COPD and Asthma. The overlap
Clinical Cases

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Welcome
Speaker Disclosure

I have no financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

Please mute your cell!
Case 1

- Asma is a 27 female presented to the ER with history of progressive dyspnea over few weeks.
- She had repeated episodes of similar symptoms since the last 6 years but with lesser extend.
- Symptoms exacerbated by URTI, 2-3 times per year, free of symptoms between the attacks.
- Last 2 years, more frequent, other factors, mild symptoms in between.
- Not smoker, husband smokes.
Asthma is a *chronic inflammatory* disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with *airway hyperresponsiveness* that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread, but variable, *airflow obstruction within the lung that is often reversible either spontaneously or with treatment.*
# Asthma Key Features

<table>
<thead>
<tr>
<th>Inflammation</th>
<th>Hyperresponsivity</th>
<th>Reversibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>Trigger by allergens</td>
<td>Day variation</td>
</tr>
<tr>
<td>Sputum</td>
<td>Trigger by exercise</td>
<td>Seasonal variation</td>
</tr>
<tr>
<td>Bronchospasm</td>
<td></td>
<td>Improve with medication</td>
</tr>
<tr>
<td>Dyspnea</td>
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</tr>
</tbody>
</table>

## Diagnosis + Monitor
Diagnosis of Asthma (Reversibility)

• Peak Expiratory Flow
  – 20% or more variability between highest and lowest values (morning and afternoon, before and after bronchodilator)
Diagnosis of Asthma (Reversibility)

- Spontaneous
- Inhaled steroids
- Systemic steroids

Peak Expiratory Flow (mL/min)

am pm am pm am pm am pm am pm am pm am pm am pm am pm
Diagnosis of Asthma (Reversibility)

Note: Each FEV\textsubscript{1} curve represents the highest of three repeat measurements.
Diagnosis of Asthma (Reversibility)

Note: Each FEV₁ curve represents the highest of three repeat measurements.
Diagnosis of Asthma (Reversibility)

Note: Each FEV₁ curve represents the highest of three repeat measurements.
Diagnosis of Asthma (Hyperresponsiveness)

Bronchoprovocation Testing for Airway Hyperreactivity

**Pharmacologic Challenge**
- *Methacholine*, histamine, cold air, hypertonic saline
- Inhalation of increasing concentration

**Exercise Challenge**

**Spirometry performed at baseline and after each challenge**

Diagram showing the relationship between baseline FEV1 and FEV1 decrease over time with methacholine challenge.

- 20% decrease in FEV1 at end point of test
- Decrease in FEV1 by 20% or more with methacholine concentration ≤8.0mg/mL is a positive test
- The weaker the concentration, the greater is hyperactivity
Case 2

- 63 years old female Bedouin presented to the clinic as a referral from primary care clinic. She was brought by her daughter whom she noticed her mother getting out of breath at rest.

- She is known to have SOB for years (at least 10) didn't seek medical care.

- Symptoms progress over years, associated with cough and sputum production.

- Less active, lost appetite.

- Never smoked, but she cook using tree wood for 30 years prior to moving to the city.
“Chronic obstructive pulmonary disease (COPD) is a respiratory disorder largely caused by smoking which is characterized by progressive partially reversible airway obstruction, systemic manifestations, and increasing frequency and severity of exacerbations.”
Facts and Figures

- Cigarette Smoking
- Occupational Dust
- Environmental Tobacco
- Indoor/Outdoor Pollution
- Genetic
COPD Is a Multicomponent Disease

- Mucus hypersecretion
  - Reduced mucociliary transport
  - Mucosal damage

- Increased numbers of inflammatory cells/activation:
  - CD8+ T-lymphocytes
  - Monocytes/macrophages
  - Neutrophils
  - Mast cells
  - Elevated inflammatory mediators: IL-8, TNF-α, LTB-4, and oxidants
  - Protease/anti-protease imbalance

- Goblet cell hyperplasia/metaplasia
- Mucous gland hypertrophy
- Increased smooth muscle mass
- Airway fibrosis
- Alveolar destruction

- Structural changes
- Airway inflammation
- Airflow limitation
- Systemic component
- Poor nutritional status
  - Reduced BMI
  - Impaired skeletal muscle
    - Weakness
    - Wasting

- Loss of alveolar attachments
  - Loss of elastic recoil
  - Increased smooth muscle contraction
<table>
<thead>
<tr>
<th>Measure</th>
<th>Meas</th>
<th>Ref</th>
<th>%Pred</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>3.66</td>
<td>4.39</td>
<td>83</td>
</tr>
<tr>
<td>FEV1</td>
<td>1.03</td>
<td>2.87</td>
<td>36</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>28</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>FEF25-75</td>
<td>0.33</td>
<td>2.48</td>
<td>13</td>
</tr>
<tr>
<td>PEF</td>
<td>4.29</td>
<td>8.33</td>
<td>52</td>
</tr>
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Case 3

