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TISSUE EOSINOPHILIA IN CHRONIC RHINOSINUSITIS WITH DIFFUSE BILATERAL NASAL POLYPS

ABSTRACT

Background: Inflammatory disease of the nose and paranasal sinuses with diffuse polypoid changes are common findings. The eosinophilic infiltration of the polypoid tissue and eosinophil driven inflammation are one of the endotypes of chronic rhinosinusitis (CRS).

Objective: The study was aimed to investigate the presence of tissue eosinophilia in patients with diffuse bilateral nasal polyps.

Method: It was a descriptive cross-sectional study on 51 patients who underwent Functional Endoscopic Sinus Surgery (FESS) for CRS. Sino-nasal outcome test (SNOT-22) questionnaire and CT scan scores were recorded. Histopathological examination of the polypoid tissue was done and the number of eosinophils per high power field (HPF) was also recorded.

Result: Fifty-one patients were included in the current study, of whom 26 were females and 25 were males. The majority of patients (n=37, 72.5%) had tissue eosinophilia counts > 10 per HPF. The mean CT score in patients with tissue eosinophilia > 10 per HPF was 18.35 (SD 4.08), which was significantly higher than the mean CT score in patients with tissue eosinophilia ≤ 10 per HPF (mean CT score = 12.24, SD 2.67). Similarly, the mean Sino-Nasal outcome Test-22 (SNOT-22) score in patients with tissue eosinophilia >10 was 71.25 (SD 5.84), which was significantly higher than the mean SNOT-22 score in patients with tissue eosinophilia ≤10 (mean SNOT-22 score = 57.85, SD 4.49).

Conclusion: There was a significant positive correlation between tissue eosinophil count and both SNOT-22 score and CT score.

Keywords: Diffuse nasal polyp, Eosinophilic Chronic Rhinosinusitis, SNOT-22, Tissue eosinophilia.

INTRODUCTION

Chronic rhinosinusitis (CRS) is termed as an inflammation of the mucosa of the nose and paranasal sinuses for a period of more than twelve weeks. It is a heterogeneous group of disorders characterized by inflammation of the nasal mucosa by a diverse group of inflammatory cells leading to the formation of polyp. Nasal polyps are oedematous, prolapsed nasal

mucosa covered by intact respiratory epithelium with underlying edematous stroma containing a mixed inflammatory cell infiltrate that lies beneath the thickened basement membrane. The inflammatory infiltrate is composed mainly of eosinophils, neutrophils, lymphocytes and plasma cells.¹ If the predominant cells infiltrating the polyp tissue are eosinophils, they are called Eosinophilic Chronic Rhinosinusitis (ECRS). The presence of excessive eosinophils in a polyp is

frequently associated with aggressive disease, extensive sinus involvement, with the possibility of polyp recurrence after surgery, higher likelihood of comorbid asthma and poor quality of life.^{2,3} The gold standard for the diagnosis of ECRS is histopathological assessment. ECRS has been described as >10 eosinophils count in histopathological examination at high power field (HPF, 400 times magnification).³

In this study we aimed to identify the tissue eosinophilia in patients with diffuse bilateral nasal polyp so that appropriate treatment can be delivered to the required patients to reduce the postoperative recurrence and improve the overall quality of life.

MATERIALS AND METHODS

We conducted a descriptive cross-sectional study on 51 patients after ethical clearance from the Institutional Review Board (IRB) was obtained. All the patients who underwent Functional Endoscopic Sinus Surgery (FESS) for CRS with nasal polyp who had diffuse bilateral nasal polyp were included. Cases where disease was limited to a single group of sinuses, patients with Cystic Fibrosis, Primary ciliary dyskinesia, Fungal Rhinosinusitis, CRS due nasal neoplasm of dental causes were excluded. Sino-nasal outcome test (SNOT-22) questionnaire was used to assess the severity of the disease and quality of life in all patients. CT scan of the nose and paranasal sinus was examined and disease was scored using the Lund and Mackay score.⁴ Serum Absolute Eosinophil Count (AEC) was done a day before the surgery. All the patients were given preoperative antibiotics and prednisolone (0.5 mg/kg body weight) for a period of 7 days prior to surgery. After surgery the polypoid tissue was fixed in formalin and embedded in paraffin. Sections were stained with hematoxylin-eosin and light microscopic examination of each slide was then conducted. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 26. In this study, we used a two-tailed Pearson correlation test to determine the correlation coefficient (*r*) between the tissue eosinophilia and the SNOT-22 score, as well as between the tissue eosinophilia and the CT score. The *p*-value was then calculated and was considered significant at *p* < 0.05.

RESULTS

Fifty-one patients were included in the current study, of whom 26 were females and 25 were males, with ages ranging from 21 to 56 years (mean = 39.5 ± 10). The most common presenting symptom was nasal blockage, followed by anosmia and rhinorrhea. The mean tissue eosinophilia count in the study population was 44.48 (SD 29.87), with a range of 2 to 85 per HPF. There was no significant difference in tissue eosinophilia between the male and female patients. The majority of patients (*n*=37, 72.5%) had tissue eosinophilia counts > 10 per HPF while few (*n*=14, 27.5%) had tissue eosinophilia ≤10 per HPF. The mean Lund-Mackay CT score was 15.49 (SD 4.9), with a range of 8 to 24. The mean SNOT-22 score was 64 (SD 8.06), with a range of 31 to 80. The mean CT score in patients with tissue eosinophilia >10 was 18.35 (SD 4.08), which was significantly higher than the mean CT score in patients with tissue eosinophilia ≤10 (mean CT score = 12.24, SD 2.67), with a *p*-value < 0.001. Similarly, the mean SNOT-22 score in patients with tissue eosinophilia >10 per HPF was 71.25 (SD 5.84), which was significantly higher than the mean SNOT-22 score in patients with tissue eosinophilia ≤10 (mean SNOT-22 score = 57.85, SD 4.49), with a *p*-value < 0.001.

