Network
Midlands Trauma Networks
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Scope

This guideline covers the indications for chest drain insertion for the treatment of traumatic pneumothorax or haemothorax and the immediate clinical management after insertion. It includes an example Local Safety Standard for Invasive Procedures (LocSSIP) in Appendix 1. This guideline does not cover the management of 'medical' patients with a spontaneous pneumothorax or pleural effusion.

Introduction

Chest trauma is common but only a minority of patients require surgical intervention. For most chest injuries, appropriate analgesia, physiotherapy ± safe insertion of an appropriately sized and positioned chest drain are the only interventions required. Detection of a pneumothorax or haemothorax on imaging is not an absolute indication for chest drain insertion. A UK Randomised Control Trial is currently recruiting to answer whether traumatic pneumothoraces can safely be managed with conservative management (https://comited.blogs.bristol.ac.uk/).

Indications for chest drain insertion following trauma

1. A life-threatening chest condition is detected on primary survey
    a. Tension pneumothorax with severe respiratory compromise or haemodynamic instability
    b. Large open pneumothorax (close and cover the wound & make a new thoracostomy site)
    c. Massive haemothorax (very difficult to distinguish clinically from tension pneumothorax)
    d. Following resuscitation from traumatic cardiac arrest (these patients will have bilateral thoracostomies performed as part of the resuscitation protocol which do not need immediate chest drain insertion)

2. Detection of pathology on imaging
    a. Moderate-large pneumothorax
    b. Moderate-large haemothorax

The identification of a small-moderate pneumothorax or haemothorax on CT scan is not an immediate indication for chest drain insertion in an asymptomatic patient; a chest drain may not be needed at all. Senior advice should be sought where there is any uncertainty.

Recent attempted needle decompression of a suspected pneumothorax is not, on its own, an indication for chest drain insertion. Cannulae do not always penetrate the pleural cavity and cause an iatrogenic pneumothorax: assess the patient and obtain imaging.

Imaging for patients with suspected chest trauma should be performed urgently, and the images should be interpreted immediately by a healthcare professional with the appropriate training and skills.

Consider immediate chest x-ray and/or eFAST (extended focused assessment with sonography for trauma) as part of the primary survey to assess chest trauma in patients with severe respiratory compromise.

If there are signs of respiratory or cardiovascular compromise due to suspected tension pneumothorax the patient may require immediate thoracostomy followed soon after by chest drain insertion. If there are no severe adverse clinical signs, perform imaging (preferably CT) to determine if there is significant pathology (e.g. pneumothorax or haemothorax) requiring drainage.

Not every intubated patient who has a pneumothorax detected on CT requires a chest drain. A risk-benefit analysis is required taking into account the size of the pneumothorax, any other injuries and whether the patient is going to be transferred to theatre or another unit. This assessment should be undertaken by senior clinicians and the decision clearly documented and handed over to the team assuming responsibility for patient care.

The trauma patient who is intubated and receiving positive pressure ventilation does not require immediate chest tube insertion following thoracostomy: this can be done post CT scan. The

patient who is not intubated and is spontaneously ventilating will need an immediate chest drain insertion following creation of an open thoracostomy.

Chest drains can be inserted through correctly sited thoracostomies (performed pre- or in-hospital): a new incision is not necessary.

Chest drains should not be inserted through stab wounds or other penetrating chest injuries even if this is in the correct site.

Beware the chest trauma mimics on CXR

- Lung bullae - not pneumothorax
- Ruptured left hemidiaphragm and intrathoracic gastric bubble - not pneumothorax
- Ruptured right hemidiaphram and intrathoracic liver - not haemothorax

Equipment required

- Sterile gloves and gown, eye protection
- Antiseptic for skin cleaning
- Sterile drapes and gauze
- Green needle and 20ml syringe
- Local anaesthetic
- Scalpel
- Spencer Wells Forceps
- Chest tube
- Connecting tubing
- Closed drainage system with underwater seal (filled with water if applicable)
- Suture (2-0 or thicker)
- Dressings

Procedure for insertion

The clinician performing chest drain insertion must be adequately trained.

A 24+ Fr chest drain is sufficient in most situations. Seldinger drains may be considered if CT shows no evidence of haemothorax.

The patient should receive intravenous analgesia and local anaesthetic as a minimum.

For non-emergency chest drain insertion and when the trauma patient has capacity to give informed consent, written consent should be taken before starting the procedure. Complications include pain, bleeding, nerve damage, drain related visceral injury, wound infection, intra-pleural infection, drain blockage and drain dislodgement.

Where possible, the patient should be positioned supine or semi-recumbent, with the arm abducted on the affected side.

Prior to starting, the patient's chest and any imaging should be re-assessed to confirm the side of chest drain insertion.

The site for chest drain insertion is just anterior to the mid-axillary line in the 4th or 5th intercostal space. The site should be formally located by palpating the angle of Louis, moving laterally into the 2nd intercostal space, counting down to the 4th space and rechecking the position.

