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Introduction

Chronic rhinosinusitis (CRS) is one of the most common chronic inflammatory conditions in North America, with an estimated prevalence ranging from 5% to 16% and a \$22 billion overall annual economic burden in 2014^{1,2}. Subsets of CRS patients are those with and without mucosal tissue eosinophilia and with/without polyps (e/ncRSsNP). Patients with eCRSsNP are known to have more aggressive disease, however, eCRSsNP patients have not been studied well. The goal of this study is to evaluate the significance of eosinophilia on surgical outcomes in patients without polyps and compare to a group of patients without eosinophilia and without polyps (ncCRSsNP).

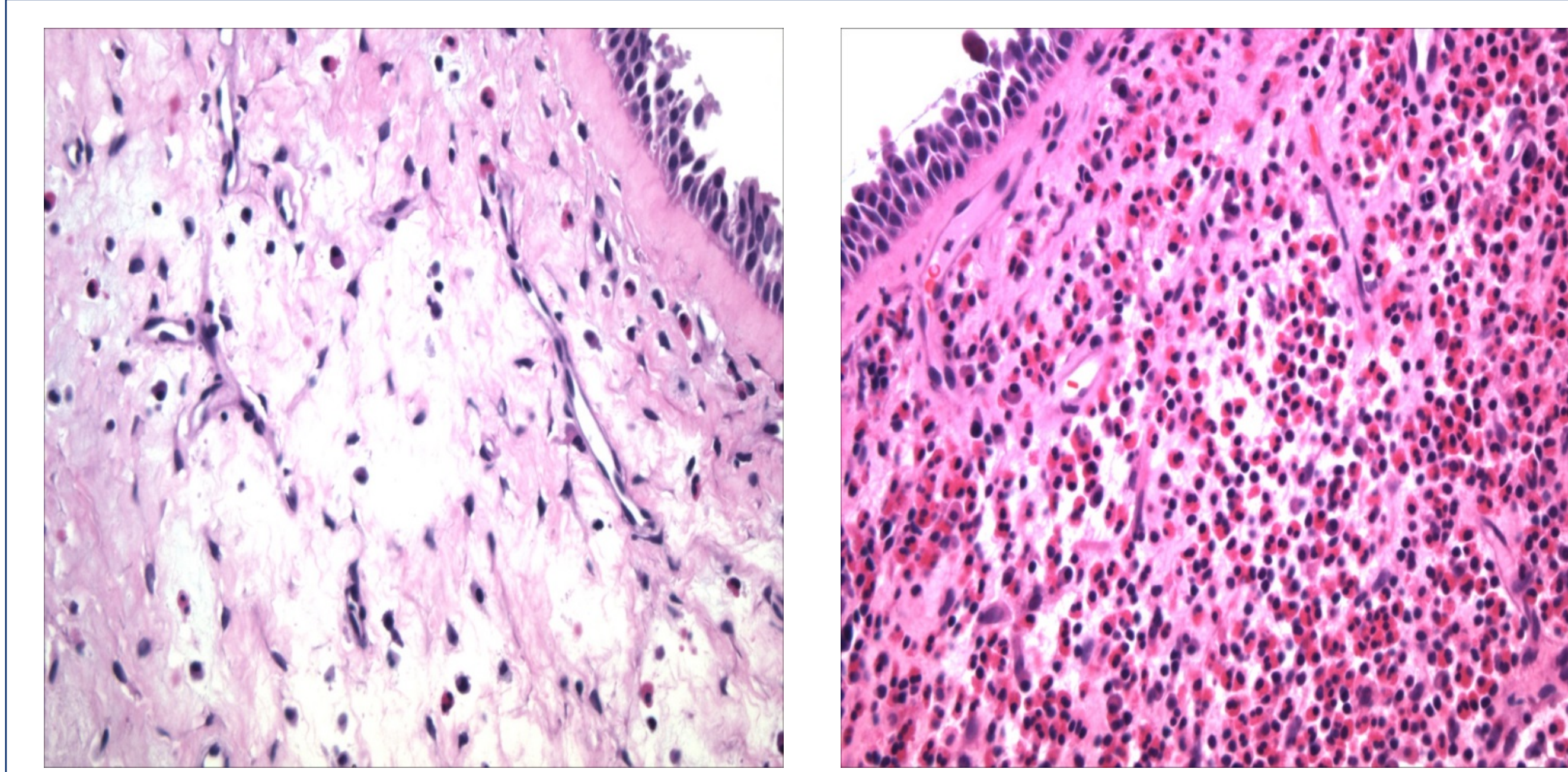
Materials and Methods

The Augusta University Institutional Review Board granted approval for this study. Prospectively collected data from a tertiary care academic rhinology practice were analyzed. All patients had a diagnosis of CRS based on the Rhinosinusitis Task Force criteria endorsed by the American Academy of Otolaryngology-Head and Neck Surgery³. Sino-Nasal Outcome Test (SNOT-20) and Lund-Kennedy endoscopy scores were documented before, one week after surgery (first visit) and at long-term follow-up (last visit). All patients underwent Functional Endoscopic Sinus Surgery by the senior author (S.K) after failing appropriate medical therapy. Postoperatively patients without eosinophilia were treated with normal saline nasal irrigations, intranasal steroid spray and postoperative debridements as needed. Patients with eosinophilia were treated similarly in addition to a leukotriene receptor antagonist. Both patient groups received postoperative pain medications and oral antibiotics for 10 days. None received pre or postoperative oral steroids. Patient inclusion criteria in the study required a clinical and histopathological diagnosis of eCRSsNP or ncCRSsNP according to postoperative analysis of mucosal tissue eosinophilia. In addition, we only included patients with similar follow-up length. Patients with revision surgery, cystic fibrosis, diabetes or any form of immunodeficiency were excluded. Mucosal eosinophils were counted in 5 high power fields and averaged to determine the degree of eosinophilia. Patients with ≥ 20 eosinophils per high-power-field (HPF) were classified as eCRSsNP and with < 5 eosinophils per HPF are classified as ncCRSsNP. Average follow-up was 17.5 months (Last Visit). Since study variables are reported as averages, the independent sample t-test was used to calculate statistical significance.

