Fatal Systemic Toxicity with Topical Lidocaine Spray

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Abstract

Introduction: Lidocaine is a class of Ib antiarrhythmic agent which is available in various intravenous (IV) and topical forms. Systemic toxicity of lidocaine has been reported following its IV injection or local infiltration for anesthesia, mostly. However, toxicity following the application of its topical gel and oral spray is also possible. Manifestations of lidocaine induced systemic toxicity include neurologic and cardiac symptoms. Reported cases of systemic toxicity after ingestion of topical lidocaine are rare. In this case study, we present a patient who developed symptoms of severe systemic toxicity following oral ingestion of topical lidocaine spray.

Case Presentation: A young woman was referred to the emergency department with agitation following ingestion of lidocaine spray solution to commit suicide. At the time of arrival, vital signs were stable. Blood tests and electrocardiogram were also normal. She underwent supportive care. Gradually, the symptoms of neuro and cardiac toxicity appeared. Standard management include intralipid and bicarbonate administration was unsuccessful and the patient experienced cardiac arrest.

Conclusion: Lidocaine systemic toxicity with topical form could be severe and fatal, since the prompt diagnosis of systemic toxicity is the key factor to preventing death, physicians should be familiar with the symptoms of lidocaine systemic toxicity.

Keywords: Lidocaine, Toxicity, Topical Lidocaine, Fatal Toxicity.

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INTRODUCTION

Lidocaine is a class of Ib antiarrhythmic agent with sodium channel-blocking characteristics which is available for local anesthesia in various forms (solution, gel, ointment) (1). Lidocaine induced toxicity has been reported with all routes of administration. Lidocaine is systemically absorbed following its local application to mucous membranes, skin or, after ingestion, so severe systemic toxicity has been described following its topical use. Lidocaine toxicity is caused by sodium channel blockade, leading to the central nervous system (CNS) and cardiac effects. Systemic absorption in small amounts may cause only mild symptoms, but in high amounts may cause life-threatening neurological and cardiac manifestations (4). The most frequent adverse effects reported with lidocaine involve the central nervous system (CNS) effects. Most common symptoms of mild toxicity include drowsiness, headache, dizziness, paresthesia, numbness of the mouth, anxiety and confusion. Severe toxicity may cause cardiac, respiratory, and CNS toxicity, as well as methemoglobinemia. Although the incidence of lidocaine toxicity is low and severe toxicity is rare, some cases of lidocaine toxicity are reported. Most of these cases are related to accidental toxicity following lidocaine IV injection or local infiltration for anesthesia and reported cases of systemic toxicity following lidocaine ingestion are very rare. Presented in this case is a woman with severe systemic toxicity following intentional ingestion of lidocaine spray, which resulted in her death.

Case Presentation

A young woman with no significant past medical history presented to the emergency department with chief complaint of agitation. In the history, she had ingested unknown amounts of the lidocaine spray solution to commit suicide. Upon arrival in the ED, she was agitated, confused and non-cooperative. Physical Examination was significant for dilated but reactive-to-light pupils. Vital signs at the time included the blood pressure of 108/80 millimeters of mercury, a pulse of 140 per minute, respiration of 14 breaths per minute, and, oxygen saturation of 96% on room air. The electrocardiogram (ECG) was significant with sinus tachycardia. Laboratory tests were obtained. Complete blood count, venous blood gas (VBG), electrolytes, renal function test and liver function test were within normal ranges. Supportive treatment started and, less than an hour after, a generalized tonic-colonic seizure occurred, which was managed with IV diazepam. Less than an hour after the first seizure, the patient experienced another seizure, immediately followed by a cardiac arrest. Cardiopulmonary resuscitation (CPR) was initiated and the return of spontaneous circulation (ROSC) happened after one resuscitation cycle. At this time, the heart rate was 130 BPM and the blood pressure was 60/40 mmHg. Due to hypotension, IV fluid and norepinephrine drip with a dosage of 10 micro /min IV infusion was administered and repeated
VBG and ECG showed severe metabolic acidosis with pH of 6.7 and HCO3 8. The Electrocardiogram showed conduction disorder with prolonged PR interval and widened QRS complex. According to these findings, IV sodium bicarbonate, (100 mEq over 2 minutes) and 20% lipid emulsion (1.5 mL/kg IV over 1 minute) were administered. The patient transferred to the ICU where supportive treatment continued. However, a few hours later she experienced a cardiorespiratory arrest, and this time, cardiopulmonary resuscitation was unsuccessful.

