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Allergic rhinitis (AR) in geriatric patients

Hayriye Karabulut *, Selcan Baysal, Baran Acar, Mehmet Ali Bababemez, Riza Murat Karasen

Department of Otolaryngology, Ankara Kecioren Research and Training Hospital, Vadi konutlari B Blok D, 4 Subayevleri Kecioren, 06130 Ankara, Turkey

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ABSTRACT

Allergic rhinitis (AR) can be defined as an inflammatory disease of the nose and the paranasal sinuses, characterized by a specific IgE-mediated hypersensitivity reaction. The aim of this study was to evaluate the correlation between the symptoms of AR and the prick test results in geriatric patients presenting with symptoms of AR by comparing these with those of a young control group. Thirty-two geriatric patients (Group 1) were analyzed retrospectively, and 37 patients (Group 2) were selected as the control group. Diagnosis of AR was made based upon the physical examination findings, nasal endoscopic examination findings and the skin prick test results. While the skin prick test positivity was 50% in Group 1, this rate was found as 75.7% in Group 2. The difference was found to be statistically significant ($p = 0.044$). A statistically significant difference was found between the two groups in terms of susceptibility to mugwort pollen and fish ($p = 0.048$, $p = 0.033$). In conclusion, in geriatric patients presenting with AR symptoms, systemic treatment should not be initiated before performing skin prick test, due to the adverse effects of the drugs.

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1. Introduction

The geriatric population is predicted to increase in the future according to the WHO. The rate of individuals above 65 years of age has been reported to be approximately 20% in Europe (Bom and Pinto, 2009). The long life expectation is considered to be related to decreased rate of infectious diseases owing to better hygiene, common antibiotic use and vaccination. Chronic diseases have an important place among factors that lead to deterioration in the quality of life and death in the geriatric population owing to the increase in life span in developed countries. Wide closed areas, use of artificial products, breeding domestic animals, living in damp houses and fungi in the environment generating along with modern life are among the factors triggering allergy (Merrett et al., 1980; Wuthrich et al., 1995). Vital functions and the lung capacity are decrease in individuals of 65 years and older (Harik-Khan et al., 1998). Allergic rhinitis (AR) can be defined as an inflammatory disease of the nose and the paranasal sinuses, characterized by a specific IgE-mediated hypersensitivity reaction, clinically arising following the exposure of the nasal mucosa to allergens. AR is characterized by sneezing, nasal obstruction, nasal itching, post-nasal drip and smell disorders. Ocular symptoms like eye itching, congestion, lividity, pulmonary symptoms like cough, dyspnea, wheezing, and dermatological symptoms such as eruption, itching, rash, and urticaria can accompany nasal symptoms in patients with AR.

Allergic diseases are known to change with age, gender, race and genetic factors. Skin test responses have been found to be of a low degree in infants, young children and those above 50 years of age (Edis et al., 2007). The skin prick test is a widely used diagnostic skin test to indicate the IgE-related reaction in determination of allergens that lead to symptoms in patients with AR. These tests are cheap, easily applicable and yield a rapid result. In this study, we aimed to evaluate the correlation between the symptoms of AR and the prick test results in geriatric patients presenting with symptoms of AR by comparing these with those of a young control group.

2. Subjects and methods

2.1. Patient characteristics and follow-up

Patients with the prediagnosis of AR who had been followed-up with the allergy test in the Otorhinolaryngology Clinic between January 2008 and April 2010 were included in the study. Of the 1700 patients who underwent the allergy test with the prediagnosis of AR, files of 32 geriatric patients were analyzed retrospectively. A total of 372 patients aged between 40 and 45 years were sorted according to the dates of presentation to the clinic and 37 patients were selected by number of 10 and its times as the control group. Age, gender, presence of nasal, ocular, pulmonary and dermatological symptoms were recorded.

* Corresponding author. Tel.: +90 0312 356 9000; fax: +90 312 356 9002.
E-mail addresses: hayriyekarabulut@gmail.com, drhayriye@hotmail.com (H. Karabulut).

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Diagnosis of AR was made based upon the physical examination findings, nasal endoscopic examination findings and the skin prick test results. Sneezing, runny nose, nasal obstruction and nasal itching, presence of serous secretion in the nasal cavity, pale nasal mucosa, edemateous, and pale or purplish conchae were interpreted in favor of AR. Patients were analyzed in terms of skin findings and presence of erythema, itching, urticaria and eruption and these were recorded. Caugh, dyspnea and wheezing were investigated as pulmonary symptoms. Itching, redness and edema were questioned as ocular symptoms.

