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Occupational rhinitis and asthma to latex*

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SUMMARY

Occupational allergic rhinitis to proteins is increasing in importance. Two cases of latex-induced rhinitis are reported in a nurse's aid and a laborato,y technician. A crossed food allergy is quoted. Positive prick-tests and specific JgE to latex have been demonstrated in both cases. A double-blind nasal challenge test has been pe,formed with the rinse fluid from a brand of latex gloves. Clinical manifestations with endoscopic modifications of the nasal mucosa have been observed. A rise in nasal secreto,y eosinophilia has been demonstrated. The authors wish to draw attention to this new aetiology of occupational rhinitis insofar as it precedes the onset of work-related asthma as shown in one case. The eviction of wearing gloves is not sufficient as latex allergens are airborne. The eviction of ordinary latex gloves must be extended to all other workers in the same place and the use of powder-free gloves is advisable.

Key words: latex allergy, occupational rhinitis, double-blind nasal challenge test, secretory eosinophilia

INTRODUCTION

Occupational rhinitis due to biological proteins is a well-known entity (Rosenberg and Gervais, 1986). In types of rhinitis due to anm al dander - and also to foods from animal or vegetable sources, vegetable gums, wood dusts, et cetera - occupational rhinitis is often the first clinical symptom of respiratory allergy. The diagnosis of occupational rhinitis has to be established at an early stage in order to prevent the development of occupational asthma. Indeed, once the latter has developed, complete recovery may not be possible, even after avoidance of the offending allergen (Docker et al., 1897; Gandevia and Milne, 1970; Novey et al., 1980; Schumacher et al., 1981; Baur et al., 1982; Agrup et al., 1986; Rosenberg and Gervais, 1986; Leznoff et al., 1986; Nelson, 1987; Venables et al., 1988).

In this paper we report on two cases involving a new occupational allergen, latex. Respiratory allergy was documented by nasal challenge tests using double-blind methodology, bronchial challenge tests, and realistic challenge tests. These cases draw attention to the still underestimated possible incidence of occupational rhinitis to latex in all health-care-related or institutional occupations (the elderly, handicapped or children), but also in all modern food-processing industries.

CASE HISTORIES

Case 1

N.V., a 23-year-old woman with no remarkable previous history, a nurse's aide in a geriatric department for the last 3 years, was referred for assessment of recurrent anaphylaxis preceded by chronic rhinitis and conjunctivitis and intermittent dyspnoea of more than I-month duration. The first allergic event followed the wearing of latex gloves and involved conjunctivitis, urticaria on the forearms, and dyspnoea.

In the workplace, this patient was immediately treated with intravascular dexamethasone. She suspected the diagnosis of latex glove allergy and she stopped wearing latex gloves. Her rhinitis regressed. One month later, 2 h after eating uncooked cherries, she experienced abdominal cramps, sneezing, rhinorrhoea, conjunctivitis, and dyspnoea which culminated in an attack of asthma 5 h later, which was responsive to corticosteroids and anti-H$_1$ medication. Two weeks later, the same symptoms recurred in succession after the patient ate a banana, and three more episodes followed after she had eaten various foods, including chestnut paste.

After a 6-month period of avoidance of latex, the patient tried wearing latex gloves again and after a few minutes developed severe rhinoconjunctivitis with urticaria and dyspnoea. Upon

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admission to the hospital, she did not present with any skin or respiratory symptoms, arid physical examination was normal.

Case2

S.J., 35 years old, is a laboratory technician. She wore latex gloves till two years ago. She stopped using them because she had sneezing, pruritus of the hands, conjunctivitis and slight facial angioedema, but she continued working with colleagues who wear this type of gloves. She was sent to the outpatient division of allergology because of the chronic rhinitis. On admittance, nasal hyperreactivity was accentuated with sneezing, rhinorrhoea, and nasal congestion. She described also a food allergy, with rhinitis and facial angioedema occuring 30 min after the ingestion of a banana.

