

Rowan University

## Rowan Digital Works

---

Stratford Campus Research Day

27th Annual Research Day

---

May 4th, 12:00 AM

# Case Report: Epinephrine-Containing Topical Anesthetic Gel Inducing Systemic Epinephrine Toxicity

MD Fateha

*Rowan University*

Philip Willsie

*Rowan University*

Follow this and additional works at: [https://rdw.rowan.edu/stratford\\_research\\_day](https://rdw.rowan.edu/stratford_research_day)



Part of the [Emergency Medicine Commons](#), [Health and Medical Administration Commons](#), [Organic Chemicals Commons](#), [Pathological Conditions, Signs and Symptoms Commons](#), [Patient Safety Commons](#), and the [Pharmaceutical Preparations Commons](#)

Let us know how access to this document benefits you - share your thoughts on our [feedback form](#).

---

Fateha, MD and Willsie, Philip, "Case Report: Epinephrine-Containing Topical Anesthetic Gel Inducing Systemic Epinephrine Toxicity" (2023). *Stratford Campus Research Day*. 90.

[https://rdw.rowan.edu/stratford\\_research\\_day/2023/may4/90](https://rdw.rowan.edu/stratford_research_day/2023/may4/90)

This Poster is brought to you for free and open access by the Conferences, Events, and Symposia at Rowan Digital Works. It has been accepted for inclusion in Stratford Campus Research Day by an authorized administrator of Rowan Digital Works.

# Case Report: Epinephrine-Containing Topical Anesthetic Gel Inducing Systemic Epinephrine Toxicity

MD Fateha DO<sup>1</sup>, Philip Willsie DO<sup>2</sup>

<sup>1</sup>*Emergency Medicine Residency and Department of Emergency Medicine, Jefferson Health NJ*

<sup>2</sup>*Department of Critical Care, Jefferson Health NJ*

## **Abstract:**

Systemic Epinephrine toxicity is a rare complication following inadvertent or excessively large or rapid subcutaneous, intramuscular or intravenous administration. Signs and Symptoms of epinephrine toxicity include rapid onset of transient agitation, hypertension, tachycardia, lactic acidosis, and dysrhythmias with potentially fatal consequences. In this case report, we present a 33-year-old female who experienced epinephrine toxicity following the use of a topical anesthetic cream containing lidocaine and epinephrine. The patient had multiple applications to her chest before and during tattoo placement which led to tachycardia, elevated blood pressure, headache, chest pain, nausea, vomiting, and anxiety. The patient was brought into the ED where her vital signs had begun to normalize but laboratory analysis was concerning for severe lactic acidosis and non-ST elevation myocardial infarction. After admission to the hospital the patient's symptoms quickly improved, the lactic acidosis resolved, and further workup was unrevealing. Our goal of this case report is to educate clinicians that topical epinephrine anesthetic gel use can cause systemic epinephrine toxicity. We aim to create mindfulness of the symptoms of epinephrine toxicity and management.

## **Introduction:**

Epinephrine is an adrenergic agonist used to treat hypotension, bradycardia, cardiac arrest, anaphylaxis, and bronchospasms [6,5]. Epinephrine is most typically administered through intravenous, intramuscular, and transdermal routes. Adverse reactions to epinephrine administration most commonly occur as a result of excessive dosing as a result of iatrogenic error. [5]. Epinephrine overdose can lead to the rapid onset of agitation, hypertension, tachycardia and dysrhythmias [5]. Lidocaine may be absorbed systemically after topical application, and manifests as bradycardia, hypotension, seizure, coma. Epinephrine is also known to be absorbed via the trans-dermal route, but the absorption is typically limited, and we can find no prior reports of systemic toxicity following the topical administration of epinephrine-containing solutions. Symptoms of toxicity typically resolve rapidly given epinephrine's short half-life, but if symptoms are not improving then treatment options may include beta blockade [1].

## **Case Presentation:**

We present a case of a 33-year-old female with no medical history who was brought into the emergency department (ED) by emergency medical services (EMS) for chest pain. 3 hours prior to arrival, the patient was obtaining a large tattoo over her upper anterior chest while at a tattoo convention. She described applying 4 tubes (40g) of "TKTX", a lidocaine and epinephrine topical anesthetic gel, to her chest over the course of several hours. The initial tube was applied prior to tattooing and shortly after the patient stated she felt her heart racing. After the tattooing process started additional tubes were applied over the course of the next couple hours. Throughout the process she felt her heart rate was elevated out of proportion to any discomfort or anxiety from the tattooing process. The rapid HR was also noted on visual inspection of her neck by the tattoo artist. She denied having an elevated heart rate during prior tattooing when she did not use the topical gel. After the application of the last tube there was a break in tattooing to allow the gel to absorb during which she began to experience severe anxiety, generalized headache, chest pain, nausea, and vomiting. EMS were called and found her vital signs to be sinus tachycardia at 130 BPM, BP 180/110 mmHg, SpO2 100% on room air, and RR 26 breaths per minute and for which the patient was transported to the ED.

