

# Anesthesia In Pediatric Patients With Allergy To Latex: Report Of Three Cases.

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## Abstract

Anaphylactic reactions triggered by latex derived are increasingly common both among children and adults, especially in the hospital environment.

We report three pediatric patients with allergy to latex scheduled for elective surgery.

The identification of high-risk patients, the adequate coordination of the entire surgical staff, the replacement of the anesthetic and surgical material containing latex, and preoperative drug prophylaxis are all mandatory to prevent severe hypersensitivity reactions.

## INTRODUCTION

In spite of being far from common (1 in 5,000 to 25,000 patients) Intraoperative anaphylactic reactions are a constant concern to the anesthesiologist. Their mortality rate, ranging between 3% and 4%, is not negligible.<sup>1</sup>

Nutter described, in 1974,<sup>2</sup> the first case of an immediate allergic reaction to latex, in the form of local urticaria. Turjanma et al.<sup>3</sup> first reported, in 1988, an anaphylactic reaction to latex during childbirth.

Anaphylaxis to latex was the main cause of anaphylactic reactions in children while it accounted for only 10% of reactions in adults.<sup>4</sup>

In recent years, there has been an increasing number of publications reporting allergic reactions to latex derived products, a material widely used in hospitals, especially in the surgical setting.

We report three pediatric cases with allergy to latex, who underwent surgery. We propose some guidelines for the diagnosis, prevention, anesthetic management and treatment of such cases.

## CASES REPORT

### CASE 1:

A 4-year-old male who was scheduled for elective orthopedic surgery to correct an equinus deformity due to a paralysis of his left lower limb. The history included birth by

cesarean section, because of acute fetal distress. He required resuscitation and a 15-day hospital stay. He had undergone 3 prior operations to treat left ureteral stenosis with hydronephrosis, and right vesicoureteral reflux. Several catheterizations were needed. At the age of 2 years, he developed erythematous papular lesions on his face, conjunctival hyperemia, swollen eyelids, cough and dyspnea after contact with latex balloons. A diagnosis of allergy to latex was established on the basis of prick and RAST tests. His family history included allergies to several drugs as well as hay fever.

The preoperative study was normal. Methylprednisolone (1 mg/kg i.m.), oral hydroxyzine (1 mg/kg), and ranitidine (1 mg/kg i.v.) were given 24 hours prior to surgery, and repeated 45 minutes before it, together with oral midazolam (0.5 mg/kg). Both the surgical and recovery room staffs were adequately instructed and all materials susceptible to contain latex were avoided. The procedure was the first to be carried out that morning in that theatre, and it had been properly ventilated before.

Balanced general anesthesia was employed with orotracheal intubation, and spontaneous ventilation, using propofol, succinylcholine, atropine, meperidine, O<sub>2</sub>/NO<sub>2</sub>, and halothane. The procedure took 60 minutes and was uneventful. The patient was kept for one hour in the recovery room before returning to the ward. Postoperative treatment was similar to premedication, together with H<sub>1</sub> and H<sub>2</sub> histamine blockers, for 3 days, and corticosteroids

for 1 week. He was discharged from the hospital 9 days after surgery, with no complications.

### **CASE 2**

A 13-year-old girl had been diagnosed of right ureteropelvic duplication. She presented an ectopic ureter at the level of the urethra, and a nonfunctioning upper half of her right kidney, as well as left sided vesico-ureteral reflux and hydronephrosis. She had previously underwent numerous surgical procedures to correct her urinary tract abnormalities (right upper pole heminephrectomy, bilateral ureteral reimplantation, and left nephrostomy). Repeated cystoscopic examinations were performed to monitor a nephrogenic adenoma of her urinary bladder. She had no known history of food or drug allergies.

Elective surgery was scheduled for left ureteral reimplantation. The only significant finding, at preoperative examination, was the presence of the ureterostomy catheter. The patient's mother mentioned that a few days earlier, the patient had developed a rash on her face and shoulders, accompanied by cough and dyspnea, while playing with balloons. The episode resolved spontaneously, but was interpreted as a possible sign of sensitivity to latex in our high-risk patient. This circumstance was taken into account during anesthesia and surgery.

