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Research Article

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The Role of Radioallergosorbent Testing (RAST) Early in the Management of Atopic Dermatitis in Children and Adults Referred to Secondary Care in the United Kingdom

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Abstract

Aim: *To evaluate the importance and relevance of doing radioallegrosorbent testing (RAST) for patients referred with atopic dermatitis (AD) to secondary care for specialist dermatological advice and investigation.*

Background: *Atopic dermatitis is usually diagnosed by Primary Care General Practitioners and treated using a stepped approach. Referral to secondary care is considered when it is not controlled with optimal treatment or if an allergy is suspected. Radioallegrosorbent testing is useful for identifying trigger factors however current literature lacks evidence for the extent to which RAST testing can improve patient symptoms.*

Method: *Standard RAST testing was requested for all patients referred to secondary care with atopic dermatitis. Allergens tested included: dairy products, house dust mite, grass, nuts, seafood, cereals, dog dander and cat epithelium.*

Results: *RAST results showed that 92.3% of children and 60.7% of adults had high total lgE levels. The proportion of children with high serum specific lgE for the allergens tested were as follows: house dust mite (60.4%), grass (50%), dairy/cow's milk (39.5%), nuts (29.1%), dog dander (16.6%), cat epithelium (12.5%), egg (10.4%), fish/seafood (6.2%), wheat (6.2%), and soya (2.0%). The results for the adults tested were as follows: house dust mite (64.7%), grass (58.8%), cat epithelium (29%), dog dander (23%), nuts (11.7%), egg (11.7%), cow's milk/dairy (5.8%), wheat/soya (0%). On follow-up, all patients reported an improvement in their AD after implementing allergen avoidance strategies.*

Conclusions: *RAST testing is a valuable clinical test that should be considered early to investigate patients with AD for relevant allergens that may be exacerbating their symptoms and causing resistance to first line treatment.*

Keywords: RAST testing, Atopic dermatitis (AD), Allergy, lgE

Introduction

Atopic dermatitis (AD) is a chronic itchy inflammatory skin condition with hereditary predis position that affects around 20% of children and 2-3% of adults in the UK [1,2,3]. It is usually diagnosed by primary care general practitioners who also assess the severity of the disease, based on patient history and examination, to help guide initial treatment. For long term management a stepped approach is used. This ensures that treatment is always adjusted, from the baseline therapy of emollient sand mild potency topical corticosteroids, according to the severity of symptoms experienced by the patient. The clinical picture of AD can sometimes be complicated by other factors including psycho-emotional problems, environmental triggers and bacterial or viral infections [4].

Referral to a dermatologist in secondary care is considered when AD is not controlled with optimal treatment or if an allergy is suspected, amongst other indications [5]. Patients and care givers often suspect allergies to be causing or worsening symptoms but can't always specify the trigger(s). Contact, food and inhalant allergens are known to precipitate or worsen flares therefore accurate identification and subsequent avoidance of these potential triggers is an important part of management [6].

Many tests such as skin prick testing, radioallegrosorbent testing (RAST), and food challenge and patch tests can help to identify and confirm trigger factors. Measuring allergen specific lgE is thought

to be a relevant method of identifying triggers because IgE is a key mediator of allergic reactions. Analyses of skin lesions from patients with AD show a predominance of Th2 cytokines including IL-4, IL-5 and IL-13. IL-4 and IL-13 are known to promote class switching of B cells to the IgE isotope. Specific allergens bind to IgE that then cross link high affinity FcERI receptors on mast cells causing release of preformed inflammatory mediators [7]. This gives rise to the established signs and symptoms of AD. The higher the concentration of allergen specific IgE antibodies detected, the higher the probability of symptoms being expressed [8,9].

However, current National Institute of Health and Care Excellence (NICE) guidelines provide limited guidance on which tests should be used to identify relevant allergens for patients with AD. Other commercially available tests that are not recommended, due to the lack of scientific evidence supporting their use, include allergy testing kits such as hair analysis tests, applied kinesiology tests and electro dermal tests (VEGA) [5,10].

