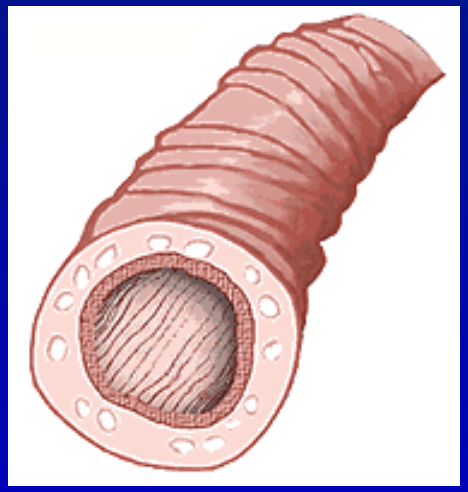
Obstructive Airway Disease



Dr. Khalid Al-Mobaireek

King Khalid University Hospital

Obstructive airway Disease:

- Physiological:
  - Reversible = Asthma
  - Irreversible: Bronchiectasis
- Anatomical:
  - Upper
  - Lower

- **Obstructive> happens in the air way**
- **Restriction > any thing prevent lung from expansion**

The upper airway is outside the thoracic cage, we creat negative pressure by inspiration because we are lowering the diagram and increasing the space

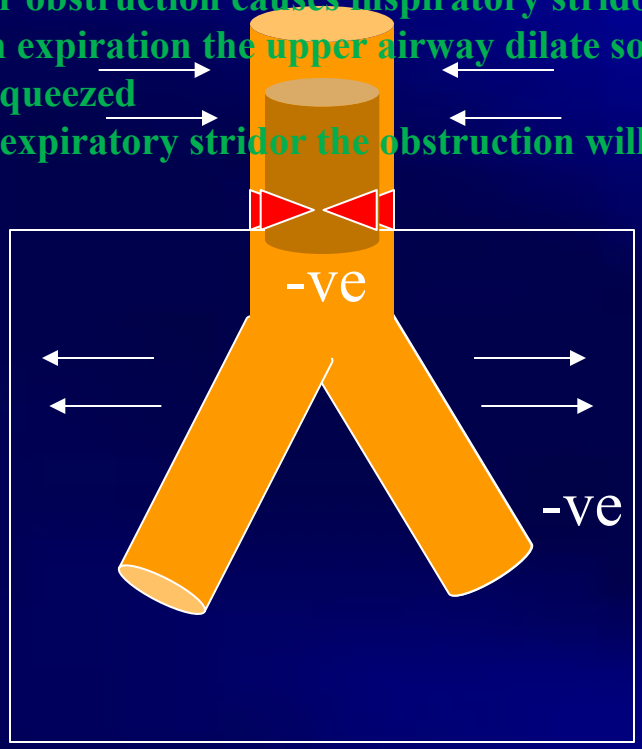
with the –ve pressure the air way inside thoracic cage will be dilated. If there is an obstruction it will not be very clear during this phase

But upper airway will be squeezed so if the obstruction is here it will be obvious

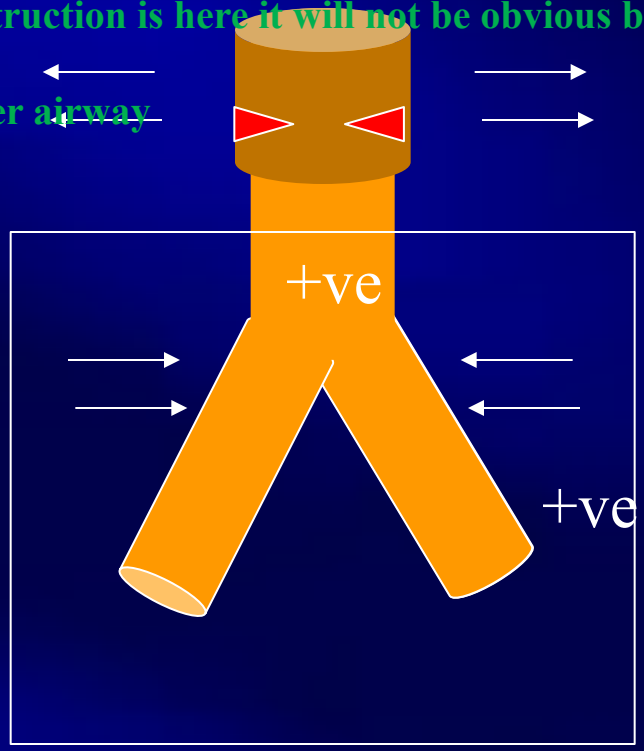
So upper obstruction causes inspiratory stridor

While in expiration the upper airway dilate so if the obstruction is here it will not be obvious but lower airway will be squeezed

