Pathology of the Respiratory System

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Objectives: You have to know the following items:

- ***Upper respiratory tract dz:***

-Infectious rhinitis.
-Allergic rhinitis.
-Nasal polyp.
-Nasopharyngeal angiofibroma.
-Nasopharyngeal carcinoma.
-Larynx : - Laryngeal nodule.
- Laryngeal carcinoma.

- Lung

- ***Atelectasis*** (Collapse).

- ***Diffuse pulmonary diseases***:

-Obstructive lung dz:

-Asthma.
-Chronic bronchitis.
-Emphysema.
-Bronchiectasis

-**Restrictive lung dz**:

-Acute (ARDS & Resp. distress syndrome of NB).

-Chronic : i. Without granuloma…

ii. With granuloma….

- ***Lower respiratory tract infection (pneumonia):***

Classification: according to etiology & clinical settings.

- ***Tumors :***

-Benign.

-Malignant : i-Primary.

ii- Secondary.

- ***Pathology of pleura.***

Upper respiratory tract

- **Infectious rhinitis: "common cold"**

Common , caused by virus(s).

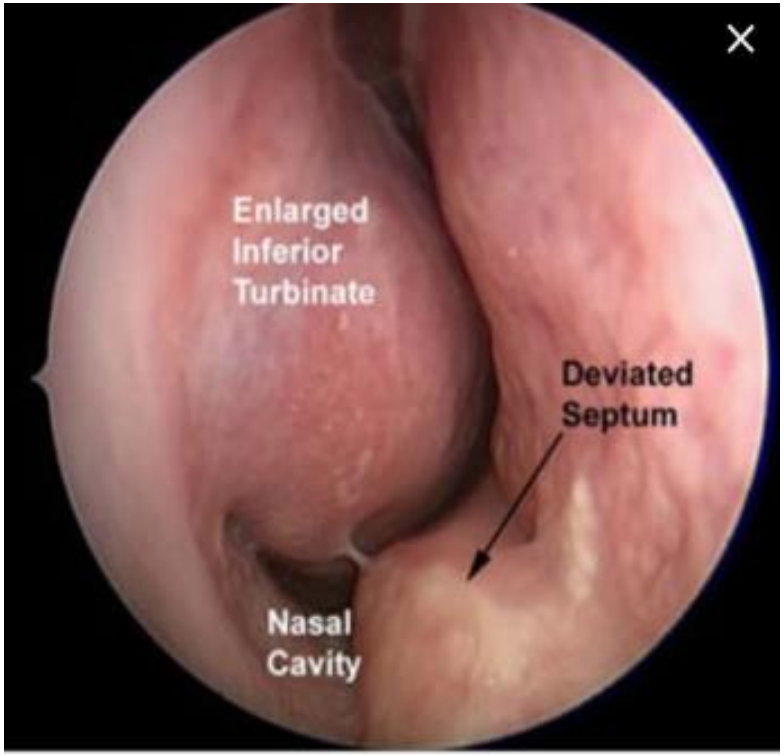
Evokes profuse catarrhal discharge ,initially the nasal mucosa is red thickened and edematous.

* without treatment clear up in a week if treated, but 7 days if ignored!.

-Secondary infection may occur…purulent secretion (AB is not a must).

- **Allergic rhinitis :"hey fever"**

Hypersensitivity-1 to some allergens, causing mucosal redness, edema and secretion with WBC (sp. eosinophil) infiltration, May be associated with turbinate hypertrophy ± nasal obstruction.



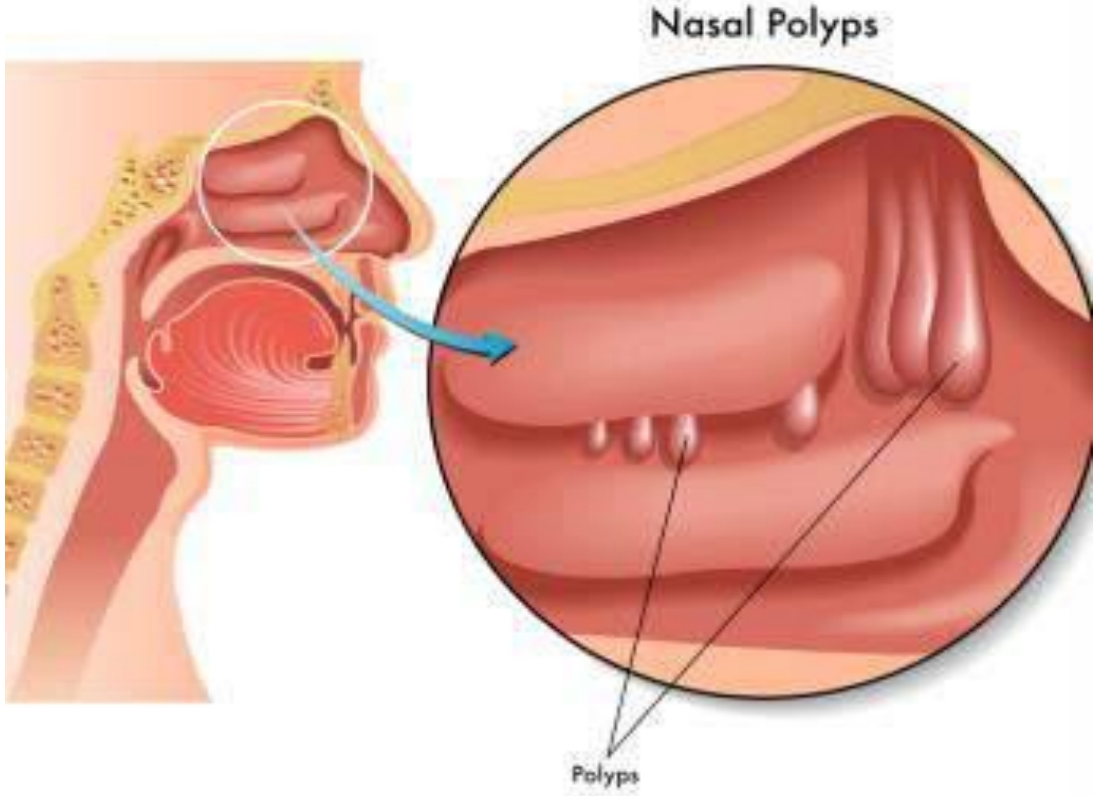
- **Nasal polyp:**

Recurrent attacks of rhinitis may leading to focal mucosa protrusion called polyp, ~ 2-4 cm. If occurs in child…CF is to be considered.

Histology:

Edematous & hyperplastic mucosa (± cystic glands) with loose stroma and infiltrated by inflammatory cells including eosinophils, plasma cells and lymphocytes. It can be multiple, may obstruct the airway &sinuses. In chronic cases there may be ulceration &infection.