Alyostal ST-IR (Stallegenes S.A. France) standard allergen extracts were used for the skin prick test. For the test, antihistamines had to be withdrawn 10 days previously, H2 receptor blockers had to be withdrawn 24 h previously, and antidepressant drugs withdrawn 20 days previously. Allergen extracts that were taken in standard doses in quick test applicators with 8 distinct edges were applied onto the skin after having cleaned the ventral part of the forearm with alcohol. The results were evaluated 15 min later. Histamine-HCl was used as positive control and isotonic NaCl was used as negative control. The validity criterion for the test was accepted as >3 mm for positive control and <3 mm for negative control. Skin reaction against the allergen with an enduration of >3 mm in diameter was accepted as a positive reaction (Polosa et al., 2005).

The most common 30 allergen extracts and positive and negative controls were applied using a total of 4 applicators onto the skin of forearm for the skin prick test. Two house dust mites, 3 fungal spores, 1 insect, 3 animal epithelia, 15 pollens and 6 food allergens were used.

The skin prick test was not applied on patients who had been treated with the diagnosis of asthma, or on those who had suspicion of asthma and who were on beta-blocker agents.

2.2. Statistical analysis

Statistical analysis was performed using the SPSS 15.0 program. Consistency of the data with a normal distribution was assessed using the Kolmogrov Simirnov test. Parametric measurements were elaborated by using the intergroup independent sample *t*-test and the non-parametric measurements were made using the Wilcoxon and the Mann–Whitney *U*-test. A $p < 0.05$ was considered statistically significant.

3. Results

Of the 69 patients, 32 were above 65 years of age (Group 1), and 37 were aged between 40 and 45 years (Group 2). Of the patients in Group 1, 21 were females (65.6%), 11 were males (34.4%); of the patients in Group 2, 27 were females (73%) and 10 were (27%) males, and a significant difference was not found between the two genders. Nasal symptoms were scored out of 7 points, ocular symptoms were scored out of 3 points and pulmonary symptoms were scored out of 3 points and comparisons were made. The total symptom scores have been presented in Table 1. Nasal symptoms are displayed in Fig. 1, and dermatological, ocular and pulmonary symptoms are displayed in Table 2. There was no significant difference between the groups in terms of symptoms on presentation and nasal examination findings.

Table 1
Mean total symptom scores in the 2 groups, mean ± S.D.

	Group 1	Group 2
Nasal symptoms	3.4 ± 1.6	4.1 ± 1.3
Eye symptoms	1.7 ± 0.8	1.6 ± 1.0
Pulmonary symptoms	1.3 ± 1.1	1.4 ± 1.0
Dermatologic symptoms	1.2 ± 1.5	1.4 ± 1.3

Notes: for all group-differences ($p > 0.05$).

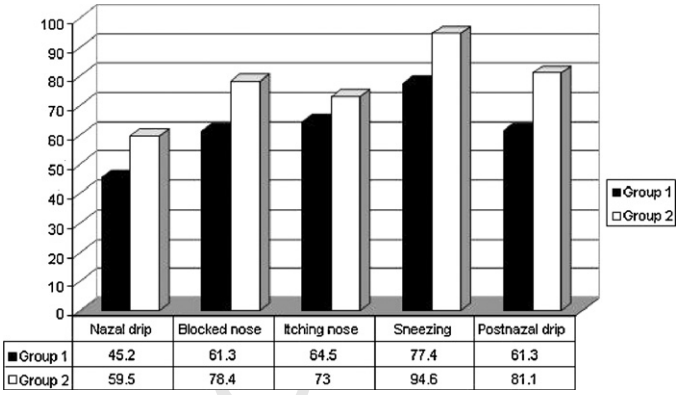

Fig. 1. Frequency of nasal symptoms ($p > 0.05$).

Table 2
Frequency (%) of ocular, pulmonar, and dermatologic symptoms.

	Group 1	Group 2
Itching eye	87.1	73.0
Red eyes	58.1	54.1
Eye edema	25.8	37.8
Coughing	54.8	54.1
Dyspnea	48.4	54.1
Wheezing	32.3	35.1
Skin eruption	25.8	40.5
Skin itch	40.9	48.6
Skin erythema	38.7	40.5
Urticaria	22.6	16.2

While the skin prick test positivity was 50% in Group 1, this rate was found as 75.7% in Group 2. The difference was found to be statistically significant ($p = 0.044$).

