

Learning Objectives

At the end of this lecture Final year students will be able to

- Define COPD
- Describe types of COPD
- Describe clinical features of COPD
- Outline the investigation plan of a patient with COPD
- Describe Gold Staging criterion for COPD
- Outline the management of Acute exacerbation of COPD
- Describe Long term management of COPD

Definition

- Characterized by the presence of **airflow obstruction**, which is generally progressive, is accompanied by airflow hyperactivity and is partially reversible on background of **smoking**.



Global Strategy for Diagnosis, Management and Prevention of COPD

Mechanisms Underlying Airflow Limitation in COPD

Small Airways Disease

- Airway inflammation
- Airway fibrosis, luminal plugs
- Increased airway resistance

Parenchymal Destruction

- Loss of alveolar attachments
- Decrease of elastic recoil

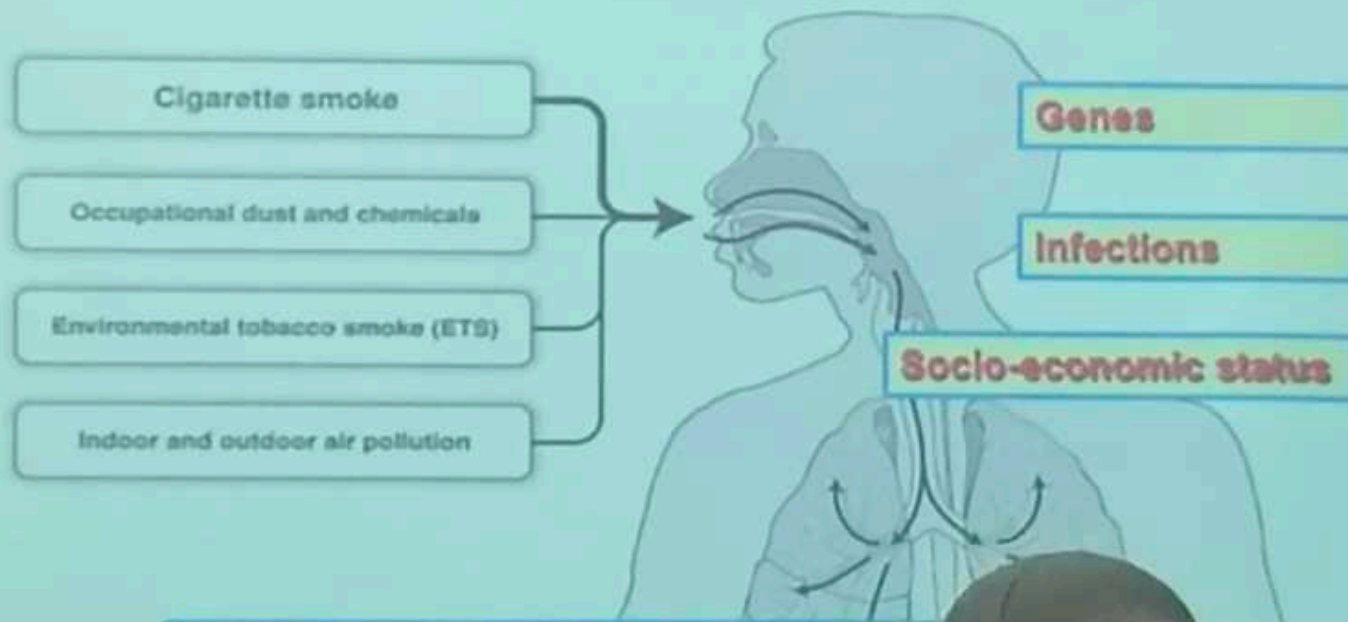
AIRFLOW LIMITATION

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graph TD; A[Small Airways Disease] --> C[AIRFLOW LIMITATION]; B[Parenchymal Destruction] --> C;
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COPD

- ▶ Airway obstruction $FEV_1 < 80\%$ predicted
- ▶ $FEV_1/FVC < 0.7$.

Risk Factors for COPD



Aging Population

- Smoking only 10–20% of heavy smokers develop COPD, indicating individual susceptibility.
- Inhalation of smoke from biomass heating fuels and cooking in poorly ventilated areas

COPD

COPD is favoured by:

- ⊗ Age of onset >35yrs
- ⊗ Smoking (passive or active)
- ⊗ Pollution related
- ⊗ Chronic dyspnoea
- ⊗ Sputum production
- ⊗ Minimal diurnal or day-to-day FEV₁ variation.

Types of COPD

- Chronic bronchitis

- Emphysema



Pink Puffers

- **Pink puffers:** Have alveolar ventilation, a near normal PaO₂ and a normal or low PaCO₂.
- They are **breathless** but are **not cyanosed**.
- They may progress to **type I respiratory failure**

- CO₂ excretion is less affected by mismatch and many patients have low-normal PaCO₂ values due to increasing alveolar ventilation in an attempt to correct their hypoxia ('pinkpuffers').

