GUIDELINE

Pneumothorax and Transillumination

Scope (Staff): Nursing and Medical Staff
Scope (Area): NICU KEMH, NICU PCH, NETS WA

Child Safe Organisation Statement of Commitment
CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Aim
Outline the process for investigating and diagnosing a pneumothorax along with management and associated conditions.

Risk
Failure to appropriately diagnose and treat a pneumothorax can lead to adverse outcomes for the infant.

Background
Air leak into the intra-thoracic space is the most encountered air leak syndrome in the newborn. The incidence of pneumothorax is increased in the presence of underlying lung disease or in association with high tidal volumes during resuscitation/mechanical ventilation, or active expiration during mechanical breaths.

The incidence of pneumothorax has decreased significantly since the introduction of exogenous surfactant.

Pathophysiology
Pneumothorax results from the over distension and rupture of an alveolus, the air travelling up the vascular sheath into the mediastinum and into the pleural cavity. Uneven ventilation and air trapping both contribute to air leak. Air in the mediastinum seldom produces enough tension to cause circulatory embarrassment but when it does, compression of mediastinal structures can impede venous return and cause circulatory collapse. High pressures within the pleural space collapse the lung and result in hypoxia and hypercapnia.
Clinical Presentations

The condition may present as a sudden deterioration in the infant’s clinical state or in the resuscitation room or as marked respiratory distress. There is usually:

- Respiratory distress
- Decreased air entry on the affected side.
- Cyanosis/fall in the oxygen saturations
- Chest asymmetry
- Sudden increase in oxygen requirement in an infant already on respiratory support
- Signs of shock if the pneumothorax is under tension

Investigations

Transillumination

Transillumination of the chest with an intense beam of light is a useful method of making the diagnosis in an emergency. It can be done by any staff member deemed competent or a trainee under direct supervision from a competent staff member. If an abnormal air collection within the chest cavity is suspected, a medical staff competent in needle aspiration of the chest must be contacted immediately to attend the unit. Transillumination is most useful in smaller infants. Large infants require a bright source and very dark room.

Equipment

- High intensity fibreoptic cold light source (transilluminator).
- Cardiopulmonary monitoring.
- Blood pressure monitoring.

Procedure

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<th>Steps</th>
<th>Additional Information</th>
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<td>1. Lower the lights in the room</td>
<td>This allows hyper-lucent areas to be seen if present. If unable to lower the light, a large covering may be required over the practitioner and infant</td>
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<td>2. Place the transilluminator along the posterior axillary line on the side on which the air collection is suspected.</td>
<td>The transilluminator may be moved up and down along the posterior axillary line and above the nipple to detect any areas of increased transmission of light</td>
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<td>3. Place the transilluminator in the third or fourth intercostal space on the left midclavicular line and angle the light towards the xiphoid process to detect any areas of increased transmission of light.</td>
<td><img src="image1.png" alt="Image" /></td>
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<td>4. Transillumination should be done on both sides of the chest to give a comparison.</td>
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- **A false-positive** result may occur with pulmonary interstitial emphysema and pneumomediastinum.
- **A false-negative** result may occur in infants with a thick layer of subcutaneous fat or oedematous infant. A bright room and weak light source also produce a false negative result.

**Chest X-Ray**

Confirmation by X-ray only if the infant is stable. If the infant is unstable, immediate draining of air is imperative.

| X-Ray of an infant with large pneumothorax; in addition to the air in the pleural space and collapsed lung on the right side there is a flattening of the diaphragm and shift of the mediastinum to the opposite side. | ![Image](image2.png) |
Management

- Small pneumothoraces may require no specific treatment apart from observation including progress X-rays and blood gases as clinically indicated.

- A larger pneumothorax may be aspirated on one occasion with a needle and 3-way tap attached to a syringe. Refer to Needle Aspiration of the Chest.

- A tension pneumothorax is likely to require insertion of an intercostal catheter with an underwater seal. Waiting for a chest x-ray when the infant is deteriorating can be fatal, therefore aspiration should happen immediately after transillumination, if transillumination is positive.

- If the baby is not deteriorating, wait for a chest x-ray as it can help with positioning of the intercostal catheter. Refer to Intercostal Catheter (ICC) Insertion and Management.

X-ray post insertion of intercostal catheter on the right side.

**Note:** Intubating an infant when it is known to have a pneumothorax can result in further deterioration because positive pressure ventilation will increase the air leak and place it under tension. Drain the air first to stabilise the infant and then intubate under controlled conditions.

**Associated Air Leak Syndromes**

Pneumomediastinum, pneumopericardium and pneumoperitoneum may all also occur in combination with pneumothorax. Pneumopericardium and pneumomediastinum occasionally present as emergencies under tension requiring urgent intervention.

Pneumopericardium is a rare form of air-leak syndromes associated with increased morbidity and mortality. It usually occurs in association with other air leaks (pneumothorax and pneumomediastinum). The clinical presentation of pneumopericardium can range from an asymptomatic neonate to one with life-threatening cardiac tamponade. Neonates can present with any or a combination of following findings such as hypotension, hypoxemia, bradycardia, and muffled heart sound. The classic radiographic finding in pneumopericardium is the “halo” sign, which appears as a continuous radiolucent band of air that outlines the heart and extends to the level of the great vessels.

The outcome of pneumopericardium when it causes circulatory collapse is invariably fatal unless the air is drained immediately by simple pericardiocentesis. If any signs of circulatory collapse are present, please call the on-call consultant and an urgent cardiac review needs to be attended.
Pneumothorax and Transillumination

Related CAHS internal policies, procedures and guidelines

Intercostal Catheter (ICC) Insertion and Management.
Needle Aspiration of the Chest
Surfactant Therapy

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Standards Applicable:
- NSQHS Standards: 📚📚📚
- Child Safe Standards: 1,10

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