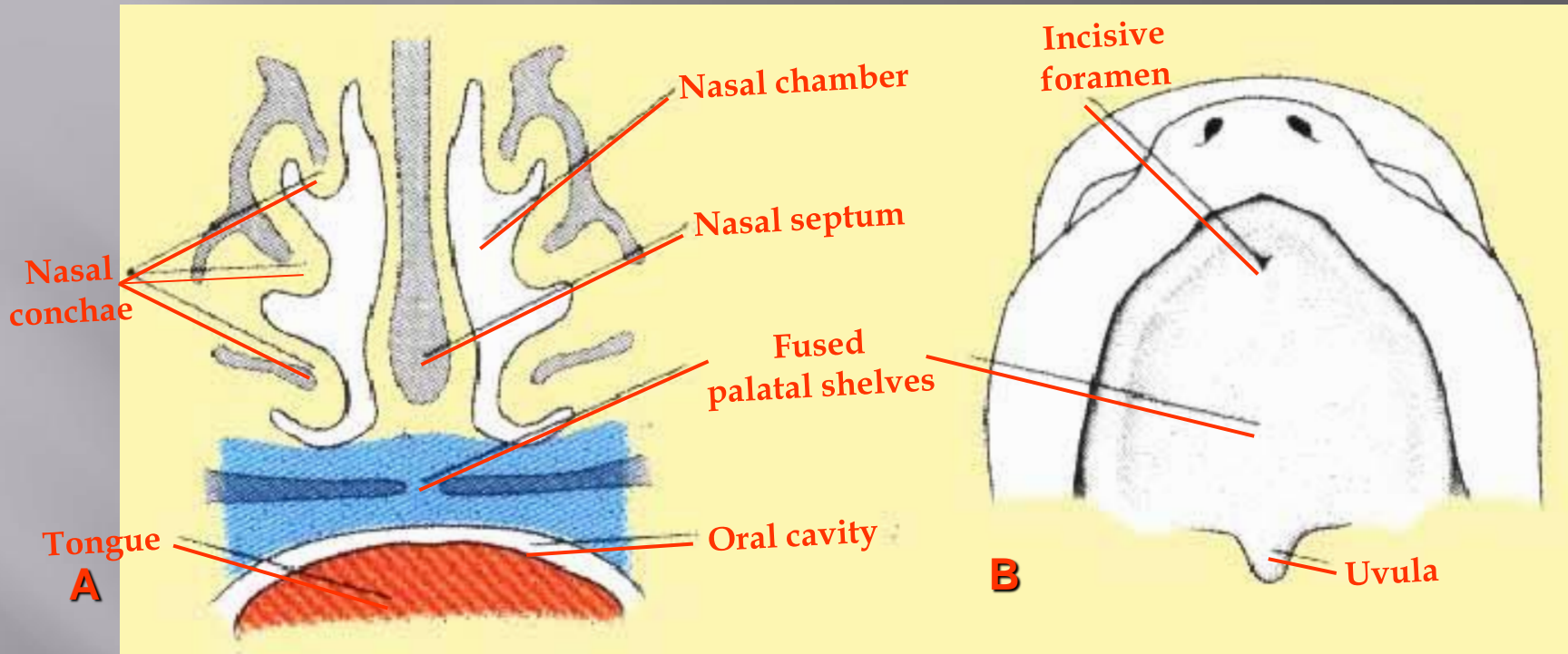
# Development of Secondary Palate



A - in the 7  $\frac{1}{2}$  week embryo the palatine shelves ascend to attain a horizontal position above the tongue and fuse with each other forming the secondary palate.

B - the wedge-shaped median palatine process fuses with lateral palatine processes and the nasal septum.

# Development of Secondary Palate



A - in 10 week embryo the two palatine shelves fuse with each other and with the nasal septum. The superior, middle and inferior conchae develop as elevations on the lateral walls of the nasal cavities.

B - the incisive foramen forms the midline between the primary and secondary palate.

