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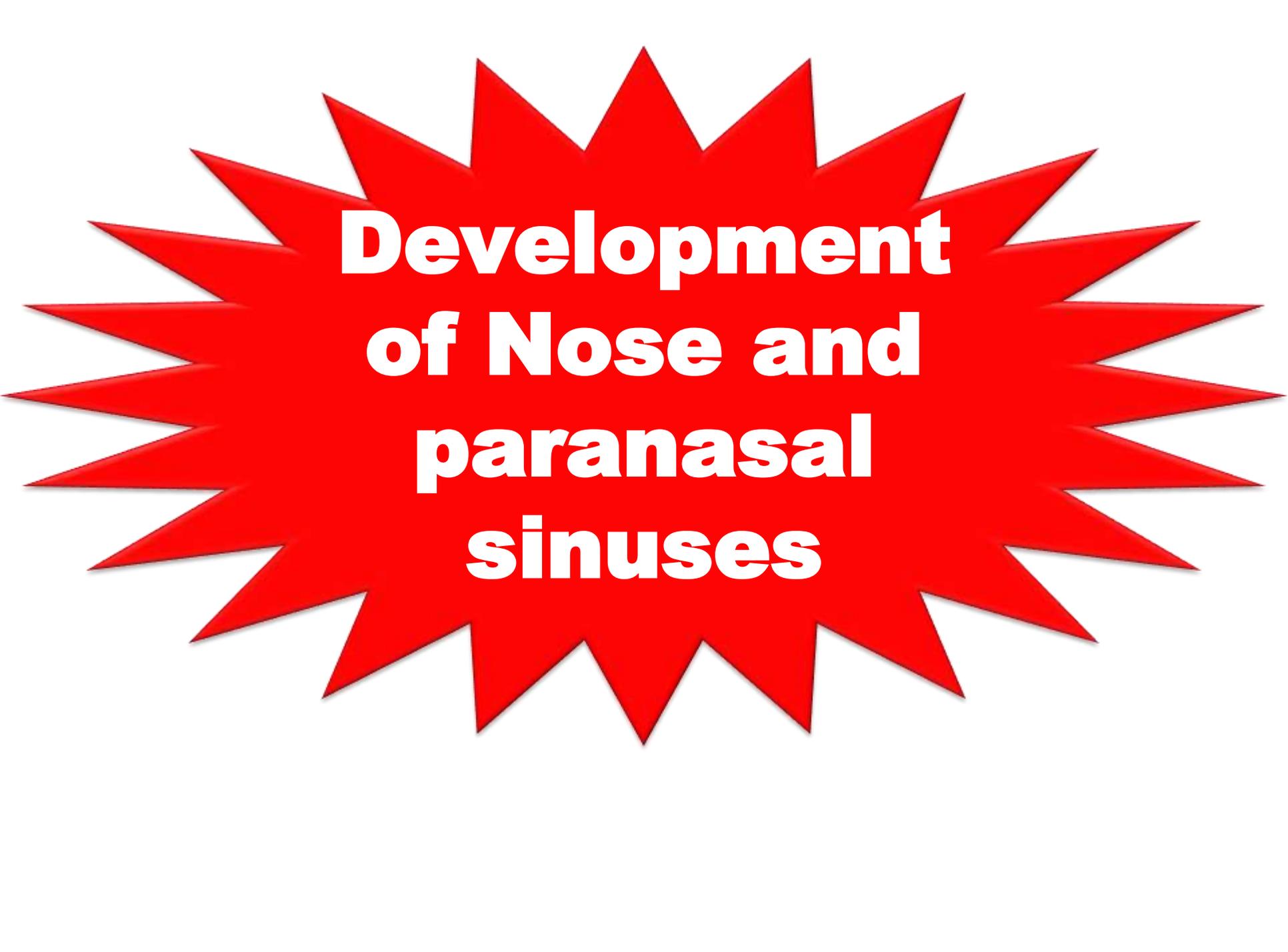