Blue bloaters

- Blue bloaters: Have alveolar ventilation, with a **low PaO₂** and a **high PaCO₂**.
- They are cyanosed but not breathless
- May go on to develop cor pulmonale.
- Their respiratory centres are relatively insensitive to CO₂ and they rely on **hypoxic drive** to maintain respiratory effort
- **Supplemental oxygen** should be given with care.

Blue bloaters

- ↳ Because of renal hypoxia, they start to retain fluid and increase erythrocyte production (leading eventually to polycythaemia)
- ↳ In consequence, they **become bloated, plethoric and cyanosed**, the typical appearance of the '**blue bloater**'

Symptoms of COPD

- Dyspnea
- Cough (usually worse in morning, sputum production)
- Wheezing
- Cyanosis
- Right heart failure

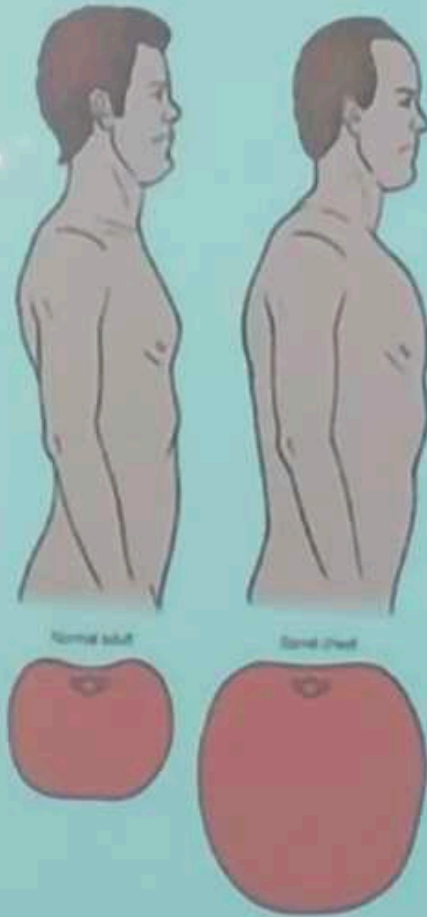


Figure 25-31 Profile and anteroposterior diameter of normal adult chest and barrel chest.

