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Mast cells on the surface of the mucous membrane - a general feature of inflammatory reactions in the nose?

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SUMMARY

A redistribution of mast cells towards the epithelial lining of the nasal mucous membrane has been shown to be a part of the allergic inflammatory reaction in hay fever. This results in an increased number of metachromatically stained cells on the surface of the mucous membrane. The involvement of mast cells in other inflammatory reactions in the human nose is not clarified and this may partly be due to methodological difficulties. Utilizing a recently developed imprint technique, specimens were taken from patients with infectious rhinosinusitis in acute and chronic stages. The total number of mast cells on 2 cm^2 of the imprint area were counted. Mast cells in extremely low numbers were found in 5 out of 26 patients. Our results indicate that mast cell migration is not present in patients with infectious inflammatory reactions of the nasal mucous membrane.

INTRODUCTION

Mast cells play a central role in allergic inflammatory reactions. Owing to methodological difficulties, the role of mast cells in other inflammatory reactions of airway mucosa is poorly understood. It has recently been shown that mast cells migrate to the surface of the nasal mucous membrane as part of the allergic inflammatory reaction in the nose (Enerbäck et al., 1985). The presence of mast cells on the surface of the mucous membrane in allergic rhinitis has also been demonstrated (Okuda, 1977; Hastie el al., 1979). Hastie et al. (1979) were, however, unable to find any mast cells in blown secretions from patients with common cold. The role of mast cells in other inflammatory reactions of the nose is still obscure although mast cell mediators may also play a central role in non-allergic perennial rhinitis (Togias et al., 1985). Quantification of different cell populations on the surface of the nasal mucous membrane is difficult. For the quantification of mast cells on the mucous membrane surface a recently developed imprint technique has been shown to be suitable (Pipkorn and Enerbäck, 1984).

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AIM OF THE INVESTIGATION

The aim of the investigation was to quantify mast cells on the surface of the nasal mucous membrane in patients with infectious inflammatory reactions in the nasal mucous membrane in acute and chronic stages.

MATERIAL AND METHODS

Design: Imprint specimens were taken from patients with acute and chronic rhinosinusitis. They were then coded and evaluated blindly.

Patients: The trial involved a total of 26 patients (10 men and 16 women). 11 patients with acute maxillary sinusitis aged 23–49 years (mean age 29.1 years) and 15 patients with exacerbation of chronic maxillary sinusitis aged 20–63 years (mean age 44.0 years) participated. All patients suffered from purulent sinusitis and the diagnosis was verified by antral lavage. The duration of symptoms was 2–3 weeks in the acute group and longer than 3 months in the group with chronic sinusitis.

Imprint: In order to evaluate the number of mast cells on the nasal mucosa, a recently developed imprint technique was utilized (Pipkorn and Enerbäck, 1984). Briefly the technique was as follows: a small polyester strip (1 × 7 cm) was coated on one side with an egg-white-glycerin solution. Using a nasal speculum and a small pair of ear forceps, the strip was inserted into the nasal cavity. It was pressed against the nasal septum for a couple of seconds. The strip was then lifted away, special care being taken to avoid any sliding and smearing. After air-drying for 30 minutes the strip was fixed for 60 minutes in ethanol-glacial acetic acid in the ratio of 3 to 1. Staining was then performed with toluidine blue at pH 0.5 for specific visualization of mast cells. After staining the strips were mounted under coverslips in a synthetic resin. The total number of mast cells on 2 cm^2 of the plastic strip was counted under a light microscope. The numbers of granulocytes and epithelial cells were estimated on a semiquantitative scale from 0 to 3 where 0 denotes no cells, 1 = few, 2 = moderate numbers of cells and 3 = numerous cells.

RESULTS

With the imprint technique, a thin film of cells with well preserved morphological details was obtained from the surface of the nasal mucosa. The staining results in a violet metachromasia of mast cell granules, other cellular elements being stained weakly orthochromatically blue. The majority of cells were granulocytes and epithelial cells. Owing to the staining and fixation procedure, no other differentation of cells was possible.

