

Latex allergies in children with spina bifida: relevance for the pediatric dentist

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Abstract

Latex is ubiquitous in pediatric dentistry and medical practice. Children with spina bifida and other urogenital abnormalities are at great risk for hypersensitivity reactions during dental treatment. Four representative cases of children with latex allergies at one institution are presented. A latex-avoidance protocol is presented with suggested instrument and equipment alternatives. (Pediatr Dent 16:18–22, 1994)

Introduction

Pediatric patients considered high risk for latex allergy include:

- Children with spina bifida and myelodysplasia including myelomeningocele, lipomyelomeningocele, and sacral or lumbosacral agenesis
- Children with exstrophy of the bladder and others deemed to have a likelihood of multiple genitourinary operations along with repetitive urinary catheterizations
- Children with neurologically impaired bladders such as those suffering from a spinal cord injury or other cases of bladder paralysis

At Children's Hospital, Boston, these children are treated with latex avoidance precautions, which aim to achieve a latex-free environment.

According to the American College of Allergy and Immunology,¹ more than 600 serious reactions to latex have been reported to the U.S. Food and Drug Administration—including at least 16 fatalities—as a result of anaphylactic shock. Warnings about latex allergies in

children with spina bifida have appeared in the FDA Medical Bulletin and The Morbidity and Mortality Weekly Report.² In 1991, the Centers for Disease Control noted that until the exact mechanisms of these allergic reactions are determined, postponing elective surgical procedures for these patients (who have myelodysplasia and congenital urinary abnormalities) should be considered.

Latex-containing dental products are widespread in the clinical practice of pediatric dentistry. Latex allergies have been reported with increasing frequency, particularly in chronically catheterized patients such as children diagnosed with spina bifida. Concern for universal precautions and increased awareness of infection control have resulted in the adoption of barrier techniques including the ubiquitous use of latex gloves. These gloves may trigger allergic reactions, but other less obvious equipment such as radiograph packets and rubber dams could be the etiologic agent for anaphylactic reactions. Four cases of latex-induced hypersensitivity reactions during routine pediatric dental procedures at one institution are presented (Table 1).

Table 1. Summary of presented cases

Case	Age/Gender	History of Latex Allergy	Previous Latex Exposure	Precipitating Cause	Alteration of Procedure
1.	15y/M	Yes	Bladder augmentation	None	Strict latex avoidance protocol
2.	10y/F	No	Spina bifida gastrocystoplasty	Pit and fissure sealant/rubber dam	Vinyl gloves Vinyl "dam"
3.	7y/F	Yes	Cloacal exstrophy bladder augmentation creation of vagina	Latex contaminated dental radiograph	Radiograph wrapped in vinyl glove
4.	8y/M	No	Repair of bladder perforation	Pit and fissure/rubber dam dental prophylaxis with disposable prophylaxis angle with a rubber cup	Vinyl dam Metal base prophylaxis brush

Case 1

A 15-year-old male with myelomeningocele and urinary incompetence presented to the dental clinic for restorative treatment. He had experienced an episode of anaphylaxis the year before during bladder augmentation surgery necessitating termination of the procedure. After the episode, he was referred to allergy/immunology clinic for latex skin testing. He had numerous previous contacts with latex gloves and catheters without reaction. Skin tests with latex purified extract revealed a strong reaction to the diluted latex extract (1/10,000 dilution preps). Scratch multitest to powder lining of the gloves was nonreactive. Some IgE to latex was demonstrated, but there was inconsistent reactivity to two of the three latex extracts reviewed. Nevertheless latex was deemed to have been responsible for his allergic crisis. Physicians recommended latex avoidance and a RAST (radioallergosorbant testing). Dental restorative procedures were carried out using vinyl gloves and a "vinyl" dam, made from a cut vinyl glove (Fig 1), as an alternative form of moisture control.

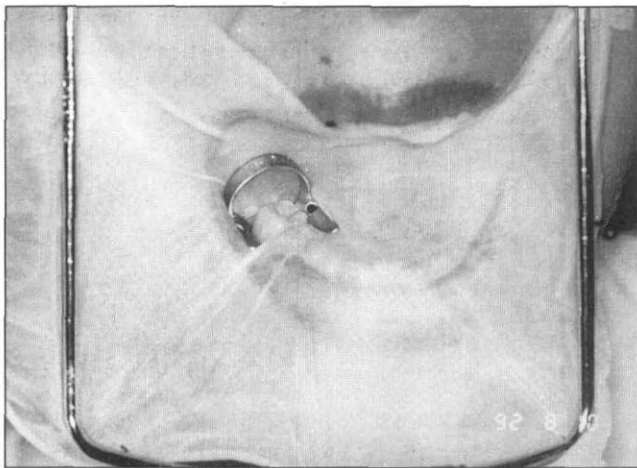


Fig 1. An example of a vinyl "dam" isolation for latex-free dental management.

