Case Report
pISSN 2383-9309 ▮ eISSN 2383-9317
J Dent Anesth Pain Med 2019;19(3):175-180 ▮ https://doi.org/10.17245/jdapm.2019.19.3.175

Anaphylactic reaction after local lidocaine infiltration for retraction of retained teeth

Hyerim Kim[1], Jung-Man Lee[1], Kwang-Suk Seo[2], Seok Min Kwon[3], Hyung Sang Row[3]

[1]Department of Anesthesiology and Pain Medicine, Seoul Metropolitan Government Seoul National University Boramae Medical Center, Seoul, Korea
[2]Department of Dental Anesthesiology, School of Dentistry, Seoul National University, Seoul, Korea
[3]Department of Anesthesiology and Pain Medicine, Seoul National University Hospital, Seoul, Korea

Although allergic reactions are not rare complications in drug use, anaphylaxis or anaphylactoid reactions to some widely used drugs can embarrass clinicians because anaphylaxis is not easily diagnosed at the time of the event and treatment is unfamiliar to many. Lidocaine is a very popular drug in dental procedures and anaphylactoid reaction to it has been rarely reported. Clinicians who use lidocaine daily should, however, be aware of the possibility of anaphylaxis after its use. Once it occurs, anaphylaxis can be fatal, but if it is quickly diagnosed or suspected, treatment is simpler than most clinicians believe. An 86-year-old woman experienced an anaphylactic reaction 30 min after local infiltration of lidocaine for retraction of retained teeth. The dentist called an anesthesiologist for assistance. Fortunately, an anaphylactic reaction was quickly suspected and after subsequent rapid treatment with the administration of fluid and drug therapy, the patient recovered completely.

Keywords: Anaphylaxis; Lidocaine; Local Anesthesia.

INTRODUCTION

Allergic reaction is not a rare event in clinical practice. Common symptoms and signs are itching and redness, which subside either without specific treatment or after the administration of antihistamine alone or in combination with steroids. Allergic reactions are subdivided into four types. Anaphylaxis, one of type I hypersensitivity is the most severe form of allergic reaction and can cause death unless it is immediately treated [1]. Clinicians should be aware of symptoms or signs of anaphylactic reaction, possible drugs that cause it, and adequate treatments.

Lidocaine is a widely used drug in clinical practice and most of its side effects are well known [2,3]. Anaphylactic reaction to lidocaine is rarely observed in clinical use [4]. Because it is rare and little is known on reactions to lidocaine by clinicians, it may not be recognized when it occurs. We report a case in which a patient received a local lidocaine injection for dental treatment and experienced an anaphylactic reaction within 30 minutes.

CASE REPORT

An 86-year-old woman presented to a dentist complaining of three retained teeth roots. The dentist planned

Received: April 23, 2019 • Revised: June 21, 2019 • Accepted: June 23, 2019
Corresponding Author: Jung-Man Lee, Department of Anesthesiology and Pain Medicine, Seoul Metropolitan Government Seoul National University Boramae Medical Center, 20, Boramae-ro 5-gil, Dongjak-gu, Seoul 07061, Korea
Tel: +82-2-870-2513 Fax: +82-2-870-3863 E-mail: jungman007@gmail.com

to retract these teeth. The patient had been prescribed amlodipine and aspirin regularly as antihypertension medication. Although her blood pressure was not well controlled, an operation was not contraindicated. Aspirin was discontinued one week before surgery to curb bleeding tendency.

On the day of operation, the patient arrived in a treatment room without any premedication. She was monitored using ECG, pulse oximetry, and noninvasive blood pressure measurements. Her initial blood pressure was 160/70 mm Hg. Pulse oximetry and ECG were normal. The dentist injected 108 mg of preservative-free lidocaine without epinephrine (LIDOCAINE HCL Inj, Huons Co., Ltd, Seoul, Korea) into the gingival mucosa. The patient did not complain of any discomfort other than the usual stinging pain during local injection of lidocaine. Five minutes later, surgery started after checking for sensory extinction. During retraction of the three retained teeth, vital signs were stable and surgery was uneventful. Total operation time was 15 minutes. After surgery, the dentist discussed some precautions with the patient and she made her way to the waiting room on foot with her guardian. After three minutes, the guardian came back to the treatment room and reported that the patient was complaining of itching and a sensation of heat. When the medical attendee took the patient to the day care unit, the patient's scalp and peri-auricular area had turned reddish and she complained of itching and was scratching the lesion.

