

Allergic Reactions to Local Anesthetic Formulations

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KEYWORDS

- Allergic reaction • Local anesthesia
- Type I anaphylactic response
- Type IV delayed hypersensitivity response

During the history of local anesthesia administration, a constant effort by chemists and scholars has been made to improve the efficacy and minimize adverse events associated with local anesthesia. Innovative products continue to replace agents that have inferior properties, and practice protocols are constantly being fine tuned to avert problematic practices. Because of this self-assessment within the respective health care fields, the potential for adverse events with currently marketed amide local anesthetics is extremely rare.¹ Dentists need to follow recommended doses, use a stress protocol, take thorough medical histories, aspirate before injections, and slowly disperse anesthetics during injection.² These procedures will help to avert many of the adverse events seen associated with local anesthesia, including allergic reactions.

Although an allergic response to a local anesthetic is remarkably rare, local anesthetics are capable of causing true allergic reactions. Clinicians need to be educated to properly treat and definitively diagnose a true allergic reaction. In the past, most allergic reactions to local anesthetics could be ascribed to procaine. The antigenicity of procaine, and other ester agents, is most often related to the para-aminobenzoic acid (PABA) component of ester anesthetics, a decidedly antigenic compound.³ This finding, as well as procaine's poor efficacy and short duration, led to the development and eventual widespread use of the superior anesthetic lidocaine, an amide compound. The incidence of true allergies to amide local anesthetics is widely accepted to be well less than 1%⁴; unfortunately, poor understanding of adverse reactions to local anesthetic and poor availability of allergy testing, has resulted in unnecessary dental consequences.

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ADVERSE EVENTS: DIFFERENTIATING ALLERGIC REACTIONS

Adverse reactions caused by fear or anxiety, inadvertent intravascular administration of local anesthetic, toxic overdose, intolerance, and idiosyncrasy could be mistaken for a true allergic response.⁵ Toxic adverse reactions associated with local anesthetics are related to systemic exposure or local pharmacologic effect.⁶ Clinicians need to be aware of potential precipitating factors such as needle phobias, chair position, liver or kidney failure, maximum recommended doses, proper safety protocols, and concomitant drug interactions. A thorough medical history is the simplest and most efficient method for the detection of risk factors that can lead to an adverse event.⁷ Patient familiarity is imperative for a provider and will allow for rapid diagnosis and effective treatment when adverse events present.⁸

Anxiety plays a major role in dentistry. Scott and Hirschman⁹ reported that a large portion of the US population becomes increasingly anxious in relation to dentistry. Psychogenic effects are the most numerous and common adverse events seen in a dental office. Because of the similarities, these psychogenic responses are often misdiagnosed as allergic reactions. In addition, needle phobias, panic attacks, and vasovagal syncope are all anxiety-related events with the potential to produce urticaria, edema, bronchospasm and unconsciousness. These reactions can present with a wide array of symptoms, including hyperventilation, nausea, vomiting, and alterations in heart rate or blood pressure.¹⁰ Understanding the differences among allergic reactions from psychogenic reactions is important so that patients receive the appropriate care.^{1,11}

THE ALLERGIC RESPONSE

Initially, the body's immune response system was thought to be purely protective; however, the dangerous potentials of severe allergic responses were eventually discovered. Hypersensitivities or allergies are abnormally vigorous immune responses, in which the immune system causes tissue damage as it fights off a perceived threat, or antigen, that would otherwise be harmless to the body.¹² There are different types of hypersensitivity reactions, which are best classified on the basis of the immunologic mechanism mediating the disease (**Table 1**).

ALLERGY-TESTING PROCEDURES

The history of a reported allergic reaction needs to be thoroughly evaluated and a clear sequence of the events documented. The drugs used, the onset of the reaction, signs and symptoms, and the duration of the event are very helpful in diagnosing a true allergic reaction. Most reported adverse reactions are psychogenic in nature and a smaller proportion of adverse responses can be attributed to avoidable intravascular injection. It is important not to prematurely label the patient as being allergic; the true nature of the problem should be investigated. If the reaction is acute and strongly suggestive of an allergic response, referral to an allergist is considered the standard of care.¹³ As demonstrated in **Fig. 1**, the allergist will use skin prick tests (SPTs), intradermal or subcutaneous placement tests, and/or drug provocative challenge testing (DPT) procedures to aid in the identification of a safe local anesthetic for an individual patient.

An SPT is usually administered first. The SPT is performed by placing a drop of the test solution on the forearm and puncturing the skin through the liquid. If this test demonstrates a positive result, a wheal and flare should occur within 20 minutes.¹⁴ If a systemic reaction occurs, appropriate treatment protocol for allergic reactions

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