Respiratory System Disorders 4

Lecture 26
Pathology and Clinical Science 1 (BIOC211)
Department of Bioscience

Text Reference:
Porth’s Pathophysiology: Concepts of Altered Health States
Ninth Edition.
Copyright © 2014 Lippincott, Williams & Wilkins Publishers, Inc.
SESSION LEARNING OUTCOMES

- This session explains the aetiology, pathophysiology, clinical features, investigations and management of diseases of the respiratory system.

- It aims to understand the following respiratory infections:
  - Lung cancers
  - Interstitial pulmonary disease
  - Sarcoidosis
  - Lung diseases caused by organic and inorganic dusts
  - Alveolitis
  - Vascular diseases
TUMOURS OF THE BRONCHUS AND LUNG

Introduction

• Lung cancer is the most common cancer worldwide (1.2 million new cases in 2000 & 18% of cancer death)
• Tobacco use is the major preventable cause
• Majority of tumours in the lung are primary bronchial carcinoma
• The lung is also a common site of secondary metastatic carcinoma
PRIMARY TUMOURS OF THE LUNG

Aetiology

- Cigarette smoking most common and though to be responsible for 90% of lung carcinomas.
- Risk proportional to amount smoked and tar content.
- Passive smoking though to be a factor in 5% of lung cancers though difficult to quantify.
- Other risk factors – exposure to naturally occurring radon, atmospheric pollution and occupation dealing with some industrial products e.g. asbestos, cadmium.
# BRONCHIAL CARCINOMA

## Pathophysiology

- Arise from either bronchial epithelium or mucous gland
- Common cell types are squamous 35%, adenocarcinoma 30%, small cell and large cell
- Onset of symptoms is dependent on cell types & position within the bronchus
- Can directly involve the pleura or by lymphatic spread
- Blood-borne metastasis occur mainly to liver, bone, brain, adrenals and skin
SMALL CELL CARCINOMA

### BRONCHIAL CARCINOMA

**Clinical features**

- Cough (dry or with sputum)
- Haemoptysis
- Bronchial obstruction  
  - complete or partial  
  - with or without infection
- Breathlessness
- Pleural pain
- Symptoms due to blood-borne metastasis
- Non-metastatic extrapulmonary manifestations
# BRONCHIAL CARCINOMA

## Investigations
- Chest X ray
- CT
- Bronchoscopy and biopsy

## Management
- Surgical resection
- Radiotherapy
- Chemotherapy
- Palliative

## Prognosis
- Very poor (5 year survival less than 6%)
BRONCHIAL CARCINOMA

radiology.med.sc.edu/BronchialCA.htm
BRONCHOGENIC CARCINOMA

SECONDARY TUMOURS
OF THE LUNG

- Blood-borne metastatic pulmonary deposits from breast, kidney, uterus, ovary, testes and thyroid
- Deposits are usually multiple and bilateral
- There are respiratory symptoms e.g. breathlessness
- Diagnosis is made by radiological examination
INTERSTITIAL & INFILTRATIVE PULMONARY DISEASES

Diffuse parenchymal lung disease (DPLDs)

- Heterogeneous group of conditions associated with diffused thickening of the alveolar walls with inflammatory cells and exudates
- Include
  - Acute respiratory distress syndrome
  - Granulomas (e.g. sarcoidosis)
  - Alveolar haemorrhage and fibrosis
- Lung disease alone or part of systemic connective tissue disorder
# SARCOIDOSIS

- Multisystem granulomatous disorder
- More commonly seen in colder parts of Northern Europe

## Aetiology – uncertain

### Pathology

- Granulomas mostly in mediastinal and superficial lymph nodes, lungs, liver, spleen, skin, eyes, parotid glands and phalangeal bones

## Clinical features

- Asymptomatic
- Lofgren’s syndrome in young women
- Respiratory symptoms
- Skin lesions
- Lymphadenopathy
Sarcoidosis

A multisystem disease

# SARCOIDOSIS

## Investigation
- Blood tests, liver function tests
- Chest X ray
- Bronchoscopy and biopsy

## Management
- Majority – spontaneous remission
- NSAIDs and corticosteroids

## Prognosis
- Overall mortality low 1-5%
Sarcoidosis

http://nikon2.magnet.fsu.edu/galleries/pathology/images/sarcoidosis/sarcoidosis20x02large.jpg
**LUNG DISEASES DUE TO ORGANIC DUSTS**

- Disease results from a local immune response to animal proteins or fungal antigens in mouldy vegetable matter.

