

MANAGEMENT OF POST-EXTUBATION BRONCHOSPASM



ALICIA SPEER, SAA, IUSM, ZACHARY COHEN MD
Indiana University School of Medicine and Indiana University Health, Indianapolis, Indiana



Indiana University Health

LEARNING OBJECTIVES

The learning objectives of this case presentation include narrowing down differential diagnoses that may present similar to a bronchospasm, the successful management and treatment of a bronchospasm, and preventing bronchospasm in patients following extubation.

PREANESTHETIC EVALUATION

A 66 y/o 52 kg male 1/4 ppd current smoker presented to the OR for bilateral common femoral and deep femoral endarterectomy and right axillary-femoral bypass. Patient was appropriately NPO with NKDA. Past medical history included prostate CA, esophageal CA s/p radiation, chemotherapy and esophagectomy in 2017, chronic pain with opioid dependence, peripheral vascular disease, hyperlipidemia, and cachexia. Past surgical history included endoscopy, colonoscopy, J tube placement, and modified esophagectomy. His at home medications included atorvastatin, ferrous sulfate, gabapentin, oxycodone, Vitamin D3, and Xarelto.

During the physical exam, breath sounds and heart tones were found to be normal. Preoperatively, the patient's vitals were HR 102 bpm, BP 137/89 (98), Sat 95% on RA, and Temp 37.4. Patient was a MP 2 with FROM, TM >3 FB, and had poor dentition with mostly missing teeth. Patient noted poor functional capacity endorsing fatigue with walking. The patient's anesthetic history was unremarkable, and all questions were answered.

Previous EKG showed normal sinus rhythm. Patient presented to the ED 9 days prior d/t SOB and chest x-ray indicated hyperinflated lungs and a flattened diaphragm. Preop BMP was Na+ 136, K+ 4.3, Cl- 104, CO2 24, BUN 22, Cr 0.75, Glucose 110. Recent CBC was WBC 15.2, Hgb 12.5, Hct 37.7%, Plt 277.

ANESTHETIC PLAN

The plan for this patient was to perform a general anesthetic with an endotracheal tube. We planned on using a McGrath 3 blade, stylet, and a 7.5 endotracheal tube.

The patient had a pre-existing 22 G right antecubital IV. After induction, a left radial arterial line was planned to be placed for blood pressure measurements and ABG / ACTs. A right internal jugular central venous line was planned to be placed for central venous pressure monitoring, the possible need for caustic vasopressors, and fluid resuscitation.

250 mcg of fentanyl, 120 mg of propofol, and 100 mg of rocuronium were used to induce. Sevoflurane was the volatile anesthetic used in this case.

INTRAOPERATIVE COURSE

Standard ASA monitors were placed. The patient was supine and adequately preoxygenated. It was decided to avoid bag masking for covid precautions. Prior to induction, a phenylephrine infusion was started at 80 mcg/min. After induction medications were given, the McGrath 3 was used and resulted in a grade 1 view. FiO2 was maintained at 100% throughout the case. 2 g of cefazolin were given prior to skin incision.

Following induction, the L radial arterial line was placed, the 8.5 Fr quad lumen CVL was placed in the R IJ, and the 22 G R AC IV was removed. The phenylephrine infusion and Plasmalyte were redirected into the CVL.

Baseline ACTs and ABGs were taken. The surgery began as an endovascular approach and the patient was adequately heparinized with 7,000 U of heparin to an ACT of 255. Subsequent ACTs were taken every 30 minutes and ABGs were taken every hour. During the procedure, the patient's calcified vasculature caused the sheaths to kink, and the surgeon was unable to pass wires and catheters. The surgery team then changed plans and instead proceeded with a right axillary to bifemoral bypass.

