Chronic Obstructive Pulmonary Disease (COPD)

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OUTLINE

- Definition
- Pathology
- Epidemiology
- Aetiology
- Mediators
- History
- Examination
- Investigations
- Management
- Complications

DEFINITION

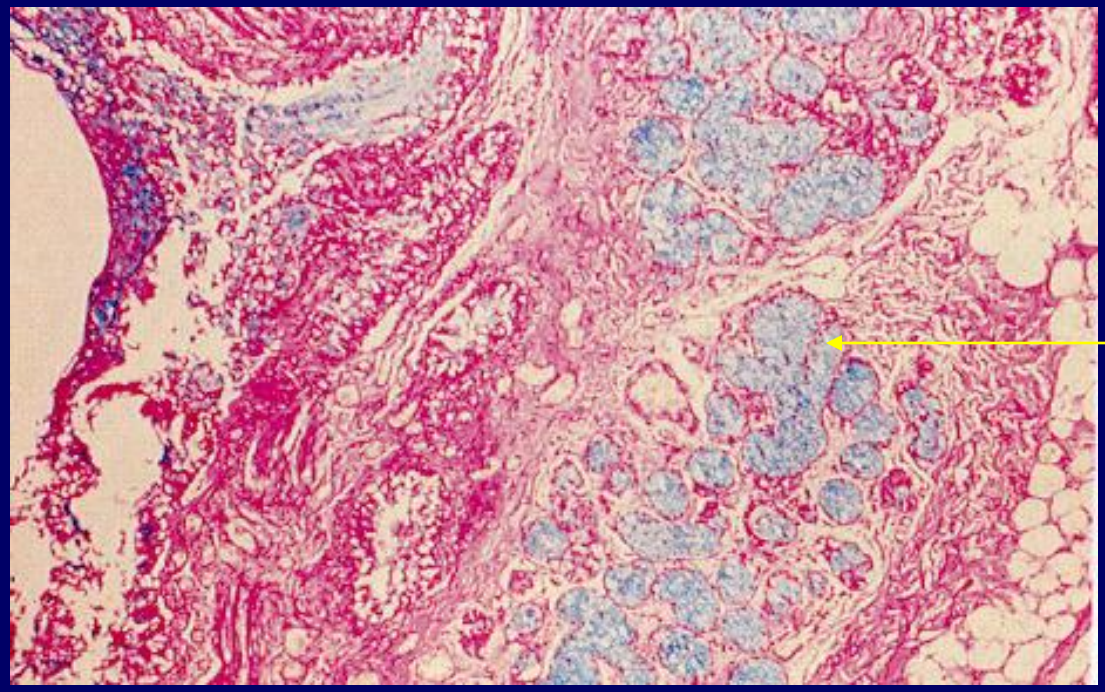
Chronic Obstructive Pulmonary Disease (COPD)

= Chronic bronchitis + Emphysema

- Chronic bronchitis: cough with sputum on most days for at least 3 months of the year for more than 2 consecutive years
- Emphysema: dilatation and destruction of lung tissue distal to the terminal bronchiole

Usually co-exist

PATHOLOGY: CHRONIC BRONCHITIS



- hypertrophy of mucus secreting glands
- acute & chronic inflammatory infiltrate
- epithelial ulceration heals with fibrosis