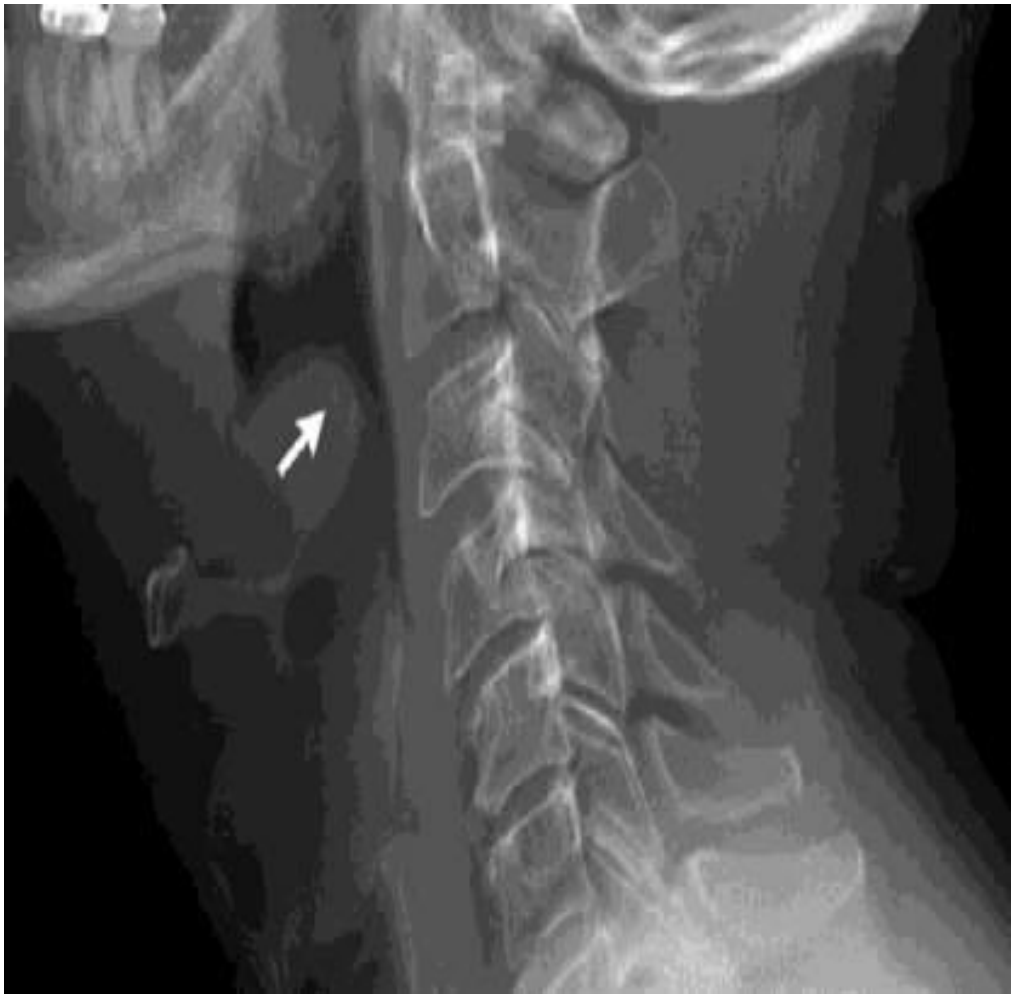
Although allergy may be an etiologic factor; only 0.5% of atopic pt developed nasal polyp and most pt with polyps are not atopic.



- **Acute epiglottitis**

H. Influenza is the most common cause.

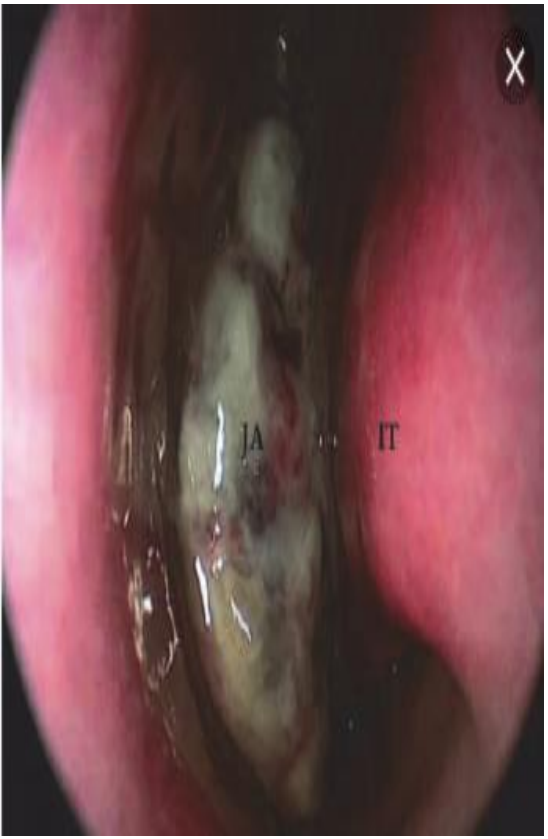
- Too much drooling, dysphagia, sore throat.
- Fever, muffled voice, inspiratory stridor.
- Thumb sign on x-ray.
- Risk of acute airway
- obstruction (medical
- emergency)

