Introduction
- Phases of cough
- Cough reflex
- Types of cough
- Evaluation
- Investigations
- Treatment
- Complications
DEFINITION

- COUGH – it is a sudden and variable expiratory thrust of air from the lungs through the air passages associated with phonation, which momentarily interrupts the physiological pattern of breathing.

- Without an effective cough reflex, there is a risk of retaining airway secretions and aspirated material predisposing to infection, atelectasis, and respiratory compromise.
PHASES OF COUGH

Irritation

Inspiration

Compression

Expulsion
PRESSURE CHANGES DURING COUGH

<table>
<thead>
<tr>
<th></th>
<th>Normal Breathing</th>
<th>Cough</th>
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</thead>
<tbody>
<tr>
<td>Intrathoracic pressure, cm H₂O</td>
<td>-4</td>
<td>+150</td>
</tr>
<tr>
<td>Cross-sectional area, cm²</td>
<td>1.5</td>
<td>0.25</td>
</tr>
<tr>
<td>Volume flow, L/sec</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Linear velocity, cm/sec</td>
<td>667</td>
<td>28,000</td>
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Cough reflex initiated by chemical/mechanical stimuli

This is carried by the afferents which are type c and type 1 fibers and innervate pharynx, larynx, large airways, terminal bronchiole and lung parenchyma

Afferents travel via vagus and superior laryngeal nerve

NTS in brain stem is the cough center

Efferents travel via vagus, phrenic, spinal motor nerves to the larynx, trachea, bronchi, diaphragm producing cough
Location of cough receptors:
- Larynx and supralaryngeal area
- Trachea and bronchi
- Ear canals and eardrums
- Pleura, pericardium and diaphragm
- Esophagus and stomach

Nerve:
- Vagus
- CNS cortical modulation

Cough center (medulla, nucleus tractus solitarius):
- Spinal motor
- Phrenic

Effector:
- Expiratory muscles, including pelvic sphincters
- Diaphragm
- Larynx
- Trachea
- Bronchi
VOLUNTARY CONTROL OF COUGH

- Voluntarily a person is capable of suppressing the reflex cough for some time.
- Cough can also be voluntarily induced (motor and pre motor areas of brain).
- Neurotransmitters involved in voluntary control of cough are serotonin, gaba, dopamine, nmda (N-methyl-D-aspartate) etc.
- The central nervous pathways for cough show interactions and plasticity.
ETIOLOGY OF COUGH

- **ACUTE (<3 WKS)**
  - Tracheobronchitis
  - Bronchopneumonia
  - Viral pneumonia
  - Acute-on-chronic bronchitis
  - Pertussis
  - Pulmonary embolism
  - Foreign body aspiration

✓ Sudden onset – bronchial asthma, asthmatic bronchitis, whooping cough, foreign body, LVF with PE
- **SUBACUTE (3-8 wks)**
  - trachiobronchitis,
  - pertussis,
  - post viral tussive syndrome
CHRONIC > 8 wks

- Upper airway cough syndrome
- Asthma
- Gastro oesophageal reflux disorder
- Post viral cough
- Chronic bronchitis
- Bronchiectasis, cystic fibrosis
- Ace inhibitor induced Cough
- Environmental irritants.
• Infections – Mycoplasma, Chlamydia, Bordetella
• Granulomatous disease – TB, Sarcoidosis.
• Neoplasms – Bronchogenic carcinoma, Carcinoid tumor
• ILD
Cont.....

- Micro aspirations
- Zenker’s diverticulum
- CVS – Disorders of pericardium, CCF, Vasculitis
- Tourette syndrome
- Habitual or psychogenic cough.
- Asymptomatic enlarged tonsils
TYPES OF COUGH

- Based on expectoration
  - Dry cough: pleural disorders, diseases of interstitium, mediastinal lesions
  - Productive cough: suppurative lung disease, airway diseases
OTHER TYPES

- Brassy/Gander cough – metallic sound d/t compression of trachea by intra thoracic space occupying lesions or aortic aneurysms also known as leopards growl
- Bovine cough – loss of expulsive nature as in a tumour pressing on the recurrent laryngeal nerve
- Paroxysmal cough – whooping cough, chronic bronchitis, foreign body, bronchial asthma
- Barking cough – involvement of epiglottis, croup (laryngo trachiobronchitis), hysteria
- Whooping cough – pertussis
- Spluttering cough - cough while swallowing
- Hacking – heavy smokers, chronic pharyngitis or laryngitis
IMPAIRED COUGH

- Decreased expiratory-muscle strength
- Decreased inspiratory-muscle strength
- Chest wall deformity
- Impaired glottic closure or tracheostomy
- Tracheomalacia
- Central respiratory depression (e.g., anesthesia, sedation)
EVALUATION OF COUGH