PATHOLOGY: EMPHYSEMA

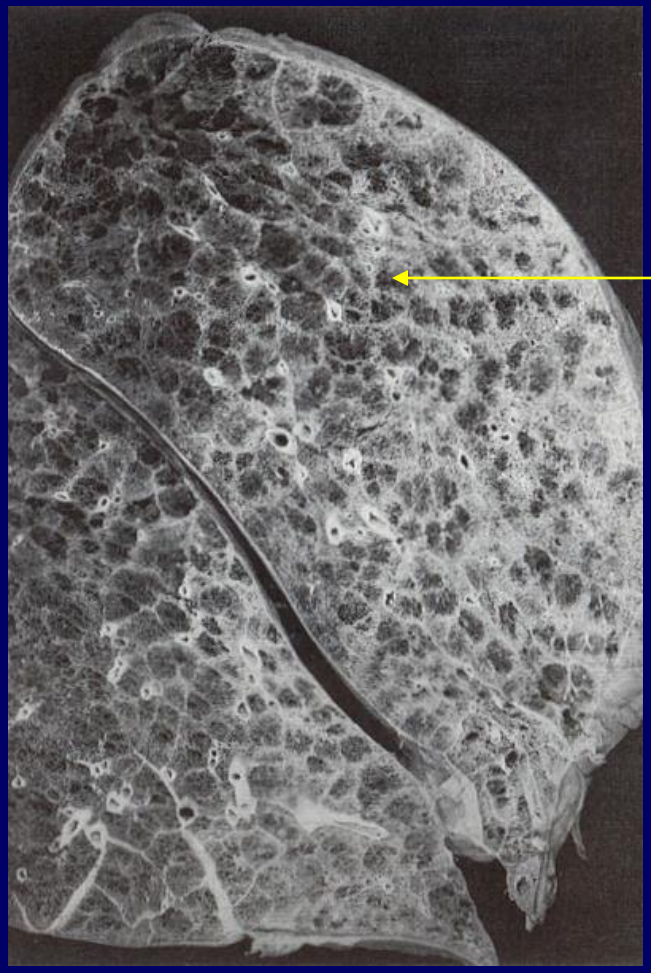
Site of damage

- *centri-acinar*

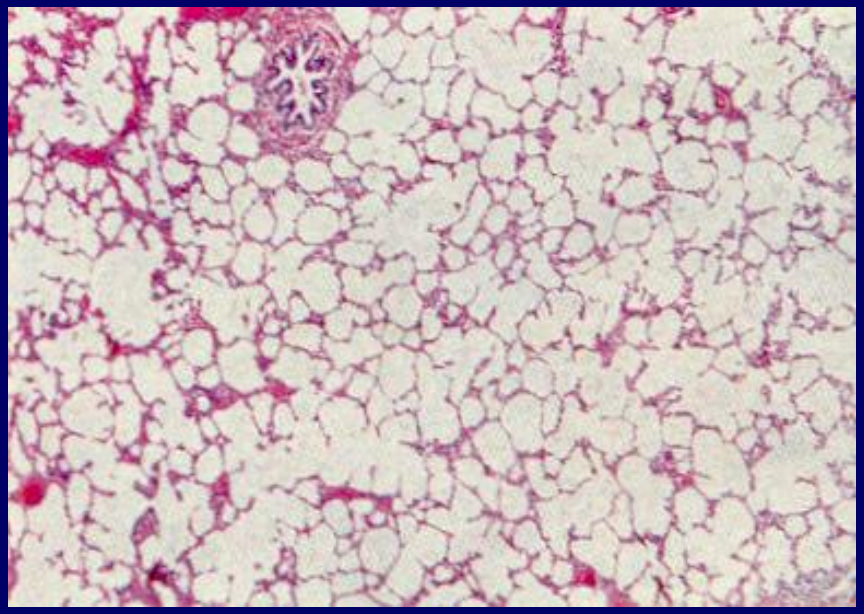
  more common, less severe

- *pan-acinar*

  less common, more severe

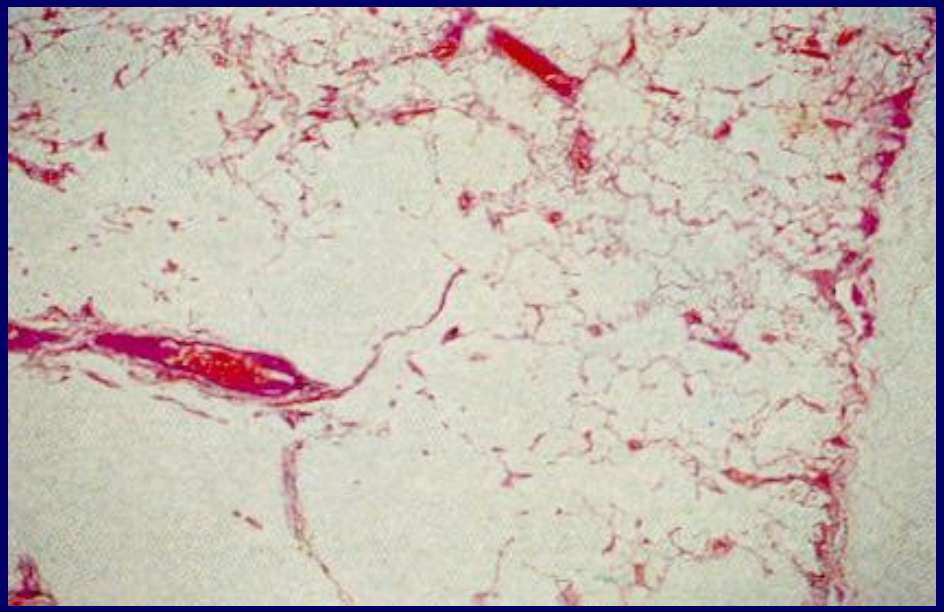


PATHOLOGY: EMPYSEMA HISTOLOGY

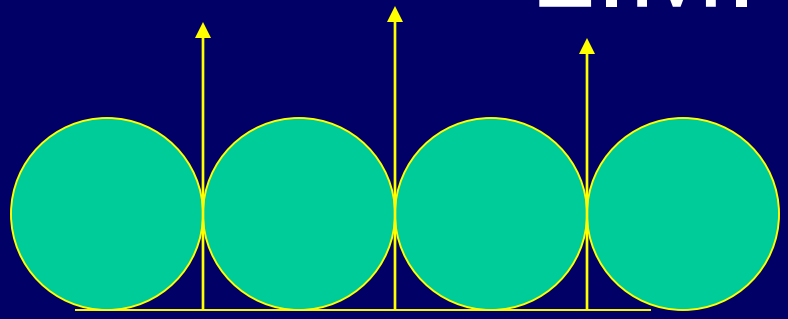


Normal lung parenchyma

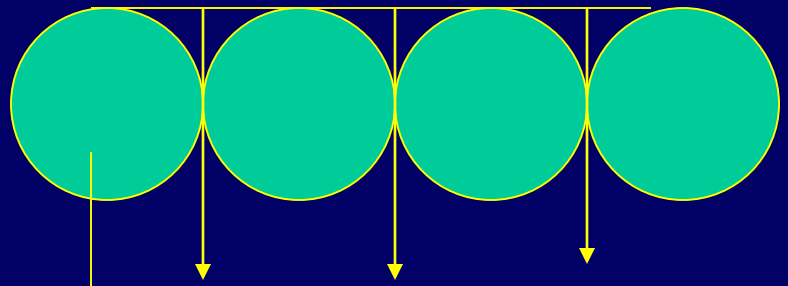
Emphysematous lung



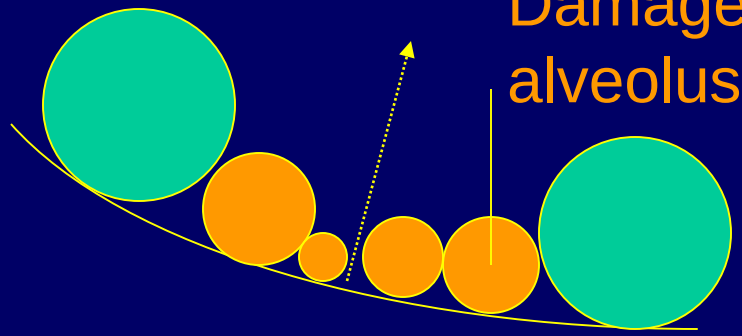
PHYSIOLOGY: FIXED AIRFLOW LIMITATION



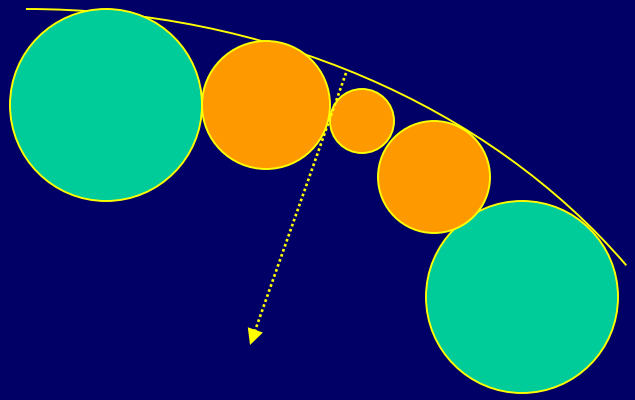
Normal airway



Normal alveolus



Damaged alveolus

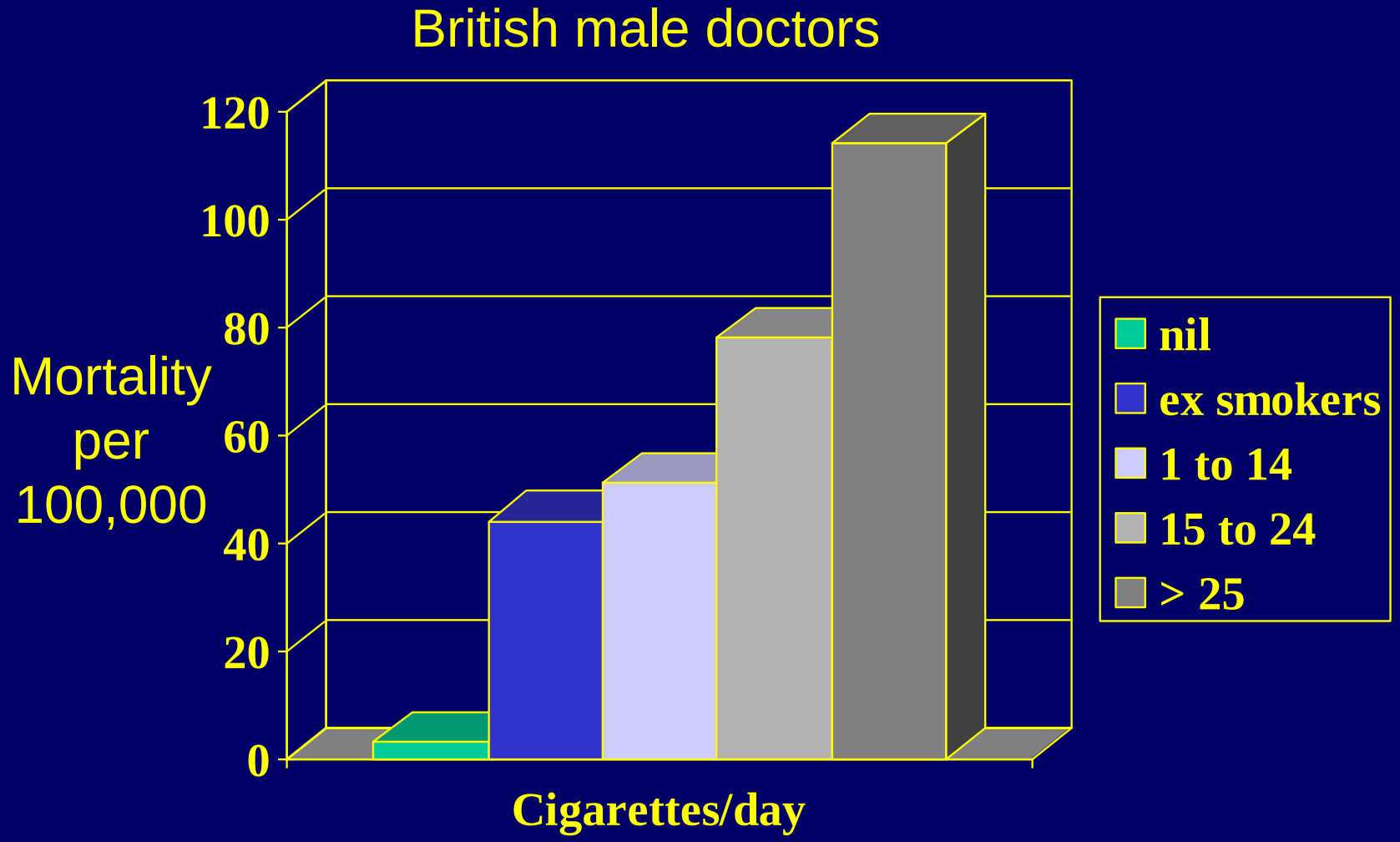


Loss of radial traction

AETIOLOGY

- Cigarette smoking
  - Most important cause
- Infection
  - Link unclear, but accelerates damage
- α_1-antitrypsin deficiency (AD)
  - MM, MZ, ZZ homozygotes develop severe SOB, basal emphysema (esp smokers) and liver disease

BRONCHITIS MORTALITY



MEDIATORS

Area of huge amount of current research:

- Broncho-alveolar lavage shows smokers have ↑neutrophils & mϕ in airway lumen
- Activated neutrophils release elastases and proteases
- May be the cause of lung damage
- A possible therapeutic target…

HISTORY

- Cough with sputum
- Dyspnoea
- Wheeze
- Cigarette smoking
  - How do you measure exposure?
  - 20 cigs/day for 1 year = 1 pack-year
  - E.g. 15 cigs/day for 15 yrs = 15/20 x 15 = 11.25

EXAMINATION

- Tachypnoea
- Prolonged expiration with pursed lips
- Hyperinflated chest
- Poor expansion
- Loss of cardiac and liver dullness
- Wheeze

CLINICAL PATTERNS

Pink puffer:

- Thin & frail
- Severe SOB
- Heart failure rare
- Near normal gases
- Severe obstruction
- CXR emphysema
- Better prognosis