Case 2

A 10-year-old female with spina bifida, renal disease, anemia, hepatitis, seizures, and a history of a series of urologic problems following repair of a perforated gastrocystoplasty was seen for routine care. She also had experienced externalization of a VP shunt, and recent placement of a central venous line under general anesthesia for a total of 29 surgeries. Her allergies included reactions to nitrofurantoin macrocrystals (Macrochantin®—Norwich Eaton Pharmaceuticals, Inc., Norwich, NY) vancomycin hydrochloride, and oxybutynin chloride (Ditropan®—Marion Merrell Dow, Kansas City, MO) At a dental visit, we attempted to apply pit and fissure sealant using cotton roll isolation and latex gloves. The procedure was aborted when the

patient developed marked periorbital edema in a hypersensitivity-type reaction. The patient was evaluated, stabilized with diphenhydramine (1 mg/kg IM), and discharged with diphenhydramine (1 mg/kg p.o. q6h x 48h) without any further complications. Her physician was consulted and the patient was eventually found to be latex allergic. Although the patient did not return to Children's Hospital for the pit and fissure sealants, vinyl gloves and a vinyl rubber dam would have been substituted for the procedure.

Case 3

A 7-year-old female with known latex allergy presented to the dental clinic for radiographic examination. She had previously survived an incident of cardiac arrest that occurred as a result of anaphylactic shock during the exposure of bite-wing radiographs at a private dental office. The patient's medical history included multiple medical problems including developmental delay and cloacal exstrophy. She had undergone multiple surgeries, including bilateral iliac osteotomies with closure of the pelvis, bladder augmentation, and creation of a small bowel vagina. A review determined that the bite-wing radiograph packets were the most likely source of latex exposure since vinyl gloves were worn by the dentist. The mother had been told (erroneously) that the radiograph packets contained latex. Later confirmation by the manufacturer indicated that there is no latex in the radiograph packets, but it is possible that powder from latex gloves was on the packet and initiated the anaphylaxis. The necessary radiographs were exposed at our clinic by first wrapping them in a vinyl glove (Fig 2) with an anesthesiologist standing by. The procedure was completed without incident.

Case 4

An 8-year-old male presented to the dental clinic for sealant application. His medical history included al-

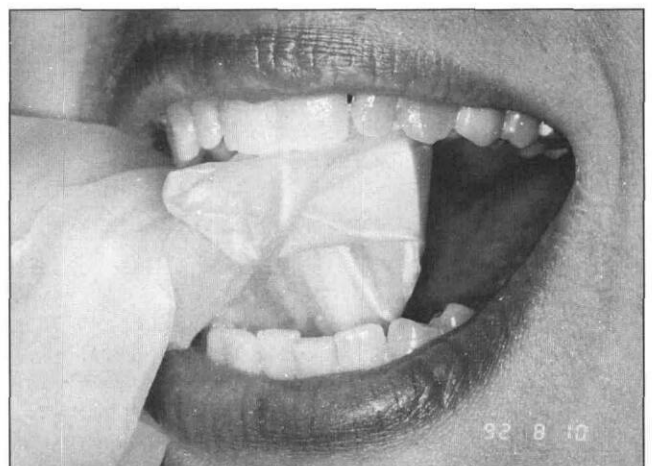


Fig 2. An example of latex-containing radiograph packet wrapped in a vinyl glove for latex-free dental management.

lergies to cephalexin (Keflex®—Dista Products Co., Indianapolis, IN) and penicillin. A bilateral inguinal hernia repair was performed at four years of age. He had been seen routinely for dental prophylaxis and fluoride treatments using latex gloves and disposable prophylaxis angles with rubber cups. He had two over-retained primary mandibular incisors extracted using one carpule of local anesthetic, and one sealant placed with cotton roll isolation. All treatment was rendered without complication. One year ago, however, he had undergone repair of a bladder perforation involving multiple latex catheterizations. At the last visit, in the process of placing the rubber dam, the patient developed red eyes and red urticarial lesions around the mouth where the rubber dam contacted the skin. The procedure was immediately terminated, and diphenhydramine (1 mg/kg) was administered intramuscularly. Postoperative medical evaluation revealed no evidence of respiratory distress or wheezing. Diphenhydramine hydrochloride (1 mg/kg p.o. q6h x 48h) was given to the mother to administer at home after the patient was discharged. The postoperative course was unremarkable. At the following routine six-month examination, vinyl gloves were used, but a dental prophylaxis was attempted using a disposable prophylaxis angle with a rubber cup. The patient immediately developed pruritus and periorbital redness without urticaria or respiratory distress. Diphenhydramine (1 mg/kg) was administered intramuscularly, which alleviated the symptoms and the patient was discharged when medically stable—again with diphenhydramine (1 mg/kg p.o. q6h x 24h) to be administered by the patient's mother at home.

