

## Suspected Compartment Syndrome and Rhabdomyolysis after "Pseudoephedrine" Use - A Case report

Eric Medrano <sup>a</sup> Jake Goliver <sup>b</sup>

Corresponding author(s): [Eric.Medrano@utoledo.edu](mailto:Eric.Medrano@utoledo.edu)



<sup>a</sup>The University of Toledo Medical Center Toledo, OH 43614, USA, and <sup>b</sup>The University of Toledo Medical Center Director of Emergency Medicine Residency, Toledo, OH 43614, USA

**Acute compartment syndrome and rhabdomyolysis are two life threatening diagnoses that cannot be missed in the emergency room. The increased pressure in the closed compartments of extremities can eventually lead to loss of peripheral pulses, decreased tissue perfusion, and ultimately muscle necrosis. This breakdown of muscle byproducts will ultimately lead to kidney damage and rhabdomyolysis. Although the most common cause of compartment syndromes are secondary orthopedic causes such as lower extremity fractures there are known documented toxicological causes. (1,2) Pseudoephedrine, a sympathomimetic amine, is commonly used in the treatment of nasal congestion. Its primary mechanism directly acts on the adrenergic receptor system which stimulates release of stored norepinephrine from neurons. Its alpha-adrenergic effect is believed to be the cause of vasoconstriction in the body (3). Clinically, intoxication from sympathomimetic drugs have produced toxidromes with prominent features such as tachycardia, hypertension, hyperthermia, agitation, and delirium. However, it is incredibly rare to see an association with pseudoephedrine overdose and rhabdomyolysis and compartment syndrome. There are documented cases where sympathomimetic drugs have been associated with compartment syndrome (2,4,5). This case of a 29-year-old male with suspected pseudoephedrine abuse highlights the need for consideration of rhabdomyolysis and compartment syndrome being a possible complication from pseudoephedrine overdose.**

Pseudoephedrine | rhabdomyolysis | compartment | syndrome | toxicology | emergency

**T**his is a case report of a 29-year-old Caucasian male with a history of untreated hepatitis C, alcohol abuse, drug abuse, and suicidal ideation presented to the Emergency Department with altered mental status, Rhabdomyolysis, concerning signs of Compartment

ment syndrome after suspected pseudoephedrine use.

### Case Report

#### *Patient Information*

Age: 30 years old. Gender: Male. Ethnicity: African American. Related Medical Problems: Schizophrenia with catatonic features, polysubstance abuse disorder.

#### *Objective for Case Reporting*

Objectives for this case report is to highlight the need for consideration of rhabdomyolysis and compartment syndrome being a possible complication from pseudoephedrine overdose. As well as bring to light the possibility to keep these conditions in the emergency medicine physicians' differential. The possibility of compartment syndrome and rhabdomyolysis after pseudoephedrine overdose is a differential that all emergency medicine physicians should be aware of.

#### *Case*

A 29-year-old Caucasian male with a history of untreated hepatitis C, alcohol abuse, drug abuse, and suicidal ideation presented

---

Submitted: 06/22/2021, published: 08/18/2021.

Freely available online through the UTJMS open access option

to the Emergency Department via Emergency Medicine Services after being found down by his significant other. Patient was reported to be drinking with his friends earlier that night. Eventually he was seen going to bed late in the evening. The following afternoon, the family found him unresponsive in the apartment with dry foam around his mouth and blood in the nostrils. Emergency Medicine Services were called, and he was transferred to the emergency department for further care.

The patient's family believed that he overdosed on pseudoephedrine which were found in his pockets by Emergency Medicine Services. The girlfriend was also concerned because the patient had recently stated a desire to kill himself. Chart review showed he was recently admitted and discharged from a separate hospital the day prior for overdose of narcotics.