الأستاذ الدكتور / يوسف حسين

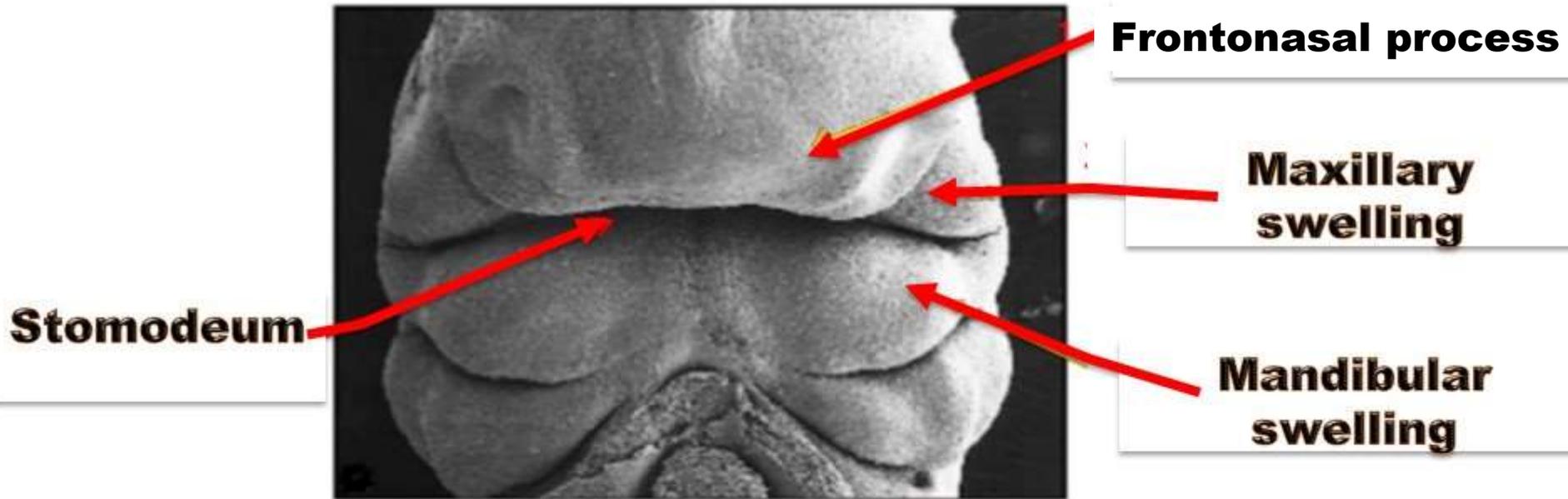
أستاذ التشريح وعلم الأجنة - كلية الطب - جامعة الزقازيق - مصر

رئيس قسم التشريح و الأنسجة و الأجنة - كلية الطب - جامعة مؤتة

دكتورة من جامعة كولونيا المانيا
جروب الفيس د. يوسف حسين (استاذ التشريح)

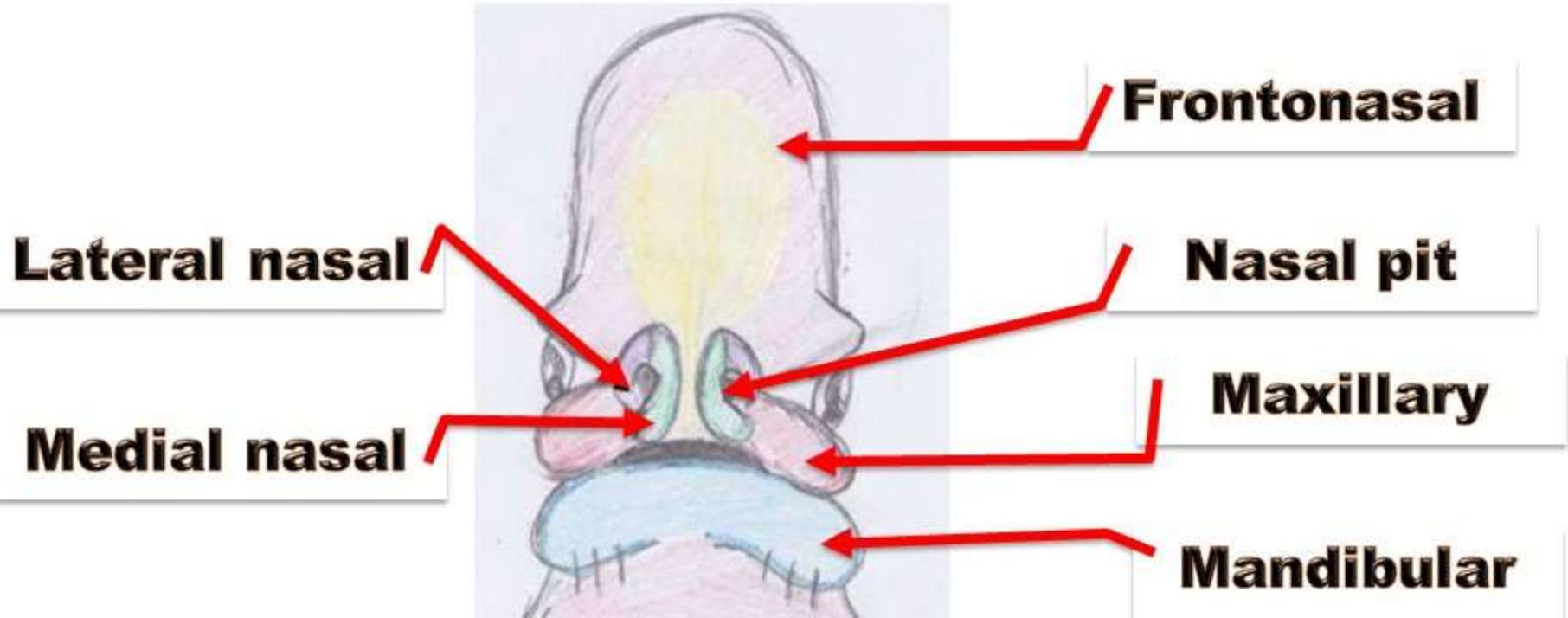
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**Development
of Nose and
paranasal
sinuses**



• DEVELOPMENT OF THE FACE

- The face develops from 5 mesodermal swellings around the **stomodeum** (primitive mouth opening) that closed by oral membrane.
- - **The 5 mesodermal swellings:**
 - I. **Frontonasal process.**
 - II. **2 maxillary swellings** (above and lateral to the stomodeum) from the 1st pharyngeal arch.
 - III. **2 mandibular swellings** (below and lateral to the stomodeum) from the 1st pharyngeal arch.

