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.
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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
BRONCHOCOGENIC 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)

### Investigations

- Chest X ray
- HRCT
- Pulmonary function tests
- Blood test – presence of antibodies to offending antigen

### Management

- Removal of antigen or dust masks with appropriate filters
- Steroids
- Oxygen therapy in severely hypoxic patients
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>Condition</th>
<th>Description</th>
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</table>
| Coal Workers Pneumoconiosis       | Inhalation of coal dust<br>Simple - does not progress after exposure is stopped<br>Progressive - massive Fibrosis<br>  
  - Disease is disabling, can shorten life expectancy and can progress even after exposure is stopped<br>  
  - Associated with chronic bronchitis, cough and sputum |
| Silicosis                         | Inhalation of silica dust<br>Clinical features similar to coal workers pneumoconiosis          |
| Asbestosis                        | Inhalation & exposure to asbestos dust<br>Causes laryngeal carcinoma plus pleural and lung pathologies<br>  
  - Decreases lung volumes and restricts ventilation of the lungs<br>  
  - Usually progresses very slowly |
COAL MINERS PNEUMOCONIOSIS

http://img.wikinut.com/img/3kh89at852q2nsi_/jpeg/180x300/Coal-Miners.jpeg

http://img.medscapestatic.com/pi/meds/ckb/09/38609tn.jpg
SILICOSIS
ASBESTOS BODIES

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

http://2.bp.blogspot.com/-_3zIlyiJjCU/TtpbfbPvLRI/AAAAAAAAMc/KqLCZh6r1s/s1600/asbes.jpg

Stevens & Lowe page 210
INORGANIC DISEASE COMPARISON


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PULMONARY VASCULAR DISEASE

Venous thromboembolism (VTE)

• Majority (75%) of pulmonary emboli arise from lower limb DVT
• Risk factors – surgery, pregnancy, cardiopulmonary disease, lower limb problem, malignant disease
• Pathophysiology
  – Based on size of the embolus
  – Acute massive, acute small or medium, chronic multiple micro emboli
  – Causes blockage or blood vessels in the lungs preventing the effective exchange of gases
  – Leads to hypoxia and hypercapnia
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 angiograph

### 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
EMPHYEMA

## 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

<table>
<thead>
<tr>
<th>Causes</th>
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<tbody>
<tr>
<td>• Congenital abnormality</td>
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<tr>
<td>• Vertebral Disease - TB, osteoporosis, ankylosing spondylitis</td>
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<tr>
<td>• Trauma</td>
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<tr>
<td>• Neuromuscular disease - Poliomyelitis</td>
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KYPHOSIS

https://uprightdoctor.files.wordpress.com/2011/07/kyphosis-adult-hyper.jpg
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:

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