



Review Article

MANAGEMENT OF INTRATHORACIC SEPSIS-A REVIEW ARTICLE

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Introduction:

Intrathoracic sepsis continues to provide one of the most challenging problems faced by the surgeons. Sepsis remains a frequent and deadly diagnosis in hospital across the world. It continues to exert a heavy toll in morbidity, mortality and resource consumption despite decades of intense research and technological advances ¹.

Common Infective Lung Pathology:

Chronic lung infections including lung abscess, bronchiectasis and empyema remain serious medical diseases despite the availability of antimicrobial agents. Recent publications contribute to our understanding of disease pathogenesis and management of disease entities ².

Pneumonia

It is not surprising that acute respiratory tract infections are so common, because the lungs are in constant communication with organisms in the atmosphere and the commensals of the nasopharynx. Most infections are treated effectively with appropriate antibiotics. Pneumonia (defined as infection of the pulmonary parenchyma) is now seldom seen as a primary disease, in contrast to the pre-antibiotic era. However, respiratory infections are a common cause of

secondary morbidity in patients with degenerative lung (e.g. emphysema, chronic obstructive pulmonary disease, cystic fibrosis), with malnutrition, general debilitation and cachexia, in immunocompromised states, sustaining major trauma. Pneumonia is a significant cause of postoperative morbidity ².

Treatment consists of antibiotic therapy based on culture of sputum samples, adequate clearance of pulmonary secretions by chest physiotherapy, bronchodilators and oxygen treatment. It is also important to correct specific risk factors by attention to nutrition, treatment of co-morbid conditions (e.g. diabetes, heart failure) and prevention of respiratory aspiration of gastric contents. Artificial ventilation may be necessary if respiratory failure occurs ².

Lung abscess

Some patients with pneumonia develop localized necrosis with abscess formation (i.e. a collection of frank pus within part of the lung). Patients are often malnourished and debilitated before developing the problem, and lung abscess is often associated with people who are 'living rough'. Aspiration or inhaled foreign body (e.g. a tooth) are likely additional causes and should be specifically looked for ³.

Diagnosis is based on a clinical history of an indolent chest infection, with localized pleuritic chest pain if the abscess abuts on the adjacent parietal pleura. Minor haemoptysis is common, and occasionally may be massive if the abscess erodes into a blood vessel. Persistent swinging pyrexia may occur but has usually been blunted by antibiotic therapy. The abscess may rupture into an airway and cause coughing of copious amounts of pus in the sputum and subsequent resolution of the infection. Rupture of the abscess

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into the pleural space causes sudden worsening of sepsis, because of the increased absorption of organisms into the circulation. Extension of the suppurative process into the pulmonary veins causes secondary embolic abscess (e.g. in the brain), which is a rare complication in debilitated patients with any chronic suppurative pulmonary disease^{2,3}.

Chest radiography and CT scanning localize the abscess, and diagnosis is straight forward if the typical air-fluid level is present. Bronchoscopy and lavage are always indicated to exclude an inhaled foreign body or associated tumor and may isolate the offending organism³.

The usual problem for management is differentiating a lung abscess from a primary neoplasm. In many patients, air and fluid are not present in the cavity. Percutaneous needle biopsy, often used for diagnosing lung cancer, has the added danger in this situation of establishing a connection between the abscess and the pleural space, with can result in an empyema. Other differential diagnoses include other cavitating lung conditions (e.g. tuberculosis, aspergillosis), infected bullae and lung cysts, and a loculated empyema extending into the lung³.

Treatment consists of antibiotics, adequate bronchial toileting and general supportive measures. Percutaneous drainage under radiological guidance is useful for peripherally located abscesses that are not responding to medical therapy. Very large abscesses (>6cm in diameter at diagnosis) will usually require drainage. Thoracotomy and resection of the area are indicated when percutaneous drainage is thought to be technically hazardous or when a primary lung cancer is excluded⁴.

Empyema

Infection of the pleural space is most commonly a secondary event in the development of pneumonia. It should be distinguished from a sterile pleural effusion, which is a more common event that should resolve spontaneously as the pneumonia responds to medical therapy. Organisms entering the pleural space, however, divide rapidly and lead to worsening sepsis. Chest pain (pleurisy) and breathlessness resulting from collapse of the underlying lung are typical symptoms. Investigation consists of chest radiography supplemented by CT scanning, aspiration and culture of pleural fluid, and bronchoscopy in any patient thought to be at risk of an associated lung cancer.

Lung cancer may cause bronchial obstruction leading to distal infection and suppuration^{3,5,6}.

The most important therapeutic intervention in patients with an empyema is early, adequate and complete pleural drainage. The sooner this is done during the course of the disease the more uneventful and complete will be the patient's recovery. All too often, multiple incomplete pleural aspirations and insertion of catheters into the pleural space of too narrow a bore leads to only partial drainage of the empyema with resulting loculations, with makes subsequent management much more difficult. In adults a drain of at least one 28F caliber should be inserted. In most patients, if this is done early enough, the lung will expand rapidly to fill the pleural space and allow the empyema to resolve with minimal pleural scarring^{3,5}.