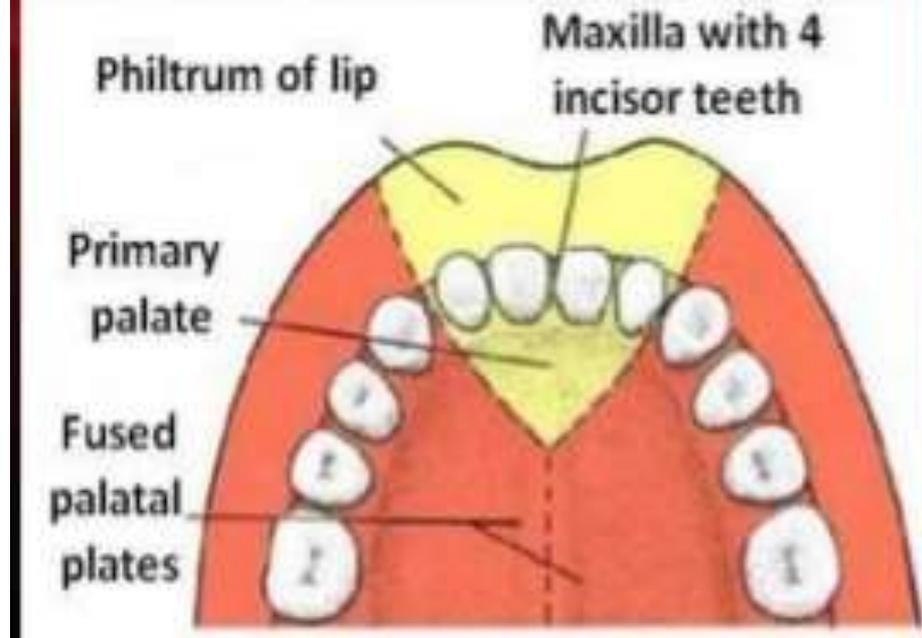


- **** Development of the frontonasal process:**

- **a-** The upper part forms the frontal bone.
- **b-** The lower part forms the nasal process.

- **At the 4th week 2 Nasal placodes (2 ectodermal swellings) develop in the lower border of the nasal process.**
- **- Two nasal pits (nostril) appear in the nasal placode divide the nasal process:**

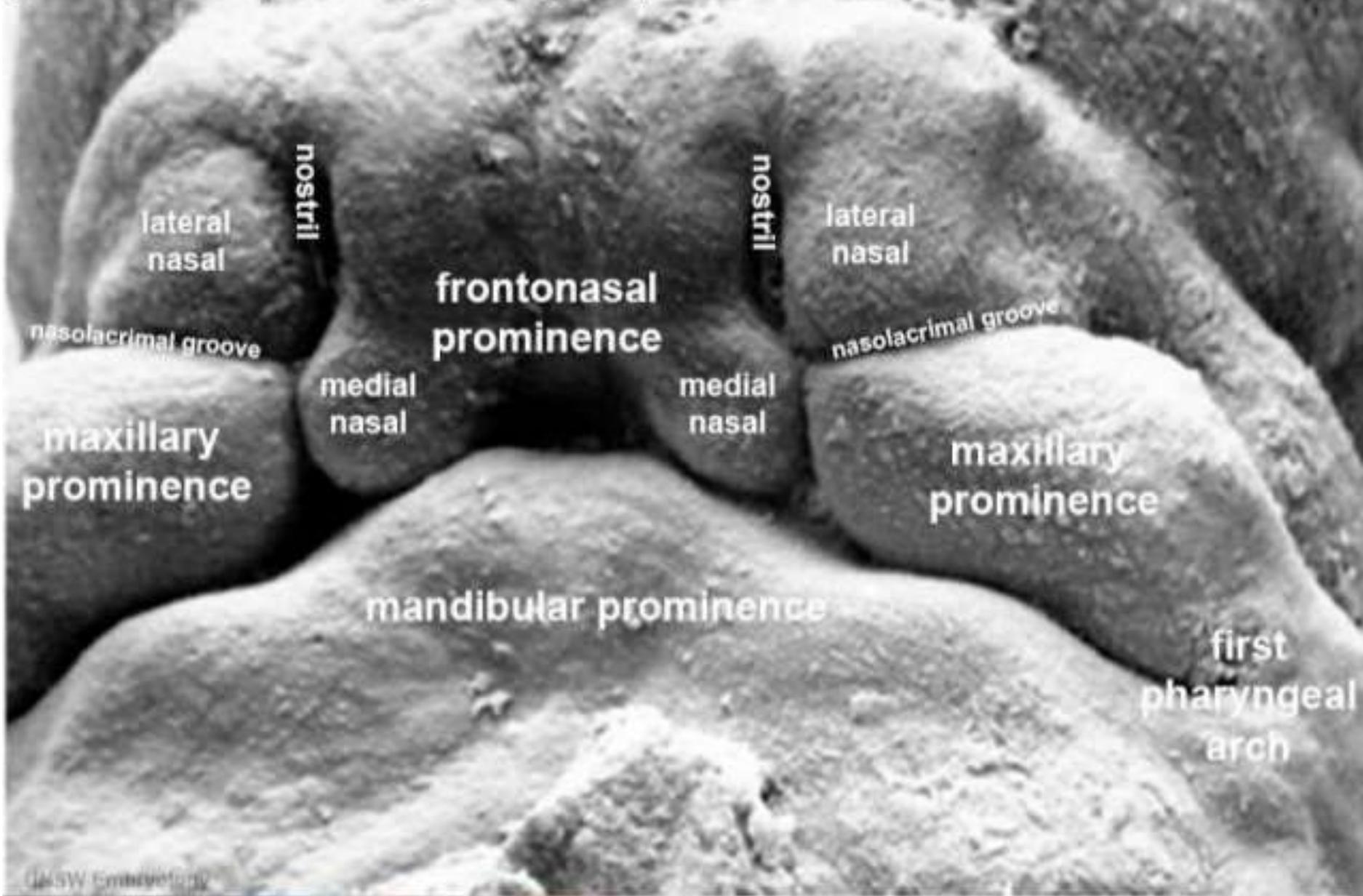
- **a-** Two lateral nasal processes form the ala of the nose.
- **b-** Two medial nasal processes unit with each other in the midline forming **median nasal process**