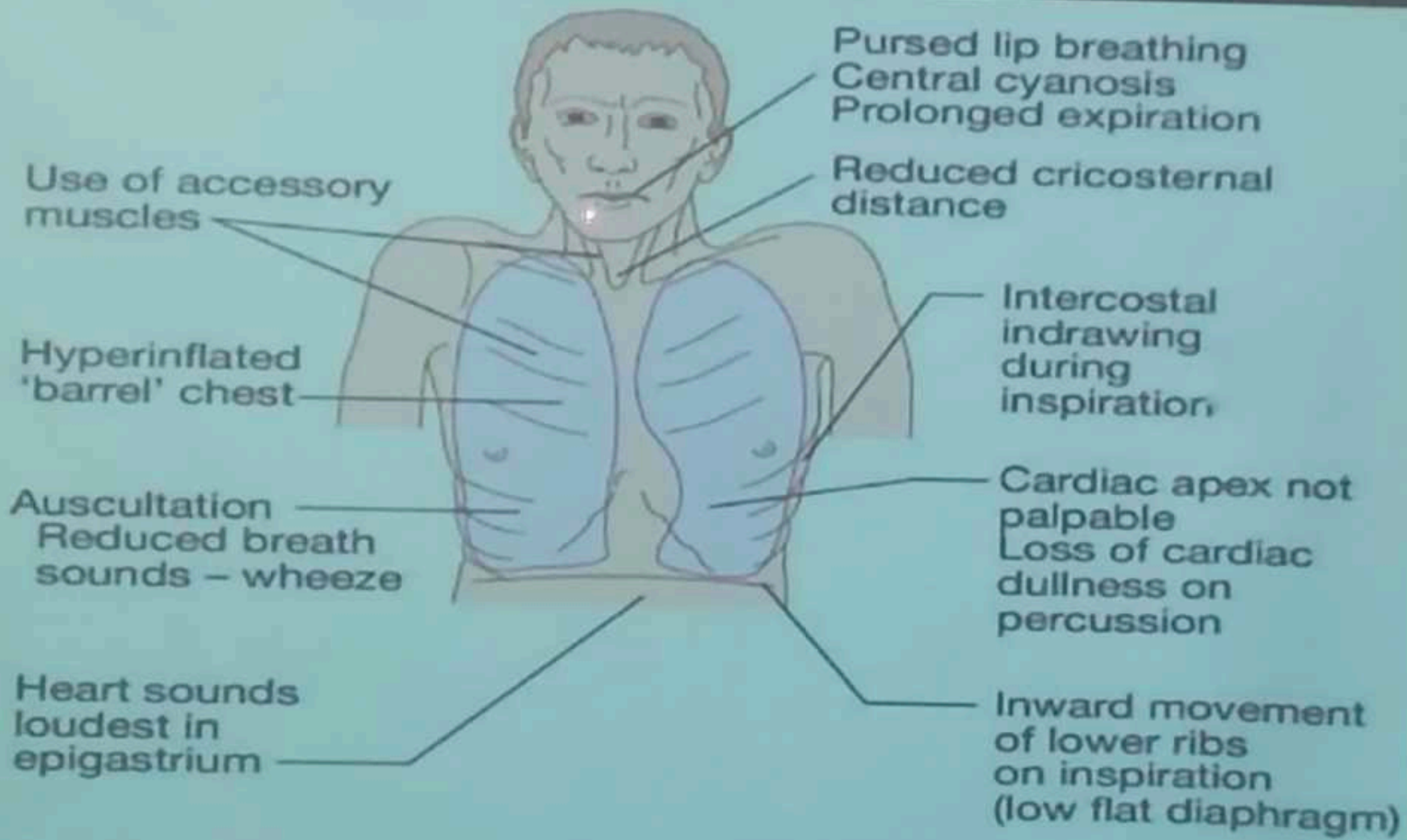
Physical Examination

➤ \uparrow RR, \uparrow HR, \downarrow O₂ saturation (cyanosis), pursed lipbreathing

➤ Gen: **Barrel-chest, accessory muscle use**

➤ CV: Impalpable apex beat
Quiet heart sounds
Palpable and loud P₂
Corpumonale , PHT
Pedal edema

➤ Resp: Decreased breath sounds
Wheezing
Rhonchi
Crackles



Also: raised JVP, peripheral oedema if cor pulmonale

Investigations



More emphysema



Pink puffer

- Lower body mass index
- Fewer cardiovascular co-morbidities
- Fewer metabolic co-morbidities