The girl was premedicated with the same drugs, doses and duration as in the preceding case, and surgery was scheduled for the early morning. The operating room was also properly aired, and all latex containing material was removed. General anesthesia, with orotracheal intubation and controlled ventilation, was applied. Induction was done with midazolam, droperidol and fentanyl, and maintenance with vecuronium, fentanyl, sevoflurane and O<sub>2</sub>/NO<sub>2</sub>.

The procedure took 240 minutes, without any special event. The girl was extubated at the operating room, and then taken to the Pediatric Intensive Care Unit. She was transferred to her ward the next day, and discharged without complications on her twelfth postoperative day.

### **CASE 3**

A 9-year-old girl had undergone nine previous operations for myelomeningocele and had also been subjected to several bladder catheterizations. When she was four, she developed erythematous papular lesions on her face, and other areas that had come into contact with the balloon she was playing with. She also had coughing, sneezing and conjunctivitis. At the age of 5, she had suffered an episode of perioral urticaria

and rhinitis after eating chestnuts. Some time after that, she began to complain of itching after eating bananas or tomatoes. She underwent her second surgical procedure anywhere at the age of 7; 107 minutes after the beginning of the operation, she had an episode of bronchospasm, hypotension, tachycardia, and maculopapular rash in her axillary and inguinal folds. 100% O<sub>2</sub>, bronchodilators, epinephrine bolus, corticosteroids, and histamine H<sub>2</sub> blockers were required. Sensitivity studies to the anesthetic agents, latex, and foods were later carried out. Positive skin and prick tests results to latex, bananas, and chestnuts were obtained.

Two years later, the patient was scheduled to undergo tenotomy of her right intrapelvic psoas muscle and the flexor muscles of both knees in our hospital.

Premedication and the preventive measures were similar to the previous two cases. General anesthesia, with orotracheal intubation and controlled ventilation was employed. Induction was obtained with propofol and atropine, and maintenance with isoflurane, O<sub>2</sub>/NO<sub>2</sub>, fentanyl and pancuronium. There were no special intraoperative events. The patient was extubated in the operating room, kept for one hour at the recovery room, and then transferred to the ward. She was discharged home thirteen days after surgery with no complications.

### **DISCUSSION**

The incidence of anaphylactic reactions in anesthetized patients ranges between 1 per 5,000 and 1 per 25,000, its mortality being 3% to 4%.<sup>5</sup>

Owing to the increasing exposure to latex containing products, allergy to this material is a growing problem, both in children and adults. Up to September of 1992, the Food and Drug Administration of the United States (FDA) had documented 1,100 cases of latex hypersensitivity, 15 of which were fatal.<sup>6</sup> At least 29 pediatric centers reported cases of anaphylactic reactions attributable to latex, between 1990 and 1991.<sup>7</sup>

Latex is a polymer of 1,3 cis-polyisoprene derived from plant sources. Protein antigens associated with the polymer are involved in the sensitization process leading to immediate hypersensitivity.<sup>8</sup>

The best way to reduce the mortality and morbidity associated with this problem is the preoperative identification of patients with high risk. Several groups of

patients have been classically considered to have a high risk (Table 1).<sup>9</sup>

TABLE 1: Latex allergy: features of the risk groups.<sup>9</sup>

- Spina bifida
- Genitourinary abnormalities
- Other medical abnormalities:
  - posterior urethral valves
  - bladder abnormality
  - myelomeningocele
  - type II Arnold Chiari malformation
  - esophageal atresia
  - imperforate anus
  - “VATER” association (vertebral abnormalities, imperforate anus, tracheoesophageal fistula, renal dysplasia)
  - prematurity
  - mental retardation
- Health-care workers
- Handling rubber and rubber products
- Atopy
- Allergy to bananas, chestnuts or avocados
- Intolerance to products containing latex
- Intraoperative anaphylactic reaction of unknown cause

Two types of allergic reactions to latex exist:

1. Type IV, delayed or cell-mediated response. It causes contact dermatitis in response to latex, with eczema in the areas where the skin has come into contact with the material. There are no systemic symptoms.
2. Type I or immediate response, in which two phases may be observed. The first, involves sensitization to the latex allergens, with specific IgE release by

plasma cells and its deposit in mast cells and basophils. The second or exposure phase, in which the allergen interacts with the IgE on the surface of the mast cells and the basophils, and triggers their degranulation, and the release of the mediators of the allergic reaction.<sup>10</sup>

The clinical manifestations of latex allergy are multiple and variable. Mild reactions, such as contact dermatitis involving seromucous glands have been reported. They can be accompanied by exanthema and angioedema, together with urticaria and itching. The picture can later progress to respiratory involvement including rhinitis, dyspnea, and severe bronchial obstruction.