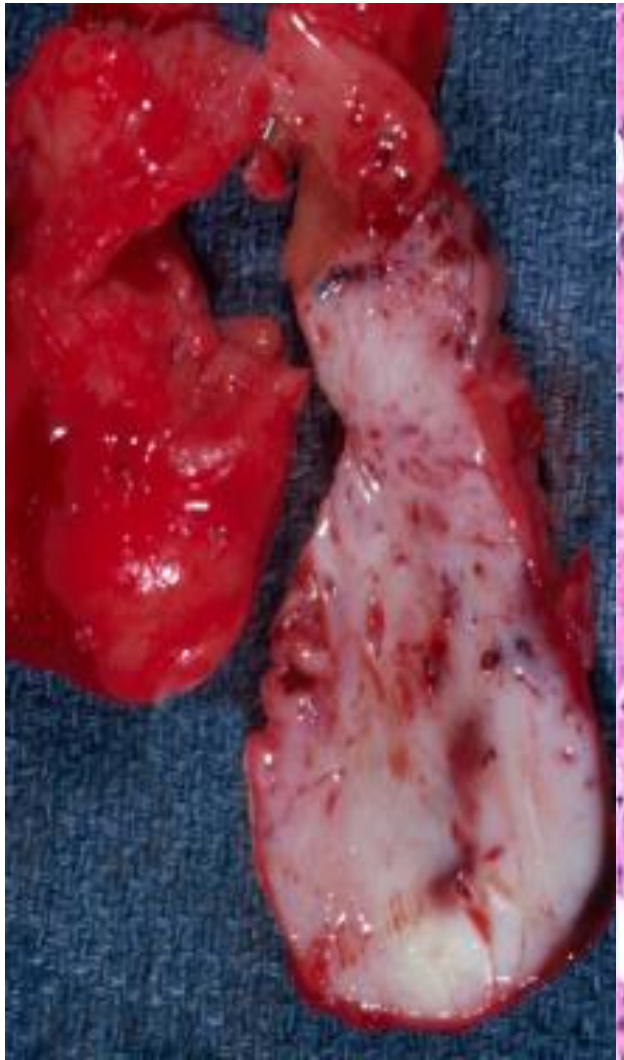


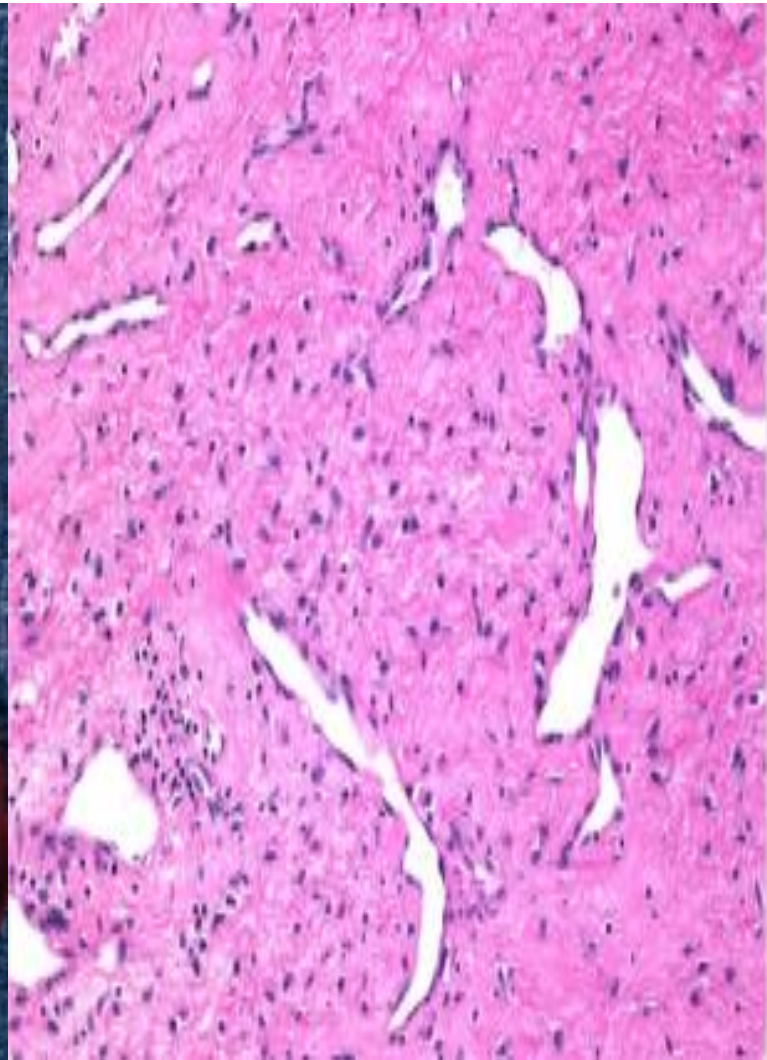
- **Nasopharyngeal angiofibroma**:

Polypoid richly vascularized spindle cell tumor, exclusively affects adolescent males.

It is benign, but can cause sever bleeding specially during surgery.







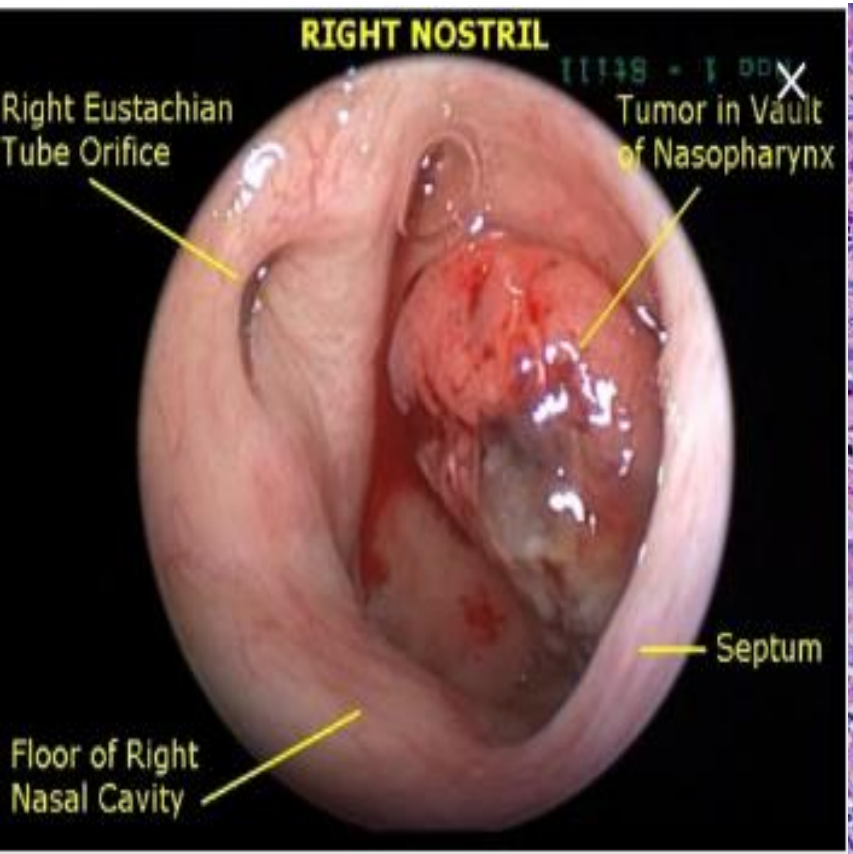
Nasopharyngeal carcinoma:

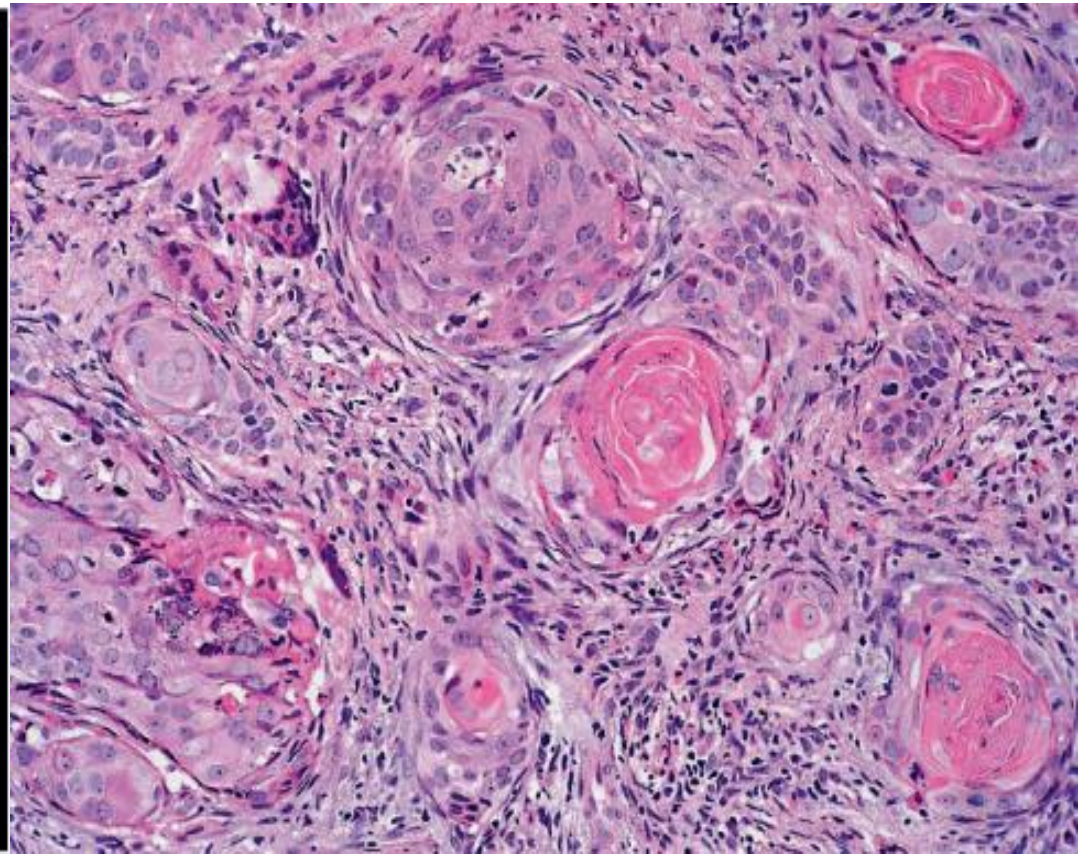
A type of carcinoma that has a special correlation to lymphoid tissue and EBV.
It is of 3 subtypes:

