1. Introduction
Life-threatening thoracic traumatic injuries are common in patients suffering major blunt trauma. Such injuries can be difficult to diagnose and patients with occult injuries can deteriorate rapidly\(^1\). An essential step in the pre-hospital management of blunt trauma is to treat any ventilatory component to cellular hypoxia by early decompression of tension pneumothoraces and prevent cardiovascular collapse or traumatic cardio-respiratory arrest (TCRA)\(^1\).

2. Objectives
Describe the assessment of blunt thoracic trauma including the signs and symptoms of pneumothorax and flail chest.
Describe the types and indications for pleural drainage.

3. Scope
Doctors
Paramedics

4. Process
4.1 Clinical signs/symptoms of a pneumothorax
4.1.1 Symptoms\(^1,3\)
- Dyspnoea (often described as tightness or difficulty in breathing rather than shortness of breath)
- Chest pain (usually pleuritic)

4.1.2. Signs\(^1,3\)
Direct
- Surgical emphysema
- Decreased breath sounds
- Asymmetrical chest movement
- Wheeze/crackles

Indirect\(^1,3\)
- Bony crepitus to chest wall
- Flail chest
External signs of trauma to chest wall following significant mechanism of injury

4.1.3. Signs such as a deviated trachea, hyper-resonance to percussion, high airway pressures during ventilation and distended jugular veins are very late and/or insensitive signs of tension pneumothorax. 1,3

4.1.4. Pneumothoraces can be subtle and difficult to diagnose, particularly in the spontaneously breathing patient, often becoming clinically apparent only after institution of positive pressure ventilation. 2,3

4.1.5. Repeated assessments are necessary, particularly immediately following tracheal intubation.

4.1.6. Thoracic ultrasound can be used by appropriately trained staff to quickly and accurately diagnose pneumothoraces and can be used pre-hospital to assist with decision making.

4.2 Decision to Intervene Pre-hospital

Not all pneumothoraces need to be treated in the pre-hospital phase1. Patients who are oxygenating well with minimal respiratory distress may be observed and intervention deferred to their hospital phase of treatment.

The decision about when to intervene will depend on the following factors:

4.3 Absolute Indications for pleural drainage following blunt thoracic trauma

- TCRA
- Significant hypoxia – Sa02 < 93% not corrected by high flow O2 or intubation and ventilation
- Significant hypotension (BP < 80 systolic) where tension pneumothorax can not be excluded

4.4 Relative Indications for pleural drainage following blunt trauma

- Pneumothorax suspected on clinical grounds (or unable to be excluded) with reference to the following factors:

<table>
<thead>
<tr>
<th>More Likely to Need Intervention</th>
<th>Less Likely to Need Intervention</th>
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<tbody>
<tr>
<td>Multiple concomitant injuries</td>
<td>Oxygenation maintained without intervention</td>
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<tr>
<td>Long transport distance/time</td>
<td>Very short transport distance time</td>
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<tr>
<td>Need for positive pressure ventilation</td>
<td>Spontaneously breathing</td>
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<tr>
<td>Altitude – helicopter transport</td>
<td>Presence of uncontrolled exsanguinating haemorrhage</td>
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5. Techniques for Pleural Drainage

- Needle Thoracocentesis (Needle Chest Decompression)
- Tube Thoracostomy (Chest tube insertion)
- “Simple” Open Thoracostomy

5.1 Needle Thoracocentesis

Definition: insertion of a large bore cannulae in the 2nd intercostal space midclavicular line through the chest wall into the pleural space

12G (9cm) “Dwellcath” cannulae should be used as several studies4,5 suggest that short cannulae (such as 14G or 16G IV cannulae used by ASNSW) are not long enough to penetrate the pleural space in many adult patients.
5.1.1 Advantages
- Rapid
- Can be carried out by Level 4 (or above) paramedics
- May be useful as a temporising measure in a patient prior to surgical thoracostomy

5.1.2 Disadvantages
- Gives the false impression that a tension pneumothorax has been definitively managed
- Many patients have chest walls too deep for standard cannulae to reach the pleural space
- Only removes the obstructive element of the shocked state. Does not facilitate lung re-expansion.
- Cannulae are highly prone to migration and kinking with re-accumulation of tension pneumothoraces.

5.2 Tube Thoracocentesis (Chest Tube Insertion)
Definition: insertion of a large bore chest tube by open surgical procedure (thoracostomy) in the 4th or 5th intercostal space in mid-axillary line. The tube is then connected to a drainage mechanism consisting of a one way valve and drainage bag.

5.2.1 Advantages
- Can be used in spontaneously breathing patients without need for positive pressure ventilation
- Enables collection of blood and avoids contamination of vehicles in the case of massive haemothorax.

5.2.2 Disadvantages
- Once secured becomes a closed system with the risk of re-tension in the case of tube kinking, luminal blockage, migration or massive air leak.
- Is a painful procedure which requires significant analgesia/sedation.

5.3 “Simple” Open Thoracostomy
Definition: open surgical procedure to create a connection between the pleural space and the atmosphere without insertion of a chest tube. This technique can only be used for patients undergoing positive pressure ventilation.

It is essential that the thoracostomy be large enough to prevent soft tissue occlusion of the thoracostomy.
5.3.1 Advantages

- The lung can be felt to re-expand.
- If the patient deteriorates during transport the thoracostomy can be “re-fingered” to ensure that re-tension has not occurred.
- Avoids chest tube insertion in a non-clinical area
- Less risk of re-tensioning

5.3.2 Disadvantages

- Haemothoraces can bleed via the thoracostomy
- In obese patients the soft tissues can occlude the thoracostomy. If this becomes problematic consider inserting a shortened chest tube (without drainage bag) to splint the thoracostomy open as a temporising measure.

6. Responsible Personnel

Medical manager, Supervisor of training, Paramedics, Doctors, Flight nurses

7. References


With thanks to BASICS Hampshire Standard Operating Procedure Needle thoracocentesis, thoracostomy and tube thoracoentesis 3/2010 and London HEMS Standard Operating Procedure Blunt Thoracic Trauma

8. Review date

May 2011