Latex allergy and otorhinolaryngological surgery

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Latex allergy in the otorhinolaryngology patient requires forward planning and coordination of management plans between the surgical, nursing and anaesthetic departments in order to ensure a safe outcome.

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Although severe allergic reactions to latex remain an uncommon problem for otorhinolaryngology patients, preparing them for theatre poses numerous difficulties for surgical, anaesthetic and nursing teams. Within this group of patients, type I immunoglobulin E (IgE)-mediated anaphylaxis is rare, but can be fatal (Hollnberger et al, 2002). Adequate patient preparation and hospital staff education are the cornerstones of management.

Since the 1980s, there has been a steady rise in the number of cases of latex allergy in both health-care professionals and their patients. As many otorhinolaryngology patients require repeated surgery, their chances of developing serious allergic reactions increase with time. This problem is compounded by the unavailability of reliable information on the latex content of many medical products. For every otorhinolaryngology patient with a history suggesting possible latex allergy, only a well-planned and highly detailed survey of equipment and medicines in the few days before surgery can minimize the risks of hospitalization (Nettis et al, 2002).

SOURCES AND PRODUCTION

The rubber tree *Hevea brasiliensis* (*Figure 1*) was first discovered by Columbus and later transported to south-east Asia for commercial production.

Figure 1. The sap of Hevea brasiliensis is the source of natural rubber latex.

Natural latex protein is an intracellular protein that coats the inner surface of the bark and its vessels, protecting the tree against insect attack (Warren, 1987). In 1839, the rubber tree was transformed from a botanical oddity to a major source of income for the industrial world by the process of vulcanization. This technique, still in use in latex manufacturing, involves the addition of sulphur at high temperatures to the natural rubber latex protein, producing a polymer that provides a formidable barrier to bacteria, viruses and has excellent properties of elasticity and durability. This made latex an almost ideal candidate for tens of thousands of household and medical products.

POPULATION EXPOSURE

In the past 20 years, the rise in latex allergy has been concordant with increased exposure to latex products. There are several reasons for this. Following the discovery of human immunodeficiency virus in the early 1980s, the demand for the production of latex gloves increased at least 100-fold (Nettis et al, 2002). The rise in demand also meant that latex manufacturers produced lower quality gloves containing a larger percentage of natural rubber latex and other chemical impurities. Furthermore, starch used in latex gloves can bind the protein and act as an inhaled source of allergen when released into the air as gloves are put on.

In hospitals, both otorhinolaryngology patients and staff are frequently exposed to latex. While gloves are the commonest source of latex exposure (Kelly and Gimenez, 2000), other sources such as surgical equipment can also contribute to the total antigen load.

PREVALENCE OF LATEX ALLERGY

Approximately 1% of the general population has specific anti-latex IgE antibody, however, the number of people with overt symptoms and signs of allergy is smaller. Nevertheless, as a

result of the rapid turnover of patients in otorhinolaryngology surgery, especially the paediatric population, the possibility of latex allergy should be borne in mind during preoperative assessment. In health-care workers, the prevalence of latex allergy has been reported to be between 17% and 36% (Kelly and Gimenez, 2000). These large percentages are more a reflection of the over-reliance on a single IgE test rather than of actual numbers affected (Tabar et al, 2002).

Levels of IgE antibodies to natural latex rubber in the general population and medical staff are fairly similar. This may be a result of the cross-reactivity that stems from the presence of fruit proteins that can trigger an allergic response to latex, in addition to the presence of latex in numerous household objects (Condemi, 2002). Therefore, a raised IgE level in itself needs further skin prick testing to support the diagnosis of latex allergy (Turjanmaa et al, 2002). In the paediatric population the prevalence of latex allergy is around 0.4% while around 4% are latex sensitized (Meglio et al, 2002; Yip, 2003).

MECHANISMS OF LATEX REACTIONS

Although not immunologically mediated, irritant dermatitis develops on health-care workers hands and is a result of recurrent hand washing, sweating, and powders present in gloves (Mehra and Hunter, 1998; Yunginger, 1998). While skin patch tests are negative for this particular form of dermatitis, its diagnosis relies upon the exclusion of more serious forms of latex allergy.

Type IV hypersensitivity reactions to latex cause a rash 1 or 2 days after exposure and induce signs distant from the site of exposure. Chemical contaminants are often present in gloves made from latex or other compounds and can induce type IV hypersensitivity reactions (Nettis et al, 2002), therefore changing to non-latex gloves does not always solve the problem. Diagnosis depends on a positive skin patch test.

