

1. OVERVIEW OF STRUCTURE AND FUNCTION OF THE RESPIRATORY MEDICINE – CLINICAL CORRELATIONS

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FUNCTIONS

- **PRIMARY FUNCTIONS**

- Gas exchange
- Blood reservoir
- Host defense
- Metabolism (synthesis and catabolism)
- Heat exchange

- **SUPPORTIVE FUNCTIONS**

- Speech
- Sleep

CONT.

- Warming the air that is breathed in (thermoregulatory role)
- Immunologic function
 - Mechanical:
 - Filtering out particulate matter from the air that is breathed
 - Cough reflex
 - Muco-ciliary function
 - Functional role:
 - Immune cells along the respiratory tract
- Acid base balance
- Gaseous exchange
- BP regulation: Role in RAAS
- Regulation of breathing
- Role in sleep
- **REVIEW EMBRYOLOGY OF THE RESPIRATORY SYSTEM**

CONGENITAL ANOMALIES

- Esophageal atresia without fistula
 - Esophageal atresia with fistula
 - Esophageotracheal fistula
 - Tracheal stenosis
 - Sequestration
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- **REVIEW HOW TO INSERT THE NG TUBE**

TRACHEAL ANATOMY

- Trachea: connects larynx to primary bronchi
- In adults → 1.4 to 1.6 cm; diameter and 10-13 cm long
- Begins immediately inferior to the cricoid cartilage
- Bifurcates at T5

HISTOLOGY

- Typically ciliated pseudo-stratified columnar
- Failure of the mucociliary escalator motility
 - Bronchiectasis
- Cystic fibrosis
 - Commonest genetic disease of the respiratory tract

TRACHEAL DISORDERS

- Stenosis
 - Tumors (malignant or benign)
 - Prolonged endotracheal intubation
 - Stridor (monophonic – upper airway obstruction, inspiratory), wheeze (polyphonic, generalized airway contraction, expiratory)

MAIN/PRIMARY BRONCHI

- Similar structure to trachea
- Originates at T4/t5
- Right is shorter, wider in diameter and more vertical than the left.
- Most aspirated foreign objects tend to go to the right
 - Presentation:
 - Recurrent pneumonia due to reduced draining of secretions beyond the object.
- If complete obstruction
 - Atelectasis due to alveolar collapse
- Examination
 - Rhonchi (unilateral)

ALVEOLI

- Functional unit of the lung
- Alveolar epithelium
 - Alveolar type I cells
 - Thin, flat, gaseous exchange
 - Alveolar type II cells
 - Secrete surfactant that increases pulmonary compliance by reducing surface tension
- Pulmonary capillaries
- Very thin interstitium
- What could go wrong:
 - Fibrosis e.g. interstitial lung disease
 - Pulmonary edema in HF
 - ARDS

RHYTHMIC NATURE OF BREATHING

- Respiratory rhythm generator
 - Located in medulla
- **REVIEW CENTRAL CONTROL AND MECHANISM OF INSPIRATION AND EXPIRATION.**

CONTROL OF VENTILATION: Central and peripheral chemoreceptors

- **Peripheral**
 - In carotid and aortic bodies
 - Stimulated by
 - Increased PCO₂
 - Reduced PO₂
 - Reduced pH
- **Central**
 - In medulla (brain ISF)
 - Stimulated by increased PCO₂ via a decrease in pH
- **Response:**
 - Change in tidal volume
 - Change in rhythm
- What could go wrong:
 - Head injury → Raised ICP, opiate toxicity,
 - Presentation
 - Bradypnea (below 12 breaths per minute)
 - CO₂ retention in COPD; reset set points due to persistent hyper-capnea

APPROACH TO THE PATIENT WITH RESPIRATORY DISEASE

- Presentation
 - COUGH
 - Productive → inflammatory process (excessive productions of secretions)
 - Infectious or non-infectious
 - Associated wheeze, hemoptysis, chest pain etc.
 - Wheeze is a sign of airflow obstruction and is polyphonic
 - Sound characteristic of the cough
 - Barking: Upper airway disorders
 - Bovine: Paralysis of the vocal chords due to damage of the recurrent laryngeal nerve
 - Cough reflex
 - Recurrent laryngeal nerve
 - SPUTUM PRODUCTION
 - Huge amount of sputum, purulent: lung abscess, bronchiectasis

CONT.

- CHEST PAIN
- BREATHLESSNESS
- EPISTAXIS
- SNORING
 - Esp. in patients with excessive day time sleepiness
 - Sleep apnea

SURFACE LANDMARKS OF THE LUNGS

- Boundaries of the normal lung
 - Upper border: clavicle (dome of the lungs is just above the clavicle)
 - Lower border: xyphi sternum
- Others
 - Suprasternal notchs
 - Sternum
 - Sternal angle
- Anterior chest reference lines
 - Mid-sternal
 - Mid-clavicular
- Posterior
 - Vertebral line
 - Scapula line
- Laterally
 - Posterior, mid, anterior axillary

REFERENCE RANGES

- RR
 - 12 – 16 breaths per minute
 - RR > 24 → critical illness esp. when associated with DIB
 - Raised RR is a strong predictor of serious adverse events in both ambulatory and hospital settings
 - CO₂ retention → high volume pulse
- Alveolar ventilation = TV X RR
 - PaCO₂ is the most important driver
 - Body corrects changes in hypoxemia and hyper-carbia by increasing TV and/or RR

TYPED BY EFFIE NAILA