

Prevalence of Sensitivity Signals to Latex in Meningomyelocele Patients Undergoing Multiple Surgical Procedures

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Summary: Yeh WSC, Kiohara PR, Soares ISC, Carmona MJC, Rocha FT, Galvão CES – Prevalence of Sensitivity Signals to Latex in Meningomyelocele Patients Undergoing Multiple Surgical Procedures.

Background and objectives: The number of patients allergic to latex has increased significantly. It is crucial to recognize the cases in order to prevent and apply adequate treatment. The objective of this study was to evaluate the prevalence of allergy to latex in meningomyelocele patients.

Materials and methods: A retrospective evaluation of medical records of patients with meningomyelocele diagnosis from January 2002 to December 2007 was conducted. Patients were grouped into allergics and non-allergics. The comparison of groups for gender was made by the Chi-Squared test, the Student's *t* test was used to compare age, and Mann-Whitney test was used to compare groups for clinical manifestations of allergy, number of procedures under anesthesia, hospital admissions and vesical catheterizations.

Results: The mean number of procedures under anesthesia was 7 in the group with allergy and 4 in the group without allergy; this difference was statistically significant ($p = 0.028$). The mean number of hospital admissions was 4.5 in the group with allergy and 3.4 in group without allergy and mean vesical catheterization was 24.5 in allergic patients and 21.7 in non allergic ones.

Conclusions: Meningomyelocele patients undergoing multiple procedures under anesthesia have high risk of developing clinical signals of allergy to latex. It is necessary that patients with meningomyelocele diagnosis should undergo exclusively latex-free procedures, avoiding high risk of sensitization and its complications. Specific tests to evaluate sensitization, genetic markers and latex-fruit relationship may contribute to a better understanding of risk factors related to allergy to latex and ways to prevent it.

Keywords: Perioperative Care; Latex hypersensitivity; Meningomyelocele.

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INTRODUCTION

Since latex hypersensitivity was acknowledge in 1979, the number of patients allergic to this raw material has increased significantly, and it has been more common for anesthesiolo-

gists to have patients in those conditions. The increase is attributed to the publication of universal precautions by the Center for Disease Control and Prevention (CDC, USA) leading to the significant increase in the use of latex surgical gloves ^{1,2}. It is crucial to recognize individuals sensitive to latex to provide adequate prevention and treatment.

Health care professionals and other individuals who have frequent contact with latex gloves are included in the risk group for this allergy. The patients with higher risk are those with previous history of atopy, individuals with history of allergy to tropical fruits ³ and children with spina bifida ⁴. It is estimated that 70% of meningomyelocele patients have some degree of allergy to latex ¹, compared with 1% of population in general ⁵.

The objective of this study was to evaluate the prevalence of latex sensitization signals in meningomyelocele patients undergoing multiple surgical procedures and prolonged vesical catheterization.

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MATERIALS AND METHODS

After approval by the institutional Ethics Committee, a retrospective evaluation of medical records of patients with meningomyelocele diagnosis admitted to the Urologic Clinic of the *Instituto Central, Hospital das Clínicas* (FMUSP) between January 2002 and December 2007 was conducted. All patients underwent some type of procedure under anesthesia. In addition to demographic data, data related to vesical catheterization time and number of surgical procedures were assessed. The patients were grouped into allergics (latex sensitive; LS) and non-allergics (non sensitive; NS) according to having one or more clinical latex sensitivity signals (Table I).

Data were descriptively evaluated and groups compared by the Chi-Squared test for gender, by the Student's *t* test for age, and by the Mann-Whitney test for clinical manifestations of allergy, considering the number of procedures under anesthesia, hospital admissions and vesical catheterizations registered in the medical records. The *p*-values < 0.05 were considered significant.

