Skin Prick Testing and Immunotherapy in Nasobronchial Allergy: Our Experience

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Abstract In the present study of 331 patients suffering from signs/symptoms of nasal allergy, 9 nasal polyps, allergic conjunctivitis and allergic asthma, who were referred by clinician, were taken up for diagnosis of allergy with skin prick test (Ten et al. Mayo Clin Proc 70(8):783–784, 1995) and subjective improvement of patients by immunotherapy. Out of 331 patients tested 321 patients showed significant positive results and rest of them tested negative for allergy. High incidences of positive results were noted in third and fourth decade age of patients. Dust and pollen allergens were positive in most of the patients compare to insect's antigens. Among the pollen antigens tested, those of *Parthenium hysterophorus* was found to be the most common (30%) followed by *Prosopis juliflora* (25%). 75.22% patients were positive to house dust, 19.33% patients were positive to *Aspergillus moulds*. *D. farinae* was the most common offender amongst the mites. Patients who attended, allergy clinic in Kamineni Hospitals during the last 4 years were referral patients, who had been on prolonged treatment without much relief. Immunotherapy was advised to patients who were having perineal allergy, in whom, medical treatment had become only palliative. Immunotherapy injections were administered subcutaneously, and their results were monitored.

Keywords Allergy · Skin prick test · Dusts · Pollens immunotherapy

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Introduction

The concept “allergy” was originally introduced in 1906 by the, Viennese pediatrician Clemens Von Pirquet after he noted that some of his patients were hypersensitive to normally innocuous entities such as dust, pollen, or certain foods [1]. Pirquet called this phenomenon “allergy” from the Greek words *allos* meaning “other” and *ergon* meaning “work”. Historically, all forms of hypersensitivity were classified as allergies, and all were thought to be caused by an improper activation of the immune system. Later, it became clear that several different disease mechanisms were implicated, with the common link to a disordered activation of the immune system. In 1963, a new classification scheme was designed by Philip Gell and Robin Coomb that described four types of hyper sensitivity reactions known as Type I to Type IV hypersensitivity [2]. With this new classification, the word “allergy” was restricted to only type I hypersensitivities (also called immediate hypersensitivity), which are characterized as rapidly developing reactions.

A major breakthrough in understanding the mechanisms of allergy was the discovery of the antibody class labeled immunoglobulin (IgE) Kimishige Ishizaka and co-workers were the first to isolate and describe IgE.

Allergen immunotherapy (also called allergy vaccine therapy) [7] involves the administration of gradually increasing quantities of specific allergens to patients with IgE-mediated conditions until a dose is reached that is effective in reducing disease severity from natural exposure. The major objectives of allergen immunotherapy are to reduce responses to allergic triggers that precipitate symptoms in the short term and to decrease inflammatory response and prevent development of persistent disease in the long term. Allergen immunotherapy is safe. An

observation period of 20–30 min after injection is mandatory. Desensitization or hypo sensitization is a treatment in which the patient is gradually vaccinated with progressively larger doses of the allergen in question. This can either reduce the severity or eliminate hypersensitivity altogether. It relies on the progressive skewing of IgG antibody [4] production, to block excessive IgE production seen in atopy. In a sense, the person builds up immunity to increasing amounts of the allergen in question. Studies have demonstrated the long-term efficacy and the preventive effect of immunotherapy in reducing the development of new allergy. A review by the Mayo Clinic in Rochester confirmed the safety and efficacy of allergen immunotherapy [2] for allergic rhinitis and conjunctivitis, allergic forms of asthma, and stinging insect based on numerous well-designed scientific studies. Additionally, national and international guidelines confirm the clinical efficacy of injection immunotherapy in rhinitis and asthma, as well as the safety, provided that recommendations are followed.

Materials and Methods

The study was performed on 331 patients who were suffering from recurrent attacks of chronic sinusitis and nasal polyposis with associated asthma in various age groups of patients. Patients with at least two of the following symptoms—running nose, sneezing, nasal stuffiness, nasopharyngeal irritation, itching, including all patients of sino nasal polyps were taken for study. These symptoms may be recurrent—at least four times in a year or chronic symptoms present for more than 4 weeks.

All patients were advised to stop the use of anti-histamines, and corticosteroids preparation 5–6 days prior to testing [12]. Selection of allergens are determined by detailed clinical history of exposure to allergens, prevalence of allergens in patients area of residence, and work. Clinical history was also taken in relation of their symptoms to seasonal variations, their occupation and food habits etc. Eosinophil counts and serum IgE levels were studied in all patients.

Skin Prick Testing

All patients were advised to stop the use of antihistamines and corticosteroids 5–6 days prior to testing. For assessing the presence of allergen specific IgE antibodies skin prick testing is preferred because of more sensitivity and its high specificity [11], simple to use, less expensive and without any complications. Skin prick testing relies on the introduction of a very small amount of allergen extract into the epidermis using a sterile lancet along with the negative

control (saline) and positive control (histamine dihydrochloride). Results of the skin prick testing were noted after 20 min after testing, and diameter of the resulting wheal and erythema in mm were recorded [3]. By convention, a positive test is one in which, the mean of the two wheal diameters is at least 3 mm, greater than the negative control (saline), although if the reaction is as small as this, the relevance of the response is in question. Positive and negative controls are critical to enable interpretation of test results respectively.

Skin prick testing is contraindicated if:

A diffuse dermatological condition is present. Testing must be performed on normal healthy skin.

Severe dermatographism is present.

Patient cooperation is poor.

The patient is unable to stop using drugs that may interfere with the test result.

Skin prick testing is inadvisable if:

Persistent severe or unstable asthma is present.

There is a severe initial reaction (anaphylaxis).

The patient is pregnant.

