EXAMINATION OF THE DISTRIBUTION OF MAST CELLS IN THE NASAL MUCOSA OF PATIENTS WITH SEASONAL ALLERGIC RHINITIS

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SUMMARY

Objective: It is know that mast cells play an important role in pathogenesis of allergic rhinitis. In this study we have investigated the distribution of mast cell in the nasal mucosa of patients with seasonal allergic rhinitis (SAR) during the pollen-season.

Materials and Methods: Patient group; twenty patients with seasonal allergic rhinitis (12 female and eight male) and twenty healty (10 female and 10 male) non-allergic controls were examined for the distribution and abundance of mast cells in nasal biopsies. Biopsies were performed in all patients and controls, once during natural provocation in the spring and were taken from the lower edge of the inferior turbinate with use of a forceps. The samples of nasal mucosa were fixed in 10 % neutral buffered formaline and stained with 0.5% toluidine blue and hematoxylin eosin and were examined under light microscope.

Findings: Mast cells were observed in mucosa of (12/20) patient and (5/20) controls cases (p=0.025).

Result: However intraepitelial mast cells were observed in nasal mucosa samples of patients with SAR but this can also be determined in non-allergic inviduals.

Key Words: Allergic rhinitis, Nasal mucosa, Mast cells.

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INTRODUCTION

Metachromatic cells in atopic patients, namely, mast cells and basophils, are present in nasal secretions, nasal mucosa, sputum and bronchial lavage. The structural morphology of human mast cells has been studied extensively and this has been well documented (1). The changes in mast cell numbers during allergen provocation have not been conclusive. Wihl and Mygind did not find any change after allergen challenge (2). However, Pipkorn and Enerbäck reported a decrease in the number of mast cells in epithelium and lamina propria (3). Borres was reported the temporary redistribution of metachromatic cells toward the mucosal surface after allergen challenge (4).

We have therefore investigated the distribution of mast cells in the nasal mucosa of patients with seasonal allergic rhinitis (SAR) during the pollen-season.

MATERIAL AND METHOD

The study was performed with the subjects informed consent. Twenty patients with allergic rhinitis (14 female and nine male) ranging in age from 18 to 34 years (mean 23.4 ± 4.7) were examined for the distribution and abundance of mast cells in nasal biopsies. At the time of study, all the patients were symptomatic. Diagnosis of allergic rhinitis was made on the basis of a typical history of seasonal allergic rhinitis, eosinophilia in nasal smears, and positive skin-prick tests to grass-pollen allergens. According to criteria reported in the position paper of European Academy of Allergy and Clinical Immunology (5), the results of skin-prick tests were scored as follows: 0=negative, + = less or equal to ¼ of histamine, ++ = from ¼ to ½ of histamine, +++ = from ½ to equal to histamine, ++++ = larger than histamine control. Patients were excluded if they gave a history of perennial allergy, had previously received immunotherapy, acute respiratory tract infection, or had taken topical or oral medication in the previous 1 month. Biopsies were performed in all patients with isolated grass-pollen allergy and controls, once during natural provocation in the spring. Control subjects had no history of allergy, and had negative skin prick tests to a panel of common aeroallergens.

Biopsies of nasal mucosa were taken from the lower edge of the inferior turbinate, about two cm posterior to the anterior edge with use of a forceps with a cup diameter of 2-5 mm. Local anaesthesia was obtained by placing a cotton-wool
carrier with 50-100 mg lidocaine and three drops of adrenaline (1:1000) under the inferior turbinate without touching the place where the biopsy would be taken.

The samples of nasal mucosa were fixed in 10 % neutral buffered formaline for 24 hours. Each sample was then embedded in paraffin block using the standard method and cut with microtome of a section thickness of 4 μm. The samples were stained with 0.5 % toluidine blue and hematoxylin eosin and were examined under light microscope.

For comparison between groups, χ² test was used.

RESULTS

In this light microscopic study nasal mast cells were in twelve patients with SAR and in five controls. In patients with SAR the presence of mast cells in the submucosal layer (12/20) was more than in normal subjects (5/20) (p=0.025). Thinned basal membrane, infiltration of mononuclear cells and polymorphonuclear cells into the stroma, the increase of capillary vessels and oedema were observed in the samples of the nasal mucosa of patients' group. The patients with SAR showed an increase in the numbers of mast cells in the lamina propria (mean 8.8/mm²) during the season. The mean number of mast cells in the lamina propria was 3.5 in five controls. However intraepithelial mast cells were observed in only three of these twelve patients with SAR. During natural provocation almost all the mast cells in the epithelium and half of those in the lamina propria were degranulated.

