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The Role of Allergy Testing in Eczematic Patients: A Benchmark Study

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Running head: ALLERGY TESTING IN ECZEMA BENCHMARK

The Role of Allergy Testing in Eczematic Patients: A Benchmark Study

A Paper Submitted in Partial Fulfillment of the Requirements

For NURS 5382

In the School of Nursing

The University of Texas at Tyler

by

Ashley Cox

April 9, 2020

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Executive Summary

Eczema or atopic dermatitis (AD) is the first visible sign that indicates a much bigger and more complex problem within the body. The first presentation of symptoms is typically in individuals less than six months of age. Concerned parents bring their child to the pediatrician where a course of topical corticosteroids is prescribed, according to current AD treatment guidelines (Weston, & Howe, 2019). Long term use of corticosteroids has proven to be detrimental to the patient's health, especially pediatric patients, in many ways such as gynecomastia, hypertrichosis, staphylococcal infections, skin atrophy, and worsening of skin diseases, just to name a few (Coondoo, Phiske, Verma, & Lahiri, (2014). Applying topical steroids to an eczematous rash is the equivalent of applying a tourniquet to a stab wound, it temporarily alleviates the issue but does not fix or address the underlying cause or problem.

Eczema has been linked to the existence of positive IgE-mediated food allergies and food sensitivities (Foong, Roberts, Fox, & du Toit, 2016). In fact, the patients with the earlier onset of eczema symptoms have the highest levels of IgE and the most severe symptoms, skin erythema, edema, oozing and crusting, skin excoriation, lichenification, and dryness (European Task Force on Atopic Dermatitis, 1993). Poorly treated, undertreated, or untreated eczema leads to a lifetime of comorbid allergic issues signified as the atopic march which includes asthma, that carries its own list of potentially life-threatening complications. Eczema is perceived to be a patient only problem but the current financial burden of over \$5 billion indicates that is a lie.

For all of these reasons, the approach and plan of treatment for eczematous patients needs to be revised. Allergy testing should be offered and utilized to develop a short term, three-month, hypoallergenic diet with patient symptoms assessed before and after. Details and recommendations are as follows in this paper.

The Role of Allergy Testing in Eczematic Patients: A Benchmark Study

1. Rationale

The rising incidence rate of eczema prompted an increase in research that has uncovered that eczema, or atopic dermatitis (AD), is more than just a skin disorder, it is the outward portrayal of a much bigger and more complex immune disorder. Abnormal immune system activation and inflammatory pathways lead to the defective skin barrier function in eczematic individuals (Nermes, Kantele, Atosuo, Salminen, & Isolauri, 2010). Symptom severity and relapse has been linked to high levels of immunoglobulin E (IgE), family history of AD, and allergen exposure (Hill et al., 2007). Also, children with AD have been found to have higher levels of IgE with an increased likelihood of food sensitizations (Foong, Roberts, Fox, & du Toit, 2016). Eczema symptom flares that are prolonged and undertreated are associated with the development of other chronic allergic disorders, such as asthma and allergic rhinitis, also known as the atopic march (Vaneckova & Bukač, 2016). Most infants and children with eczema have food allergies (FA) and the exacerbation of symptoms are increased and extended by their continued exposure to allergenic foods (Newland, Warren, & Gold, 2013). The goal of this project is to answer the question: In patients diagnosed with eczema (P), how does avoiding positive allergens identified by allergy testing (I) compared to non-avoidance of positive allergens identified by allergy testing or no allergy testing (C) influence eczema symptoms (O) over a three-month period (T)?

1.1 Project Goals

With this study there is anticipation to see an improvement in the overall SCORAD index for patients that opted for allergy testing and adhered to dietary restrictions as opposed to those that did not receive allergy testing or those that did not adhere to dietary restrictions. This

improvement in the patients SCORAD index would aid in confirmation that food allergy plays a role in overall eczema severity.

