

# CHEST DRAIN INSERTION

## Indications

**This procedure is often performed as an emergency.**

- Drainage of a pneumothorax that is causing significant respiratory or haemodynamic compromise.
- Drainage of a large pleural effusion or chylothorax.

### **Note:**

- The majority of infants requiring a chest drain for treatment of a pneumothorax will need ventilation. Remember that positive-pressure ventilation may convert a simple pneumothorax into a tension pneumothorax.
- Rapid and complete drainage of a large pleural effusion may cause haemodynamic compromise. If possible drain enough fluid to improve respiratory status and then consider clamping the tube and draining the effusion intermittently over the new few hours.

## Equipment

- Chest drain insertion pack
- Cut down set
- Chest drains – select according to the preferred technique:
  - Classic method: 8 or 10 Fr chest tubes
  - Seldinger method (less traumatic): Fuhrman straight or pigtail chest tubes (5, 6, 8.5 Fr gauge)
- Underwater sealed drainage system or a Heimlich valve

## Insertion Procedure

### **Classic (blunt dissection) method:**

1. Position the infant with a towel under the back so the affected side is raised 30° above the horizontal. Ask an assistant to hold, or secure, the arm above the infant's head.
2. Clean the skin with antiseptic solution, taking care not to allow the solution to pool under the baby's back.
3. Identify the fourth or fifth intercostal space, mid-axillary line. Infiltrate 1% Lidocain into the skin and subcutaneous tissues.
4. Assemble the equipment and remove the trochar from the chest drain tube.
5. Using a no. 11 scalpel blade, make a 1 cm long incision in the skin, parallel to and just above the rib. Insert a pair of artery forceps into the incision, and keeping the forceps perpendicular to the chest wall, use blunt dissection to penetrate the muscle layer.
6. The pleura can be incised with the scalpel or opened by applying pressure with the closed tip of the forceps. A definite give will be felt as the tip of the forceps pierces the pleura. Use your index finger as a guard to prevent the forceps from penetrating too deeply.
7. Keep the forceps in place and thread the chest drain tube between the opened tips of the forceps and advance it 2-3cm into the pleural space. Alternatively, withdraw the artery forceps and clip the chest tube via the side hold and advance the chest drain into the pleural space. The disadvantage of this second technique is that it is not always easy to relocate the tract through the intercostal muscles.

8. Direct the chest drain anteriorly and apically to drain a pneumothorax and posteriorly to drain a pleural effusion. Ensure that all of the side holes in the chest drain tube are contained within the pleural cavity.
9. Connect the tube to the drainage system with an underwater seal and look for bubbling and/or a swinging meniscus.
10. Secure the chest drain to the skin with a simple suture: the ends of the suture should be tied around the chest drain tube four or five times and knotted securely. An additional suture may be required to close the incision. Do not use a purse string suture as this leaves an unsightly scar.
11. Apply a small square gauze to the insertion site and secure the chest drain tube at right angles to the skin with two transparent adhesive dressings, applied to the tube and chest wall in an inverted T.
12. X-ray to confirm the position of the chest drain and that the pneumothorax has resolved. The tip of the drain should not lie abutting the mediastinum.
13. A low-pressure vacuum (-5-10 cmH<sub>2</sub>O) can be applied to the drainage system to assist with drainage or a pneumothorax.
14. If a large pleural effusion is present, control the rate of drainage by intermittent clamping of the drain.

**Seldinger technique:**

1. Position the baby and clean and drape the skin as before.



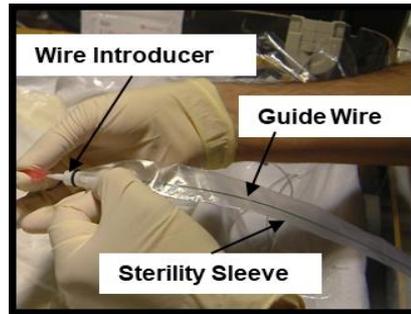
2. Infiltrate the skin and subcutaneous tissues with local anaesthetic.
3. Remember to aspirate on the needle before infiltrating the local anaesthetic.
4. Prepare the introducer needle to prevent it from going in too far by placing an umbilical clamp across it at approx. 2 cm distance from the tip. (Note: Don't use a forceps as this will hinder insertion of the guidewire; beware that umbilical clamp can slip on the needle during insertion into the chest [so do not push on it]).