The patient is taking certain types of drugs:

Antihistamines, tricyclic antidepressants, some antinauseants, and topical steroids (but not oral steroids) can interfere with results;

β -blockers and angiotensin-converting enzyme inhibitors should be used with caution.

Results

All allergens tested showed high incidence in the third and fourth decades (Table 1). Dust and pollen were the major offenders, and dust were positive in 87.72% and pollens were tested positive in 75.83% patients (Table 2). Incidence of allergy to Parthenium pollen was high (30.21%) of patients (Table 3). Mosquito allergy (18.42%) was common among the insects allergens (Table 4). Highest number of patients (75.22%) were positive to house dust allergens followed by cotton dust 67.97% (Table 5) 19.93% of patients were positive to *Aspergillus fumigatus* mould antigen compared to *Aspergillus niger* (7.78%), *Aspergillus flavus* (8.41%) moulds antigen (Table 6).

D. farinae was the most common offender among the mites. Prawns antigens were tested positive in majority of the patients with food allergy.

Immunotherapy

Immunotherapy was advised [4–9] to patients who are having perineal allergy, in whom medical treatment has

Table 1 Age and Sex

Age group (years)	Male	Female	Total
0–10	2	–	2 (0.06)
11–20	32	21	53 (16.01)
21–30	51	37	88 (26.10)
31–40	41	52	93 (28.09)
41–50	28	31	59 (17.82)
51–60	16	14	30 (9.06)
61–70	4	–	4 (01.20)
71–80	2	–	2 (0.06)
Total	176	155	331

28.09% in 31–40 age groups of patients

Table 2 Comparative percentage study of allergens

Allergen	Total positives
Pollen	251 (75.83%)
Insects	74 (22.35%)
Dust	297 (89.72%)
Moulds	140 (42.29%)
Mites	244 (73.71%)
Food	214 (64.65%)
Animal Epith.	115 (34.74%)

Dusts and pollens were positive in most of the patients

Table 3 Percentage incidence of pollen allergens

S. no.	Pollen types	Positives
1	<i>Chenopodium album</i>	34 (10.27%)
2	<i>Prosopis juliflora</i>	85 (25.67%)
3	<i>Cocos nucifera</i>	35 (10.57%)
4	<i>Acacia arabica</i>	36 (10.87%)
5	<i>Brassica nigra</i>	51 (15.40%)
6	<i>Parthenium hysterophorus</i>	100 (30.21%)
7	<i>Eucalyptus</i> spp.	68 (20.54%)

Parthenium hysterophorus is prevalent (30.21%) among the pollens tested

Table 4 Percentage incidence of insect allergens

S. no.	Insect allergen	Positive tests
1	Cockroach	12 (18.42%)
2	House fly	7 (02.11%)
3	Mosquito	61 (18.42%)

Mosquito antigens are positive in 61/331 (18.42%) patients

became only palliative, and those patients who cannot avoid allergens. Immunotherapy injections are administered subcutaneously.

Table 5 Percentage incidence of dust allergens

S. no.	Dust allergen	Positive tests
1	House dust	249 (75.22%)
2	Cotton dust	225 (67.97%)
3	Hay dust	171 (51.66%)
4	Wheat flour	65 (19.63%)
5	Paper dust	173 (52.26%)

House dust is positive in 75.22% of dust antigens

Table 6 Percentage incidence of fungal allergens

S. no.	Mould varieties	Positive tests
1	<i>Aspergillus fumigatus</i>	64 (19.33%)
2	<i>Candida albicans</i>	27 (8.41%)
3	<i>Fusarium solani</i>	22 (6.85%)
4	<i>Aspergillus niger</i>	25 (7.78%)
5	<i>Aspergillus flavus</i>	27 (8.41%)

64 (19.33%) patients were positive to *Aspergillus fumigatus* mould antigen compared to other moulds

Immunotherapy set of four vials:

Vial I—1:25000 (0.004% w/v)

Vial II—1:2500 (0.04% w/v)

Vial III—1:250 (0.4% w/v)

Vial IV—1:50 (2% w/v)

Immunotherapy Feedback

Allergic rhinitis:

Very good control of symptoms in 59%

Fairly good control of symptoms in 24%

Poor control of symptoms in 16%

Other associated allergies

Allergic conjunctivitis—(36.56%)

Asthma/bronchitis—(32.02%)

Conclusion

More than 80% of patients with sino-nasal polyps were tested positive.

Although allergen injection immunotherapy (AII) has been around for nearly a century, many doctors are still not aware of the evidence for its efficacy. About 15,000 patients are treated by allergen injection immunotherapy (AII) in Australia each year, with about 300,000 injections administered annually for a wide range of dust mite; five-grass pollen mix; 12-grass pollen mix; cat; couch grass, ryegrass

and plantain pollens; *Alternaria* mould; cockroach; and olive/privet pollen. Patients receive regular subcutaneous doses of the allergens to which they are allergic, often for 3–5 years [10].

To date, about 200 completed randomized controlled trials have examined the question of whether AII is an effective treatment for allergic airway disease. Based on National Health and Medical Research Council levels of evidence, AII significantly reduces symptoms and medication usage for allergens. The 10 most commonly prescribed allergen vaccines in Australia are house dust in both allergic rhinitis and asthma, although the former is the usual indication in Australia for this intervention.

Number of patients who attended, allergy clinic in Kamineni Hospitals during the last 4 years are referral patients, who had taken prolong treatment without much relief from their physicians. We have advised immunotherapy to patients who are having perineal allergy, in whom medical treatment has become only palliative, and those patients who cannot avoid allergens.

As per immunotherapy feed back there was a very good control of symptoms in 59% of our patients, good control in allergic conjunctivitis 36.50% of patients and in 32% of patients suffering from allergic asthma and bronchitis.

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