

Blunt Chest Injury

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Related Documents	SOP 6.1 Pre-hospital Emergency Anaesthesia SOP 2.21 Resuscitative Thoracotomy SOP 2.25 Use of Ultrasound PAM Open Thoracostomy PAM Resuscitative Thoracotomy
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Further Information	None
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1.0 Aim

- 1.1 The purpose of this SOP is to describe the management of blunt chest injuries. This SOP outlines the types and indications for pleural drainage, how open thoracostomy differs from chest drain insertion (tube thoracostomy). It also describes the assessment of a flail chest and indications for ventilation.

2.0 Background

- 2.1 Up to a quarter of all trauma deaths are directly attributable to thoracic injury. Thoracic trauma contributes to mortality in a further 50% of trauma deaths as sub lethal thoracic injury compounds the effects of other injuries. Despite these statistics, few thoracic injuries require operative intervention and simple measures such as supplemental oxygen, tube and open thoracostomy and ventilatory support often suffice.
- 2.2 The Advanced Trauma Life Support course teaches the 'lethal 6' and the 'hidden 6' chest injuries that should be considered. These are:

Lethal

- Airway Obstruction
- Tension pneumothorax
- Open pneumothorax
- Massive haemothorax
- Flail chest
- Cardiac tamponade

Hidden

- Tracheobronchial disruption
- Pulmonary contusion
- Aortic disruption
- Blunt cardiac injury
- Oesophageal perforation
- Diaphragmatic tear

The commonest conditions encountered pre-hospitally are pneumothorax (simple and tension), haemothorax, haemopneumothorax and flail chest.

- 2.3 Ultrasound may be helpful in the diagnosis and management of chest injuries such as detecting pneumo-haemothoraces and cardiac tamponade. Routinely, ultrasound should be performed in blunt chest injury –
- a) where primary survey indicated a concern for a pneumothorax
 - b) in ventilated patients who develop high airway pressures, when considering a pneumothorax could be the cause.

See SOP 2.25 for guidance on the use of ultrasound

3.0 Chest conditions in blunt trauma

3.1 Simple pneumothorax

The majority of simple pneumothoraces do not require any interventions. If there is marked respiratory distress or decreasing oxygen saturations in a spontaneously ventilating patient then an intercostal drain should be inserted. It is best in most cases to leave this until the patient is in hospital. If the patient's condition worsens, consider a tension pneumothorax in the first instance and the need for pleural space decompression (needle thoracocentesis in emergency situations or tube thoracostomy). In the ventilated patient, consider an open thoracostomy.

3.2 Tension pneumothorax

A tension pneumothorax requires immediate recognition and treatment. The recognition is not always easy in the pre-hospital setting. Decompression of the chest should be undertaken in the event of haemodynamic instability or severe respiratory distress. In a spontaneously ventilating patient, initial treatment involves needle chest decompression, followed by intercostal drain insertion. In the ventilated patient, an open thoracostomy should be performed.

3.3 Haemothorax/Haemopneumothorax

A haemothorax or haemopneumothorax may be difficult to detect. It may be difficult to differentiate from a tension pneumothorax. As with a pneumothorax, intervention will be required if ventilation and oxygenation are significantly impaired. In the spontaneously ventilating patient, treatment involves insertion of an intercostal drain. In the ventilated patient, an open thoracostomy should be performed and if there is significant blood loss in keeping with a massive haemothorax, then an intercostal drain should be inserted to collect the expelled blood. Bilateral wide bore intravenous access should be in place before any procedure is attempted for a suspected haemothorax as rapid fluid resuscitation may be necessary (but beware aggressive fluid resuscitation in chest trauma).

3.4 Flail Chest

The diagnosis of a flail segment can be difficult as the movement of the anterior chest wall may appear symmetrical. A conscious effort should therefore be made to go to the feet of the patient and look up to the chest and monitor the movements against those of the diaphragm. Palpating the chest wall will also aid diagnosis.

Key interventions in the management of a flail chest +/- lung contusion are intubation and positive pressure ventilation. Indications for pre-hospital emergency anaesthesia and ventilation in these cases are:

- Actual or impending airway compromise (including protection and maintenance)
- Respiratory failure (oxygenation +/- ventilation).
- Head injured patients who are agitated and unmanageable.
- Anticipated clinical course (where the patient is expected to deteriorate rapidly or when intubation and ventilation will have a major impact on expediting life-saving intervention at hospital).
- Humanitarian – to ease suffering and extreme pain in a multiply injured patient.

If satisfactory oxygenation is not achieved after intubation and ventilation, consider an open or tube thoracostomy.

3.5 Cardiac Tamponade

Suspected cardiac tamponade in a patient with an output is best managed in hospital. In cardiac arrest due to blunt trauma where tamponade is strongly suspected, consider the need for pre-hospital thoracotomy to relieve the tamponade in line with the Magpas

thoracotomy SOP.

4.0 Procedures

4.1 Needle Thoracocentesis (Needle Chest Decompression)

- Undertaken in the mid clavicular line 2nd intercostal space using a 14G (orange) cannula.
- Alternative site is the safe triangle as per thoracostomy. This approach should be considered in the obese patient as the depth of the subcutaneous tissue is less at this point. Cannulas inserted here are however at increased risk of kinking during patient packaging.

