Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Review of unusual patient care experiences is a cornerstone of medical education. Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to the Anesthesia Incident Reporting System (AIRS) and authors a discussion of the safety and human factors challenges involved. Real-life case histories often include multiple clinical decisions, only some of which can be discussed in the space available. Absence of commentary should not be construed as agreement with the clinical decisions described. Feedback regarding this article can be sent by email to **airs@asahq.org**. Report incidents or download the AIRS mobile app at **www.aqiairs.org**.

Aspirations from the Smallest Places

A 3-year-old, ASA I patient underwent an elective dental procedure under general anesthesia with a native airway. She was reportedly NPO for solids and liquids for more than eight hours. Approximately thirty minutes into the case, the patient vomited a large amount of clear fluid. The anesthesiologist placed the patient in steep Trendelenburg position and intubated her. He suctioned through the endotracheal tube and was not able to obtain any fluid. Postoperatively, the patient was observed for four hours; a chest X-ray was negative for evidence of aspiration pneumonia or pneumonitis, and the patient was discharged to home. The anesthesiologist contacted the patient and her family daily for one week; they reported no sequelae from the intraoperative course.

Case Discussion

The incidence of perioperative/periprocedural pulmonary aspiration among the pediatric population is infrequent: published numbers range from 2 to 3.8 per 10,000 cases.[1,2] These estimates increase for emergency surgeries with reported figures anywhere from 2.2 to 25 per 10,000 cases.[1] In a recent retrospective review, Tan found that pediatric patients undergoing emergency surgeries were 4.32 times more likely to suffer a pulmonary aspiration event than patients presenting for elective surgery.[2]

Any pediatric patients can experience a perioperative pulmonary aspiration event, including a healthy child. Tan, for example, demonstrated an aspiration rate in the pediatric population of 22 per 102,425 cases over a 13-year period; of those who aspirated, 54.5 percent were ASA 1 and 59.0 percent were between the ages of 3-12.[2] Aspiration events occur at any point during an anesthetic, although induction and maintenance are common times.[1] While subsequent morbidity can ensue (ranging from cancellation of cases to unplanned admissions to ventilator support), mortality is less frequently reported.[1,2]

Several factors may contribute to the risk of perioperative pulmonary aspiration. From a physiologic standpoint, regurgitation is more likely as the upper and lower esophageal sphincters relax. Propofol, inhaled agents and benzodiazepines affect the upper sphincter while inhaled anesthetics, opioids and succinylcholine act at the lower one.[1] In addition, the induction of general anesthesia impairs protective airway reflexes.[1] Other risk factors for perioperative pulmonary aspiration derive from specific human factors: full stomach, bowel obstructions, gastroparesis from diabetes or trauma, inadequate anesthesia without a protected airway.[1] Interestingly, a recent study demonstrated that perioperative pulmonary aspiration among the pediatric population was not associated with the type of induction.[2]

Strict adherence to the ASA NPO guidelines does not, however, prevent pediatric pulmonary aspiration. In a retrospective study, Andersson et al. failed to demonstrate a decrease in pulmonary aspiration in children who kept a 6-4-0 regimen (six hours for solids; four hours for breast milk; 0 for clear liquids).[3] Similarly, the Pediatric Sedation Research Consortium's (PSCR's) recently published data showed that NPO status for solids and liquids is not an independent negative predictor for aspiration.[4] The PSCR collects data on children who have received any medication for procedures or tests, appreciating that depth of anesthesia is often difficult to ascertain; none of their study subjects had a laryngeal mask airway or an endotracheal tube at the outset.[4]

Complications after different NPO guidelines in both adult and pediatric patient populations have been the subject of two separate Cochrane meta-analyses. Thirty-eight randomized con-trolled trials did not demonstrate that a "shortened" fluid fast as compared to a "standard" fast was associated with a significant difference in gastric content volume or pH of healthy adults (a "shortened" fluid fast refers to water, fruit juices and coffee after midnight before morning surgery or after breakfast before afternoon surgery).[5] In fact, adults who drank water preoperatively had a (clinically insignificant) lower gastric volume than patients who followed the traditional two-hour rule.[5] Moreover, the amount of fluid was not associated with a difference in outcomes.[5] Similarly, healthy children who are allowed fluids up to 120 minutes prior to anesthesia were not found to have higher gastric volumes or lower gastric pH than children who follow a six-hour fast; in addition, these children are more comfortable and better behaved than children who have a prolonged fast.[6] However, literature on adults or children who have risk factors for aspiration is lacking at this time.

If the circumstances and risk factors are not clearly described, neither is what practitioners should do regarding disclosure to families after a potential aspiration event. Although the literature is sparse, full disclosure is important. Parents are a necessary part of post-aspiration management, whether consenting to inpatient treatment or cooperating in safe, watchful waiting strategies.[7] An article on disclosure of adverse events for pediatric anesthesiologists proposes that parents seek "honest answers" and "an unrehearsed, authentic apology":[7] perhaps the best approach would be a description of the events and a proposed plan for post-event management.

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So how do anesthesiologists keep their pediatric patients safe from perioperative pulmonary aspiration? The answer is not obvious given that episodes may happen in patients who are healthy, who are not at extremes of age, who have "appropriate" NPO status and who are at any point in their anesthetic. Our strongest recommendation is for vigilance by the anesthetist. Vigilance encompasses both mental and physical preparedness: a thorough preoperative evaluation of risk factors for aspiration, a thoughtful decision about choice of airway, an acknowledgment of the possibility of aspiration, an appropriately equipped room with suction and supplies for endotracheal intubation. There are not always easy or well-proven rules as is the case with NPO status or airway choices. For pediatric dental surgery, for example, most pediatric anesthesiologists would prefer to place an endotracheal tube to avoid aspiration of blood, tooth fragments or dental restoration material, although there are studies that have demonstrated the safe use of an LMA instead.[8,9] Without clear guidelines, vigilance is vital.

We would also suggest that the anesthesia team can improve the vigilance of others involved with the case. The anesthesiologist might mention the potential for pulmonary aspiration during the consent process and during pre-case huddles, especially in circumstances where patients have a known risk factor, such as undergoing non-elective surgery. Centers may also want to develop protocols for post-aspiration care. Such protocols would include immediate repositioning the patient from supine to lateral decubitus or steep Trendelenberg, suctioning the oropharynx and intubation. Post-aspiration, monitoring should fit the clinical circumstances. Patients who are hypoxic should continue to receive oxygen therapy, supported ventilation as necessary and inpatient admission. Obtaining a chest X-ray may assist in understanding the evolution of pulmonary pathology. Similarly, large-volume aspiration of particulate matter may warrant inpatient admission even without evidence of clinical deterioration. On the other hand, a clinician may reasonably discharge a child who has no oxygen requirement or evidence of difficulty breathing within a few hours of a non-particulate aspiration;[10] in this case, parents/guardians should receive guidance about when to re-seek medical care.

In conclusion, all of our pediatric patients are at risk for perioperative aspiration at any time during an anesthetic, regardless of NPO status. Practitioners should be alert to the possibility and have protocols in place for immediate and ongoing management.

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