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Latex allergy in Saudi children with spina bifida

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Key words: latex allergy; Saudi children; spina bifida.

Background: Children with spina bifida (SB) are exposed to latex soon after birth during bladder catheterization, rectal disimpaction, and multiple surgical procedures. IgE-mediated latex-allergic reactions have been reported recently in these children. Our study was designed to assess the prevalence of allergic reactions to latex products in a group of Saudi Arabian children with SB in a tertiary care hospital.

Methods: Fifty-nine patients, aged 1–20 years, with SB were evaluated by a questionnaire on type of latex reactions; family and personal history of other allergic disorders, such as asthma, rhinitis, and urticaria; type and number of surgical procedures; and frequency of bladder catheterization and manipulation with latex materials. Confirmation of latex sensitivity was measured by skin prick test (SPT), CAP test, and latex skin challenge.

Results: Allergy to latex was detected in 25% of the study group. There was a significant variation in allergic reaction by sex (males 42%, females 12%) ($P<0.01$), use of catheters (yes 38%, no 13%) ($P<0.05$), and urologic surgery (yes 60%, no 18%) ($P<0.01$). The number of surgical procedures, age of patient, and V–P shunt were not significantly related to allergic reactions.

Conclusions: Our findings support previous studies indicating a high prevalence of latex allergy among SB patients. The CAP test was a more sensitive measure of latex allergy in SB patients than SPT or latex challenge. There was significant correlation with urologic procedures and the use of urethral catheters.

Date:

Accepted for publication 30 July 1998

To cite this article:

Kattan H., Harfi H.A., Tipirneni P.
Latex allergy in Saudi children with spina bifida
Allergy 1999; 54, 70–73.

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ISSN 0105-4538

Children with myelomeningocele or spina bifida (SB) and urogenital abnormalities have a high degree of exposure to latex products through repeated surgical procedures, catheterization, and implant of latex-containing material. This led

to a high incidence of IgE-mediated allergic reactions in this group of patients (1, 2). Several severe and unexpected allergic reactions have been reported in connection with surgical procedures in SB patients (3, 4). The risk of serious reactions related to latex intraoperatively has been estimated to be 500 times greater than that of the general population (5). The risk of anaphylaxis is suggested by history of atopic diseases, such as asthma, allergic rhinitis, food allergy, and urticaria, or previous allergic symptoms on exposure to latex-containing materials. The purpose of our study was to determine the incidence of latex allergy in a group of children with SB who have been followed in the outpatient clinics at King Faisal Specialist Hospital and Research Centre (KFSH & RC) (Riyadh, Saudi Arabia), a tertiary care hospital, and to offer protective measures for such patients, who are at high risk of anaphylaxis.

Material and methods

All patients with the diagnosis of SB who had been followed at KFSH & RC were included in the study. After consent had been obtained from the parents, all subjects completed a questionnaire on clinical history suggestive of latex allergy, such as rhinitis, bronchospasm, urticaria, anaphylaxis, and contact dermatitis. The type and numbers of surgical procedures and catheterization and manipulation with latex-containing devices were obtained from the patients' medical records. Inquiries related to personal history of atopy, such as asthma, allergic rhinitis, atopic dermatitis, and food allergy, were also noted. Patients who consented to be included in the study were evaluated for latex allergy by skin prick test (SPT) provocation and by *in vitro* specific antilatax IgE antibodies by the Immuno-CAP test. The total IgE was measured in patients who had positive SPT to latex.

Before SPT was done, patients were asked not to take antihistamines for at least 4 days (30 days in case of astemizole) before they were skin tested. SPT was performed on the volar surface of the forearm with natural latex extract. A drop of glycerinated water-soluble extract 1:100 w/v solution (Laboratories Stallergènes, Paris, France) was pricked with the 1-mm tip of a standard lancet. This extract is used in the allergy clinic for diagnosis of suspected latex allergy. Both negative saline and positive histamine controls were also used. The reaction was read after 15 min. A wheal equal to or greater than 3 mm was considered positive. The test was performed in duplicate, and the average reaction in millimeters was taken.

The Immuno-CAP test (Pharmacia CAP System, Sweden) for detection of circulating specific IgE antibodies to latex was used for the *in vitro* testing. This test has been recently introduced for latex allergens (6).

For skin provocation, a 1-cm piece of latex glove was moistened with saline and placed on the volar surface of the forearm, and the reaction was read after 20 min.

