Evaluating the treatment options for spontaneous pneumothorax

AUTHOR Paul Hilton, MSc, is clinical nurse practitioner, medical assessment unit, University Hospital Aintree, Liverpool.


Pneumothorax is the presence of air within the pleural space. The objective of any treatment of pneumothorax, if required, is to remove the air, allowing re-expansion of the lung, to facilitate pleural healing and prevent recurrence. Two clinical trials conducted in the 1960s led to opposing recommendations for the initial management of spontaneous pneumothorax, and a debate has continued since. This literature review examines the evidence for which treatment is more successful at reinflating the lung, reducing hospital stay, and preventing recurrence.

Pneumothorax is defined as the presence of air within the pleural space. As early as 1819, Laennec described the symptoms and signs of a patient with a pneumothorax. Although most pneumothoraces were then caused by tuberculosis, he also found pneumothoraces during autopsies of patients with apparently healthy lungs; he named these ‘pneumothorax simple’ (Schramel et al, 1997). Nowadays, pneumothoraces are divided into:

- Spontaneous pneumothorax – occurs without a preceding event;
- Traumatic pneumothorax – caused by direct or indirect trauma.

Iatrogenic pneumothoraces, which result from either diagnostic or therapeutic medical procedures, are also categorised as traumatic pneumothoraces.

Spontaneous pneumothoraces are divided into primary and secondary categories.

Secondary spontaneous pneumothoraces are associated with underlying pulmonary pathology, usually chronic obstructive pulmonary disease (COPD). No clinically apparent underlying pulmonary disease is present in patients with primary spontaneous pneumothorax. However, blebs and emphysematous bullae seem to play a role in the pathogenesis, as they are frequently found during thoracoscopy, thoracotomy, or sternotomy (Baumann, 2001).

Primary spontaneous pneumothoraces are believed to be caused by distal airway inflammation and obstruction, secondary to a variety of external factors such as smoking and internal factors such as bronchial abnormalities.

The distal airway obstruction may result in the development of emphysema-like changes, blebs and bullae, the rupture of which may lead to a visceral pleural air leak (Bense et al, 1992; 1987).

Incidence and presentation

Primary spontaneous pneumothorax is a commonly encountered clinical management problem with an estimated incidence of 18 cases per 100,000 of the population per year among men, and six cases per 100,000 of the population among women.

It typically occurs in tall, thin boys and men between the ages of 10 and 30 years, and rarely occurs in people over the age of 40. Smoking cigarettes increases the risk of primary spontaneous pneumothorax in men by as much as a factor of 20.

Approximately 50 per cent of patients who have an initial primary spontaneous pneumothorax will never have another (Light, 2002). Any recurrences are in the first six months after the initial event (Baumann, 2000).

Spontaneous pneumothorax is usually suggested by clinical history and examination. Radiological investigation of the chest is needed to establish the diagnosis (Schramel, 1997). Symptoms at presentation are typically chest pain and dyspnoea (Baumann, 2001). An asymptomatic primary spontaneous pneumothorax may be found during routine medical examination and during evaluation for any other types of diseases, with the only clue being an ectomorphic physique (tall and thin) (Baumann, 2000).

Treatment options

The objective of treatment, if required, is to remove air from the pleural space, thereby allowing re-expansion of the lung to facilitate pleural healing and prevent recurrence. Initial assessment and treatment usually takes place in A&E departments, medical admissions units, or general medical wards (Yeeh et al, 1999).

Several treatment options are available for primary spontaneous pneumothorax. These include:

- Observation;
- Bed rest;
- Supplemental oxygen;
- Simple aspiration;
- Intercostal drainage;
- Referral to a respiratory specialist;
- Chemical pleurodesis;
- Referral to a thoracic surgeon for thoracostomy, and surgical intervention.

