Case Report

A Case of Status Epilepticus Due to Topical Lidocaine Toxicity: A Case Report and Review of the Literature

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ABSTRACT

Background: Lidocaine hydrochloride is an acetamide derivative that was first introduced by Nils Löfgrene in 1943. It is a local anesthetic agent that is widely used in order to prepare the patient for repairing lacerations in everyday practice. Neurological toxicities have been reported with systemic and topical lidocaine.

Methods: An eight-year-old female child was reported with a pure laceration who developed status epilepticus after receiving lidocaine along with ketamine. The patient had no medical history of epilepsy or allergic reaction and had a normal physical and mental development status. She received 200 mg lidocaine without epinephrine and underwent wound repair. The patient also received 60 mg of intramuscular ketamine in order to produce relative sedation. After an hour of wound repair, she developed a tonic-colonic generalized seizure representative of status epilepticus seizure. The convulsions were managed by benzodiazepines, and the patient was discharged without complication

Conclusions: Status epilepticus can happen due to lidocaine. Although patients usually recover with no major complications, obeying safety protocols can prevent these events.

1. Introduction

Lidocaine hydrochloride is an acetamide derivative that was first introduced by Nils Löfgrene in 1943 (1). It is a local anesthetic agent that is widely used in order to prepare the patient for repairing lacerations in everyday practice. This agent provides neural block when injected adjacent to the neural tissue and can cause transient loss of sensory, motor, or even autonomic function (2). The usual recommended doses for lidocaine are 7-9 mg/kg; however, this dose can exceed 7 mg/kg with vasoconstrictor application. In some cases, this dosage can be neglected and physicians may apply higher doses that can cause chest pain or discomfort, dyspnea, dysphagia, dizziness, cardiac and nervous system toxicity (3). High doses (plasma concentration greater than 6 mg/L), injection in highly

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vascular areas, and accidental intravascular injection may provide higher plasma levels and cause lidocaine adverse effects. These complications usually happen whenever plasma levels of lidocaine reach more than 8-12 mg/L (4). Here, we present a case of generalized status epilepticus seizure in an eight-year-old girl following the local injection of toxic levels of lidocaine

2. Case Presentation

An eight-year-old Caucasian girl with an estimated weight of 10 kg presented with a pure 15 cm well margined superficial laceration in the volar surface of the forearm, elbow, and arm, which was developed by broken glass. The patient had no medical history of epilepsy or allergic reaction and had a normal physical and mental development status, except for being underweight. The wound was explored and as there were no signs of other concomitant injuries, the laceration was planned to be repaired through a simple suture. A miscalculation of the lidocaine dose caused her to be injected with a very high local dose of 200 mg lidocaine without epinephrine and underwent wound repair. The patient also received 60 mg of intramuscular ketamine in order to produce relative sedation. After an hour of wound repair, the patient developed a tonic-colonic generalized seizure representative of status epilepticus seizure. The patient had a pulse rate of 98 bpm, respiratory rate of 18 per minute, a blood pressure of 100/80 mmHg, and a blood oxygen saturation of 95%; however, she had a low level of consciousness.

Initially, the patient was positioned in the lateral decubitus position, the airway was opened through a maneuver, and she was provided with bag-mask ventilation. Then, the patient received 2 mg midazolam through an intravenous (IV) injection; however, the seizure was still evident; thus, she received (IV) another 2 mg dose of midazolam but still, seizures were not halted. Finally, the seizures were stopped after the administration (IV) of 5 mg of diazepam. As the patient's airway was not secured with mask ventilation, she was intubated in order to provide a secure airway. The patient was provided with spontaneous breathing after four hours of intubation. Therefore, the intubation was replaced with T-tube ventilation, and finally, as the patient had normal blood oxygen saturation, she was extubated and mask oxygenation was provided for her. The patient was discharged after 12 hours with normal consciousness and without any severe remained adverse effects.

3. Discussion

Toxic levels of lidocaine can cause central nervous system (CNS) and cardiovascular problems; however, this toxicity usually happens in IV uses and rarely occurs with topical applications (5). The blockage of sodium channels and subsequent inhibition of sodium ions influx hampers neural signal conduction and increases the depolarization threshold (6). Furthermore, the increase in glutamate levels causes excitatory neural activity (7). These changes result in neural toxicity symptoms that usually manifest within 10-20 minutes after injection and finally lead to generalized tonic colonic seizures (8). However, experimental models have shown that ketamine delays the appearance of tonic-colonic seizures and lowers their risk (9). Moreover, the presence of generalized tonic colonic seizure is also reported in a case of lidocaine ingestion by 16-month-old and 2-year-old boys (10, 11). In our case, the patient developed a seizure, one hour after lidocaine injection. Although low doses of lidocaine have anticonvulsant effects, the seizure may happen at 4 to 10 ug/ml plasma concentrations. Moreover, despite the localized feature of seizures in animal models, this drug mainly causes a generalized tonic colonic seizure in human beings (12).

Boparai et al. (13) reported a case of tonic colonic seizure in an eight-year-old boy due to an injection of 46 mg lidocaine along with adrenaline by a dentist in order to block the maxillary nerve. However, opposing to our case study, the patient developed a seizure, immediately after injection and was halted with the first dose of diazepam.

Hseieh et al. (14) also reported a case of generalized tonic-colonic seizures followed by the use of IV administration of 100 mg (1.85mg/kg) of fentanyl and 50 mg (0.93 mg/kg) of lidocaine. The authors reported that the seizure subsided spontaneously with no intervention.

More complicated cases than our study case were also reported in the literature; however, there were very few reports of status epilepticus due to lidocaine intradermal injection in children. Oh et al. (15) reported a case of status epilepticus in an 11-year-old girl who received 648 mg lidocaine along with epinephrine in order to provide local anesthesia for epidermal transplantation in the neck and shoulder areas. The patient received a variety of antiepileptic drugs from lorazepam to phenytoin, midazolam, and vecuronium and finally, the convulsions ceased after 45 minutes. The patient was intubated and admitted to the intensive care unit for nine days. Electroencephalograph and brain imaging

were normal and the patient was discharged with no major complications.

The management of lidocaine-induced seizure initially involves a stoppage of the drug injection and many of the cases resolve with this intervention. However, in some cases, further support, including basic life support and benzodiazepine application is needed (16). It is better to obey lidocaine injection protocols to avoid such adverse events. These requisites include using test doses, avoiding unnecessary high doses, providing aspiration before injection, and using adrenaline in order to slower vascular uptake (7).

Status epilepticus seizure can happen due to toxic doses of lidocaine in pediatrics. It seems that normal epilepsy management can help the caseation of the convulsions; however, some cases may need advanced air management, as well. Although patients usually recover with no major complications, obeying safety protocols can prevent these events. It is important to assess the serum level of lidocaine and the patient should have electrocardiography; however, these were shortcomings of our study and should be assessed in the management of these cases. Our case had cardiac monitoring, which helped to monitor the vital signs of the patient.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors contributed proportionately to this work.

Conflicts of interest

The authors declared no conflict of interest.

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