

Title: Cervical cord obstruction, bronchial compression: which should be fixed first?

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Goals: At the end of the discussion, the participants should be able to:

1. Exemplify the role of anesthesiologist as a perioperative physician in developing patient management plan and facilitating its implementation
2. Identify causes and provide treatment of acute intraoperative desaturation and inability to ventilate the patient, particularly when the child is prone and position has been adjusted.
3. Organize diagnostic evaluation of acute position dependent airway obstruction and initiate multidisciplinary discussion to prioritize surgical procedures
4. Formulate anesthetic and airway management plan for a child with bronchial obstruction requiring urgent cervical spine decompression.

Case Description:

An 8 year-old boy with right arm weakness presents for brachial plexus and cervical MRI. His medical history is significant for chronic bronchitis, on examination breath sounds are clear. Uneventful sedation with propofol, MRI reveals a large mass compressing cervical spine.

Patient transferred to OR for cervical decompression. After uneventful induction and intubation, additional IV access and arterial line placed. Patient turned prone, reverse Trendelenburg position applied, followed by sudden increase of airway pressure, difficult ventilation and profound desaturation. Breath sounds are absent on the left. The endotracheal tube position unchanged. Suction applied but no apparent obstruction noted. Table returned to neutral, hypoxemia resolved. Flexible bronchoscopy (FOB) attempted in prone position, unsuccessful. Pulmonologist consulted, FOB in supine position reveals mild left bronchomalacia. CT/Angiogram shows a left main bronchial compression between descending aorta and left pulmonary artery.

Our discussion will focus on common and unusual causes of acute inability to ventilate the patient; review diagnostic and therapeutic modalities for patient with bronchial obstruction (mass vs. vascular); the pros and cons of having cervical vs. bronchial decompression first; techniques of ensuring airway patency in a prone position with particular attention to bronchial stenting, lung separation and independent bilateral ventilation in children.

Model Discussion:

Preoperative course:

Patient is an 8 year old boy who presented for brachial plexus MRI due to progressive weakness and atrophy of the right arm. His medical history is significant for asthma and frequent respiratory infections. In fact, he is recovering from one now and still has mild residual cough. On physical examination, lung sounds are clear, café-au-lait spots noted on torso. The height is 4' 11", weight is 97 lb. Total intravenous anesthetic (TIVA) with propofol provided, patient has an uneventful MRI course. The scan appears to be normal; the child is still asleep.

Should we wake up the kid since the study is completed? Should further work up be done to find out the cause of symptoms? What will be our role in facilitating the work up? What are the differential diagnoses? Should a cervical spine MRI be done?

The MRI of the neck and cervical spine reveals a large posterior mass compressing cervical spine. Neurosurgeon is consulted, patient is scheduled to have surgery the following morning.

Next morning in the holding area: patient is anxious, but no new symptoms are noted. Vital signs are stable. Patient receives preoperative sedation with midazolam. Once sedation takes effect patient is transported to operating room and placed on operating room table.

Intraoperative course:

Routine monitors placed, normal sinus rhythm at 83, oxygen saturation 95%, blood pressure 94/56. Intravenous induction with propofol and muscle relaxant, easy bag mask airway, positive pressure initiated with 100% oxygen, endotracheal tube inserted without difficulty. Breath sounds clear and equal bilaterally. Arterial line inserted. Then patient is turned into prone position, equal clear bilateral breath sounds confirmed. Surgical field is prepped and draped. General anesthesia maintained with 60% of air and oxygen mixture and 2.4 % of sevoflurane. Patient's oxygen saturation remains at 100%. Surgeon requests to adjust the OR table into reverse Trendelenburg position to optimize surgical exposure. The peak airway pressure acutely increases, patient's oxygen saturation is now down to 80% even on 100% oxygen.

What should be done? How do you examine the patient in this position? What is the differential diagnosis? Light anesthesia vs. change of the endotracheal tube position vs. bronchospasm? Hand ventilation results in minimal chest movement. What should be done next? Sevoflurane now is up to 6% with 6 L/min oxygen and OR table is leveled. The patient is turned supine, lungs suctioned, copious secretions removed. Breath sounds are equal and clear. Oxygenation improves to 100%. The working diagnosis is bronchospasm induced by light anesthesia. As the patient remains stable, the decision is made to proceed with the planned surgery. Patient is

turned prone and has two recurred episodes of difficult ventilation and desaturation once in the prone reverse Trendelenburg position. On examination, breath sounds are decreased on the left.

Is it endobronchial intubation? Should the ETT be pulled back? Have we missed something? Should the planned surgery continue or not? What should we do? Flexible bronchoscopy performed, revealed a pulsatile compression of the left main bronchus. What is the differential diagnosis? Is additional work up needed? Why/why not? Would the patient need another surgery to relieve bronchial obstruction? What can be done to optimize the patient?

The decision is made that if neurologic status remains unchanged, postpone the surgery for a few days and a course of antibiotics, mucolytics and bronchodilators to treat the cold/congestion. The patient is rescheduled to return for removal of cervical mass in the spine.

What are the anesthetic considerations to prevent the recurrence of desaturation associated with position changes during surgery? What are the options to maintain bronchial patency in prone position?

Patient returned for surgery, routine monitors, uneventful anesthetic induction, an arterial line was placed. Uncuffed endotracheal tube is modified by cutting a side hole above the double mark and the tube is placed into left main bronchus over the fiberoptic bronchoscope, position of the side hole aligned with the right main stem bronchus. ETT secured in place, patient turned prone. ETT position and alignment verified. Procedure completed without a problem, patient extubated.

References:

1. Goldman SA, Rimell FL, Meza MP, Newman B. Diagnosis and management of left main stem bronchus compression Ann Otol Rhino Laryngol 1997, 106: 461-5
2. McLaren CA, Elliott MJ, Roebuck DI. Vascular compression of the airway in children Pediatric Respir rev 2008, 9: 85-94.
3. de Graaff JC, Biiker JB, von Wolfwinkel L, Zuithoff NPA, Kalkman CJ. Incidence of Intraoperative Hypoxemia in Children in Relation to Age. Anesth Analg 2013, 117: 1169-175.
4. Hammer GB, Fitzmaurice BG, Brodsky JB. Methods for Single-Lung Ventilation in Pediatric Patients Anesth Analg 1999;89:1426-9
5. Main EA, Brook D. The ins and outs of pediatric airway stents. Oper.Tech, Otolaryngo -Head and Neck Surgery 2001; 12:178-186.