In general, if patients are asymptomatic and the pneumothorax occupies less than 20 per cent of the hemithorax, no treatment is recommended. If it is larger than 20 per cent or if the patient is symptomatic, efforts to remove the air are indicated (Light, 2002). A key consideration for any treatment choice is whether it prevents future occurrences (Baumann, 2000).

REFERENCES


recommendations for the initial management of spontaneous pneumothorax, and a debate has continued since.

**British Thoracic Society guidelines**
The British Thoracic Society (BTS) issued guidelines on managing spontaneous pneumothorax (Miller and Harvey, 1993) based on a randomised controlled trial by Harvey and Prescott (1994) comparing simple aspiration and intercostal drainage. These guidelines stimulated much discussion (Courtney and McKane, 1998).

They recommended that the pleural air be removed by aspiration, and if the post-aspiration chest radiograph reveals that the pneumothorax is small or resolved, the patient should not be hospitalised. According to the guidelines aspiration is central to the management of spontaneous pneumothorax (Miller and Harvey, 1993). Before the introduction of the BTS guidelines, intercostal drainage was the standard treatment for moderate or large pneumothoraces. The insertion of a chest drain (intercostal drainage/chest tube) is commonly performed under local anaesthetic by inexperienced junior doctors. However, it is not a simple procedure and should ideally only be undertaken by experienced doctors (Miller and Harvey, 1993).

Many patients find indwelling tubes uncomfortable and sometimes very painful. They require admission to hospital and immobilisation due to the necessity to connect the tube to an underwater seal. Treatment may be accompanied by complications such as air leak, haemorrhage, or infection. There is confusion about suction, clamping, management of surgical emphysema, and when to seek specialist advice (Miller and Harvey, 1993).

The BTS guidelines suggested that simple needle aspiration should be preferred in the initial treatment of symptomatic pneumothorax (Gill and Shee, 1996). This was due to its simplicity, effectiveness, and acceptability to patients, minimal morbidity, outpatient-based implementation, equal efficacy compared with chest tube drainage, and low cost. However, it does not give any protection against the development of tension pneumothorax in case of a persistent airway leak (Roggla, 1996).

The guidelines were intended to be used on a national basis and designed for incorporation into casualty and ward handbooks. They were based on a randomised trial

UK respiratory physicians and thoracic surgeons. The trial randomised patients between aspiration and intercostal drainage. Since then, further prospective randomised trials have been published comparing aspiration with intercostal drainage (Soulsby, 1998).

**Data analysis**
Three randomised controlled trials (RCTs) were analysed (Box 1) using a quality assessment tool for systematic reviews. This tool assesses the quality of the trials, and has implications for data synthesis and formulating conclusions. This meta-analysis (the statistical analysis of the data from the studies) aims to compare and summarise the resulting data to provide an overall estimate of the effect of the treatment under consideration.

The trials were of varying quality and the effectiveness of the intervention has been expressed as an odds ratio:

- A pooled odds ratio for reinflation of the lung with needle aspiration was 74 per cent less likely than using chest drainage.
- A pooled odds ratio for the recurrence of a spontaneous pneumothorax after using needle aspiration to remove the air revealed that the chances were reduced by 23 per cent.
- A pooled odds ratio of the time spent in hospital after using needle aspiration to reinflate the lung is 38 per cent less time than if a chest drain was used.

**Conclusion**
In the treatment of primary spontaneous pneumothorax, nursing staff should encourage the clinicians’ initial intervention of choice to be needle aspiration. The rationale is that if successful, this will reduce the length of hospital stay and the chances of recurrence. As reported by Roggla (1996), and Harvey Prescott (1994), needle aspiration is simple to perform, relatively painless, and acceptable to patients. If it proves to be unsuccessful and chest drainage is required, the patient will not be unduly distressed by having to undergo two procedures.

On the basis of the current evidence, it is clear that further randomised controlled trials with greater numbers of subjects need to be conducted to provide statistically significant results before one treatment option can be confidently recommended over the other.

---

**REFERENCES**