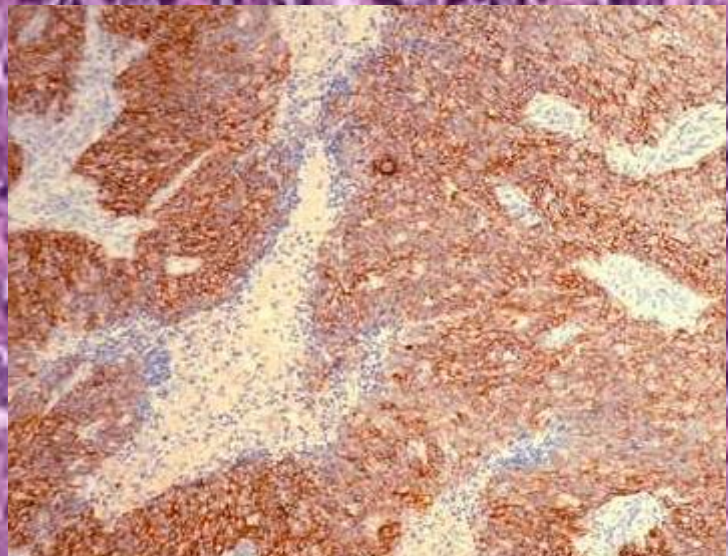
1-Keratinizing sq. cell Ca.,

2-Non-keratinizing sq. cell ca.

3-Undefferentiated carcinoma(this type charact. by large epithelial cells with round vesicular nuclei and prominent nucleoli, admixed with abundant benign lymphocytes, so called (lymphoepithelioma).







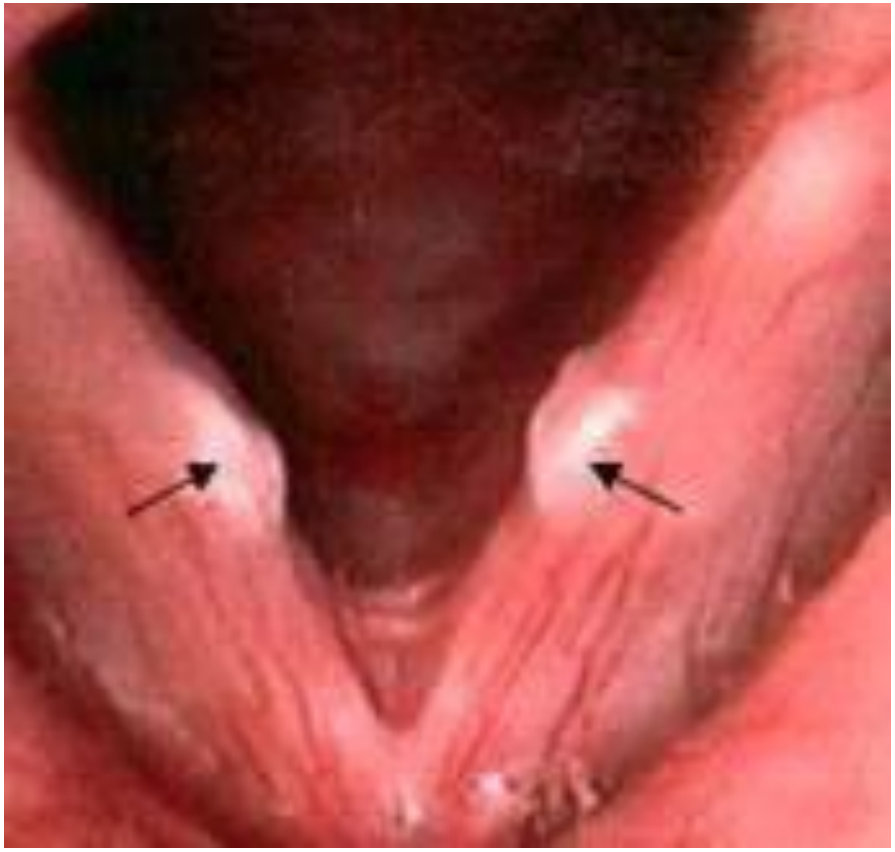
- **Reactive laryngeal nodule "singer nodule"**

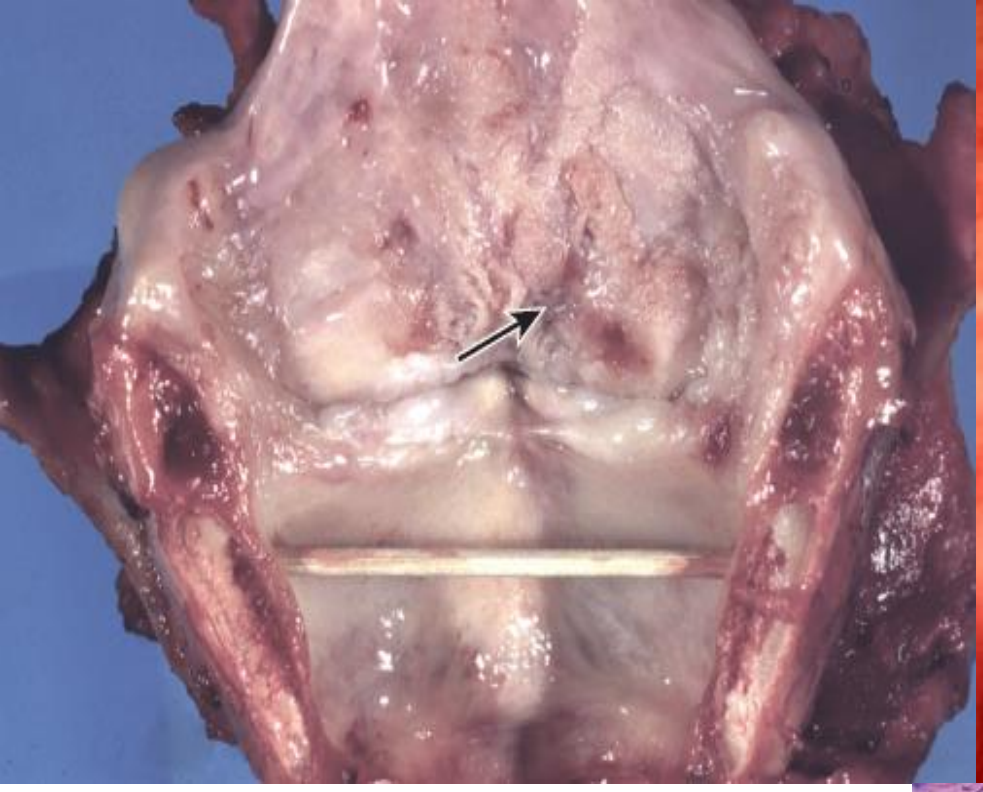
Usually bilateral smooth vocal cord nodules, ~ few mm

