

DRAINAGE OF NEONATAL PNEUMOTHORAX - NETS

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- A neonatal pneumothorax can be an emergency
- Drainage can be an urgent, lifesaving procedure
- It is a painful procedure and requires analgesia
- Needle drainage should only happen in the pre-arrest scenario and should be followed by a definitive intercostal drain
- NETS teams should be skilled in the insertion and care of intercostal catheters
- Neonatal catheters are **NOT** to be sutured to the chest wall
- Appropriate respiratory support is required pre and post drainage

CHANGE SUMMARY

- Minor edits and updated photographs
- **08/10/21:** Minor review. Removal of Atrium pneumostat due to product safety notice. Use of new device - COOK[®] chest drain valve added.

READ ACKNOWLEDGEMENT

- NETS clinical staff need to read and acknowledge the guideline
- Education sessions will be arranged at each orientation programme for new staff

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st March 2021	Review Period: 3 years
Team Leader:	Retrieval Staff Specialist	Area/Dept: NETS

RATIONALE/BACKGROUND:

- Drainage of a pneumothorax has clinical urgency when the air collection is under pressure.
- Incidence of pneumothorax is higher in infants with; prematurity, respiratory distress syndrome, meconium aspiration syndrome, elective delivery by C-section, CPAP and intermittent positive pressure ventilation at birth.^{1,2,3,4}

CLINICAL Signs and Symptoms:

- A newborn at birth, needing extensive resuscitation but with poor clinical response to increasing respiratory support.
- Sudden deterioration in clinical condition with increasing oxygen requirement and/or desaturation
- In the newborn < 1,000g - asymmetry of the chest wall with elevation of the affected side
- Increase in respiratory distress and/or diminished chest movements
- Compromised circulation with mottling and bradycardia
- Unequal or decreased air entry
- Positive transillumination sign. Note this sign is unreliable in term or hydropic infants where there is increased thickness of the chest wall
- CXR will confirm the diagnosis, however if infant is compromised treatment should not be delayed
- Blood gases may show respiratory acidosis with ineffective ventilation or metabolic acidosis from impeded cardiac output

PREPARATION:

- Ongoing respiratory support is required throughout the procedure. Babies should be supported with CPAP or mechanical ventilation as required depending on severity of respiratory distress, oxygenation and apnoeas. An educational video from the Safe-T-Centesis® manufacturers is available via the following link: <https://www.bd.com/en-us/company/video-gallery?video=5246158301001>
- Pain relief is essential and should include:
 - Oral sucrose
 - Infiltration of the insertion site with 0.3 ml/kg of 1% Lignocaine (Lidocaine) – allow 5 minutes to take effect. Maximum dose is 0.5mL/kg so be cautious in small (<1,000g) infants.

- A bolus of morphine of 50 micrograms per kilogram administered 5 minutes prior to intercostal catheter insertion unless received opiates prior to procedure. An intravenous infusion of morphine at 5 micrograms/kg/hour may be continued if not ventilated and up to 20 micrograms/kg/hour if ventilated.
- Further morphine boluses may be appropriate depending on pain score
- Be prepared to support apnoeas especially in preterm infants.

NEEDLE ASPIRATION:

- Needle aspiration is an emergency procedure for a baby becoming bradycardic and is only a temporising measure pending definitive chest drain. Care must be taken to avoid laceration of the lung or puncturing blood vessels.
- Needle aspiration is the first line procedure in tension pneumothorax but should be done while respiratory support and other resuscitation measures are ongoing. Intubation should not delay needle aspiration and mask ventilation should be provided. It will likely be necessary to stop chest compressions if they are required at the time.

