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LATEX GLOVE HYPERSENSITIVITY: A SURVEY OF AN OCCUPATIONAL HAZARD

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ABSTRACT

Objective: The purpose of this study was to assess the prevalence of glove related symptoms in a sample of 150 dentists with a high occupational exposure to latex gloves.

Method & Materials: A 35 questionnaire response form was circulated to 150 dentists residing in the city of Chennai during September 1999 for the prevalence of self reported, latex glove related symptoms.

Results: Of the dentists surveyed (N = 150), 28 responses (18.66 %) indicated glove related problems. Of these positive respondents; 24 (85.7 %) gave history of symptoms correlating to Irritant Contact Dermatitis, while 3(10.7%) had symptoms consistent with Allergic Contact Dermatitis & 1(3.57%) respondent gave a history suggesting Type 1 Hypersensitivity to Latex gloves.

Conclusion: Latex allergy, as well as other reactions associated with frequent wearing of gloves, can have potentially serious consequences for the dental worker. The dental team, therefore, should be knowledgeable about the signs, symptoms and diagnoses of these conditions and should consider means of avoiding the use of dusting powder & reducing the occupational exposure to other sensitizing or irritating agents.

Key Words: Latex, Hypersensitivity, Gloves, Dusting powder.

Clinical relevance: The prevalence of latex glove related symptoms among dental care professionals seems to be significant & it could represent a serious occupational hazard.

INTRODUCTION

One of the milestones in medical achievements has been the introduction of surgical gloves made of Natural Rubber Latex (NRL) – commonly known as Latex, by William Halstead in 1890. Almost 100 years passed before Nutter¹ reported the first case of Latex allergy in 1979. The first known case of NRL anaphylaxis in a dental professional was recorded in 1987 by Axelsson & Colleagues². Since then, latex allergy has become an emerging & serious phenomenon that has implications not just for health care workers but for all of society.

The rising incidence of latex allergy has been associated with the introduction of Universal Precautions by the Centre for Disease Control in the mid 1980s. Universal Precautions set a standard for blood and body fluid precautions that must be applied to all patients at all times. Latex surgical gloves are an important component of Universal Precautions and act as a deterrent to the transmission of pathogens such as hepatitis B virus and HIV. Any anticipated contact

between a health care provider and a patient's blood or body fluids requires the provider to wear gloves. Universal Precautions has thus increased the exposure of health care workers and patients to latex products.

The prevalence of latex allergy in the general population is not accurately documented, but is believed to be very low. One report found 0.125% of patients who were tested before surgery to be latex-sensitive³. In another study of 1000 blood donors, latex antibodies were demonstrated in 2.4% of the subjects⁴. Members of the dental profession are also at high risk for developing latex allergy. In a survey of US Army dentists⁵, 13.7% reported symptoms related to the use of latex gloves. In a more recent study conducted as part of the American Dental Association's annual health screening, 6.2% of the participants, among whom were dentists, dental hygienists, and dental assistants, tested positive for type I hypersensitivity to latex proteins⁶. Hill et al⁷ found a 19.2% incidence of self-reported latex allergy and an actual incidence of 3.8% in dental workers. Safadi et al⁸ found a 12% incidence of latex allergy by skin prick testing in dental workers. To date, 16 fatalities secondary to latex anaphylaxis have been reported, none of which was secondary to dental treatment⁹. The lack of data pertaining to the behavior of Indian general dental practitioners towards latex gloves was the basis behind this descriptive study to evaluate the prevalence of latex glove related symptoms.

METHOD & MATERIALS

A 35 questionnaire response form was developed & circulated among 150 dentists residing in the city of Chennai during September 1999. Questions were asked to determine the glove use regimen followed by the dentists & the dusting powder employed by them (if any). To assess the prevalence of glove-related symptoms attributed to the use of latex gloves, detailed questions were asked about signs and symptoms related to glove use. Moreover, the dentists were asked about a personal history of the following: other contact allergies, food allergies, hay fever, systemic drug allergies and atopic dermatitis.