So with expiratory stridor the obstruction will be in lower airway

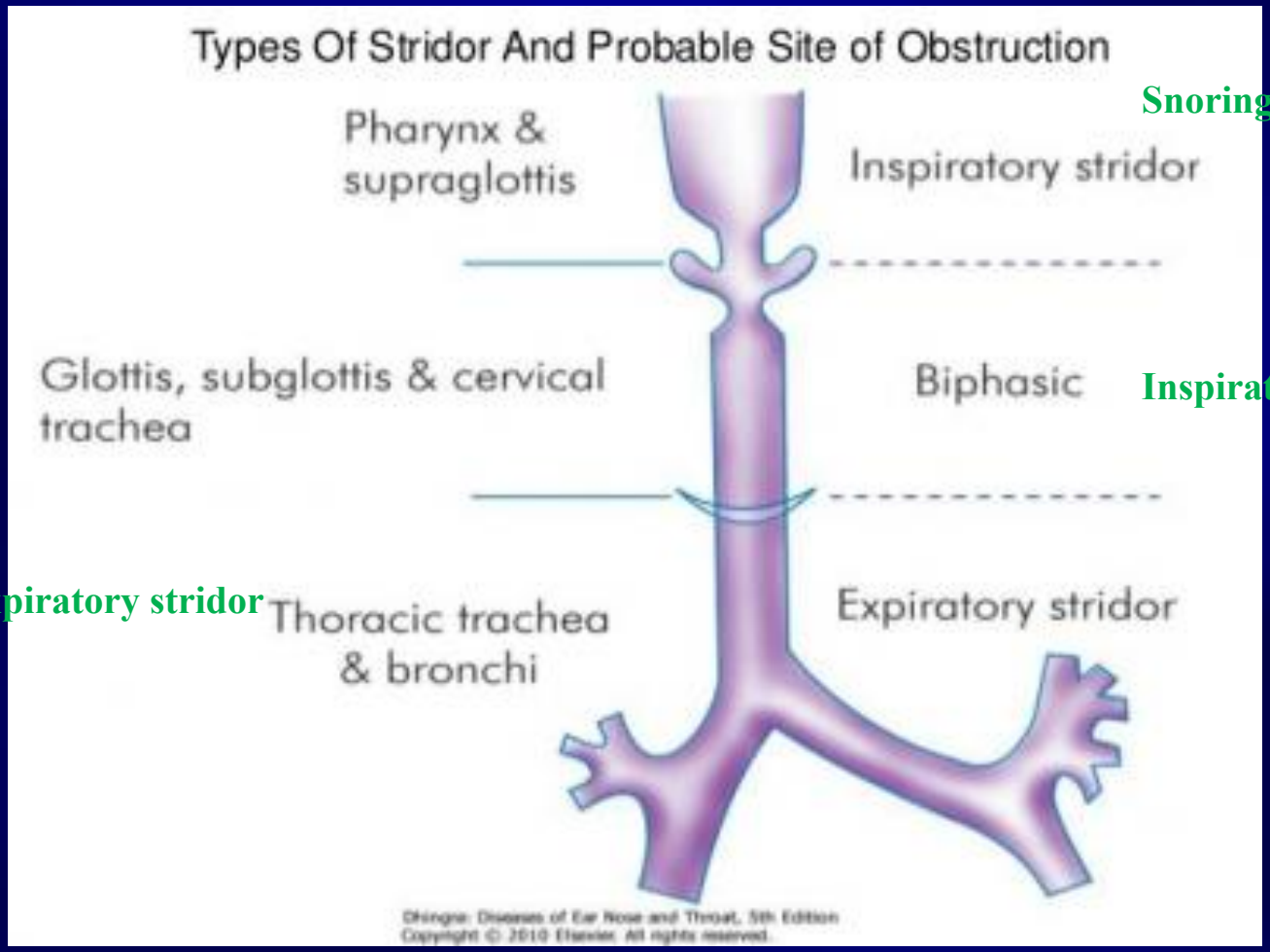


Inspiration



Expiration

Snoring During inspiration



Both phases So the problem in these areas

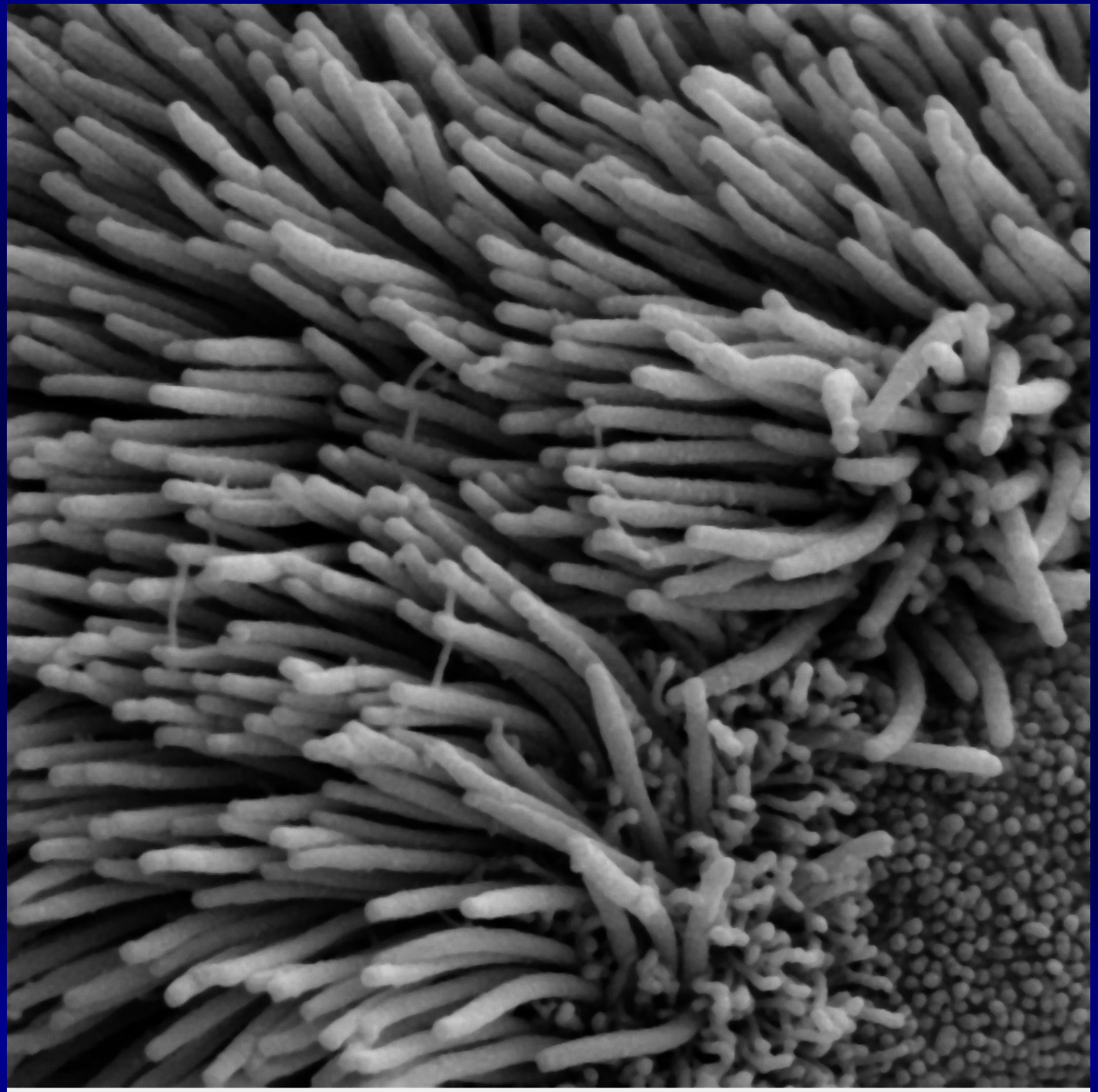
Inspiratory stridor

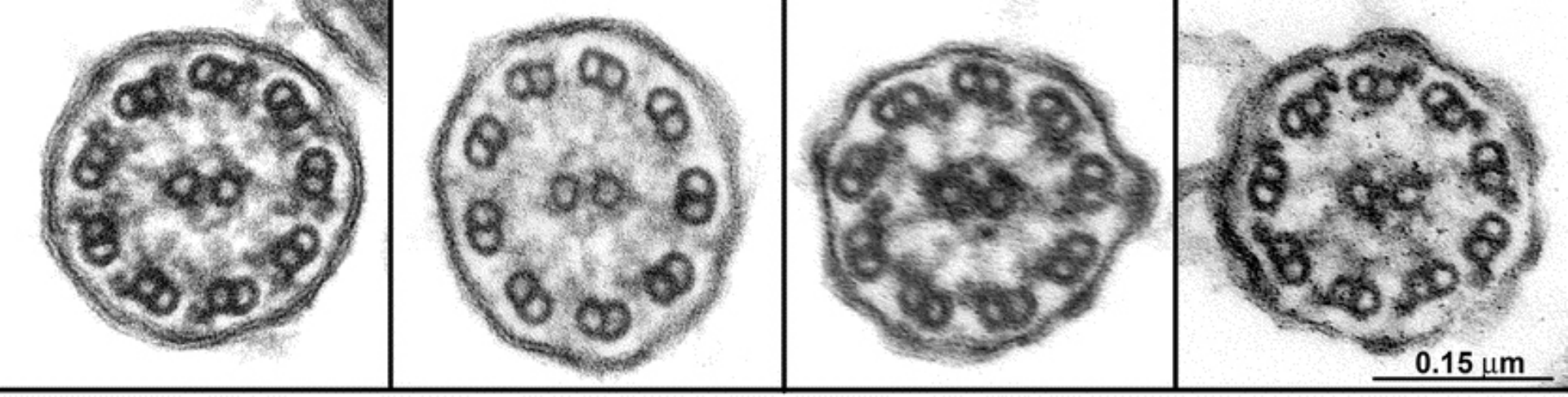
Expiratory stridor

Bronchiectasis

It is permanent dilatation of airway
The cartilage maintains the size of the air way so if it destroyed by infection then you will have dilatation
So if it happens there will be ineffective clearance there will be stagnation of secretions and mucus plugging, inflammation, and bacteria will colonize and causes infections.

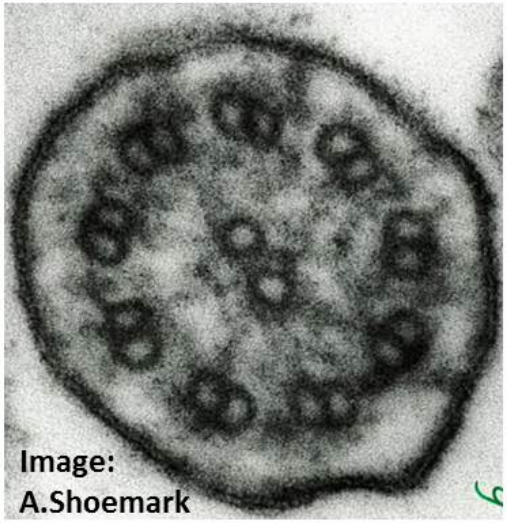
- Localized:
  - Anatomical **if only one lobe think about anatomical**
    - Airway: Internal, External,
    - Parynchymal **congenital or infection or cyst**
- Diffuse:
  - Aspiration babies who can't coordinate there swallowing like children with neurological problems
  - Mucociliary clearance: PCD, CF
  - Immune deficiency
  - Congenital **they born with no cartilage but very rare**
  - Post-infectious: Pertusis, TB, adenovirus..
  - **Like: cystic fibrosis (thick mucus because there is mutation so there are no chloride channel > no pumping of chloride so no Na then no water so the secretion will be dehydrated and heavy so the cilia will not be able to move the mucus) even if the child cough it will not help, ciliary dyskinesia (here the secretion is normal but the cilia are not moving in one direction so there will be ineffective clearance) coughing can help in airway clearing (patient will have chronic cough and the cilia is present also in the sinus so they present with recurrent sinusitis, and in the middle ear so they will have recurrent otitis media, males infertility because sperm motility depends on the cilia, females it may affect pregnancy because the movement of ovum in fallopian tube**
  - **Kartagener's syndrome it is ciliary dyskinesia with situs inversus**

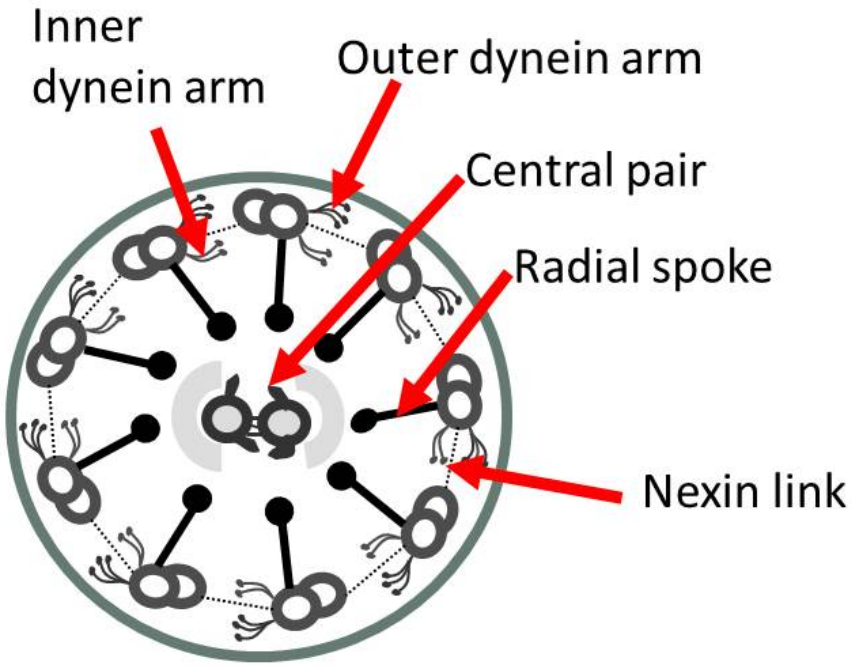




Normal | **Both Arms Absent** | **Absent ODA** | **Absent IDA**

Nose cilia cross-section

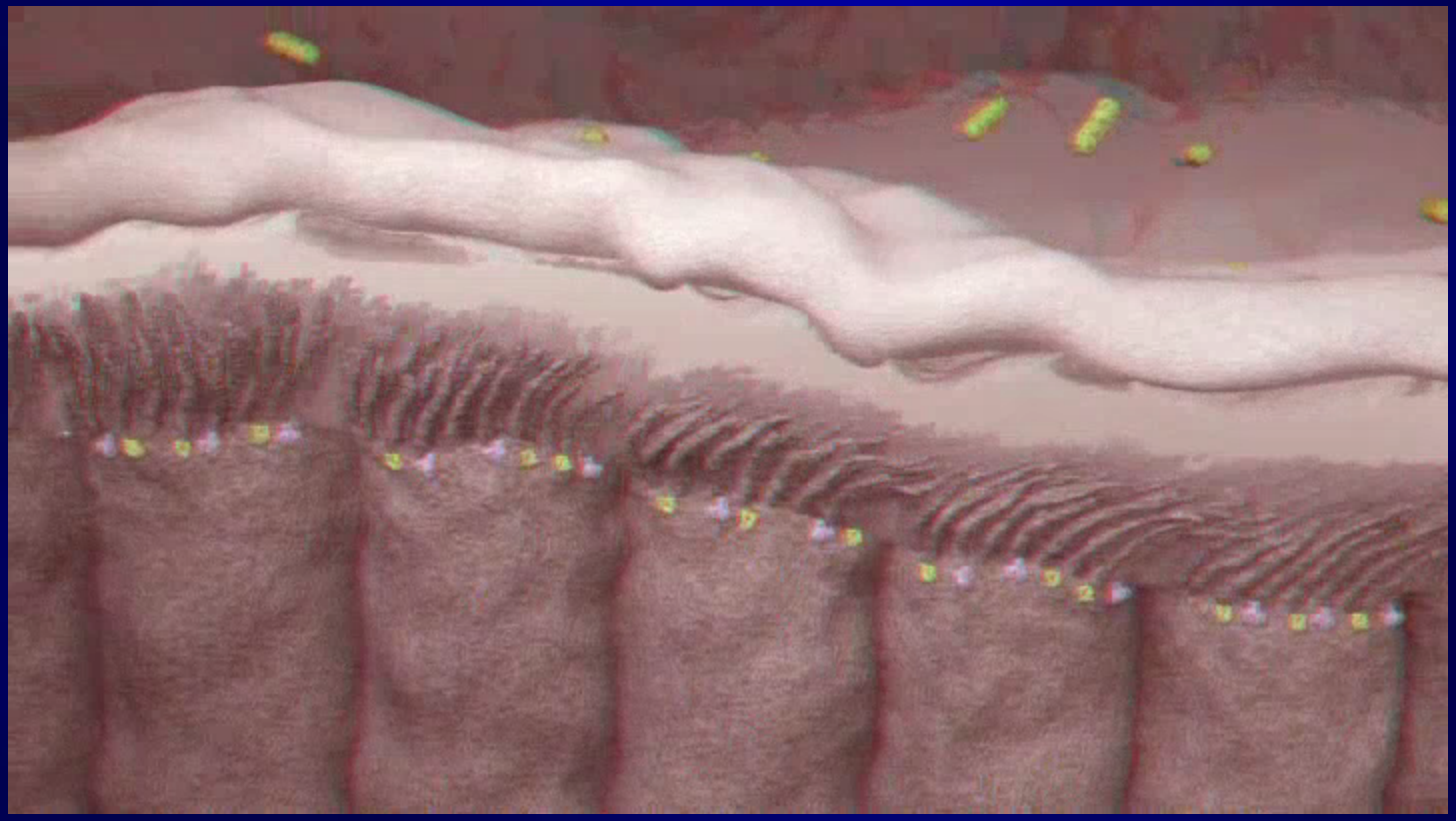




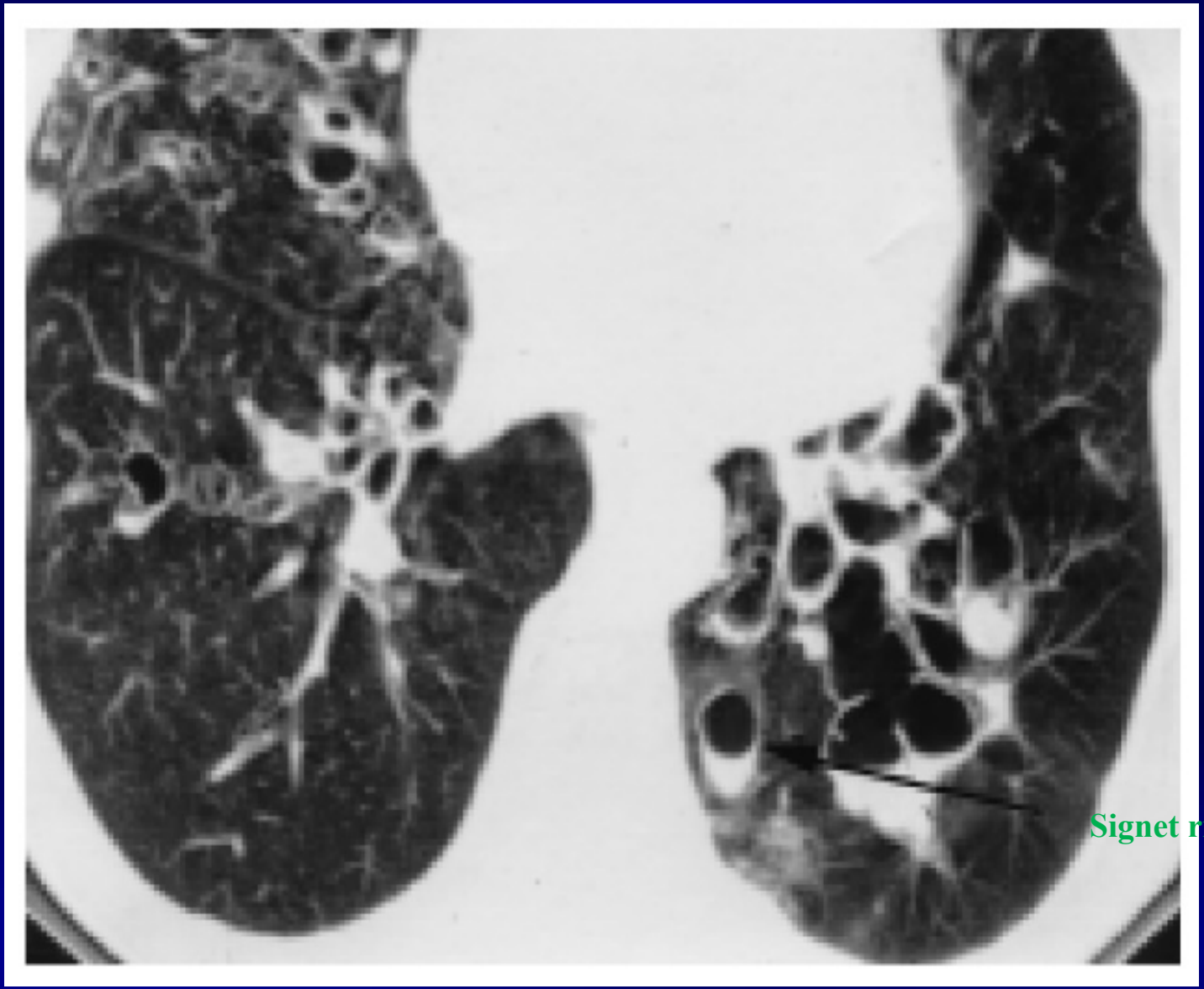
PCD

The normal cilia have 2 central tubules and 9 peripheral pairs of tube so 20 tubes

