Respiratory Tract Diseases

Respiratory tract diseases represent a major source of morbidity and mortality, with conditions such as tuberculosis, pandemic influenza and pneumonia are the most important in world health terms. Many chronic diseases of respiratory tract have further burden of overall chronic diseases in the community. Furthermore, the progressive increase in the number of cigarette smokers increases the prevalence of respiratory tract diseases.

In this lecture, the relatively more common respiratory diseases will be discussed.

 Asthma (an obstructive pulmonary disease)

Asthma is “a chronic inflammatory disorder of the airways, in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper-responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night and in the early morning. These episodes are usually associated with widespread but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment.”

Asthma affects millions of hundreds of people of all age groups with highest incidence in children.

Pathophysiology

Narrowing of lower airways due to excessive response to a trigger factor that have little or no effect in normal individuals. This phenomenon is known as atopy (the propensity to produce IgE).

Types

I. Extrinsic (allergic) childhood type precipitated by allergens (dust, pets, insects, NSAIDs, ﬁsh, milk) leading to IgE overproduction and mast cells stimulation. Mostly improve by adulthood. There may be associated eczema, seasonal rhinitis, and drug allergies.

II. Intrinsic adulthood type precipitated by stress, gastroesophageal reﬂux, or vagal stimulation leading to mast cell stimulation.

Triggering factors

Infections allergens exercise weather changes

emotional stress food drugs (aspirin, NSAIDs, BBs)

Clinical features

1. Typical symptoms include recurrent episodes of wheezing, chest tightness, breathlessness and cough.
2. Patients with mild intermittent asthma are usually asymptomatic between exacerbations.
3. Individuals with persistent asthma report ongoing breathlessness and wheeze, but these are variable, with symptoms fluctuating over the course of one day, or from day to day or month to month.
4. Asthma characteristically displays a diurnal pattern, with symptoms and lung function being worse in the early morning. Particularly when poorly controlled, symptoms such as cough and wheeze disturb sleep and have led to the term ‘nocturnal asthma’.
5. Acute severe asthma:

 medical emergency of prolonged refractory severe asthmatic attack that is characterized by inability of the patient to complete a full sentence, tachycardia, silent chest, exhaustion, and impending respiratory arrest.

Investigation

The diagnosis of asthma is predominantly clinical and based on characteristic history.

* CXR shows flat diaphragm,
* spirometry (serial PEFR) shows reduced peak flow and FEV1 that is improving with bronchodilators and between episodes.
* PFT (pulmonary function test) shows reduced FEV1/FVC that is improving with bronchodilators,
* skin tests for allergens,
* Blood gas analysis (BGA) and oxymetry show reduced oxygen saturation < 95%.

Management

The stepwise approach to the management of asthma

Step 1: Occasional use of inhaled short-acting β2-adrenoreceptor agonist bronchodilators

Used in mild intermittent asthma (*symptoms less than once a week for 3 months and fewer than two nocturnal episodes per month*). Inhaled short-acting β2-agonist, such as salbutamol or terbutaline, to be used as required.

Step 2: Introduction of regular preventer therapy

Inhaled corticosteroid such as beclomethasone and budesonide to be used daily with inhaled β2-agonists taken on an as-required basis for any patient who:

• has experienced an acute exacerbation of asthma in the last 2 years.

• uses inhaled β2-agonists three times a week or more.

• is awakened by asthma one night per week.

Step 3: Add-on therapy

If the patient still poorly controlled:

1. Addition of long-acting β2-agonists (LABAs), such as salmeterol and formoterol (duration of action of at least 12 hours), represent the first choice of add-on therapy.
2. Increasing the dose of inhaled steroid.
3. Use of leukotriene inhibitor (Montelukast).

Dental aspect:

* Anxiety and dental treatment can trigger asthmatic attack, so the clinic should be equipped with emergency kit, injectable adrenaline, aminophylline, hydrocortisone, oxygen, and easily reached bronchodilator.
* The patient needs to bring his medication (e. g. inhalers) with him to the clinic and it may be advisable to let the patient have two puffs of his inhaler a prophylactic measure.
* Consult the physician about: severity and control of asthma, preoperative cromolyn sodium, and corticosteroid during major dental procedures.
* Defer dental care until the asthma is controlled (no wheeze and coughing) and there is no signs of respiratory tract infections (RTI).
* If the patient uses systemic steroid, avoid adrenal crisis by: medical consultation, cardiac, vital signs monitoring continuously, advice the patient to take his daily dose in early morning.
* Avoid LA with vasoconstrictor to avoid irritation of sulﬁtes preservatives and precipitation of arrhythmias if theophylline &/or B2 agonists are already taken.
* Avoid prolonged supine positioning.

Drugs:

* Allergy to penicillin may be more frequent.
* Avoid aspirin, NSAlDs, sedatives (diazepam), narcotics, non-selective BBs.
* Acetaminophen is safe analgesic.
* Corticosteroids cause steroid complications, adrenal crisis, oral or pharyngeal thrush, DM, and high risk of infections.
* Leukotriene antagonists may cause bleeding tendency.