Table 1. Tissue eosinophilia distribution.

Tissue eosinophils per HPF	Number of patients	Mean CT score (SD)	Mean SNOT-22 score (SD)
≤10	14	12.24 (2.67)	57.85 (4.49)
>10	37	18.35 (4.08)	71.25 (5.84)

These findings suggest that tissue eosinophilia >10 is associated with more severe disease in patients with chronic rhinosinusitis with nasal polyps, as indicated by higher CT scan scores and higher SNOT-22 scores.

The absolute eosinophil count (AEC) ranged from 30 to 450 per microliter of blood, with a mean of 211.23 (SD 111.96). There was statistically no significant correlation between AEC and tissue eosinophilia count (*r*=0.13, *p*=0.39), SNOT-22

score ($r=0.09$, $p=0.53$), or Lund-Mackay CT score ($r=0.22$, $p=0.14$).

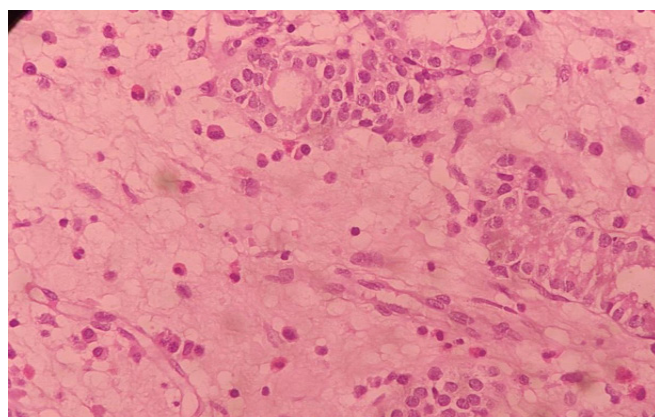


Figure 1. Nasal polyp with inflammatory cells eosinophils, lymphocytes and plasma cells (400 times magnification)

DISCUSSION

This study shows that in patients with bilateral diffuse nasal polyps, 72.5% of patients had eosinophil count >10 per HPF. Similar results were seen in the study by Aslan et al. where out of 53 patients, 33 (62.3%) had a mucosal eosinophil count of >10 /HPF, whereas 20 (37.7%) had a mucosal eosinophil count of ≤ 10 /HPF.⁵ However in a study done on patients with unilateral nasal polyp, Santoshu et al found that 53% of had absence of tissue eosinophilia.⁶

In this study, the presence of tissue eosinophilia >10 per high-power field was associated with a higher Lund and Mackay CT score and higher SNOT-22 scores. Similar results were seen in other studies where increasing CT scan scores were seen in patients with higher tissue eosinophilia.^{5,7}

In our study, the mean SNOT-22 score in patients with tissue eosinophilia >10 per HPF significantly higher than the mean SNOT-22 score in patients with tissue eosinophilia ≤ 10 . Poor quality of life in patients with high tissue eosinophils count, as indicated by high SNOT -22 score was demonstrated by other authors too.^{8,9}

Although serum AEC was not the primary focus of this study, measuring it can provide additional information about the extent of the disease and the severity of the patient's condition. In this study, AEC was not significantly different between patients who had a higher tissue eosinophil count (>10) and those who had a lower tissue

eosinophil count (≤ 10). This finding suggests that serum absolute eosinophil count may not be a reliable indicator of the severity of the disease in patients with chronic rhinosinusitis with nasal polyps. In contrast, Gitomer et al. they found significant positive correlation between CT score and peripheral eosinophil level.¹⁰

The use of steroids prior to the surgery and its effect on tissue and serum eosinophilia is also not well understood. In a study by Radajewski et al. they observed that systemic administration of 40 mg of prednisone for seven days decreased the number of eosinophils and decreased fibrosis in the nasal polyp.¹¹ However, Akiyama et al showed that low-dose and short-term oral prednisolone did not markedly affect the tissue eosinophil count in ECRS patients.¹²

Central compartment atopic disease (CCAD) is another CRS phenotype producing diffuse bilateral nasal polyps with increased tissue eosinophil count.¹² Histology alone cannot separate these two phenotypes hence beyond the scope of our study and was the limitation of this study.

CONCLUSION

This study found a high prevalence (72.5%) of tissue eosinophilia in patients with diffuse bilateral nasal polyps. There was a significant positive correlation between tissue eosinophilia count and both SNOT-22 score and Lund-Mackay CT score. These findings suggest that an increase in tissue eosinophilia leads to extensive sinus involvement and poor quality of life. Therefore, identifying tissue eosinophilia in patients with chronic rhinosinusitis with nasal polyps may be important in determining the appropriate long-term treatment strategy for these patients. Histopathological examination of nasal polyp is necessary to accurately identify and manage these cases. It is important to note that this study only included a small sample size of 51 patients, and further research with larger sample sizes is needed to confirm these findings.

Conflict of interest: None

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