

Latex Hypersensitivity in Children with Spina Bifida

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ABSTRACT

This study was undertaken to survey a population of spina bifida patients to determine latex sensitivity. Three hundred children are followed in the spina bifida clinic at Children's Hospital of Pittsburgh. Of the 300 children followed in the spina bifida clinic of the Children's Hospital of Pittsburgh, 107 patients ranging in age from 1 to 25 years were studied to date. Fifty-eight of the 107 (57%) patients had positive radioimmunoassays (RIA) for latex. Thirty-four had symptoms which suggested sensitivity to latex. Thirty-five of 53 (66%) patients with a history of frequent clean intermittent catheterization (CIC) with latex catheters were latex RIA positive. The average number of surgical procedures in the latex positive patients was 7; the average number in the latex negative patients was 5. All were fed with latex nipples and used latex pacifiers. Eighty-one patients had VP shunts. The percentage of atopic patients in this population did not differ from a normal population. Spina bifida patients have a high incidence of latex sensitivity, probably due to repeated exposure via multiple routes including repeated surgical procedures.

INTRODUCTION

HYPERSENSITIVITY REACTIONS following exposure to latex or other products associated with latex processing were initially described as contact dermatitis or delayed hypersensitivity (type IV, T cell mediated). During the past 15 years there has been an increasing incidence of reported immediate hypersensitivity (type I, IgE mediated) allergic reactions. The increased use of latex products, especially latex gloves by medical and dental health care workers largely due to universal precautions, has provoked an occupational allergy as well as a potential hazard for the patient.⁽¹⁾

Slater, in 1989, reported two patients with spina bifida who had rubber anaphylaxis.⁽²⁾ Several other studies have reported that children with spina bifida may be at increased risk for IgE-mediated reactions to latex products.⁽³⁻⁵⁾ These hypersensitivity reactions include: anaphylaxis with hypotension, bronchospasm, laryngospasm as well as urticaria, conjunctivitis, and rhinitis.

We collected sera from 107 children to date from a total population of 300 children with spina bifida to determine the incidence of latex sensitivity in our population.

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MATERIALS AND METHODS

After obtaining an informed consent, the patients/parents were interviewed by one of three RNs who work in the Spina Bifida Clinic of Children's Hospital of Pittsburgh. The interview consisted of obtaining information concerning a personal and family history of atopy (asthma, allergic rhinitis, and atopic dermatitis) as well as urticaria, angioedema, and contact dermatitis. Symptoms of wheezing, stridor, rhinitis, cough, sneezing, conjunctival irritation, and anaphylactic shock with a blood pressure fall were all noted in relation to rubber contact. It was noted whether or not the patients had a VP shunt in place for hydrocephalus and whether or not they used clean intermittent catheterization. All had a history of being catheterized for diagnostic purposes. Rubber catheters had been used up to 3 years ago when there was a switch to silicone catheters. Surgical procedures were tabulated. The parents were questioned as to the use of latex nipples and pacifiers in infancy.

A latex-specific IgE panel (IBT Reference Laboratory, Overland Park, Kansas), a competitive enzyme-linked immunosorbent assay (ELISA) or radioimmunoassay (RIA) panel was used to study these patients. This panel uses three different latex antigens to identify patients sensitive to natural rubber products. It includes two different antigens prepared from the sap of the *Hevea brasiliensis* tree (an ammoniated latex antigen and a buffered nonammoniated latex antigen) and an extract made from a Malaysian latex glove selected on the basis of radioallergosorbent studies.

The latex RIA data is reported as positive if any of the 3 antigens is greater than 5 U/ml.

RESULTS

Fifty-eight individuals (54%) of 107 tested had positive latex RIA tests (Table 1). Of these, 34 had symptoms consistent with latex allergy; 9 had clinical anaphylaxis. All patients had been bottle fed with latex nipples and used latex pacifiers. All had surgical procedures and were exposed to rubber stoppered medications, latex tubing and urinary catheters.

Atopic individuals were distributed as one would see in the general population. There were 6 children with asthma, 4 of whom were latex RIA positive. There were 8 patients with atopic dermatitis and 6 of these had positive latex RIA tests. Sixteen patients had a history of recurrent urticaria and 11 of these had positive latex RIA tests.

Thirty-five of the 53 individuals who were on clean intermittent catheterization showed positive latex RIA tests. None had a clinical episode of allergy related to bladder catheterization. Most of the patients have been changed from latex catheters to nonlatex type catheters.