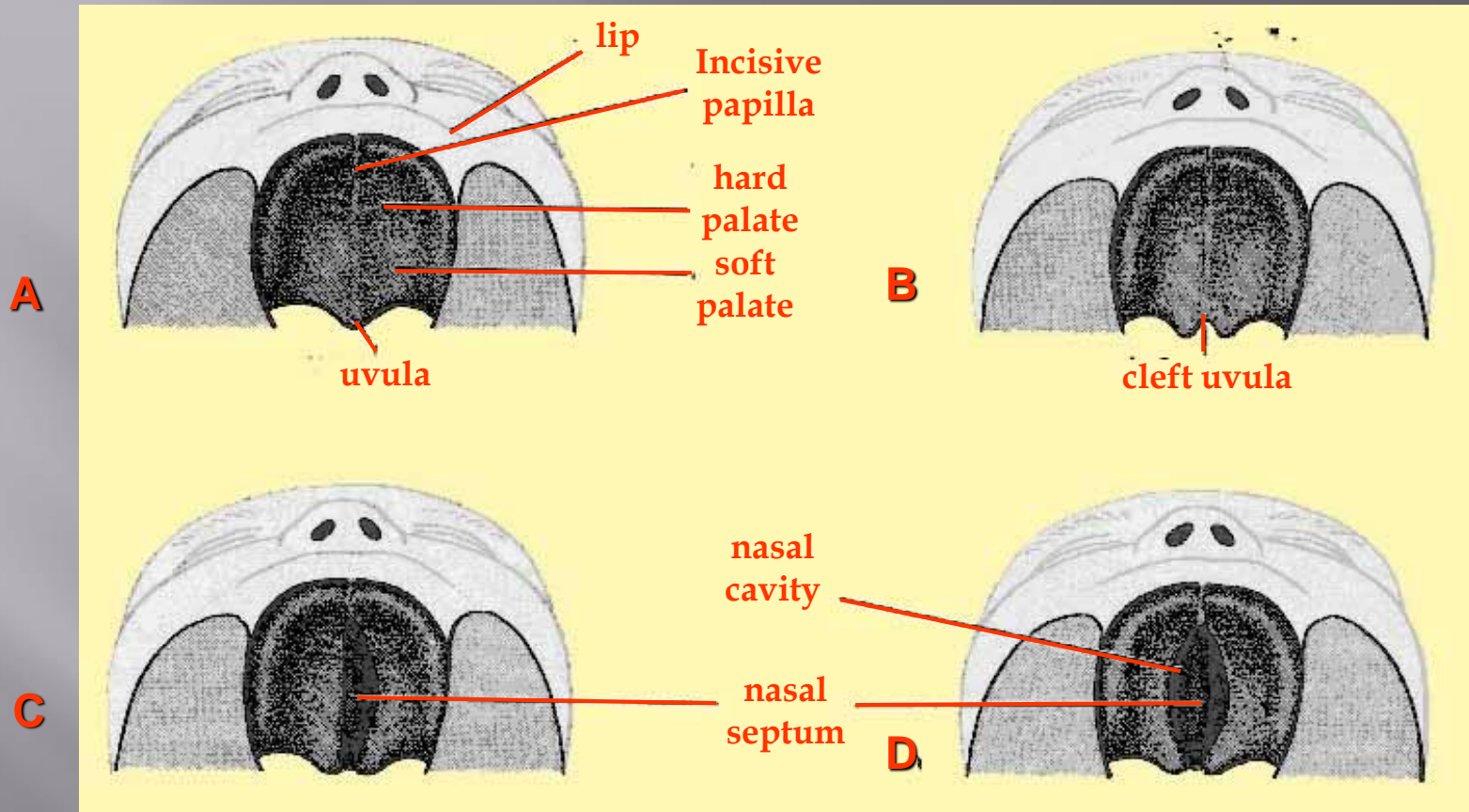
Bone gradually develops in the primary palate, forming the premaxillary part of the maxilla. Bone formation in the anterior portion of the fused lateral palatine processes creates the hard palate.

The palate posterior to the hard palate forms the soft palate and uvula.

# CLINICAL CORRELATES

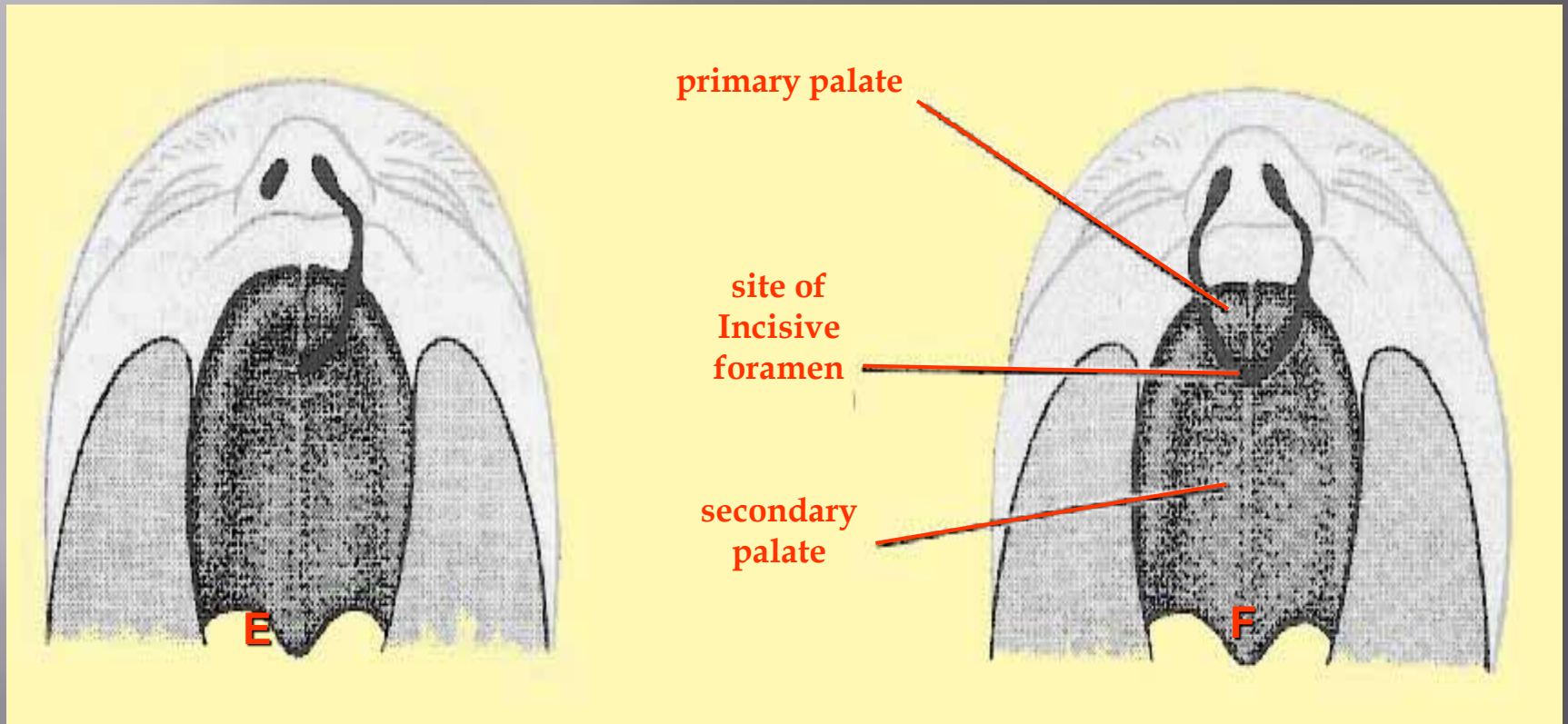
1. Congenital anomalies of face and palate are common due to the complicated course of development of the region.
2. They result from arrest of development and/or a failure of fusion of the prominences and processes involved.
3. Cleft lip and cleft palate occurring together or separately are the most common defects of the face.
4. They may occur as a result of either genetic inheritance or environmental factors.
5. Cleft lip refers to the failure of fusion of the hard and/or soft lateral palatine processes with each other and/or nasal septum and/or the median palatine process.
6. Cleft lip occurs when mesenchyme of the intermaxillary segment fails to merge with the maxillary prominence (may be uni- or bilateral, associated with cleft palate or not).

