

PBL

First Case

“...I am short of breath”



Case scenario:

- Saleh, a 19 year old student came to the ER because of **shortness of breath** for the last couple of days associated with **cough** and **tiredness**.
- A few days ago, Saleh spent the weekend in a motorbike show. The weather was dusty and cold, on the following day he didn't feel good and he had repeated coughing at night.
- He uses his **sternocleidomastoid** muscles and **alae nasi** during breathing.
- Couldn't sleep because of the shortness of breath and cough, and he was **wheezing**. His cough was dry and he has no phlegm. While sleeping he needed to place two pillows behind his head.
- Took two tablets of **Aspirin** but his condition got worse.
- No fever, no running nose and no sore throat.
- Saleh had **similar attacks** for the last three years, specially when he exercises.

Diagnosis:
Bronchial Asthma



Examination:

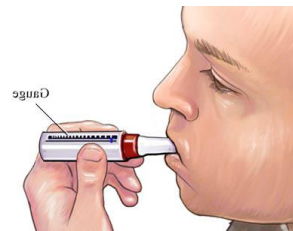
- ✓ Pulse rate <high>
- ✓ Respiratory rate is <high>
- ✓ Expiratory **wheezing** on both sides.
- ✓ No clubbing of fingers. (Exclude heart diseases)
- ✓ PEF = 350 L/Min <abnormal>
- ✓ Oxygen saturation: 89% <below normal> (Normal 95-100%)

Management:

- ✓ After examination, he was connected to a pulse oximeter to his index finger.
- ✓ Oxygen mask.
- ✓ Saline/glucose solution, given via the IV line.
- ✓ The Dr continues Saleh on **Salbutamol** inhalation through a spacer. (7-10 minutes)

Terms:

1. **Wheezing:** To breathe with difficulty, producing a hoarse whistling sound.
2. **Phlegm:** sticky mucus secreted by the mucous membrane of the respiratory tract, as during a cold or other respiratory infection.
3. **Sternocleidomastoid muscles:** Either of two muscles of the neck that serve to flex the neck and rotate the head.
4. **Alae nasi:** the expanded outer wall of cartilage on each side of the nose
5. **Cyanosis:** a bluish or purplish discoloration (as of skin) due to deficient oxygenation of the blood
6. **Pulse oximeter:** a device that measures the **oxygen saturation of arterial blood** in a subject by utilizing a sensor attached typically to a finger, toe, or ear to determine the percentage of oxyhemoglobin in blood.
7. **Salbutamol:** A sympathomimetic agent used as a bronchodilator, especially in the treatment of asthma
8. **Spacer:** A device attached to a metered-dose inhaler that aids delivery of inhaled medications.
9. **PEF:** (peak expiratory flow), the greatest rate of airflow that can be achieved during forced expiration, beginning with the lungs fully inflated. (Important)



Bronchial Asthma

✓ Definition:

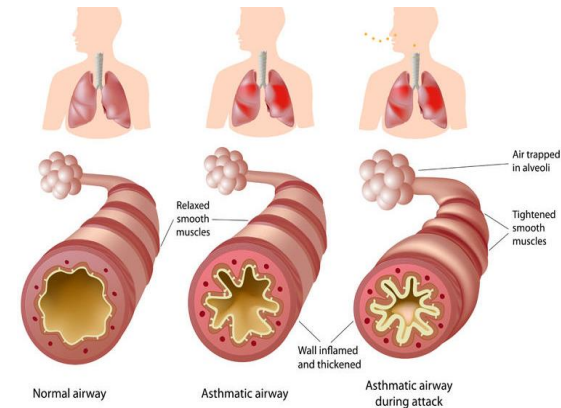
- A chronic inflammatory disease of the airways that causes periodic "attacks" of coughing, wheezing, shortness of breath, and chest tightness.

