**Respiratory system / Lec. 1 Dr. Methaq Mueen**

**Respiratory system divided into two parts:**

1. Upper respiratory tract 2-Lower respiratory tract

**UPPER AIRWAYS:** include the nose, pharynx, and larynx.

**Infections of upper respiratory tract*:***

* Upper respiratory tract infection (**URI**) represents the most common acute illness seen in the outpatient.
* URIs range from the common cold, a mild self-limited catarrhal syndrome of the nasopharynx to life-threatening illnesses such as epiglottitis.
* It includes: rhinitis, sinusitis, pharyngitis, laryngitis, and epiglottitis.

Most of these inflammatory conditions are **viral in origin,** but they are often **complicated by superimposed bacterial infections** .

**Nose inflammation:**

**Rhinitis:**  is inflammation of mucous membranes of the nose

* It is **either infectious or allergic**
* **Infectious rhinitis (common cold)** in most instances caused by viruses (adenoviruses, echoviruses, and rhinoviruses).
* They cause a profuse **catarrhal inflammation** during the initial acute stages, the nasal mucosa is thickened, edematous, and red; increase mucous secretion and the nasal cavities are narrowed.
* These changes may extend, producing a concomitant pharyngotonsillitis.
* Secondary bacterial infection enhances the inflammatory reaction and produces an essentially mucopurulent or sometimes frankly suppurative exudate.
* Most cases are self-limiting disease .

**Fate of acute rhinitis**: 1-Resolution, 2-Secondary bacterial infection and suppuration 3-sinusitis or otitis media, 4-Chronic atrophic Rhinitis, 5-development of nasal polyps

* **Allergic rhinitis (hay fever)** is Type I immediate hypersensitivity reactions to one of a large group of allergens (the most common: the **plant pollens**, **fungi, animal allergens, and dust mites).**
* Associated with asthma and eczema.
* The allergic reaction is characterized by: marked mucosal edema, redness, and mucus secretion, accompanied by a leukocytic infiltration in which **eosinophils** are prominent.

**Complications:** over time, can lead to **chronic rhinitis**, **sinusitis** and **development of nasal polyps.**

**Nasal polyps:** It is focal protrusion of the mucosa, secondary to recurrent attacks of rhinitis.

Not true neoplasms, they are associated with inflammation and allergy. Generally, they are multiple, and nearly always bilateral.

* **Microscopically:** 1- edematous stroma with 2-hyperplastic or cystic mucous glands,

3-Infiltrated by variety of inflammatory cells including neutrophils, eosinophils, and plasma cells with occasional clusters of lymphocytes.

**Complication:** 1-When multiple or large it may obstruct the airway or impair sinus drainage.

2-it may become ulcerated or infected.

**Sinusitis:**

**Acute sinusitis** : Acute inflammation of the nasal sinuses. Usually follow extension of infection from the nose. There is congestion &edema lead to obstruction of sinus opening resulting in accumulation of mucus secretion(mucocele) followed by bacterial infection & suppuration(empyema).Acute sinusitis may, in time, give rise to ***chronic sinusitis*.**

**Etiology :**Viral, Bacterial, Allergic. **Fungi** may cause severe chronic sinusitis (e.g., in mucormycosis), especially in diabetic patients.

**NASOPHARYNX**

**Inflammations:***Pharyngitis* and *tonsillitis*

* Either **mild pharyngitis**: commonest & usually associated with common cold).
* Or **severe pharyngitis** (associated with **tonsillitis)**,
* Viruses are the most common causes.
* Bacterial infections may be superimposed on these viral involvements, or may be primary invaders.
* Nasopharyngeal mucosa appear **red with slight edema**, with reactive enlargement of of nearby tonsils.
* An exudative membrane (pseudo-membrane) may cover the inflamed nasopharyngeal mucosa and the enlarged tonsils.

The major importance of streptococcal infection is the possible development of **late sequelae**, such as **: peritonsilar abscess, rheumatic fever** and **glomerulonephritis**

**Epiglottitis**: inflammation of epiglottis. Mostly affect **children**, due to **bacterial** infection **Hemophilus influenzae**.it is regard as **medical emergency** present with fever, difficulty in breathing and swallowing, **abnormal high pitched sound during inspiration** (**stridor**)

May lead to fatal outcome (due to obstruction of upper airways by edematous epiglottis).

Oropharyngeal examination using a tongue depressor can provoke laryngospasm. Therefore, in suspected epiglottitis, limit the examination to observation and an assessment of the vital signs.