2. Literature Synthesis

2.1 IgE and Complement Proteins

Hon, Wang, Pong, and Leung (2013) associated the levels of immunoglobulins, complement proteins, and white cell differentials, and found that eczema is more than a type I hypersensitivity and that more of the humoral system is involved based on the findings that immunoglobulins E, G, and A are all pathophysiologically associated with the disease. Hon et al. (2013) strongly suggest that children identified with AD be screened for allergens and immunoglobulin levels.

2.2 Atopic Dermatitis Onset and Severity

There is a strong correlation between early onset eczema, the level of IgE, and eczema severity (Hill et al., 2007; Vaneckova and Bukač, 2016). Hill et al. (2007) indicated that the most severe eczema cases were the patients with the youngest age of onset and with the highest level of IgE. Similarly, Vaneckova and Bukač's (2016) research revealed a significant dependence between the age of onset and the level of IgE; 77% of their population was under the age of five at the time of diagnosis and of those patients over 50% of them had moderate or severe eczema.

Exposure to allergens early in life has some effect on the timing of AD onset. A large sample of children that carried the diagnosis of AD were studied to evaluate the effect of early life exposures on the development of AD and the age of onset of symptoms (European Task Force on Atopic Dermatitis, 1993; Roduit et al., 2012). Early introduction of diverse food

actually helps to reduce the risk of developing onset of AD after the first year of life (Roduit et al., 2012).

2.3 Atopic Dermatitis and Food Allergy

Martin et al. (2015) performed a study that focused on identifying which infants with eczema were at the greatest risk of developing a FA. SPT was performed on a large sample of one-year-old infants for sesame, egg, and peanut then those that had any positive reaction underwent further testing using an oral food challenge (Martin et al., 2015). Astonishingly, one in five infants with eczema tested positive for sesame, egg, and peanut allergy while only one in twenty-five infants without eczema tested positive for sesame, egg, and peanut allergy (Martin et al., 2015). Martin et al. (2015) also discovered that infants with eczema were eleven times more likely to develop an allergy to peanut by twelve months than children without eczema. The younger the patient's eczema symptoms began, the greater risk they have of developing a food allergy.

Čelakovská and Bukač (2014) aimed to find a relationship between eczema and FA to common food allergens. Čelakovská and Bukač (2014) found that patients with eczema and a positive family history for atopy are at a greater risk of having a confirmed FA to more than just the limited foods tested. A significance of food allergies was found in relation to IgE levels and severity of eczema and therefore have shown the importance of eliminating the identified food allergens from the patients' diets, including breastfeeding mothers with eczematic nurslings. The importance of early intervention allergy testing and the management of eczema has been found to decrease the incidence of eczematic individuals developing respiratory allergic disease later in life (Čelakovská & Bukač, 2014).

Much research has been done connecting AD to FA in an effort to uncover how and if FA influences AD or if the relationship is reverse. A systematic review was performed by Tsakok et al. (2015) in an attempt to assess the potential causal pathway between IgE-mediated FA and AD. The systematic review confirmed that severe and chronic AD is strongly associated with FA and that AD precedes the development of allergy and food sensitization (Tsakok et al., 2015).

Čelakovská & Bukač, 2017, aimed to evaluate the relationship between IgE mediated food allergy, food sensitization, and AD severity. Results of their study confirmed a relation between AD severity and the time of reaction to food, indicating that the higher time to reaction is congruent with more severe symptoms of AD (Čelakovská & Bukač, 2017). They also documented that among their study population, symptoms of the atopic march were present in adolescents and adults with IgE-mediated food allergy and that 96% of their patients with severe AD had positive food reactions (Čelakovská & Bukač, 2017).

2.4 Allergy Testing

Foong et al. (2016) compared different types of allergy testing, such as specific IgE levels and skin prick testing (SPT) to a microarray assay (ISAC-112) to determine if one test was more beneficial than the other in accurately diagnosing FA and food sensitivities. Interestingly, when comparing the results from the ISAC-112 to the results from the SPT and specific IgE (sp-IgE) levels, for a majority of the participants, there was a change in diagnosis for specific allergies (Foong et al., 2016). This change in diagnosis could possibly be due to fact that IgE levels may vary with severity of AD symptoms at the time the blood sample is taken.