- Some examples
  - Farmer’s lung (mouldy hay, straw, grain)
  - Bird fancier’s lung (avian excreta, feathers)
  - Malt worker’s lung
  - Cheese worker’s lung (mouldy cheese)

- Most commonly presented as hypersensitivity pneumonitis.
HYPERSENSITIVITY PNEUMONITIS (EXTRINSIC ALLERGIC ALVEOLITIS)

**Pathogenesis**

- Inhalation of certain types of organic dusts → diffuse immune complex reactions (Type III & type IV) in the walls of alveoli and bronchioles
- Chronic forms may lead to fibrosis

**Clinical features**

- History of exposure
- Flu-like symptoms – headache, myalgia, malaise, fever, dry cough, breathlessness
HYPERSENSITIVITY PNEUMONITIS (EXTRINSIC ALLERGIC ALVEOLITIS)

<table>
<thead>
<tr>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chest X ray</td>
</tr>
<tr>
<td>• HRCT</td>
</tr>
<tr>
<td>• Pulmonary function tests</td>
</tr>
<tr>
<td>• Blood test – presence of antibodies to offending antigen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Removal of antigen or dust masks with appropriate filters</td>
</tr>
<tr>
<td>• Steroids</td>
</tr>
<tr>
<td>• Oxygen therapy in severely hypoxic patients</td>
</tr>
</tbody>
</table>
ALVEOLITIS

Alveolitis as seen in acute bacterial pneumonia

http://www.humpath.com/IMG/jpg/acute_alveolitis_acute_pneumonia_a.jpg
LUNG DISEASES DUE TO INORGANIC DUSTS

- Specific pathological changes in the lungs due to exposure to dusts, fumes or noxious substances
- Generally prolonged exposure to inorganic dusts leads to diffuse pulmonary fibrosis (pneumoconiosis)
- Damage is from the inflammatory and fibrotic response to the dust
- Generally a long period of exposure is required
- Exposure can lead to other lung diseases
- Need a detailed occupational case history
- Diagnose by history, radiological and pulmonary function abnormalities
- No specific treatment is available for this group of diseases
# LUNG DISEASES DUE TO INORGANIC DUSTS

<table>
<thead>
<tr>
<th><strong>Coal Workers Pneumoconiosis</strong></th>
<th>Inhalation of coal dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Simple - does not progress after exposure is stopped</td>
<td></td>
</tr>
<tr>
<td>o Progressive - massive Fibrosis</td>
<td>• Disease is disabling, can shorten life expectancy and can progress even after exposure is stopped</td>
</tr>
<tr>
<td></td>
<td>• Associated with chronic bronchitis, cough and sputum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Silicosis</strong></th>
<th>Inhalation of silica dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Clinical features similar to coal workers pneumoconiosis</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Asbestosis</strong></th>
<th>Inhalation &amp; exposure to asbestos dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Cause laryngeal carcinoma plus pleural and lung pathologies</td>
<td></td>
</tr>
<tr>
<td>o Decreases lung volumes and restricts ventilation of the lungs</td>
<td></td>
</tr>
<tr>
<td>o Usually progresses very slowly</td>
<td></td>
</tr>
</tbody>
</table>
SILICOSIS
ASBESTOS BODIES

http://upload.wikimedia.org/wikipedia/commons/7/71/Lung_asbestos_bodies.jpg

http://2.bp.blogspot.com/-_3zIlyiJjCU/TIpbfbPvLRI/AAAAAAAAMc/KqLCZic6r1s/s1600/asbes.jpg

Stevens & Lowe page 210
INORGANIC DISEASE COMPARISON

## PULMONARY VASCULAR DISEASE

<table>
<thead>
<tr>
<th>Venous thromboembolism (VTE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Majority (75%) of pulmonary emboli arise from lower limb DVT</td>
</tr>
<tr>
<td>• Risk factors – surgery, pregnancy, cardiopulmonary disease, lower limb problem, malignant disease</td>
</tr>
<tr>
<td>• Pathophysiology</td>
</tr>
<tr>
<td>– Based on size of the embolus</td>
</tr>
<tr>
<td>– Acute massive, acute small or medium, chronic multiple micro emboli</td>
</tr>
<tr>
<td>– Causes blockage or blood vessels in the lungs preventing the effective exchange of gases</td>
</tr>
<tr>
<td>– Leads to hypoxia and hypercapnia</td>
</tr>
</tbody>
</table>
VENOUS THROMBOEMBOLISM (VTE)

