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Anesthetic Management of Clamshell Thoracotomy for Large Tumor

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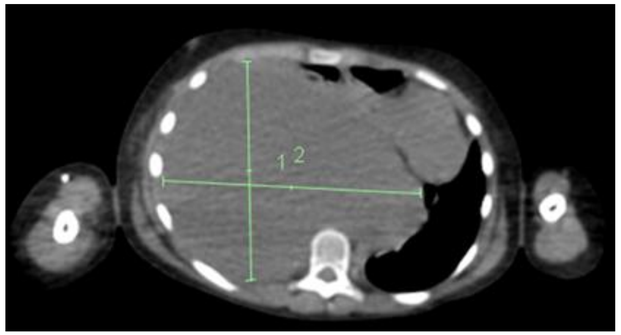
Case Introduction

- We present a 12-year-old male, 46 kg, who presented to the OR for a large thoracic mass excision via clamshell thoracotomy. This case highlights the successful anesthetic care for a fragile pediatric patient undergoing a high-risk open excision for a large tumor.
- A week prior to surgery, our patient presented to an outside hospital with worsening cough and fatigue, and found to be positive for flu. His CXR showed complete "whiteout of right lung."
- At that visit, the patient's mom endorsed the patient had shortness of breath and difficulty lying flat.
- Outside CT revealed a large right-sided chest mass with complete collapse of the right lung, mass effect on heart and IVC, and extension into T6-T7 neural foraminal canal.
- His SpO2 was in the low 90s on RA, and he was started on oxygen via nasal cannula.
- He was transferred to Children's Mercy for further evaluation and potential treatment.



Picture 1: Pre-op CT chest of mediastinal mass

Pre-operative Planning

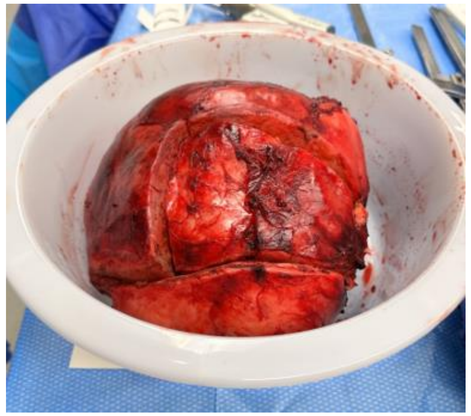
- **Pre-operative Studies:**
- Echocardiogram – Difficult study due to anterior and left shifted heart. Moderate atria and IVC compression, normal LV systolic function, distal PAs not seen (RPA compressed on CT), normal RV pressure
- Mass biopsy and PICC line placement in IR
  - Successful anesthetic - Spontaneously breathing with Ketamine and Dexmedetomidine
- PET scan confirmed presence of large intrathoracic tumor without metastasis
- Biopsy revealed a desmoid tumor. Given the size and life-threatening progress of the disease, surgical resection was required.
- **Anesthetic Concerns**:
- The patient has a large thoracic mass that completely collapses the right lung, and has significant mass effect on heart, IVC, and airway structures.
- Anesthetic induction could lead to loss of awake patient's compensatory mechanisms, causing:
  - Shifting of mass with positional changes, worsening compression
  - Loss of airway patency with relaxation
  - Increased intrathoracic pressure with decreased venous return to heart with positive pressure ventilation
- Surgical manipulation could also have adverse effects, including:
  - Hemorrhage
  - Changes to compression/mass effect
- **Interdisciplinary Huddle:**
- Given the patient's high risk of pulmonary and hemodynamic collapse, an interdisciplinary meeting with cardiac surgery, general surgery, anesthesiology, and perfusion took place.
- Determined that femoral bypass cannulas would be placed prior to induction of anesthesia.
  - Due to risk of hemorrhage with heparinization, goal was to only use bypass as a life-saving measure
- Discussed induction plans including awake fiberoptic intubation, and determined a single-lumen, reinforced tube would be suitable.
- Brachial plexus neuromonitoring planned with neuromonitoring team.

Anesthetic Management

- Physical exam on day of surgery revealed an anxious adolescent boy with labored breathing, sitting upright in bed, slightly rotated to right side.
- Premedicated with IV versed in holding, with blowby oxygen in place.
- Positioned patient while awake, and sedated with fentanyl, ketamine, and dexmedetomidine, for pre-induction bypass cannulae and line placement.
- Lines placed: Left Radial arterial line, 18 g x 2 and 20 g Ivs, R femoral arterial sheath, and L femoral venous sheath.
- Proceeded with airway management. Planned for fiberoptic intubation while maintaining spontaneous ventilation.
- Anesthetized airway with inhaled 3 mL inhaled 4% lidocaine and transtracheal block with 2 mL of 2% lidocaine. (100 mg total dose)
- Successfully placed a 6.5 cuffed, reinforced endotracheal tube
- Attempted to place in L mainstem bronchus, but challenging due to airway anatomy distortion from mass.
- Maintenance of anesthesia: Propofol and Remifentanil infusions
- Methadone bolus and ketamine infusion for analgesia; Tranexamic Acid infusion for antifibrinolysis
- Carefully moved patient to supine position and then bumped slightly to left.
- Transitioned patient's breathing from pressure support to controlled ventilation, which was well tolerated.
- Clamshell thoracotomy performed at 4th intercostal space, sternum divided
- Significant changes in venous return with mass manipulation, likely due to IVC compression
  - Responded to epinephrine, volume, and communication with surgeons
- R lung began to inflate with open chest and reduction of mass effect
- The tumor was divided into three sections for removal. Once the tumor was removed, the R lung fully expanded and filled the R chest cavity
- Mass had to be transected at the T6 neural foramen. Appeared invasive at this point.
- After successful resection of the mass, the patient's chest was close, and bilateral ESP catheters were placed for pain control.
- Blood loss 1500 ml, received 3 units of PRBCs
- The patient remained intubated and sedated, and was taken to the PICU.

Follow-up and Discussion

- The patient did very well, without need for cardiopulmonary bypass intraoperatively. He was extubated on post-op day 1.
- He was followed closely by the acute pain team. His pain was well managed with his ESP catheters, hydromorphone PCA, ketamine, and adjuvants.
- His ESP catheters were removed on day 6 and he was discharge to home on day 7. He has since followed with the pain service and surgery, and is doing well!



Picture 2:

Mediastinal mass

UMKC School of Medicine

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Children's Mercy Kansas City