THE ROLE OF SKIN PRICK TESTS IN ALLERGIC RHINITIS AND ASTHMA

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ABSTRACT

There is an increasing worldwide and regional prevalence of allergic rhinitis and asthma. Aeroallergens are important triggers in allergic rhinitis and asthma although other genetic and environmental factors also play a role in ongoing airway inflammation. Up to 20-30% of patients with allergic rhinitis have asthma. Up to 60% of patients with asthma have concomitant allergic rhinitis. Up to 50% of patients with atopic eczema develop asthma. Identification of aeroallergens enables us to target those patients where reduction of exposure to these allergens in the household, school and/or workplace needs to be considered. Another purpose of aeroallergen identification is the treatment of allergic rhinitis/asthma using these allergens in patients with persistent symptoms or where pharmacotherapy has failed (specific immunotherapy, SIT). In clinical practice, there are two main ways to identify aeroallergen sensitization in an atopic patient: in-vivo test (skin prick test) and in-vitro test (blood test for allergen specific IgE level). Standardised, commercially available preparations are available locally. Skin prick tests (SPT), properly performed are the most convenient and least expensive method for detection of allergic reactions. However, SPT should not be used solely to diagnose allergic rhinitis and asthma, both of which remain clinical diagnoses.

Keywords: allergen, allergy, house dust, immunotherapy, pollen, spores

INTRODUCTION

Various environmental aeroallergens are known to play a role in triggering or exacerbating allergic rhinitis, asthma and atopic eczema, although these are often not the sole cause of these chronic inflammatory disorders. In children, these 3 disorders form part of the "atopic march" where food allergy and atopic eczema usually present during infancy and the first 3 years of life, followed by resolution of food allergy and the development of inhalant allergies (allergic rhinitis and asthma).

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Epidemiological studies have shown that the worldwide prevalence of allergic rhinitis ranges from 5-50%. Up to 20-30% of patients with allergic rhinitis have asthma and up to 60% of patients with asthma have concomitant allergic rhinitis[1]. Up to 50% of patients with atopic eczema develop asthma, 50% develop symptoms during first year of life, and 30% of patients develop symptoms between ages of 1-5 years.

Local community-based epidemiological studies have shown that:

- overall prevalence of rhinitis in Singapore was 13.2%[2].
- prevalence of rhinitis in children in 1997 was 44%[3] and this remained unchanged in 2001[4].
- prevalence of childhood wheeze, a surrogate marker for asthma, in 1997 was 16.6% (ages 6-7 years old) and 9.9% (ages 12-15 years old)[3]. In 2001, this was 10.2% and 11.9% respectively[4].
- prevalence of adult asthma has been reported to be 2.4% in men and 2.0% in women[5].

The identification of aeroallergens is important for several reasons:

- reducing the atopic patient's exposure to these allergens
- reducing household, school and/or workplace exposure to these allergens especially where there is a high risk of allergic rhinitis and asthma developing in children of atopic parents
- treatment of allergic rhinitis/asthma using these allergens in patients with persistent symptoms or where pharmacotherapy has failed (specific immunotherapy, SIT).

However, aeroallergen skin testing should not be used solely to diagnose allergic rhinitis and asthma, both of which remain clinical diagnoses.

EPIDEMIOLOGY OF LOCAL AEROALLERGENS

The major environmental aeroallergens in Singapore in order of importance[6,7] include:

- house dust mite: the allergens are present within the droppings of 3 main mite species i.e. *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae* and *Blomia tropicalis.*
- cockroach: the allergens are present within the droppings.
- cat and dog dander: the allergens are present within the saliva and skin flakes.
- grass and tree pollen: the common allergens in Singapore include oil palm pollen and resam fern spore. These airborne pollens are usually present year round, in contrast

to grass and tree pollen in western countries (e.g. birch and timothy grass pollen) where these appear in spring or summer, resulting in "hay fever".

- moulds: these are less of a problem locally compared to western countries due to differences in the types of housing and furnishings used (e.g. wooded houses, carpets and wallpaper in homes in the west which may easily become damp).

In a recent retrospective study of 123 consecutive adults who presented to our service between 1st January 2003 and 31st October 2004 for evaluation of inhalant allergy, 95.3% had allergic rhinitis, 19.6% asthma and 16.8% atopic eczema. Eighty-four percent of patients lived in high-rise apartments, including 75% in public housing. The most common aeroallergens to which patients were sensitised were *Dermatophagoides spp*. (70%), *Blomia tropicalis* (69.2%), cockroach (40.2%), cat dander (12.1%), Bermuda grass (10.3%), dog (7.5%) and oil palm pollen, *Elaeis guineensis* (8.2%). Sixty-seven (62.5%) patients were sensitised to both *Dermatophagoides spp* and *Blomia tropicalis.* Sensitisation to *Curvularia spp* (6.1%), moulds (4.7%) and resam-fern spores, *Dicranopteris linearis* (2%) were uncommon.