# CLEFT PALATE



- A. normal lip and palate,
- B. cleft uvula (fish tail appearance),
- C. unilateral cleft of the secondary palate: results from failure of mesenchymal masses in the lateral palatine processes to meet with each other and nasal septum,
- D. bilateral cleft of the secondary palate.

# CLEFT LIP AND CLEFT PALATE

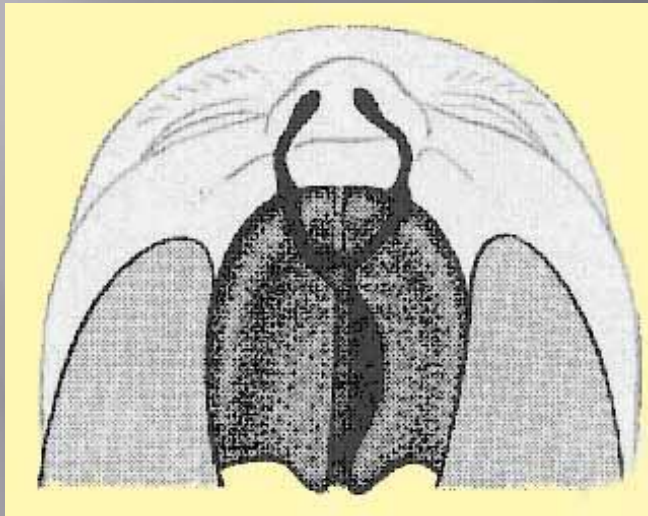


- E. complete unilateral cleft of the lip and alveolar process of the maxilla with unilateral cleft of the anterior palate - results from failure of mesenchymal masses in the palatine shelves to meet and fuse with the mesenchyme in the primary palate,
- F. complete bilateral cleft of the lip and alveolar process of the maxilla with bilateral cleft of the anterior palate.

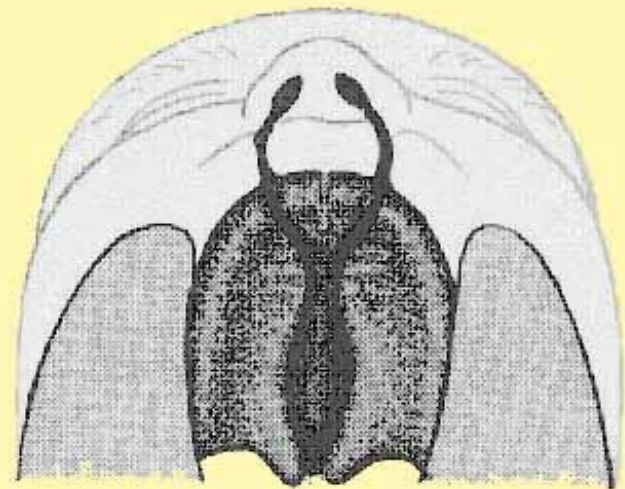


# CLEFT PALATE

G



H



- G. Complete bilateral cleft of the lip and alveolar process of the maxilla with bilateral cleft of the anterior palate and unilateral cleft of the posterior palate - results from failure of mesenchymal masses in the palatine shelves to meet and fuse with the mesenchyme in the primary palate, with each other, and with the nasal septum,
- H. Complete bilateral cleft of the lip and alveolar process of the maxilla with complete bilateral cleft of the anterior and posterior palate.

