

ESSENTIAL NOTES

Latex: a rare but important cause of perioperative allergic reactions

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Natural rubber latex (NRL) is a milky liquid obtained from the *Hevea brasiliensis* tree found in Africa and South-East Asia. The raw material tapped from the tree contains around 30% rubber; the remainder comprises proteins, enzymes and polymers in an aqueous medium. Around 90% of tapped latex is used in the production of 'dry rubber', such as that used in car tyres, with the remaining 10% used for latex-dipped goods, such as gloves, condoms and balloons. Of the many proteins identified in latex, only 5% have been proven to induce hypersensitivity reactions. The allergenic proteins are typically the plant defence proteins that the tree produces in response to stress; the more the tree is tapped and 'stressed', the greater the production of these proteins.¹

Clinical Scenario

A 53-yr-old healthcare worker presented for elective minor gynaecological surgery. At preoperative assessment, she reported recurrent episodes of facial swelling and syncope during previous visits to the dentist. One episode required admission to a hospital and treatment with adrenaline (epinephrine) 500 µg. A diagnosis of allergy to local anaesthetics had been made by her dentist, although no allergy testing had been performed to confirm this.

Skin-prick testing to a panel of local anaesthetics was negative. Drug provocation testing with articaine (used during her previous dental procedures) was also negative. Further questioning revealed recurrent episodes of lip angioedema and generalised urticarial rash triggered by blowing up balloons and eating certain fruits. She described vaginal soreness and pruritus with use of condoms. Skin-prick testing to latex glove and latex-specific serum immunoglobulin E were both positive, and a diagnosis of latex allergy was made. The patient was advised to wear a medic alert bracelet and to carry an adrenaline auto-injector device.

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Latex reactions

Latex sensitisation can occur through exposure to airborne particles, via mucosal absorption, or via absorption through damaged skin. Of the four categories of hypersensitivity reactions, latex causes only Types 1 and 4. Type 1 hypersensitivity reactions are mediated by immunoglobulin E (IgE) and typically occur immediately or within 1 h of exposure, although delayed presentations are possible after slow absorption of latex allergens through the skin. Mild reactions include rhinitis, itching, conjunctivitis and urticaria, but these can progress to life-threatening anaphylaxis. Type 4 reactions are T-cell-mediated and are a reaction to the additives used during manufacturing rather than the latex itself. An itchy, sore rash typically appears 48–72 h after exposure. This is termed allergic contact dermatitis and is not life-threatening. It is important to differentiate this condition from irritant contact dermatitis, which is the commonest adverse reaction to latex, but is non-immune. Here, localised redness and itching can progress to rough skin with open sores.² The loss of skin integrity allows latex proteins to be absorbed systemically, leading to sensitisation and true allergy. Allergic and irritant dermatitis can therefore coexist, and it is vital that irritant dermatitis is adequately treated to prevent this.¹

Latex gloves

Latex gloves are preferred over synthetic (e.g. vinyl) alternatives because they are impermeable to viruses and have marked elastic properties. Originally, talcum powder was added to make glove donning smoother, but this was abandoned in the 1950s when it transpired the talc caused postoperative granulomata and adhesions.¹ Instead, the gloves were dipped into corn starch to create a powder, which facilitated donning and also absorbed sweat. However, latex proteins absorb into the corn starch, and the process of donning/doffing releases a protein-laden powder into the environment. Removal of powdered latex gloves has been key in the effort to reduce sensitisation in the healthcare setting.³

Latex allergy epidemic

The incidence of latex allergy appeared to surge in the 1980s, coincident with increased precautions introduced to protect healthcare workers and others against blood-borne viruses, such as human immunodeficiency virus.³ A link with blood-borne viruses has not been proven definitively. Nevertheless, there has been a significant decrease in latex allergy rates in recent years attributed to the introduction of powder-free gloves, avoidance of NRL in clinical care, and increased awareness of the problem.⁴ In the perioperative setting, latex is now a rare cause of allergy. In France, the incidence decreased

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from 20% of cases between 1997 and 2004 to 5% between 2011 and 2012. These findings are replicated in Spain and in the USA, and in the UK there were no reported cases of latex allergy during the Sixth National Audit Project of the Royal College of Anaesthetists (NAP6 study) in the UK in 2018.⁵

Who is at increased risk of latex allergy?