Method

Fifty-two patients under the age of 12 and twenty-eight adults over the age of 18 with AD, referred to secondary care, were enrolled. Standard RAST testing was requested for all. This included: dairy products, house dust mite, grass, nuts, seafood, cereals, dog dander and cat epithelium. The result and level of IgE (IU/ml) was graded as follows: negative if IgE (IU/ml) is less than 0.35, Grade 1: 0.35-0.69, Grade 2: 0.70-3.49, Grade 3: 3.50-17.49, Grade 4: 17.50-52.49,Grade 5: 52.50-99.99, Grade 6 >100.

RAST testing involves collecting two vials of blood from a patient. One vial is used to measure the total serum IgE level. The other is divided in petri dishes that have radiolabeled allergens added to them.

Results

RAST results showed that 48 out of 52 (92.3%) of children (Figure 1a) and 17 out of 28 (60.7%) of adults (Figure 1b) had high total IgE levels.

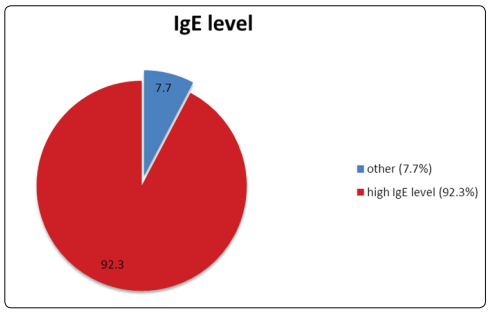

Figure 1a: Percentage of pediatric patients with AD showing high IgE level

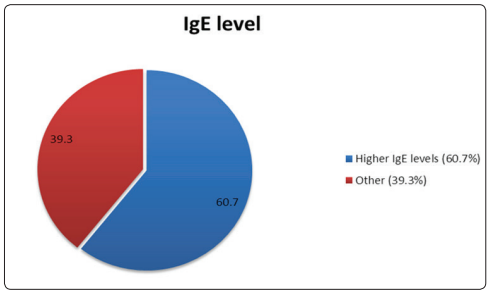

Figure 1b: This pie chart demonstrates the high abundance of adult patients with atopic eczema with elevated levels if immunoglobulin E.

The proportion of children with high serum specific IgE (Figure 2a) for the allergens tested were as follows: house dust mite (60.4%), grass (50%), dairy/cow's milk (39.5%), nuts (29.1%), dog dander (16.6%), cat epithelium (12.5%), egg (10.4%), fish/seafood (6.2%), wheat (6.2%), and soya (2.0%). The results for the adults (Figure 2b) tested were as follows: house dust mite (64.7%), grass (58.8%), cat epithelium (29%), dog dander (23%), nuts (11.7%), egg (11.7%), cow's milk/dairy (5.8%), wheat/soya (0%).

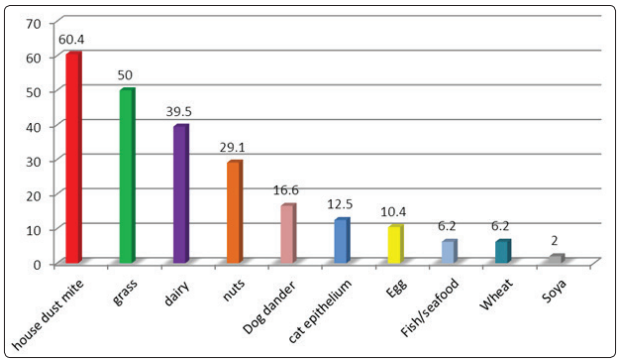

Figure 2a: Percentage of high IgE level for individual allergen item tested in pediatric patients