**Laryngitis:** Inflammatory lesion of larynx.

**Causes:** 1-The most common cause is **viral**, **bacterial** infection that associated with generalized upper respiratory tract infection. In children may be caused by diphtheria .

2-**Allergy**. 3- Heavy **environmental toxin** exposure (e.g., tobacco smoke)

**Prognosis**: most infections are self-limited.

* **The sequelae** can be serious, especially in infancy or childhood (6 months to 3 or even to 6 years), when mucosal congestion, exudation, or edema may cause laryngeal obstruction.
* **Clinical features**: acute laryngitis present with hoarseness of voice or even voice los. **laryngoepiglottitis** caused by respiratory syncytial virus, *Haemophilus influenzae,* or β-hemolytic streptococci may induce such sudden swelling of the epiglottis and vocal cords in the small airways of infants and young children as to constitute a medical emergency.

This is **uncommon in adults** because of the **larger size of the larynx** as well as **stronger accessory respiratory muscles.**

**Croup:**refers to **acute laryngotracheobronchitis** in children usually due to **viral infections**.

It produces a characteristic inspiratory stridor, hoarse voice and seal barking cough due to upper airway narrowing.

When a cough forces air through this narrowed passageway, the swollen vocal cords produce a noise similar to a seal barking. Likewise, taking a breath often produces a high pitched whistling sound (**stridor**)

**Tumors of the Nose, Sinuses, and Nasopharynx**

**NASOPHARYNGEAL CARCINOMA:**

* This rare neoplasm has a strong association **with EBV** & a high frequency in **China**.
* These facts raise the possibility of **viral oncogenesis** on a background of **genetic susceptibility.**
* It is usually clinically occult until they present at advanced stages with nasal obstruction, epistaxis, and metastases to the cervical

lymph nodes in up to 70% of patients.

* **Radiotherapy** is the standard treatment
* **The histological subtypes:**

1. Squamous cell carcinoma (keratinizing or nonkeratinizing)
2. **Undifferentiated carcinoma: is the most common and the one most closely linked with EBV**, characterized by syncytial growth with prominent eosinophilic nuclei

* Nasopharyngeal carcinomas invade locally, spread to cervical lymph nodes, and then metastasize to distant sites.

**LARYNX: tumors**

***I. Non malignant tumors:***

1**-Reactive nodules (vocal cord nodules and polyps).**

* smooth rounded protrusions (usually less than 0.5 cm in diameter) located on the **true vocal cords**.
* composed of fibrous tissue and covered by stratified squamous mucosa.
* It occurs mainly in **heavy smokers** or in individuals who impose great strain on their vocal cords ***(singers' nodules)***.suggesting that they are the result of **chronic irritation** or **voice abuse.**

Because of their strategic location and accompanying inflammation, they characteristically change the character of the voice and often cause **progressive hoarseness.**

**2-Squamous papilloma and papillomatosis:**

* are **benign neoplasms**, usually located on the true vocal cords, that form soft, raspberry-like mass rarely more than 1 cm in diameter.
* **Mic.**, multiple slender, finger-like projections supported by central fibrovascular cores and covered by an orderly stratified squamous epithelium.
* Papillomas are usually solitary in adults but are often multiple in children, a condition referred to as **juvenile laryngeal papillomatosis**.
* The lesions are caused *by* ***HPV types 6 and 11***.
* They **do not become malignant**, but frequently recur. They often spontaneously regress at puberty. The regularity of recurrence requires some children to undergo numerous surgeries.

**II- MALIGNANT CARCINOMA OF THE LARYNX**

* Most commonly occurs within the **sixth decade** of life and is more common in **men** than in women.
* Nearly all cases occur in **smokers**. alcohol , asbestos exposure irradiation, and infection with HPV may also play roles.

**Morphology.**

**Grossly**: fungating mass , focal thickenings, or ulcerated lesions.

* Types according to the **sites**:

1. **Glottic carcinoma:** (on the vocal cord), 60-70% 0f cases.
2. **supraglottic carcinoma**: above the vocal cord 25%
3. **subglottic:** below the vocal cordless than 5% of cases.

* **Mic.** :the vast majority (95%) are squamous cell carcinomas, which started as mucosal hyperplasia, dysplasia & carcinoma in situ .
* **Clinically** The initial manifestation is often persistent hoarseness of voice , dysphagia, and dysphonia.

**Prognosis:** is directly related to **clinical stage** and **tumor site**.

* **Glottic carcinomas** are **confined to the larynx (good prognosis),** this is due to the fact that this area has sparse lymphatic supply.
* **Supraglottic carcinomas** in one third of cases showing cervical lymph nodes metastases.
* The usual cause of death is infection of the distal respiratory passages or widespread metastases and cachexia.