Godwin (2008) explored the usefulness of allergy testing in patients with eczema by comparing a group of 100 eczematous individuals to a control group with no history of asthma,

eczema, or hay fever. Children with the most severe eczema symptoms had the highest levels of IgE, thus an increased importance of identifying specific allergens (Godwin, 2008).

2.5 Atopic Dermatitis and Other Allergic Diseases

AD is only one step in the atopic march and typically the first presentation of allergy and an immune system disorder. Dharma et al. (2017) applied a latent class analysis to five factors in order to show any patterns that might be present among AD, poly-sensitization to food, poly-sensitization to inhalants, food sensitization, and inhalant sensitization from one to three years of age. Dharma et al. (2012) found that persistent AD significantly increased the risk of developing asthma, FA, and allergic rhinitis. The group with the greatest risk of developing other allergic diseases were those that were poly-sensitized to food at an early age (Dharma et al., 2017).

Eosinophilia and elevated IgE levels are findings that are consistent and common in patients with eczema which is typically the first presenting symptom of the atopic march (Esenboğa, Şekerel, & Tezcan, 2019). The early onset of these symptoms is indicative of immunodeficiencies and warrant further testing and evaluation (Esenboğa, Şekerel, & Tezcan, 2019). Early onset eczema symptoms lead to a poor outcome and increased morbidity if diagnosis, control and treatment are delayed.

2.6 Hypoallergenic Diet and Atopic Dermatitis Severity

A temporary hypoallergenic diet eliminating positively identified allergens has shown to be beneficial for patients suffering with severe AD (Čelakovská & Bukač, 2013). Long term elimination of foods, unnecessarily, can lead to potential malnourishment and an increased reaction to eliminated foods (Čelakovská & Bukač, 2013). Following a hypoallergenic diet and elimination of positively identified allergens for a short period of time allows the immune system

to calm down therefore potentially decreasing its overreaction to nonharmful substances.

Čelakovská & Bukač, 2013, concluded that temporary introduction of a hypoallergenic diet for patients suffering from moderate or severe AD decreases overall symptoms and is a beneficial component to implement prior to undertaking an oral food challenge.

3. Stakeholders

The stakeholders for this proposal are the owners of the practice and to some extent the patients. Ultimately, the decision to implement this change of practice will be an agreement between the patient and/or parent and the provider, the gatekeeper. Other potential stakeholders are the insurance companies providing benefits for these patients

4. Evaluation

Outcomes of this study will be assessed by comparing the patients baseline Scoring Atopic Dermatitis (SCORAD) index to their own three-month SCORAD index with a percentage of change from baseline SCORAD calculated. Mean and standard deviation (SD) of the baseline and three-month SCORAD will be calculated and will be compared using the paired t-test. The three-month SCORAD for the patients that received allergy testing and adhered to dietary restrictions will be compared, using mean, SD, and paired t-test, to the three-month SCORAD for the patients that did not receive allergy testing. Appendix C, figure 1 contains the chart for the collection of data that will be utilized for calculating mean and SD for the t-test. The paired t-test is best utilized for this study due to its use of the same set of people and comparison of two different measurements (Polit & Beck, 2017). The mean differences between the baseline SCORAD and three-month SCORAD can be used to calculate a 95% confidence interval (CI). Constructing a CI utilizing sample means establishes a probability of the null hypothesis being correct (Polit & Beck, 2017). Utilizing mean, SD, paired *t*-test, and CI for this study will aid in

supporting the use of allergy testing and avoidance of positively identified allergens in eczematous patients.

5. Time Table/Flowchart

A flowchart outlining the details of the benchmark study can be found in Appendix A, figure 1.

