A Case Report in the Assessment of an Anesthesia Intraprocedural Complication

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INTRODUCTION

This report describes an intraprocedural adverse event during general anesthesia (GA) procedures and discusses the potential causes and prevention of the reaction.

GA is a necessary component of many dental procedures. Unlike local anesthesia, GA has advantages such as enabling the patient to be less susceptible to pain while impeding normal reflexes to pain that would otherwise create problems for the surgical provider. Also, unlike local anesthesia, GA is rapidly induced and controllable by the anesthetist, and patients can be rapidly brought back to consciousness at the end of the procedure (Benish et al., 2010; Voss et al., 2008). Two compounds that are frequently used in GA are sevoflurane and propofol, both of which have also been associated with seizure activity in adult as well as pediatric patients (Lapebie et al., 2014; Miao et al., 2023; Walder et al., 2002). Furthermore, these two medications are documented as epileptogenic medications for surgical anesthesia, even in healthy individuals (Jaaskelainen et al., 2003; Pilge et al., 2013). However, they continue to be used in GA because they afford advantages over other compounds, including the fact that they do not induce upper respiratory reactions and can be easily titrated while being co-administered with oxygen (Jaaskelainen et al., 2003; Pilge et al., 2013; Zheng et al., 2021). Unlike many GA agents, sevoflurane and propofol can be administered in an inhalational-based approach rather than strictly intravenously, making it preferable for the pediatric population and patient with special healthcare needs.

In this case report, the patient developed an intra-procedure seizure-like reaction, which was not relevant to the patient's medical history other than an episode of febrile seizure in early childhood.

RESULTS

An 18-year-old patient with a medical diagnosis of asthma, ADHD, and autism was scheduled for full-mouth dental rehabilitation under GA due to multiple caries, uncooperative behavior, and medical conditions. NPO duration was 11 hours without food or liquid intake. The last urination time was unclear.

The GA procedure was routine, including the use of sevoflurane and propofol, with no abnormalities noted during the induction of anesthesia. At approximately 1.5 hours intra-procedure, the patient was on pressure support ventilation, took a very large deep breath, and started coughing. Patient then started shaking vigorously. Propofol was administered, and inspired gas was increased until this subsided. In addition, Figure A shows the vitals of when that patient developed a seizure reaction that required mitigation involving the administration of intravenous midazolam.

The dental procedure was then brought to a safe conclusion and rescheduled for completion.

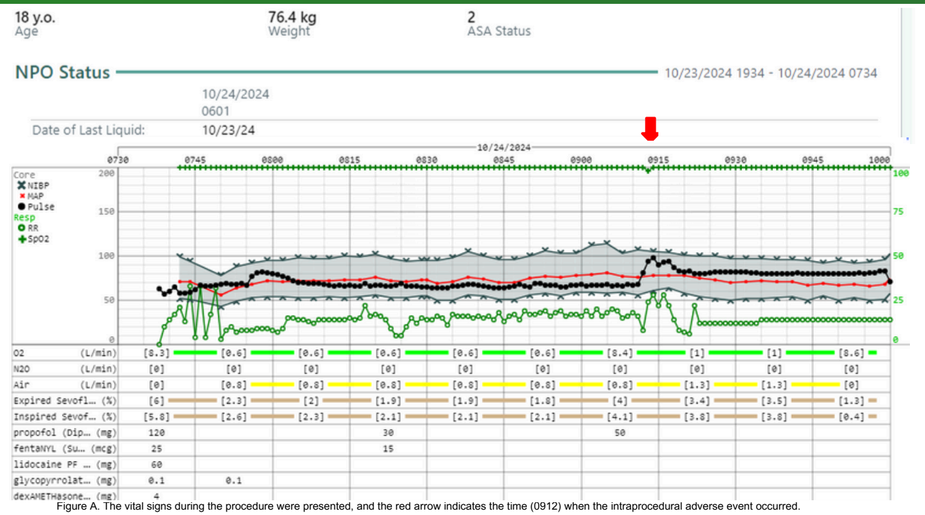

Figure A. The vital signs during the procedure were presented, and the red arrow indicates the time (0912) when the intraprocedural adverse event occurred.