The central tubules is connected to the peripheral by spikes



Diagnosis:
CT scan
Here you can see dilated airway
Normally the airway is smaller than blood vessels
If its larger this is bronchiectasis

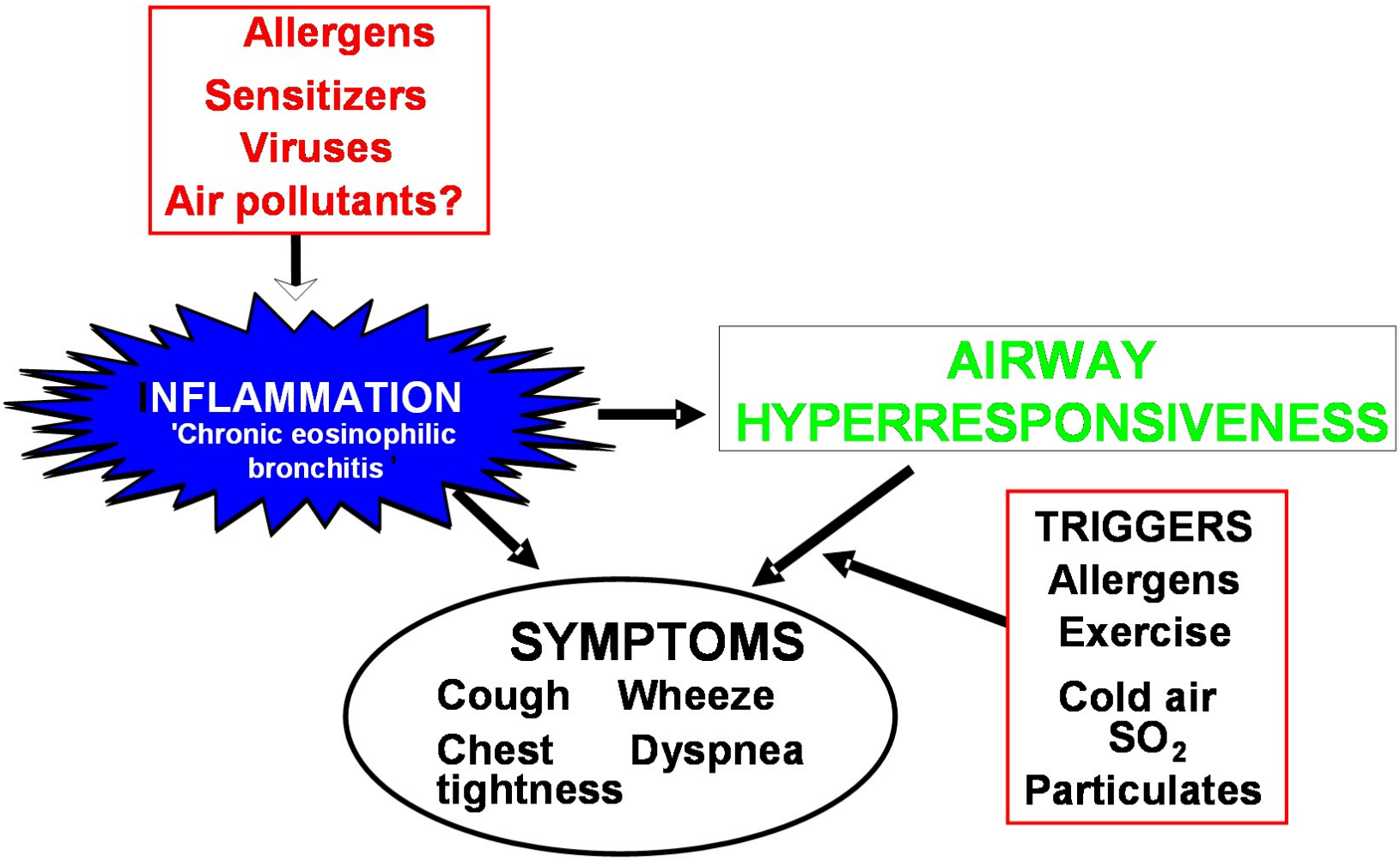


Definition of Asthma

- A chronic **inflammatory** disorder of the airways
- Many cells and cellular elements play a role
- Chronic inflammation is associated with airway hyperresponsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing
- Widespread, variable, and often reversible airflow limitation