From the returned questionnaires, the diagnosis of glove-related symptoms to latex gloves was determined by the authors in accordance with the following criteria:

1. If the respondent indicated that the contact with gloves led to short-term localized itching, redness, or rash, a diagnosis of Irritant Contact Dermatitis was made.
2. If generalized itching and hives were reported in addition to the above-mentioned local signs, a diagnosis of Allergic Contact Dermatitis was made.

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3. If this widespread skin reaction was accompanied by rhinorrhea or symptoms for respiratory distress, a systemic reaction of Type I Hypersensitivity to Latex gloves was diagnosed.

The data collected were categorical & statistically analyzed using the normal approximation to the binomial distribution.

RESULTS

Of the 150 respondents, the majority (141 respondents - 94 %) of the dentists usually wear nonsterile latex examination gloves, while 42.6 % (64 dentists) wear surgical gloves, even if not exclusively. A total of 142 dentists (94.6 %) had no knowledge of the type of dusting powder being employed in their gloves.

A total of 28 questionnaires (18.66 %) contained answers consistent with a diagnosis of glove related symptoms (Table 1). Out of these 28 positive respondents, 24 (85.7 %) gave history of symptoms correlating to Irritant Contact Dermatitis, while 3 (10.7%) had symptoms consistent with Allergic Contact Dermatitis & 1 (3.57 %) respondent gave a history suggesting Type 1 Hypersensitivity to Latex gloves (Fig 1).

Table 1: Prevalence of Latex Glove related reactions (N=150)

Latex Glove Related Reactions	Number	Percentage (%)
Total Sample	28	18.66%
Irritant Contact Dermatitis	24	85.7%
Allergic Contact Dermatitis	03	10.7%
Type I Hypersensitivity	01	3.57%

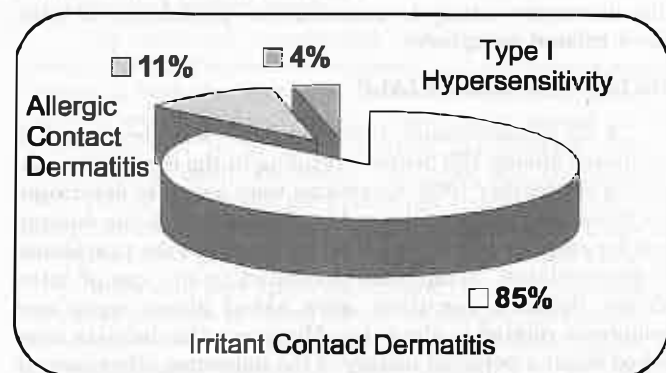


Fig. 1. Prevalence of Latex Glove related reactions (N=28)

Of the 28 respondents who provided a history consistent with latex glove related symptoms, 4 (14.2 %) respondents had a history of Drug allergies while 20 (71.4 %) had a history of inhalational allergies. 4 (14.2 %) dentists gave a positive history of Atopic Allergy in their families while 6 (21.4 %) of them had some form of food allergy and 13 dentists (46.4 %) gave a positive history of contact allergy to chemicals & cosmetics (Fig 2).

DISCUSSION

Natural Rubber Latex (NRL) or Latex which is derived from the sap of the commercial rubber tree, *Hevea*

Table 2: Alternate Glove materials

Material	Composition	Cost
Vinyl	Polyvinyl chloride	Low/ moderate
Nitrile	Acrylonitrile and butadiene	Moderate/ expensive
Neoprene	Chloroprene	Moderate/ expensive
Plastic	Polyethylene	Low
Tactylon	Styrene-based copolymers	Moderate/ expensive

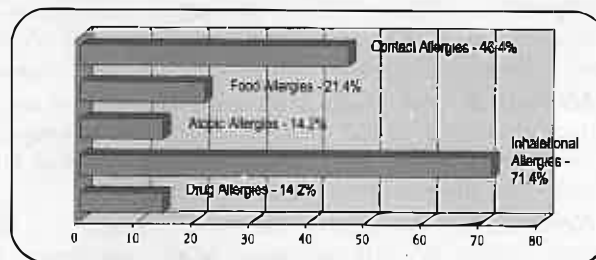


Fig. 2. History of other allergies (N=28)

brasiliensis; is a complex mixture of cis-1,4-polyisoprene particles in a phospholipoprotein envelope & a serum containing sugars, nucleic acids, lipids, minerals and proteins¹⁰. These proteins are responsible for the severe allergic reactions associated with latex glove usage.

