Learning From Others:

# A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

*Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to* **r.dutton@asahq.org**. *Report incidents to* **www.aqiairs.org**.

## Case 2013-6: The Swarm Effect

A 6-year-old girl with cystic fibrosis, recurrent rhinosinusitis and a recent pulmonary exacerbation with mycobacterium avium was scheduled for adenoidectomy and endoscopic sinusectomy (FESS procedure). She presented to the O.R. with a single lumen PICC line and was reported to have difficult peripheral I.V. access. She received an intravenous induction with appropriate doses of fentanyl and propofol. Her trachea was orally intubated and general anesthesia maintained with sevoflurane in air and oxygen.

The case proceeded unremarkably for the first hour and 40 minutes, until the anesthesia resident observed a copious amount of blood from the patient's nares and mouth. The resident immediately called for help and the attending responded to find the patient acutely tachycardic, then bradycardic and hypotensive. Aggressive resuscitation was required to support the blood pressure. Uncrossmatched type O red blood cells (RBC) were obtained and administered. The institution's massive transfusion protocol was activated and a call for all available anesthesia support was initiated.

Extra manpower included three anesthesiologists, a resident, two anesthetists and four anesthesia technicians. The expanded anesthesia team inserted an intra-arterial line and a central venous catheter. Estimated blood loss totaled 2 liters (approximately 1.75 blood volumes) and the resuscitation involved 1,172 mL of RBCs, 398 mL of plasma, 161 mL of platelets and 36 mL of cryoprecipitate. The otolaryngologists discovered and packed a laceration near the posterior tonsillar bed. As a salvage measure to stop the hemorrhage, the surgeons temporarily occluded the left common carotid artery via an anterior approach in the neck. The patient was then transported to interventional radiology, with volume resuscitation continuing. When the vascular clamp was removed, a left internal carotid artery laceration was identified and then occluded with a coil. The patient recovered with a normal neurologic exam and no identified sequelae.

### We Need Your Cases!

The Anesthesia Quality Institute (AQI) invites all ASA members to submit brief reports of unusual events, adverse outcomes or close calls to the Anesthesia Incident Reporting System (AIRS). Reports to AIRS may be confidential or anonymous, and are protected from legal discovery by the Patient Safety and Quality Improvement Act of 2005. ASA and AQI are especially seeking cases in the following categories of national importance:

- **Patient harm related to shortage or unavailability of an indicated medication.**
- **Postoperative respiratory depression occurring after discharge from the PACU.**

Please make your report to AIRS at **www.aqiairs.org**, and thank you for helping to improve the safety of anesthesia.

## Discussion

Functional endoscopic sinus surgery (FESS) and procedures involving the parasellar and paranasal regions, such as transsphenoidal tumor resection and septum surgery, are associated with the rare but important complication of carotid injury.[1-4] Procedures involving these anatomic locations can pose technical challenges for the surgeon because of the close proximities of the cavernous sinus, sphenoid sinus, optic nerve and the internal carotid artery. Anatomic variants can lead to potentially serious complications during otherwise uneventful surgeries. As patients with cystic fibrosis and subsequent recurrent rhinosinusitis are often scheduled for repeat and/or multiple sinus procedures, this population may pose a heightened

surgical risk. A review of the surgical and anesthesia literature revealed universal recommendations that the surgeon be aware of this potential complication, that strategies for managing hemorrhage be discussed and that the anesthesia team maintain adequate I.V. access.[1,2,4]

This case illustrates a rare but potentially lethal complication from massive hemorrhage in an otherwise routine operation. Similar scenarios include aortic transection caused by a laparoscopic trocar puncture and iliac vessel injury from bone fixation screws used in spine surgery and hip arthroplasty. In these cases, there is a very low risk of vascular injury to a major vessel. However, if it occurs, there is significant risk of a potentially catastrophic result.

