

“Deep Breath: A Very Complicated Pneumonia”

April 19th, 2024

Learning objectives:

- **Indications for chest tubes**
- **Ventilation in a sedated patient with chest tube**
- **Sedation and paralysis of intubated and ventilated patient on the ward**

Case:

- 6-year-old boy
- Term infant, previously healthy
- No regular meds, no known allergies
- Immunizations up to date (No covid or flu)
- No significant family history
- Lives locally in medium sized center.

Presented with 8 days of upper respiratory tract infection’ (URTI) symptoms. Initially improved but then presented to the emergency department with tachypnea, low energy, saturations of 88% and increased work of breathing. X-ray was concerning for pneumonia. Pediatrics consulted and admitted for treatment of bacterial pneumonia.

INITIAL MANAGEMENT:

Improvement for 2 days then developed fevers, worsening respiratory distress despite high flow. Repeat chest x-ray (CXR) showed signs of empyema and developing tension pneumothorax. Patient required intubation and chest tube placement and drain. Ventilated and sedated on the ward until able to transport to BCCH via Infant Transport Team (ITT).

Learnings:

Indications for chest drains in children remain clinical (work of breathing or source control) and are not purely on the size of the pleural effusion or if there are loculations.

Addressing ABCs – in this case the child was (appropriately) intubated prior to addressing the pleural effusion (chest tube insertion).

Important to dress the chest tube securely particularly with consideration of subsequent transport. ITT recommends at least three points of fixation.

Bigger is not necessarily better with regard to chest tubes. Chest tubes should be flushed regularly (q12hrs) with normal saline and tPA may be used in appropriate cases.

Chest tubes are *painful* – ensure adequate sedation and analgesia.

Typical intravenous sedation and analgesia would be midazolam and morphine (for an intubated patient). Muscle relaxants (such as rocuronium) are used intermittently to ensure airway safety, but only in a well-sedated patient.

The optimal location to look after an intubated child awaiting transport is site-specific; typically, wherever the care providers are most comfortable and able to do their job best.

Ventilation Tips from April PCCL Session (Alyssa Hawley RRT)

<ul style="list-style-type: none"> • Lower PEEP strategy (as a lung protective measure and preserves V/Q matching in unaffected lung) • Higher FiO₂ to compensate. • Low VT strategy (4-6 ml/kg) (especially in unilateral consolidation) • Goal Ppeak <30cmH₂O. Permissive hypercapnia if needed. • High RR to compensate 	<ul style="list-style-type: none"> • Higher PEEP strategy (help optimize lung recruitment, minimize VILI with an open lung approach) • Lower FiO₂ to prevent oxidative stress. • Start with 6-8 ml/kg. If the patient meets <u>PARDS criteria</u>, lower target VT. • Goal Ppeak <30cmH₂O. Permissive hypercapnia if needed. • Higher RR to compensate for lower VT
Chest Tube / Active Air Leak Considerations	
<ul style="list-style-type: none"> • Minimize ventilation pressures (PIP and PEEP) to limit damage and help with tissue healing. • Reassess for auto-triggering frequently. Minimize auto-triggering due to air leak by increasing flow required to trigger or switching to pressure trigger. • Ensure ventilator can cycle to exhalation, as active air leak increases the risk of failure to cycle. If you are using a mode with supported breaths, ensure cycle sensitivity is set at least 5% above the measured leak %. When in doubt, switch to a controlled mode. The ventilator will then automatically cycle after the set Ti. 	

Resources:

[Management of Pleural Effusions in Pediatrics](#)

[Troubleshooting Chest Drains](#)

[Chest Tube Removal](#)

[Chest tube care and Management](#)