Equipment

- 22 or 24 gauge cannula
- 3-way stopcock
- Cannula connector
- 10 mL syringe filled with sterile water (to observe bubbling) if readily available
- Alcohol swab
- 1 pair sterile gloves

Procedure

- Infant supine, prepare area with alcohol swab
- Insert needle into the pleural space (directly over the rib's superior edge in the 2nd or 3rd intercostal space in the mid-clavicular line) until air is aspirated into the syringe, then expel air through the 3-way stopcock

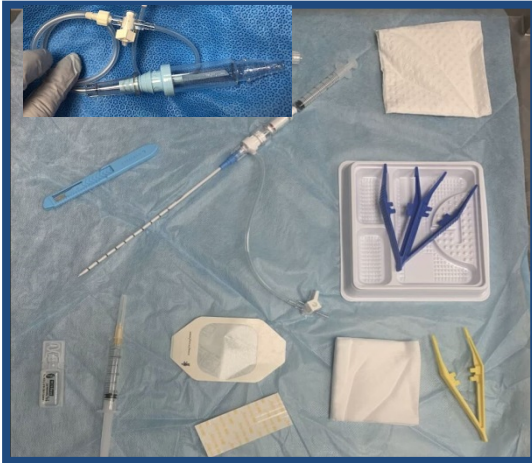
Continuing Care

- Following needle aspiration, insertion of an intercostal catheter is required for continuing management. It may be necessary to seek help with this procedure - consultation and assistance should be sought from the NETS consultant

INTERCOSTAL PIGTAIL CATHETER (ICC) INSERTION

Equipment

- Place infant under radiant heater with full cardiorespiratory monitoring.
- Maintain some area of the infant visible beyond the sterile field. Place the infant with the effected side uppermost and the arm extended above the head (a nappy cloth roll may help maintain a good position). A nurse is needed to support the infant throughout the procedure.



- Simple dressing pack
- Safe-T-Centesis® pack – 6 or 8Fg
- Drapes & 0.05% Chlorhexidine skin preparation
- Steristrips and Tegaderm x 2
- 1% Lignocaine, syringe and needle
- COOK® Chest drain valve with the vinyl luer lock tubing

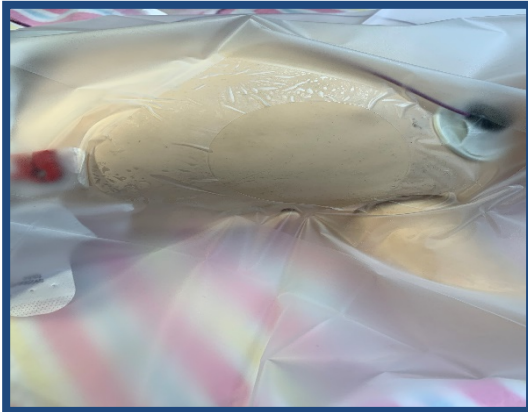
Procedure



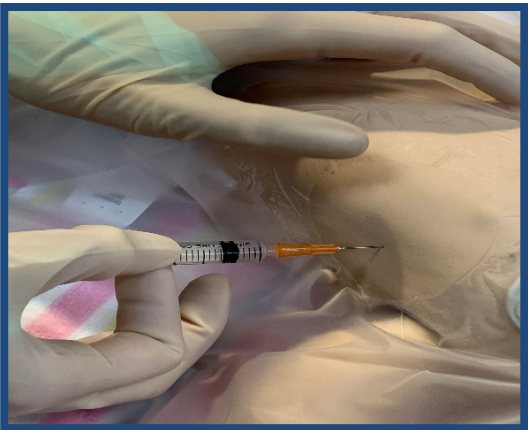
- Measure distance from lateral chest wall to mid sternum - this is the distance for insertion



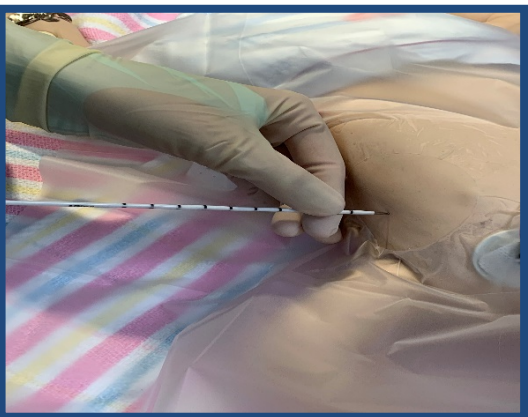
- Surgical handwash
- Don mask, sterile gown and gloves



- Clean the area around the intended insertion site with the Chlorhexidine. The pigtail catheter should be inserted in the 4th or 5th intercostal space in the anterior axillary line. This corresponds to a point 1-2cm lateral to and 0.5-1cm below the nipple. The incision must be well clear of the nipple.