In anesthetized patients, anaphylactic shock is the most severe clinical picture, because of its sudden, unexpected onset. Anaphylaxis affects several body systems and its features can range from slight cutaneous, sometimes undetected, changes to bronchospasm, laryngeal edema, circulatory collapse, hypotension, tachycardia, arrhythmias, and cardiac arrest. <sup>4,11</sup>

The personal history of the patient allows him to be included in one of the aforementioned high risk, and to adopt the required cautions. In some cases, an allergologist’ opinion may be necessary.

The diagnosis of the crisis, which is initially based merely on the clinical findings, is merely suspected during the period of anesthesia, since most cases of latex-induced anaphylaxis occur about 30 minutes after induction. A routine emergency study (Table 2) has been suggested by Escolano et al.,<sup>12</sup> in all patients with previous skin, respiratory or cardiovascular symptoms.

TABLE 2: Immediate strategy in severe anaphylactic reactions.<sup>12</sup>

1 to 2 hours

- Differential blood cell count
- Basic laboratory (blood glucose, electrolytes, creatinine, GPT, blood gases)
- Hemostasia (aPTT, PT, fibrinogen, platelets, FDP)
- Complement (C3, C4, C3a)
- Total IgE

- C1 esterase inhibitor
- Serum tryptase
- Urinary methylhistamine

6 hours

- Differential blood cell count
- Basic laboratory analyses
- Hemostasis
- Serum tryptase

24 hours

- Differential blood cell count
- Basic laboratory
- Hemostasis
- Urinary methylhistamine

The preoperative management of patients with likely latex sensitivity, scheduled for elective surgery implies a good coordination of the entire surgical staff (nurses, anesthetists, surgeons, orderlies, etc.), checking of the surgical material that contains latex and drug prophylaxis. An adequate preanesthetic interview, with special attention to drug or food allergies, problems in previous surgical interventions, and family history of allergy will allow the detection of high risk patients. When positive, consultation with the allergologist may be advisable.<sup>9,11</sup>

Table 3 shows a list of the surgical material that should be replaced and/or checked in these cases. Surgical gloves are the most important item, their contact with the skin and the mucous membranes can induce severe anaphylactic reactions.<sup>5</sup> It is important to remember that these reactions can also be triggered by aerosolized allergen particles present in the room air. Particles of allergen can get mixed with the talcum powder inside some gloves and produce a, sometimes delayed, anaphylactic reaction, even in the absence of physical contact of the latex and the patient. This mechanism may be obviated by scheduling the procedure as the first of the day, after adequate ventilation of the theater.<sup>13</sup>

**Figure 1**

TABLE 3: Anesthetic and surgical material to be checked

Material	Contraindicated	Recommended
<b>ANESTHESIA</b>		
Endotracheal tube	Low pressure, high volume (Rusch®)	Silicon (Portex®)
Face mask	Standard	Silicon (Rusch®)
Respirator circuits	Black or brown rubber	Plastic tubes
Respirator concertina	Black rubber	Silicon or plastic
Pouch	Black rubber	Silicon
Guedell	Black	Plastic
Venous compressor, sphygmomanometer sleeve stethoscope,	Direct contact with the skin	Avoid direct contact Cover the stethoscope with plastic Sleeve made of cloth
Electrodes	Cushioned with latex	3M® electrodes
i.v. Infusion systems	Standard (rubber connector)	Y-shaped infusion systems without rubber (Baxter®)
Syringes	Rubber stopper	Plastic
Medication and its mode of administration	Multidose vials (rubber cap); avoid perforating the cap	Glass ampules administration using stopcock

