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Pathology Labs

M2 – Respiratory Sequence
Gerald Abrams M.D.
M-2 Respiratory Laboratory - 1

63  Aspiration pneumonia
26  Tuberculosis
64  Pneumonia
29  Aspergillosis
200 ARDS
M-2 Respiratory Laboratory - 1

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26  Tuberculosis
64  Pneumonia
29  Aspergillosis
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M-2 Respiratory Laboratory - 1

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Aspergillosis
ARDS
63  Aspiration pneumonia
26  Tuberculosis
64  Pneumonia
29  Aspergillosis
200 ARDS
61  RDS in the newborn
M-2 Respiratory Laboratory - 1

63  Aspiration pneumonia
26  Tuberculosis
64  Pneumonia
29  Aspergillosis
200 ARDS
61  RDS in the newborn
Prematurity

Reduced surfactant synthesis, storage, and release

- Decreased alveolar surfactant
  - Increased alveolar surface tension
    - Atelectasis
      - Uneven perfusion
      - Hypoventilation

Hypoxemia + CO₂ retention

- Acidosis
  - Pulmonary vasoconstriction
    - Pulmonary hypoperfusion
      - Endothelial damage
      - Epithelial damage

- Increased diffusion gradient
  - Plasma leak into alveoli
  - Fibrin + necrotic cells (hyaline membrane)
M-2 Respiratory Laboratory - 2

59 Emphysema
67 Bronchiectasis
68 Asthma
60 Asbestosis
CPC
Lung volume

- Inspiratory reserve volume
- Tidal volume
- Expiratory reserve volume
- Residual volume
- Inspiratory capacity
- Vital capacity
- Total lung capacity
- Functional residual capacity
Obstructive Pulmonary Disorders

Pathophysiologically characterized by:
Increased resistance to air flow at any level

Pathologic processes include:
- Emphysema
- Chronic bronchitis
- Bronchiectasis
- Asthma
- Cystic fibrosis
Restrictive Pulmonary Disorders

Pathophysiologically characterized by:
- Limited lung expansion
- Reduced lung volume
- Decreased in driving force for expiration

Pathologic processes include:
- Neuromuscular
- Chest wall
- Pleural space
- Lung parenchyma (ILD)
# Pulmonary Function Abnormalities

## Restrictive Disorders

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<th>Severe</th>
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## Obstructive Disorders

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Gas Exchange in the Lung

Diffusing capacity ($D_{LCO}$)

Factors that affect $D_{LCO}$:

**Increase $D_{LCO}$**
- Increase body size, lung volume, alveolar $P_{CO_2}$
- Male sex
- Supine position
- Exercise
- Increasing age to 20 years

**Decrease $D_{LCO}$**
- Increase in alveolar $P_{O_2}$
- Most lung diseases
- Increasing age after 20 years
M-2 Respiratory Laboratory - 2

59  Emphysema
67  Bronchiectasis
68  Asthma
60  Asbestosis
CPC
Protease inhibitor (antielastase) → \(\alpha_1\)-AT deficiency → Elastase → Collagen and elastin destruction → Emphysema

Protease (elastase) ↑ smoking ↑
59  Emphysema
67  Bronchiectasis
68  Asthma
60  Asbestosis
CPC
M-2 Respiratory Laboratory - 2

59  Emphysema
67  Bronchiectasis
68  **Asthma**
60  Asbestosis
CPC
M-2 Respiratory Laboratory - 2

59  Emphysema
67  Bronchiectasis
68  Asthma
60  Asbestosis
CPC
Idiopathic pulmonary fibrosis (UIP)
Emphysema
Bronchiectasis
Asthma
Asbestosis
CPC
Squamous cell carcinoma
Adenocarcinoma
Small cell carcinoma
Carcinoid tumor
CPC
Squamous cell carcinoma
Adenocarcinoma
Small cell carcinoma
Carcinoid tumor
CPC
Respiratory Epithelium → Squamous Metaplasia → LG Dysplasia

Invasive Carcinoma → Carcinoma in situ → HG Dysplasia → MG Dysplasia
Respiratory Epithelium → Squamous Metaplasia → LG Dysplasia

Invasive Carcinoma (Carcinoma in situ) → HG Dysplasia → MG Dysplasia
Squamous cell carcinoma
Adenocarcinoma
Small cell carcinoma
Carcinoid tumor
CPC
74  Squamous cell carcinoma
75  Adenocarcinoma
28  Small cell carcinoma
73  Carcinoid tumor

CPC
74 Squamous cell carcinoma
75 Adenocarcinoma
28 Small cell carcinoma
73 Carcinoid tumor
CPC
M-2 Respiratory Laboratory - 3

74 Squamous cell carcinoma
75 Adenocarcinoma
28 Small cell carcinoma
73 Carcinoid tumor

CPC
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