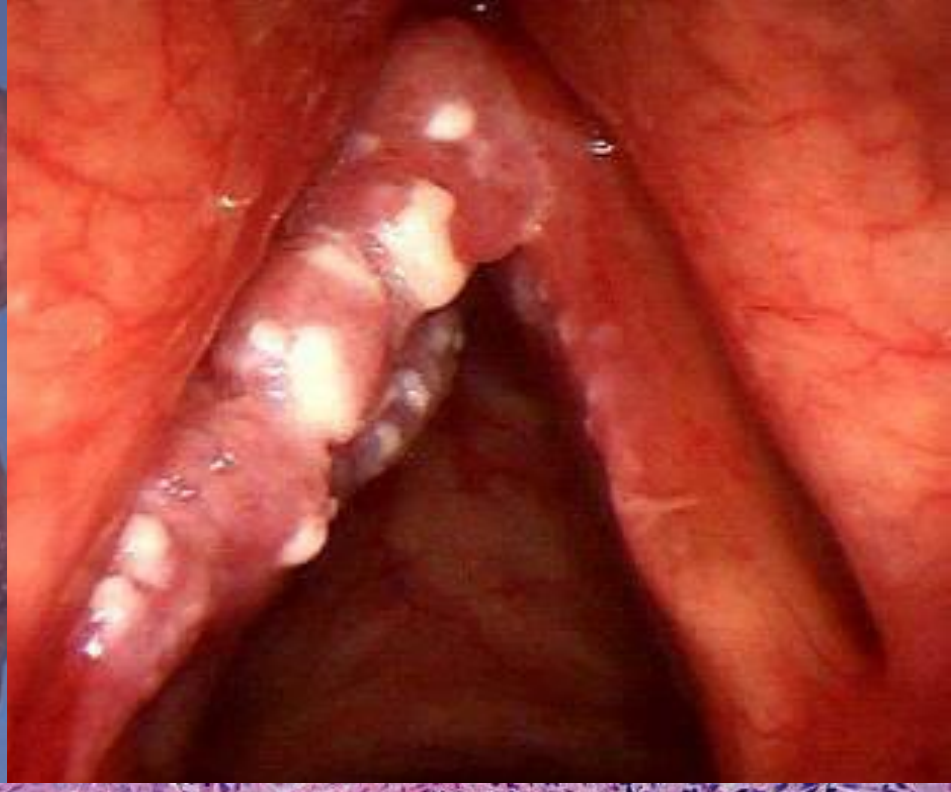
Affecting heavy smokers and those using great strain on their vocal cords. Classically presented with hoarsening voice.

Histology:

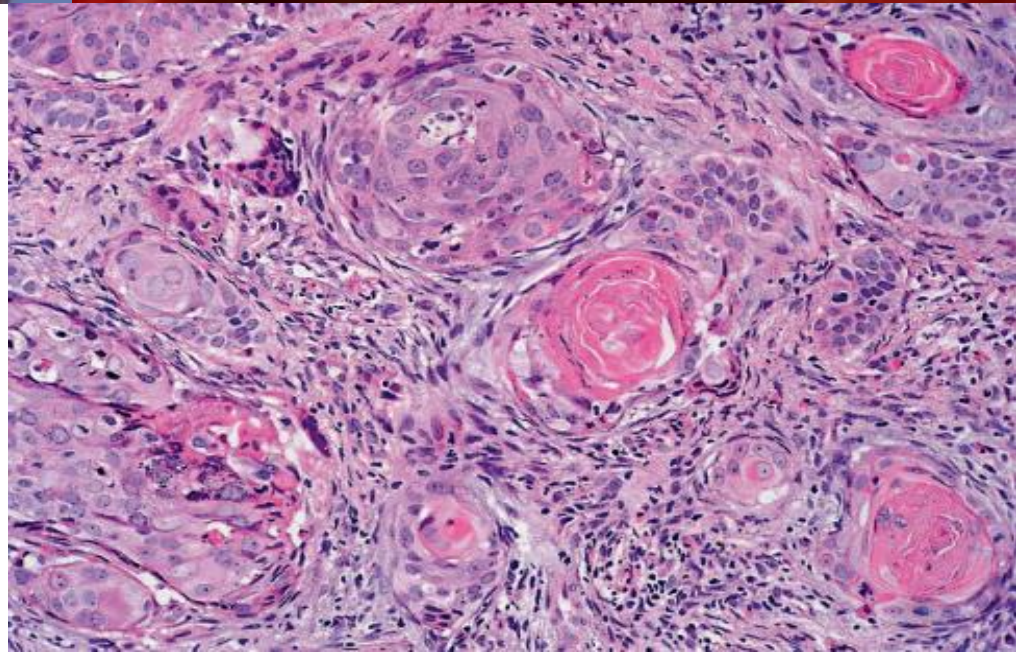
Small nodules covered by sq. epithelium overlying loose vascularized myxoid core.







<u>Carcinoma of larynx</u>: (95% is Sq. cell carcinoma).
Usually follows a spectrum of hyperplasia..dysplasia..
ca in situ...and then invasive ca.
Risk factors: **smoking** ,alcohol.. Asbestoses, HPV..



Pathology of the Respiratory System- 2

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Lung pathology

Atelectasis (Collapse).

Diffuse pulmonary diseases:

-Obstructive lung dz:

-Asthma.
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-**Restrictive lung dz**:

-Acute (ARDS , Resp distruss synd. of NB).
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Lower respiratory tract infection (pneumonia):

