

Title: Cardiovascular collapse in a patient undergoing single lung ventilation

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ABSTRACT BODY:

Introduction: One lung ventilation (OLV) to facilitate surgery in the thoracic cavity is rapidly becoming popular¹. Thoracoscopic anterior spinal fusion/release is a relatively newer approach to spine surgery in children where the decreased postoperative pain and smaller surgical scar are the advantages. We present a case of cardiovascular collapse shortly following re-expansion of the collapsed lung in a teenage child who was otherwise healthy.

Case Presentation: 15-yr old, 67kg healthy male with idiopathic scoliosis (85 degree thoracic curve) was scheduled for correction of scoliosis by combined anterior thoracoscopic spinal release and a posterior spinal fusion with instrumentation. Medical history was negative for allergies and medications. Induction of anesthesia included propofol, sufentanyl and rocuronium. Cefazolin Sodium was given intravenously. Trachea was intubated with 7.0-cuffed ETT. A 7.0 Fr Arndt endobronchial blocker was placed fiberoptically into the right main stem bronchus. Following placement of arterial line and two large bore IVs as well as electrodes for somatosensory and motor evoked potentials; patient was turned to prone position. Both anterior spinal release and posterior spinal fusion were to be performed in the prone position. Anesthesia was maintained by total intravenous anesthesia using infusions of propofol and sufentanyl with intermittent addition of remifentanyl infusion when necessary. Initially a partial pneumothorax was induced to facilitate collapse of the lung on the operative side with insufflation of CO₂ to a pressure of 6 mm of Hg. Following 45 minutes into the procedure hypercarbia occurred, as evidenced by arterial blood gas of pH - 7.14, PaCO₂ - 84 mm of Hg. Mild hypotension occurring simultaneously had been treated with 5% albumin and two small doses of ephedrine. At this time thoracic insufflation of the lung was stopped and right lung was collapsed by inflating Arndt endobronchial blocker balloon. Surgical procedure continued for the next 50 minutes while the anterior release was being completed. One episode of oxygen desaturation to 80's to 90's occurred which was treated with albuterol and re-positioning the blocker under fiberoptic guidance. The right lung was re-inflated at end of anterior spine release, which lasted roughly 150 min. Serial blood gases revealed a physiologically stable patient and the second portion of the surgery, posterior spine fusion started. **Cardiovascular collapse:** Approximately 100 min into posterior spinal fusion patient experienced sudden acute hypotension to systolic blood pressure 45-50 mm of Hg, desaturation to 70-80's, and difficulty in ventilation with acute rise in peak inflating pressures. Two rounds of epinephrine (1mg x2) were given IV while simultaneously turning patient supine. Anesthetic agents were minimized and fluids were liberalized. A mild urticaria was noted once drapes were removed and supine position resumed. Quick response to epinephrine was noted by rise in heart rate, blood pressure and ease of ventilation. No chest compressions had been initiated as the blood pressure was quickly returning to acceptable levels. No blood or blood products had been initiated except for a total of 3 units (750 ml) of 5% albumin. Patient was further treated with albuterol via ETT and steroids, as well as transfusion of 1 unit of autologous blood. The total blood loss during the surgery was 800 ml. Intraoperative CXR showed no signs of mediastinal shift, pneumothorax or fluid overload, and chest tube had minimal aspirate on suction. A blood sample had been drawn for serum tryptase level. Decision was made to postpone the posterior spine fusion and upon closing the incision patient was transferred to PICU. **The 'Tryptase' level was reported as 25.2 ng/ml (normal range 1.9 – 13.5). There was no eosinophilia; and C3, C4 and IgE levels were within normal levels.** A diagnosis of possible anaphylaxis/anaphylactoid reaction was made.

Postoperative course: Trachea was extubated the first postoperative day. He returned 5 days later for completion of his posterior spine fusion with instrumentation. Choice of anesthetic remained essentially the same as during his anterior spine procedure except for pre-treatment with hydrocortisone and benadryl IV. Anesthetic course was unremarkable with an uneventful recovery. A return visit 3 months later to 'Allergy and Immunology' clinic for further work up revealed the following: RAST and skin test negative for latex and 5% albumin.

Discussion: The quick and obvious diagnosis here would be an intraoperative process leading to 'degranulation of mast cells' releasing tryptase, followed by severe cardiovascular instability. While anaphylaxis or anaphylactoid reaction would be highly suspect for the event, the possibility exists that the patient had surgical event involving the lungs (collapse and manipulation of right lung) which are rich in mast cells leading to a mechanical degranulation of mast cells, with tryptase being released into the circulation once the collapsed lung had been re-expanded. The negative work up for immune mediated allergic reaction renders the possibility of direct damage and 'mechanical degranulation' more definitive.

Reference: (1). Single-lung ventilation in pediatric patients. *Anesthesiology* 1996; 84: 1503-6