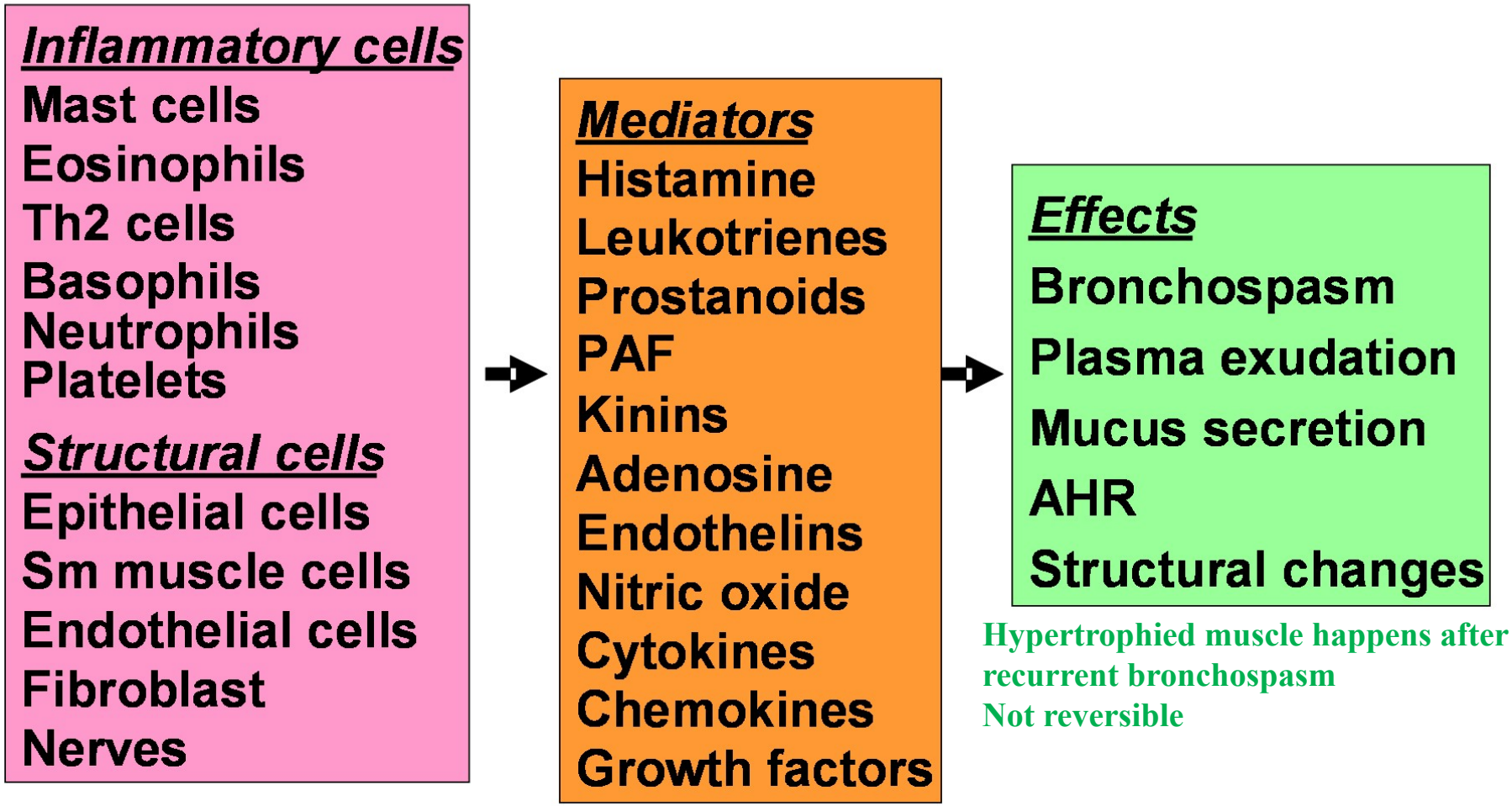

Bronchospasm
Edema, Mucus
Hyperresponsiveness
INFLAMMATION

Asthma Inflammation: Cells and Mediators



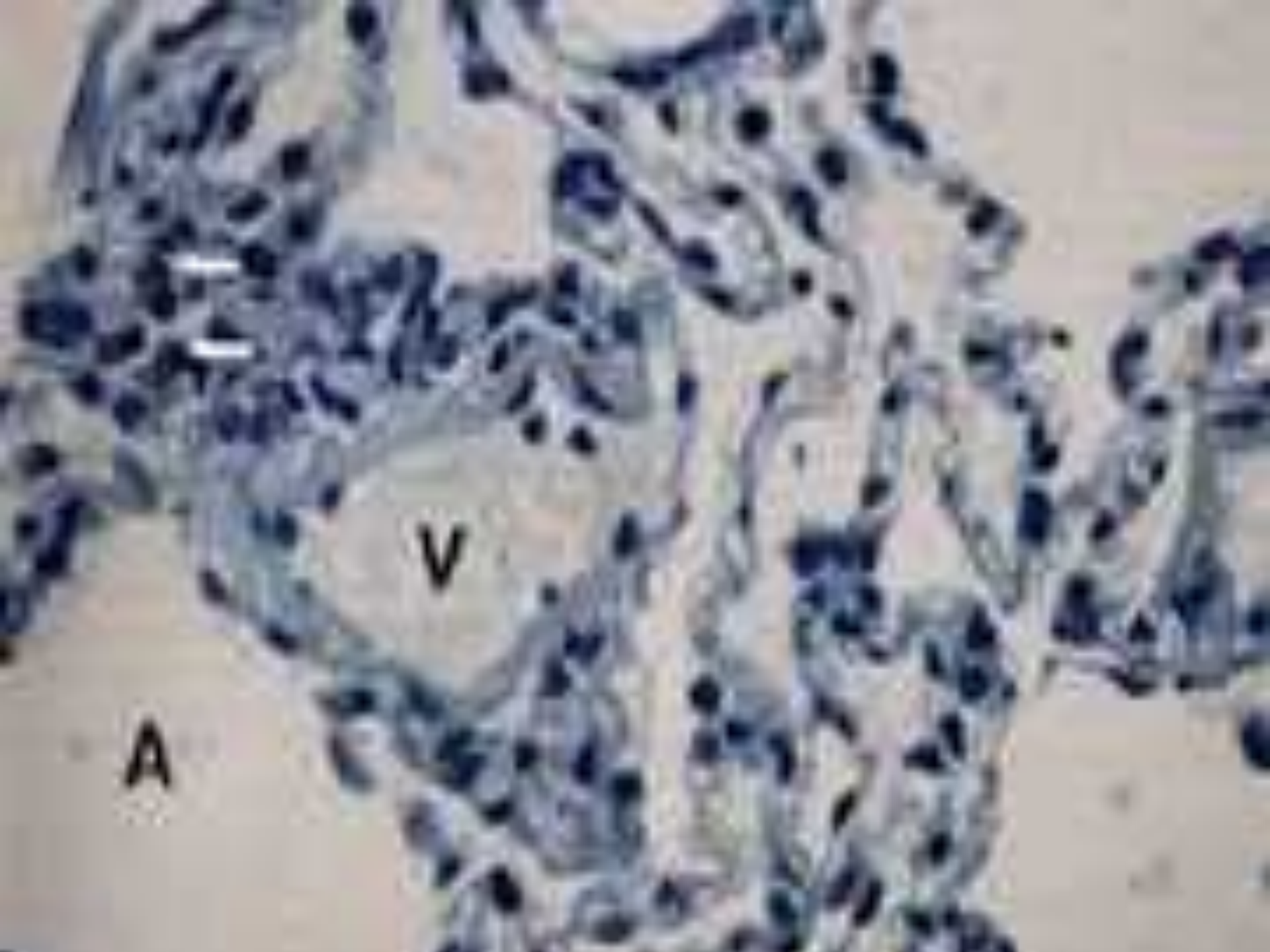
Source: Peter J. Barnes, MD

Asthma Inflammation: Cells and Mediators



Hypertrophied muscle happens after recurrent bronchospasm
Not reversible

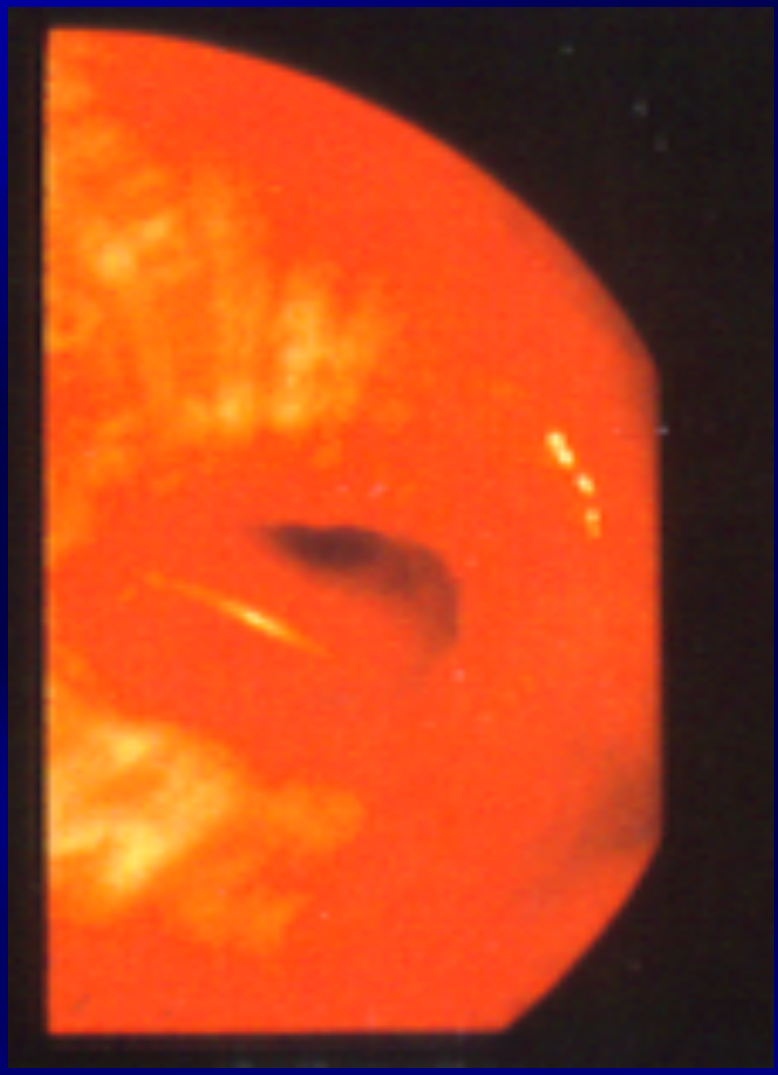
Source: Peter J. Barnes, MD


V
A

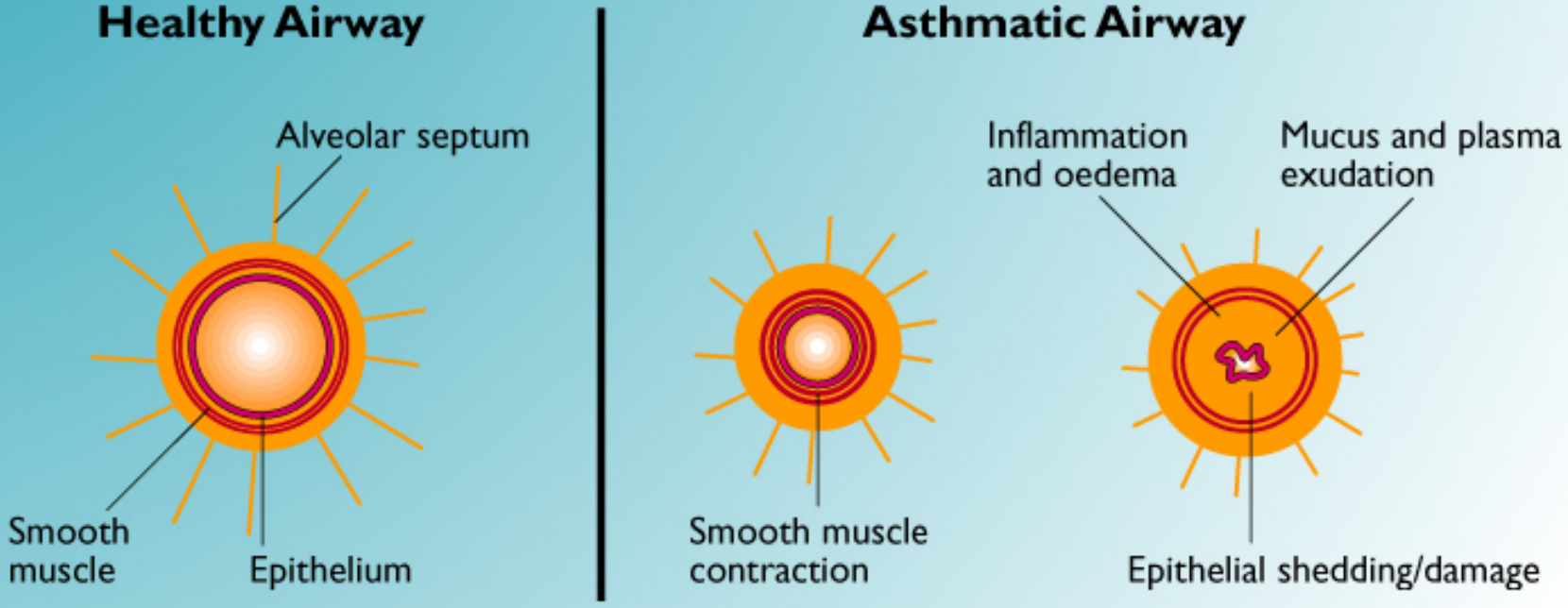
No body will do bronchoscopy to asthma patient because the airway is hyper responsive and it will cause spasm and it will cause obstruction

NORMAL

ASTHMA

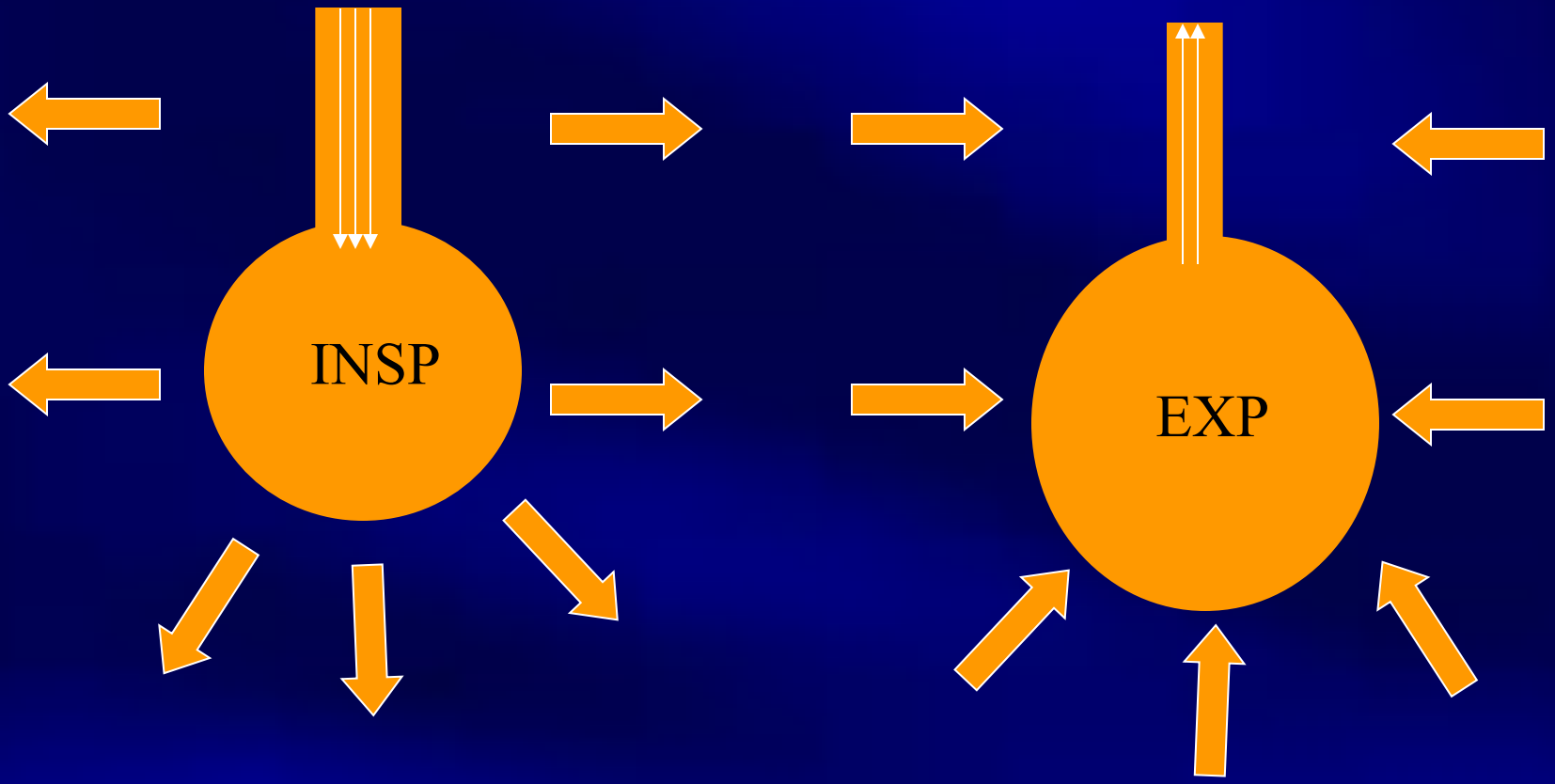


Asthma mainly is in the lower airways so expiratory stridor
So during inspiration they will have dilated airway and during expiration more obstructed airway

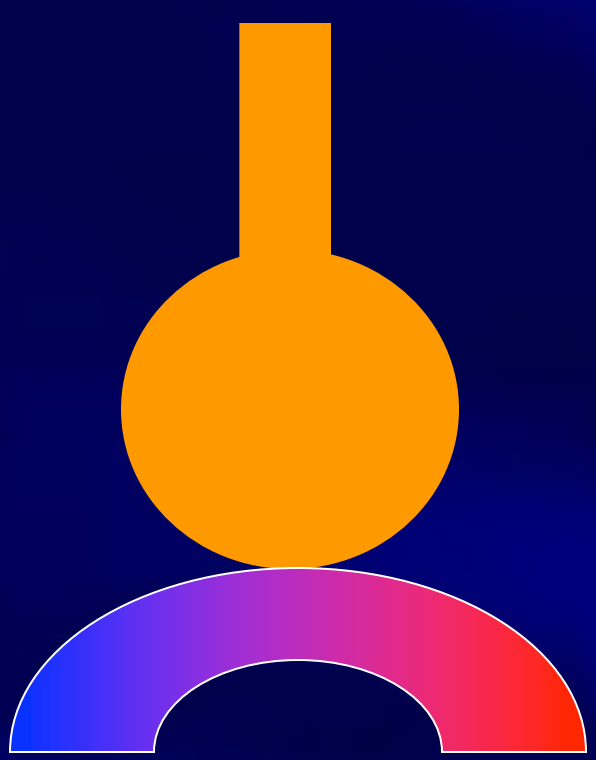


During inspiration air will enter the lung normally but during expiration the air will not be able to go out because of the lower airway obstruction so there will be air trapping and this will cause air leak because the lung is full > pneumothorax, Pneumomediastinum , subcutaneous emphysema
Also the hyperinflation will also cam compromise the circulation by decreasing cardiac output

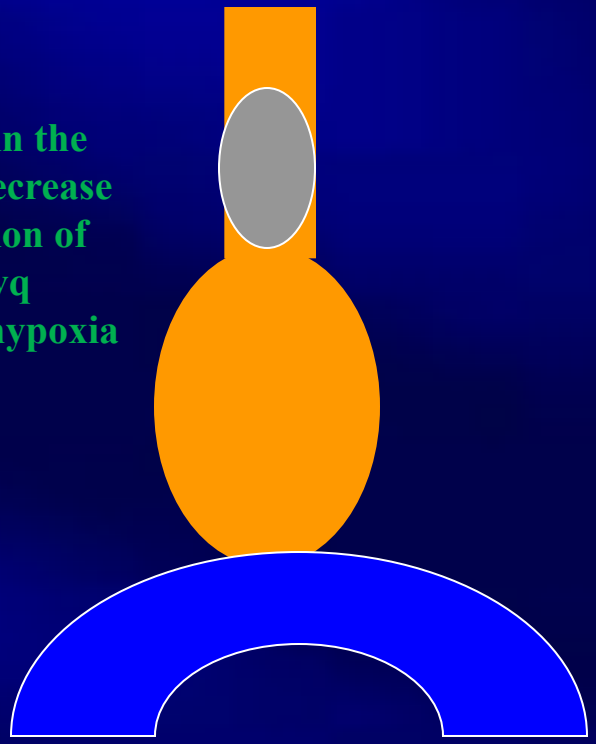
AIR TRAPPING



Ventilation Perfusion (V/Q) Mismatch



Obstruction in the alveoli will decrease the oxygenation of the blood so vq mismatch > hypoxia



