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Allergy to Local Anaesthetic Agents used in Dentistry – What are the Signs, Symptoms, Alternative Diagnoses and Management Options?

Abstract: This paper addresses the signs and symptoms of local anaesthetic hypersensitivity, differential diagnoses and the management of a patient with suspected allergy to local anaesthetics.

Clinical Relevance: While allergy to anaesthetic is rare, knowledge of other causes of similar symptoms is important.

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Following the administration of a local anaesthetic, a minority of patients may suffer one of a range of unwanted symptoms. Some of these symptoms can be mistaken for hypersensitivity or allergy and the patient may be unnecessarily told that he/she is allergic to the anaesthetic; this is not the case in the majority of patients. Mislabeling of patients as allergic to local anaesthetics can lead to problems for dental practitioners with patients unable to undergo routine dental treatment.¹

Local anaesthetic agents can be categorized into two classes:

- Amide (lidocaine, bupivacaine, prilocaine, ropivacaine, articaine, mepivacaine); and
- Ester (benzocaine, cocaine, procaine,

tetracaine).

True allergy to an amide local anaesthetic is exceedingly rare. Local anaesthetics of the ester type are more likely to produce allergic reactions as they are metabolized to para-aminobenzoic acid (PABA), which is an allergenic compound.^{2,3,4} The only ester local anaesthetic used in primary care dentistry is benzocaine, which is used in topical preparations applied prior to administration of local anaesthetic injections. An allergy to one ester local anaesthetic rules out the use of another ester, as the metabolism of all esters yields PABA. Patients are unlikely to show cross-sensitivity to amide local anaesthetics as these are not metabolized to PABA. Allergy to one amide local anaesthetic does not rule out use of another amide local anaesthetic.^{3,5} However, it would be unwise to use another amide local anaesthetic without hypersensitivity tests⁵

Local anaesthetics are considered relatively safe but, given the high number of injections that are administered, adverse reactions are inevitable.³ Adverse systemic reactions to local anaesthetics can be divided

into three categories:

- Toxic;
- Psychogenic; and
- Allergic.³

What are the signs and symptoms of local anaesthetic hypersensitivity?

A true allergy to local anaesthetics may be either type I or type IV.⁶

Type I

Type I is an immediate anaphylactic reaction mediated by IgE antibodies. Signs and symptoms of type I allergy tend to occur within minutes of giving the injection:

- The lips and periorbital areas swell (angioedema);
- The patient may become agitated and there is generalized urticaria and pruritus, particularly of the hands and feet. Other symptoms include abdominal cramps, nausea and diarrhoea;
- Tightness of the chest, with wheezing and

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difficulty in breathing may occur;

- There may be a fall in blood pressure and a rapid thready pulse, which may be accompanied by flushing of the skin or a rash.

Type IV

Type IV is a delayed hypersensitivity reaction mediated by sensitized lymphocytes with typical features as follows:

- Usually localized to the injection site;
- Commonly expressed as a contact dermatitis.⁶

Alternative diagnoses

Genuine hypersensitivity reactions to local anaesthetics are extremely rare. It has been estimated that true allergic reactions to local anaesthetics account for less than 1% of all adverse reactions to local anaesthetics.^{1,6} It is unclear where this figure originates from or the number of patients this represents, as the incidence of adverse reactions occurring in patients who have received local anaesthetics is not reported. Adverse reactions commonly mistaken for hypersensitivity reactions include syncope (fainting), panic attacks and toxic effects due to inadvertent entry of the drug into the circulation.⁷ The following are possible differential diagnoses and their symptoms.

Allergy

Many allergic reactions involving local anaesthetic preparations are due to other constituents in the injection solution rather than to the drug itself. Excipients, such as preservatives (eg benzoates – used in multidose vials) and antioxidants (eg metabisulphites – used in local anaesthetic solution containing adrenaline), can cause allergic reactions.^{4,8}

Allergy to latex contained in rubber bungs, natural rubber latex gloves, rubber dams and other dental materials should also be considered.⁴

Historically, the most sensitizing components in local anaesthetic solutions were preservatives such as methylparabens. Parabens are no longer added to dental local anaesthetic solutions available in the UK.^{3,7,9}

Psychogenic

Psychogenic reactions

(originating in the mind, an emotional response) are one of the most common adverse reactions associated with local anaesthetic use in dentistry. They may manifest in many ways, the most common being syncope, but other symptoms include panic attack, hyperventilation, nausea, vomiting and alterations in heart rate or blood pressure, which may cause pallor. They can be misdiagnosed as allergic reactions and may also mimic them with signs such as flushing of the skin, blotchy red rash, oedema and bronchospasm.³ All patients have some degree of autonomic response to injections, ranging from slight tachycardia and sweating to syncope.¹⁰

Toxic

Toxic reactions may occur if high levels of anaesthetic enter the bloodstream. Local anaesthetics can reach the systemic circulation as a result of repeated injections, inadvertent intravascular administration, or overdose in those patients who have problems eliminating or metabolizing the anaesthetic.^{10,11} Toxic side-effects are predominantly neurological and include excitability or agitation, sedation, light-headedness, slurred speech, mood alteration, diplopia, disorientation and muscle twitching. Higher blood levels may result in tremors, respiratory depression and seizures.^{3,11}

Vasoconstrictor agents, such as adrenaline, may also cause adverse effects. Adrenaline toxicity can result in symptoms such as anxiety, restlessness, trembling, pounding headache, palpitations, sweating, pallor, weakness, dizziness and respiratory distress.⁵

Toxic reactions can be minimized by staying within safe dosage parameters and using safe injection techniques.¹⁰