- **Median nasal process** that gives rise to:
 - 1- Part of the nasal septum.
 - 2- Philtrum (middle) of the upper lip.
 - 3- Premaxilla (upper jaw that carries the 4 incisor teeth).
 - 4- Primary palate.
- At first the primitive nasal cavity is continuous with the mouth cavity.
- Later; the nasal cavity is separated from mouth cavity by **secondary palate** to form the definitive nasal cavity.

Human Embryo Face

(SEM, week 7, Carnegie stage 18)



- The definitive nasal cavity is divided into 2 cavities by a **nasal septum**.
- The **nasal conchae (turbinate's)** developed as bony projections from the lateral wall of the nose.
- The 2 maxillary processes grow medially above the stomodeum towards the lateral nasal processes but separated from them by a well developed ectodermal groove called **nasolacrimal groove**.
- The edges of nasolacrimal groove fused forming a **solid cord**. Later on; canalized and forms the **nasolacrimal canal**.
- The maxillary processes continue to grow medially and **fused with the lateral nasal processes**. Later on; they **fused with the median nasal process** to form upper jaw.



Arhinia (nasal aplasia)
due to bilateral absent
of nasal placodes



Half nose due to
unilateral absent of
nasal placodes



Polyrhinia due to duplication of the medial nasal process



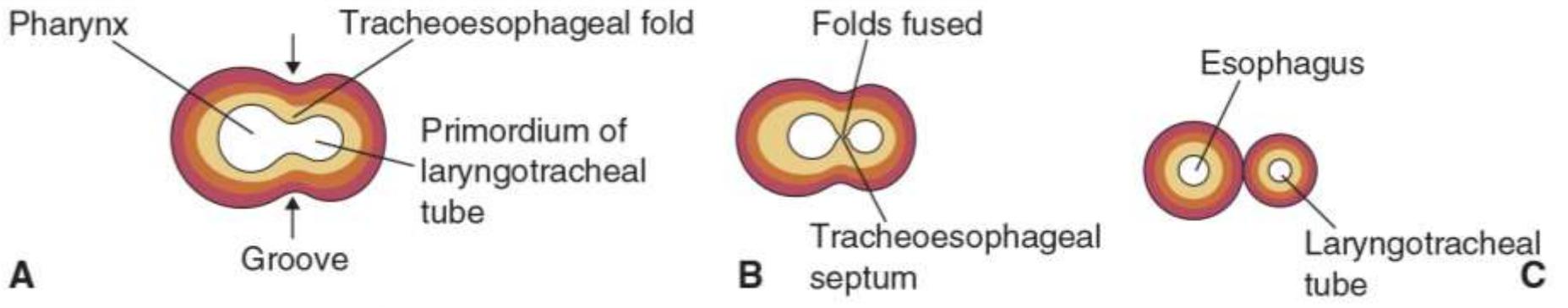
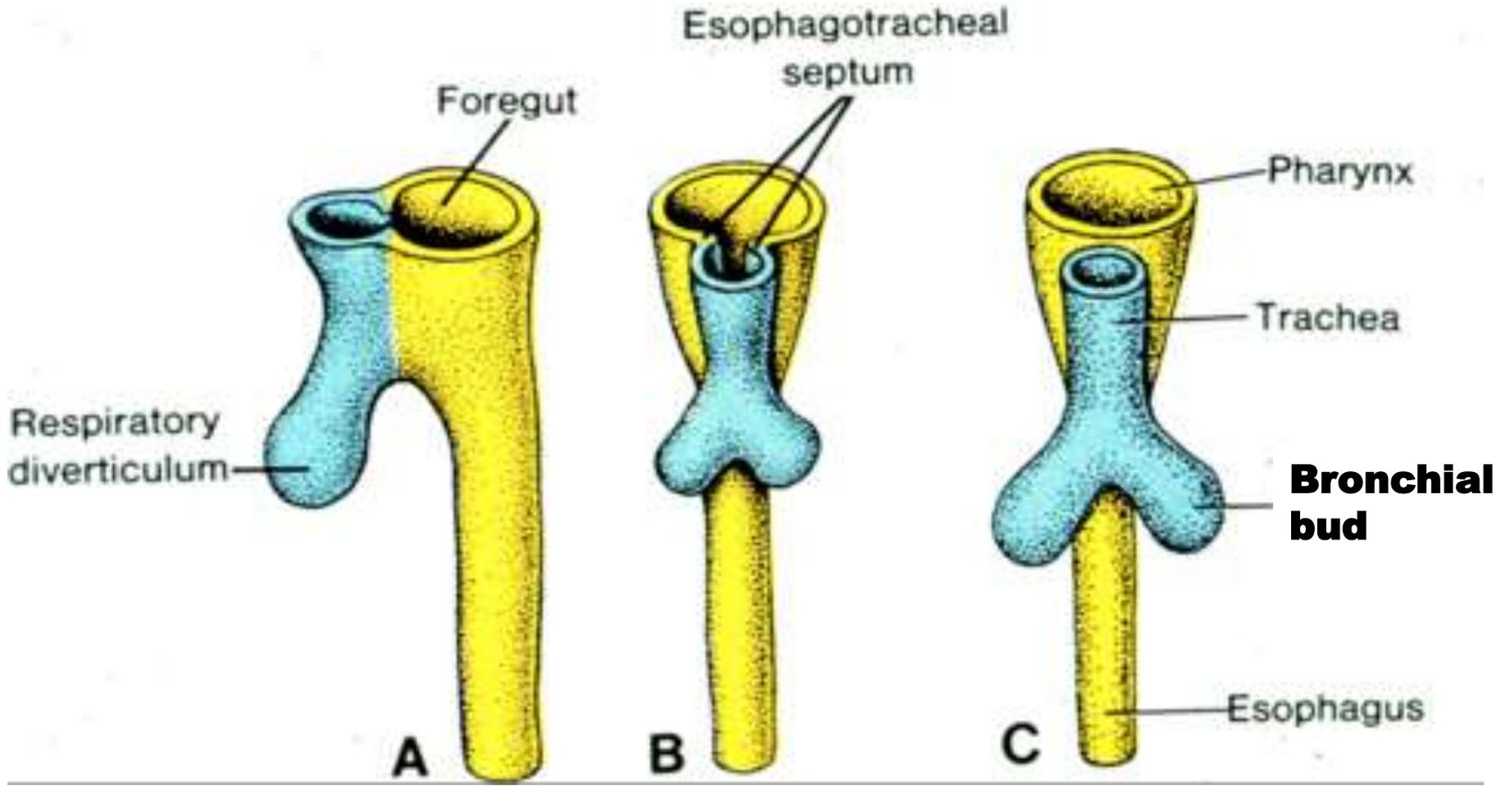