All the cases in both groups had at least one of the nasal symptoms. The rate of having one of the ocular symptoms was 90.3% in Group 1 and 83.3% in Group 2. The likelihood of having any of the pulmonary symptoms was 71% in Group1 and 78.4% in Group 2. The likelihood of having any of the dermatological symptoms was 51.6% in Group 1 and 64.9% in Group 2. The frequency of symptoms was similar in both groups ($p > 0.05$).

The number of the allergens to which patients with positive skin prick test were susceptible was 6.1 ± 5.8 (1–19) in Group 1 and 7.4 ± 6.1 (1–23) in Group 2, and no significant difference was found ($p = 0.32$). A statistically significant difference was found between the two groups in terms of susceptibility to mugwort pollen and fish. Susceptibility to mugwort pollen was found as 12.5% in the elderly group and 35.1% in the young group ($p = 0.048$). Susceptibility to fish was found to be 3.2% in the elderly group and 2.6% in the young group ($p = 0.033$).

4. Discussion

AR is an inflammatory disease of the mucous membranes developing related to type 1 hypersensitivity reaction. Type 1 hypersensitivity reaction is also referred to as early hypersensitivity, and IgE located on the surfaces of basophils and mast cells plays a role in this reaction (Prussin and Metcalfe, 2006). The allergen is usually the inhalant particles in AR and this phenomenon begins with T-cell, B-cell and plasma cell cascade. Specific antigen binds with two specific IgE antibodies on the surfaces of mast cells located in the mucosa of the respiratory and gastrointestinal

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system, subconjunctiva and subcutaneous layer of the skin. This IgE-mediated reaction then leads to mast cell degranulation and triggers the development of an inflammation by release of histamine, leukotriene, cytokine, prostoglandin and platelet activating factor. This is called the early phase or humoral reaction and occurs in 10–15 min following allergen exposure (Prussin and Metcalfe, 2006).

Release of histamine is responsible for sneezing, runny nose, itching, increase in vascular permeability, vasodilation and hypersecretion of the glands. Release of cytokines and leukotrienes causes the migration of inflammatory cells, mainly eosinophils, toward the affected area. This inflammatory response is the delayed phase or the cellular reaction, and begins 4–6 h after the first sensitization and it can prolong the allergic cascade up to 48 h and increase its severity. This response is mainly responsible for nasal congestion and post-nasal drip in AR (Kay, 2001). In our study, the rates of nasal congestion were found as 78.4% in the young and 61.3% in the elderly; post-nasal drip was found as 81.1% in the young and 61.3% in the elderly. When these results are taken into consideration, it can be concluded that allergic nasal symptoms are more common among the young compared to the elderly, despite the fact that this is statistically insignificant.

Although AR is common in the young population, its prevalence is gradually increasing among the elderly. The reason for this is desensitization developing in the past years and decrease in outdoor exposure. Studies have shown that higher exposure of the elderly to indoor allergens increases the amount of IgE against these allergens and mite allergen positivity in the skin prick test (Rogers et al., 2002; King and Lockey, 2003). In our study, the number of allergen sensitivity was found to be lower in the elderly compared to the young, which was consistent with the literature.

Concurrence of asthma and AR, which is a risk factor for development of asthma, is common and AR is present in 75% of asthmatic patients. Prevalence of asthma has been reported to vary between 10% and 40% in AR patients (Linneberg et al., 2002). Mortality rates are higher among asthmatic patients of 65 years and older compared to young asthmatic patients (Moorman et al., 2007).

Treatment of AR comprises environmental control, pharmacotherapy and immunotherapy. Intranasal and systemic antihistamines, intranasal and systemic corticosteroids, decongestants, intranasal anticholinergics, intranasal chromoline and leukotriene antagonists are used for pharmacotherapy (Howarth, 2003). In allergic disease, the main effects of histamine are upon histamine-1 (H-1) receptor; in hypotension, tachycardia, flushing and headache. Its effect is mediated by H-1 and H-2 receptors, and in skin itching and nasal congestion, its effect is mediated by H-3 and H-4 receptors (Tiligada et al., 2009).

Antihistamines prevent reactions induced by histamine, such as increased vascular permeability, smooth muscle contraction, increased mucus production and itching, by blocking the H1 receptor areas. Antihistamines are effective in the early phase reaction and decrease symptoms like sneezing, runny nose, and itchy nose (Kay, 2001). They have very few effects on nasal congestion developing as a result of delayed phase reaction.

First generation antihistamines should be used carefully in old patients due to their adverse effects including sedation, memory disturbances, psychomotor dysfunction and anticholinergic adverse effects, whereas second generation antihistamines have less effects on the central nervous system as they permeate the blood–brain barrier to a lower extent (Bousquet et al., 2003).