**LUNGS**

***Congenital Anomalies***

1-Agenesis or hypoplasia of both lungs, one lung, or single lobes.

**Pulmonary hypoplasia.** is the defective development of both lungs resulting in: Decreased weight, volume, and acini compared to the body weight and gestational age

2-Tracheal and bronchial anomalies (atresia, stenosis, tracheoesophageal fistula)

3- Vascular anomalies 4- Congenital pulmonary airway malformation.

5-Lung cyst 6- cystic fibrosis

**Cystic fibrosis**

* Cystic fibrosis (CF) is an **inherited disorder** **, Autosomal recessive** Defect in gene on **chromosome 7.**
* The defect appears in ion **transport** that affects fluid secretion in exocrine glands and in the epithelial lining of the respiratory, GIT, and reproductive tracts.
* disorder of exocrine gland function that involves **multiple organ systems** but chiefly results in chronic respiratory infections, pancreatic enzyme insufficiency, and associated complications in untreated patients.
* Pulmonary involvement occurs in 90% of patients surviving the neonatal period.
* End-stage lung disease is the principal cause of death.
* **Pathogenesis:**

Gene defect ……..… defect in cystic fibrosis transmembrane conductance regulator (CFTCR) ….. reduced chloride permeability across epithelial membrane …. Increase intracellular chloride….increase in sodium …increase in water inside the cells …. increase viscosity of mucus secretion …… obstruction of ducts …… atrophy & infection.

* **the pathogenesis In the lungs**, this dehydration leads to defective mucociliary action and the accumulation of hyperconcentrated, viscid secretions that obstruct the air passages and predispose to recurrent pulmonary infections

The one exception to this is the **sweat ducts**, *CFTR* mutations; lead to formation of hypertonic fluid with high sodium chloride

. This is the explanation for the “salty” sweat that mothers can often detect in their affected infants.

**Diagnostic test:** Sweat test: excess sweat chloride and Na .

* **Complications**: abnormally viscous secretions that obstruct organ passages, resulting in most of the clinical features of this disorder

1. Bronchiolitis.
2. Recurrent pneumonia (pseudomonas, staphylococci).
3. Obstruction of bronchi……. Bronchiectasis
4. Obstruction of biliary system ……..biliary cirrhosis.
5. Viscid secretion in intestine……… meconium ileus.( Thick viscid plugs of mucus found in the small intestine of infants)

7-Obstruction of seminal vesicles………. Male infertility

8- pancreatic duct obstruction …steatorrhea and malabsorption

**Atelectasis (Collapse):** Greek word **: incomplete expansion**

**Def.:Loss of lung volume** caused by inadequate expansion of airspaces, associated with shunting of inadequate oxygenated blood from pulmonary arteries into veins……… ventilation / perfusion imbalance & hypoxia

-It is either (**neonatal atelectasis**) (neonatal respiratory distress syndrome due to **loss of surfactant substance….** incomplete expansion of the lungs **)**-or (**acquired atelectasis :**collapse of previously inflated lung),

.**The main types of acquired atelectasis**, which occur in adults, are the followings:

**1- Resorption atelectasis**

*-*occurs when an **obstruction** prevents air from reaching distal airways.

*-*The air already present distally gradually absorbed, followed by alveolar collapse.

Depending on the level of airway obstruction, an entire lung, a complete lobe, or a segment may be involved*.*

- **The most common cause of resorption collapse is**:

**1-Postoperative collapse** (mucopurulent plug obstruct the bronchi), this is the most important cause.

2-Complicated asthma. 3- Bronchiectasis. 4-Chronic bronchitis. 5-Foreign body aspiration.

6-bronchogenic carcinoma.7-Tuberculous lymph node

2- **Compression atelectasis**is usually associated with accumulation of (fluid, blood, or air) within the pleural cavity.

**Causes:**1- Congestive heart failure. 2-Leakage of air into the pleural cavity (pneumothorax)

3-**Basal atelectasis** resulting from a failure to breathe deeply commonly occurs in bedridden patients, in patients with ascites, and during and after surgery.

**3- Contraction atelectasis**: occurs when local or diffuse **fibrosis** affecting the lung or the pleura, in these situations, there is interference with normal lung expansion .

* Atelectasis **(except when caused by contraction) is reversible**
* It should be **treated quickly** to prevent hypoxemia and infection of the collapsed lung.