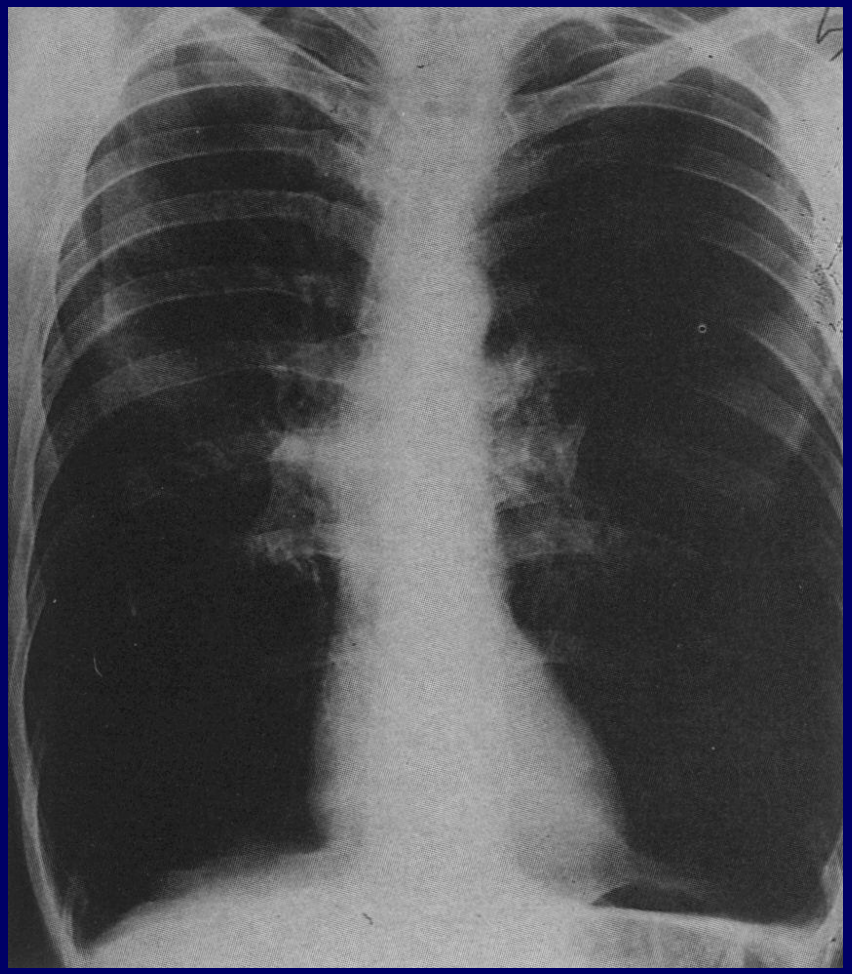
Blue bloater:

- Obese & plethoric
- Mild SOB
- Heart failure
- Respiratory failure
- Good RFT's
- CXR no emphysema
- Poor prognosis

INVESTIGATION OF COPD

- To confirm diagnosis
  - largely a clinical diagnosis
- To grade severity
  - for treatment
  - for prognosis

