

IgE Reactivity to Latex in sera of Indian Patients: An Original Research

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ABSTRACT:

Aim: *The purpose of our research was to assess and analyse IgE cross-reactivity in Indian patients sera in relation to latex extract.*

Methodology: *Sera from 27 patients with latex allergy and control sera from nonsensitive individuals were studied for latex-specific IgE antibodies. Two antigen preparations were used from different rubber tree saps. All patients had skin prick test results that were positive to latex antigens, and all sera were evaluated by enzyme-linked immunosorbent assay (ELISA) with the various antigens.*

Results: *There were considerable differences in the reactivity of patient sera with the different antigens. Only 50% of the sera from patients with later allergy demonstrated significant levels of IgE to later as determined by enzyme-linked immunosorbent assay.*

Conclusion: *The results indicate that reagents such as rubber tree sap, which contain multiple clinically significant antigenic components, should be included in evaluation of latex allergy and that differences in patient populations may result in serologic variances.*

Keywords: *Latex, IgE antibody, ELISA, anaphylaxis, skin prick test, latex allergy*

INTRODUCTION

Latex is commercially extracted from rubber tree *Hevea brasiliensis*. The rubber tree is native to Brazil, but the bulk of plantations from which commercial latex is currently harvested are located within the Pacific Rim-Malaysia, Indonesia, Thailand, and Vietnam. Latex may be a generic term meaning water emulsion, or a liquid dispersed within another liquid, NRL consists of rubber particles and water. NRL contains quite 250 different proteins, but few are found to be allergenic. Rubber's long history of use dates back to the Indians of South and Central America, before the arrival of Columbus within the New World. Charles Good Year began full scale application of Latex in form of rubber with the help of vulcanization, and it proved useful to its increased elasticity and strength. Due to these properties, rubber was implemented into surgical gloves by Dr. William Halsted.¹In medical

environment, natural rubber latex (NRL) provide the foremost effective barrier to blood-borne pathogens for both healthcare workers and patients. NRL gloves have certain chemicals which can irritate skin. Reactions to wearing gloves can vary from irritation, which is common and simply managed, to allergies. It is very important to determine the precise cause of a reaction so that it can be treated appropriately.² Latex allergy has been the most important occupational allergy among medical workers worldwide.³⁻⁸ So far, 13 allergens from natural rubber latex are characterized,⁹ and some of them have been documented to play a dominant role in food cross-reactivity to certain fruit.¹⁰ The latex products used in medical care in different countries are often obtained from different manufacturers. Because the procedures and standards in the manufacturing process vary, the protein and antigen contents of such products may also show considerable diversity. Hence, the immunologic responses of the populations exposed to such proteins may also differ significantly, and there may be significant differences in the immune responses of the populations affected because of differences in exposure patterns or underlying disease states.^{11,12} Routine testing of all patients or workers is dear. Testing should even be made available to those individuals who don't qualify as high risk, but who ask to be tested. Patch tests are wont to differentiate irritant dermatitis from allergic dermatitis (Type IV hypersensitivity reactions). The test is typically read at 2 and three days so as to spot type IV hypersensitivity reactions, which normally peak in intensity at 48 to 72 hours after exposure. Irritant contact dermatitis can be distinguished from allergic contact dermatitis by the timing of onset and duration of the skin reaction. A "use" test is performed on wet hands employing a non-latex glove as an impact. The NRL glove is first exposed to just one finger for 15 minutes; if this preliminary test is negative, the entire hand is exposed for a further quarter-hour. The test frequently produces contact urticaria if performed with highly allergenic gloves, and has caused as anaphylactic reaction during a patient with severe hand eczema. To diminish false positive results in milk-allergic subjects, the "Use" test should be carried out with a glove brand without casein. Skin prick testing is a quick and inexpensive way of screening and diagnosing Type I NRL allergy. For a skin prick testing (SPT), drop of latex extract diluted in saline is placed on the skin, and therefore the skin is gently pricked with a needle. If a private is sensitized, a wheal-and-flare reaction will develop in 15-20 minutes. The reaction is graded consistent with the diameter of redness and swelling at the test site. The advantage of SPT is its availability, low cost, quick results and sensitivity.¹³

AIM OF THE STUDY

The purpose of our research was to assess and analyse IgE cross-reactivity in Indian patients sera in relation to LE-1 and LE-2 antigens present in two different latex extract obtained from rubber tree sap.

METHODOLOGY

All patients had clinical evidence of latex hypersensitivity. The 27 Indian patients ranged in age from 20 to 56 years, and ten of them were women. Twelve of them were health care workers and 15 had localized symptoms like contact urticaria which were induced by latex. All of those subjects had immediate wheal and flare skin reactions to an extract of latex gloves commonly utilized in India when tested by the prick technique. Total serum IgE levels of these patients ranged from < 5 to 16,040 IU. Eighteen subjects who ranged in age from 19 to 29 years and who had no clinical history of latex allergy were considered normal control subjects. None had skin reactivity to the latex glove extract. In the present study, four different latex antigen preparations were wont to demonstrate specific IgE antibodies within the sera of patients and normal control subjects. Preparation from the sap of the rubber tree (*Zfveva brusiliensis*), LE-1 and LE-2, were used which were preserved in 0.5% formalin. The

extract obtained was refined by centrifugation of latex plasma from 0.5% formalin-preserved rubber tree sap. The patients were prick tested with freshly prepared antigen extract and control solutions, and the reactions were read at 20 minutes for wheal and flare reactions. Diluent and histamine were used as negative and positive controls, respectively. The cross reactivity was demonstrated with the help of SDS- PAGE as well as ELISA. The different groups of patients, normal subjects, and the antigens were compared by unpaired t test as well as standard deviation was measured with the help of SPSS 25.0.

