



Management of patients with allergy to local anesthetics: two case reports

Varun Arya¹, Geetanjali Arora¹, Sanjeev Kumar¹, Amrita Kaur¹, Santosh Mishra²

¹Department of Oral and Maxillofacial Surgery, Faculty of Dental Sciences, SGT University, Gurugram, India

²Department of Oral and Maxillofacial Surgery, Government S.S. Medical College, Rewa, India

Lidocaine is the most commonly used local anesthetic (LA) agent in various dental as well as oral and maxillofacial procedures. Although rare, adverse effects and allergic reactions to lidocaine have been reported. In patients with suspected allergy to LA or a history of such reaction, careful history-taking and allergy testing should be performed to choose an alternative LA agent to avoid any adverse effects. Here, we present two cases of delayed hypersensitivity reaction to lidocaine, wherein the patients presented with erythema, edema, and itching. Intradermal testing confirmed allergic reaction to lidocaine, and the patients underwent successful dental treatment using an alternative LA agent. This report highlights the importance of allergy testing prior to LA use considering the serious consequences of allergy to these agents and describes the management of such patients using an alternative LA agent.

Keywords: Hypersensitivity; Intradermal Tests; Lidocaine.



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INTRODUCTION

Anesthesia is indispensable for patient comfort during any surgical procedure. The discovery of modern-day local anesthesia by Carl Koller in 1884, as he anesthetized the human cornea by applying a cocaine solution, has been one of the biggest discoveries of the 19th century [1].

Reactions to local anesthetic (LA) agents can be classified as allergic, toxic, and autonomic [2]. People undergoing dental treatments often exhibit some degree of autonomic response to LA injections, such as tachycardia, sweating, and occasionally syncope [3]. However, autonomic response is usually mild. Allergic

reactions to LAs, although rare, have been reported during routine dental as well as oral and maxillofacial procedures. Mild allergic reactions usually occur because of histamine release in response to a particular agent. Such reactions are usually slow in onset and include responses such as rashes, angioedema, nausea, and itching.

Conversely, anaphylactic reactions are acute and possibly life-threatening and show multiorgan involvement. Anaphylaxis occurs when antigen-specific immunoglobulin E molecules, which are bound to mast cells and basophils, are cross-linked by the specific antigen and re-exposure to the same antigen causes these cells to degranulate, leading to the release of several biochemical mediators. The clinical signs of anaphylaxis

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Corresponding Author: Geetanjali Arora, MDS, Assistant Professor, Department of Oral and Maxillofacial Surgery, Faculty of Dental Sciences, SGT University, Gurugram, A-36, Inderpuri, New Delhi-110012

Phone: +919711958278, +918700184789 E-mail: geetanjaliarora28@gmail.com

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Fig. 1. Diffuse swelling is seen on the right side of the face in association with erythema involving the right cheek, chin, and neck region.

usually appear within few minutes; anaphylaxis is graded as follows according to its severity:

Grade I: cutaneous-mucous signs

Grade II: cutaneous-mucous signs with accompanying cardiovascular and/or respiratory signs such as tachycardia and bronchial hyperreactivity/cough

Grade III: cardiovascular collapse with multivisceral signs such as bronchospasm

Grade IV: cardiac arrest [4]

Allergies have been predominantly reported to ester-type LAs. Hydrolysis of ester-type LAs by cholinesterase causes the release of para-aminobenzoic acid (PABA), which is a known allergen [5]. Conversely, allergies to amide-type LAs have been rarely reported. Lidocaine is the most common anesthetic agent used in numerous surgical procedures for local and regional anesthesia and is the gold standard compared to other LA



Fig. 2. On allergy testing, wheel-and-flare reaction to lidocaine is noted.

agents. Herein, we present cases of two patients with allergy to lidocaine and describe their management.

CASE 1

A 51-year-old male patient, weighing 64 kg, visited our outpatient department with the chief complaint of redness and swelling on the right side of the face that had occurred 3 h after a tooth extraction at another dental clinic. Furthermore, the patient complained of continuous throbbing pain associated with difficulty in chewing food and reduced mouth opening. There was no history of systemic illness. On examination, his vitals were stable; extra-orally, diffuse swelling was noted on the right side of the face along with erythema involving the right cheek, chin, and neck region (Fig. 1). The patient had no other symptoms except for mild itching associated with the erythema. Intra-orally, edema was noted around the unhealed socket of 48. Cone-beam computer tomography revealed a 48 root stump. Considering the patient's history and examination findings, he was transferred to the Department of Dermatology to rule out any allergic reaction/allergen sensitivity before commencing any definitive treatment (surgical extraction of 48) under local anesthesia.

Skin prick and intradermal tests were performed using the HollisterStier grading system (Allergy Skin Test



Fig. 3. Erythema with mild swelling is noted on the left side of the face in a 46-year-old female patient.

Guide/HollisterStier - Sliding Guide Miles [www.hsallergy.com]) with five LAs: lidocaine, procaine, articaine, bupivacaine, and ropivacaine. Wheel-and-flare reaction was noted only to lidocaine (Fig. 2). Therefore, procaine, with a duration of action shorter than that of lidocaine, was used as the LA for performing the surgical extraction of 48. Continuous monitoring of all vitals was performed for 3 h, and no signs of hypersensitivity were noted. Patient was discharged few hours after the procedure; he was instructed to self-monitor the symptoms and report to the emergency department in case of any symptoms or discomfort.