- Less muscle mass
- Hyperinflation
- Low diffusion capacity for CO
- More dyspnoea
- Decreased exercise capacity
- Worst health status
- Lower serum levels of sRAGEs

Less emphysema



Blue bloater

- Higher body mass index
- More metabolic co-morbidities
- Cardiac compromise
- OSA-COPD overlap
- Less hyperinflation
- More chronic bronchitis
- Increased exacerbations
- More normal diffusion capacity
- Higher serum levels of inflammatory markers (IL-6 and CRP)

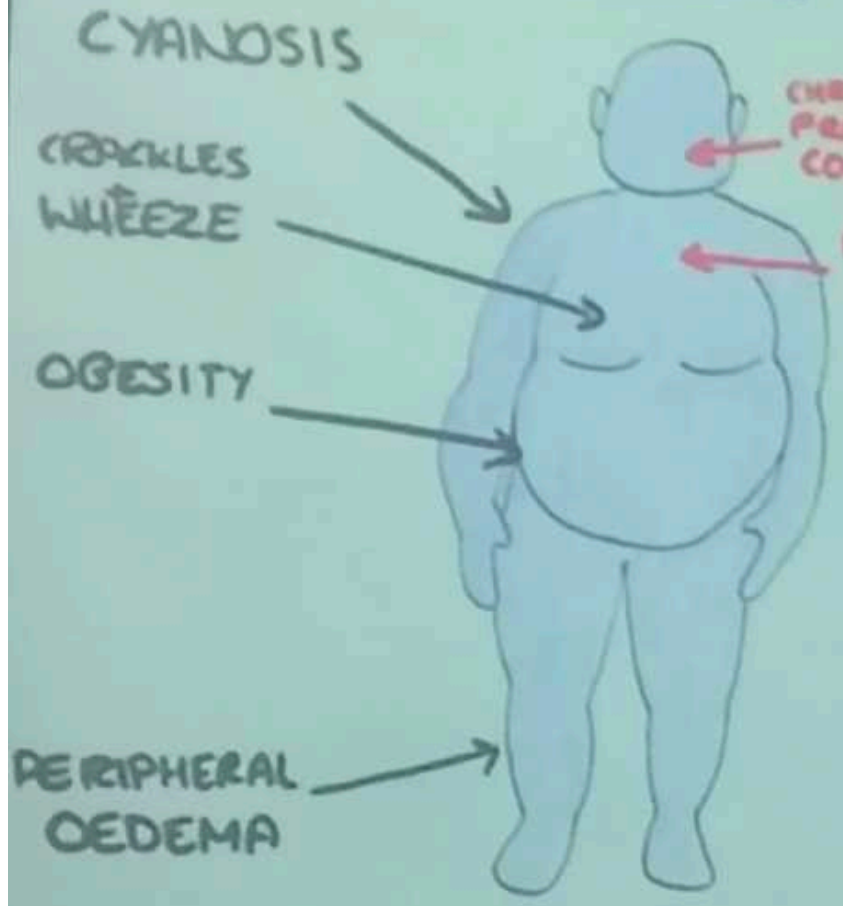


BLUE BLOATER

(BRONCHITIS)

