

## CASE REPORT

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### Intraoperative Anaphylactic Shock in a Child with No History of Type I Hypersensitivity

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#### ABSTRACT

Natural rubber latex is the second most implicated agent in intraoperative anaphylactic reactions.

This report describes a case of intraoperative anaphylaxis occurring in a non-atopic fourteen-year-old girl undergoing multiple surgical procedures, but without spina bifida, in which latex surgical gloves were the main culprit for the anaphylactic reactions. Clinical manifestations of an anaphylactic reaction were also experienced during the examination of the possible cause of intraoperative anaphylaxis by skin prick testing with a latex allergen extract. Skin tests with anesthetics were negative. Specific IgE to latex was positive at 92.9 kUA/L (class 5). The molecular basis for the reported intraoperative anaphylaxis was ascribed to three low-molecular mass latex allergens (10-15 kD) detected in the brand of latex surgical gloves used during the operation.

Given the potential of a dramatic outcome, latex allergy testing as a regular preoperative measure may contribute to the reduction of anaphylactic reactions during surgical interventions.

**Keywords:** Intraoperative anaphylaxis; Latex allergy; Latex gloves

#### INTRODUCTION

Due to its increasing frequency and severity type I hypersensitivity has been recognized as an international health problem in the last decade. After muscle relaxants, natural rubber latex (NRL) is the second most implicated agent in intraoperative anaphylactic

reactions and the incidence of latex-related anaphylactic reactions is increasing despite the preventive measures undertaken.<sup>1</sup> The prevalence of IgE mediated NRL sensitization among the general population is estimated to be less than 1%, but up to 17% of anaphylactic reactions have been recorded during surgical interventions. The clinical manifestation of intraoperative anaphylactic reactions differs from anaphylactic reactions outside anesthesia such as cardiovascular collapse seems to be the more

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common event.<sup>2</sup> The population at-risk to develop anaphylaxis to latex during surgical procedures includes patients with spina bifida and/or urogenital abnormalities, persons with increased exposure to latex such as healthcare workers, patients who have undergone multiple surgical procedures or persons with certain plant-derived food allergies especially "tropical" fruit allergies.<sup>3</sup>

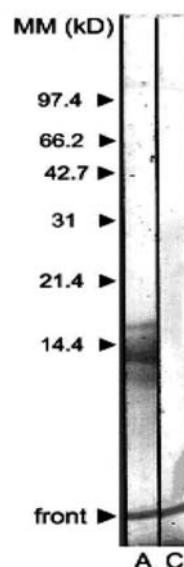
Currently, thirteen latex (*Hevea brasiliensis*, Hev b) allergens have been implicated in the clinical manifestations of latex allergy. Eight of them – Hev b 1, 2, 3, 4, 5, 6, 7 and 13, are the most significant latex allergens among healthcare workers, as they elicit the highest prevalence of IgE antibody specificities detected in the skin and blood.<sup>4</sup>

### CASE PRESENTATION

We report the case of a 14-year-old girl who developed anaphylactic shock during surgery due to latex-containing surgical gloves. The patient had no previous history of allergy, and no family history of allergic disease. She had undergone multiple surgical procedures, and was suffering from neurogenic bladder and vesicouretral reflux grades IV. Fifteen minutes after induction of anesthesia and a few minutes after coming in contact with surgical gloves, there was an acute onset of increased airway pressure, oxygen desaturation, tachycardia, and profound hypotension, as well as bronchospasm and generalized urticaria. Resuscitation with manual ventilation and oxygen, intravenous fluids and an infusion of epinephrine, aminophylline and corticosteroids was successful. Six weeks later she was referred to our allergology department in order to detect the possible causes of intraoperative anaphylaxis and to determine safe alternative drugs (anesthetics) for the future. The child underwent skin prick tests with a standard concentration of commercially available latex extract, tropical fruits (Torlak Institute for Immunology and Virology, Belgrade, Serbia), as well as with a panel of anesthetic drugs used for endotracheal anesthesia (nesdonal, leptosukcin, pavulon, fentanil, flormidal). Skin tests were interpreted as positive if a wheal larger than 3 mm in diameter accompanied by erythema was present 20 minutes later. Histamine hydrochloride was used as the positive control and 0.9% sodium chloride as the negative control. Commercially available assays for specific IgE (ImmunoCAP System, Phadia AB,

Uppsala, Sweden) were performed for latex and tropical fruits. Levels of specific IgE greater than 0.35 kU/L were considered positive. To identify the molecular basis of the anaphylaxis a latex extract was prepared from the same commercial brand of latex surgical gloves as those used during the operation. The latex proteins were transferred on to a nitrocellulose membrane (Immobilon™-NC Millipore Corporation, Billerica, MA) after separation by analytical 15% SDS-PAGE. After incubation with the patient sera (dilution 1:4), IgE-binding proteins were detected with alkaline phosphatase labeled anti-human IgE (Sigma, Steinheim, Germany).

The patient responded positively to skin prick testing with latex (wheal 15 × 30 mm) at a concentration of 5000 PNU. Thus, hypotension, bronchospasm and an urticarial rash on her arm, face and neck as well as swelling of the lip appeared within 5 min after application. This required immediate administration of anti-shock therapy. After treatment, her symptoms reduced considerably within 1 h and were completely resolved after 12 h. Skin tests with the above mentioned anesthetics were negative leading to the conclusion that the anaphylaxis was not drug induced. Skin tests and specific IgE to fruits were all negative, so latex-fruit allergy was also ruled out. The specific IgE to latex was positive (κ82:92,9 kUA/L) class 5. Three IgE-binding bands with molecular masses between 10-15 kD were identified in the immunoblot for the self-prepared latex extract (Figure 1).



**Figure 1. Detection of low-molecular mass latex allergens in the surgical gloves: A) IgE binding bands, C) control.**

## DISCUSSION

This is the first report describing a child with no history of type I hypersensitivity and no family history of allergy, who experienced intraoperative anaphylaxis and six weeks later repeated the anaphylactic reaction during skin testing. Surprisingly, in spite of the high level of specific IgE there had been no previous clinical manifestations of latex allergy. We were able to detect three IgE-binding proteins responsible for the anaphylactic reaction during the surgery, which according to their molecular mass corresponded to Hev b 1, Hev b 6, and Hev b 8.

Absolute avoidance of latex is the only safe approach to treat those who belong to a high-risk group or who are already allergic, as pretreatment with antihistamines and corticosteroids, used successfully for the prevention of reactions to radiocontrast material, are not proven to be as effective in the prevention of anaphylactic reactions to latex.<sup>2</sup> The diagnosis of latex allergy must be kept in mind in every case of perioperative anaphylaxis, even if the patient does not belong to a risk group.<sup>5</sup> For many years there has been concern about the low sensitivity of diagnostic latex skin test reagents and IgE anti-latex serology assays. However, by employing a combination of recombinant latex allergens it was possible to identify latex allergy in healthcare workers with 93% sensitivity and 100% specificity.<sup>4</sup> Accordingly, the use of a selected panel of recombinant proteins seems to be a promising concept, as it may significantly improve the diagnostic sensitivity of in vitro assays.

The key elements of NRL allergy prevention include an adequate history, testing for latex allergy in high-risk patients, preadmission measures and the establishment of a latex-free environment while the individual is hospitalized in the operating and recovery rooms.<sup>2</sup> Nevertheless, due to the possible absence of a positive history of type I hypersensitivity, as occurred in our case, a potential high-risk patient may be overlooked during the preadmission procedure. Therefore we would strongly recommend in vitro testing for latex hypersensitivity as a compulsory measure during preoperative evaluation of the patient.

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