DIAGNOSTIC TESTS

In clinical practice, there are two main ways to identify the presence of aeroallergen sensitisation (specific IgE production to the allergen in question) in an atopic patient: an in-vivo test (skin prick test) or in-vitro test (blood test for allergen specific IgE level). These are available locally using standardised, commercially available preparations.

Skin prick tests (SPT), when properly performed are considered to be the most convenient and least expensive method for detection of allergic reactions[8,9]. However, the proper interpretation of results requires a thorough knowledge of the history and physical findings. A negative test is useful as this means that the patient is unlikely to have clinical allergy to the allergen tested. A positive test alone however does not confirm a definite clinical sensitivity to the allergen (e.g. positive SPTs to house dust mites in the absence of any symptoms of allergic rhinitis or asthma). Our group has previously demonstrated that even among healthy local adults, 52.4% developed positive SPT to D. farinae and 11.7% developed positive SPT to at least one food extract tested[10]. Though SPT seems easy to perform, poor technique may result in false-positive and false-negative results. Therefore, SPT should only be done by trained personnel and only when a physician is immediately available to treat systemic reactions should they occur, the risk of which is relatively low.

The advantages of the SPT are that the result is available within 20 minutes, it can be directly visualised by the patient, and in children this is much less traumatic than venepuncture for blood tests. It is also cheaper than the blood tests for allergen specific IgE.

The disadvantages include the need to stop certain drugs like short and long-acting antihistamines for 3-7 days before the skin test, and inability to do the test if the patient has severe atopic eczema or dermographism. Under these circumstances, the only alternative would be to measure serum allergen specific IgE levels using blood tests.

The CAP specific IgE test is such a test. It is a fluorescent enzyme immunoassay (FEIA) and not a radioallergosorbent (RAST) test. Although specific, this test is not as sensitive as SPT. It may be falsely elevated in highly atopic individuals who have high total serum IgE levels to begin with.

The SPT should not be confused with patch tests which are often used to diagnose occupational and contact allergens that trigger type IV (delayed) hypersensitivity type reactions presenting as contact dermatitis/eczema. These are usually available in dermatology clinics.

The choice of the allergens to be tested is important and must be based on the aerobiology of the local environment. Inappropriate choice of allergens for SPT or specific IgE testing is a waste of resources. For example, testing to birch pollen should not be carried out for a local patient who has never lived in temperate countries because birch pollen is not part of the aerobiology in Singapore or the tropics. Food allergens have little role in triggering allergic rhinitis and asthma with only 6-8% of childhood asthma and 1% of adult asthma respectively induced by food[11]. As such, a panel of SPT for food allergens should not be used routinely in the evaluation of patients with allergic rhinitis or asthma but without any history suggestive of IgE-mediated food allergy.

THE ROLE FOR AEROALLERGEN AVOIDANCE

According to the Ministry of Health Clinical Practice Guidelines on asthma, "asthma symptoms, peak expiratory flow rate and bronchial hyper-responsiveness (BHR) improve when patients avoid environmental allergens to which they are allergic" (grade A, level 1a)[12]. Controlled trials have consistently reported a decrease in symptoms and BHR if allergen levels are decreased beyond 6 months[13-16]. However, confusion on the role of aeroallergen avoidance has arisen as several recent controlled trials showed that these measures were ineffective. It should be noted that many of these studies, which suggested that aeroallergen avoidance was ineffective, did not actually decrease mite allergen levels to low enough levels or were of very short duration of less than 3 months. Furthermore, evidence from experiments in which patients were transferred to a sanatorium or an "allergen-free" hospital room where there was a greater than 90% decrease in allergen level consistently showed impressive reduction in symptoms and BHR[17-19].

Therefore, the World Allergy Organisation (WAO) in its document "Guidelines for Prevention of Allergy and Allergic Asthma[20]" recommends detailed aeroallergen avoidance measures which can be downloaded for free from the website http://content.karger.com/ProdukteDB/Katalogteile/issn/_1018_2438/FLwaogui.pdf. Aeroallergen avoidance can only be effective if efforts are comprehensive and persistent.

THE ROLE FOR SPECIFIC IMMUNOTHERAPY (SIT)

There is grade A evidence from randomized control trials that subcutaneous SIT is effective in the treatment of allergic rhinitis and asthma[21], although the risk of adverse effects including anaphylaxis must be considered when using SIT for asthma[22]. Although there is increasing evidence from randomised control trials in Europe that sublingual immunotherapy is also effective for allergic rhinitis, a recent meta-analysis could not confirm this[23].

CONCLUSIONS

The role of SPT in allergic rhinitis and asthma is not for diagnosis of these disorders, but rather for identification of potential environmental triggers. Aeroallergen identification is important in the management of allergic rhinitis and asthma.

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