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Tumors

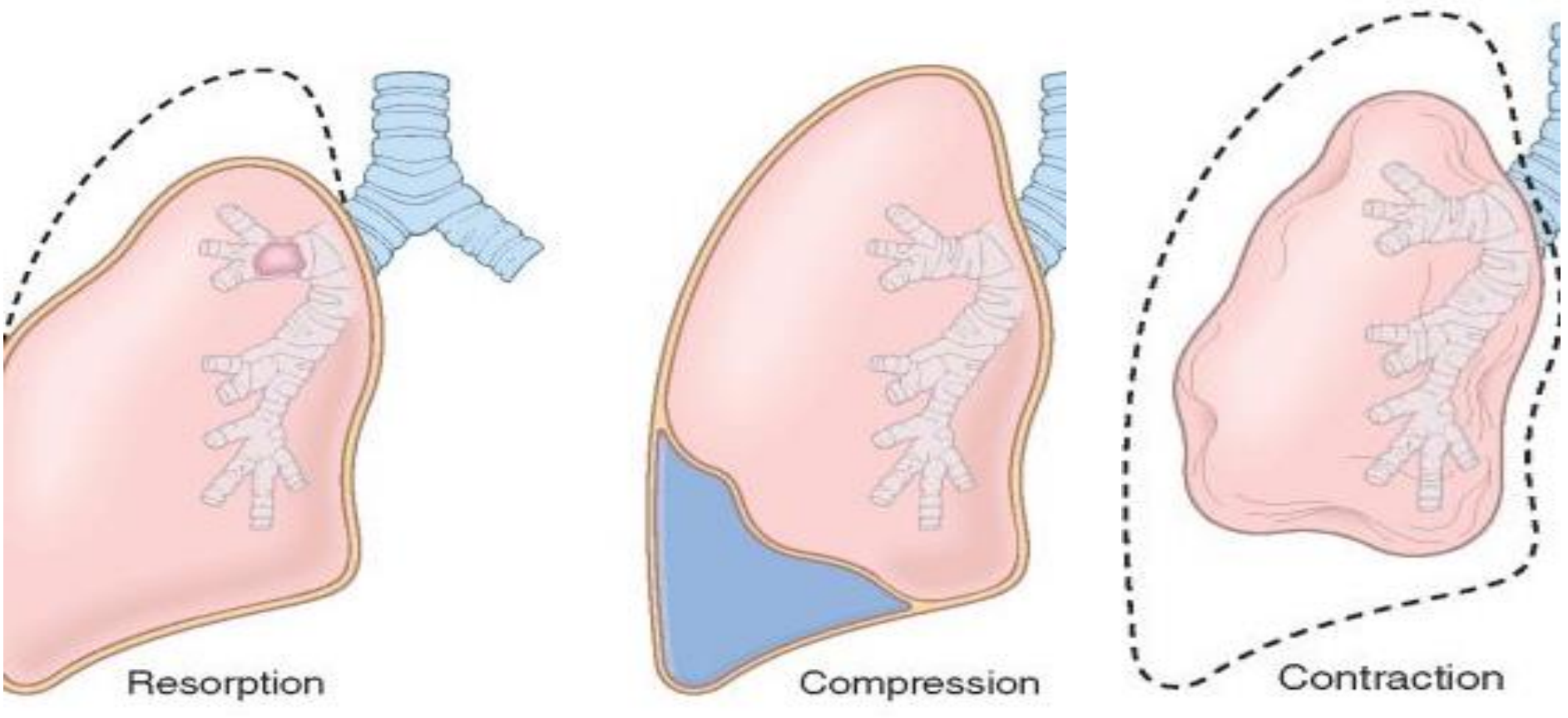
Atelectasis (Collapse):

Loss of lung volume caused by inadequate expansion of air spaces, results in shunting of inadequately oxygenated blood from pulmonary arteries into veins, thus giving rise to a ventilation perfusion imbalance and hypoxia, **Types:-**

1-Consequence of complete obstruction of an airway

2-By fluid , tumor , air.

3-Local or generalized fibrotic changes



OBSTRUCTIVE LUNG DISEASES:

-↑air out flow resistance at the level of bronchial passages (obstruction to getting air out of lungs).

- Decreased Forced Expiratory Volume (FEV at 1 sec.),
- They include:
- Asthma,
- Chronic bronchitis.
- Bronchiectaisis.
- Cystic fibrosis.
- Bronchiolitis.

Asthma

Episodic multifactorial dz in which there is hyper-responsiveness of airways to a variety of stimuli(in genetically susceptible pt), leading to inflammatory reaction, and then to episodes of bronchial obstruction that is relieved either spontaneously or by drugs.

- ***Status Asthmaticus*** : unrelieved prolonged attack.

Pathogenesis

T-helper1 secretes interferon that **inhibits** T-helper2.

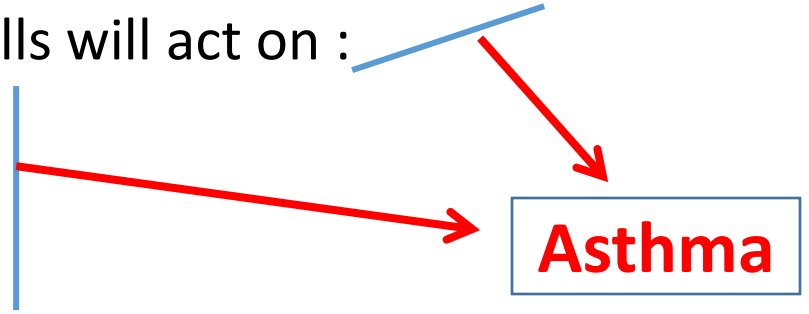
They found that T-helper1 cells from asthmatic pts have a genetic defect, and incompetent to inhibit T-helper 2.

T-Helper 2 secretes interleukins that stimulate eosinophils & IgE secretion with activation of mast cells, these mast cells will act on :

-influx of more eosinophils ,

-proliferation of bronchial smooth muscle .

-parasympathetic stimulation.



Phases of asthma:

i- Acute phase (starts within ~30 minutes)

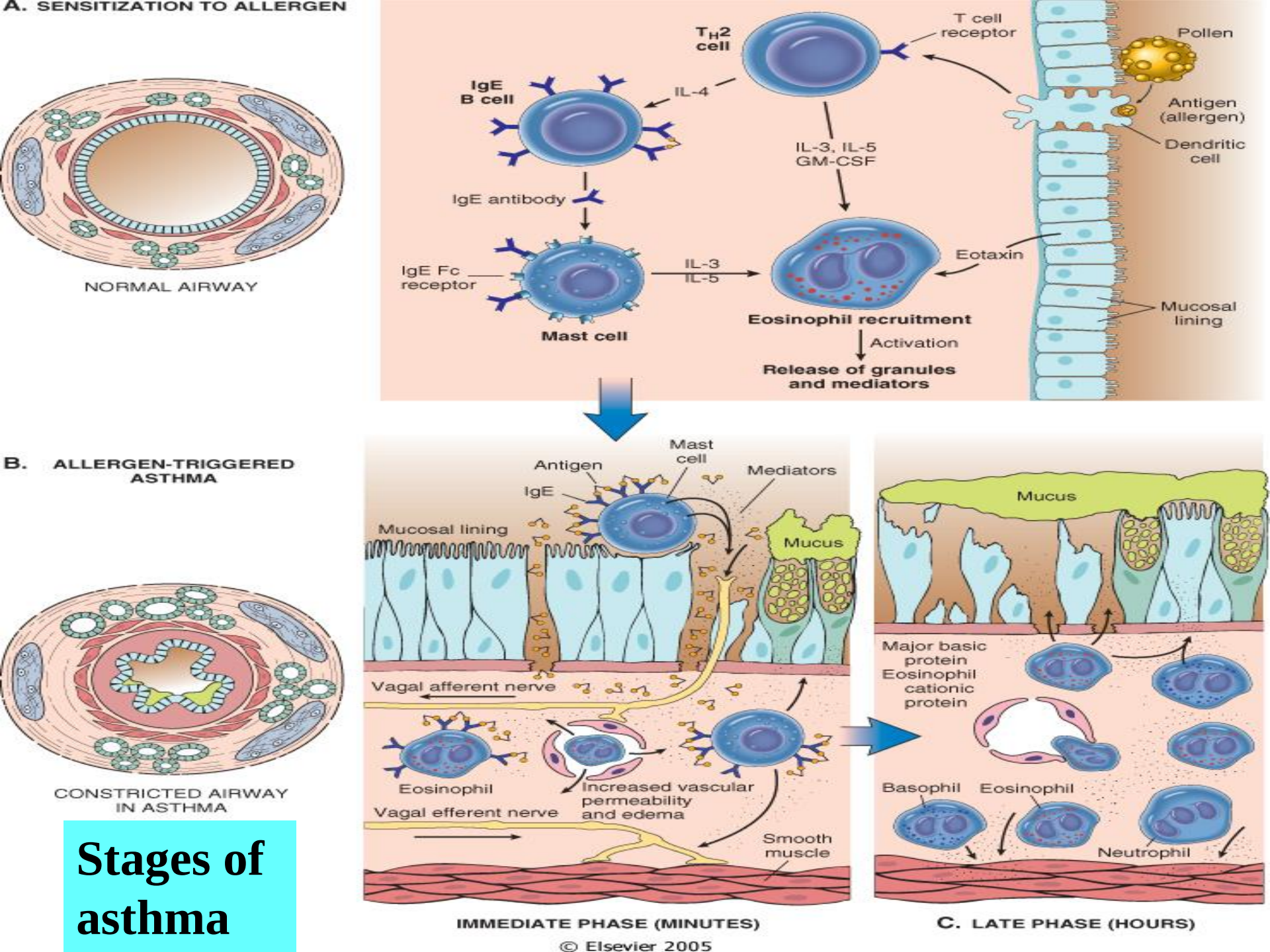
1- Allergen binds to IgE on mast cells on surface epithelium.