Four mg of chlorpheniramine, a first-generation alkylamine antihistamine drug, was injected intramuscularly. While under observation, the patient began to sweat profusely and abruptly lost consciousness. The dentist called a medical team, including us anesthesiologists, for help. On arriving, we began to monitor blood pressure, oxygen saturation, and ECG while taking history from the dentist and the guardian. Simultaneously, we rapidly obtained intravenous access and started infusing Hartmann's solution and supplying oxygen via facial mask. The patient did not respond to her name or physical stimulation but her respiratory pattern was normal. Before supplying oxygen, peripheral oxygen saturation was 95%, heart rate was 55 bpm and blood pressure was 49/38 mm Hg. Immediately after checking vital signs, we injected 10 mg of ephedrine while rapidly infusing Hartmann's solution. While assessing the patient, we suspected anaphylaxis caused by lidocaine and prepared epinephrine for resuscitation. Vital signs were again checked and the pulse rate was 96 bpm and blood pressure was 60/45 mm Hg. Ephedrine in two doses of 5 mg and 10 mg was once again injected with fluid therapy. After that, systolic blood pressure was measured in the 70s and the patient regained consciousness. Fortunately, her vital signs normalized without epinephrine administration. Five minutes after recovery, she vomited once.

When we closely checked her medical history and specific findings after she was fully recovered, we found that she had fainted for 30 minutes after dental care at a local clinic eight years ago. At that time, she was discharged without any problems after rehydration in the emergency room of a nearby hospital. In the present case, only preservative-free lidocaine without epinephrine had been used during dental treatment. We suspected that an anaphylactic reaction to lidocaine could have been the cause of the event. After recovering, she felt a desire to defecate and had diarrhea once. An oxygen saturation graph seemed to show large plethysmographic variability. Judging that intravascular volume was depleted or vascular resistance decreased, we administered 500 mL of Hartmann's solution and 500 mL of colloid intravenously. The patient recovered with an oxygen saturation of 98%, a heart rate of 88 bpm, and blood pressure at 118/81 mm Hg and was discharged after a few hours without any complication. We injected 10 mg of dexamethasone intramuscularly and referred her to the allergy department on the same day. We also recommended that she should be admitted to our hospital for close observation. The allergist made a delayed appointment to examine the suspected hypersensitivity to lidocaine under more stringent conditions because we had administered steroids to prevent a recurrent anaphylactic reaction. A few days later, we also recommended several times by

follow-up calls that she should undergo examinations such as the skin prick test or specific serum IgE tests as the allergist had suggested. However, the patient refused, and no tests recommended by the allergist were performed.

DISCUSSION

Hypersensitivity reactions can be divided into four types based on their mechanism of action. Anaphylaxis and nonimmune mediated (anaphylactoid) reactions, which belong to type 1 hypersensitivity, can be severe hazards. Anaphylaxis is an acute, generalized and often unanticipated immunologically mediated event that occurs after re-exposure to a particular substance in previously sensitized persons. Anaphylactic reactions describe a clinically identical syndrome involving similar mediators but not triggered by IgE antibodies and not necessarily requiring previous exposure [5]. In order to distinguish these two reactions, a test to find specific IgEs, such as a skin test or specific immunoglobulin E assay, should be carried out [6]. Symptoms of anaphylaxis include urticaria, angioedema, bronchospasm, and cardiovascular depression [7]. In 75% of cases of anaphylaxis that led to death, the principal causes were asphyxia from upper airway edema and hypoxia from severe bronchospasm, and in 25% of deaths there was circulatory failure with hypotension [5]. In such cases of anaphylactic reaction, subcutaneous or intramuscular epinephrine injection is recommended [8]. There is no difference in effect between the two routes, but intramuscular injections are reported to reach effective blood concentrations more quickly [9] and therefore, the intramuscular route is recommended. When using epinephrine, the initial dose for adults is 0.2 mL to 0.5 mL of 1:1,000 (wt./vol) diluted solution intramuscularly or subcutaneously and, if there is no response, continuous infusion of intravenous 1:10,000 (10 μg/mL) diluted epinephrine at a rate of 1 μg/mL can be considered. In the present case, intravenous access was obtained immediately after the patient lost consciousness, intravenous fluid was administered, and ephedrine was given under an experienced anesthesiologist's care while diluted epinephrine was prepared. In this case, we prepared 50 μg of epinephrine for intravenous administration. If the patient had not recovered in terms of circulation, we would have given her the bolus of epinephrine intravenously. Numerous articles recommend intramuscular injection in the lateral thigh as the route of choice rather than a subcutaneous injection or the intravenous route [1,9-12]. They suggest that epinephrine, which has a vasoconstrictive effect when injected into subcutaneous tissue, could delay systemic absorption compared to the vasodilator effect epinephrine has in skeletal muscle. However, the administration of epinephrine through the intravenous route can cause adverse systemic effects like ventricular arrhythmia, hypertensive crisis, and pulmonary edema. Therefore, the intravenous administration of epinephrine should be performed under close monitoring such as invasive monitoring of arterial blood pressure. Many clinicians are also not familiar with obtaining venous access, especially in the case of shock. However, anesthesiologists are very familiar with venous access, real time monitoring, and treatment in cases requiring intensive care. In our case, we rapidly obtained venous access and could prepare 50 μg of epinephrine because of our familiarity with its use. If we planned to inject epinephrine in the lateral thigh of a patient, we would prepare 0.5 mg of epinephrine. Additionally, we administered steroid to the patient to prevent biphasic and protracted anaphylaxis [13,14], even though it forced delayed examination of the suspected lidocaine hypersensitivity.