Picture 1: Mast cells in the lamina propria of nasal mucosa.
DISCUSSION

Mast cells appear to play an important role in allergic rhinitis. The allergic reaction of the mucosa is induced by an interaction between allergen and IgE antibodies on the surface of the mast cell. Most of the studies performed on the role of metacromatically staining cells (mast cells and basophils) in the nasal mucosa have been performed in nasal smears or scraping material. Few quantitative studies have been done in biopsies of nasal mucosa. In the present study we used the method of punch biopsy. Studies on mast cells have employed a variety of different tissue fixatives and staining methods, which makes it difficult to compare the results reported by different authors. The method mentioned most often in the recent literature is toluidine blue staining at pH 0.5 after fixation with 10% formaldehyde. In our study we used toluidine blue staining after formaldehyde fixation.

Mast cell degranulation is an important component of the pathogenesis of allergic rhinitis. The result of the available quantitative studies on mast cells in the nasal mucosa differ widely, ranging from an overall decrease via redistribution to an overall increase after allergen exposure (6-8). These differences could be due to the use of different staining techniques which do not always guarantee that all mast cells,
including the degranulated ones, are counted. It is conceivable that some of the literature cited refers to different stages of an ongoing process.

To study changes in the number of degranulation of mast cells, we investigated these cells in the epithelium and lamina propria of the nasal mucosa of the lower inferior turbinate in patients with isolated grass-pollen allergy and normal controls during natural provocation. Biopsy specimens of nasal mucosa were taken during the grass-pollen season between March and July. These biopsies were compared with those of controls.

More studies have been done on mast cells in allergic nasal mucosa and on the numerical changes, shown by mast cells in epithelium and lamina propria during (natural) allergen provocation. The changes in mast cells numbers during allergen provocation have not been conclusive. Okuda found an increased number of mast cells in the epithelium of the allergic patients but not in the lamina propria (9). Wihl and Mygind did not find any change after allergen challenge at all (2). It was reported no changes in the total number of mast cells in patients with allergic rhinitis by other authors (7,10). Pipcorn and Enerback reported a decrease in the number of mast cells in epithelium and lamina propria (11). A temporary redistribution of metachromatic cells toward the mucosal surface after allergen challenge was reported (4). Some comparative studies revealed that the numbers of nasal mucosal mast cells increased during natural provocation (6,12,13). Gomez et al. demonstrated a lower increase of nasal mucosal mast cells during provocation after use of nasal corticosteroid spray (14). This suggest that the use of nasal corticosteroids has led to an underestimation of the increase of mast cells found in the natural provocation study. In Drake- Lee's study, the number of mast cells in the inferior turbinate from patients with perennial allergy due to housedust mite were compared with normal controls and no statistical differences were found (10). The lack of increase in mast cell numbers was attributed to degranulation since numbers have been shown to be increased in perennial allergy when sections are examined ultrastructurally (10). In this study, we found that the number of mast cells in the lamina propria increased during seasonal grass pollen-induced allergic rhinitis. This is in agreement with the finding of Lozewicz et al. who, although they did not indicate results concerning epithelium and lamina propria separately, found an increase during natural provocation (12). However, in this study, intraepithelial mast cells were
seen in only three patients. The result of this study shows that mast cells are present
in the lamina propria but not in the epithelium of non-allergic controls. This finding is
in agreement with results obtained by other authors (8,9).

ÖZET

MEVSİMSEL ALERJİK RİNİTLİ HASTALARIN NAZAL MUKOZA MAST
HÜCRELERİ DAĞILIMININ İNCELENMESİ

Amaç: Mast hücrelerinin alerjik rinit patogenezinde önemli bir rol oynadığı
biliılmektedir. Bu çalışmada polen mevsimi döneminde mevsimsel alerjik rinitli
hastaların nazal mukoza mast hücrelerindeki dağılımı araştırdık.

Materyal ve Metod: Hasta grubu; mevsimsel alerjik rinitli 20 hasta (12
kız, 8 erkek) ve kontrol grubu ise alerji hikayesi olmayan 20 sağlam bireyden (10 kız,
10 erkek) oluşturuldu. Polen mevsimi periodunda hasta ve kontrol grubundaki
bireylerin alt konkalanından forsepsle biyopsi alındı. Biyopsi örnekleri % 10’ luk
tamponlanmış formalinde fiksasyon sonrası % 0.5’lik toluidin mavisi ve hematoksilen-
eozin ile boyanarak işık mikroskobunda inceledi.

Bulgular: Hastaların 12’sinde (12/20) ve kontrol bireylerinin 5’inde
submukozal tabakada mast hücreleri gözlandı (p=0.025). Ancak intra epitelial mast
hücrene üç hastada raslanırken kontrol grubunda raslanmadı.

Sonuç: Mevsimsel alerjik rinitli hastaların nazal mukoza örneklerinde
submukozal mast hücre sayısı belirgin artış göstermektedir. Bununla beraber alerjik
olmayan bireylerde de bu hücreler azalması beklenmektedir. Bununla beraber alerjik
olmayan bireylerde de bu hücreler azalması beklenmektedir. Bu sayesinde bu hücreler
daha fazla analiz edilebilicektir.

Anahtar Kelimeler: Alerjik rinit, Burun mukozası, Mast hücreleri
REFERENCES


