Chronic rhinosinusitis (CRS) and bronchial asthma are common diseases of the respiratory tract and frequently observed coincidentally. In previous study, pathologic findings in the asthma patients revealed the remodeling process such as increased basement thickening, goblet cell hyperplasia and eosinophil infiltration into the nasal mucosa, which were somewhat similar to the findings of asthma. Matrix metalloproteinase-9 (MMP-9) seems to play a role in upper airway remodeling. In recent study, MMP-9 in nasal secretions was considered as both monitoring and predictive value on the healing outcome after functional endoscopic sinus surgery. In this study, we tried to elucidate the histopathologic differences of nasal mucosa among CRS patients with the intrinsic and extrinsic asthma and non-asthmatic CRS patients.

Between April 1994 and December 2005, seventy-six biopsy specimens were taken from CRS patients (45 males, 31 females). Twelve-one patients had extrinsic asthma, and 25 had intrinsic asthma, and 30 were CRS patients without asthma. Severity of asthma was categorized into four groups as 1. mild intermittent, 2. mild persistent, 3. moderate persistent and 4. severe persistent based on GINA 2003. Following parameters were evaluated on H&E staining: thickness of basement membrane, goblet cell hyperplasia, subepithelial edema and eosinophil infiltration. The ratio of immunoreactive cells to MMP-9 and their inhibitors (TIMP-1) out of infiltrated inflammatory cells were evaluated on immunohistochemical staining.

Thickens of the basement membrane (BM) was measured and graded as follows: at x100 magnification; 0, none; 1, mild; 2, moderate; and 3, severe. Goblet cell hyperplasia was scored: 0, less than 3 cells; 1, 3-10 cells; 2, 11-20 cells; or 3, more than 20 cells (x400). Infiltrations of Eosinophils were counted and scored: 0, none; 1, 1-2 or eosinophils; 2, 3-10; 3, 11-30; 4, 31-60; or 5, more than 60 eosinophils (x400).

Postoperative outcomes were assessed using Kennedy’s criteria for endoscopic findings about 9 months after the surgery. When there was evidence of mucosal swelling, polyposis, discharge, adhesions, or crusting, it was considered as a ‘poor’ outcome, none of the above abnormal findings as ‘good’ outcome. Statistical analysis was done with Kruskal-Wallis test, Mann-Whitney test, and Spearman correlation test with level of significance less than 0.05.

In this study, MMP-9 expression and thickness of basement membrane were significantly increased in nasal mucosa of CRS patients with asthma compared with non-asthmatics, and Infiltration of eosinophils and goblet cell hyperplasia were prominent in intrinsic asthma group, which might be associated with poor outcome of CRS patients with intrinsic asthma. Correlation of clinical findings including disease extension and polyposis with these result is needed.

Mean percentage of MMP-9 (+) cells or TIMP-1 (+) cells of total inflammatory cells in 5 randomly selected fields(>x400) was estimated.

Figure 1. Grade of eosinophil infiltration

Figure 2. Expression of MMP-9 and TIMP-1

Figure 3. Postoperative outcome. Poor outcome (Left) and good outcome (Right).

Figure 4. Severity of asthma

Figure 5. Eosinophil infiltration

Figure 6. MMP-9/TIMP-1 expression

Figure 7. Thickness of BM

Figure 8. Goblet Cell Hyperplasia

Figure 9. Percentage of good outcome

Figure 10. Correlation between MMP-9 and eosinophil infiltration

Figure 11. Correlation between MMP-9 and thickness of the basement membrane

Conclusions

In this study, MMP-9 expression and thickness of basement membrane were significantly increased in nasal mucosa of CRS patients with asthma compared with non-asthmatics, and Infiltration of eosinophils and goblet cell hyperplasia were prominent in intrinsic asthma group, which might be associated with poor outcome of CRS patients with intrinsic asthma. Correlation of clinical findings including disease extension and polyposis with these result is needed.

References