

Anaphylaxis in the Operating Room: A Case Report

Jonny Kentros, MD

Baptist Health System Surgery Residency Program

Introduction

Anaphylactic reactions in the OR are a common occurrence. Anaphylaxis is an acute, multisystem, potentially lethal syndrome due to the rapid release of basophil and mast-cell derived mediators into the bloodstream due to a perceived outside pathogen. Typically the most common reason for anaphylaxis in the OR are muscle relaxants, however, the incidence of intraoperative anaphylaxis due to latex is increasing. The operating room setting is unique in the practice of medicine in that many different drugs are given in rapid succession and any one of these drugs can produce potentially life threatening anaphylaxis. Because of the large number of drugs given over a relatively short time, it is not always clear which drug patients is the cause of the patient's reaction when they occur.

Case Description

A 64-year-old black female with a history of multiple small bowel obstructions which have been surgically corrected presented with sudden onset abdominal pain with dry heaving. According to her daughter, she started to have sudden-onset abdominal pain in her upper quadrants and on the left side starting at 2:00 p.m. that day. Her daughter came home at 4 p.m. and upon finding the patient, immediately brought her to the emergency room. The patient said that she was dry heaving but did not actually vomit. She also says that, as far as she knows, her bowel habits have been normal. During her ER workup, the patient had a seizure in the ER witnessed by the ER physician. She has no history of seizures and this is her first episode. She then had a CT of her head performed which showed no focal intracerebral lesion, mass effect, hemorrhage, extracerebral collection or other acute process. Her white count was 14.8 and her CT scan showed dilated small bowel in the mid and upper abdomen with stranding, free fluid, questionable intussusception of a small portion of the colon, a true hernia, and a small amount of bowel edema. These findings were consistent with a mechanical small bowel obstruction. She was given Ativan in the ER for her seizure. The patient had known allergies to sulfa drugs, penicillin and ancef. According to patient's daughter, the

patient also had a heart attack in the OR after administration of ancef during one previous operation.

The patient's past medical history was significant for chronic obstructive pulmonary disease, hypertension, diabetes mellitus type II, diverticulosis, and obstructive sleep apnea. The patient's past surgical history was significant for a Hartmann's procedure, a Hartmann's procedure reversal, multiple exploratory laparotomies for small bowel obstructions, and multiple hernia repairs with mesh, the most recent in 2009. Her current medications included Calan, Claritin, Aspirin, Advair, K-Dur, Zestril, Zocor, Hydrochlorothiazide, Norvasc, Clonidine, Proventil. The patient denied alcohol, tobacco or illicit drug use. Physical exam was significant for tenderness to palpation in the left lower and upper quadrants. Her abdomen was non-distended, soft and had normal bowel sounds. The rest of her physical exam was normal except for the fact that the patient was drowsy due to her postictal state.

Upon admission a nasogastric tube was placed stat which immediately had 200cc output. She was made NPO and scheduled for the OR for the following morning for an exploratory laparotomy. The following morning the patient was taken to the operating room and placed in supine position. Once adequate general endotracheal anesthesia had been obtained, the patient's abdomen was prepped and draped in sterile fashion. A midline incision was made with a 10 blade scalpel, and this was extended through subcutaneous tissues using Bovie electrocautery. The fascia was divided midline with Bovie electrocautery. Upon entry into the abdomen, there were dense adhesions with bowel that stuck to the abdominal wall. Shortly after entry into the abdomen, the patient became hypotensive. The hypotension was initially responsive to fluid, but after a short time, the patient became extremely unstable and was placed on epinephrine and levophed. Her systolic blood pressure was in the 50s, and it was elected to stop the case to stabilize the patient. We were ultimately able to free some adhesions with some loops of small bowel but were unable to do a full exploration. The fascia was closed using a running #1 looped PDS followed by closure of the skin with skin staples. The patient was

left intubated postop. She was then treated for her shock and transferred to the ICU for further treatment.

After transfer to the ICU, the patient's blood pressure was stabilized with the SBP ranging from 100-110. The patient was very edematous and swollen all over. Over the course of the 3 days, the patient was weaned off of pressors and was able to be weaned off of the ventilator over the next week. She was not taken back to the OR and the small bowel obstruction eventually subsided with conservative supportive management. The rest of her hospital stay was uneventful and she was discharged on post-op day 11.

Discussion

Anaphylactoid reactions remain a major cause for concern and debate among anesthesiologists. The true incidence and cause of anaphylactoid reactions as well as their associated morbidity and mortality continues to remain poorly defined. Death or permanent injury from anaphylactic reactions may be avoided if they are recognised early enough and managed appropriately, however, this is difficult in the OR setting because the common features such as hypotension and bronchospasm typically have other causes. The patient is also typically draped so a full physical assessment is often difficult.

The term anaphylaxis has been used for many types of acute reactions triggered by hypersensitivity to an agent. Anaphylaxis is defined by the EAACI nomenclature committee as "a severe, life-threatening generalized or systemic hypersensitivity reaction". (1) Anaphylaxis has been further defined by this committee as either allergic anaphylaxis or non-allergic (or anaphylactoid) reactions. Allergic anaphylaxis should be used only when the reaction is mediated by an immunological mechanism such as IgE, IgG, or the complement cascade. Anaphylactoid reactions on the other hand, are defined as reactions that produce the same clinical picture as anaphylaxis but are not IgE mediated.