Results

A total of 69 patients were enrolled into the study. The demographic characteristics of the cohort are shown in Table 1. The pre-operative SNOT-20 scores for the eCRSsNP group are statistically different than those at the first and last postoperative visit. However, there was no statistical difference between the first and the last postoperative visit meaning that subjective improvement is achieved immediately after surgery. The pre-operative SNOT-20 scores for ncCRSsNP patients are not statistically different than those at the first and last postoperative visit. However, a 57.43% reduction in their SNOT-20 score is seen. The ncCRSsNP group experience a higher preoperative SNOT-20 score when compared to eCRSsNP ($p < 0.05$). (Table 2). Endoscopy scores in eCRSsNP are statistically different and continue to improve over time. The last postoperative endoscopy score in ncCRSsNP patients is statistically different than the preoperative and first postoperative endoscopy score. In comparison to SNOT-20 scores, ncCRSsNP patients experience more objective improvement as seen on endoscopy scores. (Table 3). SNOT-20 scores in both groups significantly improve after the first postoperative visit; however, there was no statistically significant difference between groups at the first and last postoperative visit. Endoscopy scores showed that ncCRSsNP had statistically significant lower scores when compared to eCRSsNP patients in addition to experiencing better results.

Results



A) – eosinophils B) >20 eosinophils

Table 1: Demographics

	eCRSsNP	ncCRSsNP	Total
Female	24 (48%)	9 (64%)	33
Male	26 (52%)	5 (36%)	31
Average Age	23-79 (46.7)		
Follow-up	17.5 months		

Table 1: Demonstrates the breakdown of patients according to gender and presence or absence of eosinophilia. Average age and follow-up are noted.

Table 2: SNOT-20 score

	eCRSsNP	ncCRSsNP	Difference	P-value
Pre-op	29	38.93	9.93	<0.05
First Visit	17.89	24.43	6.54	<0.23
Last Visit	16.34	16.57	0.23	<0.96
Difference	12.66	22.36		
p-value	<0.00005	<0.01		

Table 2: Both groups independently achieved a statistically significant improvement in their SNOT-20 scores. Preoperatively, ncCRSsNP patients had a higher SNOT-20 scores, but postoperatively there was no difference between them.

Table 3: Endoscopy

	eCRSsNP	ncCRSsNP	Difference	P-value
Pre-op	8.54	5.78	2.76	$<0.01^*$
At First Visit	6.38	4.78	1.6	<0.11
At Last Visit	4.33	0.67	3.66	$<0.01^*$
Difference	4.21	5.11		
p-value	$<0.00000^*$	$<0.0008^*$		

Table 3: At long term, both groups experience objective improvement after surgery, however, this is much more appreciated in ncCRSsNP patients.

Discussion

This study examined the impact of tissue eosinophilia on surgical outcomes in patients with CRS without nasal polyps. From a clinical and research perspective, several authors have discussed different classification systems for CRS⁴. Usually the presence or absence of nasal polyps (NP) is considered the defining feature^{5,6}. We use the presence or absence of eosinophilia to guide our treatment postoperatively due to the fact that we consider eCRSsNP patients to have a different disease manifestation when compared to ncCRSsNP. This helps explain why long-term patients with eCRSsNP experience worse endoscopy scores compared to ncCRSsNP patients. Previous studies have examined the effect of mucosal tissue eosinophilia on quality of life or amount of eosinophilia present but have not examined both factors together^{7,8,9}. Soler et al¹⁰ in a population of 102 patients followed-up for a period of 16.5 months found that eCRSsNP patients had less improvement in quality of life which is similar to the results we found. However, in contrast to our study, Soler et al had patients received oral prednisone taper seven days before surgery and oral antibiotics that may have altered mucosal inflammation and mucosal eosinophilia. Multiple studies have shown that surgery improves postoperative symptom scores in CRS patients^{11,12}. However, it is crucial to classify patients according to mucosal tissue eosinophilia, as eCRSsNP patients require long-term medical treatment and are prone to recurrence and eventual revision surgical procedures. As opposed to previous studies, we didn't use systemic steroids or antibiotics preoperatively which could have altered mucosal eosinophilia. To be clinically useful, the knowledge of mucosal tissue eosinophilia is a must since it provides prognostic information about disease severity/outcome and allows planned decision making regarding medical treatment. However, these results cannot be generalized, larger multicenter and community based studies will be necessary to validate the results.

Conclusions

- The postoperative identification of mucosal tissue eosinophilia in CRS patients seems to play a cardinal role in clinical outcome.
- Patients with ncCRSsNP have higher SNOT-20 preoperative score when compared to eCRSsNP patients but experience a faster recovery.
- Both ncCRSsNP and eCRSsNP show sustained improvement at long-term follow up. However, eCRSsNP patients have more objective evidence of long-term disease seen by endoscopy scores and require longer follow-up due to the more chronic nature of the disease.

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