DISCUSSION
Lidocaine, an antiarrhythmic drug, is also one of the most commonly used local anesthetic agent which is administered topically and by local injection. As a topical anesthetic it is absorbed by skin and mucous membranes to the systemic circulation. Thus, systemic toxicity from topically administered lidocaine is possible. (5-7) Lidocaine undergoes extensive first-pass hepatic metabolism with oral bioavailability of about 35% so low blood level of lidocaine is anticipated after its oral ingestion. (8) Symptoms of systemic toxicity correlate with peak serum concentration which itself depends on dosage and route of lidocaine administration. (9)

Systemic toxicity from lidocaine occurs due to its sodium channel-blocking effects, which may lead to cardiac and neurological manifestations. The early manifestations of mild central nervous system (CNS) toxicity are agitation, headache, drowsiness, dizziness, paresthesia, anxiety, disorientation and hallucinations. Symptoms of severe neurotoxicity include muscle twitching, seizures, respiratory depression, apnea, and coma. Cardiac toxicity symptoms include hypotension and conduction disorders manifest as sinus bradycardia, Atrioventricular block, wide QRS, cardiac dysrhythmias and, finally asystole (10).

Our patient initially presented with mild neurological manifestations like agitation, confusion and, then symptoms of severe toxicity developed as seizure, wide QRS and hypotension. The diagnosis of lidocaine toxicity is usually clinical, as serum levels are not readily available, and they do not guide or change treatment. The mainstay of management in lidocaine toxicity is supportive measures to prevent hypoxia, acidosis and hyperkalemia which may enhance the toxicity, especially cardiac toxicity. In the case of intentional oral toxicity, decontamination by gastric lavage is not indicated (11). Seizures are usually self-limited, but uncontrolled seizures should be treated initially with benzodiazepines and then phenobarbital and propofol can be administered. In severe metabolic acidosis, sodium bicarbonate is indicated. Conduction disorder of the heart should be treated with intravenous lidids and sodium bicarbonate boluses. Amiodarone can also be used, but calcium channel blockers and β-blockers should be avoided. In case of hypotension, inotropic drugs are indicated (12, 14). QRS widening of more than 120 msec should be treated with intravenous lidids and sodium bicarbonate bolus. Also, in case of cardiac arrest, intralipid 20% should be injected during cardiopulmonary resuscitation until the end of resuscitation (15). During cardiac resuscitation, arrhythmias are treated according to the ACLS and BLS guidelines, and only, the injection of lidocaine, as well as calcium channel blockers and β-blockers should be avoided, as mentioned earlier.

Although most reported cases of lidocaine toxicity are accidental toxicity which are associated with IV administration to manage cardiac arrhythmia or injection of the drug into a blood vessel during local infiltration, there are some case reports of systemic toxicity followings its topical use for anesthesia during bronchoscopy and transesophageal echocardiography, too (5-7). However, reports on systemic toxicity after ingestion of topical spray formulation of lidocaine in a suicidal attempt are very rare.

A case series published in 2018, reported that over 6 years, there were approximately 30 cases of toxicity from lidocaine following oral administration of lidocaine spray and topical use of lidocaine, 87% of which were intentional and suicidal. Of these cases, only 3 had led to death (16). Another case study reported 3 cases of toxicity from oral lidocaine spray, one of whom had ingested approximately 200 cc of 10% lidocaine spray and presented with seizures and cardiac arrest and finally died (17). In another case report, a young woman referred with cardiac arrest following oral administration of lidocaine spray was finally discharged from the hospital after a successful initial resuscitation and IV intralipid administration within 8 days of hospitalization. (18) In another case report lidocaine systemic toxicity was reported in a young man following frequent viscous lidocaine use for painful tongue ulcer. (19) Overall, in the search among the articles, so far, only 2 cases of death due to toxicity from lidocaine spray were found, both of which had occurred in Iran (20).

CONCLUSION
Lidocaine systemic toxicity can be life-threatening. Considering reported cases of systemic severe toxicity even following topical use of lidocaine, physicians who use this drug should have a high index of suspicion for the potentially serious hazards of topical lidocaine and should be aware of the early and mild symptoms of lidocaine-induced toxicity to identify it rapidly and initiate the proper management.

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