

# Surgery of the chest

## Introduction

### **:Anatomy**

The respiratory system consists of the nose, nasopharynx, larynx, trachea and two main bronchi which are divided into segmental and more subsegmental bronchi to the smallest bronchioles to form the tracheobronchial tree. The chest wall is covered predominantly with pectoralis major anteriorly and latissimus dorsi posteriorly. There are (12) pairs of ribs, seven of which are termed (True Ribs) as their cartilages articulate with the sternum anteriorly, the lower five ribs are termed (False Ribs) which are not connected directly to the sternum, the eleven and twelve ribs are called (Floating Ribs) because they are not attached anteriorly. The sternum is divided into the manubrium sterni, sternal body and xyphoid process. The clavicles articulate with manubrium and 1st costal cartilage, Muscles that associate with the intercostal space are, the external intercostal, the internal intercostal and transversus thoracis (inner most intercostal) muscles. There are (11) intercostal spaces containing in addition to the mentioned muscles a vein, artery and nerve which course along the lower edge of each rib. The pleura is a fibroelastic membrane lined by squamous epithelial cells, it is subdivided into

**Parietal pleura:** which lines the thoracic cavity and it is divided into four parts .1

.A. **costal pleura:** which lies against the ribs and intercostal muscles

.B. **diaphragmatic pleura:** cover the upper surface of both hemi-diaphragm

.C. **mediastinal pleura:** that lies against the mediastinum

.D. **cervical pleura:** which lines the dome of the thoracic cavity

.**Visceral pleura:** the pleural part that intimately invest the lung .2

.**Costo-phrenic angle:** is the angle between the costal and diaphragmatic pleura #

**Cardio-phrenic angle:** is the angle between the pericardium and the diaphragmatic pleura. #

# **Inferior pulmonary ligament:** is the anterior and posterior reflection of the pleura between the root of the lung and the diaphragmatic surface. The function of the pleura is to .maintain the environment of the pleural space in which the lung is functioning

The **bronchial artery** originates from the aorta and the intercostal arteries. The **pulmonary vein** drains into the left atrium, no **bronchial vein**

The **lymph nodes (LN)** found along the lobar branches of the bronchi are termed (hilar LN), .there are also tracheal and tracheo-bronchial LNs

The phrenic nerve located anteriorly while the vagus nerve located posteriorly in the .thoracic cavity at the mediastinal surface

The **trachea** is a fibro-muscular tube (10-12 cm) in length and (13-22 mm) in diameter. Supported laterally and anteriorly by (16-22) U shaped hyaline cartilages. The trachea starts at the level of cricoid cartilage and ends by its bifurcation at the level of the sternal angle where it is divided into right and left main bronchi, the spur at bifurcation is termed (**carina**). The right main bronchus deviates less from the axis of the trachea than the left, and this explain why foreign body impaction is more common in the right main bronchus. The main bronchi are divided into the segmental and subsegmental bronchi which end into the terminal bronchioles which divided into the respiratory bronchioles that terminate into the .alveoli

## **:Physiology of breathing**

Inspiration: the intercostal muscles contraction elevates the ribs upward in a hinge like .1 movement increasing the antero-posterior and transverse diameters of the hemithorax while the contraction of the diaphragm causing flattening of the domes and increase the vertical diameter, as a result the air flow flows into the tracheobronchial tree and reaching the alveoli until the alveolar pressure increased and reached a pressure that equal to .atmospheric pressure

Expiration: it is a passive movement resulted from relaxation of the respiratory muscles .2 and depend on the elastic recoil property of the lung tissue

Coughing: all the abdomen and chest muscles contract simultaneously, when the .3 intrathoracic and intraabdominal pressure built up and the epiglottis is opened the diaphragm move upward like a piston to expel air and mucus secretion in a high velocity

## **:The main clinical manifestations of the respiratory diseases**

.**Cough**: dry or productive of mucoid, mucopurulent and purulent sputum .1

.**Dyspnea**: it is an unpleasant subjective awareness of the sensation of breathing .2

.**Chest pain**: in diseases involving the pleura and chest wall .3

.**Hemoptysis**: is coughing of blood or sputum containing blood .4

## **:Investigations**

**Chest X-ray**: remain the 1<sup>st</sup> and important step towards diagnosis of chest diseases .1  
.including both A-P and Lateral views

**Chest C-T scan**: with or without contrast, bone window is essential to diagnose sternal .2  
and rib deformities. C-T scan with oral contrast is useful in diagnosis of hiatal hernia and  
.esophageal abnormalities

**MRI**: for mediastinal disease or to detect abnormalities in the integrity of the diaphragm .3  
.as give clear spatial arrangement of tissue plane

**Ultrasonography**: of the chest to detect any pleural fluid collections and to differentiates .4  
.between mass and effusion

**Trans-thoracic needle aspiration:** of pleural fluid for analysis AFB, culture and sensitivity .5  
.test, cytology, and **fine needle aspiration(FNA)** of pulmonary mass for cytology

**.bronchoscopy:** flexible and rigid type .6

**Pulmonary function tests:** those relevant to thoracic surgery includes .7

**a. Tidal volume(TV):** the amount of air inspired or expired per single breath

**b. vital capacity:** the volume of air exhaled by maximum expiration from total lung  
.capacity

**c. forced expiratory volume in one second(FEV1):** is the volume of air exhaled in the 1st  
second of forced expiration following maximum inspiration it decreases in chronic  
.obstructive lung diseases

**d. forced vital capacity(FVC):** is the volume of air exhaled from maximal inspiration to  
.maximal expiration it decreased in restrictive lung diseases

**Tidal volume =500 ml, # Total lung capacity=6L, # FEV1/FVC normal =70%→more than #**  
.70% restrictive lung diseases, less than 70% obstructive lung diseases