Acute severe asthma

An acute severe asthmatic episode that is resistant to appropriate outpatient therapy, is a medical emergency that requires aggressive hospital management.

Signs of Acute severe asthma:

1. PEF 33–50% predicted
2. Respiratory rate ≥ 25 breaths/min
3. Heart rate ≥ 110 beats/min
4. Inability to complete sentences in 1 breath

Life-threatening features

1. PEF < 33% predicted
2. SpO2 < 92% or PaO2
3. Normal or raised PaCO2
4. Silent chest
5. Cyanosis
6. Bradycardia or arrhythmias
7. Hypotension
8. Confusion & coma

Treatment

1. High dose of bronchodilators.
2. High dose intravenous steroid.
3. Oxygen
4. Assisted ventilation.

 Chronic obstructive pulmonary disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease characterized by persistent airflow limitation that is usually progressive, and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases.

Two major forms of COPD are present:

1. Chronic bronchitis: cough and sputum on most days for at least 3 months, in each of 2 consecutive years)
2. Emphysema: abnormal permanent enlargement of the airspaces distal to the terminal bronchioles, accompanied by destruction of their walls and without obvious fibrosis.

Extra-pulmonary effects include weight loss and skeletal muscle dysfunction. Commonly associated comorbid conditions include cardiovascular disease, cerebrovascular disease, the metabolic syndrome, osteoporosis, depression and lung cancer.

Risk factors

* Tobacco smoke accounts for 95% of cases in UK.
* Occupational exposures, such as coal dust, silica and cadmium.
* Recurrent chest infection.
* Cannabis smoking.
* Genetic factors: α1-antiproteinase deficiency.

Clinical features

* Productive cough
* Breathlessness
* Cyanosis
* Finger clubbing
* Signs of heart failure

Investigations

* Chest X ray: no specific changes, but useful for the diagnosis of heart failure and to exclude other diagnoses.
* CT scan of the chest.
* Pulmonary function test (PFT)

Treatment

* Stop smoking
* Oxygen therapy
* Vaccination against influenza and S. pneumoniae.
* Drugs: bronchodilators (ipratropium bromide & salbutamol), corticosteroids (inhaled or systemic) and antibiotics (e.g. amoxicillin).
* Physiotherapy.

Respiratory tract infections (RTI)

Infections of the upper and lower respiratory tract are a major cause of morbidity and mortality, particularly in patients at the extremes of age, and those with preexisting lung disease or immune suppression.

RTI can be acute or chronic of upper tract (vocal cords and above) or lower tract. URTIs include common cold, sinusitis, pharyngitis, tonsillitis, laryngotracheitis (stridor ‘croup’ in children) and acute epiglottitis.

1. Common cold

URTI, usually by rhinovirus or coronavirus, para-influenza and influenza viruses.

Clinical features: sneezing, nasal obstruction, mucus overproduction, nasopharyngeal soreness, mild systemic upset.

Complications: bacterial superinfection causing sinusitis, and otitis media.

Treatment: symptomatic

Dental aspect:

Defer any elective dental care

Avoid GA to avoid spread of infection and in emergency surgery under GA, use cuffed endotracheal tube with antibiotic prophylaxis.

1. Sinusitis

Sinusitis typically causes a combination of nasal congestion, blockage or discharge, and may be accompanied by facial pain/pressure or loss of smell.

Examination usually confirms erythematous swollen nasal mucosa and pus may be evident. Nasal polyps should be sought and dental infection excluded.

Treatment with topical corticosteroids, nasal decongestants and regular nasal douching are usually sufficient and, although bacterial infection is often present, antibiotics are only indicated if symptoms persist for more than 5 days.

Persistent symptoms or recurrent episodes should prompt a referral to an ear, nose and throat specialist.

Clinical features

Pain in the cheek &/or upper teeth which is worsened by lowering the head, mucopurulent nasal discharge and tender maxillary antrum.

Investigation

Occipitomental x-ray shows increased radiopacity of sinus antrum.

Treatment: analgesic, antibiotics (erythromycin, or doxycycline) for 2 weeks, decongestants (xylometazoine spray).

Complications

Chronic sinusitis and nasal polyps with post-nasal discharge. Treatment: drainage of antrum.

1. Pharyngitis/tonsillitis

Mostly viral infections and sometimes bacterial (streptococcus).

Clinical features: sore throat, painful swallowing, fever, and conjunctivitis.

Tonsillitis: enlarged tonsils with infected exudate from the crypts with cervical lymphadenopathy.

Complications: peritonsillar abscess (quinsy), otitis media, scarlet fever, glomerulonephritis, or rheumatic fever.

Treatment: Penicillin and if allergic, erythromycin.

Pneumonia

Pneumonia is as an acute respiratory illness associated with recently developed radiological pulmonary shadowing, which may be segmental, lobar or multilobar.

The context in which pneumonia develops is highly indicative of the likely organism(s) involved; therefore, pneumonias are usually classified as community- or hospital-acquired, or as occurring in immunocompromised hosts.

‘Lobar pneumonia’ is a radiological and pathological term referring to homogeneous consolidation

of one or more lung lobes, often with associated pleural inflammation.