Of the second generation antihistamines, terfenadine and astemizole have cardiac adverse effects (Estelle and Simons, 1999). This is a factor restricting their use in the elderly. Intranasal antihistamines are effective on itching, rhinorrhea and sneezing symptoms. Azelastine used twice a day decreases seasonal AR symptoms not responding to oral antihistamines. It has adverse effects like mild sedation and metallic taste (Berger and White, 2003).

Medical history and diagnostic tests are used in the diagnosis of AR. Presence of 2 or more of the symptoms of watery rhinorrhea, sneezing, nasal obstruction and itchy nose lasting for more than 1 h in most days of the week should urge one to suspect AR. Skin test and serum specific IgE level are the diagnostic tests. Demonstration of susceptibility to specific antigens with the skin test is essential in the diagnosis of AR (Murphree and Kniker, 1979). The skin prick test is the most sensitive test that can be applied easily in the diagnosis of AR (Brown et al., 1985; Scolozz et al., 1989; Akbas and Saatci, 2003). Prevalence of AR decreases with age (Jones, 2004). Richards et al. (1992) reported that the incidence of AR decreased above the age of 45. In our study, while the positivity of the skin prick test were found to be 50% in the elderly, it was found as 70% in the young, which consistent with the literature.

AR can be defined as an inflammatory disease of the nose characterized with specific IgE-mediated hypersensitivity reaction, clinically arising following exposure of the nasal mucosa to allergens. This condition can also be defined as allergic rhinosinusitis as it also affects the paranasal sinuses (Guerra et al., 2002). Allergy is a predisposing factor for chronic rhinosinusitis (Sanders, 1971). Diagnostic tests must be performed for AR, especially in the treatment of the elderly, owing to its high morbidity.

Vasomotor rhinitis is a condition triggered by alterations in various smells, heat and pressure, and characterized with nasal obstruction, rhinorrhea and nasal congestion (Druce, 1998). Vasomotor rhinitis is non-AR, the prevalence of which increases with age and is related to autonomic dysregulation of nasal functions (Bickmore, 1981). Performing skin tests before initiating the treatment of AR considering the probability of vasomotor rhinitis is a safe way to avoid the adverse effects of the drugs, as it is not IgE-mediated (Li, 2002). In our study, although the symptoms were more frequent among the young compared to the elderly who had presented with symptoms of AR, the difference was not found to be statistically significant. The skin prick test is an important diagnostic tool for AR, and its importance is gradually increasing, especially in the geriatric population when adverse effects of the systemic drugs used for treatment are taken into consideration.

According to the results of our study, in geriatric patients presenting with AR symptoms, systemic treatment should not be initiated before performing skin prick test, due to the adverse effects of the drugs.

Conflict of interest statement

None.

References

Akbas, Y., Saatci, M.R., 2003. Monitoring the efficacy of immunotherapy by symptom scores and the skin prick test in patients with allergic rhinitis. Kulak Burun Bogaz Ihtis Derg. 10, 221–225 (in Turkish).
Berger, W.E., White, M.V., 2003. Efficacy of azelastine nasal spray in patients with an unsatisfactory response to loratadine. Ann. Allergy Asthma Immunol. 91, 205–211.
Bickmore, J.T., 1981. Vasomotor rhinitis: an update. Laryngoscope 91, 1600–1605.
Bom, A.T., Pinto, A.M., 2009. Allergic respiratory diseases in the elderly. Respir. Med. 103, 1614–1622.
Bousquet, J., Van Cauwenberge, P., Bachert, C., Canonica, G.W., Demoly, P., Durham, S.R., Fokkens, W., Lockey, R., Meltzer, E.O., Mullol, J., Naclerio, R.M., Price, D., Simons, F.E., Vignola, A.M., Warner, J.O., 2003. European Academy of Allergy and Clinical Immunology (EAACI). Allergic Rhinitis and its Impact on Asthma (ARIA). Requirements for medications commonly used in the treatment of allergic rhinitis. Allergy 58, 192–197.
Brown, C.R., Higgins, K.W., Frazer, K., Schoelz, L.K., Dyminski, J.W., Marinkovich, V.A., 1985. Simultaneous determination of total IgE and llergen specific IgE in serum by the MAST chemiluminescent assay system. Clin. Chem. 31, 1500–1505.

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Druce, H.M., 1998. Allergic and nonallergic rhinitis. In: Middleton, Jr., E., Ellis, E.F., Yunginger, J.W., Reed, C.E., Adkinson, N.F., Busse, W.W. (Eds.), Allergy. Principles and Practice. 5th ed. St. Louis, Mosby, pp. 1005–1016.