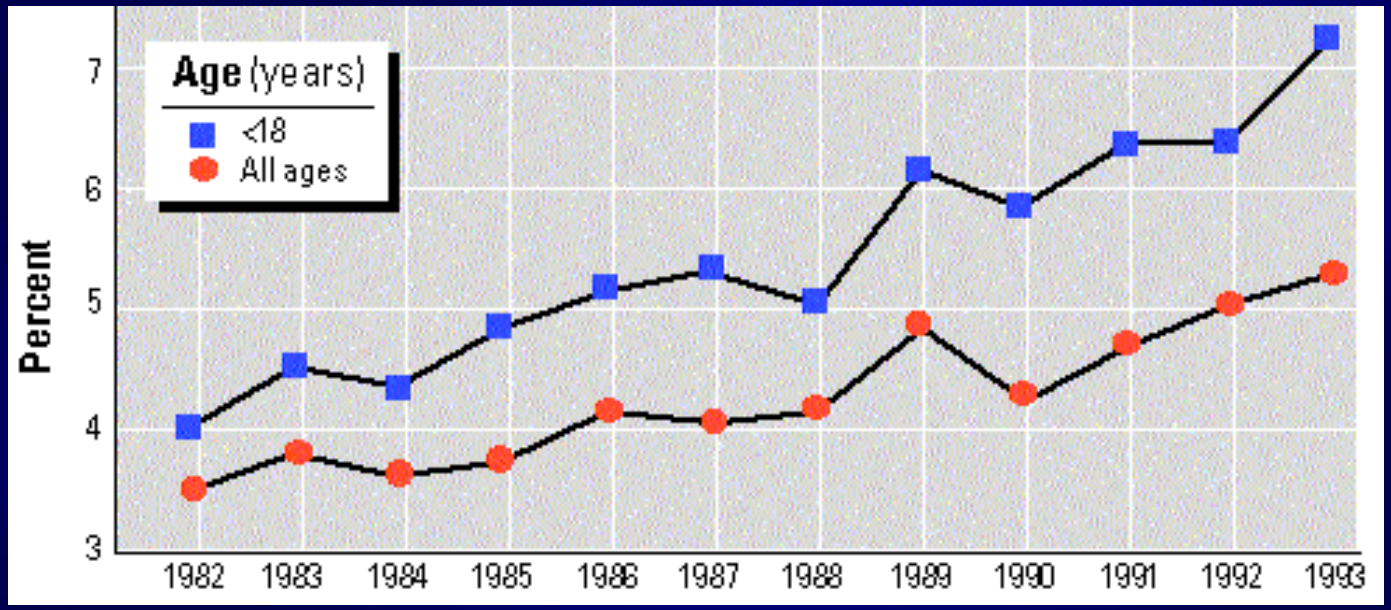
Burden of Asthma

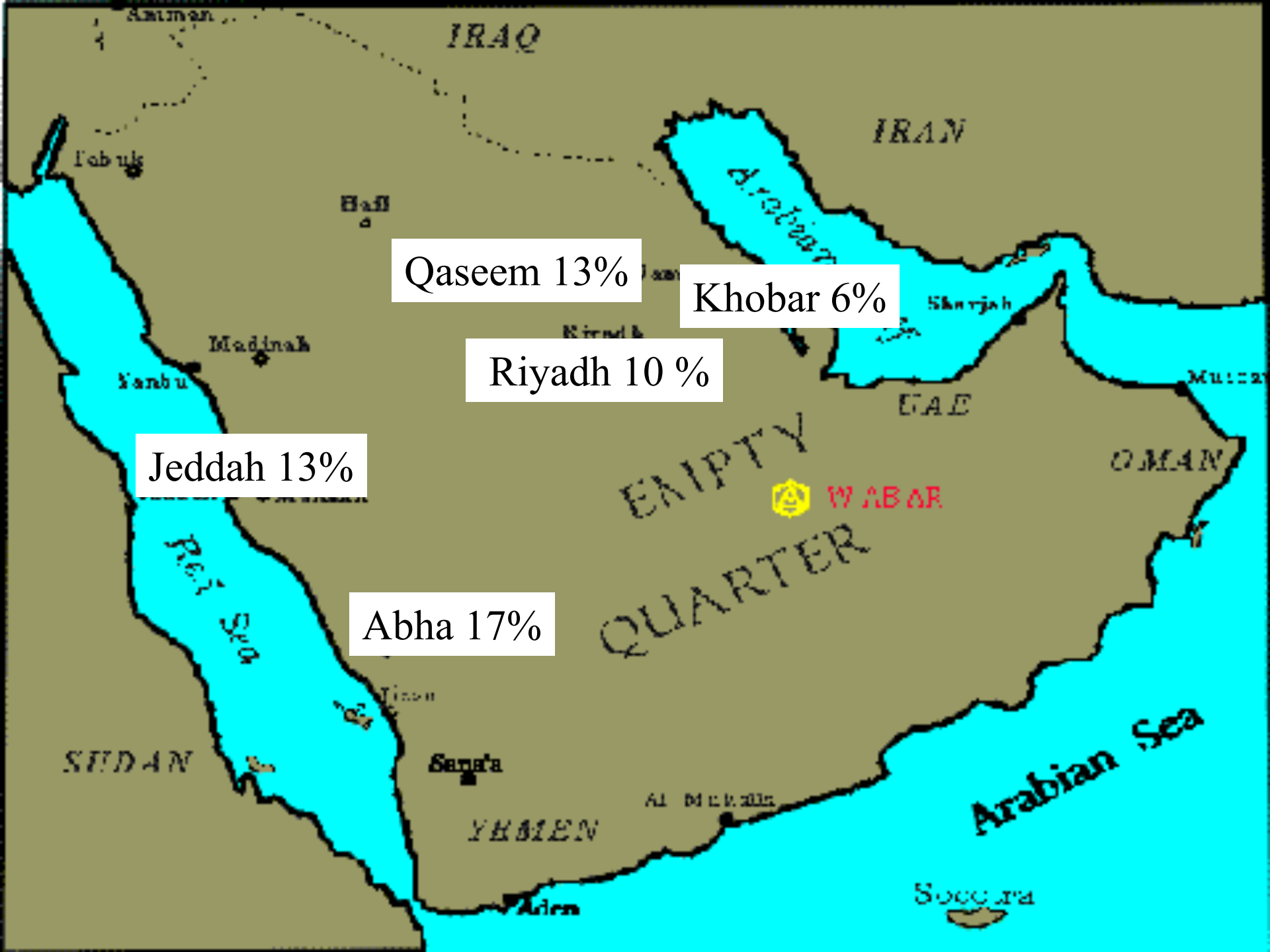
- Asthma is one of the most common chronic diseases worldwide with an estimated 300 million affected individuals
- Prevalence increasing in many countries now is plateauing, especially in children
- A major cause of school/work absence

Asthma Prevalence

10 - 15%

Asthma Prevalence




IRAQ
IRAN
Qaseem 13%
Khobar 6%
Riyadh 10 %
Jeddah 13%
Abha 17%
EMPTY
QUARTER
WABAR
UAE
OMAN
SUDAN
YEMEN
Arabian Sea
Madinah
Sana'a
Aden
Socotra

Factors that Influence Asthma Development and Expression

Host Factors

You need both to develop asthma

- Genetic
  - Atopy
  - Airway hyperresponsiveness
- Gender
- Obesity

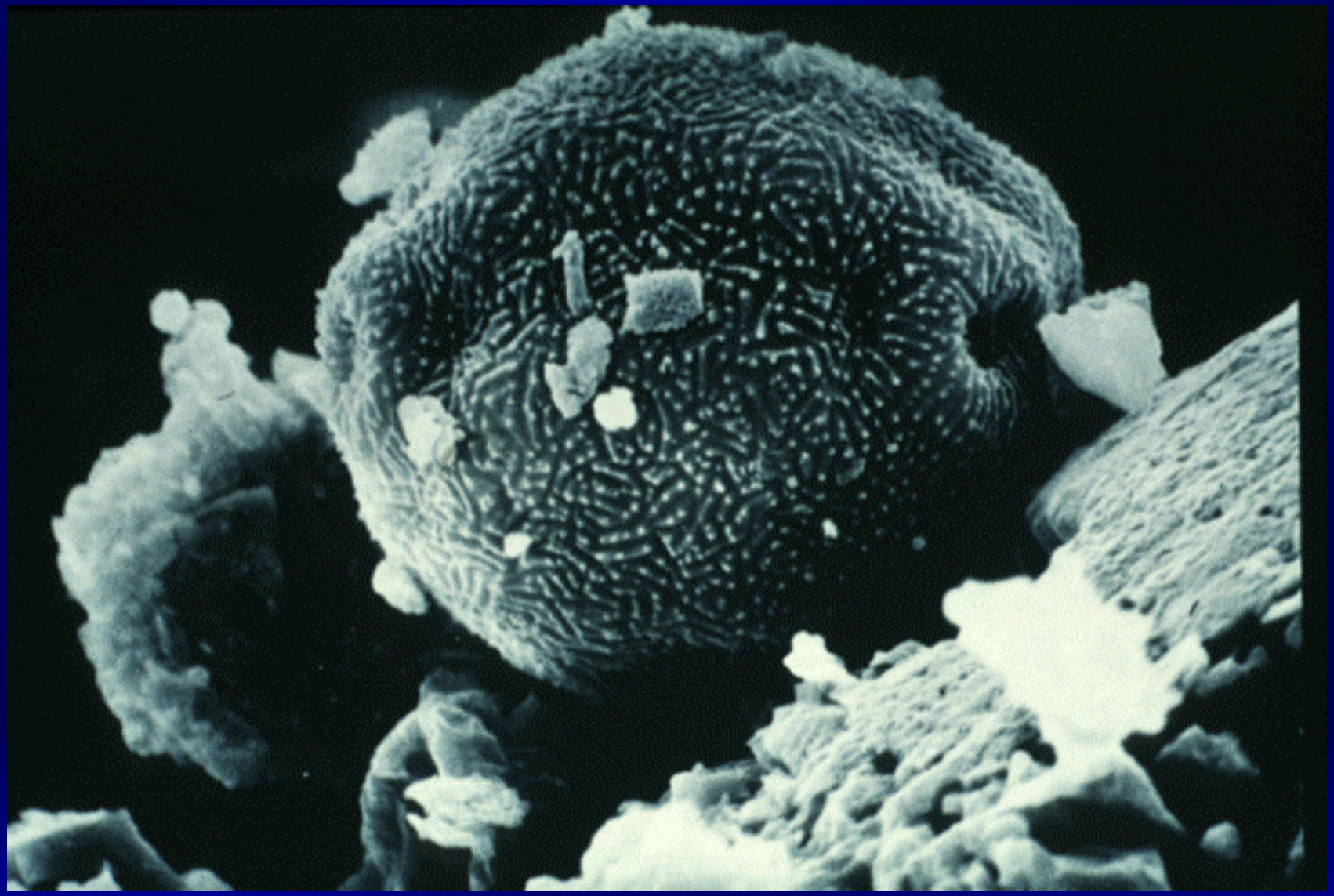
Environmental Factors

- Indoor allergens
- Outdoor allergens
- Occupational sensitizers
- Tobacco smoke
- Air Pollution
- Respiratory Infections
- Diet

Environmental Allergens and Childhood Asthma

- Dust mites عثة غبار المنزل
  They produce fecal material
- Furry pets **The effect will take months to be cleared after you remove the pets**
- Molds
- Cockroaches
- **Cigarette Smoking**

POLLENS



Management of Chronic Asthma

Daytime symptoms how many time in a day
Nocturnal symptoms how many time in month
Reliver use how many time in a weak
Exacerbation
Activities
These questions tells you Is it controlled or not

History

- Symptoms (cough, wheeze, SOB)
- Onset, duration, frequency and severity
- Activity and nocturnal exacerbation
- Previous therapy
- Triggers
- Other atopies
- Family history
- Environmental history, SMOKING
- Systemic review