# CAUSES OF CLEFT LIP AND PALATE

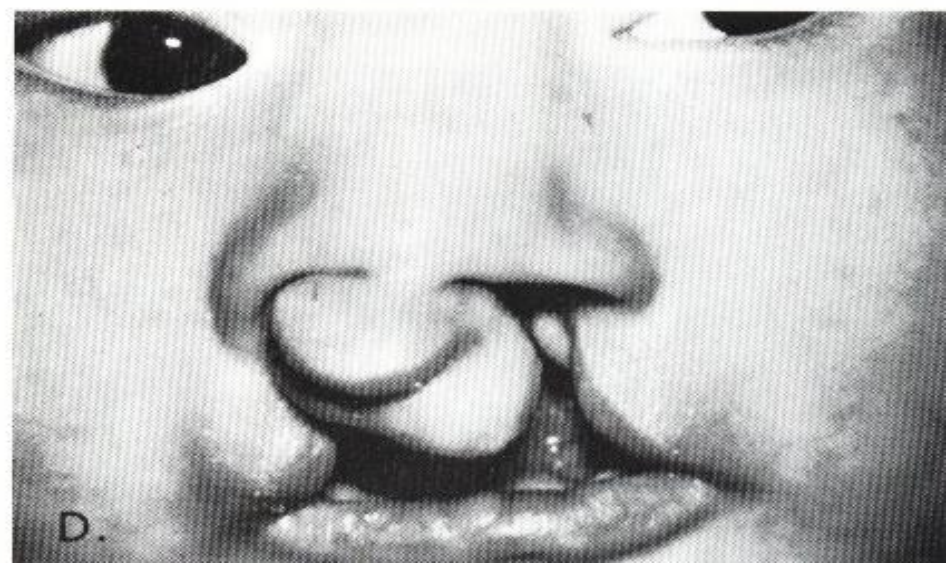
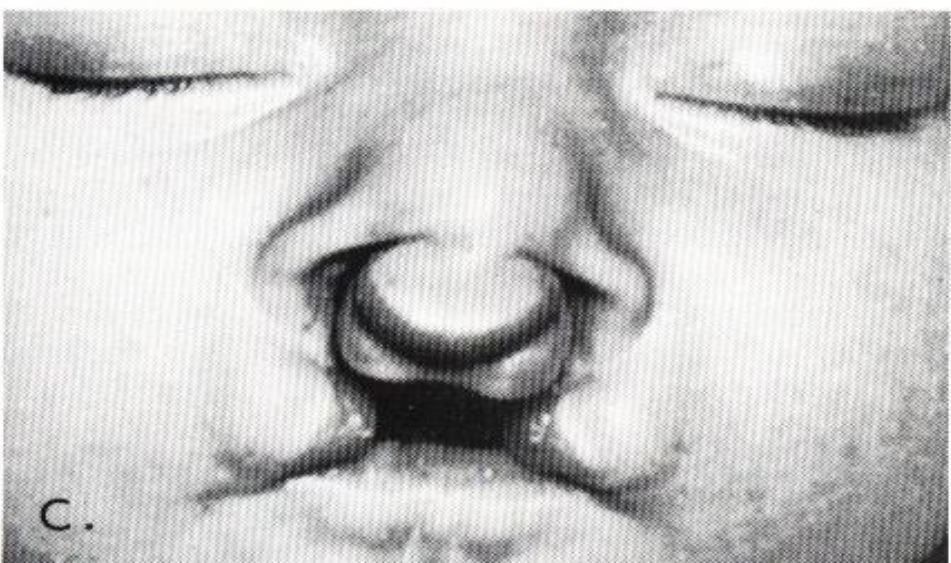
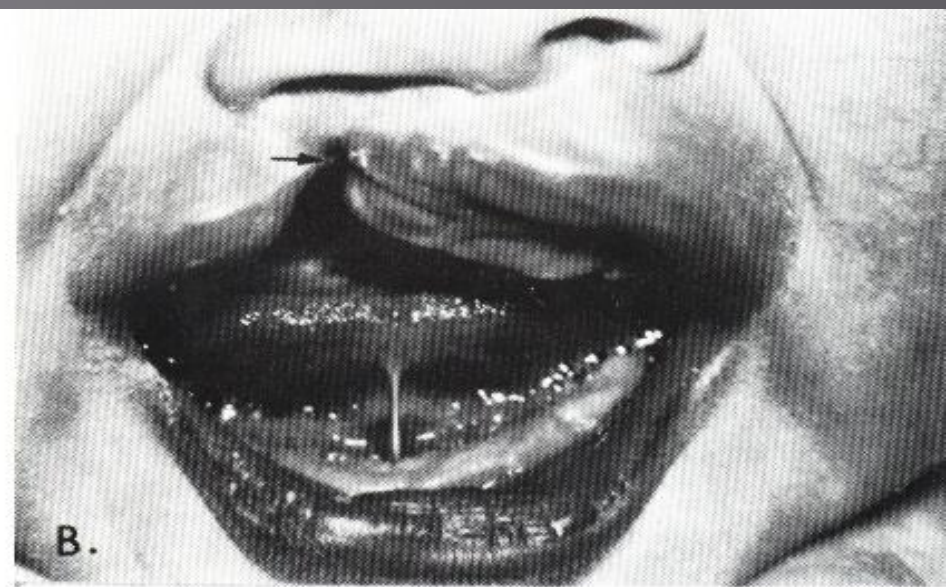
-Most cases of facial clefts are the result of the multiple factors, genetic and non-genetic, each causing a minor developmental disturbances.