The most serious and possibly fatal form of latex allergy is mediated by a type I IgE-mediated response that can lead to anaphylactic shock. Fortunately rare, this type of reaction has a biphasic response such that after initial recovery the patient may experience similar symptoms 4–12 hours later. Inhaled antigen may lead to severe asthma, and stridor, chest pain, conjunctivitis and rhinitis. Contact with mucosal membranes, e.g. Foley catheters and nasogastric tubes, can cause vomiting and abdominal pain. Tachycardia and hypotension should alert medical staff to impending collapse and a fatal outcome. Preoperative diagnostic tests that can aid in the diagnosis of this particular form of allergy include enzyme-linked immunosorbent assay, radioallergosorbent test (RAST) and skin prick tests. While not routinely available, they may be obtained for specific patients (Kelly and Gimenez, 2000).

PATIENT PREPARATION AND MANAGEMENT

Even without prior knowledge of latex allergy, several factors should alert the otorhinolaryngology surgeon in the preoperative assessment stage. A previous history of atopy such as allergic rhinitis or asthma on exposure to latex or certain fruits, e.g. kiwi fruit, apples, bananas or avocado, may point to future allergic reactions during surgical care. Frequent exposure to latex, whether through occupation or medical intervention, also increases the risk of an allergic response (Yunginger, 1998). While a history of allergic rhinitis or asthma does not necessarily lead to latex allergy, closer questioning regarding trigger factors at home and at work may provide further clues. For example, allergic responses to kiwi fruit and bananas in foods and cosmetic agents containing fruit extracts can lead to allergic responses to latex as a result of cross-reactivity.

Children with congenital urological problems merit close attention because of the frequent catheterization and subsequent direct mucosal contact with latex. Surgery should be avoided if at all possible in patients with a clear history of previous anaphylaxis on exposure to latex. For milder allergic responses, if surgery is absolutely necessary, latex desentization, whether percutaneously or sublingually, may be an option. However, these procedures carry a risk of severe allergic response and are only available in specialist immunology units (Patriarca et al, 2002; Tabar et al, 2002).

If latex allergy is suspected based on the patient's history, specific patch test or IgE, RAST and skin prick test can be requested from immunology or allergy colleagues. Following a positive diagnosis, the patient's admission must be carefully planned in advance with theatre protocols in place. While 95% of hospitals surveyed in England and Wales have protocols in place for dealing with affected patients, only one half have a named nurse and less than a third have a consultant responsible for updating latex allergy provisions (Yuill et al, 2003). As natural rubber latex is so common in household articles, providing a latex-free environment on the ward can be extremely difficult.

Complete eradication of latex allergy would require the total elimination of latex from hospitals. This a very difficult task as latex is found in liberal amounts throughout hospital furniture and equipment. Patient isolation and frequent refer-

ence to latex allergy protocols on the ward are imperative to the care of the patient. Both anaesthetic and theatre staff should be given ample notification of the patient's operation. While the ventilation system of the anaesthetic machinery needs to be checked for its latex content, administration of per-operative antibiotics can be difficult because of the variable amounts of latex used in bottle caps. A list of common otorhinolaryngology surgical materials containing latex is shown in *Table 1* and those free of latex are listed in *Table 2*.

TABLE 1.
Otorhinolaryngology equipment containing latex

Surgical gloves
Examination gloves
Surgical table surface
Cart–Brain arm support for functional endoscopic sinus surgery (uncovered)
Glove packs
Foley catheters
Jacques catheters
Penrose drains

TABLE 2.
Otorhinolaryngology equipment free of latex

Hopkins rods
Flexible light carrier cable
Thermoplastic splints
Boyle–Davis gauge
Yankaur sucker
Soft-suction tubing
Cocaine bottle caps

TABLE 3.
Raised awareness and patient planning

History	Atopy to household objects containing latex
	Allergic response to fruit and fruit products
	Rhinosinusitis or asthma in health-care professionals
Examination of the patient	Dermatitis affecting hands
	Dermatitis in a distant site from point of contact
	Rhinitis, conjunctivitis, pharyngitis in health-care workers
Investigations	Latex specific IgE and RAST sent during initial consultation
	Immunology/allergy: skin prick tests if IgE and RAST test positive
	Skin patch tests for type IV hypersensitivity
Avoid surgery	Consider non-surgical alternatives to surgery
	Plan desensitization therapy if surgery is unavoidable
Inform nursing staff, anaesthetic team, and theatre personnel	
Equipment	Obtain a detailed list of equipment and medicines for each patient
	Check the latex content on instruments
	Check pharmaceutical companies' latest manufacturing practices

IgE = immunoglobulin E; RAST = radioallergosorbent test

To discover the presence of latex in a product preoperatively, it is vital to call the manufacturer a few days before surgery. There are several reasons for this. Local drug and medical equipment distributors rarely have the latest manufacturer's specific practices on file. A company can produce a certain vial of antibiotic in several EU and non-EU countries. While factories situated in the EU have to comply with the EU directive (Council Directive 92/27/EEC, 1992), non-EU countries have no legal obligation to do so. Therefore, the rubber cap on the same product may or may not be lethal to the patient depending on its manufacturer's production techniques. Furthermore, the level of care taken by each factory worker in providing a latex-free environment can be variable. To compound matters, the latex content of the same vial cap may vary from one dose to another.