Oblique facial cleft due to failure of fusion of the maxillary process with the lateral nasal process

▪ **Development of Paranasal sinuses**

- **They Develop as out pouching from mucus membrane of the lateral wall of the nose.**
- **They extend into the maxilla, ethmoid, frontal and sphenoid bones during childhood and early adult life.**
- **Maxillary sinus** is the first to develop prenatal then, enlarge after birth, complete development nearly at 7 - 18 years
- **Sphenoid & ethmoid sinuses** , enlarge after birth and may not be significant size until 3-7 years and complete in adult.
- **Frontal sinus** is the last one to develop (absent at birth), begins to develop 2-9 years and complete during puberty

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**Development of
Larynx, Trachea,
Bronchi and
Lungs**



**** Development of the laryngotracheal tube**

- **An endodermal diverticulum called **respiratory diverticulum** arises from the **ventral wall** of the foregut**
- **Two **tracheoesophageal folds** forming **primitive laryngotracheal tube**.**
- **The two folds approximate and fuse with each other forming **tracheoesophageal septum**.**
- **The septum divides the **laryngotracheal tube** (ventral) from **pharynx** and **esophagus** (dorsal).**

- **Development of the larynx**

- **The mucosa** is developed from the **cranial part** of the laryngotracheal tube.
- **The cartilage and muscles:** from the mesoderm of the 4th and 6th pharyngeal arches.