The number of surgical procedures varied among latex positive and latex negative patients (Table 2). Fifty-eight patients who were latex positive had 229 visits to the operating room with a total of 411 procedures (131 different types of surgical procedures). Of 49 patients not sensitive to latex, 45 had 166 op-

TABLE 1. AGE CORRELATIONS

Age (years)	Number of patients	RIA ^a	Latex symptoms	ANA ^b
0-12 months	0	0	0	0
1-3	10	2	0	0
3-5	11	2	1	0
5-10	45	31	22	4
10-15	22	13	10	4
15-18	3	2	0	0
18+	16	8	4	1
Total	107	58	34	9

^aRadioimmunoassay.

^bAnaphylaxis.

LATEX HYPERSENSITIVITY IN SPINA BIFIDA PATIENTS

TABLE 2. SURGICAL PROCEDURES

	<i>Latex positive</i>	<i>Latex negative</i>
Number of patients	58	49
Number of visits to OR	229	166
Total procedures	411	283
Average procedures per patient	7	5

erating room visits with 283 surgical procedures (111 different types). The latex positive patients averaged 7 procedures per patient and the nonlatex sensitive patients averaged 5 procedures. Statistical significance of the *t* test was $p = 0.003$.

DISCUSSION

Latex is a complex intracellular product derived primarily from the commercial rubber tree *Hevea brasiliensis*.⁽⁶⁾ The rubber particle is a spherical droplet of polyisoprene coated with a layer of protein, lipid, and phospholipid. Among these proteins is prenyltransferase, which may be the primary sensitizing protein.⁽⁷⁾ The protein content varies with different lots and production methods.⁽⁸⁾ Relevant to spina bifida patients these latex protein antigens have been detected in gloves, catheters, finger cots, latex enema cuffs, balloons, and anesthesia circuitry. There is a wide range of antigen content in different brands of disposable gloves, baby bottle nipples, and vial stoppers. Exposure can occur by cutaneous, mucosal, aerosol, and parenteral routes. Latex antigen is absorbed by the corn starch with which most latex gloves are dusted for lubrication.⁽⁹⁾ Clinical and antigen cross-reactivity has been identified with several foods including bananas, avocado, chestnuts, and perhaps other fruits.⁽¹⁰⁾

The accuracy of latex IgE antibody assays varies because of differences in latex source materials and the potential of cross-reacting antibody to several food allergens. Because latex manufacturing processes vary, the sensitizing latex products may contain different epitopes than that used in the assay and can provoke a false negative test. At the present time these inherent problems must be considered when interpreting the serologic latex IgE antibody assays. A positive history accompanied by a positive serologic IgE latex antibody test eliminates the need for skin testing or provocative tests. There are currently no FDA approved *in vitro* or skin testing materials available. Skin tests may be a cause of anaphylaxis.⁽¹¹⁾

It is of interest to note that of the 58 latex RIA positive patients only approximately three-fourths of these individuals have symptoms when exposed to latex. Nine patients that had anaphylaxis were all in the latex positive group. The anaphylactic incidents occurred mainly in relation to inserting a rubber cot in the rectum when doing certain procedures.

Familial predilection (atopy) has been identified as a risk factor for latex allergy with enhanced specific IgE antibody synthesis upon latex exposure. Increased exposure to the latex allergen has been identified in several well-defined risk groups, including health care workers, rubber industry workers, and specific patient cohorts including those with spina bifida and urogenital abnormalities. Patients with spina bifida undergo numerous surgical procedures including initial repair of the meningocele and insertion of a shunt to relieve hydrocephalus. Later many of these patients have other surgical procedures that involve rubber contact. The data substantiating parenteral exposure to rubber antigens are not well established. Most of the exposure in the neonatal period is probably related to contact with rubber gloves. Our observations suggest that the latex RIA positive patients are exposed to latex more frequently than latex RIA negative patients through more surgical procedures.

Some of the patients noted to be latex RIA positive have not shown symptoms consistent with latex allergy. However, if these latex RIA screened individuals are to have surgical procedures or other contact with latex, we feel that prophylactic measures should be instituted.⁽¹²⁾ Avoidance of exposure to latex products is the only measure that will prevent serious allergic reactions. In some instances of highly allergic pa-

tients, it may be necessary to be scrupulous in the avoidance procedures that are used. Powdered latex products are especially hazardous due to inhalation of allergen by the sensitized patient who may have asthma. Nonlatex (vinyl) gloves are commercially available and should be made available to care providers during medical or dental procedures. A supply of surgical gloves free of natural rubber should be available for use in outpatient care and patients and their families should be advised to have a supply of these gloves available. Autoinjectable epinephrine should be prescribed for all individuals with positive latex RIA tests. Counseling on rubber avoidance should be provided. Ideally, patients with spina bifida are at such high risk for latex allergy that they should avoid latex exposure entirely from birth.

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