Latex exposure can occur through various routes, including the skin, mucous membranes, respiratory system & vascular system. Cutaneous exposure occurs when any product with latex contacts the skin. In addition, the latex proteins are rendered more soluble when body sweat accumulates beneath the latex gloves. The respiratory route of exposure occurs mainly from aerosolized powder. The cornstarch powder used to ease the donning of surgical gloves absorbs many of the latex allergens. It is this powder-protein complex that sensitizes patients, not be cornstarch powder itself¹¹. The powder-protein complex becomes aerosolized every time gloves are donned and removed. This finding is significant as 71.4 % of the positive respondents in our survey also gave a history of inhalational allergy (Fig 2). Thus, a significant reduction in latex aeroallergens might be achieved by using *powder-free* latex gloves rather than by increasing the air filtration rate in the operating suite¹².

There are 3 types of reactions to latex products: Irritant contact dermatitis, Allergic contact dermatitis, and Type I Hypersensitivity reactions. The 2 types of contact dermatitis account for most clinical reactions to latex products. Contact dermatitis may contribute to increased latex sensitization by reducing the protective properties of the skin. Reducing the barrier integrity of the skin allows a larger amount of latex allergens to be absorbed into the skin. Increased frequency and severity of allergic contact dermatitis may precede a latex allergy.

Irritant contact dermatitis is a nonimmunologic inflammation of the skin caused by direct damage to protective layer of the skin, the stratum corneum. Inadequate rinsing of irritants, such as soaps and detergents, and inadequate hand drying allow soap residue to remain on the skin, where it can initiate irritation. Other factors that may exacerbate this condition include friction, occlusion,

sweating, extremes of humidity, and extremes of temperature. If a person is exposed to an irritant of sufficient concentration for a sufficient amount of time, irritant contact dermatitis will develop. Certain groups are at high risk, including people who work in wet environments (such as health care workers who frequently wash their hands), atopic patients, and individuals with fair skin. Clinical findings include erythema, dryness, fissuring, chapping, and vesicle formation as a late manifestation. Irritant contact dermatitis is a diagnosis of exclusion. The signs and symptoms are similar to allergic contact dermatitis, which is ruled out by patch testing. Treatment is aimed at thorough rinsing and drying of the hands, avoidance of extremely hot water, and moisturization of the skin after hand washing. In our survey, 85.7% of the positive respondents gave a history correlating to Irritant Contact Dermatitis substantiating the fact that it is the most common reaction to latex gloves.

Allergic contact dermatitis is a delayed type IV hypersensitivity mediated by T cells. Lesions generally appear 48 to 96 hours after exposure. Accelerators and antioxidants used in latex manufacturing are the most commonly implicated agents. Allergic contact dermatitis, however, can be secondary to any of the chemicals used in latex manufacturing. Clinical manifestations are similar to those of irritant contact dermatitis and include pruritus, erythema, scales, crusts, scabs, papules and vesicles. The diagnosis of allergic contact dermatitis is by patch testing; once it is diagnosed, treatment is centered on avoidance of the allergen. In our survey, 10.7% of the positive respondents gave a history consistent with Allergic Contact Dermatitis.

Immediate type I Hypersensitivity reactions are IgE-mediated and are secondary to the proteins present in natural latex rubber. IgE antibodies are formed and bind to mast cells with the initial latex contact. Secondary exposure causes cross-linking of the IgE molecules on the surface of the mast cells, with resultant degranulation and histamine release. This mast cell degranulation and histamine release is responsible for the clinical manifestations of immediate type I hypersensitivity. These symptoms include immediate pruritus and stinging, with erythema, edema, and a wheal and flare reaction occurring minutes later. After this initial reaction, conjunctivitis, generalized urticaria, dyspnea, palpitations, dizziness, laryngeal edema, anaphylaxis & death may occur. In our survey, 3.57% of the positive respondents gave a history suggesting Type I Hypersensitivity to latex gloves.