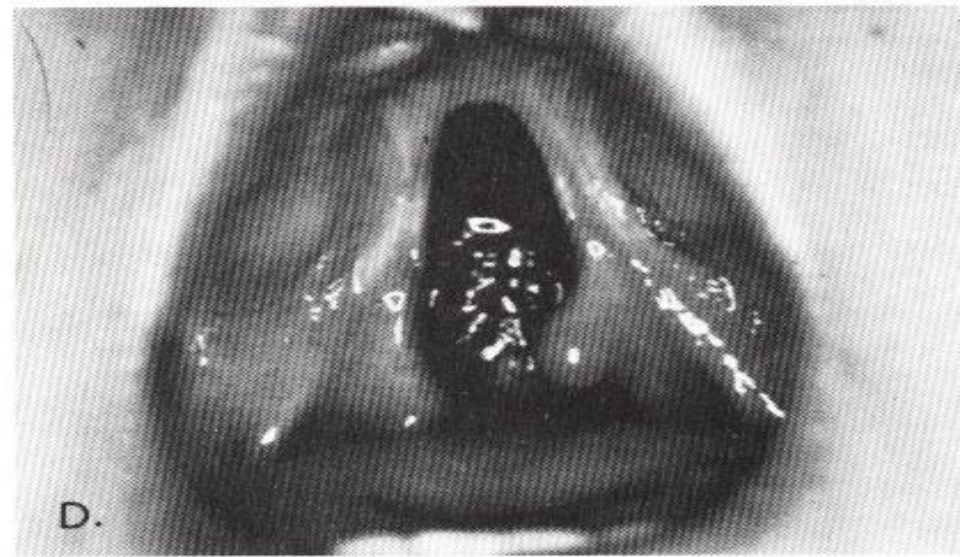
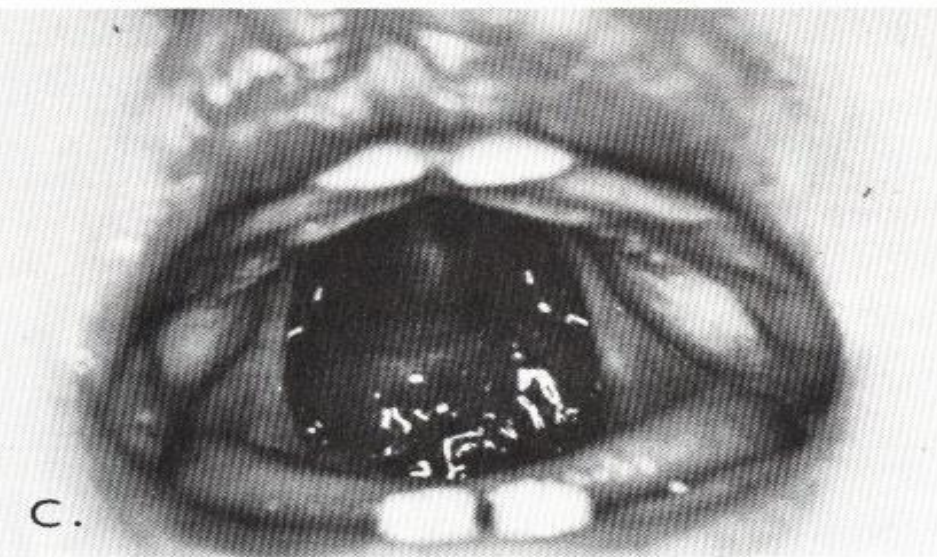
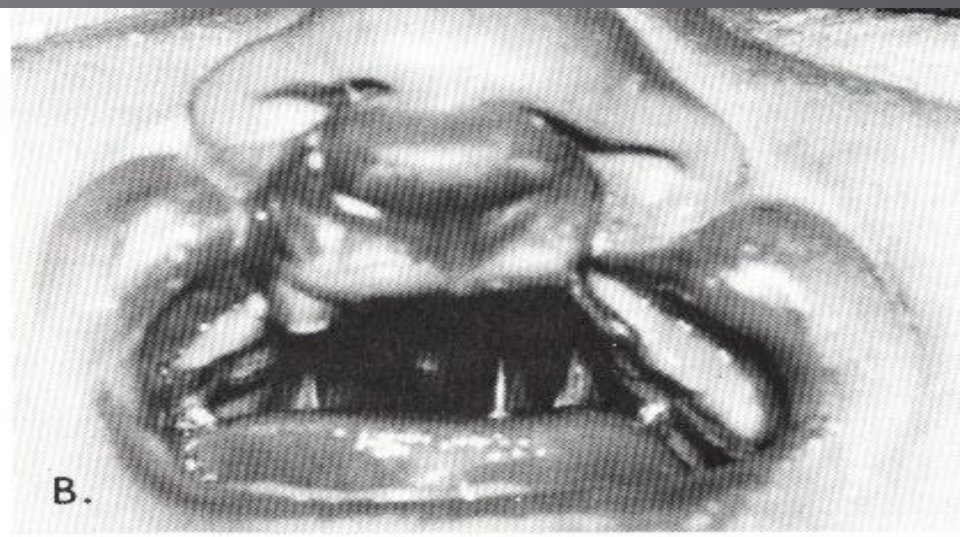
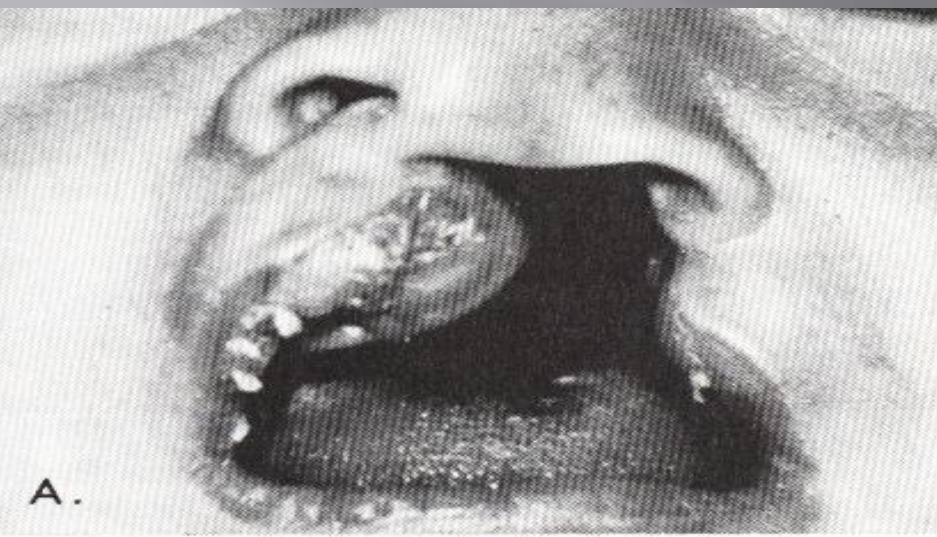
-This is called multifactorial inheritance.

-Some clefts appear as a part of syndromes determined by single mutant genes, other clefts are parts of chromosomal syndromes, such as trisomy 13.

-A few cases appear to have been caused by teratogenic agents (e.g., anticonvulsant drugs).

-Vitamin B given to pregnant women who are at risk for cleft palate, might decrease the occurrence of facial clefting in the offspring.