RESULTS

The antigen used reacted with all the sera of patients as determined by skin prick test, although only 7 of 27 showed significant specific IgE levels thereto latex antigen when compared with control subjects. (Table1) Control sera had low levels of specific IgE to all antigens studied. The rubber tree sap antigen (LE-2) showed 10 to 1.5 protein bands that were stainable with Coomassie brilliant blue in SDS-PAGE. (Table 2) This study indicates that there are considerable differences in the IgE antibody responses of patients to different latex antigen preparations as demonstrated by ELISA. Similar results were obtained in case of LE-1 however the results were not significant as was in case of LE-2 ($p=0.0311$). (Table 3)

Table 1- Skin test reactivity in the sera of patients and control subjects

Skin test reactivity	Patients with latex allergy (Mean±SD)	Control patient (Mean±SD)
Urticaria	1.39±1.02	0.23±0.11
Angioedema	3.12±2.67	0.14±0.09
Wheel and flare response	1.14±0.54	0.17±0.09

Table 2- Antigen cross reactivity with latex-specific IgE observed in SDS-PAGE

Cross-reactivity	Patients with latex allergy (Mean±SD)	Control patient (Mean±SD)
LE-1	1.45±1.05	3.21±2.99
LE-2	1.27±1.11	3.12±2.13

Table 3- t-test to evaluate the presence of various antigens in patients with latex allergy

Variability	t- test	p value
LE-1	3.43	0.078
LE-2	4.27	0.0311

* p value < 0.05 = significant

DISCUSSION

Brand-to-brand differences or batch-to batch variations in the antigenic content are likely to occur and make obtaining dependable antigens difficult. Since different latex products and batches of products differ in their protein contents, a pooled mixture of well-characterized proteins that have predictable reactivity and sensitivity is needed for use in the diagnosis of latex allergy. Recently, IgE-mediated hypersensitivity reactions to latex proteins have been reported in several countries.¹⁴⁻¹⁸ The proteins that are present in natural rubber are considered to be the responsible antigens, and the hypersensitivity responses induced include urticaria, angioedema, rhinitis, bronchospasm, anaphylaxis, and death. Individuals at high risk of experiencing latex hypersensitivity include patients with spina bifida and health care workers, especially those who are frequently exposed to latex gloves and other latex products.¹⁹⁻²³ The IgE-mediated mechanism involves the release of inflammatory mediators from mast cells and basophils after cross linkage of latex allergen with allergen-specific IgE

antibodies bound to these cells.²⁴ Approximately 30–50% of patients who are allergic to latex have evidence of a coexisting food allergy, which is defined as latex-fruit syndrome.²⁵ This syndrome was first described in 1994 after a high number of patients with a fruit allergy were found to possess a latex allergy. The common fruits identified include banana, avocado, chestnut, edible fruit, fig, pineapple, kiwi, potato, papaya, peach, grape, orange, tomato, melon, celery and peanut among others. Ziz m 1 (30 kD), the main Indian jujube allergen identified, has been found to possess sequence identity to several plant class III chitinases including latex heveamine. This protein possesses IgE binding capacity and inhibition studies have revealed evidence of cross-reactivity with the latex allergen.²⁶⁻²⁹ Additionally, it's been proposed that a 20 kD prohevein-like protein may also be implicated in the cross-reactivity.²⁷ Individuals who have undergone multiple surgical or dental procedures are also at high risk. Children with ectoderm defects (spina bifida, meningomyelocele) even have a high prevalence of latex allergy. Direct internal or mucosal contact with NRL devices appears to be a crucial route of sensitization in these patients also as for those with congenital urologic abnormalities. Lastly, persons with atopy are also at increased risk, along with those with preexisting hand dermatitis.³⁰ In the previous couple of years, latex allergy has been recognized as a possible medical problem in India. Latex allergy is reported more frequently among those heavily exposed to NRL products like latex gloves and other medical supplies employed by healthcare workers also as household gloves, elastic bandages, condoms, envelop adhesive, rubber bands, infants and children's bottle nipples etc used by housekeepers, latex industry workers, and food service workers. However, latex allergy has received little or no attention in Indian studies as evidenced by the absence of scientific, practical, and systematic data on the topic. Pherwam et al, reported latex sensitivity among operation theater personnel in India and found nurses and ward boys to be the most susceptible to sensitization in comparison to surgeons and anaesthetists, but the sample size was too small to draw any further conclusions.³¹

CONCLUSION

Differences in the patients and populations exposed especially health care workers or differences in the clinical response to latex (e.g., anaphylaxis vs contact urticaria) may play a role in defining the immune response of an individual.

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