Kratom Use: An Emerging Perioperative Nursing Concern

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ABSTRACT

Kratom is an emerging drug of concern that poses significant challenges in perioperative care, but the public and many health professionals remain unaware of its use and effects. Patients may use kratom as a substitute for opioids or to increase focus or decrease anxiety, depending on the dose. Kratom binds with μ-opioid, α_2-adrenergic, and serotonin receptors and has been associated with perioperative complications, including difficulty managing pain, hemodynamic instability, agitation, and withdrawal symptoms in patients undergoing surgery. Considering that 1.9 million Americans aged 12 years and older have used kratom, screening patients before surgery is important. Preoperative nurses can positively affect patient care by communicating a patient's use of kratom to the care team. With that knowledge, perianesthesia, intraoperative, and postoperative teams can be prepared for any untoward effects of kratom use across all perioperative settings.

Key words: *Mitragyna speciosa*, *kratom*, *herbal supplements*, *anesthesia complications*, *substance-related disorders*.

In the United States, more than half of all adults and approximately one-third of adolescents aged 12 to 19 years consume some type of dietary or herbal supplement.[1] Patients take herbals for a perceived benefit; these are often due to *alkaloids*, which are plant-derived, pharmacologically active substances either consumed from the original source plant or processed for consumption in a capsule, by dissolving in water, or by other means.[2] Because the public may perceive herbal supplements as harmless, patients may not always think of reporting their use to their health care professionals. This perception likely contributes to low disclosure rates; one study found that only 33% of patients disclose dietary or herbal supplement use to their health care professional.[3] Contributing factors include the belief that supplements are safe and unimportant to mention,[4] patient perception that supplement use is unrelated to the visit,[4-6] and failure of the health care professional to ask.[4-6] Health care professional inquiry has been cited as one of the primary motivators for patients to disclose supplement use.[4] However, despite recommendations to complete a thorough medication reconciliation, including inquiry about supplement use,[7] only 20% of patients are ever asked about their supplement use.[8] A thorough discussion of a patient's supplement use is important because the use of "herbal" and "natural" supplements has the potential to negatively affect anesthesia management.[7,9,10] Continued use of supplements may result in an increased risk of bleeding, arrhythmias, hypotension, hypertension, confusion, oversedation, and seizures during the administration of anesthesia.[7]

One supplement that has received escalating attention in the media and literature is *kratom*, a plant-derived substance that has both stimulant and opioid-like effects.[11] Also known as "gas station heroin," kratom is a $1.5 billion

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per year industry[12] that has few regulations.[13] The 2022 National Survey on Drug Use and Health found that 1.9 million people in the United States aged 12 years and older used kratom in the past year.[14] This was a 0.1% increase (+26 000 people) in kratom use from 2021 to 2022.[14] The percentage of use was highest among young adults aged 18 to 25, followed by adults aged 26 or older.[14] Increasingly, kratom is being recognized as an emerging substance of abuse.[15-17] The Survey of Non-Medical Use of Prescription Drugs Program, which queries US adults over 18 years of age (n = 59 714) about nonmedical use of prescription, illicit, and over-the-counter drugs, estimated a 12-month prevalence of kratom use of 0.8% and a lifetime prevalence of 1.3%.[18]

Regardless of whether kratom is being used casually, regularly, or problematically, case reports of complications when used concurrently with anesthetics are on the rise.[19-22] Despite increasing attention in media and literature, during informal polls of colleagues, we found that few health care professionals are aware of kratom. The nurses and other health care professionals a patient encounters throughout their surgical journey—from the initial surgical consultation and scheduling through preadmission testing and preoperative, intraoperative, and postoperative care—should be skilled in gathering data, providing education, and making recommendations about kratom use.[23] Although assessment for supplement use should begin in the surgeon's office, the preoperative evaluation—an essential component of safe anesthesia management—provides an important opportunity to reassess, clarify, and identify health behaviors that increase anesthesia risk.[24] Thus, the purpose of this article is to enhance kratom awareness among perioperative nurses (defined here as nurses involved across the surgical continuum, including preadmission testing and perianesthesia, intraoperative, and postoperative settings), discuss the risks associated with concomitant use with anesthesia and provide suggestions for meaningful screening and recommendations to mitigate complications.