Clinical features

• Depend on size of embolism and underlying disease
• Range from small emboli with few or no haemodynamic consequences to cardiovascular collapse
• Usually chest pain, dyspnoea, haemoptysis, fainting
## VENOUS THROMBOEMBOLISM

### Investigations

- Chest X-ray
- ECG
- Arterial blood gas analysis
- Ventilation perfusion scanning
- Echocardiography
- Pulmonary angiography

### Management

- General measure – pain relief, oxygen, resuscitation
- Anticoagulants
- Thrombolytic therapy
PULMONARY EMBOLISM

DISEASES OF THE PLEURA

Pleurisy

- Term for any disease that involves the pleura and leads to pleural pain or friction
  - Common in pulmonary infarction, TB or Tumour
  - Clinical features are dependent on the nature of the disease causing the pain
EMPYEMA

- The presence of pus in the pleural space (Thin like serous fluid or Incredibly thick)
- Generally unilateral – involving the whole or part of a lung
- Always secondary - generally to infection of the lung
- Bacterial pneumonia and TB

Pathophysiology

- The pleura becomes covered with a thick shaggy inflammatory exudate
- The pus is generally under pressure and can erupt into a bronchus if not treated
EMPYEMA

**Clinical Features**
- Persistent recurrent pyrexia in a patient already diagnosed with lung infection particularly if antibiotic treatment is being given

**Treatment and Management**
- Dependent of the underlying cause
EMPYEMA

## SPONTANEOUS PNEUMOTHORAX

Presence of air in the pleural space

### Causes

- Rupture of a sub pleural emphysematous bulla or pleural bleb
- Rupture of a sub pleural tuberculoses focu

### Pathophysiology

- **Closed** - No communication between the pleura and lungs with deflation
- **Open** - Communication between the lungs and the pleural space generally through a bronchus
- **Tension / Valvular**
  - Communication present but small and only allows movement of air in one direction
SPONTANEOUS PNEUMOTHORAX

Clinical Features

- Onset generally rapid, may present with infection
- Pain or tightness on the affected side of the chest aggravated by deep breathing and dependent on the size of the pneumothorax and the type
- Breathlessness and cyanosis
- Hyper-resonance on percussion and increased vocal resonance

Treatment and Management

- Bed rest
- Infection must be countered in open pneumothorax
- Valvular pneumothorax can be extreme resulting in death within minutes though generally time for medical intervention
PNEUMOTHORAX

CONGENITAL DISORDERS OF THE DIAPHRAGM

Diaphragmatic Hernias
- Defects of the diaphragm allowing herniation of the abdominal viscera. More commonly found towards the posterior aspect.

Eventration of the diaphragm
- Abnormal elevation or bulging of one hemidiaphragm
- Usually asymptomatic
ACQUIRED DISORDERS OF THE DIAPHRAGM

Diaphragmatic Paralysis

- Generally through phrenic nerve damage to one hemi-diaphragm

Clinical Features

- Loss of ventilatory capacity (20%)
- Generally asymptomatic in a healthy individual

Causes

- Bronchial carcinoma
- Injury or disease of the cervical vertebrae including birth injuries, surgery and aneurysms
## DEFORMITIES OF THE CHEST WALL

**Thoracic Kyphoscoliosis**  
Abnormalities of alignment of the dorsal spine

### Causes

- Congenital abnormality
- Vertebral Disease - TB, osteoporosis, ankylosing spondylitis
- Trauma
- Neuromuscular disease - Poliomyelitis
DEFORMITIES OF THE CHEST WALL

Clinical Manifestations (if severe)

- Restriction and distortion of the chest wall
- Misdistribution of the ventilation and blood flow to the lungs
- Can develop
  - Type II respiratory failure - Pulmonary hypertension
  - Right ventricular Failure - Survival beyond middle age uncommon
Readings and Resources

Resources:

- **Set Textbooks:**

- **Additional textbooks:**
COMMONWEALTH OF AUSTRALIA
Copyright Regulations 1969
WARNING
This material has been reproduced and communicated to you by or on behalf of the Endeavour College of Natural Health pursuant to Part VB of the Copyright Act 1968 (the Act).
The material in this communication may be subject to copyright under the Act.
Any further reproduction or communication of this material by you may be the subject of copyright protection under the Act.
Do not remove this notice.