PINK PUFFER

(EMPHYSEMA)

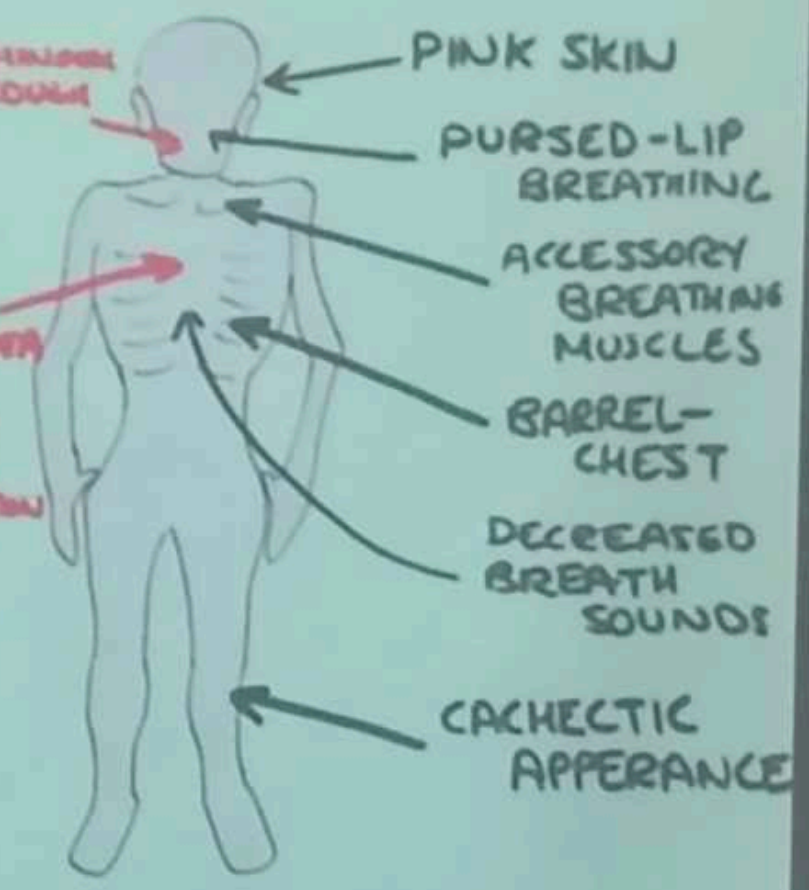


CO₂ RETENTION
(INSENSITIVE)
TO IT

CHRONIC PRODUCTIVE COUGH

PURULENT SPUTUM

TACHYPNEA
+
INCREASE
MINUTE
VENTILATION



CO₂ RESPONSIVE
↓
COMPENSATORY
HYPERVENTILATION

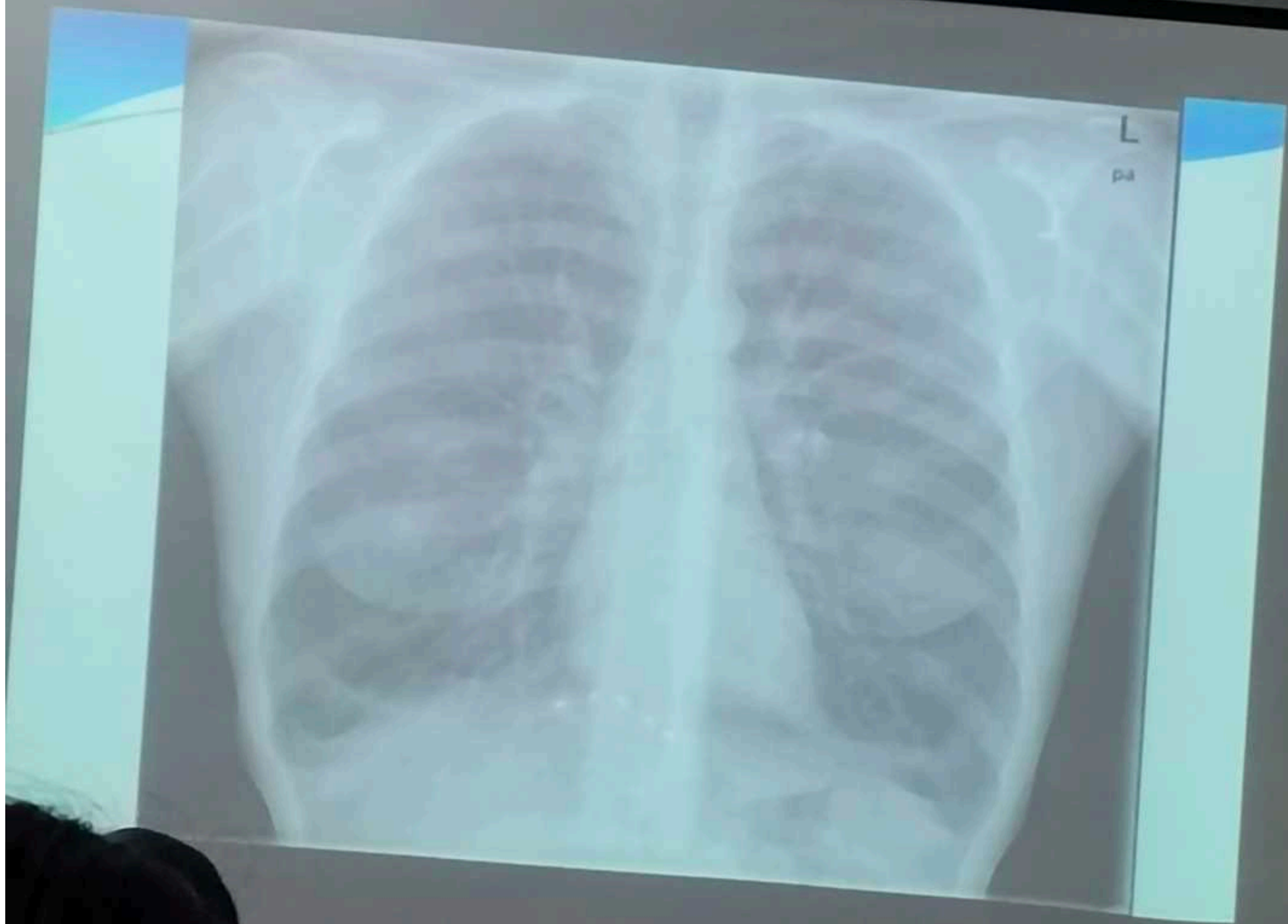
Investigations

Lung function tests

➤ *Evidence of airflow limitation*

Diagnosis of COPD – Pulmonary Function Tests

- ↳ ↓ Forced Expiratory Volume for 1 second (FEV₁)
- ↳ ↓ FEV₁/FVC (Forced Vital Capacity) ratio
- ↳ ↑ Total Lung Capacity (TLC)
- ↳ ↑ Forced Residual Capacity (FRC)
- ↳ ↑ Residual Volume (RV)
- ↳ ↑ Vital Capacity (VC)