OVERVIEW OF KRATOM

The supplement kratom is extracted from the leaves of *Mitragyna speciosa*, a tree native to Southeast Asia from which at least 40 alkaloids have been isolated.[25] The most active alkaloid is mitragynine (MTG) and its metabolite, 7-hydroxymitragynine. Kratom pharmacology is complex, and its effects on humans are mostly published in case reports.[26,27]

Clinical effects are dose-dependent and fall into two ranges: low dose and high dose. Low doses of MTG (1 to 5 g) increase alertness and physical energy, whereas high doses of MTG (5 to 15 g) produce sedation and analgesia.[25,26] Users of kratom consume it for these intended purposes, but MTG's interactions with multiple receptors and enzyme systems during metabolism in the liver may lead to unintended side effects or adverse outcomes for consumers.

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Mitragynine is a partial agonist of μ-opioid receptors, which explains the responses of analgesia and sedation in the higher dose range (greater than 5 g). Interestingly, MTG does not activate a β-arrestin-2 pathway, which, when stimulated by the μ-receptor agonism, leads to opioid-associated respiratory depression; therefore, kratom alone is not associated with respiratory depression.[25] Mitragynine also interacts with α_2-adrenergic, serotonin, and dopamine receptors in the brain,[25,26] which are responsible for the aforementioned dose-dependent central nervous system effects. The onset of action after oral ingestion of kratom takes 10 to 20 minutes, with full effect noted in 30 to 60 minutes, strongest effects in two to four hours, and a duration of action of five to seven hours.[28] From a perioperative nursing perspective, the interactions with the μ-opioid, α_2-adrenergic, and serotonin receptors may complicate patient care, contributing to difficulty with pain management, hemodynamic instability, agitation, and withdrawal symptoms.

Cytochrome (CYP) P450 enzymes are a group of liver enzymes responsible for metabolizing orally ingested medications. Depending on the dose, MTG can inhibit CYP3A4, an enzyme responsible for metabolizing more than half of commonly used medications, by 15% to 23%.[29] Mitragynine also inhibits other CYP enzymes, including CYP2C9 and CYP2D6.[29] Inhibition of these enzymes is clinically important because it may alter how other medications are metabolized, potentially leading to stronger, weaker, or unpredictable effects when kratom is used concurrently.

Reasons for Use

Traditionally in Southeast Asia, leaves of the *M speciosa* tree are brewed, chewed, or smoked for their medicinal properties (treatment of diarrhea, fever, or stress) or for their stimulating or pain-reducing effects.[30] In the United States, kratom is gaining popularity as an over-the-counter supplement to treat emotional and mental conditions (anxiety, depression, posttraumatic stress disorder), fatigue, acute or chronic pain due to medical conditions; replace prescription opioids; or prevent withdrawal symptoms from prescription or illicit opioid dependency.[31] The supplement is widely available at vape shops and similar outlets as dried leaves, powders, capsules, tablets, and extracts.[30] In a 2023 survey of tobacco specialty stores across the United States (n = 520), more than 72% of stores reported selling kratom.[32]

Kratom is currently unregulated by the US Food and Drug Administration and listed as a Drug and Chemical of Concern by the US Drug Enforcement Agency.[33] The US Food and Drug Administration cautions against using kratom due to the potential for adverse effects and has issued warnings when kratom products were identified to be contaminated with heavy metals and *Salmonella*.[34] Due to concern about its abuse potential and a variety of untoward effects resulting from its use, a few states have begun implementing laws regulating kratom products (ie, alkaloid content, adulteration and contamination, and strength), labeling, and sales; a few have banned kratom altogether.[13]