Individuals with certain food allergies may also have co-existing latex allergy because many of the polypeptides found in rubber are also found in certain foods, especially fruits. Kurup et al¹³ found that IgE cross-reactivity existed between different latex and food allergens. The foods most often implicated include banana, avocado, chestnut, apricot, kiwi, pineapple, peach, nectarine, plum, cherry, melon, fig, grape, papaya, passion fruit, potato, tomato and celery. Incidentally, in our survey 21.4 % of the positive respondents gave a history of some form of food allergy.

At present no gold standard exists for the diagnosis of

latex allergy. In vitro serologic tests measure the serum level of latex-specific IgE. The most common IgE assay method used is the radioallergosorbent test (RAST), which has not been shown to be an accurate indicator of latex allergy. Currently, skin prick testing is the most reliable method of diagnosing a latex allergy; it has a sensitivity of 90% - 95%. Other in vivo tests include the use test and the patch test. Patch testing is used to differentiate irritant contact dermatitis from allergic contact dermatitis: & is the definitive diagnostic test for type IV latex hypersensitivity. In spite of being the most common & popular method; the diagnosis of glove use related symptoms from the answers to a questionnaire can lead to an over-estimation of latex allergy. An accurate diagnosis can be made only by measuring IgE antibodies to latex or by performing a skin prick test. Hence, in this study it was not possible to determine whether the reactions to latex gloves was the primary symptom or was an aggravation of preexisting dermatoses. However, the prevalence that was found is quite similar to that reported in other studies.

Once a person has been diagnosed with a latex allergy, the treatment is centered on avoidance – to the extent feasible – of all latex products. This is difficult in the case of NRL, since latex is used in a wide variety of common dental & nondental products. However, there are some simple steps that dentists may take to reduce exposure to the primary sources of NRL in the dental office. The following recommendations are based on those issued by the National Institute of Occupational Health and Safety in June 1997¹⁴.

- ✦ Using low-protein, *powder-free latex gloves* prevents the aerosolization of the protein-powder complex, thus preventing any sensitization to latex.
- ✦ Frequently cleaning all work areas contaminated with latex dust;
- ✦ Educating the dental staff on the signs and symptoms of latex allergies.
- ✦ Dental workers diagnosed with NRL protein hypersensitivity should only use nonlatex (synthetic) gloves. (Table-2)
- ✦ Should allergic contact or irritant dermatitis be diagnosed, subsequent exposure to the specific chemical(s) should be avoided to the extent feasible.
- ✦ Hand care in the form of topical moisturizers, corticosteroids and periods of glove avoidance also may be helpful in resolving the symptoms.

CONCLUSION

In summary, Latex (NRL) protein allergy, as well as other reactions associated with frequent wearing of gloves, can have potentially serious consequences for the dental worker. Latex products should be replaced with nonlatex alternatives for people who have a Type I (immediate) allergy to Natural Rubber Latex. In addition, there may be around 20% of the health care workers experiencing a delayed (Type IV) allergy or an irritant dermatitis caused by any one of the many chemicals or procedures used in

the medical and dental environment today, including NRL gloves.

The limited use of appropriate diagnostic and prevention strategies may cause many of the Latex allergic reactions that do occur in the dental environment to be misdiagnosed, misunderstood or ignored. The potential danger for sensitized but undiagnosed people who are routinely exposed to Latex allergens at work, at home and during medical or dental procedures underscores the need for definitive strategies toward professional awareness. The confusion about the immunological mechanisms of latex hypersensitivity and ignorance of the hazard posed by the latex protein - dusting powder nexus have limited the dental community in its ability to recognize symptoms, obtain definitive diagnoses and develop practicable strategies to protect itself and patients from allergic reactions in the dental environment.

Latex hypersensitivity is an area of emerging science. The dental team, therefore, should be knowledgeable about the signs, symptoms and diagnoses of these conditions and should consider means of reducing occupational exposure to the sensitizing or irritating agents.

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