METHODOLOGY

AlJergological investigation included prick tests to the principal mites, grass pollen, tree pollen, molds, cat and dog dander, along with prick tests to the following foods: cherry, banana, avocado, kiwi fruit, chestnut, walnut, hazelnut, almond, apple, carrot, celery, beef, chicken, egg white and egg yolk, milk, cod, garlic, onion, corn, orange, pea, peanut, potato, rice, rye, crab, soy bean, melon, tuna, lysozyme, mushroom, wheat flour, sunflower seeds, and bakers' yeast. Prick tests were also performed with 3 latex extracts: Stallergen-Pasteur® (Stallergenes; Fresnes, France), Allerbio® (Allerbio; Varennes-en-Argonne, France), and an ammoniated natural rubber latex emulsion, which had been centrifugated twice, with an intermediary wash. The final concentration of rubber particles was 60% and that of ammonia 0.5%, and its density was 0.95 (information provided by Porges S.A.; Sarlat, France). The extracts from Stallergenes and Allerbio were used at 1:100 w/v. Other pricks were made through several brands of latex gloves. The criterion for positivity was a diameter of an oedematous reaction 50% greater than that of a positive control with phosphate-buffered saline. A negative control was made with diluent for allergenic solutions. Skin tests were supplemented with the RAST Phadebas Cap System and the human basophil degranulation test (HBDT; Gerard et al., 1981).

Challenge tests involved wearing a vinyl or latex gloves for 30 min using single-blind methodology, supplemented by a double-blind nasal challenge test (NCT): the instillation of physiological saline or different concentrations of latex solution. The latex solution was prepared according to Ownby's technique (Ownby et al., 1991). Briefly, small pieces of gloves were incubated overnight with phosphate-buffered saline (pH 7.4) by gentle stirring at room temperature, then dialysed. The protein concentration was measured by Dr. Guilloux (Institut Pasteur; Lyon, France) using the BCA protein assay kit (Pierce Chemical Co.; Rockford, U.S.A.). The level averaged 1 mg/ml. Instillations were made into the patient's right nostril (vials 1-3), and then the left nostril (vials 4-7), every 15 min (Case No. 1). For the second patient, vials A-D preceded vials 1-4. Pruritus, sneezing, and rhinorrhoea were evaluated on a severity rating scale: absent (O); slight (1); moderate (2); accentuated (3). The mucosa! presentation and the presence of serous secretions were rated by an ENT specialist. Lavage to recover nasal secretions was performed using a published technique (Jankowski et al., 1992) 1 h before and 24 h after the NCT, followed by a second lavage 1 h before and 1 h after the wearing of the glove (Case No. 1), and 1 h before and 2 h after the NCT in the second patient.

In Case No. 1, a bronchial challenge test to carbamyl choline and then to latex solution was performed with the monitoring of FEV. Peak expiratory flows (PEF) were measured during challenge tests using a Mini-Wright Peak Flow Meter.

RESULTS

Case 1

Pulmonary auscultation, 24-hour PEFs and the baseline volume/flow curve were normal. The test to carbamyl choline revealed the presence of non-specific bronchial hyperreactivity (PC_{20} = 1,100 μg).

Prick tests to inhalants were negative (confinned by a negative Phadiatop test). There was evidence of skin sensitization to banana (4 mm), tomato (3 mm), avocado (5 mm), walnut (5 mm), and kiwi fruit (3 mm). A prick test to chestnut was very strongly positive: 17 mm. It was followed 10 min later by a reaction of oedema and conjunctiva! hyperaemia with facial erythaema, rhinorrhoea, and nasal blockage. Prick tests to latex were positive. Among the different brands of latex gloves tested, only the brand worn by the patient was positive. RAST to latex was class IV (20.5 kU/1), RAST to avocado was 6.1 kU/1. RASTs were negative to other foods. The HBDT to chestnut was strongly positive (but negative to other foods).

A challenge test with vinyl gloves did not cause any reaction. The wearing of latex gloves resulted in the development of pruritus with urticaria! papules, then 10 min later rhinoconjunctivitis and after 25 min dyspnoea, with a 30% fall in FEV and a 70% decrease in the Median 50 flow. One hour later, an increase in nasal secretory eosinophilia was observed (Figure 1). A nasal challenge test was negative to instillation of physiological saline. Instillation oflatex resulted in pruritus with sneezing and rhinorrhoea starting with the first concentration of solution. Overall, the mean score with placebo was zero, and 5.25 with instillation of the allergenic solution. The nasal mucosa showed a congested presentation and there was profuse nasal secretion with the 1:10 concentration (Table 1). There was a distinct increase in local eosinophilia at t = 24 h (Figure 1).