2- Degranulation of mast cells and release mediators that open the junctions and permits Ag to reach the subepithelial mast cells and parasympathetic nerves, so as a result there will be:

-bronchoconstriction , edema , mucus secretion and setting the cells (eosinophils, neutrophils, macrophages ..) for late phase.

ii- Late phase (12-24 hrs):

Causes epithelial cells damage especially by eosinophils mediators (major basic protein and eosinophil cationic protein) in addition to bronchoconstriction , edema and mucus secretion.



Stages of asthma

Pathology

- Mucosal edema, congestion + inflammatory cells(~ eosinophils.), lumen of bronchi & bronchioles contain thick mucous that contain:

** Charcot Leyden* crystals: Eosinophil protein (~ eosinophilia).

** Curshmann's spirals* : Whorls of necrotic epithelial cells.

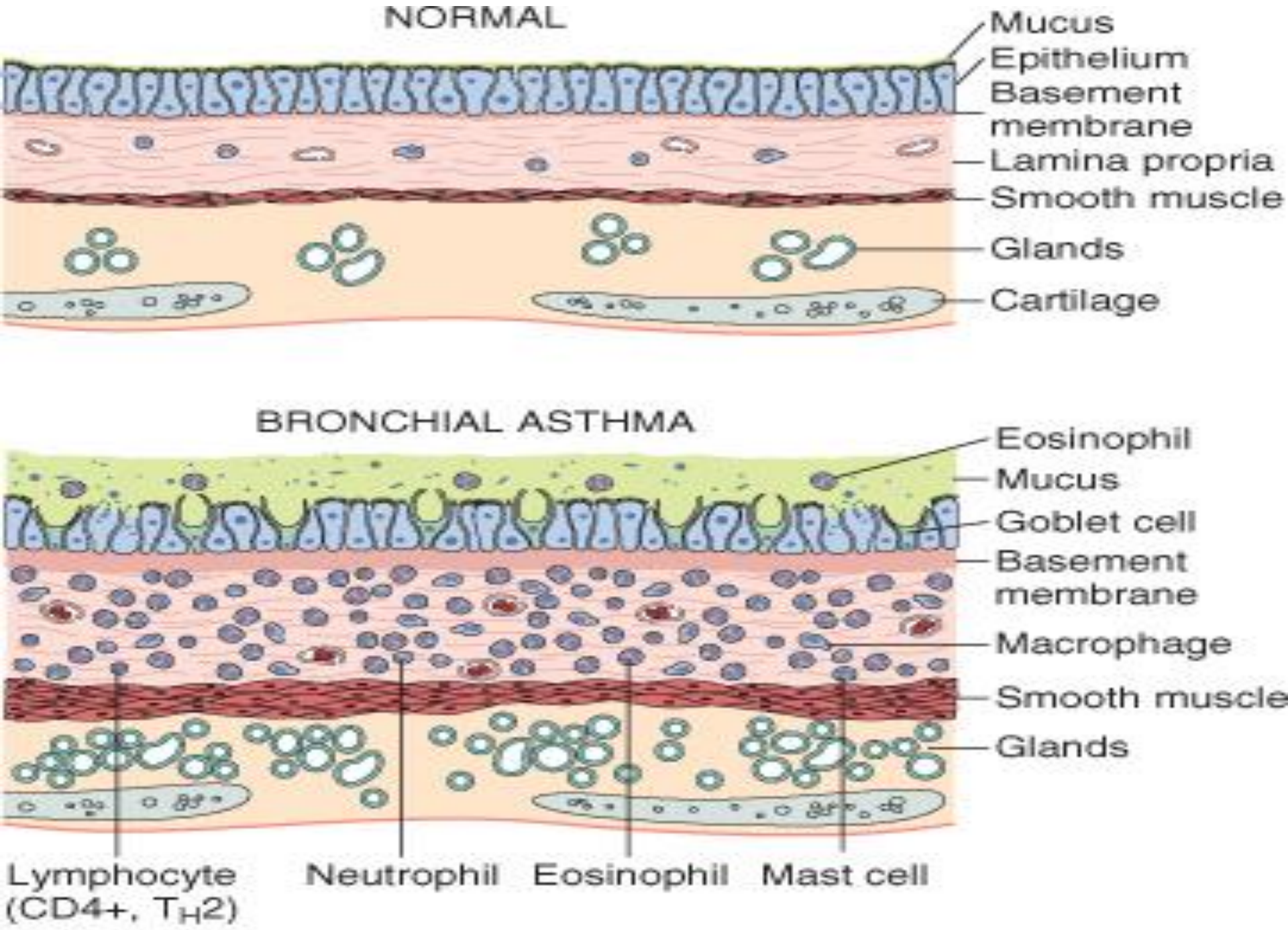
- Necrosis of surface epithelium.
- Increased basement membrane collagen deposition
-Hypertrophy & hyperplasia of mucus gland with goblet cell metaplasia
-Hypertrophy & hyperplasia of smooth muscle.

