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Cannabis abuse and spinal Anesthesia-A case series

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Abstract
Background: Cannabis abuse is very common in our society and it is not uncommon to encounter patients abusing these drugs to come for surgery under Anesthesia. Cannabinoid compounds act on cannabinoid receptors CB1 and CB2 which are present in different locations in the body including the spinal cord, thereby interfering with anesthetic effect of various drugs such as inhalational, intravenous and local anesthetics.
Cases: In this case series, we report six cases of subarachnoid block (SAB) failure in cannabinoid abusers. There was delayed onset, patchy effect and decreased duration of both sensory and motor block among these abusers, with increased requirement for supplementation with analgesic or anesthetic drugs or conversion to general anesthesia (GA).
Conclusion: Alternative to SAB such as regional nerve blocks or GA should be the considered in these abusers. If at all SAB is administered, conversion to GA should be kept as a ready option.

Keywords: Cannabinoid abuse, cannabinoid receptors, endocannabinoids, subarachnoid block, delayed onset, failure of block

Introduction
Cannabis abuse is very common in our society and it is not uncommon to encounter patients abusing these drugs to come for surgery under anesthesia. Cannabinoids have been used for therapeutic and recreational purposes for a long time. Apart from natural cannabinoids such as 'bhang', 'ganja' and marijuana (also popularly called weed or pot) derived from the leaves and flowers of Cannabis sativa, an easily grown plant, synthetic cannabinoid receptor agonists such as K2 and 'Spice' are increasingly being abused due to their ease of availability [1]. All these compounds act on cannabinoid receptors CB1 and CB2 which are present in different locations in the body including the spinal cord, thereby interfering with anesthetic effect of various drugs such as inhalational, intravenous and local anesthetics. [2,3,4] In this case series, we report six cases of subarachnoid block (SAB) failure in cannabinoid abusers from all of whom informed consent was taken.

Case Report: Case 1
Our first case was a 29 years old male with a history of road traffic accident. He had no co-morbidities except that he was a chronic ganja smoker for 8 yrs. He was posted for open reduction and internal fixation (ORIF) for fracture shaft of tibia under SAB. SAB was administered in the sitting position in the L3-L4 interspace with 3.4 ml of 0.5% Bupivacaine heavy. No sensory or motor block was noted even after 20 minutes. SAB was repeated with 2.5 ml of the same drug but again no effect was seen. Finally the patient was taken under general anesthesia (GA) and requirement of higher doses of induction agent and analgesics was noted.

Case 2
The second case was a 35 years old chronic ganja abuser for the past 6 yrs, posted for implant removal. Proximal femur nailing was performed 4yrs back under SAB wherein effect was patchy and anaesthesia was supplemented by intravenous drugs as reported by the patient. This time too, SAB with 0.5% Bupivacaine heavy failed and GA had to be administered.

Case 3: A 45 years old chronic ganja smoker for 10 yrs. with cellulitis of left lower limb posted for debribement under SAB yielded

a delayed and patchy sensory response after 25 min. Motor response was intact. Further surgery was supplemented with IV Fentanyl and Dexmedetomidine.

Case 4
A 26 years old gravida 2 at 39 weeks of gestation with polyhydraminos and history of previous ceaseren section (CS) was posted for emergency CS. She was addicted to tobacco powder (gul) and 'bhang'. SAB using 2.2 ml of 0.5% Bupivacaine heavy produced no effect after 15 minutes and GA was administered.

Case 5
A 30 years old chronic 'ganja' abuser for interval appendectomy had similar SAB failure with conversion to GA and higher requirement of anesthetic drugs than usual.

Case 6
A 25 years old autorickshaw driver with history of abusing 'bhang' in the form of 'ladoo' (cannabinoid mixed in sweetmeat) was posted for ORIF in view of fracture shaft of tibia. SAB failed and supplemental IV Fentanyl and Propofol were used.

