


- Lecture 18: Development of thoracic cavity and diaphragm
- Dr Shafqat Ali
- Development of Thoracic Cavity and Diaphragm
- ***By the end of this session, the student should be able to:***
- Describe the developmental changes of thoracic cavity and diaphragm.
- Correlate the development with the function.
- Identify Clinical Correlations.
-  **Langman's Medical Embryology: T.W. Sadler, 12<sup>th</sup> ed., CH. 11, P. 87- 95.**

- Partitioning of intraembryonic coelom
- The intraembryonic coelom is initially one continuous space. To form the definitive adult pericardial, pleural, and peritoneal cavities, two partitions must develop. The two partitions are the **paired pleuropericardial membranes and the diaphragm.**
- Paired pleuropericardial membranes:
  - 1. These membranes are sheets of somatic mesoderm that

separate the pericardial cavity from the pleural cavities.

- 2. The formation of these membranes appears to be aided by lung buds invading the lateral body wall and by tension on the common cardinal veins resulting from rapid longitudinal growth.
- 3. These membranes develop into the definitive fibrous pericardium surrounding the heart.

- **Diaphragm:**

- **1. The diaphragm separates the pleural cavities from the peritoneal cavity.**

- **2. The diaphragm is formed through the fusion of tissue from four different sources:**
  - **a. The septum transversum** is a thick mass of mesoderm located between the primitive heart tube and the developing liver. The septum transversum is the primordium of the central tendon of the diaphragm in the adult.
  - **b. The paired pleuroperitoneal membranes** are sheets of somatic mesoderm that appear to develop from the dorsal and dorsolateral body wall by an unknown mechanism.
  - **c. The dorsal mesentery of the esophagus** is invaded by myoblasts and forms the crura of the diaphragm in the adult.

- d. **The body wall** contributes muscle to the peripheral portions of definitive diaphragm.
- Positional changes of the diaphragm
- A. During week 4 of development, the developing diaphragm becomes innervated by the phrenic nerves, which originate from C3, C4, and C5 and pass through the pleuropericardial membranes (this explains the definitive location of the phrenic nerves associated with the fibrous pericardium).

- B. By week 8, there is an apparent descent of the diaphragm to L1 because of the rapid growth of the neural tube.
- C. The phrenic nerves are carried along with the “descending diaphragm,” which explains their unusually long length in the adult.
- Clinical Correlates
- **A. Congenital diaphragmatic hernia:** herniation of abdominal contents into the pleural cavity caused by a failure of the pleuroperitoneal

membrane to develop or fuse with other components of diaphragm.

- **B. Esophageal hiatal hernia:** herniation of the stomach through the esophageal hiatus into the pleural cavity caused by an abnormally large esophageal hiatus.