Usually the child is normal between the attack
For example if a child presented with cough and Diarrhoea or failure to thrive

think about another disease

Physical Examination

- Growth parameter
- ENT
- Features of atopy
- Chest findings
- PEF

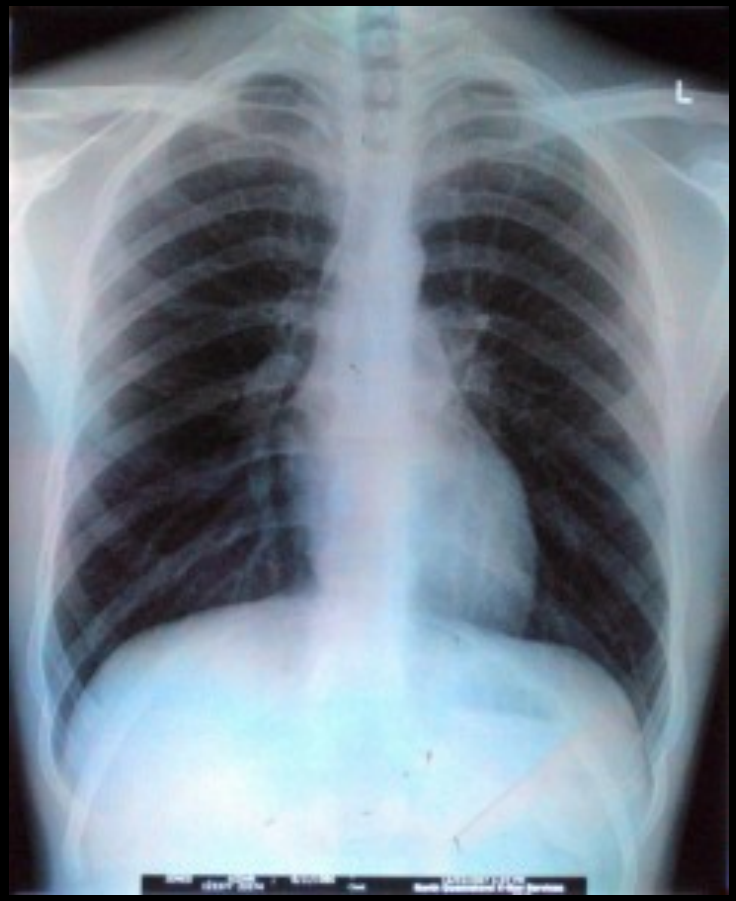
Not helpful

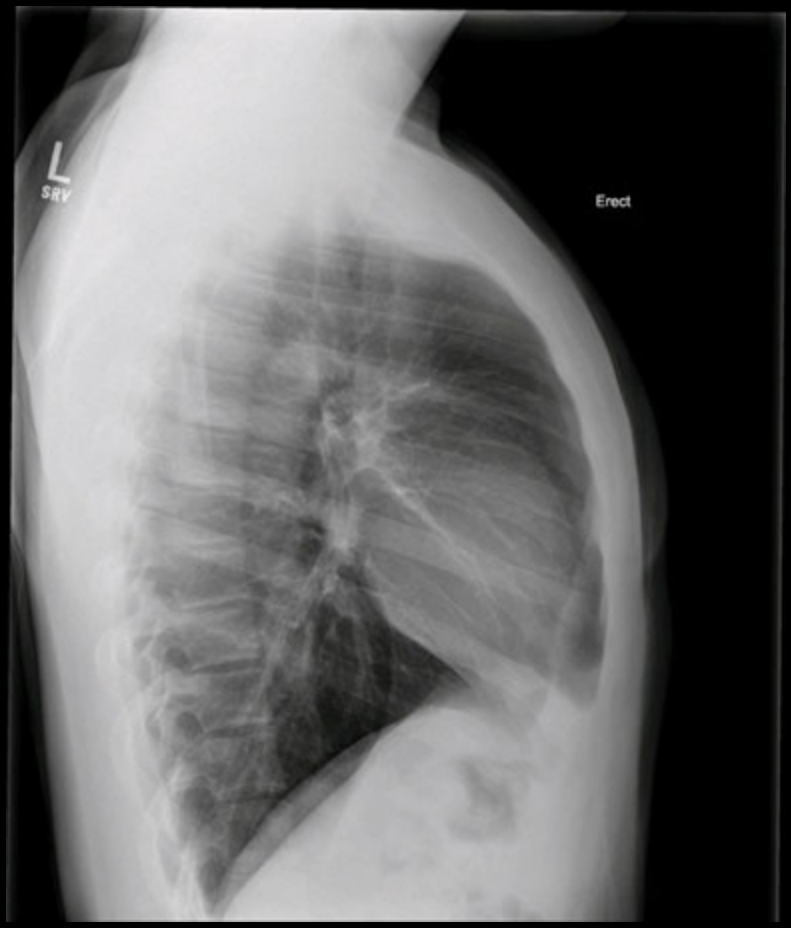
- **Asthma doesn't cause clubbing because clubbing come with suppuratif lung disease**

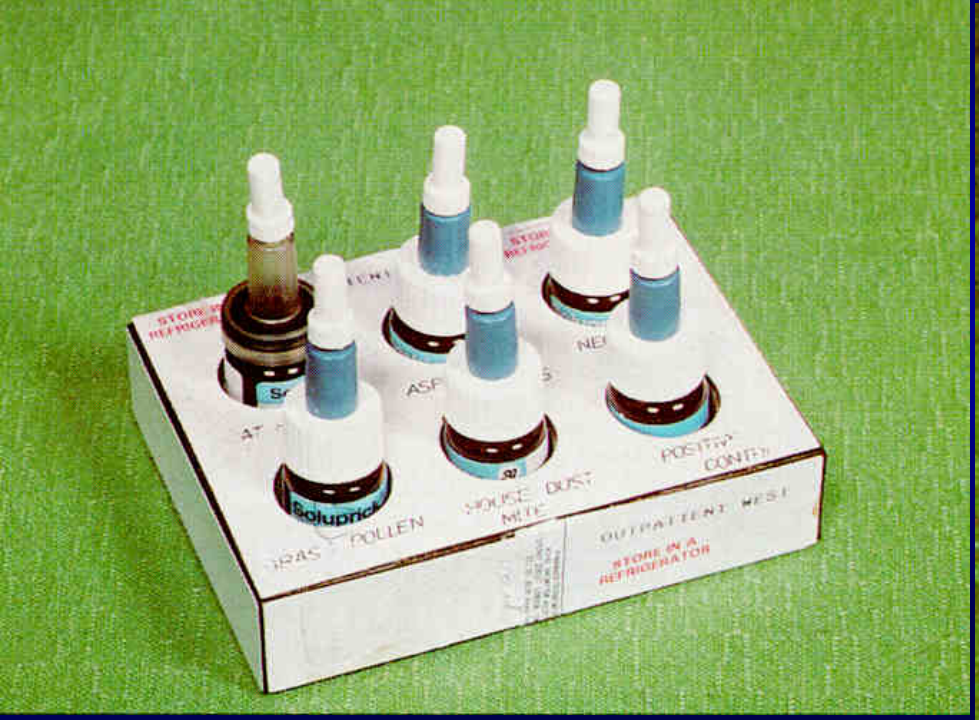
Investigations

- Pulmonary Function **the only thing can help**
- Chest X ray in some.
- Allergy testing in some