*"This case illustrates the risk of potential catastrophic complications and the value of developing plans to address them. Had this case occurred at night, or without the ability to summon adequate resources, the outcome may well have been different."*

This divergence of risk likelihood and risk seriousness poses a conundrum frequently faced by anesthesiologists: how to balance the preparation for rare catastrophic events against the cost and potential complications of the interventions required to mitigate these risks. In this specific case, the team began the anesthetic with intravenous access that would be inadequate if major hemorrhage occurred. This was a conscious decision weighing the potential need for additional vascular access (unlikely, but remotely possible), the difficulty of gaining the access (hard), and the risk and seriousness of complications that could result from seeking additional access which, in most cases, would not be needed. Anesthesiologists must make this type of judgment every day, and there is seldom complete information available to guide a decision.

Most of the debate and consideration in these scenarios is focused on patient risk factors and specific treatment algorithms (e.g., the massive transfusion protocol); however, consideration should also be given to the overall system and environment in which the case is performed. What ultimately allowed the patient to sustain this complication and survive unharmed was the ability of the anesthesia team to expand and leverage the full resources of the operating room as soon as help was requested. Once the need for assistance was identified, a "swarm" of anesthesia attendings, anesthetists and technicians arrived to the room.

This "swarm effect" is a key environmental factor that allowed for many simultaneous interventions, including insertion of peripheral and additional central venous access, an intra-arterial catheter and procurement of emergency blood. Another team was able to ready the interventional IR suite to accept an unstable patient and continue the resuscitation. In most anesthesia crises, step 1 is to call for help, a fact reflected in a variety of existing and emerging "emergency manuals" for perioperative care.[5,6] (For further reading, see the article on page 10 of the May *NEWSLETTER* on cognitive decision-making by Drs. Stiegler and Goldhaber-Fiebert.)

Step 2 in anesthesia crisis management, implemented in this case, is to clearly identify the individual in charge of the team. The primary anesthesiologist should be relieved of the need to perform procedural interventions so that he or she can focus on supervision of the overall effort, to ensure it progresses in the most favorable fashion. One recommendation from this case is that each procedural area has a well-publicized and reliable way to summon additional assistance. This will vary in size and structure based on the complexity of cases performed and the resources available, but the system should be able to respond and provide adequate resources to treat all serious complications.

Another consideration often overlooked is timing of the procedure. All anesthesiologists have experienced the late running room with an elective case on a medically complicated patient. For urgent or emergent cases this may be unavoidable, but for elective surgery with the potential for disaster, consideration should be given to starting the case earlier in the day or to having more personnel available in the evening.

Under more austere conditions – off-hours, smaller surgical facilities – consideration should be given to a system that can mobilize additional personnel from other areas. Anesthesiologists should ask themselves, who would I call if I needed immediate assistance? Are there other anesthesia resources available, perhaps in the obstetric suite? Will the code team respond to the O.R.? Is there an ICU or emergency physician available? A pharmacist can be of great assistance in preparing medications, and additional nursing staff can help with fluid resuscitation. Although there are many effective approaches to this problem, the goal is to have a reliable system designed and publicized, with clear

*Continued on page 61*

# A Case Report from the Anesthesia Incident Reporting System

*Continued from page 43*

instructions on how to activate it at different times of the day or night.

Finally, while it is important to have a crisis management plan, it is even better if there are regular drills to test all the relevant assumptions and procedures. As recommended by Atul Gawande, M.D., operating room crews should take the time to run verbally through a crisis scenario every so often. Further, there is a place for simulation. Leading or participating in a team faced with a grave, time-sensitive complication is a skill that anesthesiologists should study and practice. Implementation of the MOCA® simulation requirement is one opportunity to hone these skills, especially if simulation exercises can be designed to include multiple services and specialties.

This case illustrates the risk of potential catastrophic complications and the value of developing plans to address them. Had this case occurred at night, or without the ability to summon adequate resources, the outcome may well have been different.

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## References


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