JPPT | Case Series

Contrast-Induced Vomiting in Pediatric Patients Under Propofol Sedation: A Case Series

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Gadolinium-based compounds are frequently used in contrast-enhanced magnetic resonance imaging studies. Rarely, adverse events have been reported with administration of these compounds, of which the most common are nausea and vomiting. Although well established in the adult literature, these adverse effects are less well described in the pediatric population, who often need sedation to complete imaging studies. In this case series, we present 3 children who experienced vomiting shortly after contrast administration while under sedation with propofol, which is known to have antiemetic properties. Although all 3 children recovered without complication, this case series illustrates the serious potential consequences of vomiting while sedated, and providers should be aware of these possible adverse events as pediatric sedation becomes more common outside the operating room.

ABBREVIATIONS IV, intravenous; MRI, magnetic resonance imaging

KEYWORDS adverse effects; anesthesia; contrast; patient safety; propofol; radiology; sedation

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Introduction

Gadolinium-based compounds are commonly used contrast agents in MRI studies and are safe, well tolerated, and effective in both adult and pediatric patients.[1–3] Adverse events associated with gadolinium contrast agents are infrequent and occur less often than those associated with iodinated contrast materials.[1,3] Specifically, the most common acute adverse events are nausea and vomiting, which occur in less than 1% of cases.[4] The data regarding gadolinium-associated nausea and vomiting in pediatrics are less well established, although these adverse events remain infrequent and are comparable to the adult literature.[3,5,6] However, many pediatric patients undergoing MRI procedures with contrast will require some element of sedation, most commonly with propofol (Diprivan, Fresenius Kabi, Lake Zurich, IL).[7] Propofol may be given via bolus or continuous infusion (often patients are induced via bolus and sedation maintained by continuous infusion), is widely tolerated by patients, and has few incidences of complication, specifically respiratory depression and loss of airway control.[8–12] Furthermore, propofol is well known to have antiemetic properties, rendering it a potentially useful asset in sedation for those patients receiving contrast.[13,14] We present 3 pediatric cases of vomiting shortly after contrast administration while under propofol sedation. Although novel and fortunately rare, contrast-induced vomiting under propofol sedation can have serious consequences, including aspiration pneumonitis, hypoxemia, and induced laryngospasm, among others,[10] necessitating that providers remain aware of the presentation and management of these complications.

Case Report

Case 1. An 8-year-old African American female with a past history of traumatic brain injury after being hit by a car a year prior presented for a follow-up MRI of her brain. Prior to her accident, she had been healthy, with no chronic medical conditions. She required several days of extracorporeal membrane oxygenation while hospitalized. In the year after the accident, the patient had also suffered from cognitive decline, including difficulty answering questions and poor grades. In the weeks leading up to her MRI, she had been reportedly healthy, with no recent illness, respiratory symptoms, vomiting, or diarrhea.

Her weight was 32 kg. Induction was carried out with a 32-mg bolus of IV propofol and 10 mg of IV lidocaine. Another 16-mg bolus of IV propofol was given 1 minute later, and an infusion was started at 5 mg/kg/hr. Twenty-five minutes after the infusion was started, 7 mL of IV gadoteridol (ProHance, Bracco Diagnostics Inc, Monroe Township, NJ) was given. One minute after administration of IV contrast, she had a single episode of non-bloody, non-bilious emesis. She was repositioned and suctioned, given 4 mg of IV ondansetron, and did not have any further vomiting. After these interventions, another 32-mg bolus of IV propofol was given, and her infusion was increased to 6 mg/kg/hr to maintain adequate sedation. The study was completed 15 minutes later without further complications, and there were no issues with recovery or patient discharge.

Case 2. An 11-year-old African American male with no significant past medical history presented for a routine MRI of his brain due to new-onset seizures.

Approximately 2 months prior to his procedure, he was admitted to the intensive care unit for status epilepticus and acute respiratory failure, which was found to be secondary to juvenile myoclonic epilepsy. He had previously been healthy and denied recent illnesses, respiratory symptoms, vomiting, and diarrhea.

His weight was 50 kg. Induction was carried out with two 50-mg boluses of IV propofol and 10 mg of IV lidocaine, and a propofol infusion was started at 4 mg/kg/hr. Thirty-five minutes after the infusion was started, 10 mL of gadoteridol was given. Two minutes after administration of IV contrast, the patient had several episodes of non-bloody, non-bilious emesis requiring significant suctioning. The propofol infusion was stopped, and he was given 4 mg of IV ondansetron. He did not experience any hypoxemia or aspiration. After these interventions, he was given a 25-mg propofol bolus, his infusion was restarted at 4 mg/kg/hr, and his study was completed 20 minutes later, with no further episodes of vomiting. He recovered from sedation without issue.

Case 3. A 12-year-old Hispanic male with a past history of autism spectrum disorder and attention deficit hyperactivity disorder presented to complete a routine MRI of his brain. He had previously been in his usual state of health and denied previous respiratory symptoms, vomiting, diarrhea, and other recent illnesses.