Any doctor trying to discover these details from his/her hospital pharmacy will soon find that obtaining them is extremely difficult at nighttime or on weekends. Responses from government sources can be variable, and many manufacturers now out-source their information such that a recorded message is often the end-point of one's endeavours. A list of precautions can be found in *Table 3* and practical tips are listed in *Table 4*.

LATEX-FREE OTORHINOLARYNGOLOGY SURGERY?

As the number of patients afflicted with latex allergy has coincided with the increase in use of latex products, it seems prudent to reduce the amount of latex in their surgical care. Previous exposure to latex gloves can increase the odds of developing latex allergy 13-fold. The highest level of aeroallergen exposure for any population has been recorded in latex glove production factory workers (Sri-akajunt et al, 2000). Currently, latex gloves create the greatest source of latex allergen in surgical practice. A ten-fold reduction in the total amount of aeroallergen can be achieved by simple measures such as wearing latex-free gloves (Elliott, 2002). Alternatives to latex gloves include vinyl (which may not be as effective a barrier as latex), Neoprene, Elastryn and Tactylon. The latter have equivalent barrier profiles to latex but can be more expensive (Thomson, 1998). While the current cost-saving climate may at first dissuade hospital financiers from converting to non-latex gloves, studies have shown that the long-term cost of supporting staff affected by latex allergy far outweighs the price rise in purchasing non-latex gloves (Phillips et al, 1999).

Most otorhinolaryngology surgery requires a blood-free field, which is often achieved by injecting a local anaesthetic solution combined with a vasoconstrictor. The usual combination is Xylocaine (AstraZeneca: 1–2% lidocaine hydrochloride) with 1:80 000 or 1:200 000 adrenaline. This is delivered by a dental syringe from a standard glass cartridge that has a latex rubber bung and a diaphragm. It is recommended that Xylocaine and adrenaline should be avoided in latex-sensitive patients although there is no evidence in the literature that anaphylaxis from latex allergy has ever been induced by injecting this solution (Shojaei and Haas, 2002).

In the UK, the task of the otorhinolaryngology surgeon is exacerbated by several factors. For several years, there have been no legal requirements for medical equipment manufacturers to declare the presence or amount of latex in their products. This is in direct contrast to the US where a few well-publicized law suits against pharmaceutical companies resulted in a rapid change in manufacturing law. However, the law in the UK is about to change. The latest EU directive (European Commission, 2003) clearly states that medical products should carry a warning that latex is present in the product and may cause severe allergic reactions. While this law has not yet been implemented in the UK, medical companies will have to conform to this new guideline. In addition to the familiar label 'may contain traces of nuts', one can imagine 'product may contain latex' appearing on many drug and medical instrument packages.

CONCLUSIONS

Latex allergy is a serious, potentially life-threatening risk for otorhinolaryngology patients and staff. The number of people affected by this problem, although small, has been increasing rapidly over the past 20 years. Staff education and avoidance of exposure are the best means of preventing severe allergic reactions. Meticulous planning and following clear protocols are the cornerstones of management for this difficult problem. HM

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TABLE 4.
Practical tips for managing latex allergy patients in theatre

Ensure that 'latex allergy' is specified on the operating theatre list and all patient's documentation
Setting up operating trays must only be done by staff wearing latex-free gloves
The patient should be first on the operating list to minimize the risk of exposure to latex-bound aero-allergens – if the patient is not the first operation on the day, theatre 'downtime' will be incurred, which is likely to be at least 1 hour
Patients with a latex allergy should be advised of the importance of informing all medical and health-care staff of their problem in the future
Latex-free emergency equipment should be available in the operating theatre
The recovery area should be latex free

KEY POINTS

- The management of latex allergy starts during the history-taking process and requires a high index of suspicion.
- Once suspected, specific immunological investigations should be instigated.
- If any of the diagnostic tests are positive, detailed planning and communication with the nursing and anaesthetic departments are essential.
- Latex allergy protocols should be available and updated regularly.
- For every patient a comprehensive checklist of medications and instruments used in surgery should be gathered and each item checked for its latex content with its manufacturer a few days preoperatively.