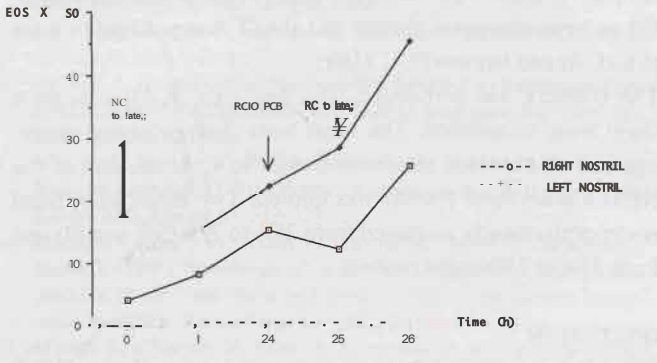

Figure 1. Variations of nasal secretory eosinophilia induced by nasal (NC) and realistic challenge (RC) to latex (Case No. 1).

Table 1. Clinical symptoms and aspect of the nasal mucosa during nasal challenge test. The agent was phosphate buffer in samples 1-4 and A-D, and latex in concentrations of 1:1,000, 1:100, 1:10, and undiluted, respectively, in samples Nos. 5, 6, 7 for NV and Nos. 1, 2, 3, and 4 for SJ.

samples		pruritus		sneezing		rhinorrhoea		mucosa! aspect		serous secretion	
NV	SJ	NV	SJ	NV	SJ	NV	SJ	NV	SJ	NV	SJ
		0	0	0	0	0	0	violin	congestion	1	0
1	A	0	0	0	0	0	0	violin	congestion	1	0
2	B	0	0	0	0	0	0	violin	congestion	1	0
3	C	0	0	0	0	0	0	erythema	congestion	1	0
4	D	1	0	1	0	0	0	erytbema	congestion	1	0
5	1	2	0	1	1	2	1	erytbema	congestion	1	1
6	2	3	0	0	3	2	3	congestion	congestion	2	1
7	3	3	0	3	3	3	3	congestion	congestion	3	2
	4	-	3	-	3	-	3	congestion	congestion	-	3

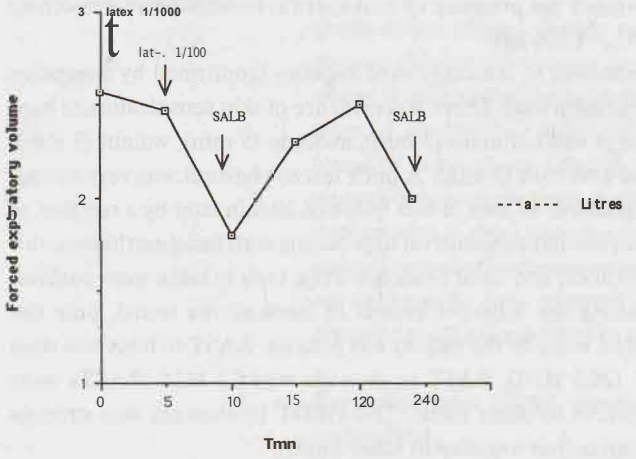

Figure 2. Variations in forced respiratory expiratory volume induced by bronchial challenge to latex (Case No. 1).

A bronchial challenge test, after 5-min inhalation of a 1:100 solution was followed by coughing with rhinorrhoea and bilateral sibilant rales and a fall in FEV. Bronchospasm was relieved by administration of salbutamol in aerosol spray (Figure 2). Bronchospasm recurred 5 h after the end of the test and again abated after inhalation of salbutamol. During the night, another episode of bronchospasm recurred, also reversible with treatment.

Case 2

All prick-tests to inhalants were negative, and atopy could be excluded. Prick tests were positive to three latex extracts and to different brands of gloves, even to two of them which are labelled as hypo-allergenic gloves, and RAST was positive to latex (6.6 kU/l) and banana (0.41 kU/l).

The DBNCT was performed. The first vials (A-D) induced a slight nasal congestion. The other vials (1-4) provoked sneezing, and rhinorrhoea increased from 2 to 4. At the end of the NCT, a pharyngeal pruritis was quoted. Two hours later, nasal eosinophilia clearly increased from 25% to 72% (left nostril) and from 31% to 71% (right nostril).

