



Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

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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.

Case 2020-6

"When a man's stomach is full it makes no difference whether he is rich or poor." – Euripides

"Never eat more than you can lift." – Miss Piggy

Discussion

Case 1: 3-year-old male presented to O.R. for scheduled circumcision. PMH: ex 32-week preemie with NICU stay, albuterol nebulizer therapy required during URIs, URI 3 weeks ago s/p course of antibiotics now asymptomatic per mother. Versed PO for premedication for anxiolysis. Induction of anesthesia via face mask, initially 70/30 N₂O/O₂ then sevoflurane to 8%. Mask held by dental resident with two anesthesia residents and myself supervising. Patient obstructed so jaw thrust with IPL valve to 5-10 cm H₂O initiated; N₂O discontinued and FiO₂ to 100%. Patient then vomited about 5 mL of milky, curdled fluid. Since SpO₂ continued to drop, succinylcholine 20 mg mixed with atropine given IM. Requested circulating RN call for help and the patient was intubated. Albuterol administered via ETT prior to slow, controlled emergence and extubation performed by me. Copious yellow-green secretions were suctioned from nares and ETT prior to extubation.

- Resolving URI in child with known RAD
- Ex-preemie
- Novice trainee performing mask induction despite supervision
- Possible undiagnosed obstructive sleep apnea

Case 2: 2-year-old for circumcision, coughing on mask induction while trying to obtain I.V. access, pink material in mouth (oral midazolam), laryngospasm and desaturation with bradycardia, improved with IM succinylcholine and atropine. ETT placed, small amount returned with ETT suction via 8F catheter. OG suction returned approximately 6 ml/kg of gastric contents and food bits. Lower than normal saturations during



case for FiO₂. CXR at end of case showed RUL infiltrate vs. atelectasis (patient was supine at time of event).

Mother insisted that patient had been NPO for >6 hours, but nursing staff said she sounded uncertain. Mother reiterated time of last intake to attending anesthesiologist. Still unclear.

Discussion:

The association of induction of anesthesia and the risk of aspiration pneumonitis was noted in the earliest days of anesthesia, but a pathophysiological description of the event and its consequences was first reported by Mendelson in 1946,¹ and the eponym "Mendelson's syndrome" may still be familiar to some (especially those of us with more grey hair). The original paper described aspiration of gastric contents during inhalation induction of anesthesia in obstetrical patients leading to a chemical injury to the lungs. Wide applica-

tion of the lessons learned from this seminal retrospective case series led to the adoption of fasting times for elective surgical patients, considered a standard of care in the world of anesthesia. ASA has long promulgated fasting times for elective surgery in otherwise healthy patients in order to reduce the risk of aspiration during induction even though the nature of induction has changed dramatically from Mendelson's time. When ether and other historical agents were in use, very prolonged induction times with much greater likelihood of nausea, vomiting, and extended periods without a protected airway were the norm. Pediatric anesthesia remains the last setting in which inhalation induction is common, albeit with agents far different and superior to those available 75 years ago, and aspiration of gastric contents during anesthesia even in this population is not common. A recent multicenter study of a large, unselected population of over 30,000 children in Europe found an incidence of 0.1%, including emergency operations, with almost half of the cases occurring during induction. Fifty-five percent of those had no sequelae, and while more than one-third experienced transient hypoxia, just one child developed pneumonia, and none required ICU admission.² Other large-scale multicenter studies report even lower incidences in elective cases.³

ASA's most recent set of practice guidelines (2017) have been liberalized to permit clear fluids up to two hours prior to induction in healthy patients undergoing elective surgery, but still caution that ingestion of fried or fatty foods and meat may delay gastric emptying, requiring at least eight hours, and that "both the amount and type of foods ingested must be considered when determining an appropriate fasting period."⁴⁻⁶ Indeed, recent evidence suggests that not only is there little difference in gastric residual volume between clear liquid fasting times of two and four hours, gastric volumes and pH were favorably altered when shorter fasting times were allowed in children and adults.⁷

In recent years, there has been a movement toward further relaxing the NPO criteria for clear liquids in children, suggested by studies that show emptying in 30 minutes (for water) and less than one hour (for clear liquids with glucose).^{8,9} Advantages to such an approach include decreased patient irritability, increased satisfaction, and decreased postoperative nausea. Advocates for ERAS protocols point to diminished catabolic states and improved metabolic homeostasis. It is also notable that, despite shorter current fasting recommendations, most patients come to the O.R. with periods of fasting that exceed the two-hour limit, often by many fold. An international consortium of pediatric anesthesia societies, including the Association of Paediatric Anaesthetists of Great Britain and Ireland, the European Society for Paediatric Anaesthesiology, the French-Language Society of Paediatric Anesthesiologists (ADARPEF) and the Society for Paediatric Anaesthesia in New Zealand and Australia recently issued a consensus statement that the clear fluid fasting time be reduced to one hour's duration.¹⁰

Nevertheless, even optimal fasting in healthy patients for elective operations does not guarantee that the stomach is empty. There is large variability in both the volume and pH of residual gastric contents in children who have fasted.¹¹ Even children with appropriate NPO times in whom there are no apparent risk factors may have unsuspectedly large gastric volumes, up to 6 ml/kg. Furthermore, there are no specific factors associated with the outliers with large gastric residual volumes, making comorbidities such as anxiety, obesity or diabetes mellitus unreliable as predictors.^{11,12}

Adverse respiratory events are the most common complications of general anesthetics in children. Even long fasting periods cannot guarantee an empty stomach, and careful attention to anesthetic depth prior to initiating stimulating procedures is necessary to help reduce the incidence of regurgitation.

So, what are we to make of these cases? The reporter in case 1 suggested several factors that might have posed an increased risk for their patient, and it is telling and probably accurate that none of them concerned eating. The common thread in these cases is not just the regurgitation of partially digested gastric contents, but that noxious stimulation of the patient in an unintended light plane of anesthesia was the precipitating event. One might postulate that had that not occurred, the existence of those gastric contents might never have been known. In an important report from the Australian Anaesthetic Incident Monitoring Study, which identified 133 cases of aspiration during anesthesia in all ages, the most common predisposing factors in elective cases were "inadequate" anesthesia and difficult airway; inadequate anesthetic depth was also the most common reason for regurgitation without aspiration.¹³ Similar findings have been reported in other studies, including those of supraglottic airway devices. The presence of increased risk factors for exaggerated airway irritability, clearly described in our first case, was a clue that what ordinarily might have been adequate depth of anesthesia for airway manipulation was not enough in this case, and that a deeper plane of anesthesia, airway topicalization with local anesthetic, or a combination of the two might have been of help. The reporting physician also implied that the lesser skill of the trainee might have missed the warning signs that would have prompted a

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more experienced clinician to avert the event with earlier intervention. An additional consideration is that the early use of neuromuscular blockade may avert some of these events and, while often not used in children, can be considered, especially if one thinks a patient might be an increased risk.

Adverse respiratory events are the most common complications of general anesthetics in children. Even long fasting periods cannot guarantee an empty stomach, and careful attention to anesthetic depth prior to initiating stimulating procedures is necessary to help reduce the incidence of regurgitation. Thankfully the data from several studies suggests that sequelae from these events are uncommon.

References:

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