- 45 years old male, smoker of 12 pack year, presented with 3 years history of cough and wheeze.
- Childhood history of wheeze up to age of 9
- Cough sputum on/off especially with nasal congestion
- Now symptoms more persistent
- Oxygen normal
- Chest: occasional wheeze
Asthma vs. COPD

Asthma Definition

- Chronic **inflammatory** disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night and in the early morning. These episodes are usually associated with widespread but **variable airflow obstruction** that is **often reversible** either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial **hyperresponsiveness** to a variety of stimuli.
Disease state characterized by **airflow limitation** that is **not fully reversible**. The airflow limitation is usually both progressive and associated with an **abnormal inflammatory** response to the lungs to noxious particles or gases. The chronic airflow limitation characteristic of COPD is caused by a mixture of small airway disease (obstructive bronchiolitis) and parenchymal destruction (emphysema).
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**COPD Definition**

- Disease state characterized by **airflow limitation** that is **not fully reversible**. The airflow limitation is usually both progressive and associated with an **abnormal inflammatory** response to the lungs to noxious particles or gases. The chronic airflow limitation characteristic of COPD is caused by a mixture of small airway disease (obstructive bronchiolitis) and parenchymal destruction (emphysema).
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<th>Disease Pathology</th>
<th>Asthma</th>
<th>COPD</th>
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<tr>
<td>Reversible airflow obstruction</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>Airway inflammation</td>
<td>+++</td>
<td>+ +</td>
</tr>
<tr>
<td>Mucus hypersecretion</td>
<td>+</td>
<td>+ + +</td>
</tr>
<tr>
<td>Goblet cell metaplasia</td>
<td>+</td>
<td>+ +</td>
</tr>
<tr>
<td>Impaired mucus clearance</td>
<td>+ +</td>
<td>+ +</td>
</tr>
<tr>
<td>Epithelial damage</td>
<td>++</td>
<td>—</td>
</tr>
<tr>
<td>Alveolar destruction</td>
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<td>++</td>
</tr>
<tr>
<td>Smooth muscle hypertrophy</td>
<td>+ +</td>
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<tr>
<td>Basement membrane thickening</td>
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Asthma vs. COPD

- Definitions are not exclusive and are differentially based on clinical, anatomic, or functional conditions
- Definition are overlapped
Asthma vs. COPD

- Definitions are not exclusive and are differentially based on clinical, anatomic, or functional conditions
- Definition are overlapped

- Two large databases (USA&UK)
- 8.5% reported asthma, chronic bronchitis, or emphysema.
- 17% reported more than one condition.

Soriano, Chest 2003
Case 3

45 years old male, smoker of 12 pack year, presented with 3 years history of cough and wheeze. COPD? ASTHMA?

Childhood history of wheeze up to age of 9

Cough sputum on/off especially with nasal congestion

Now symptoms more persistent

Oxygen normal, Chest: occasional wheeze COPD? ASTHMA?
Laboratory Testing

- Spirometry (pre- and post-bronchodilator)
- Chest radiography
- Lung volumes
- Carbon monoxide diffusing capacity
- Arterial blood gases
A 75 year old female has a history of dyspnea and palpitations.

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Physiologic Differences

Asthma

- Normal DLCO
- Normal lung volume
- Normal elastic recoil
- Flow dominant BD response

COPD

- Abnormal DLCO
- Hyperinflation
- Decreased elastic recoil
- Volume dominant BD response
Both disorders of airways obstruction
Both inflammatory
COPD is progressive
1\textsuperscript{st} line therapy for asthma are ICS
1\textsuperscript{st} line therapy for COPD are BD
Attend to comorbidities
Case 4

- 26-year-old UAE lady
- Referred to the Pulmonology clinic as a case of progressive asthma not responding to systemic steroids for the last two years.
- She tried different combinations of inhalers in addition to “on and off” systemic steroids.
- SOB for 4 years, became progressively worse over the last year (dyspnea on minimal exertion)
- SOB increases on exposure to perfumes
- Noisy breathing (wheezing)
- No cough, chest pain, orthopnea, or heart burn
- H/O allergic Rhinitis
Examination

- A young lady in obvious respiratory distress on minimal exertion with noisy breathing

- Good body built, no pallor, no jaundice, no LN, no clubbing or no cyanosis

- Thyroid was not palpable

- Biphasic (inspiratory and expiratory) noisy sound predominantly heard central chest radiated bilaterally to the chest

- Other systems were normal
Before

After