✓ Symptoms:

- Difficulty breathing.
- Wheezing.
- Cough, specially at night.
- Speech is fragmented when he talks. (shortness of breath)

✓ Risk factors:

- Changing weather and place.
- Dusty places
- Exercising

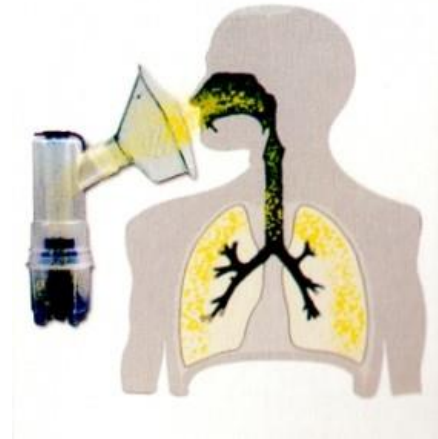


✓ Causes:

- Outdoor allergens. (Dust)
- Conditions. (Cold weather)
- Emotions. (Stress)

✓ Management:

- He had a moderate asthma attacks, which are related to exercising and exposure to dusty and cold air.
- Saleh continues on a **bronchodilator** for two hours.
- His condition got much better.
- The reading on the PFE measurement shows improvement (80% of predicted value) <due to the inhalation of Bronchodilator>
- Oxygen saturation has improved (94%)



Videos Corner

[Asthma](#)
[PEF](#)

Salbutamol



Short-acting **selective B2-adrenergic** receptor agonist. Rapid relief onset relax bronchial smooth muscle and may decrease mediator release from mast cells and basophils.

It may also inhibit airway microvascular leakage. It's marketed as Ventolin among other brand names.

Medical Uses

Used for the relief of bronchospasm in conditions such as asthma and chronic obstructive pulmonary disease.

Used in second line anaphylactic shock treatment.

Adverse effects

The most common side effects are fine tremor, anxiety, dry mouth, and palpitation.

Rout of Administration

Given orally, by inhalation or parentally.

Why didn't he respond to **Aspirin**?

Aspirin causes the body to produce excess amounts of a class of chemicals known as **leukotrienes**. Leukotrienes cause the muscles surrounding the bronchial tubes to contract, resulting in wheezing and shortness of breath. And because NSAIDs induce bronchoconstriction.

Questions

Q1: Discuss the main differences between salbutamol and cortisol inhalers?

Salbutamol inhaler:

- **Bronchodilator**
- It can be used either alone or combined.
- Salbutamol + Ipratropium
- Short acting β_2 agonists
- main choice in acute attack of asthma
- It causes: Adenyl cyclase & cAMP

Cortisol inhalers:

- **Anti-inflammatory drugs (prophylactic)**
- (Inhibits phospholipase A2)
- Dexamethasone, Fluticasone and Budesonide.

Q2: The pathological changes encountered during an acute asthma attack?

1- Intermittent and reversible airway obstruction that causes:

- acute bronchoconstriction
- airway edema
- chronic mucous plug formation
- airway remodeling

2- Chronic bronchial inflammation with eosinophils

3- Bronchial smooth muscle cell hypertrophy and hyper-reactivity causes exaggerated bronchoconstriction.

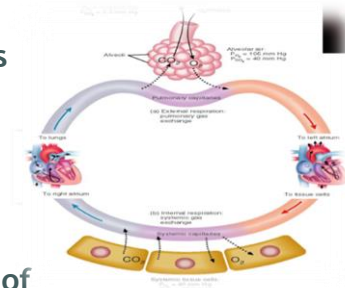
Q3: Discuss the physiological gas exchange.