The results from the cell-counting procedure are presented in Figure 1. The strips from the patients with acute rhinosinusitis are separated from the strips from the patients with chronic rhinosinusitis. Only 5 of the patients had mast cells present in their imprints. The numbers were low and positive findings were unrelated to history of allergy.

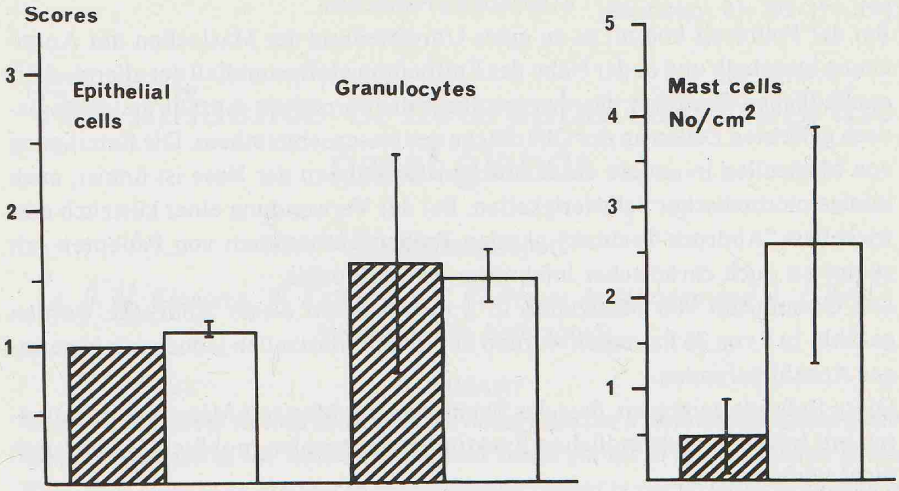

Figure 1. Mean scores ± SEM for epithelial cells and granulocytes and mean number ± SEM of mast cells on 1 cm^2 of the imprint.
▨ = patients with acute rhinosinusitis n = 11
□ = patients with chronic rhinosinusitis n = 15

DISCUSSION

Important immunological reactions take place on the surface of mucous membranes. For the study of human airways, the nasal mucosa is the most accessible region and may therefore be used as a model tissue for different immunological reactions in vivo.

Several methods have been suggested in order to obtain samples from the nasal mucosa. The most frequently used, the smear technique, has very poor reproducibility and does not allow quantification (Whelan, 1980). A recently developed modification of an imprint technique seems however to allow quantification (Pipkorn and Enerbäck, 1984), at least of mast cells on the surface.

The role of mast cells in other inflammatory reactions of the human nasal mucous membrane is still obscure. In contrast to the previous findings of high numbers of metachromatically stained cells on the nasal mucosal surface in patients with allergic symptoms (Enerbäck et al., 1985), only a few mast cells were found in a few of the patients suffering from infectious inflammatory nasal symptoms. This indicates that mast cell migration may be a specific allergic manifestation. However, further investigations on patients with other nasal diseases must be performed in order to clarify this.

ZUSAMMENFASSUNG

Bei der Pollinosis kommt es zu einer Umverteilung der Mastzellen mit Anreichung innerhalb und in der Nähe des Epithelium als Bestandteil der allergischer-enzündlichen Reaktion. Daraus resultiert die vermehrte Anzahl metachromatisch gefärbten Zellen an der Oberfläche des Nasenschleimhaut. Die Beteiligung von Mastzellen in andere entzündlichen Reaktionen der Nase ist unklar, auch infolge methodischer Schwierigkeiten. Bei der Verwendung einer kürtzlich entwickelten "Abdruck-Technik" wurden Proben entnommen von Patienten mit akuter als auch chronischer infektiöser Rhinosinusitis.

Die Gesamtzahl von Mastzellen in 2 qcm-Arealen dieser Abdrucke wurden gezählt. In 5 von 26 Patienten wurden überhaupt Mastzellen jedoch nur in geringer Anzahl gefunden.

Diese Befunde zeigen an, dass das Phenomen der Mastzell-Migration in Patienten mit infektiös-endzündlichen Reaktionen des nasalen mukösen Membranen nicht vorhanden ist.

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