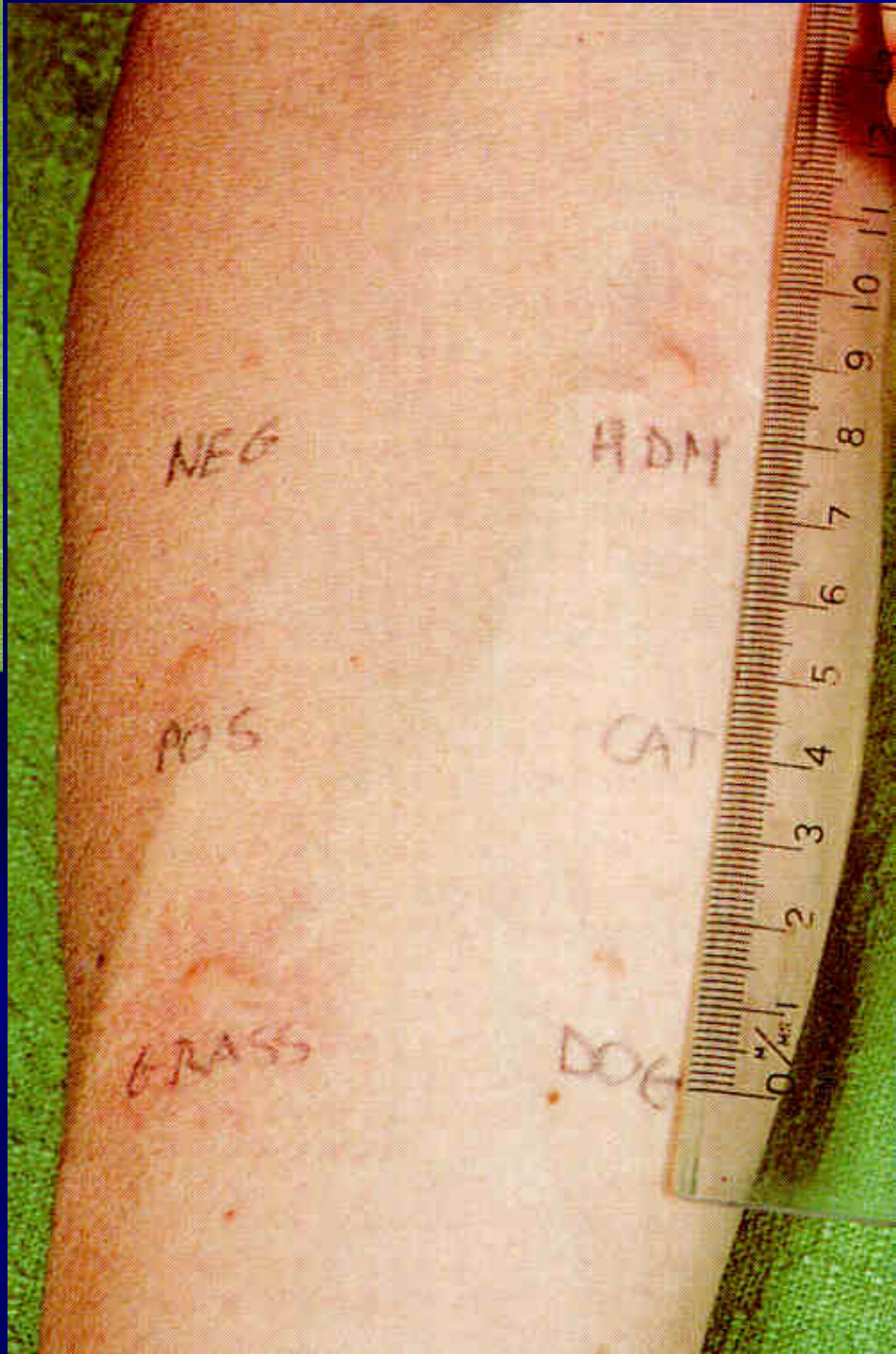
Doesn’t help you







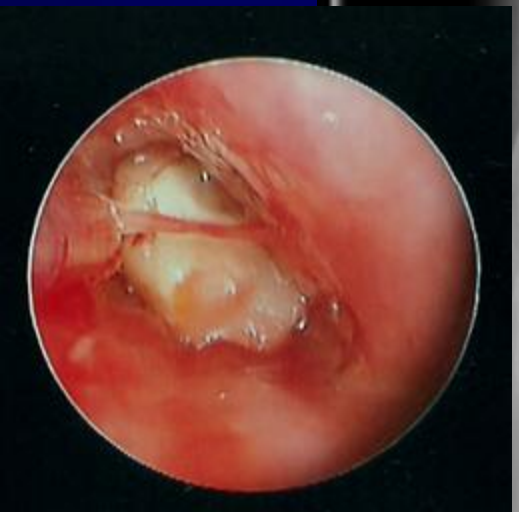
Skin Testing

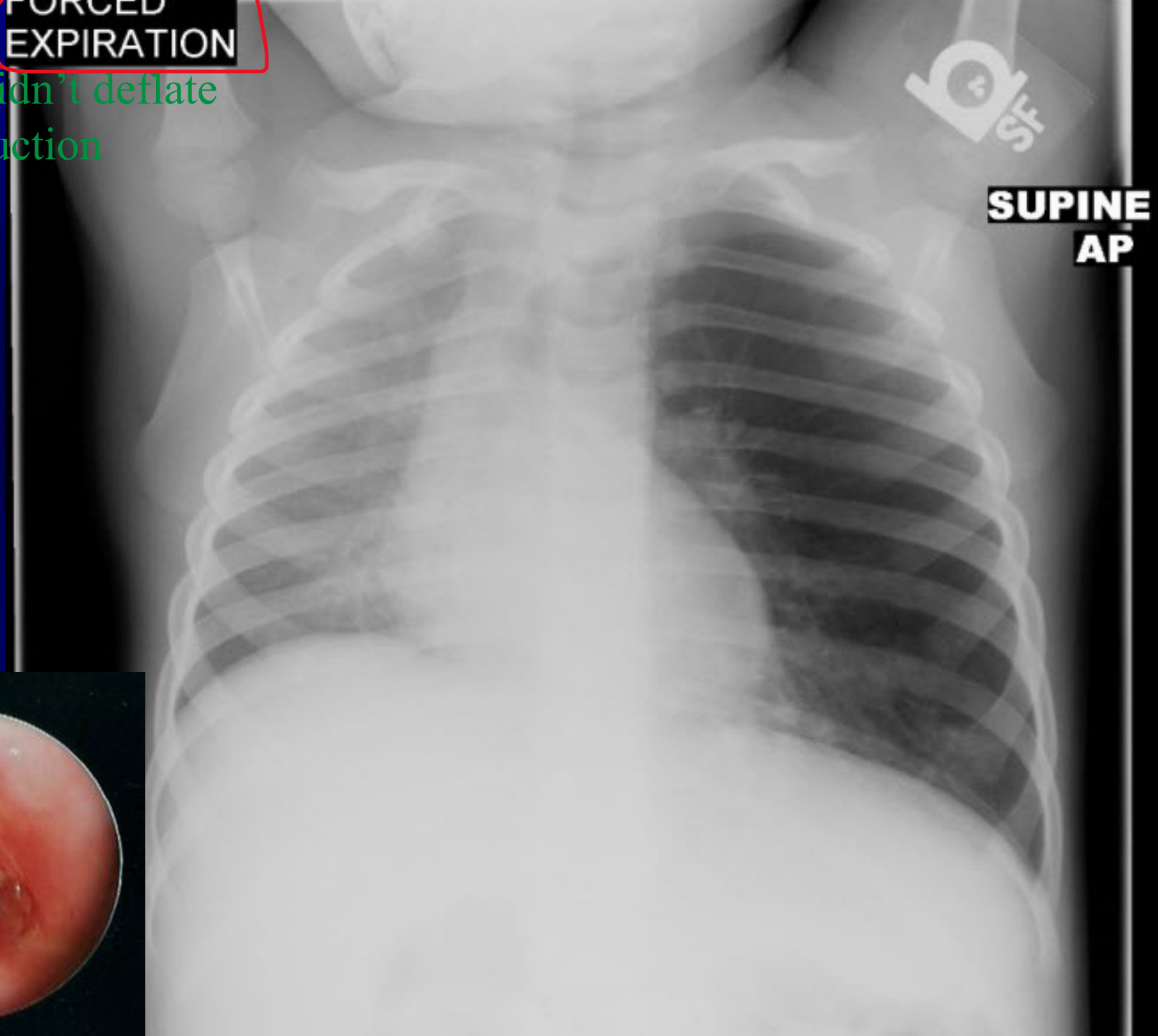


Differential Diagnosis

- Recurrent aspiration
- Bronchiolitis
- Cardiac failure
- Bronchopulmonary Dysplasia
- Inhaled foreign body
- Bronchiectasis
- Gastroesophageal Reflux
- Primary Ciliary Dyskinesia
- Cystic Fibrosis
- Vocal cord dysfunction/ Hyperventilation
- Structural anomalies: Tracheomalacia/ Bronchomalacia..etc.

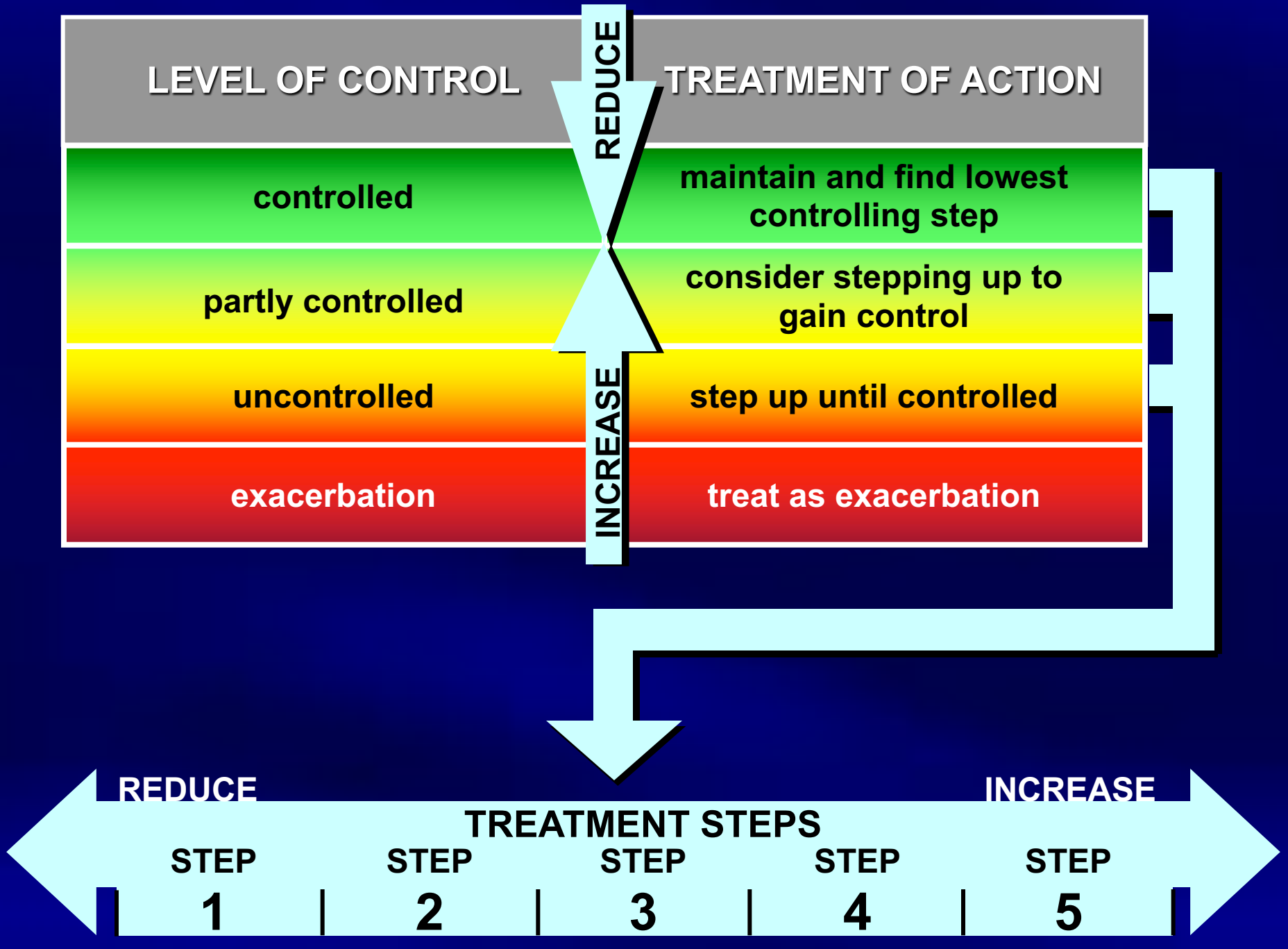
Left lung didn't deflate do to obstruction



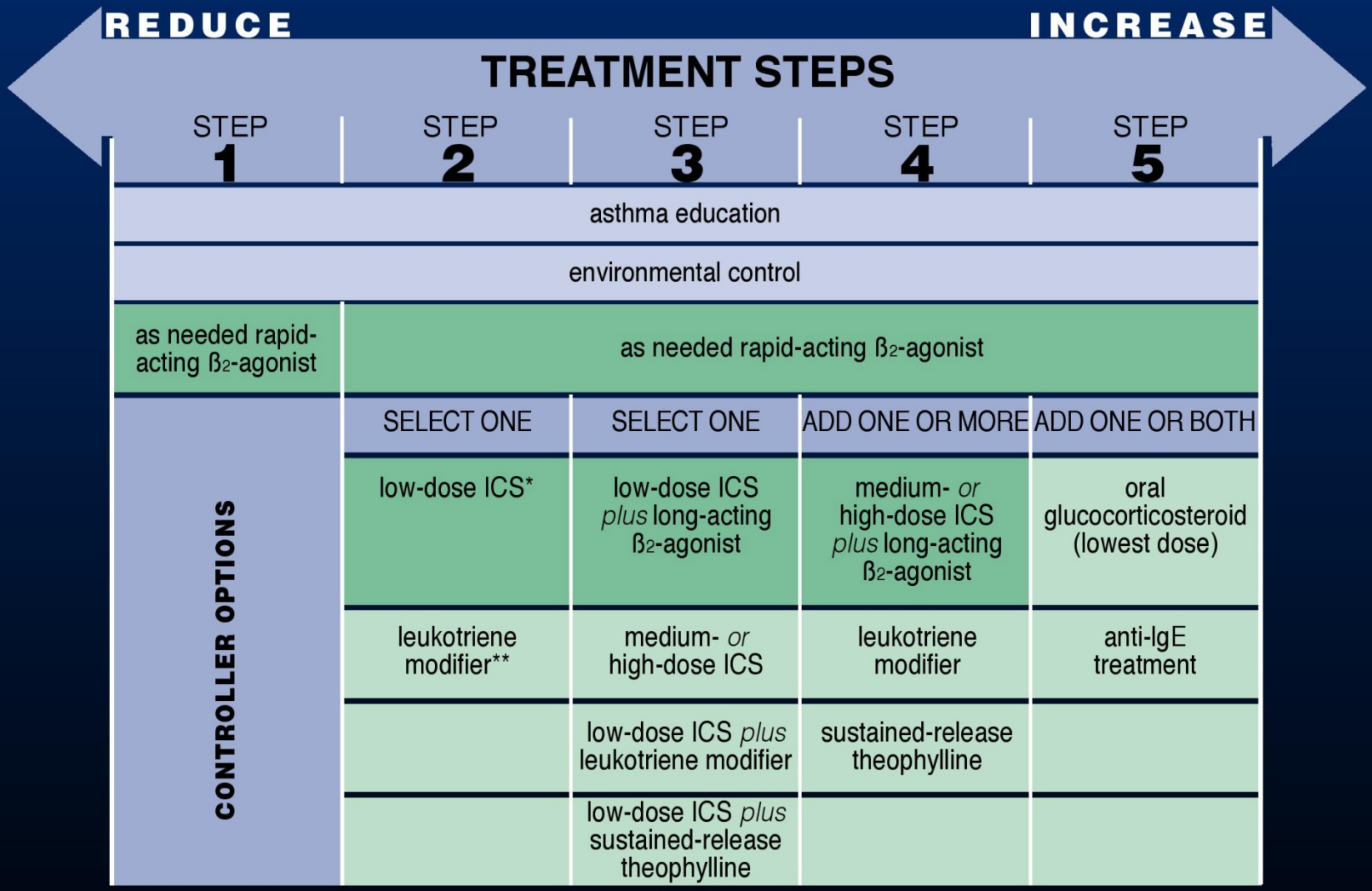


Levels of Asthma Control

Characteristic	Controlled (All of the following)	Partly controlled (Any present in any week)	Uncontrolled
Daytime symptoms	None (2 or less / week)	More than twice / week	3 or more features of partly controlled asthma present in any week
Limitations of activities	None	Any	
Nocturnal symptoms / awakening	None	Any	
Need for rescue / "reliever" treatment	None (2 or less / week)	More than twice / week	
Lung function (PEF or FEV_1)	Normal	< 80% predicted or personal best (if known) on any day	
Exacerbation	None	One or more / year	1 in any week


LEVEL OF CONTROL
TREATMENT OF ACTION
REDUCE
INCREASE
controlled
maintain and find lowest controlling step
partly controlled
consider stepping up to gain control
uncontrolled
step up until controlled
exacerbation
treat as exacerbation
REDUCE
INCREASE
TREATMENT STEPS
STEP 1
STEP 2
STEP 3
STEP 4
STEP 5

You will not be asked about the details



*inhaled glucocorticosteroids
** receptor antagonist or synthesis inhibitors

Treatment objectives

- Achieve and maintain control of symptoms
- Maintain normal activity levels, including exercise
- Maintain pulmonary function as close to normal levels as possible
- Prevent asthma exacerbations
- Avoid adverse effects from asthma medications
- Prevent asthma mortality

Treatment strategy

1. Develop Patient/Doctor Partnership
2. Identify and Reduce Exposure to Risk Factors
3. Assess, Treat and Monitor Asthma
4. Manage Asthma Exacerbations
5. Special Consideration

Pharmacological therapy

- **Relievers**
  - Inhaled fast-acting β_2-agonists
  - Inhaled anticholinergics
- **Controllers**
  - Inhaled corticosteroids
  - Inhaled long-acting β_2-agonists **use it with ICS never alone**
  - Inhaled cromones
  - Oral anti-leukotrienes
  - Oral theophyllines
  - Oral corticosteroids

Why don't patients comply with treatment?

