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Cough

Objectives:

1- Define what is Cough

2- Know the Mechanism of cough

3- Know the causes of cough

4- Know the side effects of cough

4- Manage how to approach a patient with cough

★ **Resources Used in This lecture:**

Slides & Doctor notes, Davidson, Step-up,Pharmacological recall.

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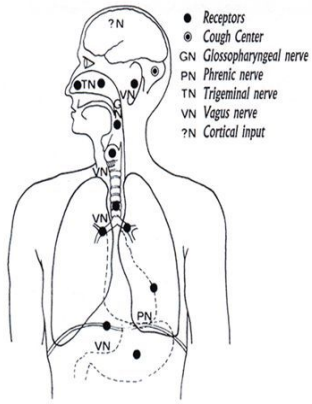
Definition:

A cough is a forced expulsive manoeuvre against a closed glottis a associated with a characteristic sound.

General Characteristic:

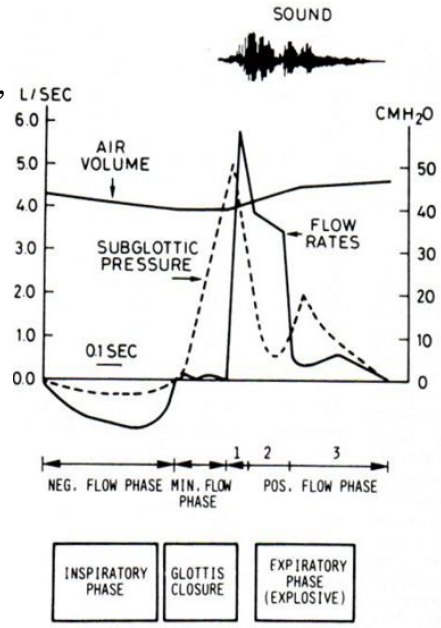
- Cough is the most frequent symptom of respiratory disease
- Cough is triggered by: change in temperature scent,sprays,aerosols and exercise→ indicates an increase cough reflex sensitivity and not only seen in asthma.



> **Cough is a symptom not a disease or a diagnosis!**

Mechanism

1. Mechanical stimuli (trauma, foreign body , cancer) or Chemical stimuli (strong smells , noxious gases) → stimulate cough receptors in pharynx, larynx, trachea ,ear, tracheobronchial tree heart, pericardium, esophagus, and nasal passages.
2. Cough receptors sends Afferent impulses through vagal nerve to the → cough center in medulla oblongata.
3. Cough center sends Efferent impulses back through 4 different nerves (phrenic, spinal motor,recurrent laryngeal & vagus nerves) to → the effector muscles: Respiratory muscle , Larynx muscle & Bronchial smooth muscle.
4. Then this will initiate the following cough reflux:



A. **Inspiratory phase:**

By taking deep breath in → stretching expiratory muscle→ increasing lungs pressure. -Flow rates and subglottic pressure are negative.

B. **Compressive phase:**

The glottis closes → Respiratory muscle contract→ more increase in lung pressure. -Negative flow rates come to a state of equilibrium and negative subglottic pressure increases exponentially.

C. **Expiratory phase.**

The glottis will open → air is pushed out→ due to high pressure inside the lungs.

D. **Relaxation phase.**

- The previously mentioned mechanism for **involuntary cough** to protect airway from (pathogens,particulate,food or foreign body) or To clear the airways of accumulated secretions,particles (ex: Asthma ,COPD, Smoking).
- A person can **voluntarily** cause a cough from higher centers in the brain (ex:Attract attention or signal displeasure).

Classification of Cough (→ depends on duration)

1. Acute Cough (≤ 3 weeks)

Causes:

A. Upper Respiratory Tract infections such as common cold and viral sinusitis most common cause.(Affect 2-5 per adults per year, 7-10 per child per year)
B. Asthma /COPD.
C. Lower Respiratory Tract infections such as Pneumonia , bronchitis , Foreign body aspiration , inhalation of bronchial irritant (smoke , fum).
D. Left ventricular heart failure.

Diagnosis:

No tests are indicated in a patient with acute cough → most acute cough resolve within 2 weeks.