In cases where prior anaphylaxis was reported, only SPT and CAP test were done. Statistical analysis of significance was done by the chi-square test; when numbers were small, Fisher's exact test was used.

Results

Fifty-nine consecutive outpatients who were found to have the diagnosis of SB were evaluated. Their age distribution was as follows: 11 patients were 0–2 years, 15 patients were 3–5 years, 13 patients were 6–8 years, and 20 patients were more than 9 years of age (range 1–20 years). There were 26 males and 33 females. Twenty-five percent (15/59) of the patients were test positive for latex allergy by SPT, CAP, and challenge; nine (60%) by SPT, 14 (93%) by CAP test, and only two (13%) by skin challenge. As shown in Fig. 1, out of 14 patients who were latex positive by CAP, seven were latex positive by SPT and one by both SPT and challenge. Out of the nine SPT latex-positive patients, seven were CAP positive and two were challenge positive. Immuno-CAP and SPT had the best, and challenge had the least, correlation with history of reaction to latex. None of the patients with latex-positive tests had a history of anaphylaxis. Most had a history of mild respiratory and/or cutaneous symptoms.

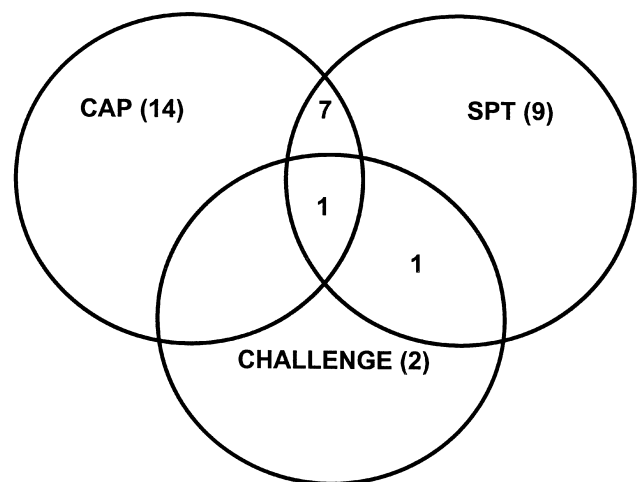


Figure 1. Overlap between CAP test, skin prick test (SPT), and challenge among 15 latex-positive patients.

Table 1. Comparison between latex-positive and -negative groups

	Latex-positive	Latex-negative	P value
No. of patients	15	44	–
Sex (M/F)	11/4	29/15	<0.01
Age (years)	8–4	6–5	NS
No. of surgical procedures	4	3	NS
V–P shunt	10	25	NS
Urologic surgery	6	4	<0.01
Daily latex exposure	9	19	NS
Use of catheters	11	18	<0.05
Urticaria	3	1	<0.05
Rhinitis	3	6	NS
Eczema	3	3	NS
Asthma	0	2	NS
Food allergy	0	1	NS
NS: not significant.			

Seven of the latex-positive patients had serum IgE measured; only three had IgE levels more than two standard deviations above normal.

Tables 1 and 2 show several variables used in the questionnaire and variables of significance between latex-positive and latex-negative patients. There were 11 males and four females in the latex-positive group, and 29 males and 15 females in the latex-negative patients ($P<0.01$). Patients who had undergone urologic procedures and repeated catheterization, and who had played with balloons had a higher chance of sensitization (4.9 vs 4.2 procedures) than the latex-negative groups ($P<0.01$ and <0.05 , respectively). Ten patients had 6–7 operations, 27 had five operations each, and 22 had 2–4 operations each. This low

Table 2. Variables significant in latex-positive group by questionnaire

Variables	Latex allergy	Chi-square test	P value
Sex	M 11 (42%)	6.9	<0.01
	F 4 (12%)		
Play with balloons	Yes 7 (44%)	3.8	<0.05
	No 8 (19%)		
Urticaria	Yes 3 (75%)	5.6	<0.05
	No 12 (2%)		
Urologic procedures	Yes 6 (60%)	7.5	<0.01
	No 9 (18%)		
Catheters	Yes 11 (38%)	4.7	<0.05
	No 4 (13%)		