Neuromuscular blocking agents (58.2%), latex (16.7%), and antibiotics (15.1%) [15] are known as the most common causes of anaphylactic and anaphylactoid reactions during anesthesia. On the other hand, anaphylactic and anaphylactoid reactions to local anesthetics are known to arise in less than 1% of cases [7,16-18]. In comparison, a previous retrospective study showed that actual adverse drug reactions due to local anesthetics were very rare, only 16 cases out of 210,017 patients in France

[19]. In another previous study, authors examined 199 patients who had suffered from alleged lidocaine hypersensitivity and found that true lidocaine hypersensitivity was demonstrated in only 1 patient [18]. The authors said that most patients suffered from symptoms that would most likely be caused by vasovagal syndrome. Although we could not identify whether our case corresponded to true lidocaine hypersensitivity, symptoms such as skin rash, urticaria, vomiting, and diarrhea strongly suggested this case was indeed lidocaine hypersensitivity. As there was no use of any other drug except lidocaine and the patient had had a similar experience after dental care eight years ago, we strongly suspect that lidocaine was the cause of anaphylactic reaction in this patient.

Since 1981, four cases [6,20-22] of lidocaine anaphylaxis were reported in Korea. Two [20,22] cases showed bronchospasm only, while the others [6,21] showed both bronchospasm and hypotension. One case [21] led to death. Anaphylaxis caused by lidocaine might be more common than is shown in the literature. In dental surgeries, lidocaine for local anesthesia is used extensively. In most cases, lidocaine containing small amounts of epinephrine (i.e. diluted by 1:100,000) is used to prevent systemic absorption of lidocaine and prolong the duration of the local anesthetic effect. This epinephrine may block early anaphylactic reaction to lidocaine, but this has not yet been proved and further research is needed to investigate this matter. The use of epinephrine-free lidocaine may increase the chances of an anaphylactic reaction.

In the present case, the authors checked the patient's medical history precisely for unusual findings and found that she had a similar experience in the past. If a detailed medical history had been taken in advance, the patient would have had proper tests and got premedication or received dental treatment using a drug other than lidocaine. It may be helpful to include not only lidocaine or amide-based local anesthetics but also other local anesthetics in examinations such as the skin test. We could not definitively confirm that lidocaine was the cause of this case by any objective laboratory test due to the patient's refusal to engage in further testing. However, we are nearly convinced that lidocaine was the cause because of the medical history, concrete clinical symptoms, and drug usage before anaphylaxis. Mackley et al. suggested that medical history was very important in evaluating possible sensitivity to anesthetic agents when comparing the four cases they studied [23].

The best treatment for hypersensitivity is to avoid the triggering allergen and clinicians should keep in mind that precise history taking is important. Among previous case reports of suspected or confirmed anaphylactic reactions to lidocaine, the route of administration was almost always local infiltration in the soft tissue such as the gingiva or subcutaneous tissue. There was only one case in which lidocaine hypersensitivity occurred after intravenous administration of lidocaine [24]. It is possible that immune-related cells such as mast cells have a key role in anaphylactic reactions and they are more abundant in the soft tissue than in the intravascular compartment. Also, the time in which they are in contact with lidocaine may be longer in the former than the latter because lidocaine injected into vessels could be diluted and washed out in the blood stream. The route of local infiltration in our case was also in the soft tissue of the gingiva.

In conclusion, clinicians should be aware that anaphylactic reaction to lidocaine is possible, and that rapid and simple treatment with epinephrine can support rapid resuscitation of the patient suffered from anaphylaxis.

AUTHOR ORCIDs

Hyerim Kim: https://orcid.org/0000-0001-6517-1634
Jung-Man Lee: https://orcid.org/0000-0002-7115-2939
Kwang-Suk Seo: https://orcid.org/0000-0001-5906-0639
Seok Min Kwon: https://orcid.org/0000-0002-0656-7433
Hyung Sang Row: https://orcid.org/0000-0002-1674-2290

CONFLICT OF INTEREST: The authors have no financial interests to declare in relation to the content of this article.