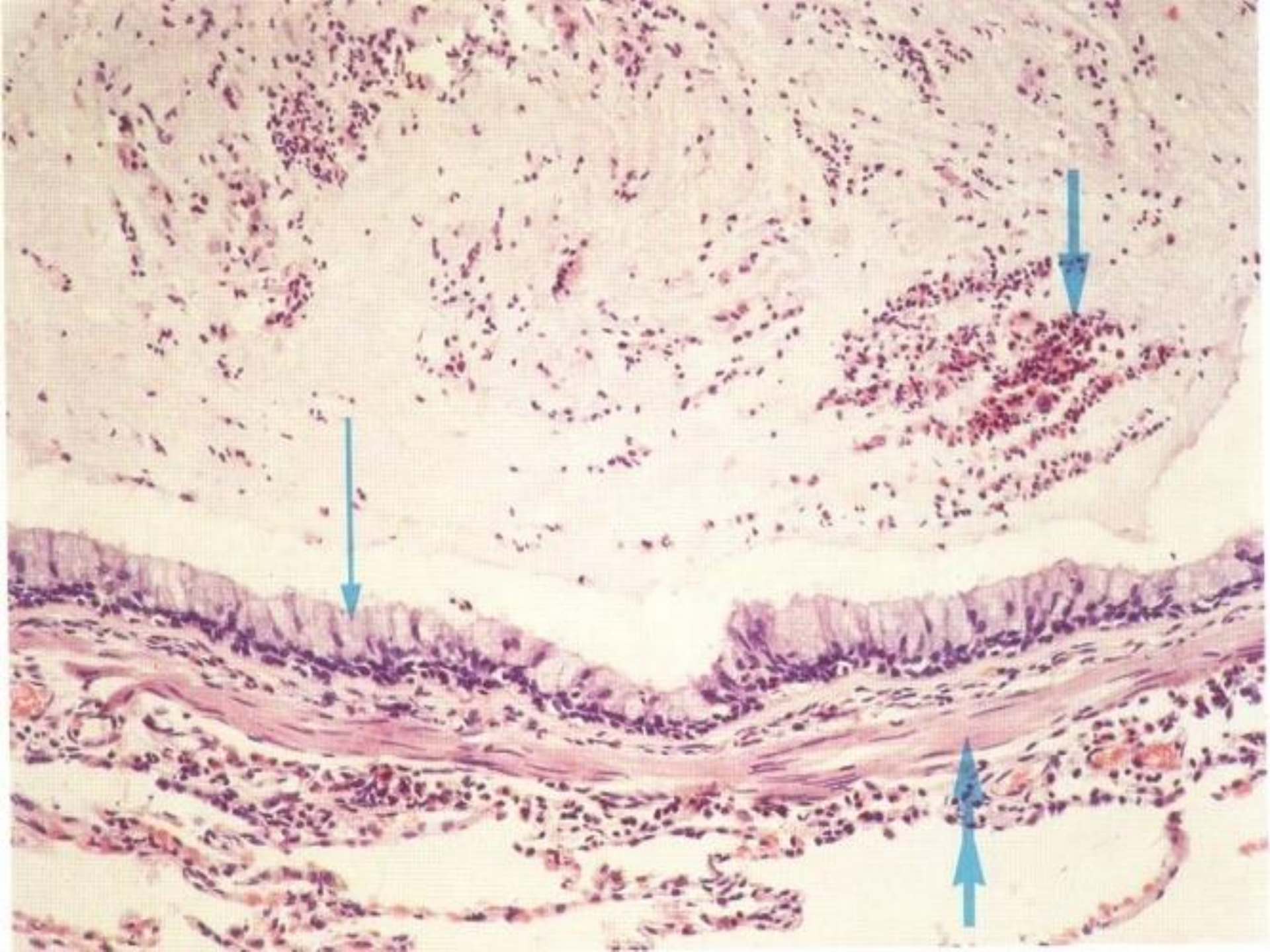
Clinical picture :

1- Reversible severe dyspnea ,wheezing & cough.

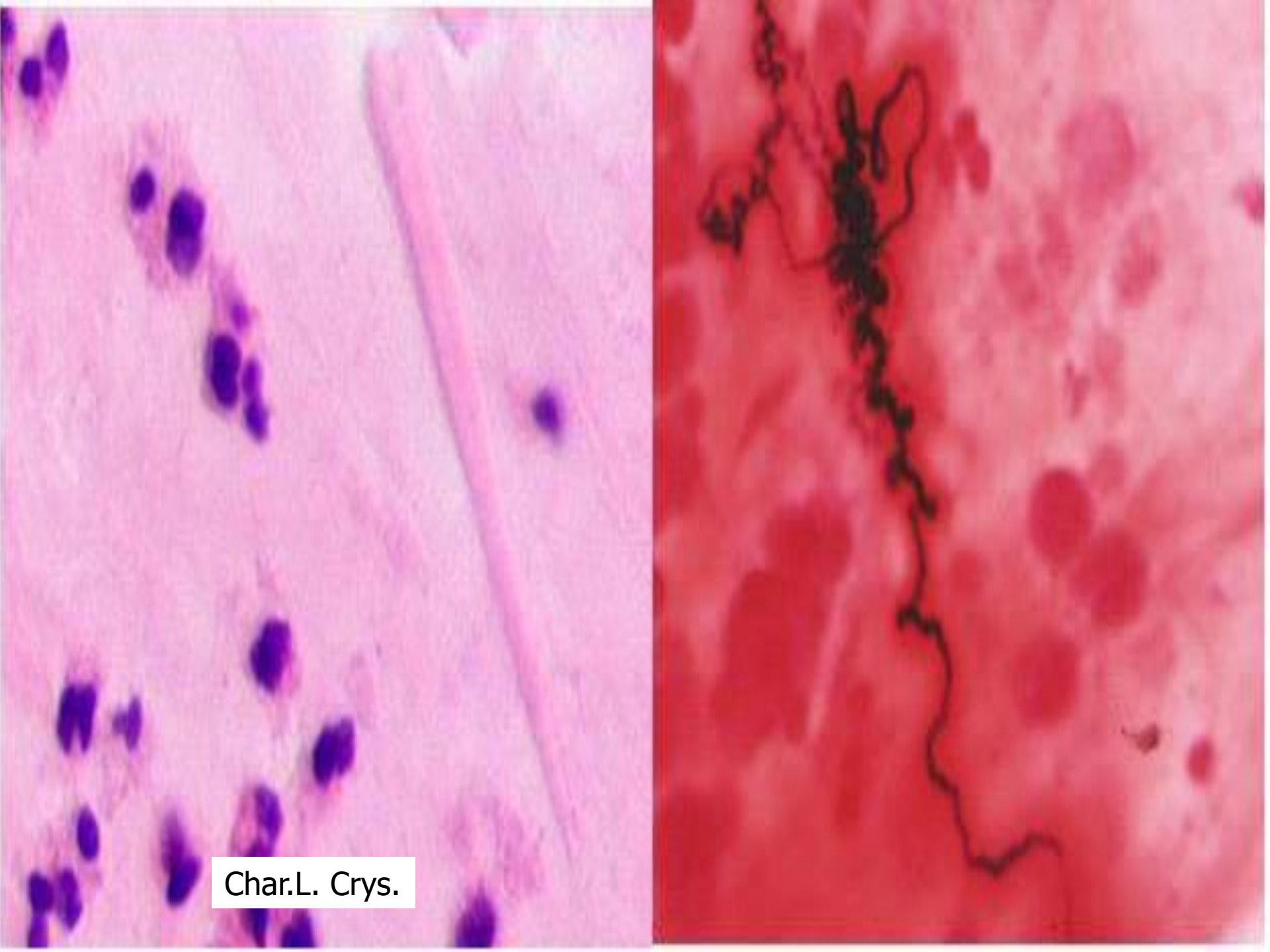
2- Lung hyperinflation

3- Bronchospasm lasting several hours or ***Status Asthmaticus.***





Mucus bronchial cast


Char.L. Crys.

Types of asthma:

Clinically :mild, moderate and severe asthma, but according to presence or absence of an **underlying immune disorder** it divided in to extrinsic & intrinsic asthma**.**

A- Extrinsic Asthma :

- Immune mediated resulting from exposure to:
  - a- Allergen (Atopic)
  - b- Occupational agents.
  - c- Aspergillosis.
- Early age
- Increased IgE
- Positive family history for asthma or others.
- ± Other allergic disorders.

B- Intrinsic Asthma (non atopic)

- ? Viral infection, ? Aspirin,? Air pollution , ? Exercise (these factors increase the respiratory hypersensitivity in both normal and asthmatic persons , but in the latter, the response is more severe and sustained).
- Family history for asthma and other allergies are uncommon.
- ~ no increase of IgE.

asthma-histo.mp4