- **External respiration:**

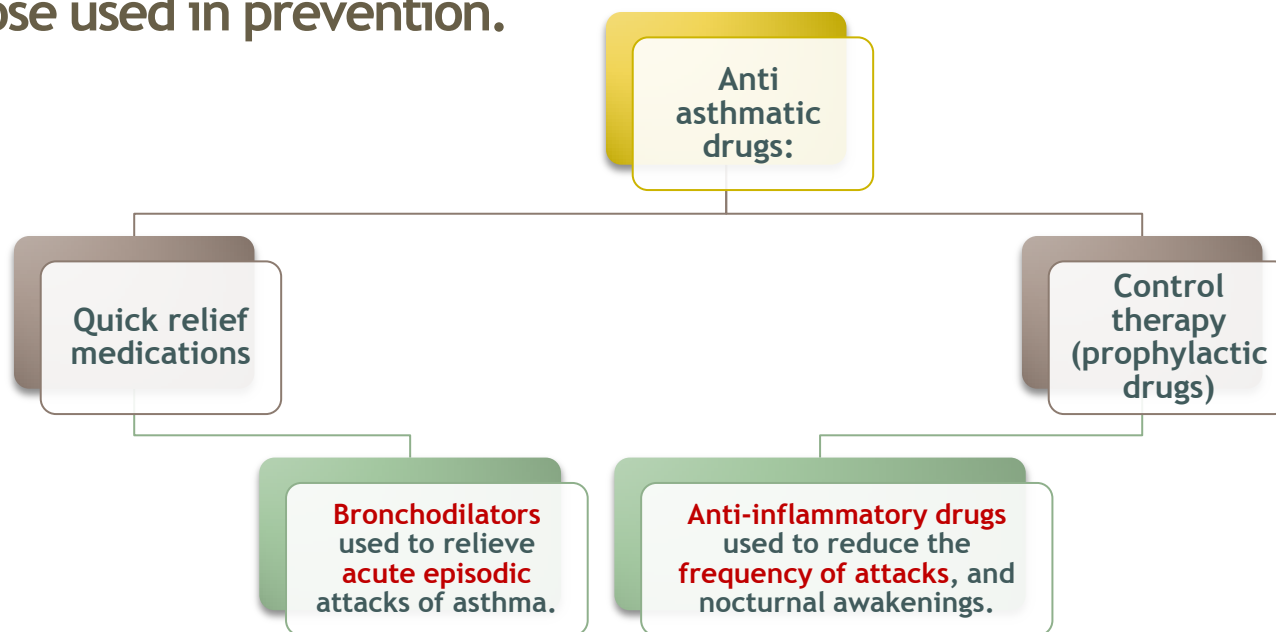
1. At the alveoli the inhaled (O₂) travels through the pulmonary capillaries and ultimately reaches the heart.
2. Through the left atrium of the heart, the oxygenated blood is then travels to the tissue.

- **Internal respiration:**

1. The oxygenated blood travels through the systemic circulation and oxygenates the tissue.
2. Carbon dioxide (CO₂) is carried by the systemic capillaries and finally reaches the right atrium of the heart which pumps it to the lungs' alveoli where it is then exhaled.



Q4: Discuss the pharmacology of drugs used in the management of acute asthma and those used in prevention.



Q4: What are the differences between obstructive and restrictive lung diseases?

Obstructive lung diseases:

- Is a category of respiratory disease characterized by airway obstruction. It is generally characterized by inflamed and easily collapsible airways, obstruction to airflow and problems exhaling.
- Pulmonary function test: decreased FEV1 and decreased FEV1/VC.
- Examples: **Bronchial asthma, COPD**.

Restrictive lung diseases:

- Are a category of diseases that restrict lung expansion, resulting in a decreased total lung capacity, increased work of breathing, and inadequate ventilation and/or oxygenation.
- Both FEV1 and FVC are decreased, with normal to high FEV1/VC.

Q5: The pathogenesis of bronchial asthma.

- Principal cells in asthma: **mast cells, eosinophils, epithelial cells, macrophages, and activated T lymphocytes (TH2 subset) and neutrophils**.
- T lymphocytes play an important role in the regulation of airway inflammation through the release of numerous cytokine
- **Bronchospasm** is induced by inhaled antigens.
- Salbutamol is used for acute asthma attacks

Best of luck!



Done by:
The PBL team

Contact info:
PBLearning434@gmail.com