Table 3. Clinical profile of patients with latex reactivity

Patient no.	Age (years)	Sex	Surgical procedures	Atopy history	SPT
1	4	M	5	–	+
2	4	M	3	+	+
3	17	M	2	–	–
4	7	M	3	+	+
5	8	M	4	+	+
6	2	F	7	+	–
7	3	M	3	+	–
8	8	F	3	–	+
9	9	F	5	–	–
10	1	M	1	–	+
11	3	M	2	–	+
12	16	F	6	+	+
13	16	M	6	–	–
14	20	M	7	+	+
15	9	M	2	–	–

number of surgical procedures in our patients may explain the low sensitization compared to previous studies. Moreover, patients with a history of urticaria on exposure to latex had more positive tests (3 vs 1). There was a general tendency toward sensitization with increasing age, but the difference was not significant. Family history of atopy, V–P shunt, number of surgical procedures, and degree of exposure to latex had no significant correlation with sensitization to latex. Table 3 summarizes the clinical profile of SB patients who were test positive to latex.

Discussion

Children with SB have been reported to be at high risk of developing allergic reactions to latex due to repeated urologic and surgical procedures using latex-containing materials early in life (3). Frequencies as high as 60% have been reported in these patients (1, 7). One-fourth of our patients were test positive, indicating sensitization to latex, with males being more affected (11 males vs four females) (2). This finding agrees with data reported by Konz et al. (2), who found males (72% frequency) to be more liable than females to latex sensitization among his patients, but this conflicts with data reported by Yassin et al. (8) and Leger & Meeropol (9), who found more female sensitization. As in previous studies, our patients who had undergone more urologic procedures had a higher incidence of sensitization to latex (1, 8, 9). History of atopy was reported to be a significant risk

factor for development of sensitization to latex (8). In contrast, our data showed no significant correlation between either family or personal history of atopy and sensitization to latex. The only significant correlation was with the presence of positive history of urticaria.

V-P shunt, number of surgical procedures, or frequency of exposure to latex had no correlation with sensitization by latex. This is in contrast to studies which showed a significant correlation between the number of surgical procedures and the occurrence of latex sensitization (8). We have no explanation for the difference in our patients, other than the possibility of genetic differences and, perhaps, extra precautions taken by our surgeons in minimizing the use of latex articles in such patients. The low number of surgical procedures in our patients may be another explanation for the incidence of sensitization in our patients. Once a patient is diagnosed as having SB, the use of latex-containing products is excluded. We believe this is the most significant factor that reduced the incidence of latex allergy in patients.

V-P shunt did not have any bearing on sensitization to latex in our group of SB patients, a finding which contrasts with the findings by Leger & Meeropol, who found more latex-sensitive patients with V-P shunt (9).

Among diagnostic tests to establish sensitization to latex, SPT and Immuno-CAP test are the most reliable, with 14/15 (93%) being positive by CAP and 9/15 (60%) positive by SPT. The higher rate of positive tests by Immuno-CAP than SPT may be related to either low potency of the extract due to storage during shipment, or higher sensitivity of the Immuno-CAP test. We do not think this difference is related to false-positive results, since both negative and positive controls were used, and tests were run in duplicate. However, this finding

must be confirmed by more studies. Cutaneous challenge with latex gloves was the least reliable, with only 2/15 (13%) positive. The results of our SPT were similar to those of Yassin et al. (8). Although previous authors have reported a low incidence of positive reaction to latex by RAST (10, 11), the newly modified CAP test in our hands is a highly sensitive and reliable test compared to the classical RAST. Although the SPT is more economical than CAP and the results are more readily available, the latter is the test of choice in patients who have skin problems that preclude SPT, such as dermographism and extensive dermatitis, and in patients who are on long-acting antihistamines. The low yield of positive reactions after challenge is probably related to the low concentration of allergen contained in pieces of different gloves used. Therefore, we do not recommend challenge with latex gloves as a diagnostic procedure.

In conclusion, SB patients with a history of repeated urologic procedures and a history of urticaria, especially male patients with such history, are most likely to develop allergy to latex products. SPT and Immuno-CAP are sensitive and reliable diagnostic tools in detection of SB patients who are at high risk of developing allergic reactions to latex and should be used routinely to exclude the use of latex products in sensitized patients. Alternative products should be used in such patients. The incidence of sensitization to latex in Saudi children with SB is similar to reports in the world literature. However, anaphylaxis and other severe allergic reactions have been virtually eliminated in our patients. This is due to minimizing the use of latex products in these patients.

Acknowledgment We thank Gamal Mohammed for assistance with the statistics.

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