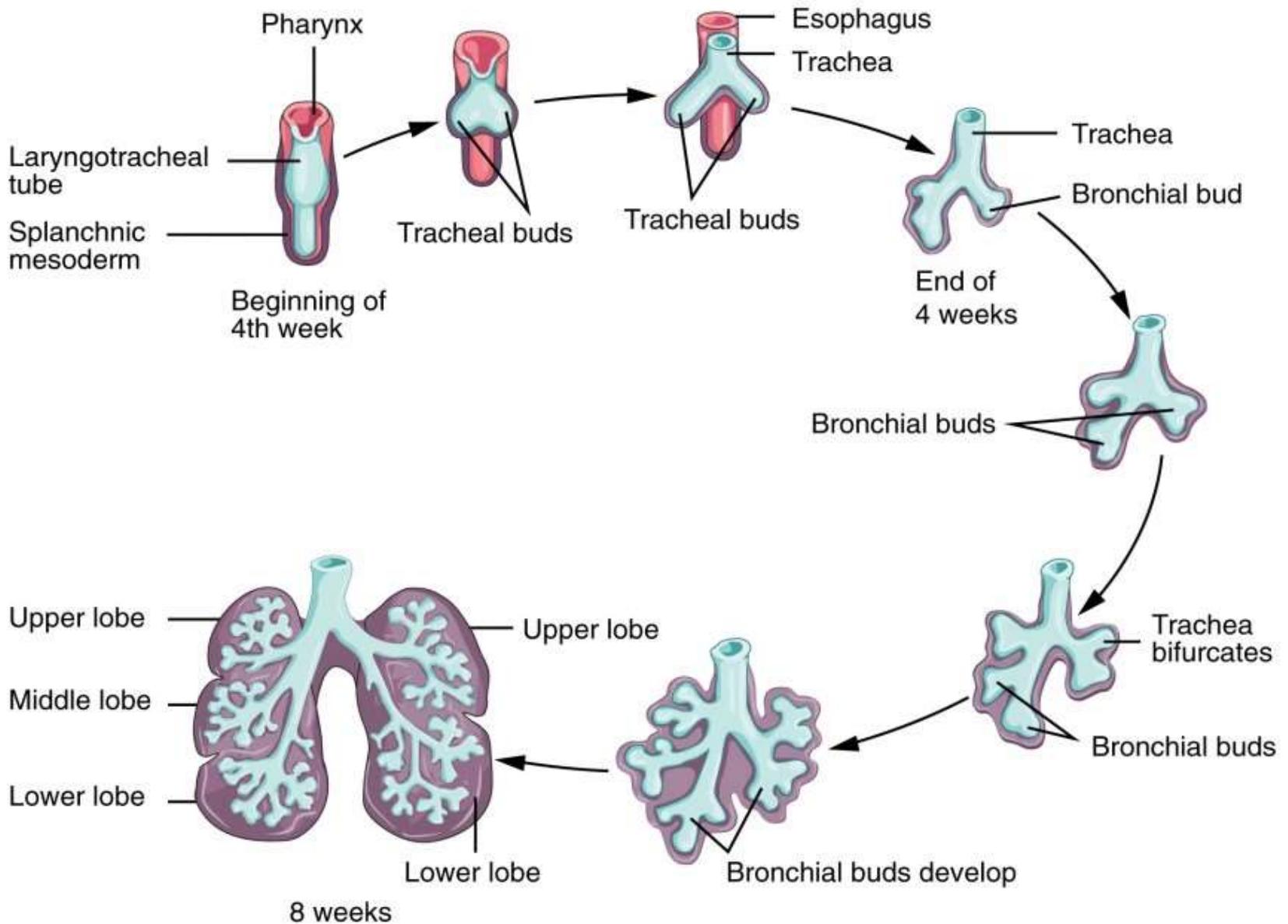
- **Development of the Trachea**

- **The mucosa** is developed from the **caudal part** of the laryngotracheal tube.
- **The cartilages:** from the mesoderm around the laryngo-tracheal tube.

- **Development of the bronchi**

- **The lower end of the tube derived into two bronchial buds** forming right and left bronchus.
- **The cartilages:** from the mesoderm around the buds.