CASE 2

A 46-year-old female patient, weighing 72 kg, reported to our outpatient department with the chief complaint of pain in the lower left back tooth region for 1 week. Pain was intermittent and sharp in nature. On examination, a

grossly decayed 38, which was tender on percussion, was noted. Atraumatic extraction of the tooth was performed under local anesthesia using 2% lidocaine with 1:80,000 adrenaline. After 1.5 h post-operatively, the patient presented erythema and mild swelling on the left side of the face, extending from the zygomatic arch region superiorly to the mandibular inferior border inferiorly and from the corner of the mouth anteriorly to the angle of the mouth posteriorly (Fig. 3). The patient had mild itching with stable vitals and no other typical allergy symptoms (discomfort, choking, or loss of consciousness). Considering her clinical presentation, hypersensitivity reaction was suspected, for which 1–2.5 mg/kg steroid (hydrocortisone) was administered and tablet fexofenadine 180 mg once daily prescribed for 3 days. The erythema and itching was relieved with medication. The Department of Allergy confirmed hypersensitivity response to lidocaine, procaine, and mepivacaine.

DISCUSSION

Immune response represents body's defense mechanism and is generally protective in nature to the host. However, occasionally, it may be harmful to the host. Hypersensitivity is characterized by an exaggerated immune response that can cause tissue damage, organ disorders, and even death in a sensitized host. Gell and Coombs classified hypersensitivity reactions into four types: type I, IgE-mediated, immediate-type hypersensitivity; type II, antibody-dependent cytotoxicity; type III, immune complex disease; and type IV, delayed or cell-mediated hypersensitivity [6]. Hypersensitivity reactions can be "immediate" (rapid onset) or "delayed" (slow onset after 24 h). Type I, II, and III hypersensitivity reactions depend on antigen-humoral antibody interaction, whereas type IV reactions are mediated by T-lymphocytes.

Although rare and reported in only 1% cases, allergic reactions to LAs do occur during routine dental treatment and oral and maxillofacial surgery [7]. The reactions vary

from mild ones, such as rashes, angioedema, nausea, and itching, to life-threatening ones, such as bronchospasm and respiratory or cardiovascular collapse, necessitating immediate intervention and management. Allergic reactions might occur even on exposure to other antigens such as methyl-p-hydroxybenzoate (a preservative); chlorhexidine (an antibiotic); bisulphate (an anti-oxidant); and other antigens, such as latex [8-10]. To exclude the possibility of allergic reaction to such allergens, allergy testing of our patients was performed.

LAs can be amide or ester type. The molecular structure of all injectable LAs is composed of three components: a lipophilic aromatic ring, which is necessary for drug penetration across the lipid-rich nerve membrane; an amino terminus, which ensures solubility in aqueous medium; and an intermediate chain connecting the aromatic and amino group. The last component determines whether the LA is an ester (-COO-) or amide (-NHCO-). LAs cause depression of the excitation in nerve endings or blocking of conduction via acting on voltage-gated sodium channels, thereby producing a complete and temporary loss of sensation in a circumscribed area [11].

Clinicians frequently encounter cases of allergic reactions to LAs; however, these cases are rarely documented, making it difficult to elucidate the true underlying mechanism of allergic response. Among the documented cases, allergic reactions to the ester-type LAs have been mostly reported [12]. PABA, a metabolite released during the hydrolysis of ester-type LAs, acts as an allergen and is also a common ingredient of many cosmetic products and sunscreens. It has been hypothesized that previous contact with PABA in small amounts via these creams can sensitize a susceptible individual, and after LA administration, such individuals exhibit a full-blown response. Furthermore, methyl paraben, which is added to LA (both amide and ester type) cartridges as a preservative, metabolizes to form PABA. Although allergic reactions to amide-type LAs are rare, allergy to methyl paraben may account for significant allergic reactions to these LAs as well. True

allergy to amides is very rare; however, there have been reports of true amide allergy wherein patients usually exhibited contact dermatitis [13,14].

In patients with a suspected true allergy to LAs, skin testing is a reliable method for diagnosing sensitization and for analyzing cross-reactivity patterns. Skin prick test is the most commonly used initial evaluation method to determine allergy in suspected patients. It is safe and easy to perform; moreover, allergy to different LA solutions with the suspected allergen can be tested. Intradermal test is another option; however, it is not commonly used because it is slightly painful and associated with false-positive response due to the primary irritant effect of LAs. Subcutaneous challenge test is considered as the gold standard for confirming a true IgE-mediated allergy. However, it is quite unethical to introduce an allergen into an otherwise normal person; therefore, it is recommended to perform this test in a hospital setting so that the patient can be managed effectively if severe symptoms appear.

We often come across patients who experience palpitations, sweating, lightheadedness, or hypotension during surgical procedures. It is important to rule out whether these signs represent an autonomic response or a true allergic reaction. In the present cases, allergic reactions were confirmed via an intradermal skin test and patients were managed with alternative LAs without any adverse effect.

In conclusion, thorough history should be taken for patients with a positive history of any kind of allergy or adverse reaction to LAs. Furthermore, allergy tests must be performed to determine the exact causative agent so that an alternative LA, if available, can be used.

AUTHOR ORCIDs

Varun Arya: <https://orcid.org/0000-0001-9597-8586>

Geetanjali Arora: <https://orcid.org/0000-0002-2575-3207>

Sanjeev Kumar: <https://orcid.org/0000-0001-6049-5322>

Amrita Kaur: <https://orcid.org/0000-0002-1792-9065>

Santosh Mishra: <https://orcid.org/0000-0002-4832-996X>

AUTHOR CONTRIBUTIONS

Varun Arya: Conceptualization, Validation

Geetanjali Arora: Methodology, Writing - original draft, Writing - review & editing

Sanjeev Kumar: Supervision, Writing - review & editing

Amrita Kaur: Writing - original draft, Writing - review & editing

Santosh Mishra: Investigation, Validation

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