Discussion
In general, a number of factors might be responsible for failed, delayed or inadequate effect after SAB. Factors like problem in the technique while performing the block or gross anatomical variation in the neuraxis were ruled out in all the above mentioned cases. The block was performed by an anesthesiologist with minimum 3 years of experience using the same drug in all the patients, namely, 0.5% Bupivacaine heavy. Another factor responsible for poor sensorimotor blockade could be poor quality of the drug used. However this was also excluded in our cases by checking drug label, storage condition, batch number and expiry date in each ampule and it was seen that the same batch was being used in the particular operating room during the time the cases were taken up. By excluding these factors, our patients had no other apparent cause affecting the success rate of the neuraxial block procedure but the chronic substance abuse of cannabinoids as elicited from the history.
Repeated exposure to high doses of any drug for long duration may lead to a state of tolerance in many receptors. Numerous theories are suggested for explaining the development of tolerance due to cannabis abuse. Cannabinoids act primarily via adenylyl cyclase G-protein-coupled receptors, namely CB1and CB2receptors.Tolerance develops within weeks of regular use of cannabinoids due to downregulation of both CB1 receptors and endocannabinoid levels. Down regulation of these receptors decreases the response to the drug, the receptor function and the affinity for agonists. Cannabis tolerance might also result from uncoupling between the receptor and intracellular second messengers by increasing adenylyl cyclase activity [4, 5]. The two main cannabinoids, tetrahydrocannabinol and cannabidiol, interact with brain cannabinoid type 2 receptors, leading to inadequate hypnosis and increased requirement of anesthetic agents for GA through brain neurotransmitters affecting sleep and arousal [6].
CB1 cannabinoid receptors are widely distributed in the central and peripheral nervous systems, especially the hippocampus, cortex, olfactory areas, basal ganglia, cerebellum, and dorsal horn of the spinal cord. Activation of these receptors inhibits the production of cyclooxygenase and lowers the inflammatory component of acute pain and central sensitization at the dorsal horn of the spinal cord. The receptors involved in local or spinal anesthesia are comparable in distribution, constitution and function to cannabinoid receptors in certain parts of the body such as the spinal cord, making them affected by the prolonged exposure to cannabinoid compounds. Based on the above theories, there would be an expected decrease in the duration of spinal anesthesia among abusers as compared to non-abusers. Therefore, increasing the dose of anaesthetic and analgesic drugs should be considered in order to achieve the desired effect. An excessive exposure to exogenous cannabinol compounds could also affect mu, kappa, and delta receptors thereby causing variability in the release and function of the endogenous peptides responsible for pain relief. Interestingly, cannabis itself has an antinociceptive effect mediated by a decreased calcium and increase potassium transmembrane conductance via inactivation of the voltage-activated channels [2, 7, 8, 9].
Multiple studies are already available about the interaction between cannabis abuse and anesthetic drugs used during GA [5, 10]. Literature suggesting the effect of cannabis abuse on spinal anesthesia or SAB are limited but recently, few studies have reported the incidence of failed spinal anesthesia in cannabinoid addicts as compared to non addicts [2, 7, 11]. The study by Youssef et al compared the effect of SAB in patients abusing Marijuana, Cannabis, Tramadol, and Clonazepam with that in non-abusers [7]. We could not however find any such study specific to cannabis abusers. The cases that we report were encountered over just a span of a year in our hospital and adds to this knowledge that cannabis abuse affects the motor and sensory block development after SAB. Clinical studies with appropriate sample sizes would be required to corroborate these findings objectively.
As our cases show, the incidence of failure of spinal anaesthesia with intrathecal 0.5% Bupivacaine heavy could be higher in cannabis abusers than in non-abusers. Delayed and patchy effect and decreased duration of sensorimotor block among abusers, with increased requirement for supplementation with analgesic or anesthetic drugs are seen. Alternative to SAB such as regional nerve blocks or GA should be considered in these abusers. If at all SAB is administered, conversion to GA should be kept as a ready option in such patients while remembering that these patients might require higher doses of drugs used for GA as well.

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