A team will be formed utilizing strengths from several different inter-professional roles. The team should consist of a provider, a registered dietician (RD), the patient and/or, and a receptionist or office clerk. The provider will identify patients with a diagnosis of eczema and present the option of testing to the patient/parent. The provider will educate the patient/parent about the role and process of allergy testing in eczema, as well as establish a baseline SCORing Atopic Dermatitis (SCORAD) index using the form attached in Appendix B, figure 1 (European Task Force, 1993).

Those patients that decide to continue with allergy testing will have blood drawn for the following test: total IgE level; IgE cow milk, egg, wheat, soy, and peanut; IgG food panel. The items selected for allergy testing have been identified as the most common allergens in eczematous individuals (Newland, Warren, & Gold, 2013). Lab specimens will be collected in the office and sent to an outside laboratory for testing.

Follow up to review lab results with the provider and meeting with the RD should occur one to two weeks after testing. At that time a meal plan will be established between the RD and the patient/parent ensuring to eliminate positively identified allergens. All patients, regardless if they received allergy testing, will follow up in three months from their initial encounter for a final SCORAD index. The final SCORAD will be completed by the same provider that performed the initial SCORAD.

Due to amount of time required for testing and follow up, no new patients will be presented with the option of allergy testing at the end of the initial three-month period. The length of the study may need to be extended by three months in order to obtain the follow up results for all patients that opted in for allergy testing and elimination of positively identified allergens.

6. Data Collection Methods

Data will be collected as outlined in the evaluation section of this paper. Data that is collected will be entered into the designated charts provided in Appendix C, figure 1 and Appendix D, figure 1. The number of patients that presented to the clinic during the three-month study period with the diagnosis of atopic dermatitis or eczema will be recorded in Appendix C, figure 1 as N. The number of patients that opted in and out of allergy testing, and the patients that opted for allergy testing and adhered to dietary restrictions, and those that did not adhere to dietary restrictions will also be recorded in Appendix D, figure 1 in their respective location.

7. Cost/Benefit

Immediate identified cost that impact the patient and the practice include the charge for the office visit with the provider and the RD. The patients that opt for allergy testing should be seen in office a total of three times during this three-month period. Due to the depth of the visit, the provider may allocate an extended amount of time with these patients, which may decrease the number of patient encounters that day. Other associated cost are the fees accrued at the laboratory. The list price for the allergy panels identified for this study is about \$1500 (Quest Diagnostics, 2020). The allergy panels are covered by health insurance, and the price can be discounted for cash pay patients.

The most recently identified financial burden of patients with eczema and their families is estimated to be about \$5.297 billion (Drucker, Wang, Li, Sevetson, Block, & Qureshi, 2016). This amount is inclusive of the patient and family members quality of life, occupational, social, economic, and academic impacts on society (Drucker, Wang, Li, Sevetson, Block, & Qureshi, 2016). Altering the course of treatment for eczematic patients potentially improves their outcome and future therefore decreasing the astonishing financial burden produced by these patients.

9. Discussion and Recommendations

At this time there is not an official evaluation of this benchmark study due to the recent pandemic and limitations placed on nursing students and clinics.

Recommendations at this time would be to implement this change into practice utilizing the flowchart, data collection methods, and evaluation plan detailed in this paper along with the provided materials in Appendix A. At the three-month mark if there is a decrease in the SCORAD when compared to the initial SCORAD, for the patients that underwent allergy testing and adhered to dietary restrictions, this should indicate a positive correlation between allergies and eczema and the need to consider adopting this change.

Conclusion

The goal of this study is to implement a change of practice that incorporates allergy testing for eczematic patients by comparing and evaluating the effect of avoidance and non-avoidance of positively identified allergens via allergy testing in patients with eczema. The identification of allergens and avoidance of identified allergens has been noted to not only decrease the severity of AD symptoms, but also decrease the risk of developing other atopic diseases. Altering the action plan and course of treatment for eczematic patients potentially puts

a halt to the atopic march therefore improving the patients and family's future and overall decreasing the astronomical financial burden associated with these patients.

