

Original Research Article

Relationship between postoperative recurrence rate and eosinophil density of nasal polyp: a record based retrospective study

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ABSTRACT

Background: Nasal polyposis is one of the chronic severe airway diseases. It is known as a non-neoplastic inflammatory process of nasal mucosa that eventually leads to the outgrowth of abnormal masses inside the mucosa of nasal cavity and paranasal sinuses. Eosinophils and nasal polyps are believed to affect the surgical outcome of chronic rhinosinusitis (CRS). This study was conducted to determine relationship between postoperative recurrent nasal polyp rate and types of histopathology of nasal polyp.

Methods: A retrospective study of 121 patients at Khamis Mushayt General Hospital (Aseer region, Saudi Arabia) from 2012 to 2017. All diagnosed and treated for nasal polyposis with different histopathological types. we collect all the recurrent cases with the same histopathological result.

Results: The study included 121 patients with polyps whose ages ranged from 18 to 77 years old. 58% were males and 42% were females. it was noticed that 33.9% of edematous types of polyps with Eosinophilic infiltration were recurrent compared to 25% of other types among patients below the age of 30 years with no statistical significance. At patients above 30 years, the recurrence rate among eosinophilic type was significantly higher than other types (54.5% compared to 13.3%, respectively).

Conclusions: Presence of mucosal eosinophilia is a more important factor than nasal polyps for classifying CRS in terms of the surgical outcome. Patients with mucosal eosinophilia had higher polyp recurrence rate than patients without mucosal eosinophilia, whereas patients with nasal polyps did not have higher polyp recurrence rate than patients without nasal polyps.

Keywords: Eosinophils, Nasal polyps, Endoscopic sinus surgery, Recurrence

INTRODUCTION

Nasal polyps are epithelial and stromal non-neoplastic proliferations of the nasal cavity and paranasal sinuses.¹ There many theories developed regarding the etiopathogenesis of nasal polyps, it has not been identified yet. Histologically, nasal polyps have myxoid

and edema- stroma covered by respiratory epithelium exhibiting hyperplasia or squamous metaplasia and infiltrated pre- dominantly by eosinophils.^{2,3} Nasal polyps develop as a result of chronic inflammation in the nasal passages. Continued inflammation in these patients may be accompanied with chronic bacterial sinusitis, allergic rhinitis, cystic fibrosis, allergic fungal sinusitis, or autonomic nervous system dysfunction.⁴

The association with nasal polyps and bronchial asthma is considered.⁵ More attention is paid to nasal polyps with eosinophil infiltration are known to frequently coexist with asthma.^{6,7} Role of allergy in the pathogenesis of nasal polyps is questionable. However, most polyps, especially those with eosinophilia, have allergic background associated with a high local level of immunoglobulin E (IgE) and histamine and increased interleukin (IL)-4 and IL-5.⁵ Several studies suggest that nasal polyp patients with allergy have a greater recurrence rate after surgery.^{8,9}

Although nasal polyps are one of the most frequent diseases, their etiopathogenesis remains unclear. Since eosinophils are the main inflammatory cells in the substantial proportion of nasal polyp tissues, they are considered potentially responsible for the etiopathogenesis and prognosis of the disease. However, eosinophilic inflammation has been reported to play a critical role. Histological studies have demonstrated high levels of eosinophils in nasal polyp tissues and assume some relation with recurrence.¹⁰⁻¹²

This study was conducted to determine relationship between postoperative recurrent nasal polyp rate and types of histopathology of nasal polyp.

METHODS

The files of patients who underwent endoscopic sinus surgery for massive nasal polyposis at Khamis Mushayet General Hospital between 2012 and 2017 were retrospectively reviewed. Patients with massive nasal polyposis, filling at least half of each nasal passage, operated on by the same surgeon and who stayed under follow-up for at least 12 months were included in the study. The surgeries were performed under endoscopic vision and included nasal polypectomy, anterior and posterior ethmoidectomy, and widening of the sinus ostia. The patients below 16 years of age were excluded from the study to eliminate nasal polyposis due to cystic fibrosis. The patients were called for intranasal endoscopic examination after 2 weeks, one month, two months, six months, and after 12 months of the surgery to determine the recurrences of nasal polyps. Eosinophil leukocyte counting in nasal polyps was carried out retrospectively on histologic slides by use of computer-assisted image analysis software.

Data analysis

After data were collected it was revised, coded and fed to statistical software IBM SPSS version 20. The given graphs were constructed using Microsoft excel software. All statistical analysis was done using two tailed tests and alpha error of 0.05. P value less than or equal to 0.05 was considered to be statistically significant. Chi square or Mont Carlo exact test and Fishers exact test were used to test for the association between different patients' factors with type of polyp and recurrence. Exact testes were used

if there are small frequencies where chi square is invalid. Adjusted relation between patient characteristics, polyp type and recurrence was tested using multiple logistic regression model.

RESULTS

The study included 121 patients with polyps whose ages ranged from 18 to 77 years old with mean age standard deviation was 38.3 ± 14.9 years. About 58% of the patients were male. Regarding polyp types, 64.5% were complaining of edematous polyp with Eosinophilic infiltration while the remaining patients had other types.

About 33% of the patients had recurrent polyps after endoscopic excision (Figure 1).