Techniques such as using the male nipple, the patient's hand in the axilla or the 'safe triangle' alone are inaccurate at locating the correct space and should not be used as the sole method.

Where landmarks are difficult e.g. obesity, rib fractures, pregnant patients with a raised diaphragm, aim for a higher intercostal space (as long as the incision is lower than the axilla) to avoid an intra-abdominal incision. The practitioner should also confirm that the defined site is well within the 'safe triangle' - bordered by the anterior border of the latissimus dorsi, the lateral border of the pectoralis major muscle, and a line superior to the horizontal level of the nipple.

Clean the skin with alcohol/chlorhexidine solution and drape the patient.

Infiltrate local anaesthetic under the skin along the site of the proposed incision, and then perpendicular through the layers of the chest wall into the pleural cavity. The needle should be aspirated to confirm aspiration of pleural contents. If this is not possible, chest drain insertion should not continue.

Make a 4-5 cm incision parallel to the ribs and use Spencer Wells forceps to dissect bluntly through the subcutaneous tissues and intercostal muscles; keep the tract straight and avoid burrowing.

Puncture parietal pleura with the tip of the forceps, open them to expand the hole, and insert a gloved finger to maintain the tract.

Use a 360-degree finger sweep to clear any adhesions or clots but beware of rib fractures which may puncture gloves and give a sharps injury.

With the inserted finger, identify if the lung is up or down and whether the lung is re-expanding upon decompression.

Trocars must never be used. Spencer wells forceps should be used to pick up the proximal end of the chest tube and advance into the pleural space until all holes are within the chest.

Ideally a chest tube is positioned up for air and down for blood but either direction will cover both injury patterns.

Post chest drain insertion

Check that the chest tube is fogging with expiration. Attach the drain to an underwater seal bottle or one-way valve bag designed for this purpose and keep below the level of the patient's chest to prevent backflow. Fluid in the chest tube should swing with respiration or bubble if there is a large air leak. A record of the volume of fluid draining must be documented. Re-examine the chest and vital signs, and in the awake patient reassess symptoms.

Secure the chest drain to the skin using 2-0 or thicker non-absorbable sutures. A horizontal mattress suture is recommended. Purse string sutures create poor cosmetic results and difficult wound healing with chronic pain so must be avoided. Place a small dressing over the wound and secure lightly with tape. An 'omental tag' of adhesive tape may be used to support the tube and protect it from being pulled out.

Obtain a CXR and check the position of the drain: are all holes within the pleural cavity, is the drain too far in and abutting the mediastinum?

For misplaced drains, e.g. intra-abdominal or intra-parenchymal, consult the on-call Cardiothoracic team at the regional Major Trauma Centre and consider repeating the CT scan.

Involve Cardiothoracic Surgery if there is significant blood loss of more than 1000mls on insertion or ongoing blood loss of >100 mls per hour or persistent air leak >24 hours. If no Thoracic Surgery is provided on-site, discuss with the regional Major Trauma Centre regarding transfer.

Prophylactic antibiotics

A minimum of three doses of intravenous antibiotics should be administered to patients who have had:

- Pre-hospital thoracostomy
- Emergency Department emergency (i.e. non-sterile) thoracostomy
- Penetrating chest trauma e.g. stab or gun shot

Patients having routine sterile chest drain insertion with skin cleaning do not require prophylactic antibiotics.

Antibiotic selection is based on local trust policy for prophylactic antibiotics for open fractures (e.g. Co-amoxiclav - or Clindamycin in the case of Penicillin allergy).

References

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Appendix 1 – LocSSIP

INVASIVE PROCEDURE SAFETY CHECKLIST – CHEST DRAIN INSERTION

Before procedure		
Indication for chest drain?	Yes	No
Patient identity checked?	Yes	No
Any allergies?	Yes	No
Appropriate patient brief & consent?	Yes	No
Equipment ready? (incl chest drain bottle with sterile water)	Yes	No
Examine chest & check CXR/CT to confirm site of insertion	Yes	No
Confirm site of insertion	Right	Left
Anticoagulation status checked?	Yes	No
Landmarks for safe site of insertion assessed & marked	Yes	No
Are there any concerns about this procedure?	Yes	No

Time out before start		
Is patient position optimal?	Yes	No
Adequate analgesia/sedation?	Yes	No
Sterile gown/gloves/drapes ready	Yes	No
Skin prep ready	Yes	No
Local anaesthetic if required	Yes	No
Team members identified & roles assigned	Yes	No
Any concerns about this procedure?	Yes	No
Operator		
Grade		
Assistant		
Date		
Signed		

Sign out		
Connected to single flow drainage system	Yes	No
Chest drain is swinging	Yes	No
Sutures, tubing & dressing secured?	Yes	No
Procedure documented in notes	Yes	No
CXR confirms correct position	Yes	No
Analgesia prescribed on drug chart	Yes	No
Verbal handover to nurse/ODP looking after patient	Yes	No
Have nursing staff restocked chest drain trolley?	Yes	No

Patient sticker here