

CLINICAL VIGNETTE

Propofol Sedation for GI Endoscopy in a Cannabis User

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Case Presentation

A 41-year-old 71 kg male presented for diagnostic upper endoscopy and colonoscopy for microcytic anemia bowel. He denied other medical problems and reported rare cannabis use. After placement of monitors and oxygen, monitored anesthesia care (MAC) with intravenous propofol was initiated at a 1mg/kg induction dose followed by 20-30 mg boluses as needed to achieve appropriate sedation. Despite two boluses, the patient was still visually awake. Several more boluses were given and his seemingly adequate level of sedation failed during the initial attempt to place the scope through the mouth. After further propofol exceeding 250mg and above the 2mg/kg typically administered as General Anesthesia, the patient was finally sedated enough to tolerate the esophageal endoscopy. This was initially tested by a jaw thrust to better open the mouth for the endoscope. With the increased amount of propofol, the patient had much shallower breaths and a drop in blood pressure. To maintain this level sedation throughout the procedure, a continuous propofol drip was initiated at 200 mcg/kg/min. Additional 128 mg of propofol was given for the 9 min upper procedure and 160 mcg/kg/min for the colonoscopy portion with additional boluses of propofol during the more stimulating turns in the colon for a total of 730 mg during the 30-minute total procedure sedation. After the procedure the patient acknowledged greater use of cannabis, vaping marijuana several times a week.

Discussion

Intravenous propofol is the most common form of anesthesia sedation for GI endoscopy. Its pharmacokinetic profile allows for rapid onset and rapid recovery, with minimal side effects when dosed properly by a trained professional. Dosage routinely begins with 1 mg/kg for induction with additional 20mg boluses to achieve the desired level of sedation which is followed by a continuous maintenance drip. Adjustments are often made for patient's medical conditions and age, with elderly receiving less and those with anxiety disorders receiving more.

Doses of propofol used for MAC for endoscopy are generally below amounts used for GA. However, cannabis users require increased propofol for adequate sedation. Levels often surpassing GA, levels with increased risk of hypotension, bradycardia, and respiratory depression. At GA levels there may be impaired cardiovascular function and inadequate ventilation, requiring support to maintain the patient's airway.

Obtaining an accurate history and physical is important to an anesthesiologist to safely dose propofol to achieve an appropriate depth of sedation. Overmedicating can lead to respiratory depression or apnea, and hemodynamic changes of hypotension and reflexive tachycardia. On the other hand, undersedation not only leads to decreased patient satisfaction and the potential for intraoperative awareness and discomfort, but also increases the risk of gagging, excessive salivation, and laryngospasm or bronchospasm which can potentially lead to respiratory emergencies including inability to ventilate the patient.

The prevalence of cannabis has drastically increased since its legalization, and its use, especially when minimized or withheld, can present challenges to adequately sedating patients, compared to nonusers. In the United States, cannabis has become the most common recreational drug with 10% of the population reporting use at least once a month.¹ In adults between 18-30 years, 43% reported use in the past year with daily cannabis use almost doubling to 11 % from 2011 to 2021.² Similar to tobacco smokers, cannabis smokers or vapers have similar pulmonary pathology, such as airway inflammation and damaged lung mucosa which may present perioperatively as an increased tendency to coughing, wheezing, and phlegm production, increasing risk of intraoperative bronchospasm, laryngospasm, and airway obstruction.³ THC also can delay gastric emptying increasing aspiration risk under anesthesia, especially since these procedures are typically performed without an endotracheal tube to protect the airway. Acute cannabis use can also lead to tachycardia and increased myocardial oxygen demand, increasing risk of myocardial ischemia, acute coronary events, stress cardiomyopathy, vasculitis, transient ischemic attacks, and stroke. Cannabis use in patients with prior myocardial infarction are reported to have a 2.5 to 4 times increase in the risk of death, depending on the frequency of use.⁴

Besides the physiological effects of cannabis use, the increase in sedation requirement also provides a challenge to the anesthesiologist ability balance sedation without compromising safety. Regular cannabis users undergoing outpatient endoscopy require significantly more propofol, as much as >220% to maintain sedation for the whole procedure compared with those with no or occasional cannabis use.³ Using the Modified Observer's Assessment of Alertness and Sedation (MOAA/S) scale, cannabis use was associated with significantly higher propofol doses to achieve adequate sedation compared to non-

users, 0.33 mg/kg/minute \pm 0.24 vs 0.18 mg/kg/minute \pm 0.11; $p < 0.0001$.⁵ In a small case control study of patients receiving endoscopy, increased propofol requirement of the cannabis group led to several sedation-related complications including use of bag-mask ventilation with an oral airway to support oxygen requirements compared to none in the non-using group. Studies also report regular cannabis users with more pain and 20% more post-operative nausea and vomiting after surgery which may delay recovery times, in rapid turn-around outpatient endoscopic procedures.¹ This effect is also seen in other types of endoscopy sedation, with cannabis users requiring 19.6% more midazolam and 14% more fentanyl.⁶

The exact cause of these observed increased medication requirements is unknown but it is believed that THC's interactions with the glucuronidation system in the liver and the enzymatic induction of the cytochrome P-450 CYP2C9, CYP3A4, and to a lesser degree CYP2C19 increases the breakdown of propofol.⁷ Another theory based on in vivo models suggests cannabis and propofol both have an effect on the endocannabinoid system causing a down-regulation of the cannabinoid CB-1 receptor in chronic cannabis users versus partial agonism/antagonism at the CB-1 receptor by other phytocannabinoids in marijuana products that may compete with propofol, increasing the required dose.⁵ Another theory involves the activation of the cannabinoid 2 CB-2 receptor which inhibits hippocampal gamma-hydroxybutyrate release leading to a need for higher propofol doses.⁸

Regardless of the exact mechanism of the interaction between cannabis and propofol, further studies are needed to help predict and prepare for endoscopic cases like the one presented in this vignette. Currently, there are no universal guidelines for cannabis use in perioperative period or its ramifications under anesthesia. Very few studies examine the effects of cannabis on anesthesia, and unfortunately, they tend to have small sample sizes or show mixed results, thought to be due to confounding variables such as EtOH and anxiety also affecting overall sedation requirements. Hopefully with legalization and the increasing prevalence of cannabis and cannabinoid products, further research will be done on cannabis effects on perioperative care to safely balance sedation and minimize respiratory and cardiac side effects of propofol. The American Society of Regional Anesthesia and Pain Medicine (ASRA) recently presented recommendations to improve care for patients using cannabis. At this time, they do not recommend routine toxicology screening, nor the abrupt cessation of cannabis in the days before a procedure, as withdrawal and safety studies have not been done. Elective procedures should be postponed at least 2 hours after cannabis use because of the increased risk of myocardial infarction, and cases rescheduled if patients are impaired from acute cannabis intoxication.¹ In the future, there may be a quantitative test to measure the levels of cannabinoids preoperatively which may help determine better sedation medication conversion algorithms as it is possible the individual's level of THC may explain the sedation variability requirements among cannabis users.⁹ Until there is a better understanding of the perioperative anesthetic implications of

cannabis use, anesthesiologists should start questioning all patients on potential cannabis use and its impact on sedation, especially since patients may be reluctant to be forthcoming given the stigma and fear of it being included in their medical chart. This includes asking the form utilized (edible, vape, oil), frequency, chronicity, the dosage or percentage of each cannabinoid if known, such as THC or CBD, and their last use.

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