Potential Seizure-Trigger Factors for Healthy Individuals (Table 1)	
Pre-existing Condition	History of Febrile Seizure
Anesthetic Medications	Sevoflurane with oxygen can cause atelectasis Sevoflurane and Propofol can lead to abnormal NMDA activity
Physiological Imbalance	Dehydration from no liquid intake for a prolonged period of time that causes electrolyte imbalance

DISCUSSION

A post-anesthesia evaluation of the patient showed that the perioperative course of anesthesia revealed no abnormalities. The patient's airway was patent and clear. His hemodynamics were stable. His mental status was within acceptable limits for the patient, as were the levels of analgesia and pain, and those of nausea and vomiting. The postoperative hydration for the patient showed that they were tolerating orally administered fluids. The cardiovascular and respiratory functions for the patient showed that they were within acceptable limits for the patient. The patient's disposition was evaluated as phase 2 and then the patient could be discharged home.

The patient's initial exposure to sevoflurane and propofol could be sufficient for the seizure activity that was noted in this case example. However, multiple other factors could have been implicated. For one thing, sevoflurane with oxygen can cause atelectasis, which could induce seizure activity through the pulmonary sequelae associated with that particular compound. This is usually accompanied by inadequate oxygenation following the loss of consciousness (Induction of anesthesia with sevoflurane, 2022). The patient's n-methyl d-aspartate (NMDA) receptor activity could have also been implicated, as sometimes sevoflurane and propofol can lead to abnormal NMDA activity, resulting in seizures (Lapebie et al., 2014). The patient's own past history of a febrile seizure, as well as a potential familial history of such seizures, might also account for the reappearance of seizure activity when sevoflurane and propofol were administered as GA agents (Voss et al., 2008; Yano et al., 2008). The patient's electrolyte levels in the bloodstream could also have factored into the seizure activity. This is due to adhering to the pre-surgical fasting regimen while staying hydrated could be challenging, which causes certain electrolyte imbalances facilitating seizures through the conductivity of epileptogenic patterns of neuronal activity (Benish et al., 2010; Castilla-Guerra et al., 2006). The patient was being monitored for their electroencephalographic activity during the GA procedure. However, the use of only a few EEG channels to monitor the patient for signs of abnormalities might not been adequate because the use of a few EEG channels could be inadequate to detect the emergence of EEG changes that would have signaled the onset of a seizure in the patient (Miao et al., 2023; Pilge et al., 2013).

The potential causes of seizure under GA for a relatively healthy individual are summarized in Table 1.

CONCLUSIONS

Based on the limited literature available, the patient may have experienced complications from sevoflurane or propofol, which are common medications for general anesthesia but can induce intraprocedural seizure-like phenomena. Therefore, this case report aims to bring awareness to dental providers and discuss the management of this event, including early detection with an electroencephalogram, prophylactic medication for seizures (Midazolam would be particularly useful in this regard), or avoiding using sevoflurane (Voss et al. 2008).

Although rare, seizures induced by electrolyte imbalance (Castilla-Guerra et al., 2006) from mild dehydration could not be ruled out. Recent NPO guidelines (Joshi and Abdelmalak, et al., 2023) recommend actively taking fluids until two hours prior to the procedure to stay hydrated for smoother surgical anesthesia. Due to the factors causing this intraprocedural adverse event were not clear, we included this in our consideration to highlight instructing the parents on the importance of staying hydrated while following the NPO time prior to the surgical procedure. Documenting urination time, carefully monitoring electrolyte levels through bloodstream analysis as needed, or adequate IV electrolyte supplementation before surgery are things to be considered.

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