Discussion

Latex is the milky sap from the rubber tree *Hevea brasiliensis*. Latex allergens are water-soluble proteins contained in the natural gum used to make gloves and other dental products. Traces of these allergens remain in the finished product. They are resistant to the high temperatures used for vulcanizing (100° C for 5 min) and to the chemical agents used as catalysts in vulcanization. The finished product is an isoprene polymer that contains 2–3% protein. Liquid latex is used for nonmedical products such as rubber gloves, condoms, nipples, pacifiers, balloons, elastic threads, bandages, and other adhesives.

In 1979 Nutter was the first to document a case of contact urticarial reaction to rubber.³ Latex-specific IgE can be demonstrated by skin prick tests, leukocyte histamine release, human basophil degranulation, and RAST, according to Moneret-Vautrin et al.⁴ and Sussman et al.⁵ The skin test results are evaluated by a wheal-and-flare response to dilutions of latex and *H. brasiliensis* extracts in epicutaneous injection and to dilutions in intradermal injections. Cimetidine, corticosteroids, and diphenhydramine have been suggested as prophylac-

tic agents for latex-induced hypersensitivity reactions.

In 1989 Slater⁶ reported two 11-year-old females with spina bifida who had hypersensitivity reactions to latex. One child developed urticaria and rhinorrhea and the other angioedema on exposure to rubber balloons. Both children developed intraoperative anaphylaxis, the first during orthopedic surgery, the second during VP shunt revision. A similar case was described by Swartz et al.⁷ in 1990, in a 14-year-old with biliary colic who was admitted for cholecystectomy. Axelsson⁸ reported three cases of angioedema in children after exposure to latex products, such as balloons and the dental rubber dam. Gold⁹ identified 15 children with either spina bifida or congenital urologic abnormalities who had intraoperative anaphylaxis. All patients had exposure to rubber materials since infancy as part of their medical management. All had positive skin tests and positive RAST to latex allergen. Gold concluded that this group was at risk when they were exposed to latex intraoperatively as a result of frequent past exposure to these materials.

According to Holtzman,¹⁰ about one-third of patients with myelodysplasia/spina bifida are seropositive to latex allergens. Meeropol et al.,¹¹ in a survey of New England myelodysplasia clinics, indicated that 18–28% of patients reported an allergic reaction to latex. Repeated contact with surgical gloves due to frequent surgical procedures is one sensitization factor. To this must be added daily contact with latex urinary catheters. Patients requiring intermittent self-catheterization—such as those with: spinal cord injury; complex urological, genitourinary, and esophageal strictures (requiring repeated dilatations); and chronic care needs—should be considered at high risk for latex allergy. A history of atopy (multiple allergies) has been reported in 45–100% of patients who are allergic to latex.¹²

Slater in 1993 noted that “the Food and Drug Administration has not yet approved a latex skin testing reagent. With no readily available confirmatory tests, the diagnosis of latex allergy remains one based predominantly upon careful history, and on occasion, an environmental survey.”¹³

The goal of managing patients who have latex allergies can be simple — avoiding exposure to latex. Achieving that goal may be difficult since latex products are common in dental practice and the home environment. In the myelodysplasia clinic at Children's Hospital, an attempt has been made to remove furniture, toys, pacifiers, examination gloves, tourniquets, and blood pressure cuffs that contain latex, and to switch to the use of urinary catheters and appliances that are latex free.¹⁴ It has been more difficult to avoid exposure to latex in the dental clinic. Latex-free dental products are available but awareness of latex content is low and some manufacturers are reluctant to list latex content. Persistent investigation yielded some items that may

