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).16 17 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 anterioposterior 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 oArise from the aorta oProvides nourishments to the lung parenchyma 13 MUSCLES OF RESPIRATION oInspiratory muscle: oDiaphragm and Abdominal breathing oexternal intercostal muscle and thoracic breathing oaccessory muscle of inspiration oExpiratory muscle orelax during normal breathing oInternal intercostal muscle oMuscles of the abdominal wall 14 15 Thoracic Walls and Muscles of Respiration Breathing Rate oAt rest: 10–20 breaths / minute oDuring exercise: 40 – 45 at maximum exercise in adults oWhat 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.o 2.o 3

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