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The impact of house dust mite allergy on chronic rhinosinusitis

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Objectives

Chronic rhinosinusitis (CRS) is a heterogeneous disease partially related with Th2 immunity and eosinophilic inflammation. The object of this study is to investigate the impact of house dust mite (HDM) allergy on the clinical characteristics and the effects of HDM allergen on the nasal epithelial cells of CRS patients.

Methods:

A retrospective study of 138 CRS patients underwent endoscopic sinus surgery after failed conservative medical therapy from April 2016 to April 2017. Brief history of rhinosinusitis symptoms, allergy to medication history, blood eosinophil count, blood specific allergen tests, rhinoscopic examination, CT scan findings, Lund-Mackay CT scores and SNOT-22 scores before endoscopic sinus surgery were collected and analyzed. The recurrent rate post operation 3 months and 6 months were also evaluated. Sinus mucosal biopsies from the nasal polyps in selected cases were sampled. The nasal epithelial cells harvested from nasal polyps were collected and grown for air-liquid interface (ALI) culture. The ALI cultured epithelial cells were stimulated with HDM, and chemokine and cytokine concentrations in sample supernatants were quantified by protein arrays, and qPCR was performed to validate the expressions of chemokine and cytokine. In addition, ALI cultured nasal epithelial cells were exposed for 24 hour to IL-1 α , IL-4, and IL-13 before stimulated with HDM.

Results

In the 138 patients, ImmunoCAP test was positive in 71 (51%) patients and negative in 68 (49%) patients. The mean

age was significant younger in allergic group compared with nonallergic group ($p=0.008$). The peripheral eosinophil count in allergic group was significant higher than nonallergic group ($p=0.008$). Lund-Mackay score and SNOT-22 Questionnaire scores were not significant different. The recurrence rate of nasal polyps in allergic group was higher than non-allergic group but no significant difference at post operation 3 and 6 months. For nasal epithelial cells after stimulation of HDM, the levels of most cytokines were around the detection limit on the protein arrays. Without pre-treatment of cytokines, variable expression patterns of different cytokines in nasal epithelial cells were demonstrated. In the exposure of IL-13, the expressions of CCL2, GM-CSF, IL-1 α , IL-6 were up-regulated, while the expression of IL-33, and TSLP were up-regulated by IL-4. Expression of IL-25, IL-33, and TSLP were up-regulated after exposure with IL-13 without stimulation of HDM.

Conclusions

CRS patients with HDM allergy were younger than nonallergic patients at the time of surgery which may imply accelerating CRS progression under allergic inflammation. Furthermore, serum specific IgE elevated correlated with peripheral eosinophil percentage especially in CRS with nasal polyps (CRSwNP) patients which suggests contribution of eosinophilic inflammation to the formation of nasal polyps. The effect of IL-4 and IL-13 on the innate immunity function of airway epithelial cells in reaction to the stimulation of HDM allergen, which confirmed the existence of crosstalk between epithelial cells and lymphocytes.