Patients with a history of frequent exposure to latex are at increased risk of allergy, typically patients with multiple previous surgeries, spina bifida, or urogenital abnormalities requiring frequent catheterisation.³ Atopy is a risk factor and in particular eczema.⁶ Healthcare workers are a high-risk group because of high latex exposure.³

Food cross-reactivity

Some of the allergenic proteins within latex are structurally similar to those found in certain fruits and vegetables, including banana, pear, chestnut, avocado, kiwi, and some nuts.² This leads to the latex–food allergy syndrome, in which ingestion of these foods by latex-allergic patients can result in perioral itch and swelling, or occasionally a more generalised systemic allergic reaction. This syndrome affects around 30–50% of latex allergy sufferers, and a history suggestive of latex allergy should be actively sought in a patient presenting with allergy to one of the common culprit foods.⁴

Testing for latex allergy

For suspected Type 1 immediate hypersensitivity reactions, patients require skin-prick and intradermal testing. These identify the presence of specific IgE antibodies to latex. In the skin-prick test, a drop of latex extract is placed on the skin and the skin scratched with a needle. In the presence of appropriate positive and negative control tests, a wheal or redness at the site indicates sensitisation.⁷ Reported sensitivity and specificity of skin-prick testing for latex vary, but may be as high as 100%.⁹ Allergen content in latex extracts varies, which can reduce the reliability of these tests.⁷ An alternative technique is to perform a skin-prick test through a latex glove itself. A blood test may also identify the presence of specific IgE antibody to latex and has the advantage of being completely risk free. However, sensitivity of this test may be as low as 53%.²

In patients with a high clinical suspicion of Type 1 latex allergy but negative skin and blood testing, a provocation test may be considered. This involves placing a piece of dampened latex glove onto the patient's skin for 15 min. If negative, a specialist clinician may proceed to place an entire dampened glove on the hand or further 'provoke' by rubbing the glove.^{2,7} Again, this must only be performed if resuscitation facilities are available because of the risk of systemic reaction.

Patch testing, where latex is applied to the skin via a patch that is left in place for 24–48 h, is reserved for the diagnosis of Type 4 hypersensitivity reactions and has no place in the diagnosis of Type 1 reactions.

Table 1 Useful screening questions to identify individuals at increased risk of latex allergy.

Screening questions to identify potential latex allergy

- (i) Are you frequently exposed to latex?⁷
 - Medical conditions (e.g. spina bifida or bladder dysfunction)⁸
 - Recurrent urogenital surgeries⁸
 - Repeated catheterisation⁸
- (ii) Do you suffer from rash, itchy eyes, sneezing, or a runny nose when around latex or at work?⁷
- (iii) Are you allergic to any fruits? Have you ever experienced mouth burning or itching after eating any fruits, such as banana, kiwi, or avocado?⁷
- (iv) Do you suffer from hay fever, asthma, or eczema?⁶
- (v) Have you previously had a reaction with any of the following:
 - Blowing up balloons⁶
 - Latex birth control devices⁸
 - Rubber gloves⁸
 - Hot water bottles⁸
 - Rubber bands⁸
 - Dental rubber dams⁸
 - Elastic bands⁸

Latex allergy in the perioperative setting

Previous work has demonstrated that a focused preoperative allergy history identifies individuals subsequently confirmed to have high titres of latex-specific IgE. Table 1 lists useful screening questions to identify patients who may require further investigation before surgery.⁶

In patients with a confirmed or suspected Type 1 hypersensitivity to latex, all latex-containing products should be removed from the perioperative environment. Ideally, drug vials with rubber stoppers should be avoided, as some work suggests that the stopper itself produces clinically relevant latex contamination of the contents of the ampule. However, there is only limited evidence that this contamination results in systemic allergic reactions.⁹ After the use of powdered latex gloves, the operating theatre should be 'rested' to allow the removal of airborne allergens. Although some studies have recommended a rest period of at least 6 h, more recent guidance suggests that a period of up to 3 h is sufficient. If non-powdered latex gloves have been used, there is no requirement to rest the operating theatre.^{6,7} Prophylaxis with steroid or antihistamine premedication is not recommended, as it does not prevent Type 1 hypersensitivity reactions.¹ All departments should have a latex policy that lists safe and unsafe equipment.

Chlorhexidine: the new latex?

Whilst latex allergy has decreased, widespread use of another environmental allergen, chlorhexidine, has led to a dramatic rise in the number of severe allergic reactions to this agent.¹⁰ In the NAP6 study in the UK, chlorhexidine was the causal agent in 9% of life-threatening perioperative allergic reactions.⁵ Chlorhexidine is described as a 'hidden allergen' because, despite its ubiquitous perioperative use, it is frequently overlooked as a cause of allergy; the risk of human error leading to accidental exposure in a chlorhexidine-allergic patient remains high.

Summary

In summary, latex allergy remains a cause of severe perioperative allergy, although the incidence of this has significantly decreased over time. A detailed history will elicit symptoms suggestive of previous Type 1 hypersensitivity that warrant referral to an allergy clinic; if allergy is confirmed, careful planning of a latex-free perioperative environment is required.

Declaration of interests

The authors declare that they have no conflicts of interest.

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