Indication for surgery includes if the empyema fails to resolve effectively with simple drainage, thoracoscopy is invaluable in breaking down loculations and assessing the potential for expansion of the underlying lung. Pleural and lung biopsies help to confirm or exclude an associated mesothelioma or lung cancer, both of which may be difficult to separate radiologically from a complex empyema. Decortication is seldom necessary in the acute situation, but may be invaluable in a patient with persistent sepsis who has multiple loculations that have defied effective drainage. As in the management of all pleural sepsis, the aim of decortication is to allow the lung to expand to fill the hemithorax completely, which is the only way an empyema can resolve. This is achieved surgically by cutting away the thickened visceral and parietal pleurae from the lung and chest wall, which is always a major undertaking. Continuing parenchymal infection, which may be shown on the CT scan, will limit lung expansion into the pleural space and cause an empyema cavity to persist even after decortication. Assessing the status of the underlying lung is paramount in deciding on the likely success and optimal timing of decortications⁵.

Long-term drainage is necessary in patients who are unfit for a major operation. Resection of a segment of rib overlying the empyema cavity allows insertion of a large bore drain, which may be changed at intervals. As the underlying pleura become heavily scarred, pneumothorax and collapse of the lung do not occur. The drain is usually connected to a bag for collecting discharging pus, rather than to an underwater seal system, which allows the patient to be managed at

home via the out patient clinic. The empyema cavity gradually shrinks towards the site of drainage, assuming that effective drainage continues, resulting in full expansion of the lung and resolution, allowing the drain to be removed. This process may take many months to achieve. Other causes of empyema are oesophageal rupture or perforation, blunt or penetrating thoracic trauma, nasopharyngeal sepsis spreading into the chest, any thoracic surgical procedure which may be complicated by infection spreading to the pleural space and also to the mediastinum (mediastinitis).

Principles of treatment are to confirm the primary cause and establish adequate drainage of the infected areas⁶.

Other lung infections

Tuberculosis

Tuberculosis is increasing in prevalence in both developing and developed countries. Although antibiotic therapy remains the main stay of treatment, surgery is being considered with increasing frequency because of the development of multidrug resistant organisms. Areas of cavitations within the chronically infected lung may need to be resected to allow resolution of the disease^{1,2}.

Aspergillosis

Aspergillosis is a fungal infection with a predilection for cavities in the lung. As in tuberculosis, antibiotics may not penetrate the surrounding scar tissue and so established infection is often chronic and relapsing. Haemoptysis is a constant feature, and is often life threatening. Resection of the affected area is technically demanding but may be necessary. In patients unfit for resection, embolization may be possible if the feeding artery causing haemoptysis can be identified angiographically⁵.

Bronchiectasis

Bronchiectasis is the permanent dilatation of the bronchi and bronchioles, and is characterized by areas of scarring and chronic inflammation within the walls of major and minor bronchi. This interferes with the physiological mechanisms for clearing pulmonary secretions which leads to chronic infection within the lungs. The classic features are copious production of foul sputum (up to several) cupfuls per day in severe cases, haemoptysis (which may be severe), halitosis, poor general health, worsening respiratory function caused by gradual lung destruction⁵.

Although bronchiectasis is much less common than in the pre-antibiotic era, it is not uncommon in thoracic clinics. Patients will often have had a severe respiratory infection in childhood, especially whooping cough, though any chronic repeated pulmonary infections may lead to the condition. Chronic aspiration (e.g. in association with oesophageal achalasia) and certain genetic defects (e.g. cystic fibrosis) may also be responsible^{2,6}.

Diagnosis is based on clinical symptoms, supplemented by bronchoscopy to exclude other causes (e.g. foreign body, tumours) and high-resolution CT scanning. Bronchography, the investigation of choice in the past, has largely been superseded by CT scanning. Identifying an underlying cause of aspiration or a genetic defect is important in overall management^{2,3}.

Treatment consists of postural drainage of secretions aided by chest physiotherapy, and antibiotics for acute exacerbations. Long-term antibiotic therapy (often prescribed) is seldom useful, because it results in colonization of the patient with resistant organisms.

Surgical resection of the affected area should be considered in patients with severe haemoptysis, though this procedure is impossible for patients with limited respiratory reserve. Embolization, as described for aspergillosis, may be useful in such cases. Surgical therapy for bronchiectasis is reserved for those patients who can tolerate lung resection, and in whom the disease is confined to one segment or lobe of a lung. Inevitably some areas of less severe bronchiectasis are present at a site distant from the area to be resected, which may preclude complete relief of symptoms after surgery. Also the disease is often progressive, and so an initially pleasing result after surgery may be followed by a recurrence of symptoms as unresected areas of bronchiectasis become more troublesome. It is possible that some individuals may have a successful second resection. Careful patient selection and intensive preoperative preparation to optimize pulmonary status is the key to a successful result^{4,6}.

Conclusion:

Lung infections cause more disease than other threats to the public's health such as cancer, heart attacks, strokes, HIV/AIDS, tuberculosis. The persistent and pervasive burden of lung infections

receives little attention from the biomedical and public health communities. Lung infections are especially common and severe among the poor populations. Proper diagnosis and needful medical or surgical intervention can minimize the health related burden to the society.

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