REFERENCES

1. Simons FE, Ardusso LR, Bilo MB, El-Gamal YM, Ledford DK, Ring J, et al. World allergy organization guidelines for the assessment and management of anaphylaxis. World Allergy Organ J 2011; 4: 13-37.
2. Wallace MS, Laitin S, Licht D, Yaksh TL. Concentration-effect relations for intravenous lidocaine infusions in human volunteers: Effects on acute sensory thresholds and capsaicin-evoked hyperpathia. Anesthesiology 1997; 86: 1262-72.
3. Naguib M, Magboul MM, Samarkandi AH, Attia M. Adverse effects and drug interactions associated with local and regional anaesthesia. Drug Saf 1998; 18: 221-50.
4. Bhole MV, Manson AL, Seneviratne SL, Misbah SA. Ige-mediated allergy to local anaesthetics: Separating fact from perception: A uk perspective. Br J Anaesth 2012; 108: 903-11.
5. Brown AF. Anaphylactic shock: Mechanisms and treatment. J Accid Emerg Med 1995; 12: 89-100.
6. Lee SM, Song WJ, Yang MS, Lee SH, Kwon JW, Kim TW, et al. A case of lidocaine anaphylaxis. Korean J Asthma Allergy Clin Immunol 2006; 26: 249-53.
7. Thyssen JP, Menné T, Elberling J, Plaschke P, Johansen JD. Hypersensitivity to local anaesthetics–update and proposal of evaluation algorithm. Contact Dermatitis 2008; 59: 69-78.
8. Simons FE. Anaphylaxis pathogenesis and treatment. Allergy 2011; 66: 31-4.
9. Simons FE, Roberts JR, Gu X, Simons KJ. Epinephrine absorption in children with a history of anaphylaxis. J Allergy Clin Immunol 1998; 101: 33-7.
10. Simons FE, Gu X, Simons KJ. Epinephrine absorption in adults: Intramuscular versus subcutaneous injection. J Allergy Clin Immunol 2001; 108: 871-3.
11. Sampson HA. Anaphylaxis and emergency treatment. Pediatrics 2003; 111: 1601-8.
12. Soar J, Pumphrey R, Cant A, Clarke S, Corbett A, Dawson P, et al. Emergency treatment of anaphylactic reactions-guidelines for healthcare providers. Resuscitation 2008; 77: 157-69.
13. Stark BJ, Sullivan TJ. Biphasic and protracted anaphylaxis. J Allergy Clin Immunol 1986; 78: 76-83.
14. Kim TH, Yoon SH, Lee SY, Choi YH, Park CM, Kang HR, et al. Biphasic and protracted anaphylaxis to iodinated contrast media. Eur Radiol 2018; 28: 1242-52.
15. Mertes PM, Laxenaire MC, Alla F; Groupe d'Etudes des Réactions Anaphylactoïdes Peranesthésiques. Anaphylactic and anaphylactoid reactions occurring during anesthesia in france in 1999-2000. Anesthesiology 2003; 99: 536-45.
16. Baluga JC, Casamayou R, Carozzi E, Lopez N, Anale R, Borges R, et al. Allergy to local anaesthetics in dentistry. Myth or reality? Allergol Immunopathol (Madr) 2002; 30: 14-9.
17. Berkun Y, Ben-Zvi A, Levy Y, Galili D, Shalit M. Evaluation of adverse reactions to local anesthetics: Experience with 236 patients. Ann Allergy Asthma Immunol 2003; 91: 342-5.
18. Amsler E, Flahault A, Mathelier-Fusade P, Aractingi S. Evaluation of re-challenge in patients with suspected lidocaine allergy. Dermatology 2004; 208: 109-11.
19. Fuzier R, Lapeyre-Mestre M, Mertes PM, Nicolas JF, Benoit Y, Didier A, et al. Immediate-and delayed-type allergic reactions to amide local anesthetics: Clinical features and skin testing. Pharmacoepidemiol Drug Saf 2009; 18: 595-601.
20. Lee MY, Park KA, Yeo SJ, Kim SH, Goong HJ, Jang AS, et al. Bronchospasm and anaphylactic shock following lidocaine aerosol inhalation in a patient with butane inhalation lung injury. Allergy Asthma Immunol Res 2011; 3: 280-2.
21. Sim SJ, Han JD, Ryu WS, Lee DW, La DJ, Park CW. Anaphylactic reaction after topical lidocaine anesthesia during bronchoscopy. J Asthma Allergy Clin Immunol 1999; 19: 219-23.
22. Kwon YS, Kwon YI, An DA, Kim IH. A case report of asthmatic breathing with lidocaine. Korean J Anesthesiol

1981; 14: 492-4.
23. Mackley CL, Marks JG, Jr, Anderson BE. Delayed-type hypersensitivity to lidocaine. Arch Dermatol 2003; 139: 343-6.
24. Ismail K, Simpson PJ. Anaphylactic shock following intravenous administration of lignocaine. Acta Anaesthesiol Scand 1997; 41: 1071-2.