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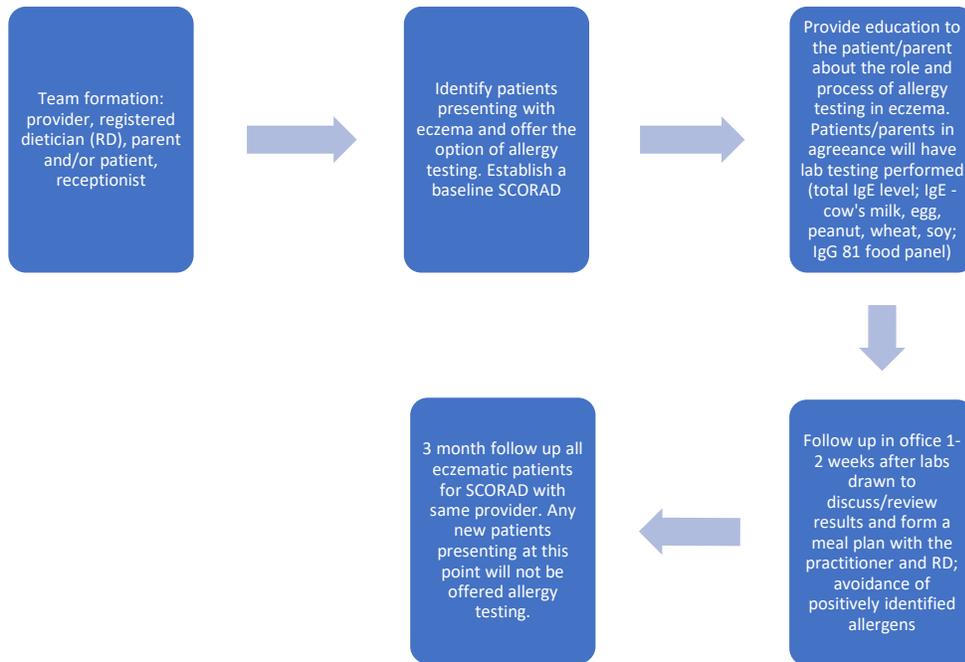
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Appendix A

Figure 1. Plan Flowchart



Appendix B

Image 1. SCORAD Form

SCORAD
 EUROPEAN TASK FORCE
 ON ATOPIC DERMATITIS

INSTITUTION: _____
 PHYSICIAN: _____

Last Name: _____ First Name: _____
 Date of Birth:

 DD/MM/YY
 Date of Visit:

Topical Steroid used:
 Potency (brand name): _____
 Amount / Month: _____
 Number of flares / Month:

4.5 (8.5)

4.5 18 9 9

4.5 (8.5)

4.5 18 6 6

Figures in parenthesis for children under two years

A: EXTENT Please indicate the area involved:

B: INTENSITY

CRITERIA	INTENSITY	MEANS OF CALCULATION
Erythema		INTENSITY x TOB (average representative area) 0 = absence 1 = mild 2 = moderate 3 = severe
Edema/Papulation		
Crusting/Scale		
Excoration		
Lichenisation		* Dryness is evaluated on uninvolved areas.
Dryness *		

C: SUBJECTIVE SYMPTOMS
 PRURITUS + SLEEP LOSS:

SCORAD $A/5 + B/2 + C$

Visual analog scale (average for the last 3 days or nights)

PRURITUS (0-10):

SLEEP LOSS (0-10):

TREATMENT: _____

REMARKS: _____

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European Task Force on Atopic Dermatitis/SCORAD

Eczema Foundation. 2020. Retrieved from <https://www.fondation-dermatite-atopique.org/en/healthcare-professionals-space/scorad>

Appendix D**Figure 1. Allergy Testing and Adherence to Dietary Restrictions Data Chart**

Allergy testing	
Yes	
No	
Adhere to diet restrictions	
Yes	
No	