Table I – Clinical Signals of Allergy to Latex

- Heavy sneezing
- Obstructed nose, with mouth breathing
- Nasal discharge
- Repetitive cough
- Pruritus in the eyes, nose, throat or in any part of body
- Watery eyes
- Skin rashes
- Nettle rashes
- Edema on lips or eyelids
- Allergic conjunctivitis, pharyngitis, sinusitis and otitis
- Marcs on eyelids
- Dyspnea

RESULTS

In the studied period, 69 patients diagnosed with meningomyelocele were identified. The observed prevalence of clinical allergy signals was 23.2%. The age distribution ranged from 5 to 47 years, with an average of 14 years in the LS group and 17 years in the NS group. In the distribution by gender, a prevalence of males (62.5%) was observed. On average, individuals from the LS group underwent 7 procedures under anesthesia versus 4 in NS group (*p* = 0.028); 4.5 hospital admissions in the LS group and 3.4 in the NS group; and 24.5 vesical catheterizations in the LS group and 21.7 in the NS group (Table II).

Among patients with latex sensitivity history, six had immunologic tests with the presence of IgE specific to latex (positive RAST – Radioallergosorbent Test).

Of six LS patients, two reported intraoperative clinical manifestations like skin rash, bronchospasm and anaphylactic shock. One case was about a male patient with meningomyelocele diagnosis at birth who underwent the first surgery

Table II – Comparison between Patients with or without Clinical Signals of Latex Sensitivity (N = 69)

	Allergic (n = 16)	Non allergic (n = 53)	p
M:F Gender	10:6	23:30	0.108*
Age	14.0 ± 4.6	17.0 ± 8.6	0.073#
Number of procedures under anesthesia	7.0 ± 4.3	4.0 ± 1.8	0.028 [§]
Number of hospital admissions	4.5 ± 2.9	3.4 ± 2.0	0.246 [§]
Number of vesical catheterizations	21.7 ± 20.2	24.5 ± 26.6	0.990 [§]

*Chi-Squared test; #Student's *t* test; and [§]Mann-Whitney test. Data collected in January 2008.

on the second day of life to correct this congenital malformation. He underwent ventricle-peritoneal bypass on the second month of life and two orthopedic surgeries at the age of 2 years. He underwent the first urologic surgery at the age of 3 years followed by four other interventions without unexpected events. On the eighth intervention, after anesthetic induction and before beginning of surgery, the patient had intense bronchospasm, which was promptly treated. However, he did not recover and evolved with hypoxia and cardiopulmonary arrest responsive to recovery maneuvers. The surgery was suspended and the investigation for allergy to latex showed a specific result for strongly reactive IgE (RAST, grade IV). A specific protocol for allergy to latex was used and the subsequent surgeries had no unexpected event ⁶.

DISCUSSION

The retrospective evaluation showed that meningomyelocele patients undergoing multiple procedures under anesthesia had a high prevalence of personal history of latex sensitivity. Among sensitive patients, the number of procedures under anesthesia was higher.

This retrospective study has some limitations like the variable time of patient observation and the fact that only the personal history was considered for classifying patients as “allergic to latex”; only six patients had specific tests described in medical records.

Latex is a common raw material and frequently used in the routine of health care professionals and the population in general. It is present in hospital products like face masks, vesical catheters, tourniquets, syringes and emboli, venous infusion equipment, electrodes, anesthesia circuits, ventilation bags, pressure cuff, drains, stethoscope (tube), aspiration tubes, among others. Differences in proteins of the internal and external surfaces of surgical gloves were detected, suggesting eventual distinct sensitization mechanisms ⁷.

Latex is a complex mixture of polyisoprenes, lipids, phospholipids, proteins, chemical preservatives (ammonia or sodium sulfate), accelerators (tiurams, thiocarbamates, mercapto compounds, thioureas), antioxidants (fenilediamina)

and vulcanized compounds (sulphur), all added to the final product. The protein included in the latex, found in three formulations (hydrosoluble, linked to amide or latex) is accountable for most of the related allergic reactions. There are at least 240 potentially allergenic proteins, being the elongation factor of latex from rubber trees the main allergen⁸. Other studies mention a 14 kDa component as an important latex allergen⁹. Sensitization by Hev b 5 is common among health care professionals¹.

Exposition and sensitization may be the result of direct contact with skin and mucous membranes, inhalation, ingestion, parenteral injection or inoculation through wounds. Corn starch used as powder in gloves works as carrier of latex allergens, linking to proteins¹⁰. Thus, those linked particles are in suspension and may cause different respiratory symptoms when inhaled: from rhinitis, cough, hoarseness, hives to bronchospasm^{11,12}.