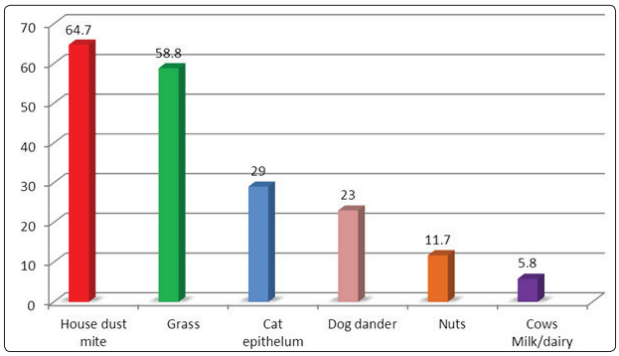

Figure 2b: Percentage of high IgE level for individual allergen item tested in adults showing a high percentage for house dust mite, grass and common pets

As for the severity level, the following proportions of children (Figure 3a) had scoring levels of IgE above 52.50 (IU/ml) (Grade 5 and 6): house dust mite (47.9%), nuts (25%), dairy products/egg (7.4%) and grass (3.7%).

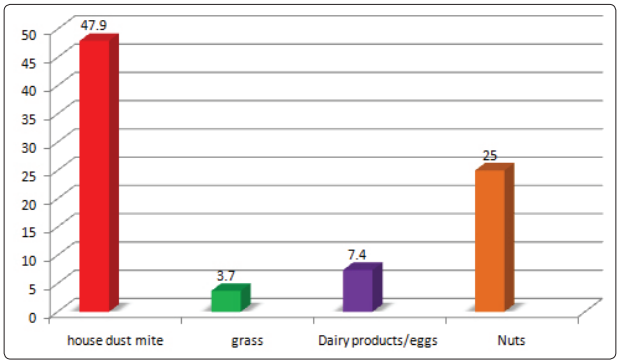

Figure 3a: Percentage of IgE level for various allergens tested scoring severe grade 5&6 (RAST) in the pediatric group

In the moderate grading of severity (Figure 3b), the following proportions of children had scoring levels of lgE within the range of 3.5-52.49 IU/ml (Grade 3 and 4): dairy products/egg (25%), house dust mites (17%), grass (14.5%), cat epithelium (14.5%), nuts (12.5%), dog dander (12.5%), wheat (4.5%) and soya all (2.0%).

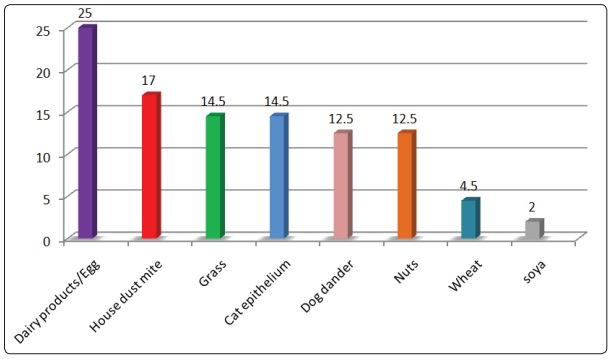

Figure 3b: Percentage of IgE for various allergens tested scoring moderate grade 3&4 in the paediatric group

In adults, results of individual specific lgE among those patients who tested positive was as follows, starting with the highest, house dust mite (64.7%), grass (58.8%), cat epithelium (29%), dog dander (23%), nuts (11.7%), egg (11.7%), cow's milk/ diary (5.8%), wheat/ soya (0%). As for the severity level, the following proportions of adults (Figure 4a) had scoring levels of lgE above 52.50 (IU/ml) (Grade 5 and 6): house dust mite (17.6%) and grass (5.8%).

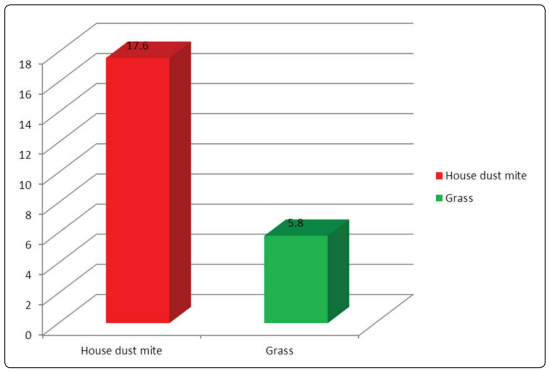

Figure 4a: Percentage of IgE levels for various allergens tested scoring severe grade 5&6 (RAST)

In the moderate grading of severity, 3.5-52.49 IU/ml, (Grade 3 and 4) the results were as follows (Figure 4b): cat epithelium (23.5%), house dust mite and dog dander (17.6%), grass (11.7%), fish/seafood and nuts (5.8%).