Health Consequences

The adverse effects associated with kratom use are not inconsequential. In fact, kratom is being reported as a primary agent responsible for both minor and serious health concerns. In a retrospective review of data reported to the National Poison Data System between 2011 and 2018, kratom accounted for 2312 exposures (935 were kratom alone); most exposures were intentional (abuse or misuse).[35] Kratom was identified as the cause or contributing factor in four deaths, two of which were attributed to kratom as the single substance used. The most common adverse effects were tachycardia, drowsiness, vomiting, agitation, and confusion; the most serious adverse effects were seizure, withdrawal, hallucinations, respiratory depression, coma, and cardiac or respiratory arrest. In another National Poison Data System data review (2014 to 2019), there were more than 3000 exposures, and 162 of them were in persons 60 years or older.[36] Three deaths in this age group were attributed to kratom ingestion. Similar neurological, cardiovascular, gastrointestinal, and respiratory effects were reported.

Although rare, severe organ damage has also been reported.[25] This includes cardiotoxicity,[37] acute liver injury,[38] and renal failure.[39] However, there may be confounding factors, particularly if kratom is used with other substances (prescription medications, alcohol, illicit drugs) that influence the damage to major organs as well as the occurrence of serious adverse effects.[40] Further, both kratom-associated adverse effects and organ damage appear to be dependent on the dose, duration of use, and strain of alkaloid in the product used.[22]

Although not all persons who use kratom misuse or develop problematic use, there are escalating concerns about its addiction potential leading to the development of a substance use disorder.[15,41] A substance use disorder is characterized in the DSM-5 (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*) as a chronically relapsing, compulsive pattern of drug taking that ranges from mild to severe.[42] According to the DSM-5, diagnosis of a substance use disorder is based on a pattern of use resulting in clinically significant impairment, manifested by at least two of the following within a 12-month period:

- craving;
- difficulty with reducing use;
- using more or longer than intended;
- spending a significant amount of time to obtain, use, or recover from the substance;
- withdrawal;
- tolerance;
- hazardous use;
- failure to fulfill role functions;
- giving up or reducing activities due to the substance use; and
- continued use despite relationship or health problems.

As with most substance use disorders, a combination of behavioral therapy alongside pharmacotherapy are the

mainstays in treatment.[43] Because withdrawal from kratom mimics that of opioids, medications for opioid use disorder (naltrexone, buprenorphine, and methadone) are often the pharmacotherapy of choice.[41,44]

PERIOPERATIVE STRATEGIES

There are increasing case reports of kratom interfering with anesthesia management,[19-22] yet there are no published clinical guidelines for anesthesia management when kratom is being used.[17] However, due to the known pathways by which kratom elicits its effects, anesthesia professionals and perioperative nurses can expect and be prepared for difficulty with sedation, hemodynamic instability, anesthetic-drug interactions, emergence delirium, and difficulty managing pain, all of which may contribute to delayed discharge or result in a transfer to another level of care. Considerations across the perioperative period, including preadmission testing and the preoperative, intraoperative, and postoperative phases, are reviewed next.

Preoperative

The preoperative evaluation encounter provides an opportunity for nurses to offer important education and recommendations to patients related to supplements. In general, supplements should be withheld two weeks before surgery.[45] In regard to kratom, in a 2021 consensus statement, the Society for Perioperative Assessment and Quality Improvement recommends that rather than withholding kratom use, it should instead be discontinued altogether.[24] Further, due to the concern for withdrawal if taking more than 5 to 15 g per day, they recommend tapering versus abrupt cessation. Patients may not be successful in self-tapering; thus, a referral to treatment may be the ideal option to support cessation before surgery if time allows.[16]

Patients who regularly take kratom should be counseled preoperatively about the potential for difficulty managing their pain. A recent case study report described the perioperative course of a 42-year-old male undergoing an elective knee replacement.[21] The patient had a history of opioid and alcohol use disorder and was currently using kratom to manage his chronic pain. Before surgery, he was referred to the pain clinic for recommendations for pain management intraoperatively and during the postoperative period. Opioid-free analgesia with multimodal pain management was employed, and the patient was transitioned to buprenorphine in the postoperative period. Thus, patients should be informed that comanagement with a pain specialist and buprenorphine may be a component of their treatment plan. In instances when cessation is not possible, such as emergency procedures, when a patient fails to cease use, or when use is not disclosed or discovered until the anesthesia event, anesthesia professionals and perioperative nurses should be prepared to recognize and manage potential interactions across the intraoperative and postoperative periods.

