Comparison of local cytokine gene expression and the distribution of eosinophils and CD4-positive cell subsets in the paranasal sinus mucosa between atopic and non-atopic subjects

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Background: The role of Th2 type cytokines in the persistence of chronic rhinosinusitis, especially that induced by non-infectious inflammatory causes, has been noted. However, the original cause of sinus eosinophilia remains unclear and whether the presence of allergic rhinitis (AR) may be a risk factor has been an issue of debate. In the present study, we examined cytokine expression and the distribution of CD4-positive cell subsets in the paranasal sinus mucosa of patients with chronic sinusitis.

Methods: total of 133 sinusitis patients was examined. Patients were subdivided into four groups based on the presence of AR and the degree of local eosinophil infiltration. The expression of granulocyte-macrophage colony stimulating factor (GM-CSF), interleukin (IL)-5, IL-8, IL-16, eotaxin and interferon (IFN)-γ mRNA was detected by reverse transcription-polymerase chain reaction. Immunohistochemical localization of CD4-, CXCR3- and CCR4-positive cells in the same specimens was quantitatively analyzed using a laser scanning confocal microscope.

Results: The group of non-AR patients with low eosinophilia (the AR(-)Eo(-) group) only showed an increase in IFN-γ mRNA expression. In contrast, the other three groups showed similar cytokine profiles, with high expression levels for GM-CSF, IL-5 and eotaxin mRNA. The total number of CD4+ cells was also increased in these three groups. The density of CCR4-positive CD4+ cells was significantly higher in groups with high eosinophilia, irrespective of the presence of AR. As a result, the CXCR3+/CCR4+ cell ratio in the AR(-)Eo(-) group was significantly increased compared with the other three groups.

Conclusions: These results indicate that high expression of Th2-type cytokines concomitant with the infiltration of a predominant number of CD4+ cells and their Th2 subsets play a role in the pathogenesis of eosinophil inflammation in sinus mucosa. In addition, the finding that some of the non-atopic patients also shared Th-2 type immune responses provides support for the concept of chronic sinusitis as a Th2-mediated disease process.

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