Tissue Examination of Pediatric Patients Having Surgery for Chronic Rhinitis

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Background

- Chronic rhinitis is one of the most common chronic diseases in the United States accounting for annual healthcare costs estimated at around $3 billion dollars a year (1-2). Rhinitis is defined as inflammation of the nasal mucosa and is associated with impaired quality of life and multiple healthcare visits for appropriate diagnosis and treatment.
- Allergic rhinitis is currently diagnosed based on clinical history and a positive skin prick test (SPT) and/or the presence of specific IgE antibodies to environmental or airborne allergens. Patients with NAR have negative SPT and lack IgE antibodies to specific allergens in their serum.
- Recent literature has increasingly described a subset of non-allergic rhinitis patients who have an allergen-specific IgE response in the nasal mucosa, but lack systemic atopy.

Objective

The objectives of this project were to correlate serum IgE to aeroallergens to tissue IgE levels taken from the turbinates of pediatric patients undergoing turbinate reduction.

Methods

- We invited 26 pediatric patients at the time of turbinate reduction surgery to take part in the study and 24 agreed to participate
- At the time of recruitment patients completed the 22 item Sinonasal Outcome Test (SNOT-22, Table 2) to describe symptoms prior to surgery.
- At time of surgery 1mL of blood was collected to analyze serum IgE antibodies (Table 1). These antibodies were measured using the ImmunoCAP 2500 (Thermo Fisher Scientific/Phadia, Uppsala, Sweden).
- During the turbinate reduction surgery a 0.1 gram piece of turbinate tissue was shaved and collected. Homogenates were analyzed for IgE antibodies (Table 1).
- Comparisons were then made between non-allergic and allergic groups.

Results

Patients ranged in age from 2 to 15 years (median 9), and the majority were male (69%). The prevalence of asthma was high at 44%. Serum analysis revealed IgE antibody levels >0.10 IU/ml to at least one aeroallergen in 54%. All patients testing negative for serum IgE (levels <0.10 IU/ml) revealed positive results for IgE antibody to at least one aeroallergen in the turbinate sample. (>0.10 IU/ml). A majority of samples had detectable IgE antibodies to Alternaria (20/23) and oak (19/23). Thirteen patients had IgE antibodies to other allergens, and in this group 6 concurrently had serum positives consistent with systemic sensitization and 7 did not.

Table 1:
Allergens used to detect allergen-specific IgE

Allergens used to test plasma	D. Ptero, D. Farinae, Cat, Dog, Cockroach, Alternaria, Cladosporium, Aspergillum, Elm Tree, Oak Tree, Pecan Tree, Walnut Tree, June Grass, Johnson Grass, Bermuda Grass, and Ragweed.
Allergens used to test nasal specimen	D. Ptero, D. Farinae, Cat, Dog, Alternaria, Cladosporium, Aspergillum, Oak Tree, Timothy Grass , Birch Tree, Bermuda Grass, and Ragweed

Total Patients (n=23)	
Allergic Rhinitis	13 (54%)
Non-Allergic Rhinitis	11 (46%)
NAR with 1-2 positive aeroallergens	6
NAR with >2 positive aeroallergens	5
Noted Improvement with Pharmaceutical Treatment (prior to surgery)	
Allergic Rhinitis	5 (38%)
Non-Allergic Rhinitis	8 (72%)

SNOT-22 Questions	Allergic Rhinitis Avg. Score	Non-Allergic Rhinitis Avg. Score
Sneezing	2	1.5
Runny Nose	2.5	1.83
Ear Pain	1.57	0.83
Difficult Falling Asleep	2.36	1.92
Reduced Productivity	1.43	0.42
Reduced Concentration	1.79	0.92
Frustrated	2.14	1.83
Congestion	**3.5**	2.08
Can't Smell	1.43	0.59
***Overall Bother**	**3.57**	2.83

SNOT-22 questions were complete by the patient in conjunction with their guardian. The scale for responses range from 0 (no problem) to 5 (very severe problem).

*12 patients reported Overall Bother of symptoms as severe (4 or 5). Of these patients 75% were allergic rhinitis patients and 25% were non-allergic rhinitis patients.

Discussion

The pathology of chronic rhinitis has long been characterized as either allergic or non-allergic based off the patient's history, skin prick tests, and serum IgE responses. Although using this diagnostic approach is successful in distinguishing systemic allergic pathology, it seems that a subset of non-allergic patients show local allergic responses at the level of the nasal mucosa.

This idea of Local Allergic Rhinitis (LAR) has been explored in the adult population, however, little work has been done in pediatrics. Thus, we recruited pediatric patients and compared serum IgE antibody levels to nasal mucosa IgE antibody levels for numerous aeroallergens.

Conclusion

The finding of low levels of IgE antibodies in patients without evidence of systemic sensitization could be consistent with the concept of local allergy or entopy. Future direction will involve expanding our sample size to explore optimal baselines in IgE analysis for better interpretation of local allergic responses. We also plan to analyze tissue inflammatory markers at the microscopic level.

References

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