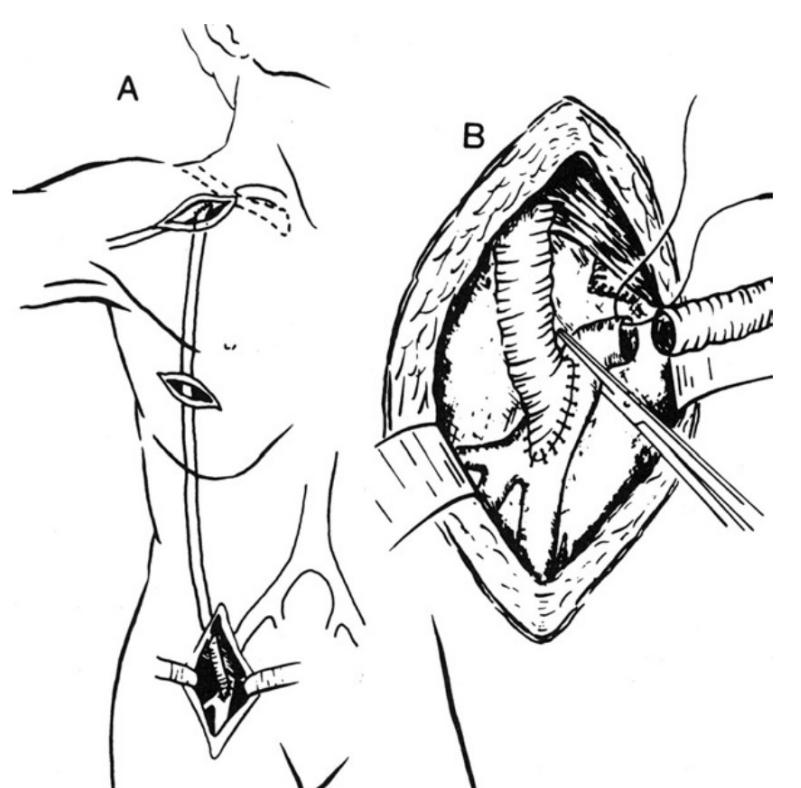


Figure 1. Incisions made for the right axillary to femoral bypass.

During the procedure, another 250 mcg of fentanyl was given and all ABGs and ACTs were normal. 50 mg of protamine were given upon surgeon request. The patient was found to have a TOF 2/4 and 200 mg of Sugammadex was given prior to extubation and TOF 4/4 was noted after administration. 250 mcg of fentanyl was incrementally titrated to bring the respiratory rate from 18 br/min to 8 br/min.

The patient met extubation criteria and was extubated. Immediately following extubation, the patient was extremely agitated. He was transferred over to his ICU bed and connected to the transport monitor. The patient had severe SOB with an increased work of breathing. Upon auscultation, there was significant wheezing, stridor, and breath sounds were bilaterally distant.

INTRAOPERATIVE COURSE

SpO2 dropped to 70s and the patient was started on 6 L/min of O2 via nasal cannula. An additional 200 mg of Sugammadex was administered. An albuterol nebulizer was administered until an albuterol inhaler was available. The patient received 30 puffs of albuterol. Respiratory distress somewhat resolved, and saturations returned to the mid 90s. The patient was transported to the CVICU in critical but stable condition.

RESULTS

The patient was successfully transported to the CVICU where an ABG was taken upon arrival. Results indicated pH 7.35, PCO2 42, PO2 75, BE -2, Bicarb 23, O2 Sat 94%, Hgb 7.8, Hct 23%. A chest x-ray was taken shortly after arrival.



Figure 2. Chest x-ray of patient from 9 days prior to surgery indicates flattened diaphragm and hyperinflation. Linear opacity in L lung may show atelectasis or pleural thickening.