When patient presented to the Emergency Department, he was found awake, but only occasionally responsive to both painful and verbal stimuli. Initial vital signs were: Heart rate 127/min, BP 150/96; respiratory rate 20; and temperature of 37.2 C. Physical exam showed no sign of external trauma. His pupils were 8mm dilated bilaterally. Skin was hot to the touch. It was noted he had diffuse upper and lower extremity rigidity. On examination of patient's personal effects, pseudoephedrine was found in his pants pocket. No other medications were found during the physical exam.

Initial laboratory findings were white blood cell 8.7, hemoglobin 14, platelets 182, PT 13.3, international normalized ratio 1.2, sodium 145 potassium 4.4, chloride 111, bicarbonate 17, anion gap 17, blood urea nitrogen 28, creatinine 2.09, glomerular filtration rate 38. Serum myoglobin was 23,639 and creatine kinase 35,717, Lactate 2.0, aspartate aminotransferase, 3,980, alanine transaminase, 2,838. urinalysis protein 100, negative for glucose, ketones 10, hemoglobin large, arterial blood gas 7.34/35.9/93/19.4. Troponin was 2.64. During the patient's ED course, he was given intravenous normal saline boluses, 1 mg Ativan and placed on oxygen via nasal cannula.

Due to the patient's diffuse lower extremity rigidity, the decision was made to consult orthopedics for possible compartment syndrome. On their initial exam, they noted that the patient's lateral thigh compartments were firm, however the patient's gluteal compartments were soft and compressible. The patient was also noted to have 2+ distal pulses. When they returned to bedside with a Stryker compartment measuring kit, the patient's thighs were noted to be much softer on repeat examination and they decided not to proceed with measurements at the time due to lower concern for compartment syndrome. The quantitative urine and blood screen showed that the patient's initial blood ethanol level was less than 0.01, acetaminophen level less than 10, salicylate less than 2.5. Cocaine, tetrahydrocannabinol, opiates, ecstasy, methadone, phencyclidine, and amphetamines were also found to be negative on urine drug screen.

Patient's initial laboratory studies were consistent with rhabdomyolysis with a creatine kinase of 35,717, myoglobin is 23,639, and an initial creatinine of 2.09. Due to the patient's troponin of 2.64, AST of 3,980, and ALT of 2,838. there was a concern for possible acetaminophen overdose, even with a negative acetaminophen OD level. The ED physician contacted poison control regarding the patient's case and lab results who recommended giving the patient Acetadote, and he was subsequently admitted to the ICU.

The patient continued to have elevated liver and kidney enzymes while in the ICU necessitating temporary dialysis. There was further discussion of transfer to a transplant center if his liver

enzymes did not improve. Through supportive care measures, he did have gradual improvement and was ultimately discharged from the hospital on day 6.

## Discussion

This case describes the development of rhabdomyolysis and near compartment syndrome after this patient's suspected pseudoephedrine overdose. Although causality cannot be established with this case alone, the patient had established rhabdomyolysis based on his elevated creatine kinase and myoglobin which required intensive care unit admission which raises further investigation into the topic. Rhabdomyolysis and Compartment syndrome can occur for many reasons, including infection, trauma, and drug use. Pharmacological compartment syndrome can occur due to direct myotoxic and muscle overuse (6).

There is suspicion that the pathophysiology of the patient's stimulant induced rhabdomyolysis is multifactorial. Patient was known to be found down for an unsuspected prolonged amount of time. Concerns about skeletal overuse secondary to excited delirium, vasoconstriction, and hyperthermia, all of which are known side effects of pseudoephedrine and synthetic cathinone overdoses, can lead to increased muscle metabolic demand leading to muscle breakdown. Furthermore, based on the patient's initial presentation of depressed level of consciousness and rigid thighs on initial presentation in the emergency room, there was a concern for compartment syndrome likely secondary to compression. Lastly, seizure activity is a known complication of pseudoephedrine overdose (5,6), which can also be a contributing factor to the patients unwitnessed down time and his elevated creatinine kinase and myoglobin leading to rhabdomyolysis.