5. Attach a saline-filled syringe to the introducer needle and insert the introducer needle into the pleural space holding the needle behind the clamp and keeping the needle at a right angle to the skin.

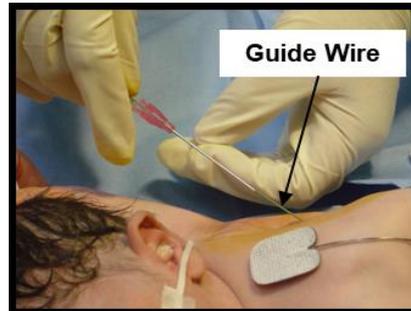


6. Advance the introducer needle no more than 2 cm through the chest wall. Fluid or bubbles of air should be aspirated into the syringe to confirm that the needle lies in the pleural space.

7. Remove the syringe and pass the curly end of the guidewire into the pleural space (straighten the curly end of the guidewire beforehand by using the white plastic sheath in the pack). The guidewire should be inserted until the light grey marked area on the wire lies just inside the introducer needle.



8. Remove the introducer needle keeping the guidewire in position (may require second sterile person).

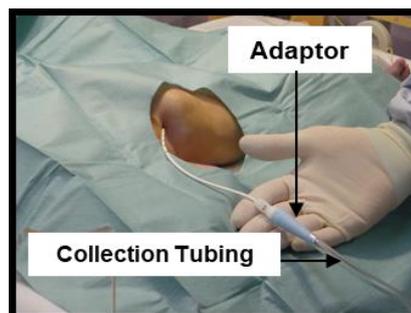


9. Thread a dilator over the guidewire and gently dilate the tract, using a twisting motion. Do not insert further than 1 cm beyond the depth of the chest wall as measured with the introducer needle.



10. Remove the dilator and thread the chest drain tube over the guidewire, angling the tube anteriorly for a pneumothorax and posteriorly for a pleural effusion. Insert the pigtail catheter at least until the first black line has gone through the chest wall.

11. Withdraw the guidewire, secure the chest drain in place, connect to the underwater drain using the blue/white bladder catheter adaptor and apply an adhesive dressing as described above.



12. Confirm the position of the tube with an x-ray.

### Chest drain removal

- Consider removing the chest drain once the pneumothorax or pleural effusion has resolved, i.e. stopped bubbling or swinging (and draining, if applicable) for several hours.

#### **Equipment:**

- Dressing pack, stitch cutter, suture or Steri-strips, sterile dressing.

#### **Procedure:**

1. Clamping the tube for several hours and repeat x-ray are not routinely required in otherwise stable newborns.
2. Provide pain relief (short-acting, rapid-onset systemic analgesic).
3. Remove dressings and clean the skin in the area of the chest drain with antiseptic solution.
4. Remove any sutures.
5. Pull the chest drain out slowly (especially when using pig-tail catheter), keeping the edges of the wound approximated.
6. Apply Steri-strips to close the wound. Use a simple suture if the wound is gaping or the Steri-strips do not stick.
7. Dress with sterile gauze and cover with transparent dressing.
8. Perform a chest X-ray to exclude re-accumulation of the pneumothorax, if clinically indicated.
9. Consider removing dressing after > 72 hours.

### Needle Aspiration

#### **This procedure may be used diagnostically or in an emergency situation for the treatment of a tension pneumothorax.**

1. Wash hands and apply alcohol hand rub and non-sterile gloves. The procedure should be undertaken using an aseptic non-touch technique.
2. Prepare the skin with chlorhexidine.
3. Attach a 23G or 25G 'butterfly' with extension to a large syringe (minimum 20 ml) via a 3-way tap.
4. Insert the needle in a perpendicular line to the anterior chest wall into the second intercostal space in the mid-clavicular line. Aim to slide over the top of the third rib to minimise the chance of damaging the intercostal artery.
5. Apply continuous suction to the syringe as the needle is inserted. A rapid flow of air will occur when the pneumothorax is entered. Minimise needle penetration to reduce the risk of puncturing the lung while free air is evacuated.
6. Once air flow ceases, remove the needle. If the air leak is continuous leave the needle in place with the extension tubing in a pot of sterile water. Allow to bubble whilst a chest drain is inserted. (Alternatively, a 22G or 24G cannula can be used in place of a butterfly. Remove the needle once you are through the chest wall).
7. Document the procedure with the time and date and condition of the infant during the procedure.