

Grand Rounds

Latex Allergy: Children's Hospital, San Diego—12/17/93

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CASE HISTORY

AN 11-YEAR-OLD BOY PRESENTED with myelomeningocele, paraplegia, hydrocephalus, neurogenic bladder, and atonic bowel. While undergoing anterior thoracolumbar spinal fusion under general anesthesia, he developed severe bronchospasm after the chest was opened and the lung compressed. Ventilation was difficult and, therefore, he was treated with nebulization therapy with albuterol, intravenous (IV) methylprednisolone, two epinephrine IV boluses, and an epinephrine drip. After the procedure was completed and the surgical drapes were removed, a rash was noted on his trunk. The patient was placed in the intensive care unit (ICU) and was treated with nebulized albuterol and IV steroids. He recovered and was soon discharged from the ICU. He was continued on oral prednisone and albuterol nebulization until discharged 1 week later.

His past medical history is remarkable for an episode of severe bronchospasm during the surgical procedure (bilateral ankle osteotomies and derotation) just previous to this surgery. While under general anesthesia, he required treatment with IV epinephrine, IV methylprednisolone, and an isoproterenol drip, which resulted in dramatic improvement. He was placed in the ICU for 1 day and given IV aminophylline, steroids, and albuterol nebulization. He responded well and was eventually discharged without any further complications.

He developed asthma at age 4. His therapy consisted of albuterol and cromolyn by metered-dose inhaler, and oral theophylline and/or albuterol by nebulization as needed. This child has no other atopic history other than his asthma. His family history is negative for asthma.

Of note is that this patient has undergone a total of 18 previous surgical procedures. Throughout his life he has needed intermittent bladder catheterization four or five times a day and digital stool removal twice a day by a parent.

QUESTION

After reviewing the above case history, the most likely diagnosis for this child's difficulty in the operating room is the following:

1. Allergic reaction to vecuronium, a muscle relaxant used during general anesthesia
2. Allergic reaction to the IV cephalosporin given intraoperatively

3. Allergic reaction to latex he was exposed to during the procedure
4. Asthma and hive reaction related to the stress of the surgery

Answer: 3. This child appears to have had a significant allergic reaction to latex. A radioallergosorbent (RAST) test for latex was carried out immediately after his surgery and the result was 4 +. He has subsequently undergone two further operative procedures with anesthesia in a latex-free environment without adverse events. Furthermore, since his mother instituted latex-avoidance at home, his asthma has completely resolved, and he is off all asthma medications.

Over the last decade, there have been an increasing number of reports in the medical literature of significant allergic reactions to latex-containing products. Latex is the milky sap obtained from numerous plants, predominantly the rubber tree (*Hevea brasiliensis*), and is used in the manufacture of natural rubber products for both medical and nonmedical uses. Through a process of purification and heating (vulcanization), the material we call rubber is produced. Products containing natural rubber include surgical, examination, and cleaning gloves; condoms; balloons; catheters; rubber bands; and elastic adhesives used in dentistry.

Two types of allergic reactions to latex-containing products have been described. Contact dermatitis (T-cell-mediated, type IV hypersensitivity) from exposure to rubber products, especially gloves, has been recognized for decades. This immunologic reaction is not directed against latex antigens but to sensitizing chemicals added during the manufacturing process, such as mercaptobenzothiazole or tetramethylthiuram. This reaction can be determined by patch testing for the relevant additives. The second type of sensitivity is an IgE-mediated, immediate type I hypersensitivity with the relevant allergen(s) likely being a protein or group of proteins that exist as an impurity after vulcanization.

Clinical reactions resulting from immediate hypersensitivity have included local contact urticaria, systemic urticaria, rhinoconjunctivitis, asthma, and anaphylaxis. Most dramatic have been reports of intraoperative anaphylaxis from exposure to surgical gloves and other latex-containing products and anaphylactic reactions from rubber-tipped enema catheters; numerous fatalities have been recognized and reported to the Centers for Disease Control. Exposure to latex allergen has usually been at mucosal surfaces but can also be from other cutaneous, percutaneous, and parenteral transmission. Aerosol transmission has also been described and is postulated to be caused by latex allergen adhering to cornstarch released into the air with the manipulation of rubber gloves.

The prevalence of IgE-mediated latex allergy in the general population is not known but appears to be low (less than 1%). Allergic reactions to latex are more often seen in atopic persons, and in those with prolonged or repeated exposure to latex products. Between 18 and 28% of children with myelodysplasia (e.g., meningocele, spina bifida) have a history of acute allergic reactions to rubber product. A serologic survey of similar patients revealed 34% to have rubber-specific IgE by radioallergosorbent tests (RAST). Children with congenital urologic abnormalities also have an increased risk of IgE-mediated latex allergy; in both of these groups, this propensity to allergy presumably is a result of increased exposure to latex from frequent urinary, bladder, or bowel catheterization and multiple surgical procedures. During the period when IgE-mediated latex allergy was just being recognized, one third of all surgical procedures under anesthesia being done at one certain institution on patients with meningocele were associated with anaphylaxis due to latex allergy.

The evaluation of patients for IgE-mediated latex allergy is done by either epicutaneous testing or *in vitro* testing. Anaphylactic reactions to skin testing, although rare, have been reported. There are no U.S. Food and Drug Administration-approved extracts available in the United States, although skin testing can be done with natural latex or with rubber products such as gloves. The amount of allergen in latex products varies with different manufacturers and even different lots, so they are an unreliable testing source. There is a commercial extract for skin testing available in Canada. *In vitro* tests are commercially available in the United States, but most studies have shown RAST testing to be less sensitive than skin testing. The specific latex allergens have been incompletely characterized to date.

We need to be able to identify patients at risk for latex allergy before they undergo surgical, medical, radiologic, or dental procedures. Because no current test is completely reliable and safe, a history of a possible allergic reaction is the only means to identify at-risk patients. It has been recommended to test high-

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risk patients by skin testing, if available, or by *in vitro* testing. Patients with evidence of IgE-mediated sensitivity to latex or any history of previous latex allergic reaction should strictly avoid all latex products. Although no controlled trials have been done, prophylactic premedication with histamine-1 and -2 antihistamines and parenteral steroids (similar to recommendations for radiocontrast media reactions) may be useful in patients known to be sensitive. There have been reports of the failure of premedication in patients with parenteral infusion of latex proteins. The avoidance of latex products is preferable.

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