DISCUSSION

Skin allergy to latex has been recognized since Nutter (1979) reported a case of contact urticaria to latex gloves. The association of other clinical manifestations has been reported: angioedema, systemic urticaria, bronchospasm, and anaphylactic shock following physical examination or intra-operative procedures involving contact with the surgeon's gloves (Axelsson et al., 1987; Jaeger et al., 1992; Levy et al., 1992; Laxenaire et al., 1992). The risk of sensitization to latex appears significantly higher in medical professions (Turjanmaa, 1987; Beaudoin et al., 1990). However, the risk of respiratory allergy is hardly documented (Carillo et al., 1986; Marcos et al., 1991; Chatte et al., 1992; Kanny et al., 1992). Yet, attention is drawn to this possible condition by a study conducted on workers in the rubber-processing industry. Tarlo et al. (1991) noticed that some sensitized patients complained of symptoms of rhinitis, which he thought to be of irritative origin.

The patients reported here did not have any history of asthma or allergic background. They did not manifest any allergic reaction in response to classical prick tests to inhalants. Should the investigations have been stopped at that point, one could have concluded it to be a non-allergic vasomotor rhinitis (Case No. 1) or a NARES (Case No. 2). The rhinitis that occurred in the month of June could not be attributed to pollen allergy in the first subject. Furthermore, it regressed when the wearing of latex gloves was discontinued. A realistic challenge test (wearing a latex glove) induced rhinitis and indicated its association with asthma. The double-blind nasal challenge tests confirmed the diagnosis of allergic rhinitis to latex by the clinical symptoms and by the local increase in nasal eosinophilia, as is classically observed in allergic rhinitis (Pelikan, 1983). The BCT also confirmed the diagnosis of diphasic allergic asthma to latex, with an immediate reaction followed by a late-phase reaction. It has been shown that latex allergens behave like airborne allergens (Baur and Jager, 1990). Latex proteins are carried by the com-starch powder which is used to facilitate the slipping on of surgical gloves. Handling of such gloves emits a dry aerosol which causes respiratory symptoms. Consequently, the avoidance of wearing such gloves by persons affected is not sufficient and must be extended to all personnel that work in the same areas. The current use of powder-free latex gloves significantly decreases the level of airborne latex allergens, and could be a safe alternative (Tarlo et al., 1994).

Table 2. Biological agents implicated in occupational rhinitis.

allergens	involved occupations
garlic powder	farmers, food industry
laboratory animals (e.g., rats, mice, guinea pigs) urine and salivary antigens animal dander arthropods	zoologists, agronomists, bee-keepers, poultry farmers
wood dusts (e.g., red cedar, iroko)	joiners, carpenters
wheat, cereal dusts, mites, cockroach floum, molds	bakers
cow dander	farmers
green coffee bean	factory workers
Candida tropicalis	animal feeding
enzymes (e.g. bromelaine, papaine, *B. subtilis* protease, trypsine, amylase)	food, pharmaceutical and detergent industry
henne	hair dressers
sea-food products (e.g., fish, crab, shrimps, oysters)	food factory workers
vegetable gums (e.g. arabic, locust, psyllium, karaya)	food industry
animal and vegetal proteins (e.g., egg, soy bean, bovine serum albumin)	food industry, laboratory workers
sericine	hairdressers, perfumers
licorice powder	pharmaceutical industry

Food allergy cross-sensitivity has previously been described for several different foods (Levy et al., 1992). The most frequently mentioned foods are banana (34%), avocado (25%), and kiwi fruit (20%). The first case implicates other food: cherry and chestnut. Our patient's reactions were serious, requiring the use of epinephrine once and included ENT, ocular, skin, gastrointestinal, and respiratory symptoms. In the other patient, banana allergy was also responsible for rhinitis. Although they are manifestations of occupational allergy, these allergic reactions to foods can not be recognized as occupational injuries. It is important to inform physicians of such possible cross-sensitivity, suggesting allergy to certain foods, so that they can systematically screen for occupational exposure to latex.

The technique for preparation of a latex solution, proposed by Ownby, in our opinion is very satisfactory, provided that diluted solutions are used. The amount of soluble proteins of this rinsing fluid is not negligible: 1 mg/ml. Performing nasal and bronchial challenge tests now make it possible to establish the diagnosis of respiratory allergy to latex. This substance should now be added to the list of proteins recognized as causing occupational rhinitis (Table 2). Every case of rhinitis occurring in a subject exposed to latex should now call attention to the role played by exposure to this airborne allergen, in order to prevent occupational asthma.

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