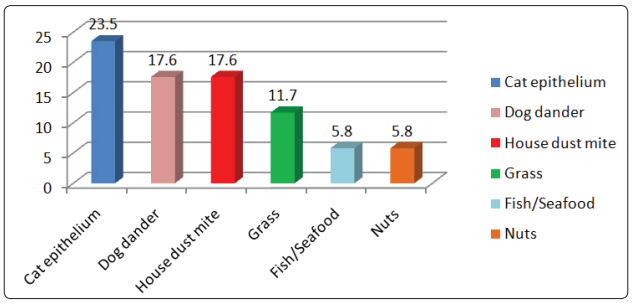

Figure 4b: Percentage of IgE levels for various allergens tested scoring moderate grade 3&4 (RAST).

Discussion

This study was conducted with the aim of evaluating the importance of carrying out RAST testing in patients with AD referred to secondary care. We found that a high proportion of these patients (92.3% of children and 60.7% of adults), had high total serum lgE levels.

High severity grade so fallergen specific lgE were also detected in these patients and this guided patient education on which specific allergens should be avoided. On follow-up, all patients reported an improvement in their AD.

Previous studies have shown that some patients with positive tests have no clinical manifestations of disease when exposed to the allergen [11]. A positive result for an allergen specific lgE measured by RAST indicates a sensitized state to the allergen which is not synonymous to a clinical diagnosis. The results provided by RAST in our study helped increase our ability to rank allergens according to their likely contribution to the symptoms of each participant. An improvement in AD symptoms reported by every participant provides promising evidence that specific allergen avoidance, guided by RAST, can help manage AD. However, there still need to be further investigation and a causality assessment before any conclusions can be reached.

Our study showed that a high proportion of children (47.9%) and adults (17.6%) had a grade 5 and 6 allergen specific lgE response to house dust mite. Currently NICE does not recommend house-dust mite elimination strategies for managing AD as previous studies have been unable to determined clear implications of this to inform clinical practice [12]. Simple strategies, such as eliminating fluffy toys from the bedroom of a child with AD made a significant impact for our patients.

NICE (National Institute for Health & Care Excellence) has also found no evidence regarding pet removal. However, experts recommend that this should be advised on if it is a likely AD trigger [13]. Our study showed that 14.5% of children and 23.5% of adults had a grade 3 and 4 allergen specific lgE response to cat epithelium and 12.5% and 17.6% respectively towards dog dander. Informing this group of patients about pet removal is challenging, especially in the adult population, as some may have had their pets for longer than their symptoms of AD. The quantitative nature of RAST results helped to address this aspect of patient rejection towards the issue. Reducing contact with pets in the living areas has some effect. This was important because complete removal of pets isn't always feasible. However further research into practical ways of reducing contact with pets is needed.

RAST testing has a negative predictive value above 95 percent [14]. For the patients in this study with negative allergen specific lgE test results, it helped guide management towards other factors such as minimal exposure to irritants, excessive heat and rough clothing instead of avoidance of allergens.

RAST testing in atopic dermatitis can only be used as a tool in aiding doctors to identify allergens possibly contributing to the flare up of the condition and should only apply to confirm patients. Our research by no means suggests that RAST testing should be used as first time investigation, especially our research and outcome only applies to those patients who have been referred to secondary care specialist

center by their general practitioners. The specificity and sensitivity of RAST testing is still debatable. However, we found it very helpful in management of the majority of patients who took the test.

Conclusion

RAST testing has been undervalued and under estimated by many practitioners. Our results demonstrate significant positive results to RAST testing which may indicate a direct association between severity of AD and grade of allergen specific lgE antibody positivity. Therefore, we recommend a consideration of RAST testing for every patient that fails to respond to first line treatment for AD.

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