- Efforts should be made to identify the cause of cough.
- A cough lasting more than 3 weeks require a detailed evaluation.
- Cough associated with or without sputum is more important than the amount of sputum and the presence or absence of sputum should not be taken as a strict criterion for diagnosis.
Considerations at 1st visit
✓ Determine the severity
✓ Assess the cause
✓ Plan investigation and treatment
HISTORY

- Cough: onset, duration, character, triggers
- Sputum-volume & character
- Postural variations
- Diurnal variations
- Smoking, occupation
- Drug history (ACE inhibitors)
- Asthma: wheeze, nocturnal symptoms, atopy
- GE Reflux ass. Symptoms
- Rhinitis: PND, sinusitis, throat clearing, nasal congestion
- chest pains, incontinence,
- syncope, anxiety, disturbed sleep
SOME CHARACTERISTIC FEATURE OF COUGH

- Lobar pneumonia – the cough is initially dry a/w chest pain later becomes productive
- Chronic bronchitis – productive cough for most days of 3 months for 2 consecutive yrs
- Bronchiectasis – copious amt of foul smelling sputum more on lying down
- Gastro esophageal reflux disorder - Nonproductive cough often following meals with or without symptoms of GERD
- Left ventricular failure - Cough intensifies while supine, along with aggravation of dyspnea
- Angiotensin-converting enzyme (ACE) inhibitors Nonproductive cough, more common in women, may occur at any time, neurokinin 1 receptor polymorphism
INVESTIGATIONS FOR COUGH

- Routine investigations
- Absolute eosinophil count
- Pulmonary function tests
- Sputum gram stain, culture sensitivity, zn stain
- Chest x ray
- Ct chest
- Sinus x ray/CT sinus
- Quality of life questionnaires
- Leicester cough questionnaire used to assess cough intensity and frequency
- Measurement of cough reflex - by inhalation of tussive agent like capsaicin
- Visual analogue scales
ACUTE COUGH

- Cough lasting less than 3 wks
- Usually it is due to viral and bacterial infections of upper respiratory tract
- Usually the cough resolves within 2 wks
- Other symptoms that can be associated with cough are post nasal discharge, nasal obstruction, nasal discharge
Rhinitis associated with common cold may have mucopurulent discharge but it is not an indication of antibiotics unless it persists for more than 10 to 14 days.
CHRONIC COUGH

- Step 1: Identification and Treatment of Obvious Causes
- Step 2: Focused Testing for and Treatment of Asthma, Gastroesophageal Reflux, and Rhinosinusitis
- Step 3: Investigations to Rule Out Rarer Causes of Cough
- Step 4: Management of Idiopathic or Refractory Chronic Cough
Chronic cough

Investigate and treat
A cause of cough is suggested
History, examination, chest X-ray
Smoking ACE-I
Discontinue

Inadequate response to optimal Rx

Upper airway cough syndrome (UACS) (i.e., postnasal drip)
Empiric treatment

Asthma
Ideally evaluate (spirometry, bronchodilator, reversibility, bronchial provocation challenge) or empiric treatment

Nonasthmatic eosinophilic bronchitis (NAEB)
Ideally evaluate for sputum eosinophilia or empiric treatment

Gastroesophageal reflux disease (GERD)
Empiric treatment
Inadequate response to optimal Rx

Further investigations to consider:
- 24-h esophageal pH monitoring
- Endoscopic or videofluoroscopic swallow evaluation
- Barium esophagram
- Sinus imaging
- HRCT
- Bronchoscopy
- Echocardiogram
- Environmental assessment
- Consider other rare causes

Important general considerations
Optimize therapy for each diagnosis
Check compliance
Due to the possibility of multiple causes, maintain all partially effective treatment
Diagnosis is often made only with clinical assessment of response to empiric treatment

Initial treatments
UACS - A/D
Asthma — ICS, BD, LTRA
NAEB - ICS
GERD — PPI, diet/lifestyle
COUGH WITH NORMAL CHEST X RAY

- Cough variant Asthma
- Upper airway cough syndrome
- Aspiration
- Habitual cough
- Foreign body
- Drugs Angiotensin converting enzyme inhibitors
- Chronic bronchitis
COUGH HYPERSENSITIVITY SYNDROME

- Chronic idiopathic cough,
- narcotic cough suppressants, such as codeine or hydrocodone
- Dexomethorphan can also be used
- Benzonatate
- Case series have reported benefit from off-label use of gabapentin or amitryptyline for chronic idiopathic cough.
In paediatric age group cough more than 4 wks is considered chronic

Most common cause of chronic cough in infants is aspiration and congenital heart defects