**Figure 2**

<b>SURGERY</b>		
Operating room	Objects of latex and aerosol formation	Removal of all articles made of latex; airing first procedure of the day
Gloves	Standard (latex)	Neolon® (Becton-Dickinson) Nitrile (Gomaytex®) Vinyl (Sensicare®, Tru-touch®)
Drainage tubes	Standard (latex)	Silicon (Jackson-Pratt®)
Bladder catheter	Standard (Foley®)	Silicon
Nasogastric tube	Red rubber (latex)	Transparent (Levin®)

Venous compressors, the sphygmomanometer sleeve, the rubber tubes of the stethoscope and the pulse oximetry finger probe should be padded with cloths or cotton in order to avoid direct contact with the patient's skin. The pads of the monitoring electrodes can also produce these reactions. The connectors of the venous infusion systems (brown rubber) and syringes with rubber stoppers should be avoided; the latter, in any case, must not be perforated by the needle.

A combination of H1 and H2 histamine blockers and corticosteroids is recommended to prevent histamine-release responses. Nevertheless, the time along which these drugs should be administered has not been definitively established (Table 4). As a rule, prophylaxis should begin 24 to 36 hours prior to surgery; histamine blockers should be maintained for 24 to 72 hours after surgery and corticosteroids for one week.<sup>8,9,14,15</sup>

**Figure 3**

TABLE 4: Chemoprophylaxis in patients allergic to latex\*

DRUG	DOSE
Hydroxyzine	1 mg/kg body wt/6 h (i.v./oral)
Ranitidine	1 mg/kg body wt/8 h (i.v.)
Methylprednisolone	1 mg/kg body wt/6 h (i.v./oral)
Treatment is begun 12 to 24 h prior to surgery. Antihistaminics are continued for 72 h and corticosteroids for one week.	
i.v.: intravenous administration	

Histamine-release responses should also be prevented during the anesthetic period, in addition to avoiding exposure of the patient to the allergen by mean of the above mentioned precautions. First, we should give as few drugs as possible and they have to be administered slowly in diluted form. Regional anesthesia should be preferred, whenever it is possible. If general anesthesia is unavoidable, we should use inhaled and intravenous agents with the less capacity for histamine release (Table 5). We must nor forget that prophylaxis and prevention of contacts with the allergen are more important than the anesthetic technique. In the our cases, three different anesthetic techniques were applied (balanced general anesthesia with spontaneous breathing, neuroleptic analgesia and balanced general anesthesia with mechanical ventilation) without problems.<sup>16,17</sup>

**Figure 4**

TABLE 5: Anesthetic drugs with low histamine-release capacity.<sup>12</sup>

	LOCAL ANESTHETICS
<b>HYPNOTICS</b>	Lidocaine
Propofol	Bupivacaine
Etomidate	
Ketamine	
Halogenated hypnotics	
Benzodiazepins	
	<b>MORPHICS</b>
	Fentanyl
	Alfentanil
<b>NEUROLEPTICS</b>	<b>MUSCLE RELAXANTS</b>
Droperidol	Vecuronium
	Pancuronium

Drugs for the immediate treatment of an anaphylactic reaction should always easily available. Treatment in anesthetized patients is similar to that in any anaphylactic reaction. Recurrence is avoided by the administration of antihistaminics and corticosteroids.<sup>8,9</sup>

**CONCLUSIONS**

Despite the increasing number of reports dealing with allergic reactions to latex, their frequency is probably greater than it appears to be.

Prophylaxis is mainly based on the preoperative identification of risk patients, administration of prophylactic drugs, and prevention of exposure to the allergen.

Patients should be informed and specifically advised about their sensitivity to latex (Table 6).<sup>18</sup>

TABLE 6: Recommendations to patients with latex allergy.<sup>9</sup>

- Avoid contact with rubber products
- Wear a medical alert bracelet indicating the type of allergy
- Be equipped with non-latex gloves for use by a health care worker or dentist in an emergency
- Permanent availability of antihistaminics and self-injectable adrenaline

We think that latex-free material should always be employed when handling patients with risk factors, especially children with spina bifida, myelomeningocele and urinary abnormalities, to avoid repeated exposure and their likely sensitization to latex.

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