Intentional

- Feel better
- Fear of side effects
- Don't notice any benefit
- Fear of addiction
- Fear of being seen as an invalid
- Too complex regimen
- Can't afford medication

Unintentional

- Forget treatment
- Misunderstand regimen / lack information
- Unable to use their inhaler
- Run out of medication

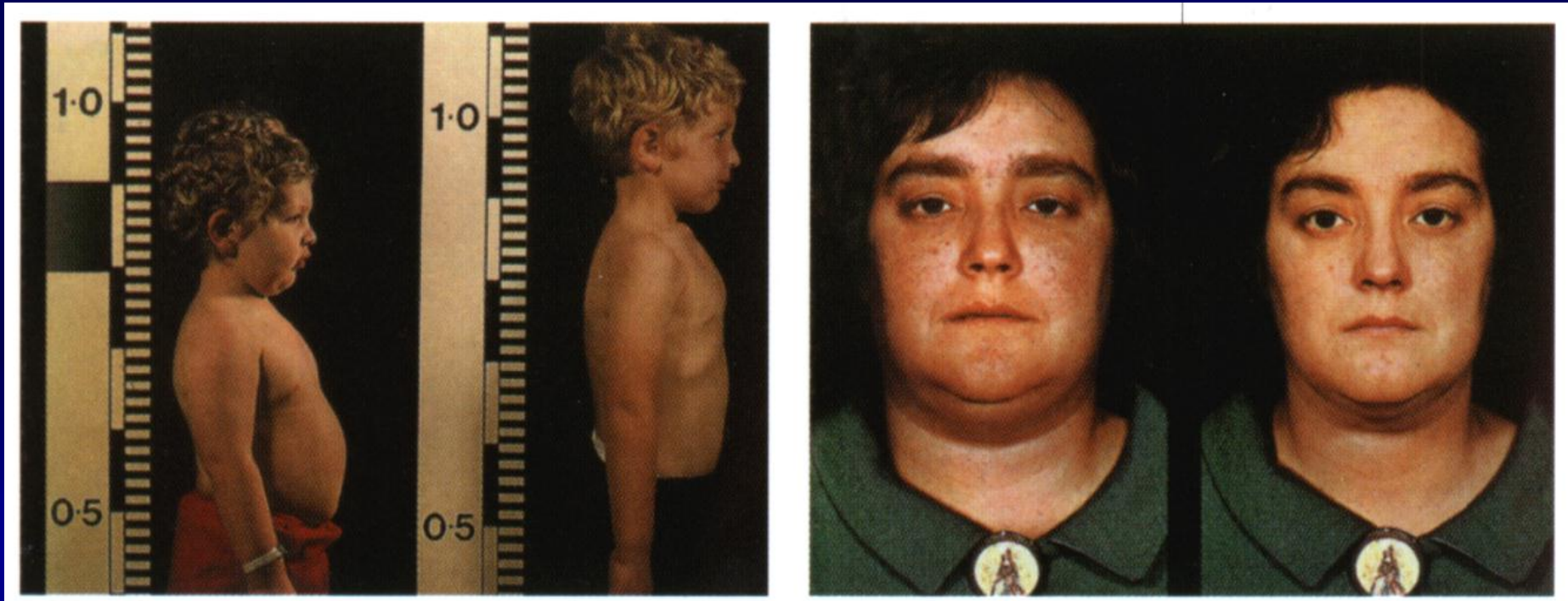
Cromolyn Sodium

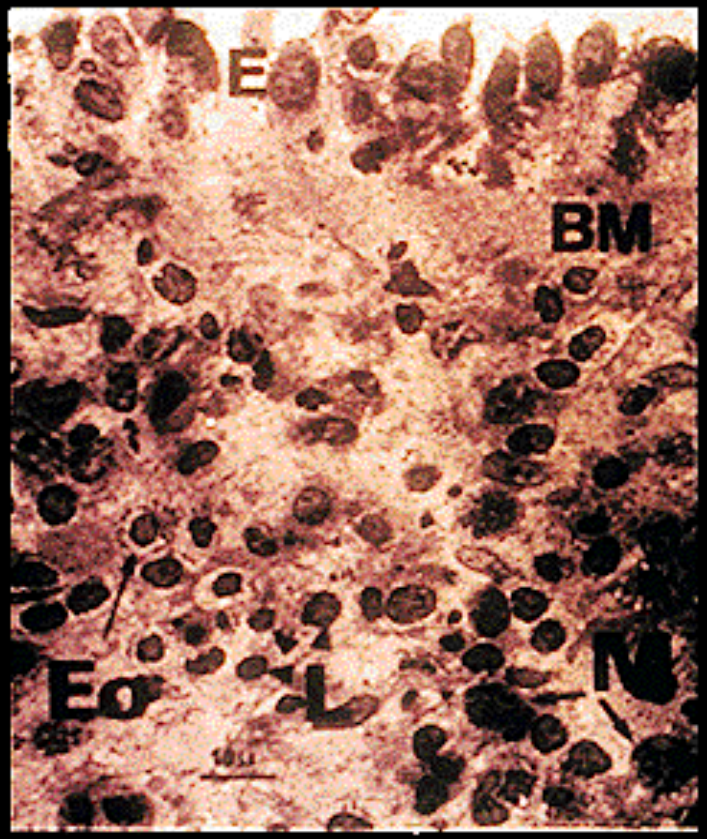
- Non-steroidal anti-inflammatory
- Weak action on Early and late phases
- Slow onset of action
- If no response in 6 weeks change to ICS
- Side effects: Irritation

Amni Visnage, also known as khellin, from which the cromone for DSCG was derived

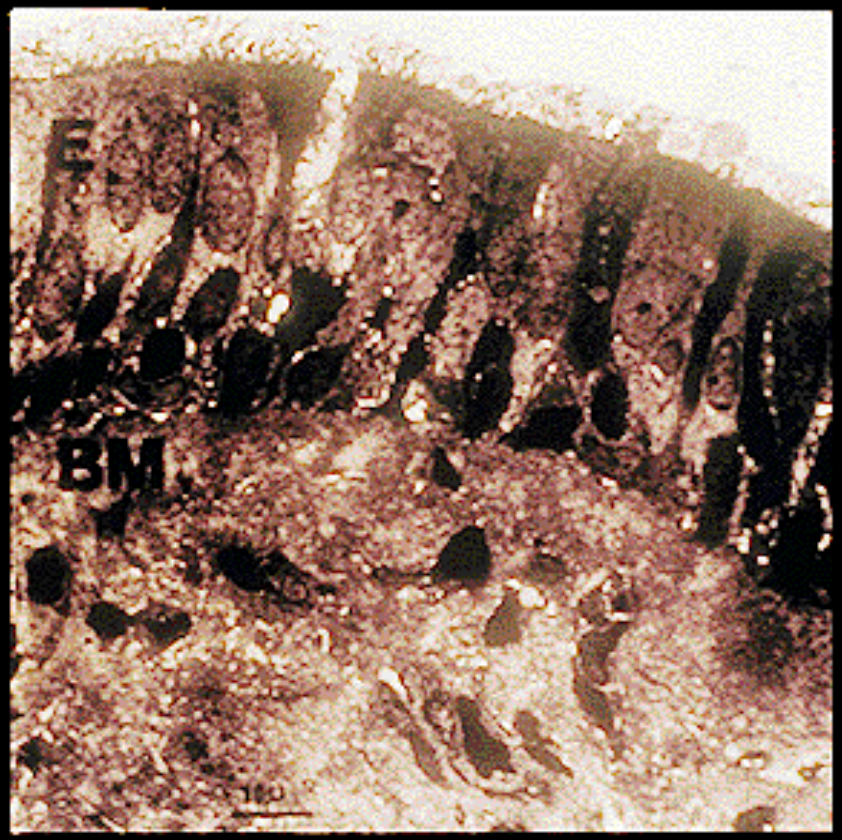
Inhaled Corticosteroids

- Effective in most cases
- Safe especially at low doses
- The anti-inflammatory of choice in asthma





Asthmatic



Steroid-treated asthmatic

Laitinen LA

Inhaled Steroids
Side Effects

- Growth: No significant effect at low to moderate doses.
- Bones: not important
- HPA axis: No serious clinical effect (high doses)
- Alteration of glucose and lipid metabolism: Clinical significant is unclear (high doses)
- Cataract: No increase risk
- Skin: Purpura, easily bruising, dermal thinning
- Local side effects

Nebulizers

MDI and spacer

Dry powder inhalers

MANAGEMENT OF ACUTE ASTHMA

Assessment: History

- Symptoms
- Previous attacks
- Prior therapy
- Triggers

Physical examination:

Signs of airway obstruction:

- **Fragmented speech**
- **Unable to tolerate recumbent position**
- **Expiration > 4 seconds**
- **Tachycardia, tachypnea and hypotension**
- **Use of accessory muscles**
- **Pulsus paradoxus > 10 mmhg**
- **Silent hyperinflated chest** **in very sever cases**
- **Air leak**

- **Cyanosis**
- Wheezing is a good sign it tells you there is airflow

Physical examination:

Signs of tissue hypoxia:

- Cyanosis
- Cardiac arrhythmia and hypotension
- Restlessness, confusion, drowsiness and obtundation

Physical examination:

Signs of Respiratory muscles fatigue:

- Increase respiratory rate
- Respiratory alterans (alteration between thoracic and abdominal muscles during inspiration)
- Abdominal paradox (inward movement of the abdomen during inspiration)

Investigations:

- Peak expiratory flow rate
- Pulse oxymetry
- ABG
- CXR

ONLY IN FEW CASES

The First Hour

Oxygen

- Hypoxemia is common
- It worsens airway hyperreactivity
- Monitor saturation

Inhaled β2 agonist

Every 20 minutes in the first hour

Assess after each nebulizer

You can give it with spacer to avoid infections specifically now to avoid Covid-19

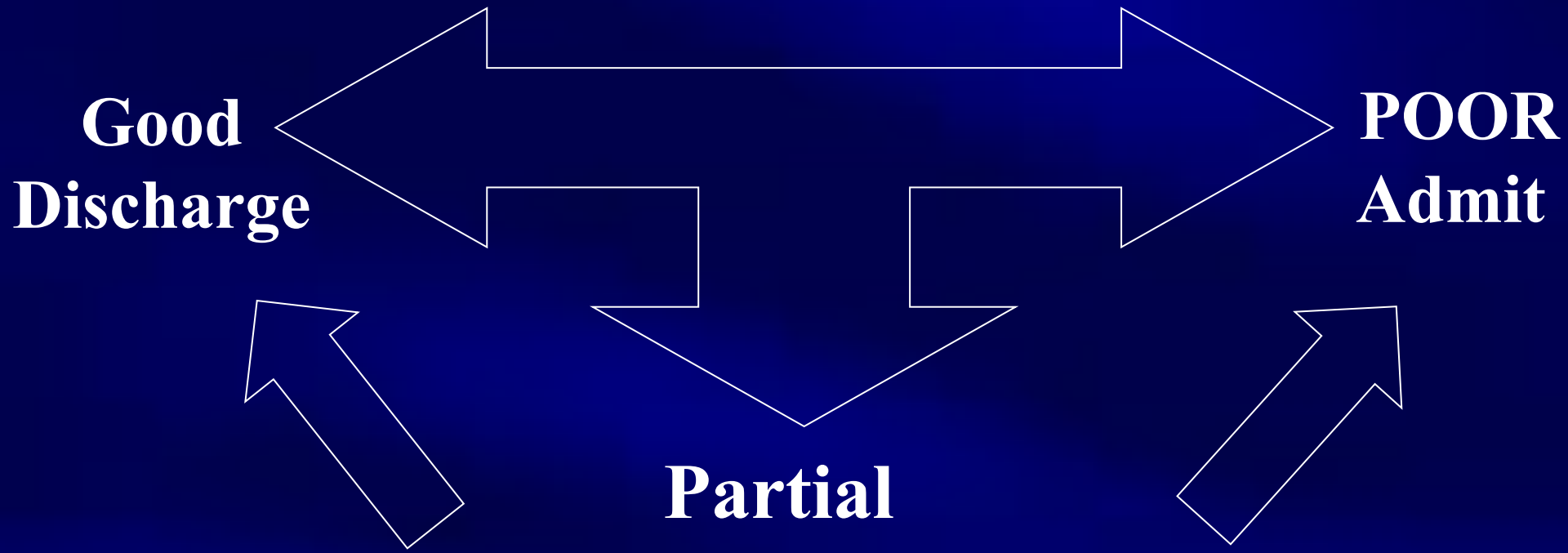
Steroids

- If not responding to the βagonist
- If severe in the beginning
- If on PO prednisone or high dose inhaled steroids.
- Previous severe attacks

Ipratropium Bromide

- Anti-cholinergic
- For severe cases
- Along with β2 agonist

Response to the first hour



Discharge

- Follow up
- Give inhaled β2 agonist
- Steroids
- When to come back?