

Respiration Part 1 Dr. Ashfaq Bukhari Assistant Professor, Physiology RAKCOMS 1 Objectives At the of the lecture, students will be able to:

- o 1.o During inspiration the lungs are stretched
- o Compliance is measure of effort that has to go into stretching or distending the lungs
- o Volume change per unit of pressure change across the lungs
- o The less compliant the lungs are, the more work is required to produce a given degree of inflation
- o Decreased by factors such as pulmonary fibrosis

36 Lung Compliance Diagram Elastic Forces of the Lungs

- o Characteristics of the compliance diagrams are determined by 2 elastic forces:
 - Elastic properties of the lung tissue itself (fairly straight forward).

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- oPleural fluid produced by pleural membranes –Acts as lubricant –Helps hold parietal and visceral pleural membranes together

18 Ventilation

- o Movement of air into and out of lungs
- o Air moves from area of higher pressure to area of lower pressure
- o Pressure is inversely related to volume

Inspiration

- o Diaphragm and intercostals muscles contract
- o Diaphragm moves inferiorly and flattens during contraction, causing height of thoracic cavity to increase
- o Intercostals contraction lifts the ribcage and thrusts sternum forward, increasing anteroposterior and lateral dimensions (circumference)
- o Lungs adhere tightly to the thorax walls (due to surface tension of fluid between pleural membranes), they are stretched to the new, larger size of the thorax.

4 An Overview of Key Steps in Respiration

5 Respiration can be divided into four major functional events

- o Ventilation: Movement of air into and out of lungs
- o Gas exchange between air in lungs and blood
- o Transport of oxygen and carbon dioxide in the blood
- o Internal respiration: Gas exchange between the blood and tissues

Respiratory System Functions

- o Gas exchange: Oxygen enters blood and carbon dioxide leaves
- o Regulation of blood pH: Altered by changing blood carbon dioxide levels
- o Voice production: Movement of air past vocal folds makes sound and speech

6 ANATOMY OF THE RESPIRATORY TRACT

7 8 Respiratory System Divisions

- o Upper Airway – Nose, pharynx, larynx and associated structures
- o Lower Airway – trachea, bronchi, lungs

9 Conducting Zone

- o All the structures air passes through before reaching the respiratory zone.

BLOOD SUPPLY TO THE LUNG

- o Two separate blood supplies:
 - o Pulmonary circulation
 - o Bronchial circulation

11 Pulmonary circulation

- o Brings deoxygenated blood from the right ventricle to the gas– exchange units
- o At the gas–exchanging units, oxygen is picked up and carbon dioxide is removed from the blood
- o The oxygenated blood returned to the left atrium for distribution to the rest of the body

12 Bronchial circulation

- o Arise from the aorta
- o Provides nourishments to the lung parenchyma

13 MUSCLES OF RESPIRATION

- o Inspiratory muscle:
 - o Diaphragm and Abdominal breathing
 - o external intercostal muscle and thoracic breathing
 - o accessory muscle of inspiration
- o Expiratory muscle
 - o relax during normal breathing
 - o Internal intercostal muscle
 - o Muscles of the abdominal wall

14 15 Thoracic Walls and Muscles of Respiration

Breathing Rate

- o At rest: 10–20 breaths / minute
- o During exercise: 40 – 45 at maximum exercise in adults
- o What about Kids?
- o Normally this is a passive process, but if passageways are narrowed due to spasms of bronchioles (asthma) or clogged with mucus/fluid (bronchitis/pneumonia), it becomes an active process, using intercostal muscles to help depress rib cage and abdominal muscles to help squeeze air out of lungs.
- o As inspiratory muscles relax and resume normal resting length, rib cage descends and lungs recoil.
- o Includes respiratory bronchioles and alveolar sacs.

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