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Intraoperative

Kratom use has been linked with hemodynamic instability that results in hypertension and tachycardia, likely due to its activity on α_2-adrenergic and serotonergic receptors,[41] especially in those with recent use. During the intraoperative period, perioperative nurses may expect the need for antihypertensives or beta blockers to manage this instability. For instance, a case report described an 18-year-old patient regularly taking up to 35 g of kratom daily who presented for facial surgery.[19] Among other concerns, the intraoperative course was complicated by the development of hypertension requiring boluses and infusions of antihypertensive medications for the duration of the surgery to achieve a mean arterial pressure of less than 80 mm Hg.

Anesthetic-drug interactions

As noted previously, kratom interacts with opioid receptors, particularly the μ-opioid receptor.[26] Because of this interaction, patients who use kratom may have a reduced response to medications commonly administered by anesthesia professionals, including opioids and anesthesia induction agents. As a result, significantly higher doses of these medications may be required to achieve the desired effect.[19] Alternatively, anesthesia professionals may

consider regional or neuraxial anesthesia techniques along with multimodal pain management strategies.

Postoperative

During the postoperative period, nurses should be aware that kratom use may result in an increased length of stay due to poorly managed pain, emergence delirium, or withdrawal. Chronic kratom use has been associated with physical dependence and withdrawal symptoms similar to those observed in opioid withdrawal.[16] Common symptoms of withdrawal are autonomic instability (rapid heart rate, hypertension, excessive sweating, fever, nausea, vomiting, diarrhea, or tremors), agitation, and aggression, all of which make distinguishing extreme pain from withdrawal in the immediate postoperative period difficult.[19] Further, unmanaged pain or withdrawal may precipitate emergence delirium. Management strategies described in the literature include the administration of α_2 agonists, benzodiazepines, and full or partial opioid agonists in combination with nonsteroidal anti-inflammatory drugs to address both pain and withdrawal symptoms and mitigate emergence delirium.[19,21,22] Alternatively, buprenorphine, which is a partial opioid agonist and has a ceiling effect on respiratory depression, may be the preferred prescription pain medication in both the postoperative and postdischarge periods to reduce the risk of overdose.[21]

Nurses should also be aware that withdrawal symptoms may develop later in the postoperative course. A case report described a 55-year-old female who underwent an uncomplicated colon resection.[20] Two days after surgery, she developed nausea and vomiting, which were initially suspected to be an emerging complication of the surgery (ie, ileus). These symptoms were later attributed to kratom withdrawal.

The patient had not disclosed her use of kratom for chronic pain and anxiety before surgery. Supportive treatment of her symptoms included haloperidol and IV fluids, and she was ultimately discharged on day 12. However, the nondisclosure of kratom use complicated her recovery and resulted in an unanticipated intensive care unit admission due to aspiration pneumonia. The authors noted that earlier identification of kratom use and anticipation of withdrawal may have mitigated the development of pneumonia and the prolonged hospital stay.[20]

PERIOPERATIVE NURSING IMPLICATIONS

Suboptimal analgesia and a problematic perioperative course can occur when an anesthesia professional is unaware that a patient is using kratom.[46] This concern highlights the importance of obtaining a thorough medication history. Although many patients manage their health care data via a health system portal or app, in terms of over-the-counter medications, supplements, and substance and alcohol use, the portal is only as accurate as the inputs by the user. Moreover, patients may be reluctant to document kratom use due to concerns about privacy, trust, judgment, and stigma.[3,47] Thus, ensuring an accurate method of collecting and sharing information with anesthesia or other health care professionals is an important step in safe health care. Preoperative nurses are invaluable in obtaining and validating a patient's medication history and other medical information and ensuring that the perioperative team is well-informed for clinical decision-making.