Beware:

- This is not a definitive treatment. It only removes the obstructive element of the shocked state and does not facilitate complete (if any) lung re-expansion.
- The cannula may kink or rapidly track back out of pleural space and ceases to function.
- The majority of people have soft tissues greater than the length of a cannula in the second intercostal space mid-clavicular line.
- Patients will **ALWAYS** require immediate thoracostomy in ventilated patients prior to transporting (so usually best to simply perform thoracostomy in first instance)
- Needle decompression may be of particular use in the entrapped peri-arrest patient where immediate RSI and thoracotomy is not possible

4.2 Tube Thoracocentesis

If respiratory distress is minimal, the patient has single system injury and there is little to indicate an oxygen debt, consider leaving chest drain insertion until hospital. A typical example would be simple pneumothorax following a stabbing to the chest outside the nipple line.

4.3 Open Thoracostomy without Drain Insertion

This can only be used in patients undergoing positive pressure ventilation (ie an intubated ventilated patient). It is indicated in:

- any potential pneumothorax in a patient undergoing positive pressure ventilation,
- actual or near traumatic cardiac arrest,
- patients presenting in a shocked state with no apparent cause.

Whilst the principles of the process are the same as the technique to place a chest drain there are certain points to note and reinforce:

- Chloraprep stick applicator and clean (sterile) gloves should be used for the procedure.
- The incision is usually made with the patient on the floor. the patient should be approached at "right angles" with the arm abducted to 90°. If possible position yourself so that you are at the same level as the incision. Blunt dissection should be directed inferiorly over the top of the 4th rib.
- The presence of surgical emphysema and flail segments can make placement of the incision over the 4th intercostal space difficult. The incision should always be above the nipple line (in males)
- Blunt dissection should be undertaken with Spencer Wells forceps, rather than via incision. This minimises bleeding from the subcutaneous tissues in the axilla.

- The hole through intercostal muscles should allow free insertion of a finger without pushing. This may require some of the intercostal muscle being "stripped" off the rib.
- Thoracostomy should be performed within a minute or two of endotracheal intubation. In a peri-arrest situation needle chest decompression should be considered and bilateral thoracostomies performed while intubation is taking place
- IV co-amoxiclav should be given routinely if there are no contraindications.

Process summary- see Procedural Aide Memoire

- With the patient supine abduct the arm to approximately 90°.
- Clean the area with a chloraprep stick applicator
- Confirm the position prior to incision with colleague if time enables.
- Make a 2 inch incision along the line of the ribs in the 4th or 5th intercostal space in the mid axillary line.
- Use a scalpel for the skin only. There after use blunt dissection to pass through the intercostal muscles.
- Make a hole sufficient to push 1 finger into the pleural cavity. Be careful when you push as there may be fractures ribs which are sharp.
- Ensure the lung is felt up and expanded.
- Leave the soft tissues fall back over the wound which will act as a flap valve.

Advantages:

- The lung can be felt/seen to re-expand.
- If the patient persists in a shocked state during transport the thoracostomy can be "refingered" to ensure the lung is up and working thus excluding one cause of obstructive shock.
- Avoids intubation of the chest in a non clinical area.
- Avoids risk of re-tension caused by blockage and kinking of drainage systems.

Disadvantages:

- Bleeding from thoracostomy wounds can be profuse and may need suturing if not tamponaded with a chest drain.

4.4 Thoracostomy with Drain Insertion

Follow ATLS teaching and use the Portex Ambulatory Chest Drain Kit with introducer and urinary drainage bag. Ensure drain is properly secured with sutures and tape.

Advantages:

- Allows collection of intrathoracic blood loss and tamponades bleeding from thoracostomy incision
- Allows an occlusive dressing to be applied to reduce wound contamination

Disadvantages:

- Once sutured in place the drain and its collecting system effectively become a closed system and have the potential to tension. There are several mechanisms which can lead to this, all of which are common when drains are inserted in the emergency situation and the patient is being moved on and off stretchers and in and out of ambulances:
 - Lung or clots can block the drainage holes within the chest.

- The drain may kink with in the chest.
- The drain or tubes connecting the drain to the collecting bag may kink

Properly inserted, pre-hospitally inserted chest drains have not been associated with increased rates of infection compared with hospital insertions (J. Trauma 2005). Nonetheless, chest drain insertion is best avoided pre-hospitally in ventilated patients with pneumothoracies (though a drain can be useful for collecting blood in haemathoraces).

4.5 Pre-hospital thoracotomy

The team carries the equipment necessary for a resuscitative thoracotomy, and it is recognised that teaching these skills is difficult. The full indications and management is discussed in the Resuscitative Thoracotomy SOP and PAM.

5.0 **Transport**

5.1 Patients should be conveyed according to the regional trauma triage tool guidelines. When considering use of a helicopter there is no evidence available to suggest that flying at low altitude will worsen a pneumothorax. However, consideration must be made of the difficulty in assessing the chest whilst in flight and accessing thoracostomy wounds. Safety of the patient is paramount and in self ventilating patients who have undergone chest decompression, road transfer should always be undertaken as a preference wherever possible, due to the increased risk of deterioration in flight.

5.2 In patients where it is thought that a specialist in cardiothoracic surgery would be needed upon the arrival of the patient in the Emergency Department, this should be communicated to the receiving ED who can make arrangements with Royal Papworth Hospital (cardiothoracic) or Norfolk and Norwich Hospital (thoracic only) staff. ATLS recommends cardiothoracic input if:

- There is > 1.5L blood initially drained
- There is more than 200ml/hr for > 2 hours