Upon arrival to the ED 20 minutes later her repeat vital signs were HR 100 BPM, BP 104/55 mmHg, SpO2 100% on room air, RR 20 breaths per minute. The patient was still experiencing chest pain but her other symptoms were resolving. Her physical examination was significant only for mild tachycardia and tachypnea and a fresh incomplete tattoo across her chest. Electrocardiogram showed normal sinus rhythm at 83 beats per minute, normal axis, QRS 96 milliseconds, QTC 446 milliseconds, and no ST-segment or T-wave abnormalities. Laboratory analysis was significant for hypokalemia with a potassium of 2.7 mmol/L. Acute kidney injury with a creatinine of 1.24 mg/dL prior creatinine level 0.72 mg/dL, non-ST elevation myocardial infarction with a high-sensitivity troponin of 1272 ng/L increasing to 3946 ng/L 3 hours later and elevated lactate at 7.9 mmol/L decreasing to 2.3 mmol/L 3 hours later. While in the ED, the patient was given 60 mEq potassium chloride, 2 L normal saline, 81 mg aspirin, and was admitted to the intensive care unit for close monitoring given her unexplained presentation.

After admission repeat laboratory analysis showed resolution of her hypokalemia with a potassium of 4.9 mmol/L. Acute kidney injury with a creatinine level of 0.72 mg/dL. Urine drug screen was negative for cocaine, methamphetamine, phencyclidine, patient denied any illicit or over-the-counter drug use. The patient stated her chest pain, headache, nausea and vomiting had fully resolved. Transthoracic echocardiography was performed and showed low normal left ventricular systolic and diastolic function with no regional wall abnormalities to suggest myocardial infarction. The patient was safely discharged home after 14 hours of observation.

## **Discussion:**

We report the first documented case of epinephrine toxicity secondary to the use of topical epinephrine-containing anesthetic gel. Epinephrine is an adrenergic agonist known to induce vasoconstriction through increasing vascular smooth muscle contraction [4]. Epinephrine is absorbed into the systemic vasculature within one to two hours of topical application and can lead to vasoconstriction of the nearby vasculature [4]. Our patient experienced symptoms of toxicity within minutes of application that peaked after a few hours of use. Although we cannot be sure, the rate of transdermal absorption may have been hastened by the tattooing process itself and the effects enhanced by the proximity of the application to the patient's heart.

## **Discussion continued:**

When administered systemically, epinephrine is well known to increase heart rate and the force of myocardial contraction resulting in tachycardia and elevated blood pressure, to lower serum potassium levels, and to increase lactate production. Our patient presented with tachycardia, hypertension, hypokalemia, and an elevated lactate level. Epinephrine has a half-life of only 11 minutes once in the blood stream and so its effects after intravenous administration are quickly fleeting [2]. Our patient's symptoms persisted for more than 30 minutes after the last application. This prolonged duration is likely due to consistent transdermal absorption leading to persistently toxic serum levels that diminished as the topical epinephrine concentration decreased and the systemic epinephrine was quickly metabolized upon reaching the blood stream.

TNTK is a widely available topical anesthetic cream that contains various concentrations marketed for topical anesthesia prior to tattooing or piercing. Our patient used a total of 4 tubes that each contained 10g of gel containing 7% lidocaine and 2% epinephrine. Significant systemic absorption of topical anesthetics resulting in toxicity secondary to lidocaine are well documented but result in hypotension, coma, seizure, and bradycardia [7]. None of our patient's symptoms or findings were consistent with lidocaine intoxication, making it very unlikely to have been the culprit [3].

We performed a thorough review of existing medical literature as of March 2023 and could find no documentation of epinephrine toxicity resulting from transcutaneous absorption prior to our case. Toxicity may have occurred in our patient and not others because of the large dosage of 4 times the manufacturer-recommended amount applied. She also had tattooing performed on top of the skin where the gel was applied and then had the gel re-applied to a large area of freshly tattooed skin, both of which may have increased the speed and amount of systemic absorption due to the needling process disrupting the cutaneous barrier and increasing perfusion to the area. It is also feasible that the proximity of the application to her heart could have facilitated some absorption via direct extension. This case helps raise awareness for medical providers to the potential for systemic epinephrine toxicity resulting after cutaneous application and helps to differentiate this from local anesthetic-induced systemic toxicity. Clinicians should be mindful that patients presenting with signs and symptoms signifying a hyperadrenergic state in the setting of topical anesthetic-based gel application could be suffering from systemic epinephrine toxicity. Similarly, the greater tattoo community need to be aware of the potential for this uncommon but potentially serious complication.

## **Conclusions:**

This case report describes the first ever documented occurrence of epinephrine toxicity following topical epinephrine-containing anesthetic gel use. In patients where clinicians suspect accidental epinephrine toxicity we recommend obtaining an electrocardiogram and troponin to rule out dysrhythmia and myocardial infarction, basic metabolic panel to investigate for significant hypokalemia, acidosis, or kidney injury, and serum lactate level to help confirm the diagnosis. Consideration should be given to hospital admission with telemetry monitoring while further confirming the absence of other causes or organ damage.

## **References: available on request**