The majority of the studies surrounding intraoperative anaphylaxis come from Europe, the USA and Australia. Incidences vary. One report in Australia found incidences of

between 1 in 5,000 and 1 in 25,000 general inductions with a mortality rate of 3.4%¹. A further study also performed in Australia found the incidence of anaphylaxis to be between 1 in 10,000 and 1 in 20,000¹. There have been a few other studies performed since 1980s and all of them have incidences roughly between 1 in 5,000 and 1 in 20,000 with mortality rates ranging between 3-6%.

Many agents are used during induction of general anesthesia. Muscle relaxants (such as Succinylcholine, atracurium, vecuronium, pancuronium), induction agents, (such as barbiturates, etomidate, propofol) Narcotics (such as fentanyl, meperidine, morphine), colloids, antibiotics, radiocontrast, blood products, and latex are all commonly used products in the OR. The patient in this case study received fentanyl, propofol, anectine, rocuronium, lidocaine, albuterol, lactated ringers and a fluoroquinolone around the time of induction.

Without a doubt, according to multiple different studies, the most common cause of anaphylactic reactions in the OR is due to muscle relaxants. In a comprehensive study from France comparing all agents involved in anaphylactic reactions between January 1, 1999 and Dec 31, 2000, muscle relaxants led the list causing 58.2% of reactions. Latex was the second most common with 16.7%, antibiotics were third with 15.1%. The remaining agents combined accounted for only 10% of all reactions. This study also found a significant female predominance of 70% of all reactions. The predominance was irrespective of the causal agent³. Of the muscle relaxants, rocuronium was found to be the most common cause with 43.7% of cases followed by succinylcholine at 22.6%. There is still controversy around this as some consider the increased incidence of reactions to rocuronium due to the drug itself whereas others consider the increased incidence reflective of increased market use³. Other studies have been performed which have similar conclusions as this study and report muscle relaxants being the causal agents of anaphylactic reactions at around 60%².

Early recognition and clinical diagnosis of anaphylaxis is paramount in the treatment. Clinical features include hypotension, tachycardia or bradycardia (in 10% of cases), cutaneous flushing, rash or urticaria, and bronchospasm. Previous history of any sort of

allergies or anaphylactic reactions should also raise the index of suspicion for intraoperative anaphylaxis if the patient begins showing some of the symptoms. As with our patient, multiple allergies as well as a history of intraoperative anaphylaxis helped provide early diagnosis and treatment.

Immediate treatment involves first using the ABC approach. All potential causal agents should be removed and the case should be immediately terminated. Oxygen should be administered, and the patient's legs should be elevated. Intravenous epinephrine should also be administered and if multiple doses are necessary, a continuous infusion should be considered. The patient should also be receiving a high rate of intravenous fluids, either normal saline or lactated ringer solution. The secondary treatment includes administration of intravenous chlorpheniramine and hydrocortisone. If blood pressure does not respond to this, a second vasopressor should be added. Bronchospasm should be treated with an intravenous infusion of salbutamol. Patient should be transferred to the ICU and blood samples should be drawn to test for Mast Cell Tryptase to confirm diagnosis.

Cross sensitivities of muscle relaxants is fairly common. Current recommendations from the Journal of the Association of the Anesthetists of Great Britain and Ireland suggest that if a patient has a history of anaphylaxis due to a suspected muscle relaxant, the patient should be skin prick tested with all muscle relaxants. The patient should optimally avoid any muscle relaxant use in the future, however, if surgery and the use of a muscle relaxant is necessary one should be chosen that had a negative skin test.

Conclusion

Due to this data, it is most likely that our patient had an anaphylactic reaction to the muscle relaxant given which was rocuronium. The patient had a vague history of intraoperative anaphylactic reactions in the past which were originally attributed to ancef, however, because the patient had another intraoperative anaphylactic reaction, the patient more than likely reacted to a muscle relaxant both times. Due to the large number of drugs used over a short period of time, her earlier anaphylactic reaction was

likely mis-attributed to ancef. Unfortunately, it was not possible to obtain the anesthesia record from that episode because it was performed decades ago at an outside institution. The anesthesiologist on call luckily promptly recognized the reaction and because it was early in the case, closure was not difficult. The patient was treated appropriately and a good outcome was obtained. In the future, as with the guidelines mentioned above, rocuronium should be avoided and the patient should have a skin prick test, testing all of the different kinds of muscle relaxants. If surgery is necessary in the future, the skin prick test should serve as a guide for muscle relaxant use and extreme caution should be taken.

References

1. Lieberman P. Anaphylactic reactions during surgical and medical procedures. *J Allergy Clin Immunol* 2002;110: S64–9.
2. Harper NJ, Dixon T, Dugue P, Edgar DM, Fay A, Gooi HC, Herriot R, Hopkins P, Hunter JM, Mirakian R, Pumphrey RS, Seneviratne SL, Walls AF, Williams P, Wildsmith JA, Wood P, Nasser AS, Powell RK, Mirakhur R, Soar J: Suspected anaphylactic reactions associated with anaesthesia. *Anaesthesia* 2009; 64:199–211.
3. Mertes PM, Laxenaire M-C, Alla F. Anaphylactic and anaphylactoid reactions occurring during anesthesia in France in 1999–2000. *Anesthesiology*. 2003;99:536 –545. (Iib)