His weight was 44 kg. Induction was carried out with three 44-mg boluses of IV propofol and 10 mg of IV lidocaine, and a propofol infusion was started at 6 mg/kg/hr. Thirty-nine minutes after the infusion was started, 8 mL of gadoteridol was given. One minute after administration of IV contrast, the patient had an episode of non-bloody, non-bilious vomiting requiring vigorous suctioning of the oropharynx. This episode of vomiting was accompanied by hypoxemia with an oxygen saturation of 45%, which corrected with 8 L of oxygen via nasal cannula. The propofol infusion was stopped during these interventions. After suctioning, repositioning, and initiation of supplemental oxygen, the patient was given a 44-mg bolus of propofol, and his infusion was restarted at 6 mg/kg/hr. His study was completed 27 minutes later without any further vomiting. His oxygen was slowly weaned over the remainder of the procedure without any further episodes of hypoxemia. There were no other complications, and he recovered appropriately from sedation and was discharged home.

Discussion

Acute adverse events following gadolinium-based contrast administration are rare. Nausea and vomiting are the most frequent of these adverse events, and they occur in less than 1% of all cases of contrast administration.[1–4] The pediatric literature is less well established but is consistent with those studies conducted in the adult population. In 1 review of 47 children younger than 2 years, only 1 child experienced contrast related vomiting.[5] A larger study of 2393 children found that only 1.7% experienced an adverse event, with more than half of those events consisting of nausea and vomiting, and noted that the adverse events occurred less frequently in patients undergoing sedation compared with their non-sedated counterparts.[6] Furthermore, the widespread use of propofol sedation for pediatric patients undergoing MRI should theoretically decrease the risk of contrast-induced vomiting, because propofol has well-known antiemetic properties.[13,14] We report 3 cases of contrast-associated vomiting that occurred under propofol sedation. To our knowledge, this is the first reported case series of contrast-related vomiting as a specific adverse event in pediatric patients under sedation with propofol.

Gadoteridol was the contrast medium of choice in all 3 cases, and it has a standard concentration of 279.3 mg/mL. The drug was given at the manufacturer's suggested dosing rage of 0.1 mmoL/kg (approximately 0.2 mL/kg) per institutional protocol.[15] Nausea is listed as the compound's most common adverse event, occurring in 1.4% of patients enrolled in clinical trials. Vomiting is also listed as an additional adverse event, occurring in less than 1% of cases. These adverse event rates are consistent with the current reported literature regarding adverse reactions to gadolinium contrast media.[4,16]

Determining if an event is a true adverse drug reaction is frequently difficult given the inherent subjectivity in many clinical observations. However, based on the Naranjo adverse drug reaction probability scale,[17] the likelihood that our patients' vomiting was related to the contrast medium was classified as probable with a score of 7 (scale range, −4 to 13, with <0 being doubtful, 1–4 possible, 5–8 probable, and >9 definite). Although it has been argued in the past that nausea and vomiting could be attributed to anxiety regarding the patient's underlying disease state or over the procedure itself, as opposed to the contrast medium, this argument is less probable given the sedative effects of propofol. Furthermore, in each of our patients, the vomiting occurred within several minutes of contrast administration following more than 30 minutes of exposure to propofol, suggesting a connection to the gadolinium compound rather than the sedation. Additionally, 2 of our 3 patients were of African descent, in which a higher incidence of nausea and vomiting reactions to gadolinium compounds has been reported.[18] The third patient was Hispanic, and there are no reports in the literature regarding the incidence of nausea and vomiting in this population.

Identifying patients at risk of sedation-related complications is challenging. Common adverse effects of propofol include decreased respiratory drive, diastolic hypotension, burning at the injection site (for which lidocaine is often concurrently administered, as in these cases), and, less frequently, apnea and laryngospasm.[10] Nausea and vomiting are well-described complications associated with general anesthesia, although both

are more frequently encountered after inhalational anesthetics compared with propofol.[19,20] Among the drugs commonly used for pediatric sedation, ketamine and nitrous oxide are most commonly associated with nausea and vomiting. Vomiting during ketamine sedations has been reported in up to 12% to 25% of cases in some studies.[21,22] Less frequently, nausea and vomiting occur in approximately 0.5% of cases where nitrous oxide is used for sedation.[23] Vomiting in the sedated patient is particularly dangerous because many deep sedations border on general anesthesia, and patients may not be completely protecting their airway, and aspiration of vomitus and subsequent pneumonia are risks. Of our 3 patients, 1 had significant desaturations and required oxygen support, in addition to suctioning. He also required more propofol boluses after the event for resedation, which adds additional risk, including the possibility of further respiratory depression and decreased airway tone. Fortunately, he recovered well, with no sequelae; however, sedation providers should be aware of the possibility of this adverse event, given the risk of significant complications.

Conclusion

We present 3 cases of gadolinium-based contrast-associated vomiting in pediatric patients undergoing propofol sedation. Although rare, vomiting after contrast is a well-described phenomenon, and it can have significant consequences in the sedated patient. As pediatric sedation becomes more common outside the operating room, providers should remain aware of the potential for this adverse event and be prepared to manage the related complications.

ARTICLE INFORMATION

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