‘Bronchopneumonia’ refers to more patchy alveolar consolidation associated with bronchial and bronchiolar inflammation, often affecting both lower lobes.

Common causative bacteria



Clinical features

Pneumonia, particularly lobar pneumonia, usually presents as an acute illness.

* Cough
* Fever and chills
* Pleuritic chest pain
* Complete loss of appetite

Investigations

* Leukocytosis (WBC count > 20 x 109 /L)
* Mild increase in blood urea
* Mild elevation in liver enzymes.
* Blood culture: may be positive and indicates severe infection.
* Chest X ray: Patchy opacification evolves into homogeneous consolidation of affected lobe.

 Air bronchogram (air-filled bronchi appear lucent against consolidated lung tissue) may be present.

Management

* Oxygen
* Intravenous fluids
* Antibiotics:

- uncomplicated community acquired pneumonia: Amoxicillin 500 mg 3 times daily orally.

- severe community acquired pneumonia:

Clarithromycin 500 mg twice daily IV ***plus*** Co-amoxiclav 1.2 g 3 times daily IV

***or***

Clarithromycin 500 mg twice daily IV ***plus*** Ceftriaxone 1–2 g daily.

Dental aspect

Elective dental care should be deferred until upper respiratory infection is treated to avoid spread of infection to lower respiratory tract.

GA is absolutely contraindicated during pneumonia.

Legionnaire’s disease due to Legionella pneumoniae may be contracted during aerosolization of water at dental units that have been idle for long periods. Flushing the system before treating patients may minimize this possibility.

Tuberculosis

Tuberculosis (TB) is caused by infection with Mycobacterium tuberculosis (MTB) which is part of a complex of organisms including *M. bovis* (reservoir cattle) and *M.* africanum(reservoir human).

TB was estimated to account for nearly 1.5 million deaths, making it the second most common cause of death due to an infective disease. Furthermore, it is estimated that around one-third of the world’s population has latent TB. The majority of cases occur in the world’s poorest nations, who struggle to cover the costs associated with management and control programs.

*M. bovis* infection arises from drinking non-sterilized milk from infected cows. *M. tuberculosis* is spread by the inhalation of aerosolized droplet nuclei from other infected patients.

Risk factors

* Age (children > young adults < elderly)
* Close contacts of patients with smear-positive pulmonary TB.
* Overcrowding (prisons, collective dormitories); homelessness
* Chest X-ray evidence of self-healed TB
* Primary infection < 1 yr previously.
* Smoking: cigarettes
* Associated diseases:

-Immunosuppression: HIV, anti-tumour necrosis factor (TNF) therapy, high-dose corticosteroids, cytotoxic agents.

-Malignancy (especially lymphoma and leukaemia)

-Diabetes mellitus

-Chronic kidney disease

-Gastrointestinal disease associated with malnutrition (gastrectomy, jejuno-ileal bypass, cancer of the pancreas, malabsorption)

-Deficiency of vitamin D or A

-Recent measles in children

Clinical presentation of pulmonary TB

- Chronic cough, often with hemoptysis - Pyrexia of unknown origin

- Unresolved pneumonia - Exudative pleural effusion

- Asymptomatic (diagnosis on chest X-ray) - Weight loss

- Spontaneous pneumothorax

Investigations

* Mantoux tuberculin skin test (TST)
* Interferon-gamma release assays (IGRAs)
* Chest Radiograph: diffused infiltration or cavitation.
* AFB detection.
* Direct detection of M. tuberculosis in clinical specimen using nucleic acid amplification (NAA).
* Specimen culturing and identification.

Treatment

Drugs: 2 months of rifampicin, isoniazid, ethambutol or/and pyrazinamide followed by 4 months of rifampicin and isoniazid.

Follow up

Two weeks of successful treatment makes the patient non infective and the parameters of improvement include: clinical improvement and negative sputum exam of 3 consecutive specimens over different days.

Prevention

BCG vaccine for children, high-risk people and health care personnel.

Drug prophylaxis with isoniazid & rifampicin for risk group.

TB patient isolation.

High-efficiency particulate air (HEPA) filters in aircraft and isolation units in hospitals.

Dental aspect

- Take detailed history about high risk people, past TB infection and treatment.

- Dental staff with TB should be precluded from occupation until treated as they may contract TB to site of patient’s extraction socket or lymph node.

- Consult the physician, to verify the diagnosis, disease activity, and any associated problems from TB or its medications.

- Patient with active TB (clinical features, positive PPD, positive sputum) and need elective dental care should be deferred and referred to the physician.

- Use heat sterilization as mycobacteria resist disinfectants.

- GA is contraindicated because of contamination risk or impaired pulmonary function.

- Consider any associated alcoholism, drug abuser, hepatitis, or HIV may influence dental management.

- Oral manifestation of TB: chronic tongue ulcers from coughing of infected sputum.

- Rifampicin and rifabutin can cause red saliva.

- Tuberculous cervical lymphadenitis: painless enlarged matted cervical nodes, systemic symptoms, CXR findings, positive PPD test, and fine need aspiration biopsy (FNA biopsy) with culture & histopathology, and PCR.