Sensitization is defined by the presence of immunoglobulin E (IgE) antibodies, but patients do not necessarily have clinical manifestations of allergy in this condition. Allergy to latex refers to any immune mediated reaction with clinical symptoms, including Type I and Type IV hypersensitivity reactions.

Allergic contact dermatitis or type IV hypersensitivity reaction (mediated by T cells) corresponds to approximately 84% of the reactions to latex and is much more common than type I reaction. It is a late response to the activation of T cells specific to latex. In repeated expositions, the reaction begins 48-72 hours after contact and usually together with erythema, site vesicles and skin rash. The diagnosis may be done with patch test for these antioxidants or accelerators of the previously described final product¹.

Type I hypersensitivity reaction, IgE-mediated or anaphylactic reaction presents more morbidity. It requires sensitization and production of IgE antibodies. On the first exposure, patients are sensitized and produce IgE specific to Hev b. These work as antigens, activating Th2 CD4+ cells and inducing B cells to form secretory cells of specific Hev b IgE. The latter links to mastocytes and basophils surface and release mediators like histamine, proteases like tryptase and even arachidonic acid metabolites, generating a reaction ranging from local urticaria to complete anaphylactic reaction, beginning some minutes after exposition¹.

Studies suggest that spina bifida, even in the absence of multiple surgical procedures, is a risk factor for latex sensitivity¹³. Adult patients undergoing multiple surgeries have lower sensitivity than children with spina bifida. The prophylaxis since birth in children with spina bifida is the most effective way to prevent sensitization^{1,6,14}. Machado et al.¹⁵ reported that children with meningomyelocele are the most sensitive to latex by very frequent and early contact with catheters, gloves, ventricle-peritoneal bypasses, among others. Nowadays, this population is considered under most risk to have allergy to latex; many studies show a frequency ranging from 11.5% to 72%.

Spartà et al.⁴ demonstrated that one third of children with urological malformations have sensitivity or allergy to latex. Some risk factors are multiple surgical interventions, as every previous exposure increases 13 times the chance of reaction to latex. The authors suggest that those patients must be included in a prevention protocol using latex-free gloves, vesical catheters and tubes in routine procedures or anesthetic-surgical ones^{16,17}.

The latex sensitivity diagnosis is obtained by specific questionnaire and/or thorough physical examination searching dermal or allergic reactions associated with *in vivo* and *in vitro* laboratory tests. Prevention and education are crucial to handle the sensitization.

Researchers suggest that allergy to latex is due to multiple factors and only exposure to products containing latex would not be enough to cause allergy. Brown et al.¹⁸ believe that in addition to environmental factors, there are genetic factors that contribute to this allergy's phenotype. Despite a significant support for a genetic component, the multigene nature of this phenotype hinders the identification of susceptible genes. Polymorphisms in over 30 genes located in 15 different chromosomes were related to allergy in humans. There is a significant association of polymorphisms in promoters of IL13 and IL18 interleukins with allergy to latex, suggesting a site for its genetic control, extending the comprehension of genetic basis for induction of immediate hypersensitivity in health care providers exposed to latex^{18,19}.

Blanco et al.²⁰ conducted a case-control study in a group of patients allergic to latex to investigate the association between this syndrome when associated to fruits, to class I and II HLA genes, HLA DR functional groups and to IL4-R1 and Fc R1-βca markers. They concluded that latex/fruits allergy is associated with HLA-DQB1*0201, DRB1*0301, and *0901 alleles, as well as the HLA-DE functional group E. Allergy to latex not related to fruits is associated with DQB1*0202 alleles, and both allergies are associated to DRB1*0701 and *1101 alleles. Knowing the genetic basis of allergy to latex may help to apply primary prevention measures in health care providers and high-risk individuals in order to develop hypersensitivity to products containing latex.

The results of this study allowed us to conclude that meningomyelocele patients undergoing multiple procedures under anesthesia have a high risk of developing clinical signals of latex sensitization. The assessment done in this study on the prevalence of latex sensitivity reinforces the requirement that patients with meningomyelocele diagnosis exclusively undergo latex-free procedures, avoiding high risk of sensitization and its complications. In the studied population, specific tests to evaluate sensitivity, genetic markers and latex-fruit relationship²¹ may contribute to a better understanding of risk factors related to latex allergy and ways to prevent it.

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