2-5 yrs – foreign body inhalation, hyper reactive airways

Adolescents – hyper reactive airways, infections
ANTITUSSIVE AGENTS

- Morphine
- Dihydro-morphinone

- Codeine
- Pholcodeine

- Dexometorphane
- Noscapine

- Diphenhydramine
- Benzonatate
- Triprolidine
MOA OF CENTRALLY ACTING ANTITUSSIVES

- Depression of medullary centres or associated higher centres.
- Increased threshold of cough centre
Codeine

- An opium alkaloid.
- It is more selective for cough centre.
- Suppresses cough for about 6 hours.
- The antitussive action is blocked by naloxone.
- Cough suppression occur with low doses of opioids than those needed for analgesia. (sub-analgesic dose 15 mg)
- Abuse liability is low, but present.

**Adverse Effects**

- • Constipation.
- • Respiratory depression & drowsiness
Pholcodeine

- Little/no analgesic or addicting property.
- Similar efficacy as antitussive to codeine
- Is longer acting—acts for 12 hours or more.
- Given once or twice daily.

Adverse Effects

- Nausea
- Drowsiness
Noscapine

- Depresses cough but has no narcotic, analgesic or dependence inducing properties.
- Efficacy same as codeine, specially useful in spasmodic cough.

Adverse Effects

- Headache & nausea can occur
Dextromethorphan

- Raises threshold for cough & depresses cough centre in medulla.
- It has been found to enhance the analgesic action of morphine & other μ receptors agonists
- As effective as codeine, does not depress mucociliary function of the airway mucosa.
- Devoid of addicting actions.
- Produces less constipation than codeine.
- Antitussive action for 6 hours.
- It does not act through opioids receptors.

**Side effects:**

- Dizziness, nausea, drowsiness & ataxia.
Levocloperastine

- It acts at the CNS level by inhibiting the medullary cough centre
- In addition to this peripheral effects are related to its antihistamine, antiserotonergic and muscle-relaxant properties
- It is used in the treatment of cough, bronchospasm and related symptoms
Triprolidine

- It has antihistamine with anticholinergic properties
- Centrally acting with no addicting properties
- The most common side effect is drowsiness
- Quick acting drug that can clear congestion and stop runny noses in 15–30 minutes
- Useful in cough in allergic conditions
Diphenhydramine

- Diphenhydramine is an antihistamine used to relieve symptoms of allergy, hay fever, and the common cold.
- Commonly present in many cough syrups
- Drowsiness, dizziness, constipation, stomach upset, blurred vision
PERIPHERAL ACTING ANTITUSSIVES

- **Demulcents.** promotes salivation & inhibit impulses from inflamed mucosa
- **Linctus** Thick liquid preparation containing sucrose and medicinal substance
- **Throat lozenges:** They have lubricating and soothing effect on irritated tissue of throat may contain benzocaine or dextromethorphan.
NEWER ANTI TUSSIVES

- selective NOP1 (nociceptin opioid 1) receptor agonist
- TRPV1 antagonists
- TRPA1 antagonists
- Memantine, the non competitive NMDA channel blocker
- The neurokinin-1 (NK1) receptor has been implicated in the sensitization of synapses in the nTS, and its antagonist (aprepitant) was recently found to reduce cough in patients with lung cancer
MUCOLYTICS

Drugs which render sputum less visous

**Inhalational:**
- Acetylcysteine,

**Oral:**
- Acetylcysteine,
- Bromohexine,
- Carbocysteine,
- Methylcysteine.

**Clinical Uses**
- Acute & chronic bronchitis.
- Bronchial asthma
MUCOKINETICS

Drugs which ↑ bronchial secretions or reduces its viscosity facilitating its removal by coughing

- Ipecacuanha
- Ammonium chloride
- Ammonium bicarbonate
- Terepin hydrate
- Potassium Iodide
- Guaiphenesin
- Sodium or Potassium citrate
COMPLICATIONS OF COUGH

RESPIRATORY
- Pneumothorax
- Subcutaneous emphysema
- Pneumomediastinum
- Pneumoperitoneum
- Laryngeal damage

CARDIOVASCULAR
- Cardiac dysrhythmias
- Loss of consciousness or cough syncope
- Subconjunctival hemorrhage
CENTRAL NERVOUS SYSTEM
- Syncope Headaches
- Cerebral air embolism

MUSCULOSKELETAL
- Intercostal muscle pain
- Rupture of rectus abdominis muscle
- Increase in serum creatine phosphokinase
- Cervical disc prolapse
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GASTROINTESTINAL

- Esophageal perforation

OTHER

- Social embarrassment
- Depression
- Urinary incontinence
- Disruption of surgical wounds
- Petechiae Purpura
To All The Healthcare Workers On the Front Lines Of The Coronavirus Pandemic:

THANK YOU!

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