Use of standardized screening tools during preoperative evaluation is a common and acceptable means to identify opioid and other substance use.[48] Unfortunately, there is no tool specific to screening for kratom.[23] Further, kratom is not tested by most point-of-care multipanel urine screens. Instead, urine specimens are sent to a laboratory for initial presumptive testing by immunoassay; presumptive positives are then confirmed using definitive chromatography or tandem mass spectrometry. This additional testing is neither convenient, efficient, nor cost effective.[23]

Direct questioning has been suggested as the means for eliciting the most accurate information.[4] Essential to support open dialogue and disclosure is rapport building.[23] By establishing rapport with patients in the preoperative period and using a direct, culturally sensitive, nonstigmatizing question, nurses are more likely to gain a greater understanding of the patient's supplement use history. The following question has been proposed:

- "Do you use [dietary supplements] or herbs including products picked in the garden, infusions/teas, natural/folk/traditional remedies, or products similar to [kratom] for your health issues?"[49(p308)]

This question incorporates key words that encompass cross-cultural diversity as well as nonstigmatizing language.

Key Takeaways

- Kratom use is increasingly common among patients and can significantly complicate perioperative care. This substance's interactions with multiple receptor systems may lead to hemodynamic instability, difficulty with pain management, agitation, and withdrawal during the surgical period.
- Preoperative nurses play a critical role in identifying kratom use, as patients often do not voluntarily disclose their supplement habits. Early recognition allows the care team to anticipate risks, plan cessation or tapering strategies, and coordinate specialty consultations when needed.
- Intraoperative management may be challenging in patients who use kratom regularly due to altered responses to anesthetic agents and the potential for significant blood pressure and heart rate abnormalities. These physiologic changes may require higher medication doses, alternative anesthetic strategies, or additional pharmacologic support.
- Postoperative complications, such as withdrawal, unmanaged pain, and emergence delirium, may prolong recovery and increase care needs. Thorough communication among perioperative teams and proactive symptom management help reduce adverse outcomes and support safer discharge planning.

When kratom use is disclosed, nurses can identify potential areas of concern by asking detailed follow-up questions about the last use, the amount used, the frequency of use, and the duration of use. When chronic kratom use is identified, given the potential for associated complications, nurses should consult with the surgeon or anesthesia professional regarding the need for additional testing, such as liver and thyroid function or an electrocardiogram, if not already completed.

Although the focus of this article is the supplement kratom, perioperative nurses should also be aware that there are other emerging substances of concern that can influence the perioperative course. These include nonprescribed substances that are legally accessed and may be considered "natural" supplements (eg, delta-8 or delta-9 tetrahydrocannabinol), or those that are appropriately prescribed for a medical condition (eg, desvenlafaxine, amitriptyline, bupropion, quetiapine) but are being misused.[50] This consideration further underscores the importance of thorough, nonstigmatizing, culturally inclusive questioning during perioperative screening, particularly when standardized screening tools and point-of-care testing are limited.

Communication With Anesthesia Professionals

Communicating about a patient's kratom use to anesthesia professionals and the perioperative team enables the development of a more individualized plan of care. This may include anticipating potential complications across the intraoperative and postoperative periods, altering anesthesia or pain management plans, or consulting with pain management specialists. Further, because timely referral and treatment supports recovery, involving behavioral health professionals when a use disorder is suspected is important for both short- and long-term outcomes.

CONCLUSION

The preoperative nurse evaluation is crucial to the identification of patient supplement use as well as misuse of nonopioid prescription medications that may affect anesthesia management. By building rapport and using direct, nonstigmatizing questioning, nurses may facilitate disclosure of supplement use. When disclosed, preoperative nurses can then provide education about cessation before surgery or investigate whether additional referral is needed to support cessation if a use disorder is suspected. When cessation is not possible or use is discovered during the perioperative course, communicating this information to the anesthesia and perioperative team allows time to plan for potential untoward events. Nurses working in the intraoperative and postoperative areas can then anticipate, assess, and plan for known complications, such as emergence delirium, withdrawal symptoms, or difficulty managing pain. Preparation will help to facilitate a smooth perioperative course and improve patient outcomes.

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