LUNG DISEASES DUE TO ORGANIC & INORGANIC DUSTS

Dr. Kassim M. Sultan
F.R.C.P
Definition of hypersensitivity pneumonitis (extrinsic allergic alveolitis):

- Inflammatory disorder of the lung, involving alveolar walls and terminal airways, that is induced, in a susceptible host, by repeated inhalation of a variety of organic agents.
- "farmer's lung" is the term most commonly used for HP.
- Thermophilic actinomycetes species include Micropolyspora faeni, Thermoactinomyces vulgaris.
Selected Examples of Hypersensitivity Pneumonitis (HP):

- farmer's lung caused by Micropolyspora faeni.
- Bird fancier's, breeder's caused by exposure to avian protein in Avian droppings or feathers.
- Byssinosis in textiles & cotton industry.
- Humidifier or air-conditioner lung (ventilation pneumonitis) caused by *Candida albicans*, Thermophilic actinomycetes, mycobacterium spp.
- Cheese washer's lung caused by *Penicillium casei* from handling Moldy cheese
Pathogenesis:

- Not fully understood, and may involve T-cell mediated immunity and granuloma formation (type IV hypersensitivity) and/or antibody-antigen immune complex formation (type III hypersensitivity).
- It is not an atopic disease, and is not characterized by a rise in tissue eosinophils or IgE (type I hypersensitivity).
- Non-caseating granulomata are often present, and typically are ill-defined and single associated with lympho-plasmacytic interstitial infiltrate & bronchiolitis.
- Chronic HP is characterized by fibrosis
Clinical features-Acute HP:

- Breathlessness, dry cough, and systemic symptoms (fever, chills, arthralgia, myalgia, headache) occur 4-8 hours after exposure to antigen.
- Examination: end inspiratory crackles on both lung fields on auscultation.
- In the absence of ongoing exposure, symptoms settle spontaneously within 1-3 days, can be recurrent.
Clinical features-chronic HP:

- Progressive exertional breathlessness, dry cough, sometimes systemic symptoms (weight loss) over course of months-years. May be history of acute episodes
- Examination: crackles on auscultation, clubbing rare, may be features of cor pulmonale.
Investigations:

- **Acute HP**
  - CXR: bilateral Diffuse small (1-3 mm) centrilobular nodules or infiltrates, sometimes ground-glass change, mainly in mid-upper lobe with apical sparing.
  - HRCT: Patchy ground-glass change and poorly defined centrilobular nodules.

- **Chronic HP**
  - CXR: Typically upper- and mid-zone reticulation
A: Chest radiograph of a patient with pigeon breeder’s disease with fever, dyspnea, and bibasilar rales. The patient had kept pigeons for 5 years and presented with fever, dyspnea, and myalgias approximately 8 h after cleaning the pigeon coop. He had serum antibody to pigeon dropping extract. Note bilateral lower lobe 2- to 3-mm nodules.

B: Chest radiograph of the same patient 2 weeks later without specific treatment. Note clearing of the lower lobe nodules and the staples in the left chest from the open lung biopsy.
High-resolution computed tomography scan of a nonsmoking patient with exposure to both birds, who presented with progressive dyspnea and weight loss and had hypoxemia and a restrictive ventilatory defect. Note the diffuse nodular radiodensities in the lower lobes, with areas of groundglass densities posteriorly.
Investigations:

- PFTs Typically restrictive pattern with reduced DLco.
- Blood gasses: decrease paO2 with type I respiratory failure.
- Serum antibody (IgG) precipitin results are presented either as an ELISA or Precipitins to organic antigens are found in 90% of patients, but are also present in up to 10% of asymptomatic farmers and 50% of pigeon breeders.
- BAL: lymphocytosis (>40% of cells) is a typical finding, but not in itself diagnostic.
Predictive factors in identification of HP:

- Exposure to a known offending antigen
- Positive precipitating antibodies to offending antigen
- Recurrent episodes of symptoms
- Inspiratory crackles on examination
- Symptoms occurring 4-8 hours after exposure
- Weight loss
Treatment:

- Symptoms typically resolve following cessation of antigen exposure.
- Liberal O2
- Prednisolone 40-60 mg daily for up to a month, and then slowly reduce dose over several months.
- Treatment of complications like respiratory failure
LUNG DISEASES DUE TO INORGANIC DUSTS
Types of mineral dust exposure:

1-Non-fibrous mineral dusts: Silicosis, Coal workers' pneumoconiosis & Mixed mineral dusts containing quartz: slate, kaolin, talc, non-fibrous clays

2-Fibrous mineral dusts: Asbestos, Other mineral fibres

3-Metal dusts and fumes: Iron, aluminium, beryllium, cobalt.
SOME LUNG DISEASES CAUSED BY INORGANIC GASES AND FUMES:

- **Irritant gases** (chlorine, ammonia, phosgene, nitrogen dioxide) may cause Acute lung injury (ARDS)
- **Cadmium**
- Welding and electroplating cause COPD
- **Isocyanates** (e.g. epoxy resins, paints)
- Plastic, paints; manufacture of epoxy resins and adhesives cause Bronchial asthma & Eosinophilic pneumonia
Pneumoconiosis:

- Occupational lung disease result from prolonged exposure to inorganic dust.
  1-coal workers pneumoconiosis
  2-silicosis
  3-asbestosis
  4-berylliosis
Coal Workers Pneumoconiosis:

- Deposition of coal dust within the lung and its associated inflammatory reaction.
- There are two types:
  1. Simple pneumoconiosis, there is nodular shadowing, with nodules of varying size, up to 10 mm, particularly in the upper and middle zones. It is reversible if the patient leaves his job, but if not, it can progress to
  2. Complicated pneumoconiosis, also known as progressive massive fibrosis (PMF). One or more opacities of > 1 cm diameter are present in the upper lobes, on the background of simple pneumoconiosis.
Clinical features:

- Simple pneumoconiosis is usually asymptomatic with no associated clinical signs. This is a relatively benign disease.
- PMF is usually associated with cough, productive of mucoid or blackened sputum (melanoptysis), and breathlessness, particularly on exertion, and may in time lead to the development of cor pulmonale.
- no clubbing
Caplans syndrome:

- In 15% of miners with seropositive RA or positive serum rheumatoid factor can develop large well-defined nodules.
- These occur on a background of simple pneumoconiosis and in those with a relatively low coal dust exposure.
Silicosis:

- Chronic nodular densely fibrosing pneumoconiosis, caused by the prolonged inhalation of silica dioxide particles.
- Mining, quarrying, stone dressing, metal grinding, pottery, boiler scaling, Foundry work.
4 types of Silicosis recognized:
1-acute silicosis caused by intense exposure to fine dusts
2-Subacute silicosis Nodules coalesce and calcify and can progress to progressive massive fibrosis (PMF). Associated calcified hilar lymphadenopathy (egg shell calcification).
3-Chronic silicosis occurs with lower dust concentrations
4-Silicotuberculosis Increased likelihood of active TB infection
Asbestosis:

- Chronic interstitial fibrosis resulting from asbestos inhalation.
- Demolition, ship breaking, manufacture of fireproof insulating materials and brake-pads, pipe and boiler lagging.
- CXR: Bilateral symmetrical reticulonodular pattern, primarily affecting the lower lobes, may progress to honeycomb lung.
Thanks for your listening