The role of adenoid immune phenotype in polysensitized children with allergic rhinitis and adenoid hypertrophy

YOUJIN LI¹, Lanye Hu¹, Wenjun He¹, Junyang Li¹, Yan Miao¹, and Huanhuan Liang¹

¹Shanghai Children’s Medical Center Affiliated to Shanghai Jiaotong University School of Medicine

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Abstract

Background: There has been increasing interest in elucidating the relationship between adenoid hypertrophy (AH) and allergic rhinitis (AR). However, the impact of aeroallergen sensitization patterns on children concurrently experiencing AH and AR remains unclear. Methods: Patients aged 2-8 years (January 2019 to December 2022) with nasal symptoms were assessed for allergies, adenoid size and respiratory viral infection history. The levels of serum total immunoglobulin E (IgE) and specific IgE and flexible nasal endoscopy were performed. We analyzed the relationship between AH and sensitization patterns and lymphocyte subpopulations in adenoid samples using flow cytometry. Results: 5281 children were enrolled in our cohort. 56.5% of children was diagnosed with AR and 48.6% with AH. AR was more prevalent in AH children compared to nAR. Compared to non-sensitized, those with AR polysensitized to molds had a higher prevalence of AH (adjusted OR 1.61, 95%CI 1.32-1.96) and a greater occurrence of two or more respiratory viral infections, particularly in cases with adenoidealctomy. In AH-AR children, adenoid tissues showed reduced frequencies and corrected absolute counts of regulatory T cells (Tregs), activated Tregs, class-switched memory B cells (CSMB), natural killer (NK) T cells and NK subpopulations compared to AH-nAR children. Polysensitization in AH-AR children correlated with lower CSMB frequencies. Conclusion: Polysensitivity to molds significantly increased the risk of AH in children with AR. Adenoids of AR children demonstrated less number of B cells, NK cells and Treg cells with an effector/memory phenotype, which was closely linked to sensitization models and respiratory viral infection, particularly concerning CSMB.

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Children with suspicion of either having allergies or enlarged adenoid (n=5281)

Tests for tIgE and sIgE

Flexible nasal endoscopy

AR (n=2984)

AH (n=2567)

AR-AH (n=1771)

AR-nAH (n=1213)

Aeroallergen sensitization patterns

Poly-sensitized to molds (n=573)

Mono-sensitized to molds (n=334)

Non-sensitized to molds (n=2077)

Allergen sensitization and AH

AH-AR (n=1771)

AH-nAR (n=796)

Children underwent adenoidectomy with medical record of respiratory viral infection (n=80)

Excluded data: usage of nasal steroids, antihistamines, or antileukotrienes within 6 weeks before surgery; having acute or chronic respiratory disease within 4 weeks before surgery; immunosuppression caused by any condition, congenital heart disease or genetic disorder

Immune cell panel in adenoid tissue (n=36)

Immunological mechanisms related to AH and allergen sensitization

Prevalence of sensitization (%) vs Age (years old)

- 47.3
- 56.2
- 57.8
- 58.3
- 59.5
- 63.5

- 45
- 50
- 55
- 60
- 65
- 70
HLA-DR⁺ NKs

% HLA-DR⁺ NKs / NKs

# HLA-DR⁺ NKs (μL)

AH-AR  AH-hAR

B cells

% B cells / Lymphocytes

# B cells (μL)

AH-AR  AH-hAR
CSMB cells

% CSMB cells / B cells

AH-Molds⁺HDM⁺  AH-HDM⁺

AH-Molds⁺HDM⁺  AH-HDM⁺

# CSMB cells (μL)

0  1000  2000  3000

B cells

AH-Molds⁺HDM⁺  AH-HDM⁺

CD3 PCs.5

10^3  10^4  10^5  10^6

CD19 ECD

10^3  10^4  10^5  10^6

70.4

60.8
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