CHEST RADIOGRAPH



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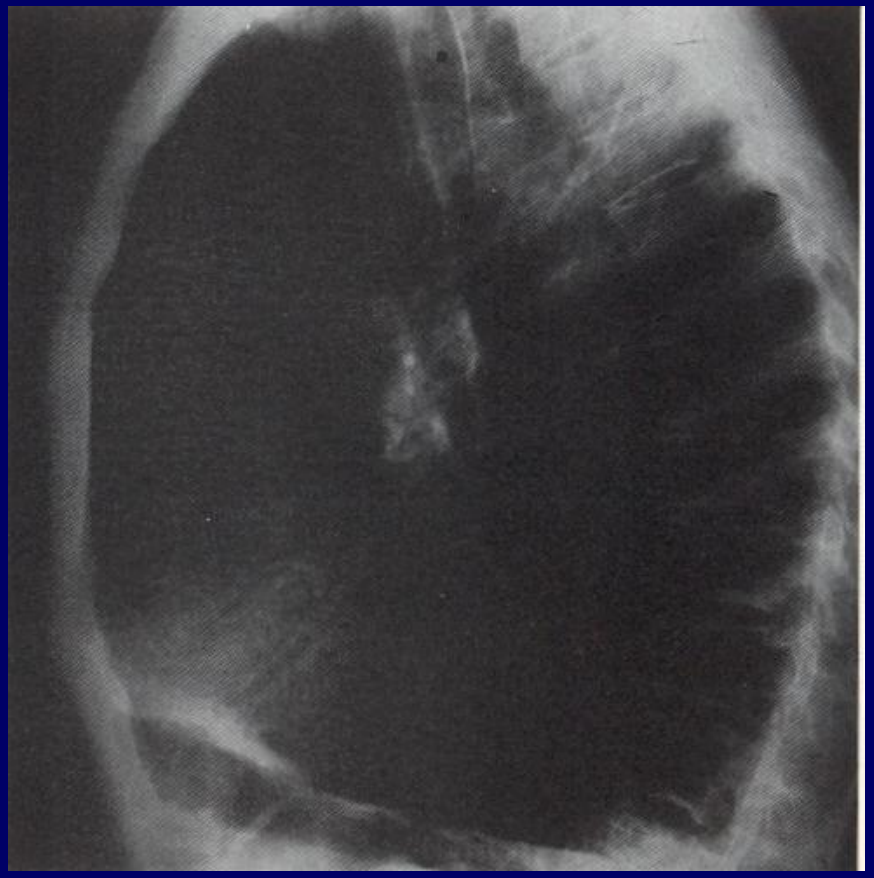
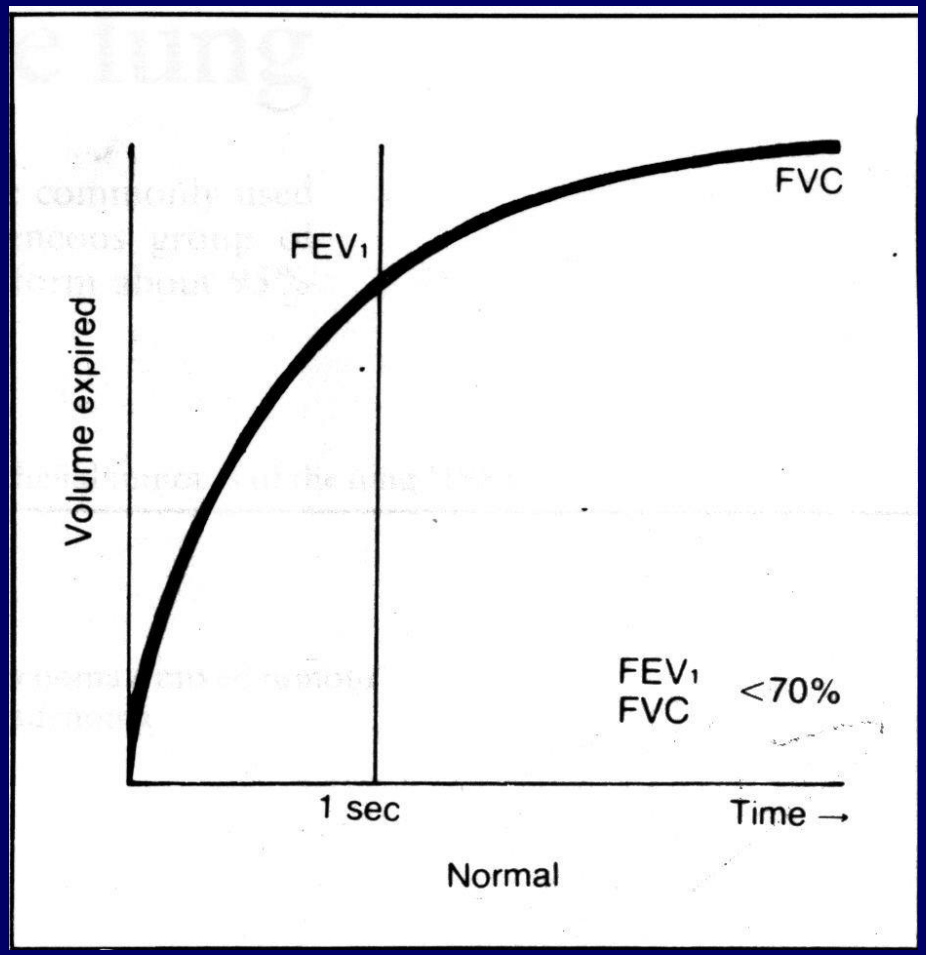
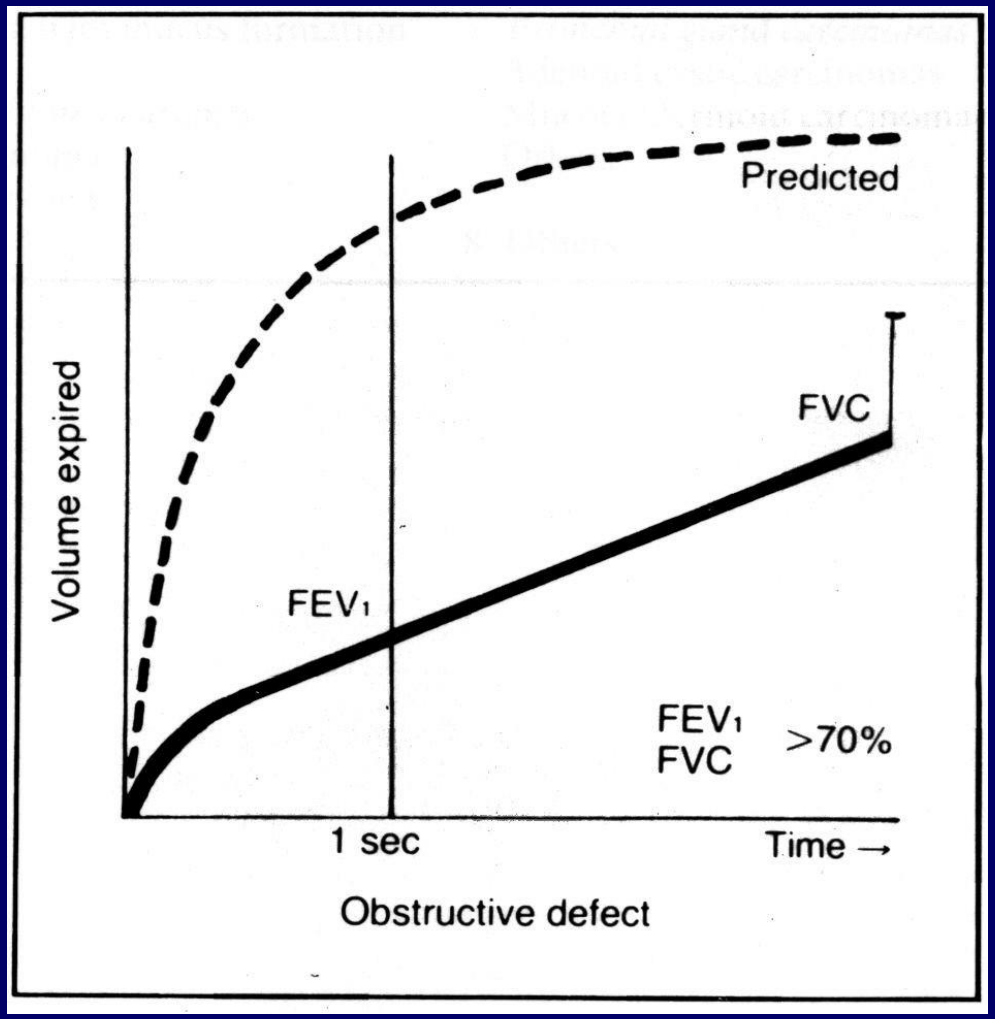


