# Succinylcholine Induced Rhabdomyolysis in a Heavy Marijuana Smoker: A Case Report

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Rhabdomyolysis is a syndrome caused by muscle necrosis and the release of intracellular muscle constituents into the circulation. It is characterized by muscle pain, significantly elevated creatine kinase (CK) levels and myoglobinuria. The severity ranges from asymptomatic elevations in serum muscle enzymes to life-threatening disease associated with extreme enzyme elevations, electrolyte imbalances, and acute kidney injury [1].

Surgical patients are prone to rhabdomyolysis due to their medical background, a surgical procedure, and the use of procedural medications. Among these medications, rhabdomyolysis has been associated with volatile anesthetic (e.g., halothane, isoflurane, sevoflurane, desflurane), succinylcholine, corticosteroids, and propofol [2].

We present a case of rhabdomyolysis following a minor surgical procedure performed under general anesthesia, possibly as an isolated clinical manifestation of succinylcholine induced malignant hyperthermia.

## PATIENT DESCRIPTION

A 24-year-old male (weight 80 kg, height 188 cm) underwent elective pilonidal sinus excision under general anesthesia. He had a medical history of mild asthma treated with inhaled salbutamol but was otherwise healthy with no known history of myopathy, malignant hyperthermia, or myoglobinuria. He reported smoking cigarettes and marijuana heavily and denied any allergies or the use of anabolic steroid and nutritional supplements. He also denied any strenuous physical activity in the 2 weeks prior to the surgery. The preoperative assessments (including laboratory blood and urine analysis) were within normal range.

During and immediately after the surgery, the patient received fentanyl intravenous (IV, 300 mcg), succinylcholine IV (100 mg), propofol IV (250 mg), lidocaine 1% IV (60 mg), paracetamol IV (1000 mg), metoclopramide IV (10 mg), and ondansetron IV (4 mg). The patient was under general anesthesia for 82 minutes. The procedure itself was 58 minutes long and was overall uneventful. A Foley catheter was not inserted.

During the postoperative period, the patient started complaining of dark stained urine and muscle fasciculations. Dip stick urinalysis was positive for blood; however, tea-color appearance raised the suspicion of myoglobinuria. Laboratory workup showed elevated CK levels of 68,320 U/L (normal range values 22–198 U/L) and a mild elevation of creatinine levels to 1.4 (mg/dl) (normal levels 0.7–1.3 mg/dl), myoglobin (urine) was negative. Electrolytes and blood gasses, including potassium, were within normal range. Vital signs, including body temperature, were normal, and physical examination showed no muscle rigidity.

The patient was transferred to the intensive care unit. Further laboratory workup showed myoglobinuria of 59,450 (ug/L), elevation of blood myoglobin levels 227 ng/ml (normal range 0–85 ng/ml), aspartate aminotransferase 1851 U/L (normal range 10–40 U/L), alanine aminotransferase 322 U/L (normal range 7–56 U/L), and low-density lipoprotein 6983 U/L (normal range 140–280 U/L). The patient was monitored and treated with IV fluids. Throughout the hospitalization, vital signs, complete blood count, and electrolytes remained within the normal range and there were no further adverse medical events. The CK levels peaked to 153,540 (U/L), before declining. The patient was discharged against medical advice on postoperative day 4 with CK levels of 45,800 (U/L), normal creatinine levels, and a mild elevation of liver function tests. The patient's laboratory results after discharge, including CK levels, continued to slowly return to normal. On discharge he was counseled to perform a workup for muscular disease and malignant hyperthermia. Consequently, he had a nerve conduction velocity\electromyography (NCV\EMG) test that showed no evidence for any large fiber polyneuropathies or myopathies. To the best of our knowledge, he did not complete the workup for malignant hyperthermia.