- Place sterile transparent fenestrated drape in position – do not stick to infant especially if ≤ 30 weeks of gestation
- Infiltrate with 1% Lignocaine allowing 5 minutes to work – test effect with gentle needle pricks



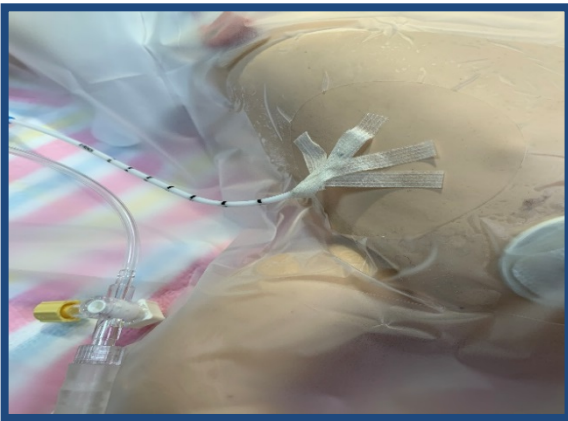
- Using the supplied scalpel blade make a 0.3cm incision through the skin and subcutaneous tissue
- Aim for just above the inferior rib and well below the superior rib to avoid the neurovascular bundle
- Cut along the line of the rib



- Load and lock the catheter
- Supporting the catheter at the skin enter the incision site and apply firm pressure
- Advance into the pleural space 3 - 5cm directing the tip anteriorly as well as superio-medially (aiming towards opposite shoulder) so that the tip lies beneath the anterior chest wall
- Observe the red flash in the catheter mechanism as the catheter moves through the intercostal tissue in sharp mode and back to white when in blunt mode as it arrives in the pleural space



- Withdraw the introducer and connect the ICC to a COOK® chest drain valve
- Release of air may be heard and improvement in observations noted



- Apply steri-strips around the catheter to secure to the skin



- Apply two Tegaderms® to form a mesentery around the catheter to secure the pigtail ICC to the chest wall



- Apply Leukoplast® around the catheter to secure and prevent pull at the insertion site
- Duoderm® should be applied under the Leukoplast® in the < 1,000g neonate

Ongoing Care

- Check the tube position and resolution of the pneumothorax with x-ray
- The need for ongoing analgesia is based on an assessment of physiological and behavioural responses associated with pain. Particular attention should be paid to minimising pain associated with transferring patient into and out of the NETS transport crib by appropriately supporting the intercostal catheter and associated equipment
- Infants requiring an intercostal catheter usually require transfer to an NICU
- Most neonatal pneumothoraxes are due to a primary lung disease (the exception being a baby depressed at birth and given overvigorous resuscitation) and will therefore require ongoing respiratory support as appropriate to their level of respiratory distress with CPAP or mechanical ventilation. Appropriate respiratory support minimises the risk of a contralateral pneumothorax or further deterioration of the patient.

References:

1. Vibede, L., Vibede, E., Bendtsen, M., Pedersen, L., & Ebbesen, F. (2017). Neonatal pneumothorax: a descriptive regional Danish study. *Neonatology*, *111*(4), 303-308..
2. arcia-Munoz-Rodrigo F, Diez Recinos AL, Aponte Contreras O, Perez Matos C, Gutierrez Garcia L, & Garcia Hernandez JA. Influence of gestational age, type of delivery, and resuscitation, on the incidence of pneumothorax in term neonates.
3. *Anales de Pediatría*. 80(3):138-43, 2014 Mar
4. Juárez, S. P., Small, R., Hjern, A., & Schytt, E. (2017). Caesarean birth is associated with both maternal and paternal origin in immigrants in Sweden: a population-based study. *Paediatric and perinatal epidemiology*, *31*(6), 509-521.
5. Shen, A., Yang, J., Chapman, G., & Pam, S. (2020). Can neonatal pneumothorax be successfully managed in regional Australia?. *Rural and remote health*, *20*(3), 5615-5615..
6. Safe-T-Centesis™ - product information

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