lateral

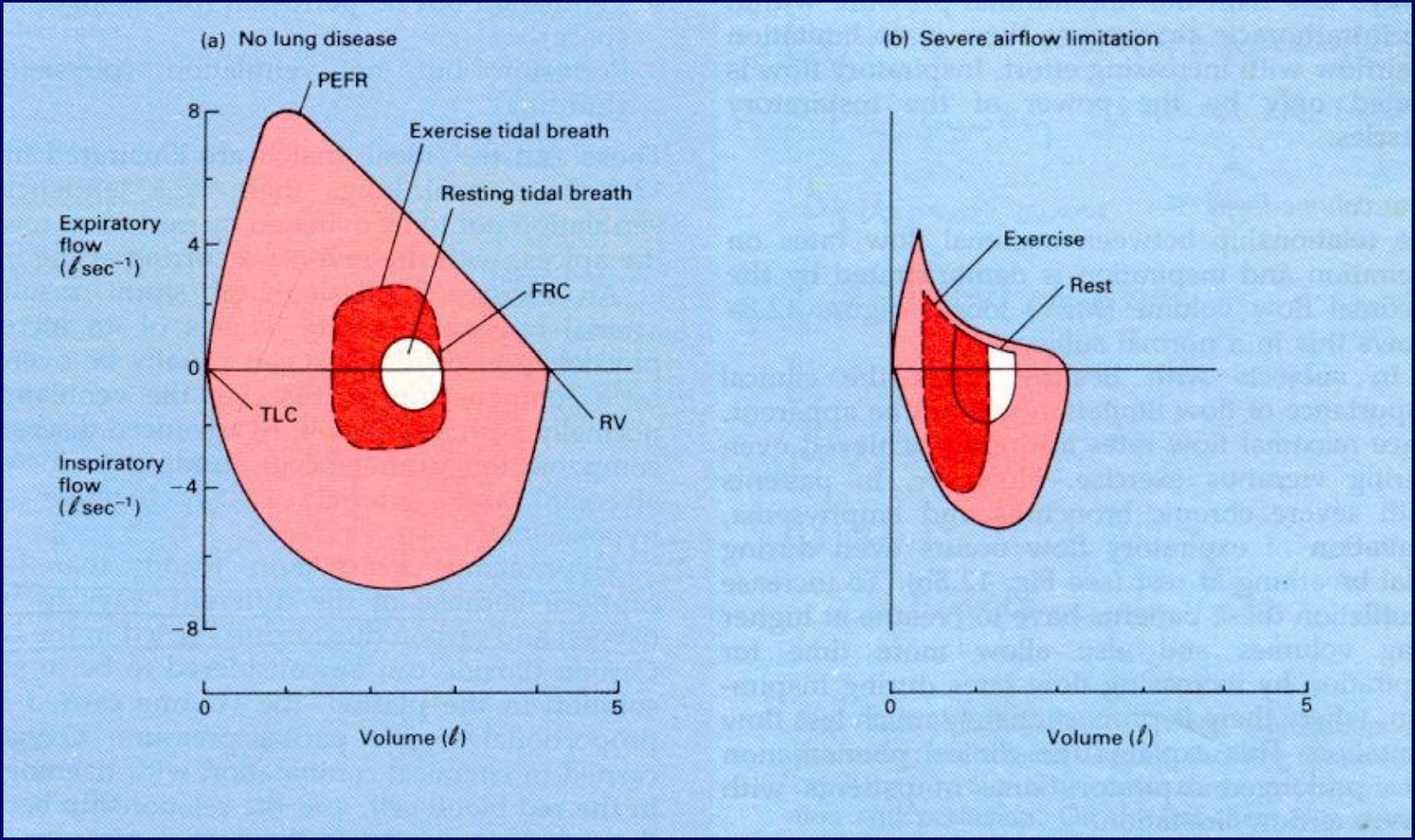
SPIROMETRY: NORMAL



SPIROMETRY: CHRONIC AIRFLOW LIMITATION



FLOW-VOLUME LOOP



HOW DO WE DISTINGUISH COPD FROM ASTHMA ?

Both are obstructive lung diseases

Time…

- In asthma severity varies over short periods of time and with treatment;
- COPD is airway obstruction that is fixed over months

In practice, repeat spirometry before and after $ß_2$ agonists or short course oral steroids

ASTHMA vs COPD

- Onset in childhood
- Episodic symptoms
- Diurnal variation
- Hx/FHx atopy

- Onset in middle life
- Persistent, progressive
- Minimal
- Cigarette smoking

HOW DO WE GRADE SEVERITY OF COPD ?

Measured FEV_1 as a % of predicted FEV_1 in the presence of obstructive lung function

- I Mild $\geq$ 80%
- II Moderate 30 – 80 %
  - IIA 50 – 80 %
  - IIB 30 – 50 %
- III Severe <30%

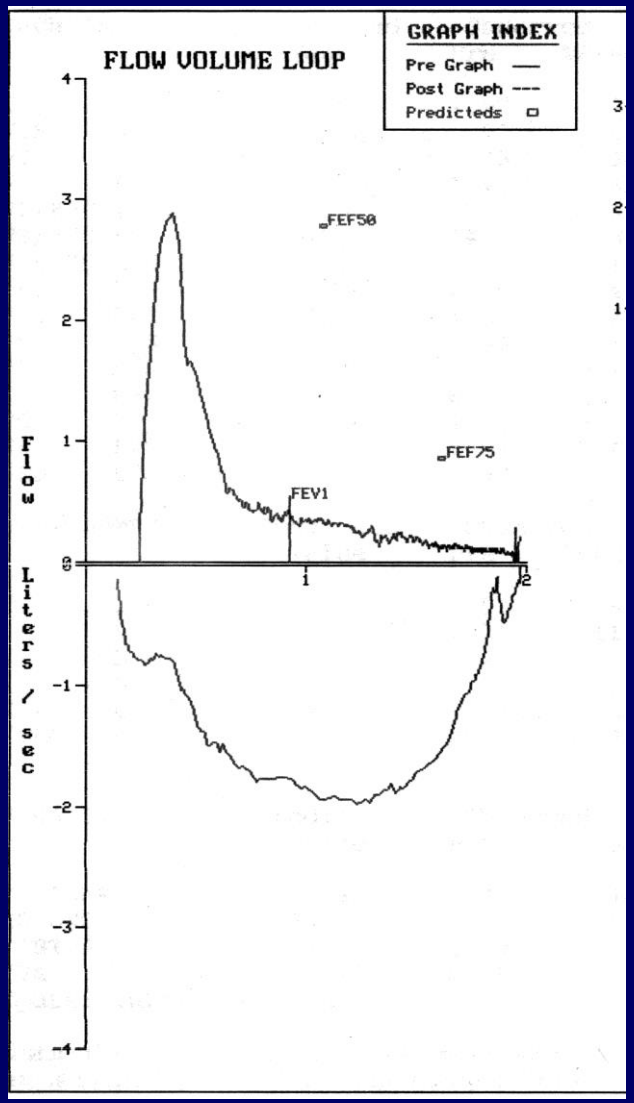
use post-bronchodilator result

MODERATE OBSTRUCTION

SPIROMETRY		Predicted Value	Observed Pre	%Pred
FVC	L	2.16	1.97	91
FEV.5	L	1.66	.73	43
FEV1	L	1.71	.93	54
FEV3	L	2.22	1.46	65
FEV1/FVC	%	80	47	58
FEV3/FVC	%	92	74	80
FEF25-75	L/S	2.17	.34	15
PEFR	L/S	6.49	2.89	44
FEF25	L/S	5.92	1.66	28
FEF50	L/S	2.79	.36	12
FEF75	L/S	.86	.22	25
FET	Sec		8.13	
FIVC	L	2.16	1.82	84
PIFR	L/S	4.33	1.97	45
FIF50	L/S		1.92	