In one study, patients were found to have an increase of their maximal creatinine kinase after exposure to synthetic cathinones. This resulted in an increase probability of developing rhabdomyolysis compared to the non-exposed patient group. (6,7) Known complication from sympathomimetic toxicity include altered mental status, metabolic acidosis, seizures, rhabdomyolysis, acute kidney injury, hepatic injury, disseminated intravascular coagulation, and death. (8) In one case report, pseudoephedrine has also been associated with biphasic elevation of creatine kinase and elevated myoglobin leading to Rhabdomyolysis (9).

This case report demonstrates that patients are at a higher risk of developing rhabdomyolysis and possibly compartment syndrome when exposed to higher levels of synthetic catecholamine medication such as pseudoephedrine. Treatment of alpha1 adrenergic decongestants such as pseudoephedrine is primarily supportive with aggressive intravenous hydration being the main therapy. Like amphetamine overdose, hypertension and agitation can occur due to the adrenergic effects caused by pseudoephedrine, therefore the use of benzodiazepines can help reduce muscle activity and metabolic demand in agitated patients, which was evidenced in this case as the patient had an symptomatic improvement after Aitvan administration. Finally, maintaining a urine output of >2mL/kg/h should be a key treatment during intravenous hydration (6).

## Conclusion

This case of a 29-year-old male with suspected pseudoephedrine use highlights the need for consideration of rhabdomyolysis and compartment syndrome being a possible complication from pseudoephedrine overdose. The possibility of compartment syndrome and rhabdomyolysis after pseudoephedrine overdose is an important differential that all physicians should be aware of in

the Emergency Department.

### Conflict of interest

Authors declare no conflict of interest.

### Authors' contributions

EM wrote this case report. JG conceived of the presented idea, supervised the findings of this work and provided critical feedback to the contribution of this report. All authors read and approved the final document.

1. Tiwari, A., A. I. Haq, F. Myint, and G. Hamilton. (2002) Acute compartment syndromes." *British Journal of Surgery* 89, no. 4, 397-412.
2. Levine, Michael, Rachel Levitan, and Aaron Skolnik. (2013) Compartment syndrome after "bath salts" use: a case series. *Annals of emergency medicine* 61, no. 4, 480-483.
3. Laccourreye, O., A. Werner, J-P. Giroud, V. Couloigner, P. Bonfils, and E. Bondon-Guitton.(2015) Benefits, limits and danger of ephedrine and pseudoephedrine as nasal decongestants. *European annals of otorhinolaryngology, head, and neck diseases* 132, no. 1 31-34.
4. Minnema, Brian J., Peter C. Neligan, Nasir A. Quraishi, Michael G. Fehlings, and Suma. (2008) A case of occult compartment syndrome and nonresolving rhabdomyolysis. *Journal of general internal medicine* 23, no. 6 871-874.
5. Roberge, Raymond J., Kamal H. Hirani, Paul L. Rowland III, Ross Berkeley, and Edward P. Krenzelok. (1999) Dextromethorphan-and pseudoephedrine-induced agitated psychosis and ataxia: case report. *The Journal of emergency medicine* 17, no. 2 : 285-288.
6. O'Connor, Ayrn D., Angie Padilla-Jones, Richard D. Gerkin, and Michael Levine.(2015) Prevalence of rhabdomyolysis in sympathomimetic toxicity: a comparison of stimulants. *Journal of Medical Toxicology* 11, no. 2 195-200.
7. Li, Siu Fai, Jennifer Zapata, and Elizabeth Tillem. (2005) The prevalence of false-positive cardiac troponin I in ED patients with rhabdomyolysis. *The American journal of Prakash emergency medicine* 23, no. 7 860-863.
8. Salmon, J., and D. Nicholson. (1988) DIC and rhabdomyolysis following pseudoephedrine overdose. *The American journal of emergency medicine* 6, no. 5 545-546.
9. 9) Gülhan, Bora, Benan Bayrakci, Melih Önder Babaoğlu, Burak Bal, and Serdar Beken. (2009) Biphasic creatine kinase elevation in pseudoephedrine overdose. *British journal of clinical pharmacology* 67, no. 1 139.