Development of the respiratory system



- **Development of the lungs**

- **Each bronchus divides repeatedly forming bronchioles and alveoli**

- **The blood capillaries and connective tissue developed from the mesoderm**

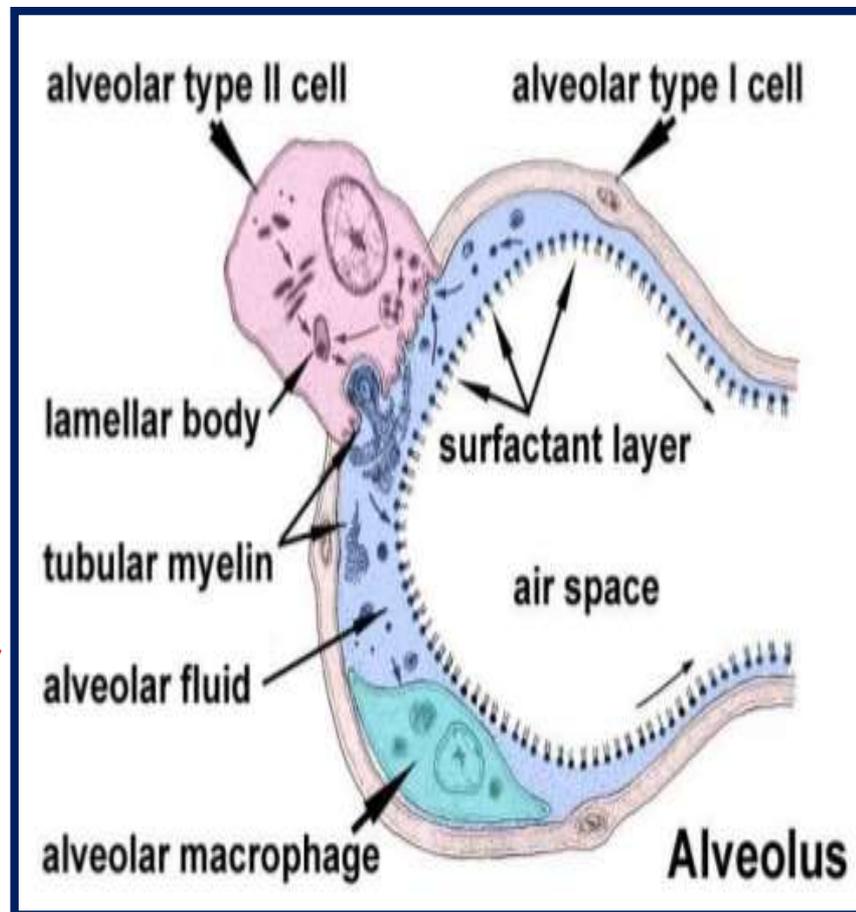
- **No mature alveoli before birth**

- **The cells line the alveoli become gradually thinner (**Type-I blood air barrier**)**

- **Another epithelial cells developed (**Type -II surfactant cells**) to low the surface tension of the barrier**

- **The amount of the surfactant increases especially during the first two weeks after birth**

- **The fluid in the alveoli is absorbed and alveoli expanded with air**



Congenital anomalies (Tracheoesophageal fistula)

- An abnormal opening between esophagus and trachea caused by failure of complete closure of the tracheoesophageal septum.

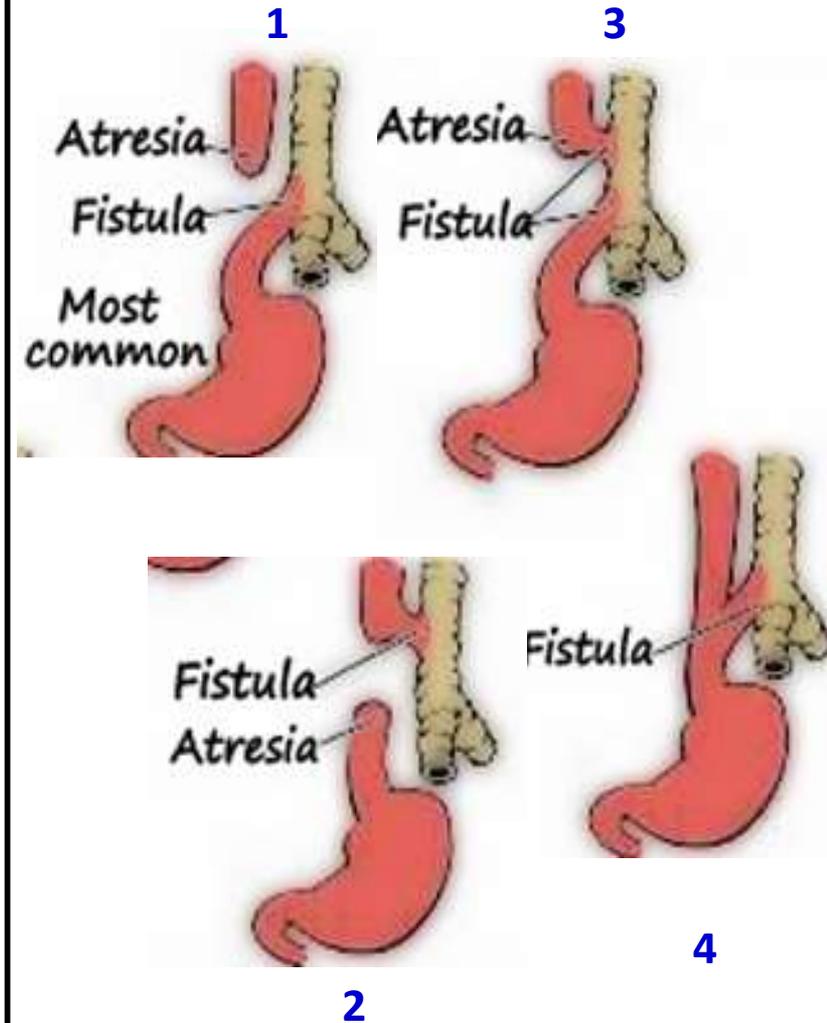
• Types of the fistula:

1. **Proximal part** of esophagus ends as a **blind sac** and distal part continues with the trachea.

2. **Proximal part** of esophagus **continues** with trachea and distal part ends as blind sac.

3. Proximal and distal parts of esophagus **continue** with trachea separately.

4. Proximal and distal parts of **continue** with trachea by **single tube (fistula)** .



- **** Congenital anomalies of respiratory system:**

- **(II) Agenesis of one or both lungs:** is rare and caused by failure of the **bronchial buds** to develop.

(III) Abnormal number of lung lobes: due to abnormal division of the **bronchial buds**.

(VI) Congenital cysts of the lungs: either single or multiple. This give rises to **honeycomb appearance** in the X-ray.

- **(V) Congenital collapse of the lung (respiratory distress syndrome of neonate):** due to congenital absence of the **surfactant**. It is one of the common causes of death in the premature infants.