- Every chronic was first an acute cough.
- It can be an indicator of a Serious disease.
- Keep differential in your mind→ Pneumonia, Cancer, LVF

Identify the Red flags (high risk group) → To Do the chest X-ray

Symptoms	Signs
• Hemoptysis • Chest Pain • Fever • Weight Loss • Breathlessness	• Tachypnoea • Cyanosis • dull chest • Bronchial breathing • Crackles

2. Sub-Acute Cough (*3-8 weeks*)

Causes

- Post infection either: Postnasal drip[1] or Tracheobronchitis[2].
- Bacterial sinusitis
- Asthma
- Start of chronic cough (ex: Beginning of lung cancer)

- A post-infectious cough is a cough that begins with an acute respiratory tract infection and is not complicated by pneumonia → normal Chest x-ray.
- It will resolve without treatment.

Diagnosis

- History and Chest examination
- PFT (spirometry) or PEF: Measure of airflow obstruction

Chest X-ray is done if there is abnormal signs on examination or patient is a smoker .

3. Chronic Cough (≥ 8 Weeks)

[1] When excessive mucus is produced by the nasal mucosa. The excess mucus accumulates in the throat or back of the nose. It is caused by rhinitis, sinusitis.
[2] infections causing inflammation in the bronchial airways and trachea

Causes

- Lung Disease either: normal CXR or abnormal CXR.
- Post-nasal Drip caused by either: Allergic/non or vasomotor Rhinitis or Bacterial sinusitis. **Symptoms:** something dripping, frequent throat clearing,nasal congestion/discharge.
- Asthma
- Irritable bowel Syndrome
- Gastro-Oesophageal Reflux.
- ACE inhibitors: Starts after one week to six months of using drugs .

Mechanism of cough in:	
ACE inhibitors	**GERD**
Bradykinin or Substance P increase → metabolized to PGE2 → PGE2 accumulates and caused vagal stimulation of cough.	➢ Mechanical: Aspiration of acid to larynx/trachea. ➢ Chemical : Acid in distal oesophagus stimulates vagus and cough. **Causes[3]:** Drugs (Theophylline, oral B adrenergic agonists,NSAIDS,ascorbic acid, Calcium channel blockers) or Food (chocolate, caffeine,peppermint,alcohol,fat). **Features of cough:** ➢ Throat clearing. ➢ Worsening at night and during eating. ➢ CXR or Spirometry is→ normal (CXR might show hiatus hernia).

Associated with:

- Smoking (dose related)
- Pollutants (occupation)
- Environmental irritants (cat dander)
- Female

Diagnosis

- History(including occupation) & Examination
- CHEST X-RAY
- PFT (Spirometry).
- CBC: if the infection is suspected.
- Bronchoscopy : if the diagnosis is unknown after above workup.

Chest X-Ray and Differential of Cough	
Normal CXR:	**Abnormal CXR:**
- Gastro-oesophageal reflux. - Post-nasal Drip. - Smokers cough/Chronic Bronchitis. - Asthma. - COPD. - Bronchiectasis. - Foreign body	- Left ventricular failure. - Lung cancer. - Infection/ TB. - Pulmonary fibrosis. - Pleural effusion

[3] due to medications or food that reduce lower esophageal sphincter pressure

Treatment of Cough

➢ **Treat the underlying cause.**

❑ **GERD:**

- Diagnose it by: 1- PH and Diary monitor for 24 Hour 2- Barium swallow[4] 3-Endoscopy.
- Proton pump inhibitor (PPI[5]) for minimum 8 weeks (ex:Omeprazole)+ prokinetic [6] (ex:domperidone or metoclopramide)
- Eliminate contributing factors.

❑ **Postnasal drip:**

- Sinusitis: 1-Antibiotics 2-Nasal corticosteroids.
- Rhinitis :Avoid irritants but if it was caused by a virus → medical options include: 1-Antihistamine (Diphenhydramine,promethazine,loratadine) 2- Nasal corticosteroid (beclomethasone,flunisolide)3-Cromolyn Sodium[7] 4-alpha adrenergic agonists(ephedrine, pseudoephedrine).

❑ **ACE inhibitors:**

Switch to Angiotensin 2 receptor blockers(ARBS).

➢ **Antitussive medications** Such as:*Require only in severe cases or some situations (ex: exam and traveling)

❑ **Dextromethorphan such as e.g. Benylin non-drowsy (1st choice)** :

- Have no benefit in the cough caused by smoking, asthma, or emphysema.
- Contraindicated in children(< 4 years) and in combination with paracetamol.

