

LEADING ARTICLE

Management of haemothorax

Thoracic trauma, both penetrating and non-penetrating, continues as a common clinical problem and a haemothorax of at least some degree is an almost invariable accompaniment to most forms of thoracic trauma. The management of haemothorax is essentially straightforward, although experience in our unit suggests that effective treatment is often delayed, with predictable consequences.

Haemothorax most frequently results from damage to chest wall vessels, ie small muscular arteries in which vessel haemostasis will generally be achieved spontaneously and reasonably rapidly. Similarly, haemothorax as a result of pulmonary parenchymal laceration is infrequent and spontaneous resolution is again the rule in this group of patients. Much more rare is a haemothorax resulting from a great vessel (aorta or pulmonary artery) injury. These patients are likely to present *in extremis* with a massive haemothorax.

There are three major clinical effects of a haemothorax, two acute and the third more chronic. The acute early effects of a haemothorax are those of both hypovolaemia and altered lung mechanics; changes in pulmonary function are essentially caused by parenchymal compression. The more 'chronic' effects of a haemothorax result from significant amounts of retained clot and subsequent empyema formation. These most often result from inadequate early management of haemothorax.

Diagnosis of haemothorax is seldom difficult; clinical examination may reveal diminished air entry on the affected side with dullness to percussion. The trachea may be displaced away from the affected side. Tension pneumothorax may be confused with this, but the hyperresonant hemithorax in a pneumothorax should be confirmatory.

Plain chest films may reveal rib fractures, pneumothoraces or a widening of the superior mediastinum. Although useful when revealing a complete or partial 'white-out' on the affected side, the film may not reveal anything more subtle than a vague haziness on the injured side. Many, if not all, of these films are obtained as portables with the patient supine; under these circumstances at least 500–1000 ml of fluid can be located in the hemithorax with no marked radiological signs. Decubitus films, though theoretically worthwhile, are seldom useful in the clinical setting of chest trauma.

When a haemothorax is suspected, the essential management, along with appropriate resuscitation, is intercostal drainage. The only exception to prompt insertion of an intercostal drain is where there are clinical and radiological signs suggestive of an aortic dissection or transection. In this situation, intercostal drainage can lead to rapid exsanguination. Thus, in these

patients, drainage should be deferred until confirmation of the diagnosis is obtained.

Intercostal drainage in haemothorax achieves two objectives. First, to drain the pleural space allowing expansion of the lung and, second, to allow assessment of rates of continuing blood loss. It is the latter, along with the general clinical state of the patient, that dictates further management.

Chest drains to deal adequately with a haemothorax should be large (28–30G minimum) and placed at the base of the hemithorax. The ideal insertion point is the 6th intercostal space in the midaxillary line, utilising the standard ATLS technique for placement. Lower spaces should be avoided; contraction of the hemithorax is frequently present because of pain and/or pulmonary collapse and selection of too low a space may cause iatrogenic intra-abdominal injury. Intercostal drains inserted through the 2nd space in the midclavicular line are not useful in the management of haemothorax, since they cannot drain blood effectively.

Accurate insertion of an intercostal drain for haemothorax may be followed by a brisk flow of blood; a disconcerting 1–2 litres is not unusual, though the initial rapid flow generally declines promptly after this. The maintenance of stable haemodynamics in association with this loss is mandatory. The considerations relating to possible thoracotomy are discussed below.

After satisfactory resolution of haemothorax managed with intercostal drainage alone, the drain(s) should not be removed too promptly. They should remain *in situ* for 48–72 h after drainage has ceased. Other circumstances permitting, the patient should be mobilised fully at this stage with adequate thoracic physiotherapy. These measures should allow optimal drainage of the pleural cavity.

Thoracotomy in haemothorax

The place of thoracotomy in haemothorax is simple to define; most patients with a traumatic haemothorax will not require this procedure. A United States study (1) revealed a thoracotomy rate of under 10% for haemothorax. The United Kingdom Thoracic Surgery Register documented only 70 thoracotomies for haemothorax in 1993–1994 (2).

The indications for emergency or urgent thoracotomy in haemothorax are:

- 1 In excess of 2 litres blood loss on insertion of a correctly sited intercostal drain.

- 2 Continued blood loss in excess of 300 ml/h for 4 h.
- 3 Continued blood loss in excess of 150 ml/h for 4 h in patients over 60 years of age.
- 4 Significant haemodynamic instability (ie >20% fall in blood pressure or 20% rise in heart rate).

About 5–10% of patients with chest trauma will sustain a 'delayed' bleed into the intercostal drains at 4 to 7 days after injury (3,4). Typically, this group will have had minimal bleeding after insertion of an intercostal drain initially, but proceed to sudden and often brisk bleeding into the drains at the time interval indicated. They will usually have evident rib fractures and bleeding results from fracture displacement. Management, including considerations relating to thoracotomy, are exactly as already outlined.

Residual haemothorax and clotted haemothorax

Small residual pleural blood collections are often seen radiologically as 'blunted' costophrenic angles. These are seldom a clinical problem and resolve completely in 3–4 weeks (5).

Larger residual haemothoraces (often in excess of 50% of the hemithorax) will all ultimately clot. They are generally a sequel to suboptimal management of the initial haemothorax and they should therefore be largely avoidable. Problems in residual haemothorax include thickened fibrin layers on both visceral and parietal pleura and empyema formation (6).

The management of a clotted haemothorax should involve a thoracotomy before any of these adverse effects develop (7). This is frequently not the case in practice and it should be emphasised that intercostal drainage alone is of very limited value at this stage. There are a number of reasons for this; clot liquefaction takes several months, visceral and parietal thickening cannot be dealt with, pleural fluid will be loculated and complete pulmonary parenchymal expansion will not be achieved.

Attempted clot lysis with streptokinase or hyaluronidase is of no practical value; evidence for effective lysis is

minimal and the incidence of allergic reactions significant. Moreover, the patient is committed to very prolonged intercostal drainage.

In summary, we recommend the following:

- 1 Early discussion with a cardiothoracic surgical unit on overall management.
- 2 Placement of large basal intercostal drains retained *in situ* for several days after drainage has apparently ceased.
- 3 With the above caveats, the avoidance of thoracotomy in most instances of haemothorax.
- 4 Early referral to a cardiothoracic surgical unit if a clotted haemothorax (or a complication thereof) develops.

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References

- 1 Trunkey D. Torso trauma. *Curr Probl Surg* 1987; 24: 234–5.
- 2 Society of Cardiothoracic Surgeons of Great Britain and Ireland. *United Kingdom National Thoracic Surgery Register, 1993–1994*.
- 3 Symbas PN. *Cardiothoracic Trauma*. Philadelphia: WB Saunders Company, 1989.
- 4 Hood RM, Boyd AD, Culliford AT. *Thoracic Trauma*. Philadelphia: WB Saunders Company, 1989.
- 5 Kirsh M, Sloan H. *Haemothorax: Blunt Chest Trauma*. Boston: Little Brown, 1977.
- 6 Eddy AC, Lunn GK, Copass M. Empyema thoracis in patients undergoing emergency tube thoracostomy for thoracic trauma. *Am J Surg* 1989; 157: 494–7.
- 7 Coselli JS, Mattox KL, Beale AC. Re-evaluation of early evacuation of clotted haemothorax. *Am J Surg* 1984; 148: 786–90.