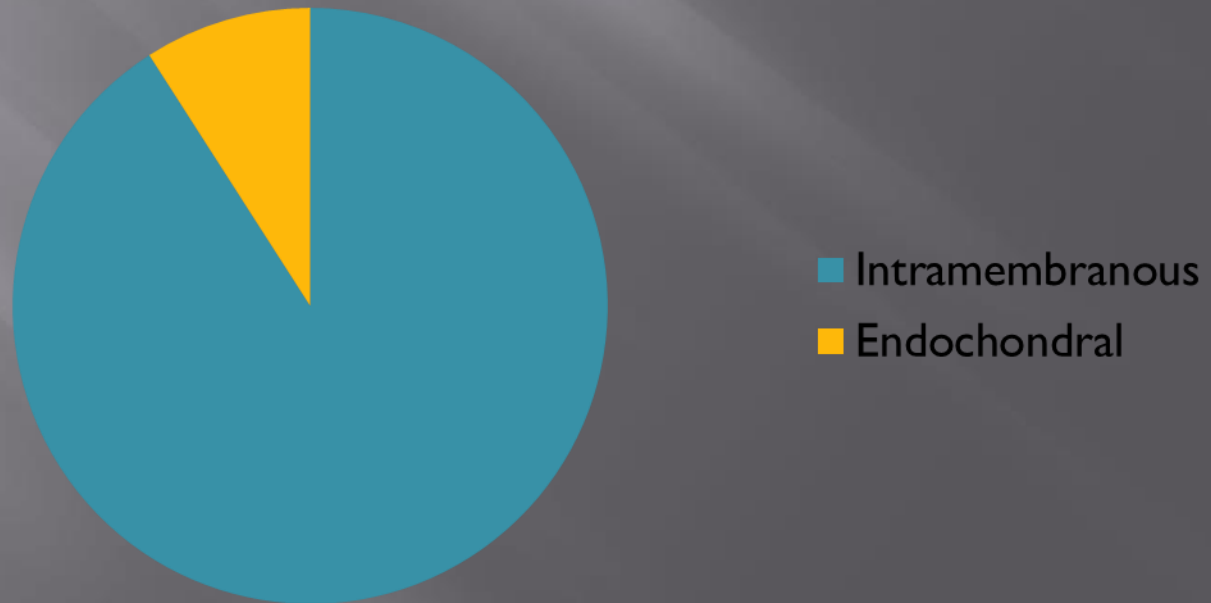


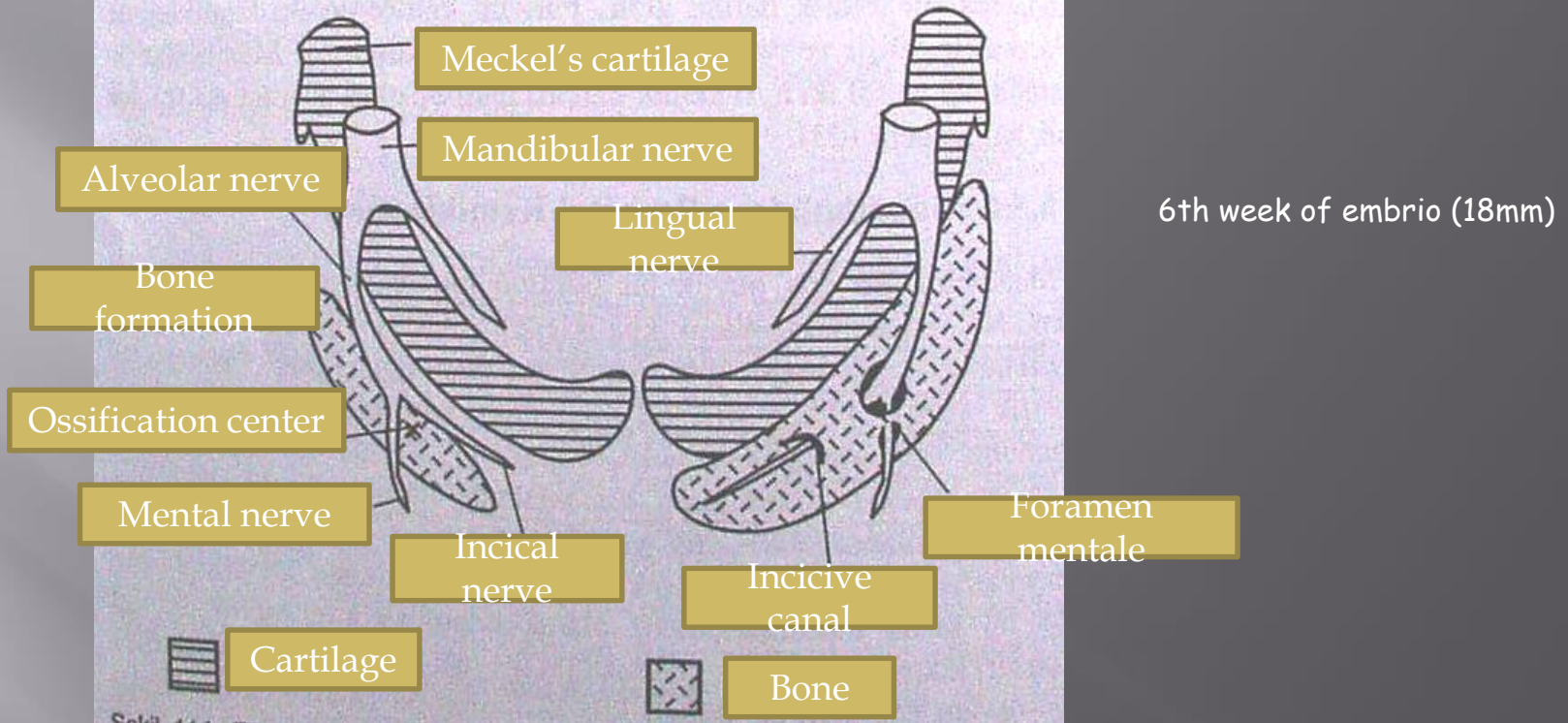


# DEVELOPMENT OF MANDIBULA

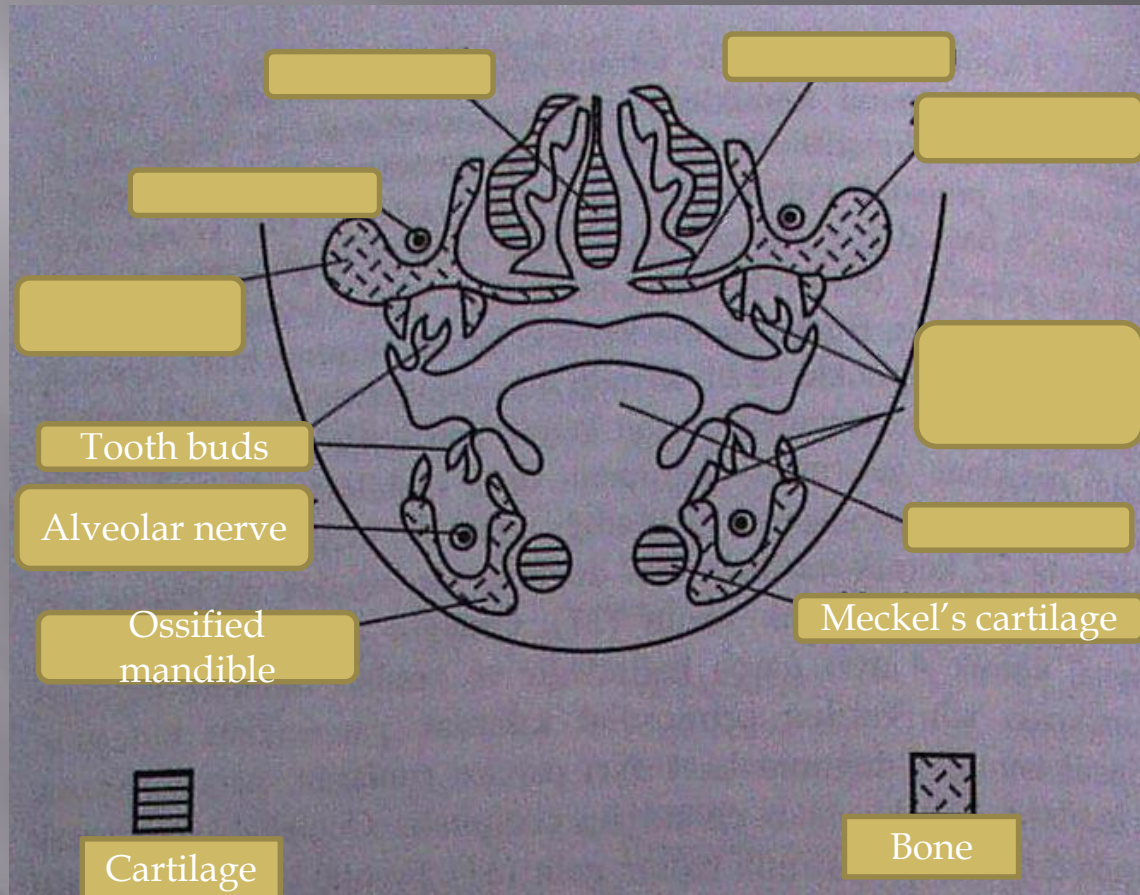
- ▣ The mandible is ossified in the fibrous membrane covering the outer surfaces of **Meckel's cartilages**.