❑ **Menthol:** Steam inhalation , it has short duration of action.

❑ **Sedating antihistamines:** used in nocturnal cough. Major side effect is sleepiness.

❑ **Codeine and Pholcodine:** Not recommended as it has more side effects and less effectiveness comparing to Dextromethorphan.

➢ **Guaifenesin and water:** to improve the effectiveness of antitussive medications.

- Antitussive opiates (codeine and pholcodine) they decrease CNS sensitivity to peripheral stimuli and decrease mucosal secretions.
- Dextromethorphan is a synthetic derivative of codeine. Same action but no addictive potential and less constipating than codeine.

[4] Barium sulfate is a metallic compound that shows up on X-rays and is used to help see abnormalities in the esophagus and stomach.
[5] To reduce amount of acid in stomach.
[6] help strengthen the lower esophageal sphincter and cause the contents of the stomach to empty faster. This allows less time for acid reflux to occur.
[7] anti-inflammatory medication

Cough Complications:	Cough Consequences:
• Rib fractures • Musculoskeletal pain and problems • Lung hernia • Headache, dizziness, • Urinary incontinence. • Syncope	• Aspiration of oropharyngeal or stomach contents(bacteria,food,other) • Acute airway obstruction • Pneumonia • Lung abscess • Respiratory failure/ARDS • Bronchiectasis • Pulmonary fibrosis

- Syncope result from continuous stimulation of vagus nerve → valsalva maneuver → bradycardia and hypotension.

Summary:

19.5 Cough

Origin	Common causes	Clinical features
Pharynx	Post-nasal drip	History of chronic rhinitis
Larynx	Laryngitis, tumour, whooping cough, croup	Voice or swallowing altered, harsh or painful cough Paroxysms of cough, often associated with stridor
Trachea	Tracheitis	Raw retrosternal pain with cough
Bronchi	Bronchitis (acute) and COPD Asthma Eosinophilic bronchitis Bronchial carcinoma	Dry or productive, worse in mornings Usually dry, worse at night Features similar to asthma but AHR absent Persistent (often with haemoptysis)
Lung parenchyma	Tuberculosis Pneumonia Bronchiectasis Pulmonary oedema Interstitial fibrosis	Productive (often with haemoptysis) Dry initially, productive later Productive, changes in posture induce sputum production Often at night (may be productive of pink, frothy sputum) Dry and distressing
Drug side-effect	ACE inhibitors	Dry cough

(ACE = angiotensin-converting enzyme; AHR = airway hyper-reactivity; COPD = chronic obstructive pulmonary disease)
Based on Crompton GK. The respiratory system. In: Munro JF, Campbell IW. Macleod's clinical examination. 10th edn. Edinburgh: Churchill Livingstone; 2000 (p. 119); copyright Elsevier.

CHRONIC COUGH

Useful mnemonic for causes:

GASPS AND COUGH

Gastroesophageal reflux Disease

Asthma

Smoking/chronic bronchitis

Post-infection

Sinusitis/post-nasal drip

Ace-inhibitor

Neoplasm/lower airway lesion

Diverticulum (esophageal)

Congestive heart failure

Outer ear

Upper airway obstruction

GI-airway fistula

Hypersensitivity/allergy

MCQs:

1. **What is the most common and frequent cause of Acute cough?**
   A. COPD.
   B. URTIs.
   C. Left ventricular heart failure.
   D. Foreign body aspiration.

2. **A 30 years old patient came to the ER complaining of cough for the last five days , breathlessness , chest pain and crackles. In this situation which of the following will you consider as first step?**
   A. Chest X-ray.
   B. Cough suppressants.
   C. Reassure the patient.
   D. Spirometry.

3. **A 55 years old female patients was diagnosed with hypertension Four months ago and she started an ACE-inhibitor course . She presented to the clinic with history of dry cough for the last one month , what is the best treatment option:**
   A. Switch to proton pump inhibitors (PPIs)
   B. Switch to Angiotensin II Receptor Blockers (ARBs).
   C. Switch to Dextromethorphan.
   D. Continue on the current treatment.

4. **Which of the following conditions will appear normal on X-ray in chronic cough?**
   A. Asthma.
   B. Lung cancer.
   C. Pleural effusion.
   D. TB.

Answers : 1-B , 2-A , 3-B , 4-A