Table 2. Dental products potentially containing latex and alternatives

<i>Products Containing Latex</i>	<i>Alternatives</i>
Brown tensor ace bandages	White (Conco E-cotton) aces
Bite blocks	Molt mouth prop with silastic wrap
Blood pressure cuff tubing	Cover areas of contact
Latex gloves	Vinyl gloves
Rubber dam	Vinyl dam or cotton rolls
Fingercots	Neolon nonlatex glove finger
Self-adhering tape (certain brands)	Silk tape
Penrose drains	JP drains
Orthodontic elastics	Closing springs
Disposable rubber cup prophylaxis angles	Metal base prophy brush
Elastic ligature thread	Elastomeric thread
Break away headgear	Check with the company on straps — it varies
Rubber positioners	Thermoplastic vinyl positioners
Anesthetic carpules with rubber plungers	No premix meds (should be freshly drawn up)

Most separators and nitrous oxide hoods are made from nonlatex materials. However, check with the company since chemical composition may vary.

contain latex and some suggested alternatives (Table 2). Medication containers with rubber stoppers have been implicated as a trigger for allergic reactions.¹⁵ Local anesthetics are contained in carpules with latex containing plungers, suggesting that some of the allergic reactions to "local anesthetics" actually may be latex allergies. Two per cent lidocaine with epinephrine 1:100,000 can be obtained in glass vials and can be freshly drawn up.

Summary

Allergy to latex is a relatively recent addition to the medical/dental literature and may be a rapidly growing problem. It is of particular concern in children with myelodysplasia (spina bifida) or congenital urinary

anomalies who have had multiple operative procedures. Allergic response is to the residual plant proteins in natural latex products and is an IgE-mediated, immediate hypersensitivity reaction. Dental management of these children should include preoperative questions about previous contact with and reactions to latex rubber. Strictly avoiding latex-containing products appears to be sufficient management for patients with confirmed or suspected latex allergy. The pediatric dentist should be familiar with treatment modalities for these possibly life-threatening allergic reactions (Table 3).

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Table 3. Management of limited allergic reactions (diffuse, pruritic rash, localized swelling, or benign involvement of the mucous membrane without upper airway obstruction) at Children's Hospital, Boston

Step 1.	Diphenhydramine 1 mg/kg PO/IM/IV every 4–6 hours with a maximum of 300 mg/24 hr or Subcutaneous epinephrine 0.01 ml/kg 1:1000 to a maximum of 0.5 ml
Step 2.	Continue at home with diphenhydramine (1 mg/kg p.o. q4–6 hr) for a minimum of 48 hr. Follow-up with primary care physician.

All children with a history of life threatening anaphylaxis should have been instructed by their physicians to carry a preloaded syringe of epinephrine to be used in emergencies (EpiPen).

Management of cases of upper airway obstruction (anaphylaxis) at Children's Hospital, Boston¹⁵

Step 1.	Follow the ABC's of basic life support, including summoning an emergency team, and administer 100% oxygen
Step 2.	If there is an incomplete airway obstruction administer simultaneous epinephrine 0.01 ml/kg 1:1000 to a maximum of 0.5 ml subcutaneously

If there is a complete airway obstruction endotracheal intubation is indicated. Treatment of hypotension and bronchospasm may also be indicated.

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From The Archives

A prescient opinion stated in 1877

Dr. Prall, in the (British Medical) Journal of 14th October, condemns what may be the "constant supply" system of feeding infants, and it would be strange were so great a departure from the periodic feeding at the breast altogether harmless. When prolonged, as it generally is, after the upper front teeth are in place, it indirectly causes decay, and not seldom the complete destruction of the crowns. Opportunities of observation enable me to affirm that instances of the complete loss of the crowns of these teeth have greatly increased since artificial feeding has lost its terrors, and the use of the long tube in improved feeding bottles has become so very general. The food put into the bottle at night cannot fail to have an acid reaction long before morning, and, being rubbed on the backs of the teeth by the teat while sucking, it dissolves them more or less completely, as nursing is more or less protracted. Were infants fed at intervals, as at the breast, with fresh food, the bottles and teats being thoroughly cleaned immediately after feeding, the teeth would remain sound. The few cases of complete loss of the crowns of the upper front temporary teeth that formerly came under my notice were caused by the quieting expedient of a teat, without a bottle, soaked in sweetened milk, and sucked almost continuously, often a year or two after infancy; and this expedient comes now into use when the infant, having emptied its bottle, continues to suck as before. Parents are alarmed lest the early loss of these teeth indicates some constitutional delicacy, or may affect their permanent successors. On both points they may be assured there is no reason for alarm, and, besides that, the temporary roots need not be interfered with.

A. Stewart, British Medical Journal, 1877