- The great part of the mandible, ossifies as **intramembranous** and a small portion ossifies as the **endochondral**.





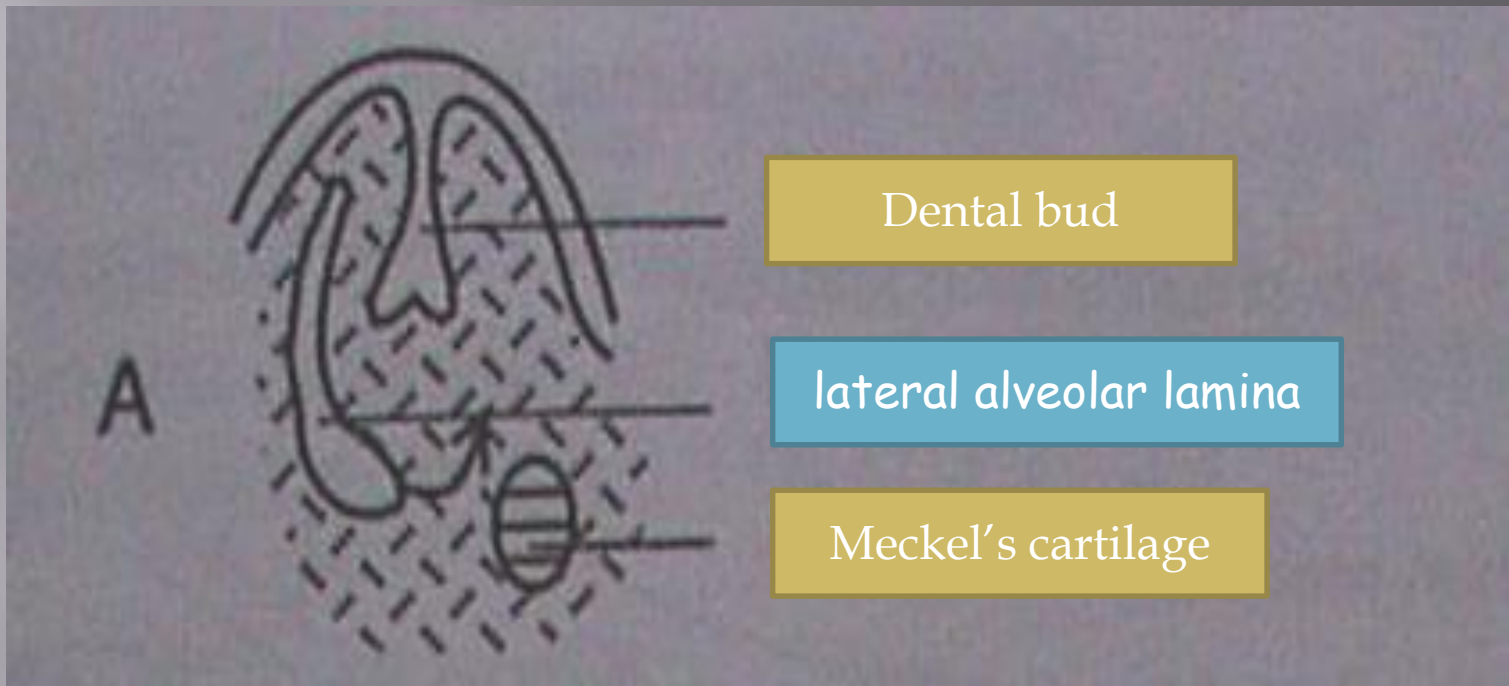
- ▣ Meckel's cartilage of the mandible, supports the formation by creating a guidance such as a walking stick.