LUNG VOLUMES		Predicted Value	Observed Pre	%Pred
SVC	L	2.16	1.97	91
IC	L	1.47	1.76	119
ERV	L	.69	.21	30
RV	L	1.68	.67	39
TLC	L	3.84	2.64	68
RV/TLC	%	35	25	71

DIFFUSION	Predicted Value	Observed Pre	%Pred
DLCO CORR	20.3	9.93	48
DLCO UNC	20.3	9.39	46
VA @BTPS	6.12	2.39	39
DL/VA	3.93	4.15	105



OTHER FEATURES ON LUNG FUNCTION TESTING

- Gas trapping – increased FRC and TLC
  - Measured by helium dilution
- Reduced diffusion capacity
  - Measured by CO diffusion
  - Assesses access to pulmonary capillary circulation

OTHER INVESTIGATIONS

- Haematology
  - polycythaemia, consider venesection
- Arterial blood gas
  - hypoxia and hypercapnia common
  - screen using pulse oximetry
  - arterial sampling if O_2 saturation < 92%

AIMS OF MANAGEMENT

- Assess and monitor disease
- Reduce risk factors
- Manage stable disease
- Manage acute exacerbations

NON DRUG MANAGEMENT

- Stopping cigarette smoking
  - single most important intervention
  - nicotine replacement helps
  - monitor CO levels

WHY STOP SMOKING?

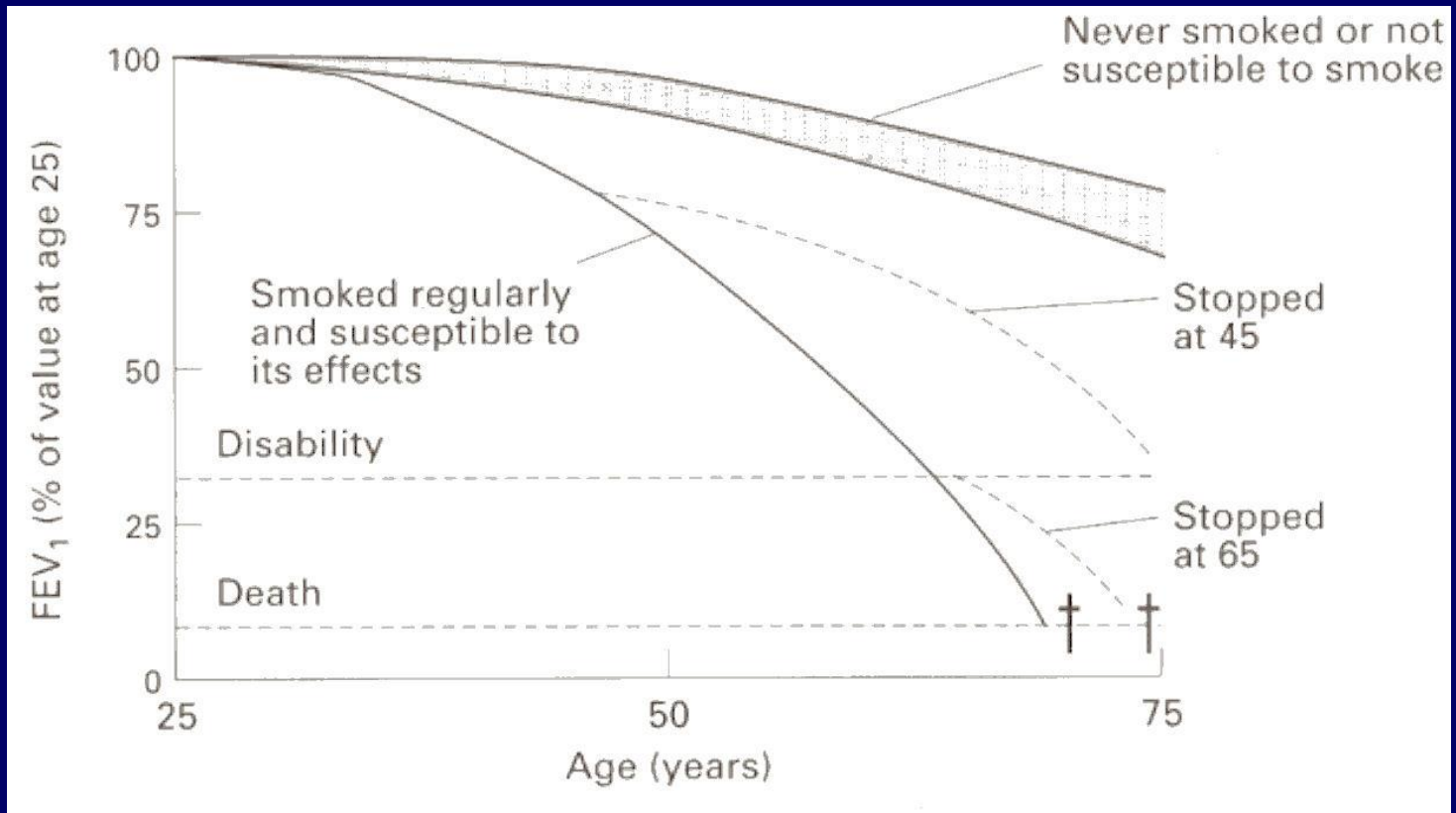


Figure 2 Model of annual decline in FEV_1 with accelerated decline in susceptible smokers. On stopping smoking subsequent loss is similar to that in healthy non-smokers. Modified from Fletcher and Peto.[15]

OTHER NON DRUG INTERVENTIONS

- Regular exercise, pulmonary rehabilitation programmes
- Treat obesity and poor nutrition
- Influenza vaccination

DRUG INTERVENTION 1

Treatment is symptomatic & unsatisfactory:

- Mild disease: with symptoms, trial of inhaled ß agonist or anticholinergic agent prn; if ineffective stop

- Moderate disease: single inhaled bronchodilator

DRUG INTERVENTION 2

- Severe disease: combination of inhaled bronchodilators, oral sustained-release theophyllines

- Place of inhaled corticosteroids under investigation
  - Consider if lung function improves or there are regular exacerbations

TIATROPIUM

- Inhaled anticholinergic agent (M_1 and M_3)
- Once daily dosing 18µg dry powder
- 12 month trials vs placebo & vs ipatropium