Investigations

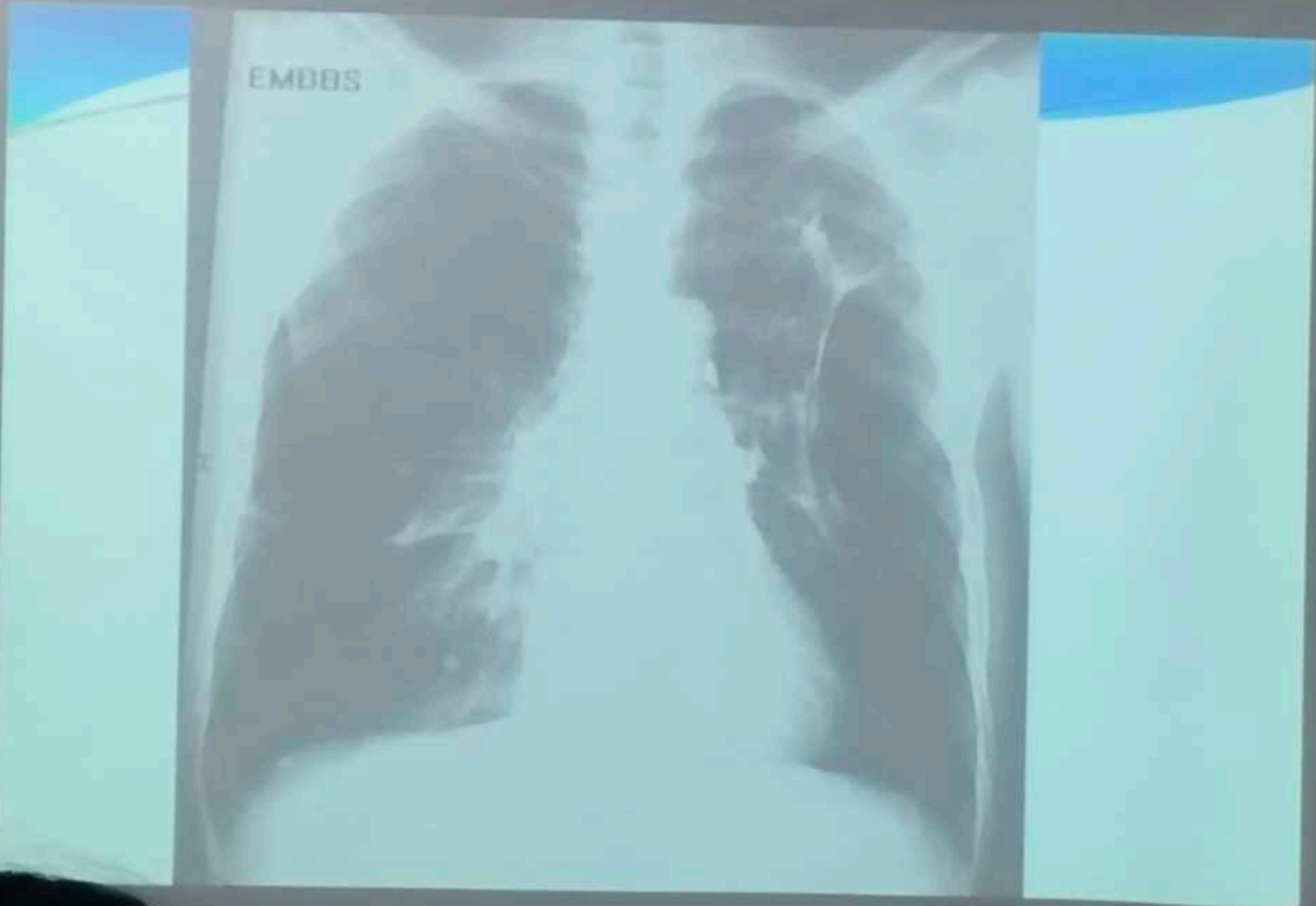
Chest X-ray

- ☞ Often normal, even when the disease is advanced.

The classic features are

- ☞ Hyperinflation of the lungs
- ☞ Low flattened diaphragms
- ☞ Tubular heart
- ☞ Sometimes the presence of large bullae.