6th week of embryo (18mm)



# Development of the teeth in the prenatal period

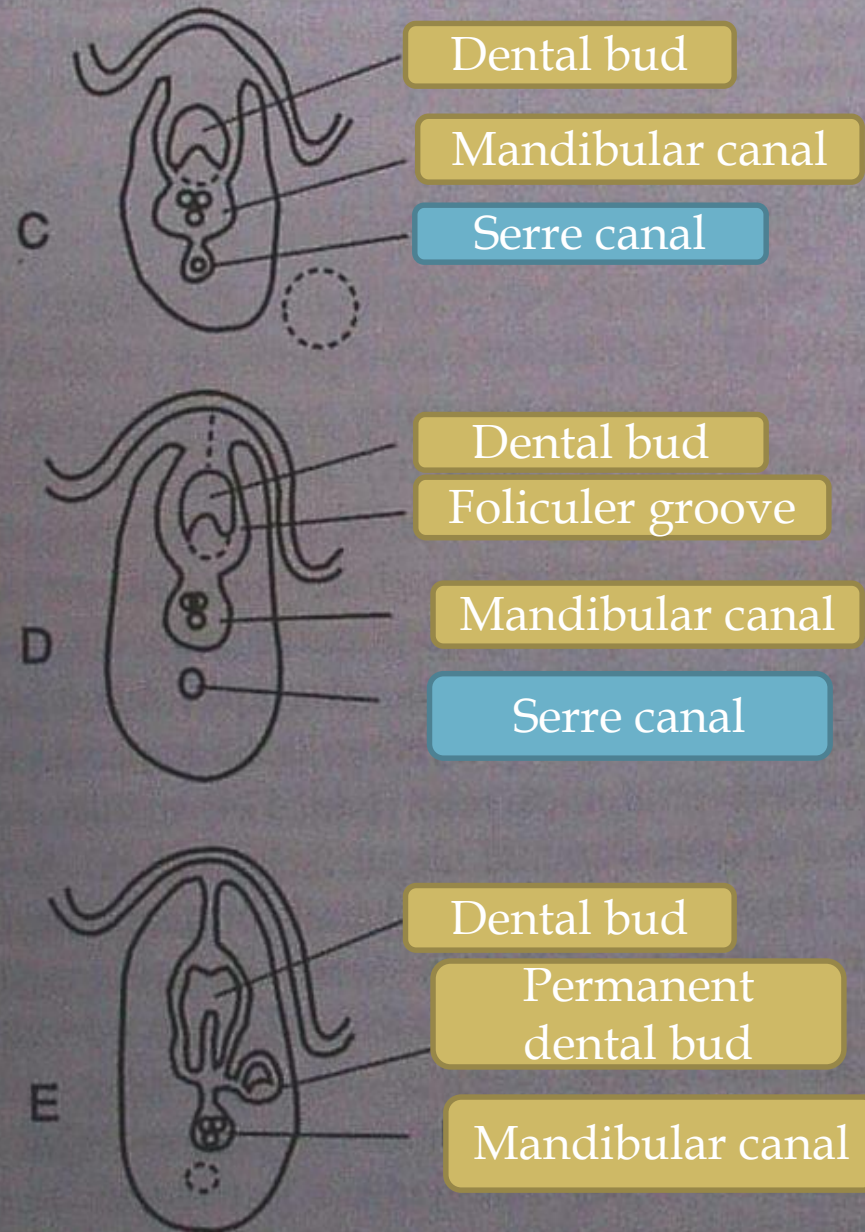


- By the seventh week, the epithelial labial lamina becomes apparent along the perimeter of the maxillary and mandibular processes. This wedge of epithelial cells penetrates the underlying connective tissue to separate the tissue of the future alveolar ridge from the lip.
- At the same time, a second lamina, lingual to the labial lamina, which, at regular intervals, will give rise to the epithelial enamel organs.

▣ These organs, along with adjacent dental papillae of connective tissue origin, rapidly differentiate to form the enamel and dentin of the teeth.

▣ As the developing crowns enlarge and the roots elongate, the jaws increase in anterior and lateral dimension, as well as height, to provide space for the teeth and growing alveolar processes.

### Ossification of the corpus mandibularis



# The fetal period

- ▣ By the third month, the face assumes a more human appearance the eyes are now directed forward and the eyelids have grown together and are fused.
- ▣ The head is erect and the bridge of the nose becomes somewhat more prominent.
- ▣ As the face grows downward and forward, the ears appear on a horizontal plane with the eyes instead of at the lower corners of the face, as in the embryonic period.

- ▣ During the fetal period, from the twelfth to the thirty-sixth week, the head increases in length from approximately 18 mm to 120 mm, in width from about 12 mm to 74 mm and in height from 20 mm to 100 mm, thus maintaining a fairly constant ratio of width to length but not to height.
- ▣ In the embryonic period, the cranium to face ratio may be as high as 40:1, dropping at 4 months to 5:1 because of the differentially more rapid facial growth during the period.
- ▣ Postnatal facial growth will reduce the adult ratio to approximately 2:1.

- ▣ At birth, the intervening connective tissue that separates the bones of the cranial vault is still wide.
- ▣ At six sites located at each corner of the parietal bones they form the fontanelles.
- ▣ Synchondroses between the ethmoid, sphenoid and occipital bones are still actively growing at birth.
- ▣ The skull contains 45 separate bones at birth, which will be reduced by fusions and consolidations to 22 in adult.

- ▣ Some of these sutures, such as the midline mandibular suture, disappear shortly after birth.
- ▣ The maxillary midpalatal suture, however, does not close until the sixth to seventh year, although it may be orthopedically activated until the late teens.