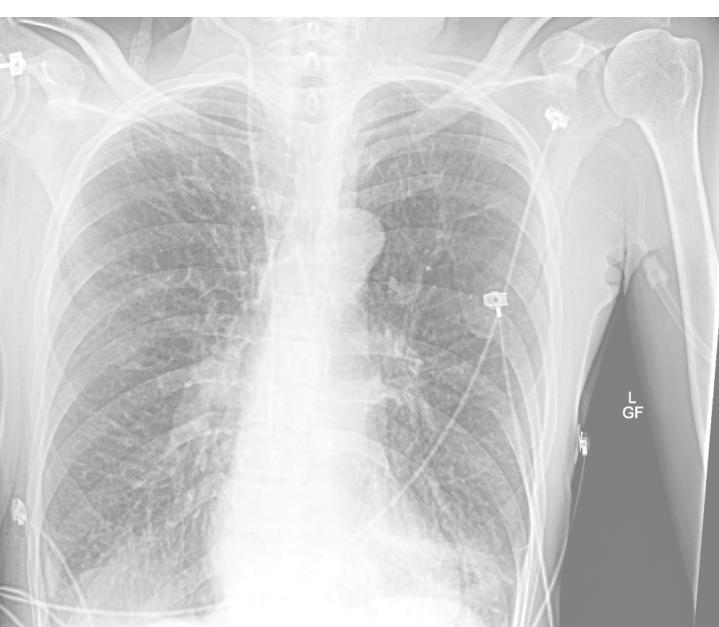


Figure 3. Chest x-ray of patient immediately following surgery indicates coarse opacities in both lungs. COPD is likely. Subsegmental atelectasis is present. CVL is seen in R IJ. No pneumothorax is present.

DISCUSSION

There were a few differential diagnoses that were able to be made in this case. A pneumothorax was on the differential because of the surgeon's proximity to the pleural cavity with the superior incision and the central line placement. Because breath sounds were symmetrical, this was ruled out and confirmed following the chest x-ray. Residual neuromuscular blockade was considered. The additional dose of Sugammadex was given to ensure complete reversal. The patient was able to sit up and follow commands when prompted.

DISCUSSION

Bronchospasm was immediately considered. Individuals with reactive airway disease are more prone to this event. Upon extubation, this can be triggered by secretions, aspiration, and suctioning. These events cause the afferent sensory fibers in the Vagus nerve to stimulate the nucleus of the solitary tract which in turn stimulates efferent fibers in the Vagus nerve to contract the smooth muscle surrounding the bronchioles resulting in bronchospasm. This increase in airway resistance in the spontaneously breathing patient, presents as labored breathing with use of accessory muscles.

To manage a bronchospasm, the patient should be on 100% FiO2 and given a bronchodilator. Most often, a beta-2 agonist such as albuterol is given to relax bronchiole smooth muscle. Epinephrine can also be given in 10 mcg intervals to assist with circulatory collapse as well as bronchodilation. In this case, the nebulized and inhaled albuterol were able to stabilize the patient, but reintubation was considered.

Prevention in this patient could have been achieved through optimization. Due to chronic smoking, he likely would have benefited from preoperative inhaled bronchodilators. A deep extubation could have been considered to avoid the stimulation of extubation and suctioning. A more detailed history of the patient's pulmonary function and symptoms could have been taken to predict risk. An anticholinergic such as IV glycopyrrolate could have been given for bronchodilation and reduction of secretions.

SUMMARY

In summary, bronchospasm should have been high on our differential due to the patient's chronic smoking history and his likely COPD. The preoperative chest x-ray could have indicated the likelihood of a pulmonary event during airway manipulation. Anticipating these events based on the patient's comorbidities can assist in avoiding complications.

REFERENCES

- 1) Gropper, M., Miller, R., Eriksson, L., Fleisher, L., Wiener-Kronish, J., Cohen, N., & Leslie, K. Miller's Anesthesia, 2-Volume Set E-Book.
- 2) Fleisher, L., & Rosenbaum, S. *Complications in anesthesia* (3rd ed.).
- 3) Gaba, D., Fish, K., Howard, S., & Burden, A. (2015). *Crisis management in anesthesiology* (2nd ed.). Elsevier/Saunders.
- 4) Freeman, B., & Berger, J. *Anesthesiology core review*.
- 5) Blaisdell, F. (2011). Development of femoro-femoral and axillo-femoral bypass procedures. *Journal Of Vascular Surgery*, 53(2), 540-544.

<https://doi.org/10.1016/j.jvs.2010.06.018>