Management options to prevent occurrence of adverse effects

When a patient experiences signs and symptoms that are suggestive of an allergic reaction, possible alternative causes should be considered, such as contact with other common allergens, toxic dose or a psychogenic reaction. The possible causes of the symptoms experienced should be discussed with the patient. Use of the terms 'allergic' and 'allergy' should be avoided

when discussing any adverse event, as this term is recognized by patients and readily adopted as the explanation.¹²

Adverse reactions caused by toxicity or anxiety can be minimized by:¹²

- Administering injections with an aspirating syringe to avoid intravascular injection;^{7,12}
- Relaxing nervous patients to relieve their anxiety. For extremely anxious patients, sedation may be required;
- Treating patients in a supine position to prevent fainting;
- Giving injections slowly to reduce discomfort and improve localization of solution.
- Restricting the total dose given to the patient to prevent toxic effects occurring by overdose. The maximum dose for the individual patient can be calculated using the dosage information contained in the package insert or recognized dental textbooks on local anaesthesia, and taking into account the age and weight of the patient, any concomitant drug therapy and underlying medical conditions.

Management of a patient who suffers an adverse reaction in the surgery

Psychogenic reaction

If a fall in blood pressure occurs or the patient feels faint, laying the patient flat and elevating the legs should be sufficient to help restore the blood pressure.¹³ Any tight clothing around the neck should be loosened.¹⁴ Once conscious, the patient should be given a glucose drink.¹³ Calm the patient and reassure them.

Toxic reaction

Symptoms caused by toxicity will be short-lived in most patients. The pharmacokinetics of the local anaesthetic agents used in dentistry suggest that the drug will be eliminated from the bloodstream within a couple of hours, but may be as long as 12 hours in some individuals. Reassure the patient that he/she will feel better after several hours and inform him/her that, although the reaction is unpleasant, it should not happen again, and it is not necessary to avoid that local anaesthetic in the future.

Management of a patient when local anaesthetic allergy is strongly suspected

If symptoms suggestive of a true allergic reaction occur (localized reaction consisting of swelling, erythema, an itchy rash or systemic features such as dyspnoea, wheezing, widespread skin rash or circulatory collapse), the patient should be given emergency treatment following the *Emergency Treatment of Anaphylaxis* guidelines (see *Medical Emergencies in Dental Practice* in the *Prescribing in Dental Practice* section of the current BNF or the *Medical Emergencies and Resuscitation Standards for Clinical Practice in General Dental Practice* guidelines: www.resus.org.uk/pages/MEdental.pdf for details). If the patient feels unwell, his/her condition is deteriorating, or they are very distressed, they should be transferred to hospital.

The patient should be referred for further investigation to confirm if the local anaesthetic or another possible allergen (eg excipient, latex) was the cause of the adverse effects.^{12,13} First, consider alternative diagnoses, as discussed above. If further clinical input is needed to establish the diagnosis, contact a local hospital dental department. For patients in whom a true allergic reaction is strongly suspected, patients can be referred by the dentist or GP directly to the allergy clinic at their local hospital, if this service is available.

Very rarely, allergy to the local anaesthetic is confirmed. In these cases, immunological testing should be extended to other local anaesthetics in order to identify a safe alternative for future dental procedures.

Management of patients who report to be allergic to local anaesthetic agents

New patients who claim to have had an allergic reaction to a local anaesthetic should be carefully questioned to obtain a history of past events. These details may be more reliably obtained from the patient's previous dentist.

Questions to ask the patient or dentist include:

- What symptoms did the patient experience?
- What explanation for the symptoms was given at the time? Who told them this?
- Have they ever had any other dental treatment or surgery in the past that required

them to have a local anaesthetic agent? What happened?

- Have they any other allergies?
- Have they ever been tested for a local anaesthetic allergy? If so, what was the result? (The allergy specialist should be contacted for confirmation and further information).

Management

- If further information obtained strongly suggests an allergy, but no details are available, refer the patient for allergy testing.
- If further information strongly suggests a psychogenic reaction, proceed with care and address the patient's anxiety.
- If further information strongly suggests toxicity, proceed with care, starting with low doses of local anaesthetic/vasoconstrictor.
- If no information is available from the patient or dentist, contact the GP who may have information about previous local anaesthetic exposure or other relevant knowledge.
- If it is strongly suspected that the patient has previously suffered an allergic reaction to a local anaesthetic and emergency dental treatment is required, consider contacting a local hospital dental department to discuss management and referral to a unit that has full resuscitation facilities available.

Summary

Allergy to amide local anaesthetics is rare. Allergic reactions are most likely to occur with the ester local anaesthetic agents; these are not used routinely in dentistry. Adverse effects experienced after administration of local anaesthetics may be mistaken for allergic reactions, but often there is another explanation for the symptoms. True allergic reactions to local anaesthetics are either immediate (type I: angioedema, urticaria, pruritus, tightness of the chest, wheezing, fall in blood pressure) or delayed (type IV: localized reaction at the injection site, contact dermatitis) hypersensitivity reactions.

Owing to the rarity of local anaesthetic allergy, if a patient experiences signs and symptoms suggestive of an allergic response, consideration should be given to other possible causes of the symptoms, eg toxicity (sedation, light headedness, slurred speech, mood alteration, diplopia, disorientation and muscle twitching) or a psychogenic reaction (anxiety, flushing of

the skin, blotchy red rash, bronchospasm, sweating, tachycardia, syncope, hyperventilation, nausea and vomiting). Where local anaesthetic allergy is strongly suspected, patients should be referred for allergy testing for confirmation.

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