## COMMENT

Postoperative rhabdomyolysis is a rare, and potentially life threatening, complica-

tion of surgery under general anesthesia. Common surgical-related causes include muscle compression due to compartment syndrome or prolonged immobilization [3]. We presented a patient with no known predisposition for rhabdomyolysis who underwent a relatively short and minor surgical procedure under general anesthesia. His diagnosis was inconsistent with these etiologies.

There have been few case reports describing succinylcholine-associated rhabdomyolysis, some of them were systematically reviewed by Barrons et al. [3]. To the best of our knowledge, our case is the first described in Israel. Table 1 compares our patient's characteristics with those of the patients described in the review. Our patient was similar in gender and in succinylcholine dose. However, he was younger, had a shorter surgery duration, was not obese, and did not have acute kidney injury, possibly due to the prompt diagnosis and treatment. Of note is the fact that our patient had elevated liver function tests, similar to 5 of the 10 reviewed cases [Table 1].

Another drug that our patient had received that was previously associated with rhabdomyolysis is propofol. Propofol can cause rhabdomyolysis as part of propofol infusion syndrome (PRIS), which is defined as the appearance of high anion gap metabolic acidosis, rhabdomyolysis, hyperkalemia, acute kidney injury, elevated liver enzymes, and cardiac dysfunction following initiation of propofol. The risk factors for PRIS include a propofol infusion rate exceeding 4 mg/kg/hour (or 67 µg/kg/minute) and infusion duration greater than 48 hours in critically ill patients requiring vasopressor and corticosteroids and experiencing carbohydrate depletion [4]. Our patient had none of these risk factors and had received only 250 mg (3.125 mg/kg) of propofol during the short operation. In addition, in a review of 37 reported cases of PRIS published by Mirrakhimov and colleagues [4], 35 of the 37 patients received an infusion of propofol for more than 24 hours. The two patients who received propofol for less than 24 hours (one received a single bolus and the other received the drug during a 12.5-hour long surgery) did not have rhabdomyolysis. Furthermore, among all the clinical manifestations defining PRIS, our patient only exhibited rhabdomyolysis. As such, propofol was not a likely cause to the patient's symptoms.

It is worth noting that the patient reported smoking marijuana heavily in the time prior to the surgery. Marijuana was also previously associated with rhabdomyolysis, although this association was not very strong [2,5]. Previously reported cases of rhabdomyolysis following heavy marijuana usage were also reported to be connected to other known risk factors. Therefore, marijuana use may have been a contributing factor in the development of rhabdomyolysis in this patient.

**Table 1.** Comparison of our patient's characteristics with those of the patients described in the review by Barrons et al.

| General characteristics | Our patient | Barrons et al. |
|---|---|---|
| Number of cases | 1 | 10 patients |
| Age (range) | 24 years of age | 42 years of age* (23–81) |
| Male:Female | Male | 9 males:1 female |
| Creatine kinase levels (U/L) | 153,540 | 48,697* (15,500–418,800) |
| Succinylcholine dose (mg) | 100 | 100** (80–160) |
| Surgery duration (minutes) | 78 | 133** (40–150) |
| Obesity (BMI > 30 kg/m$^2$) | 22.6 kg/m$^2$ | 5 obese, 2 normal BMI, 3 unknown |
| Medical history of neuromuscular disease | none | none |
| Renal injury or failure | none | 6 patients |
| Dark urine | yes | 7 patients |
| Elevated liver function tests | elevated | 5 patients |

BMI = body mass index
*median
**mean

## CONCLUSIONS

We present a case of isolated rhabdomyolysis without malignant hyperthermia following administration of succinylcholine during low-risk surgery. Succinylcholine-induced rhabdomyolysis is a rare and potentially life-threatening complication that has been previously described in several cases. Caregivers should have a high index of suspicion in patients following general anesthesia who complain of dark stained urine or muscle fasciculation, especially in the setting of succinylcholine administration. In addition, healthcare professionals should obtain and document any substance abuse, including marijuana, in every preoperative evaluation. Further research is needed regarding succinylcholine-induced rhabdomyolysis, including possible contributing factors such as marijuana.

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