+ FEV1 120ml - Exacerbations (20%) NNT 13

+ Quality of life - Hospital admissions NNT 25

COMPLICATIONS: RESPIRATORY INFECTION 1

- Diagnosis:
  - Increase in SOB, sputum volume or development of purulent sputum
- Differential diagnosis:
  - Pneumonia, PTX, LVF, PE, Ca bronchus
- Place of management:
  - usually in the community

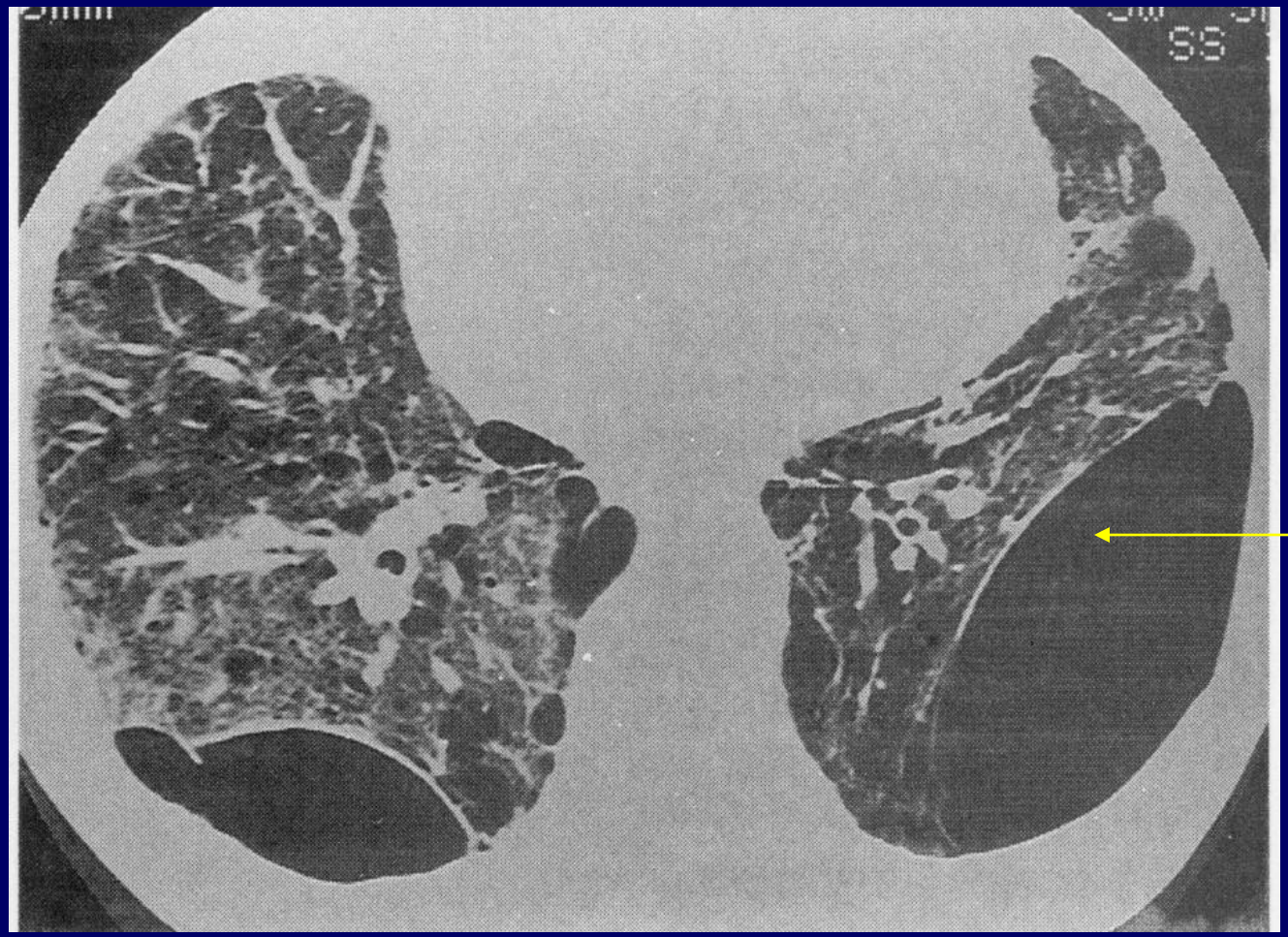
COMPLICATIONS: RESPIRATORY INFECTION 2

- Oxygen therapy
  - Beware using FIO_2 > 28% or nasal canulae > 2 l/min
- Nebulised bronchodilators
  - Driven by air, continue O_2 inhaled
- Antibiotics
  - *H. influenzae, S. pneumoniae, M. catarrhalis*
  - Amoxycillin, cephalosporin, macrolide

COMPLICATIONS: RESPIRATORY INFECTION 3

- Corticosteroids
  - In all but the mildest exacerbations
- Respiratory failure
  - Intubation and ventilation or NIPPV
  - Who to ventilate?
    - Clear precipitating event
    - Good quality of life
    - First episode of respiratory failure

COMPLICATIONS: BULLOUS DISEASE



COMPLICATIONS: RESPIRATORY FAILURE

Chronic type 2 respiratory failure

- Long-term Oxygen Therapy (LTOT)
  - Measure: in stable phase of disease
  - Criteria: PO_2 < 7.3 Pa & FEV_1 < 1.5 l
  - Intervention: O_2 for > 15 hrs /day
  - Method: O_2 concentrator & nasal canulae
  - Outcome: improves 5 yr survival from 21% to 41%
  - Beware CO_2 retention

COMPLICATIONS: COR PULMONALE

Right heart failure due to pulmonary hypoxic vasoconstriction

- raised JVP, RV heave, loud P2, tricuspid regurgitation, peripheral oedema
- diuretics
- LTOT

SUMMARY

- Definition
- Pathology
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Global Initiative for Chronic Obstructive Lung Disease

GLOBAL STRATEGY FOR THE DIAGNOSIS, MANAGEMENT, AND PREVENTION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE NHLBI/WHO WORKSHOP REPORT

EXECUTIVE SUMMARY

NATIONAL INSTITUTES OF HEALTH
National Heart, Lung, and Blood Institute