EMDBS

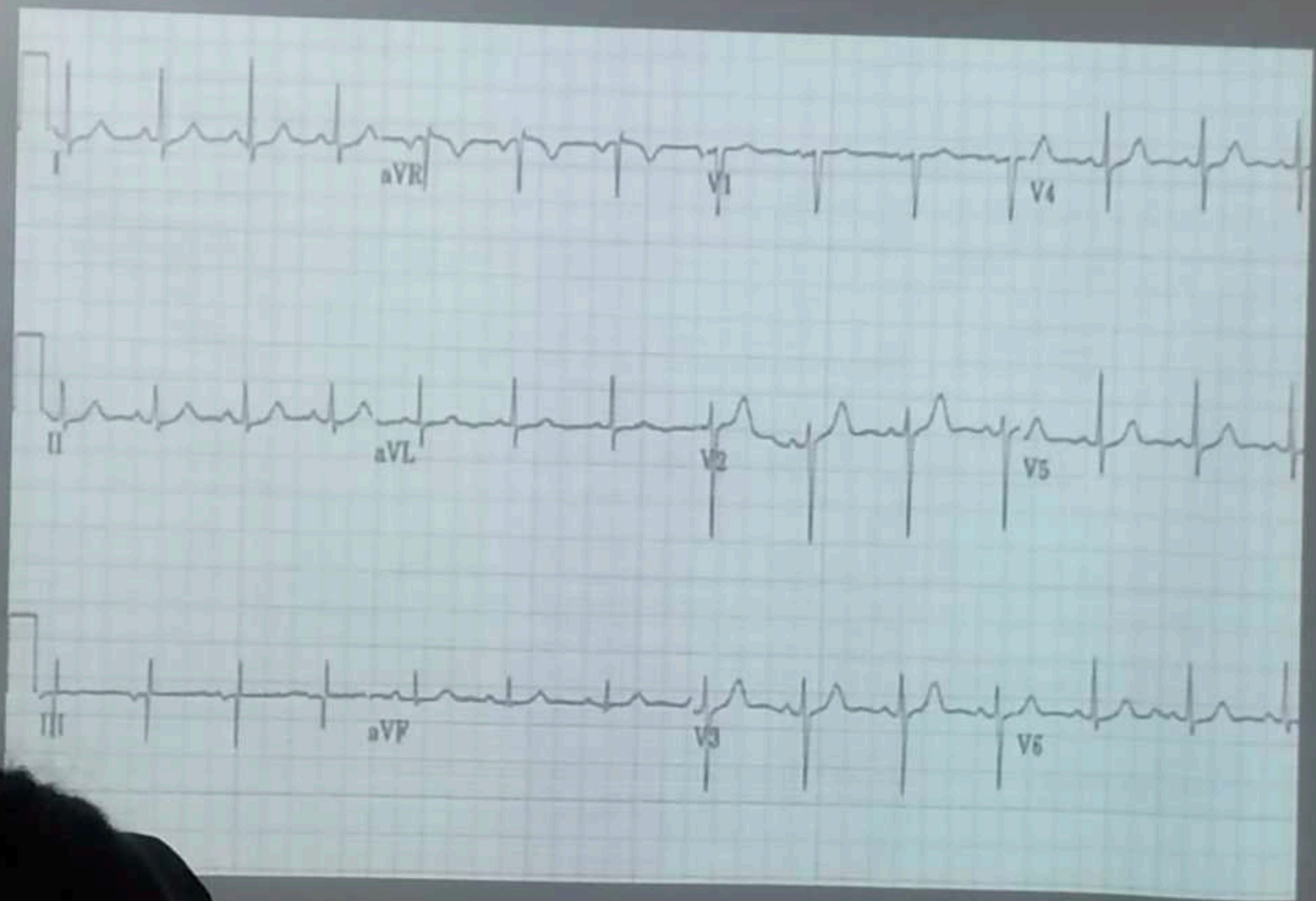


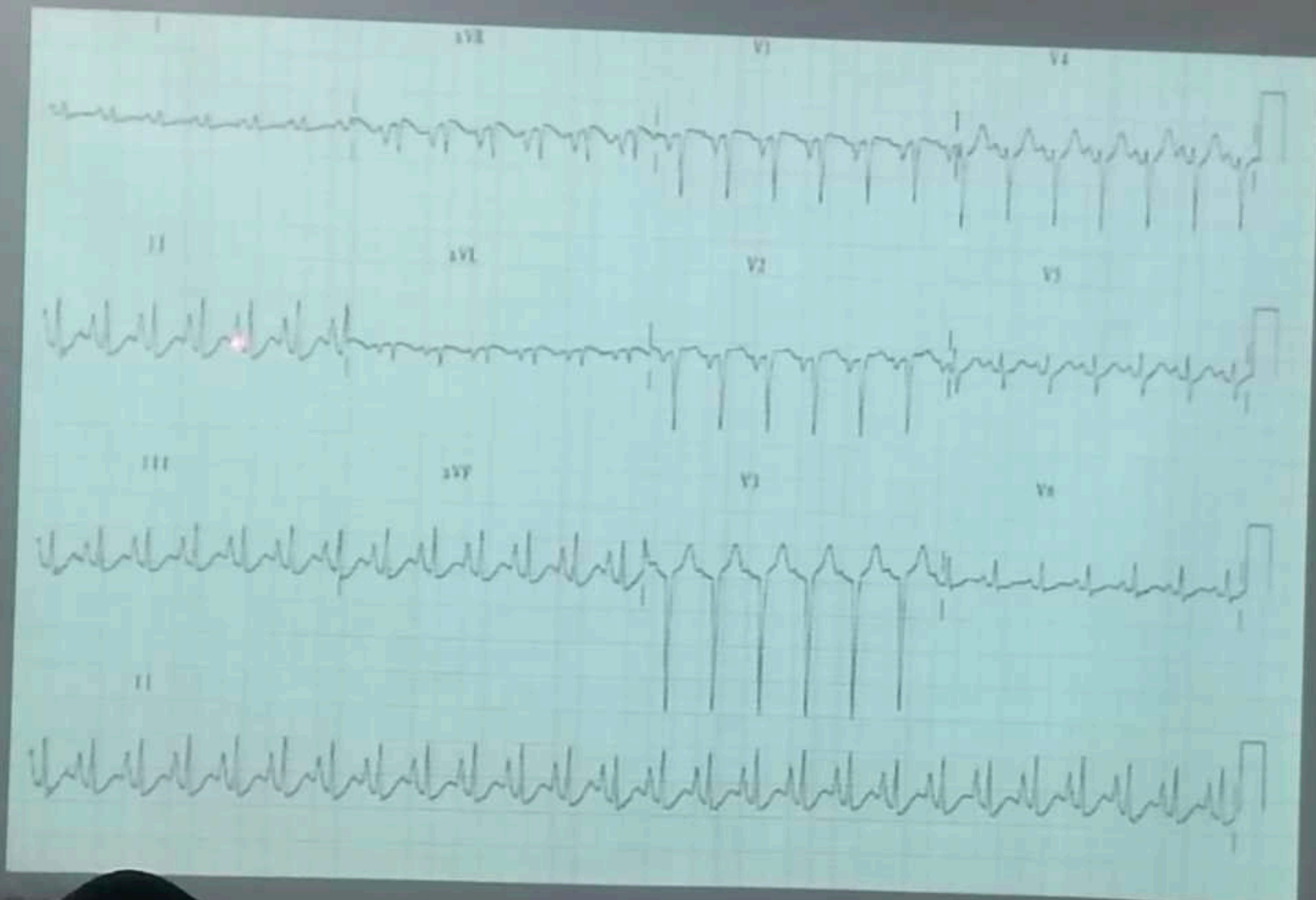
ABG's

- *Blood gases are often normal at rest but patients desaturate on exercise.*
- *In more advanced cases, there is resting hypoxaemia and there may also be hypercapnia.*

Sputum

- *Sputum examination is not useful in ordinary cases. Strep. pneumoniae and H. influenzae Moraxella catarrhalis are the only bacterial common organisms to produce acute exacerbations.*
- *Many acute episodes are viral in origin.*





α 1-Antitrypsin levels

- α 1-Antitrypsin levels in premature disease or lifelong nonsmokers.*

The Global Initiative for COPD

GOLD Staging of COPD

GOLD stage	FEV ₁ / FVC	FEV ₁ % predicted ^a
1. Mild	<70%	≥80%
2. Moderate	<70%	<80%
3. Severe	<70%	<50%
4. Very severe	<70%	<30%

^aFEV₁ levels post bronchodilator therapy.

Modified MRC (mMRC) Questionnaire

PLEASE TICK IN THE BOX THAT APPLIES TO YOU
(ONE BOX ONLY)

mMRC Grade 0. I only get breathless with strenuous exercise.

mMRC Grade 1. I get short of breath when hurrying on the level or walking up a slight hill.

mMRC Grade 2. I walk slower than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level.

mMRC Grade 3. I stop for breath after walking about 100 meters or after a few minutes on the level.

mMRC Grade 4. I am too breathless to leave the house or I am breathless when dressing or undressing.

Management of COPD

Treatment: Goals of management

- Recognition of disease (early Diagnosis and staging)
- Smoking cessation (secondary prevention) nicotine replacement and Zyban

Treatment

- Influenza and Streptococcus pneumoniae vaccination
- Bronchopulmonary drainage and postural drainage (physiotherapy) for patients with CB
- Oxygen therapy for patients with hypoxia ($\text{PaO}_2 < 55 \text{ mmHg}$, $\text{SaO}_2 < 88\%$) and erythrocytosis (Hematocrit > 55)
