

Surgical considerations of marijuana use in elective procedures¹

Literature review by Lillian Han

Background

- Marijuana consumption has increased to 9.5% of the U.S. adult population in 2015-2016.
- Currently, 10-20% of patients between the ages of 18 and 25 years are estimated to regularly use marijuana.
- Medicinal marijuana differs in chemical composition, containing a higher tetrahydrocannabinol (THC) concentration and less cannabidiol than the recreational version.
- Various extraneous agents may be found within the available recreational drug.
- However, there is very little research on potential implications for surgical outcomes amongst users.
- Despite the multiple studies on the physiologic effects of marijuana use, clinical studies are lacking in the medical literature.

Methods

- Literature review focused on:
 - o How is marijuana use screened for in clinical and pre-operative settings?
 - o What are potential surgical complications of marijuana use?
 - o How should surgeons handle patient marijuana use regarding elective surgery?
 - o Are marijuana's effects the same or different from those of tobacco?
- This literature review draws from various fields such as orthopedic, dental and bariatric with anesthesia considerations.

Results

- Pharmacological effects
 - o Cannabinoids are highly lipid soluble, leading to a slow release into the blood stream with a single dose for up to 30 days.
 - o Smoking: peak effect in 15 minutes and persists for up to 4 hours.
 - o Oral ingestion: peak effect in 90 minutes and persists about 5-6 hours due to continued absorption in the gut and despite the first-pass metabolism by the liver.
 - o The cognitive and psychomotor effects can last up to 24 hours regardless of administration route.
 - o Cardiovascular effects:
 - o A case series revealed that sinus tachycardia was induced by inhalation and persisted for 90 minutes.
 - o A significant elevation of systolic and diastolic blood pressures as well as the presence of premature ventricular contractions was observed. Above findings have also been explored by other authors such as Malit *et al.* and Beaconsfield *et al.*
 - o Marijuana use has been linked to multiple ECG changes in various case reports. A case reported that cannabis use was linked to the development of atrial flutter

and atrial fibrillation, and other studies have reported the presence of sinus bradycardia and AV block at higher doses of marijuana.

- Marijuana also has a role as a risk factor for myocardial infarction. A study found a statistically significant 4.8 fold increase in myocardial infarction within the first hour of marijuana use ($P < 0.001$). Another study found that in patients with prior myocardial infarction, its use up to once per week increased risk of death 2.5 fold while more frequent use yielded a fourfold risk of dying.
- Marijuana has also been reported as a risk factor for stroke. Marked change in blood pressure or the reversible cerebral vasoconstriction from marijuana are likely the mechanisms of stroke, but admitted that no firm conclusions could be drawn without further studies.
- Respiratory effects
 - Due to the unfiltered nature of marijuana compared to tobacco cigarettes, the amount of carcinogens and irritants that enter the upper airway is increased three-fold and one third more tar is deposited in the respiratory tract.
 - Marijuana use is associated with airway inflammation that is similar to that of a tobacco smoker.
 - The pulmonary complications in the chronic marijuana smoker are equivalent to those seen in the chronic tobacco smoker.
 - Similar to tobacco use, marijuana use plays a role in the development of lung cancer.
- Impact on anesthesia
 - A series of case report presented patients who suffered from significant respiratory distress due to postoperatively isolated uvulitis from inhaling large quantities of cannabis before.
 - These findings stress the importance in the maintenance of the airway during and after anesthesia following acute marijuana use due to the potential airway obstruction that may occur.
 - Some recommend that elective operations should be avoided if a patient was recently exposed to cannabis smoke because prophylactic treatment may not be efficient for uvular edema and laryngospasm following extubation.
 - Studies have shown that chronic marijuana users required significantly increased doses of propofol to facilitate successful insertion of the laryngeal mask.
 - A review and a randomized controlled trial recommend the avoidance of anesthesia in any patient with cannabis use within the past 72 hours due to its cardiovascular effects.
- Peri-operative complications
 - One of the most researched and known risk factors for peri or postoperative complications is smoking.
 - Bryson² recommends that ketamine, pancuronium, atropine and epinephrine, all drugs known to affect heart rate, should be avoided in patients with history of acute marijuana use, while the bradycardia and hypotention that results from high doses of marijuana calls into question the amount of atropine and vasopressors needed.
 - Animal studies and observational studies have shown that marijuana could lead to a diminished platelet aggregation. However, this is controversial.

- In chronic marijuana users, the perioperative narcotic requirements to gain appropriate analgesia were significantly increased, demonstrating a potential interaction between marijuana and opioids.

Conclusions

- No investigation has been done regarding patient's marijuana use and surgical considerations, such as effect on wound healing.
- The documented evidence of marijuana's effects is of great concern for surgery.
- As cannabis use becomes more prevalent due to legalization of its use, the lack of data leaves surgeons without much evidence-based guidelines to marijuana management within the surgical patient population.

Summary

- In acute settings, marijuana's effects peaks at approximately 1 hour post initiation, lasting 2-4 hours.
- Marijuana increases cardiac workload, myocardial infarctions and strokes in young, chronic users.
- Cannabis causes similar pulmonary complications to those of a tobacco smoker.
- Marijuana causes airway obstruction and increases anesthetic dosages needed to place laryngeal effects.
- Marijuana use is problematic for surgeons, who are left without much evidence-based guidelines
- Further research is needed to provide information to guide elective procedures.

References

1. Henry B. Huson, Tamara Marryshow Granados, Yvonne Rasko. Surgical considerations of marijuana use in elective procedures. *Heliyon* 4 (2018) e00779.
2. E.O. Bryson, E.A. Frost, The perioperative implications of tobacco, marijuana, and other inhaled toxins, *Int. Anesthesiol. Clin.* 49 (1) (2011) 103e118.