Edis, E.C., Tabakaodlu, E., Caḑlar, T., Hatipodlu, O.N., Altýay, G., 2007. Skin prick test results in patients from thrace region presenting with pulmonary symptoms. Med. J. Trakya Univ. 24, 12–16.

Estelle, F., Simons, R., 1999. H1-receptor antagonists: safety issues. Ann. Allergy Asthma Immunol. 83, 481–488.

Guerra, S., Sherrill, D.L., Martinez, F.D., Barbee, R.A., 2002. Rhinitis as an independent risk factor for adult-onset asthma. J. Allergy Clin. Immunol. 109, 419–425.

Harik-Khan, R.I., Wise, R.A., Fozard, J.L., 1998. Determinants of maximal inspiratory pressure. The Baltimore longitudinal study of aging. Am. J. Respir. Crit. Care. Med. 158, 1459–1464.

Howarth, P.H., 2003. Allergic and non-allergic rhinitis. In: Middleton, E.Jr., Ellis, E.F., Yunginger, J.W., Reed, C.E., Adkinson, N.F., Busse, W.W. (Eds.), Allergy. Principles and Practice, 6th ed., vol. II. St. Louis, Mosby, pp. 1253–1289.

Jones, N., 2004. Allergic rhinitis: aetiology, predisposing and risk factors. Rhinology 42, 49–56.

Kay, A.B., 2001. Allergy and allergic diseases. Second of two parts. N. Engl. J. Med. 344, 109–113.

King, M.J., Lockey, R.F., 2003. Allergen prick-puncture skin testing in the elderly. Drug Aging 20, 1011–1017.

Li, J.T., 2002. Allergy testing. Am. Fam. Physician 66, 621–624.

Linneberg, A., Henrik Nielsen, N., Frolund, L., Madsen, F., Dirksen, A., Jorgensen, T., 2002. The link between allergic rhinitis and allergic asthma: a prospective population-based study. The Copenhagen Allergy Study. Allergy 57, 1048–1052.

Merrett, T.G., Pantin, C.F., Dimond, A.H., Merrett, J., 1980. Screening for IgE-mediated allergy. Allergy 35, 491–501.

Moorman, J.E., Rudd, R.A., Johnson, C.A., King, M., Minor, P., Bailey, C., Scalia, M.R., Akinbami, L.J., 2007. Centers for Disease Control and Prevention (CDC). National surveillance for asthma: United States, 1980–2004. MMWR Surveill. Summ. 56, 1–54.

Murphree, J.T., Kniker, W.T., 1979. Correlation of immediate skin test responses to antigens introduced by multi-test and intracutaneous routes. Ann. Allergy 43, 279–285.

Polosa, R., Al-Delaimy, W.K., Russo, C., Piccillo, G., Sarvŕ, M., 2005. Greater risk of incident asthma cases in adults with allergic rhinitis and effect of allergen immunotherapy: a retrospective cohort study. Respir. Res. 28, 153.

Prussin, C., Metcalfe, D.D., 2006. 5. IgE, mast cells, basophils, and eosinophils. J. Allergy Clin. Immunol. 117, S450–S456.

Richards, S., Thornhill, D., Roberts, H., Harries, U., 1992. How many people think they have hay fever, and what they do about it. Br. J. Gen. Pract. 42, 284–286.

Rogers, L., Cassino, C., Berger, K.I., Goldring, R.M., Norman, R.G., Klugh, T., Reibman, J., 2002. Asthma in the elderly: cockroach sensitization and severity of airway obstruction in elderly nonsmokers. Chest 122, 1580–1586.

Sanders, S.H., 1971. Allergic rhinitis and sinusitis. Otolaryngol. Clin. North. Am. 4, 565–578.

Scolozz, R., Boccafogli, A., Vincentini, L., Baraldi, A., Bagni, B., 1989. Correlation of chemiluminescent (CLA) with RAST and skin prick test for diagnosis of inhalant allergic diseases. Ann. Allergy 62 193a–193b.

Tiligada, E., Zampeli, E., Sander, K., Stark, H., 2009. Histamine H3 and H4 receptors as novel drug targets. Expert Opin. Invest. Drug 18, 1519–1531.

Wuthrich, B., Schindler, C., Leuenberger, P., Ackermann-Liebrich, U., 1995. Prevalence of atopy and pollinosis in the adult-population of Switzerland and (Sapaldia study). Int. Arch. Allergy Immunol. 106, 149–156.

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