- Pulmonary rehabilitation and education (improving quality of life)- exercise program and improved nutrition
- Prevention and treatment of complications (cor pulmonale) and limitation of disease progression

Treatment of COPD

☞ Short-acting bronchodilators

- ☞ Albuterol

☞ Long-acting bronchodilator

- ☞ Salmeterol, Formoterol

☞ Combination of anti-cholinergic and β -agonist bronchodilator

- ☞ Ipratropium + albuterol (combivent)

- ☞ Tiotropium (spiriva)

Treatment of COPD

☞ Methylxanthines (Theophylline)

- ☞ Has anti-inflammatory effect, and improves respiratory muscle function, stimulates the respiratory center, and promotes bronchodilation
- ☞ Adverse effects include anxiety, tremors, insomnia, nausea, cardiac arrhythmia, and seizures⁴

☞ Inhaled corticosteroids

- ☞ Fluticasone (Flovent), budesonide (Pulmicort)

☞ Combination of Inhaled corticosteroid and long-acting β -agonist

- ☞ Fluticasone + salmeterol (Advair)

Treatment of COPD

Oxygen Therapy

Continuous oxygen has been shown to cut mortality in half or decrease morbidity when compared with non-continuous oxygen

- ↳ Continuous (24 hours/day)
- ↳ Noncontinuous During exercise – when PaO₂ is <55 mmHg or Oxygen sat. < 88% with low level of exercise.

Stages of COPD

Stage	FEV1/FVC Ratio	FEV1 %	Clinical Findings
At Risk	>0.7		Patients who smoke, patients exposed to high pollutants, and patients with recurrent respiratory symptoms/infections. Give influenza and pneumonia vaccines.
Mild	< 0.7	>80	Add short-acting bronchodilator as needed
Moderate	<0.7	50-80	Add regular treatment with one or more long-acting bronchodilator and add Pulmonary rehabilitation
Severe	<0.7	30-50	Add inhaled corticosteroids if repeated exacerbations
Very Severe	< 0.7	<30	Add long-term oxygen if chronic respiratory failure; Consider surgical treatments