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Development of the Diaphragm

Developing Diaphragm

6 Cervical myotome of somites

3

Pleuroperitoneal membrane

2

Oesophageal mesoderm

1

Septum transversum

4

Body wall

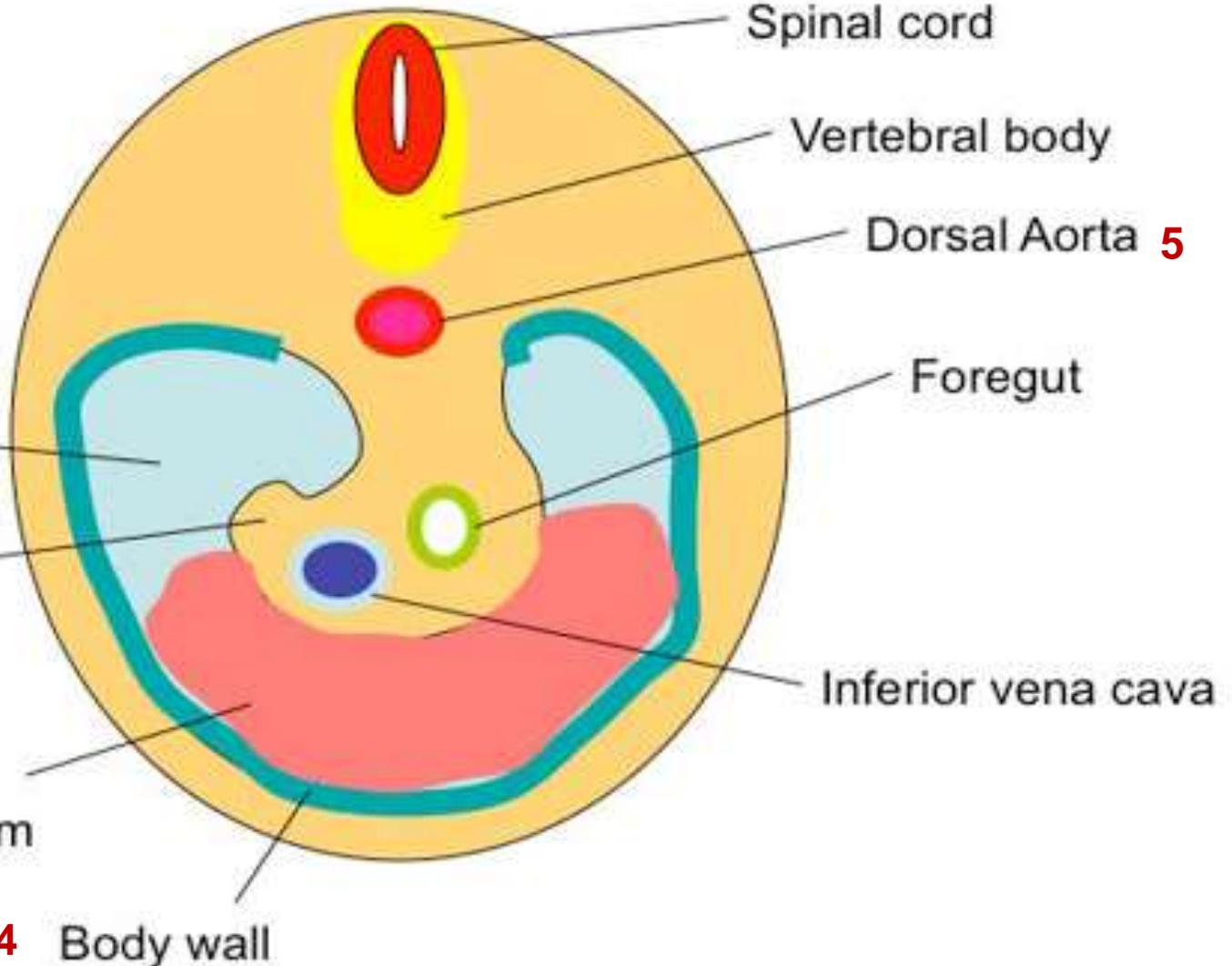
Spinal cord

Vertebral body

Dorsal Aorta 5

Foregut

Inferior vena cava



- The diaphragm developed from :

- 1. Septum transversum** in front the neck and forms the central tendon.
- 2. Oesophageal mesoderm** forms the crura.
- 3. Pleuro-peritoneal membrane** forms small part of diaphragm.
- 4. Body wall** forms the margin. This part receives sensory nerves from lower intercostal nerves.
- 5. Mesoderm around the aorta.**
- 6. Cervical myotomes from the somites of C3, 4, 5;** this explains innervation of the diaphragm by C3, 4, 5 (phrenic nerve).

* The diaphragm migrates caudally from the level of C3 segment (somite) to the level of T12 segment (somite).

- **Congenital malformations**

- 1. Congenital diaphragmatic hernia:** a common malformation in the newborn due to **failure of fusion of its parts**, abdominal viscera herniate to the thoracic cavity.
- 2. Congenital hiatus hernia:** if **esophagus is shorter** than normal and large esophageal opening, part of stomach may appear in the thorax leading to constriction of stomach
- 3. Retrosternal or parasternal hernia of Morgagni:** a rare **defect between sternum and sternocostal parts** of diaphragm.
- 4. Congenial eventration of diaphragm:** rare; **defective muscles of** half of diaphragm and balloons up into chest cavity. Upward displacement of abdominal contents



Thank You
Questions