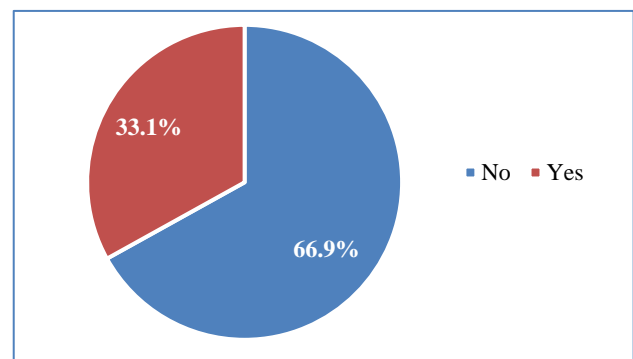


Figure 1: Recurrence rate among patients with polyps.

On relating recurrence with patients' characteristics and polyp type (Table 1), it was clear that 37.8% of patients under the age of 20 years had recurrent polyps compared to 47.6% of those who were above 50 years with no recorded statistical significance. As for gender, 41.4% of male patients had recurrent polyps compared to 21.6% of females with statistical significance ($p=0.022$).

Considering type of polyp, 39.7% of patients with edematous polyps with eosinophilic infiltration complained of recurrence compared to 20.9% of other types and this difference was found to be statistically significant ($p=0.035$).

After stratifying sampled patients according to age, it was noticed that 33.9% of edematous types of polyps with Eosinophilic infiltration were recurrent compared to 25% of other types among patients below the age of 30 years with no statistical significance. At patients above 30 years, the recurrence rate among eosinophilic type was significantly higher than other types (54.5% compared to 13.3%, respectively) (Table 2).

Finally, multivariate analysis based on regression model to identify the adjusted effect each other's, recurrence rate was 50% more among those who aged above 30 years (AOR=1.5; 95% CI: 0.5-3.5) with no significance. Also

males recorded 205 times more risk for recurrence than females (AOR=2.5; 95% CI: 1.2-5.9) with significance recorded after adjusting effect of other factors.

Eosinophilic polyps recorded 2.6 more risk for recurrence than other types (AOR=2.6; 95% CI: 1.1-6.2) with significant effect.

Table 1: Distribution of recurrence rate among the sampled patients according to their characteristics and polyp type.

Factor		Recurrence					P value
		N (%)	No		Yes		
			Number	%	Number	%	
Age (in years)	<30	37 (30.6)	23	62.2	14	37.8	0.243
	30-39	37 (30.6)	27	73.0	10	27.0	
	40-49	26 (21.5)	20	76.9	6	23.1	
	50+	21 (17.4)	11	52.4	10	47.6	
Mean±SD			37.7±13.5		39.1±16.9		
Gender	Female	51 (42.1)	40	78.4	11	21.6	0.022*
	Male	70 (57.9)	41	58.6	29	41.4	
Edematous with eosinophil	No	43 (35.5)	34	79.1	9	20.9	0.035*
	Yes	78 (64.5)	47	60.3	31	39.7	

P value for χ^2 test; *p<0.05 (significant).

Table 2: Distribution of recurrence rate among the sampled patients according to polyp type at age groups.

Age (in years)	Edematous with eosinophils	Recurrence				P value
		No		Yes		
		Number	%	Number	%	
<30	No	21	75.0	7	25.0	0.404
	Yes	37	66.1	19	33.9	
30+	No	13	86.7	2	13.3	0.011*
	Yes	10	45.5	12	54.5	

P value for χ^2 test; *p<0.05 (significant).

Table 3: Multivariate association between polyp recurrence rate and patients characteristics and polyp type.

Factor	COR	95% CI	AOR	95% CI
Age >30 years	1.4	0.61-3.1	1.5	0.5-3.5
Male	2.6	1.1-1.7*	2.5	1.2-5.9*
Eosinophilic	2.5	1.2-1.7*	2.6	1.1-6.2*

COR: crude odds ratio, AOR: adjusted odds ratio, CI: confidence interval, *significant factor based on confidence interval.

DISCUSSION

Although nasal polyps are one of the most frequent diseases, their pathophysiology of chronic rhinosinusitis (CRS) and nasal polyps remains unclear; however, eosinophilic inflammation has been reported to play a critical role. Histological studies have demonstrated high levels of eosinophils in nasal polyp tissues.^{10,12,13}

Because of the histologic diversity of nasal polyps, there have been several attempts at classifying them. One such classical classification scheme was proposed by Mygind, who classified nasal polyps into 4 categories based on histological findings: eosinophilic edematous type, chronic inflammatory or fibrotic type, seromucinous gland type, and atypical stromal type.¹⁴ A more commonly used method of grouping the nasal polyps is to grade the infiltration of eosinophils in the nasal polyp

tissue into several categories. Many authors have described the scoring system in a similar manner as the following: grade 0, no eosinophil; grade 1, slight infiltration; grade 2, moderate infiltration; and grade 3, marked infiltration.¹⁵⁻¹⁷

Eosinophil infiltration is a hallmark of nasal polyposis. Eosinophil infiltration in local tissue plays an important role in the pathogenesis of nasal polyposis. Nasal polyp tissue is characterized by TH2-driven eosinophilic inflammation with high concentrations of eosinophilic cationic protein (ECP), eotaxin, and IL-5.¹⁸ Eosinophilia is also associated with clinical conditions such as asthma and allergy.

The present study found that (33%) of patients with NP had mucosal eosinophilia. regarding the relation of recurrent nasal polyposis with age it shows patients above

30 years, the recurrence rate among eosinophilic type was significantly higher than other types.

There are studies confirming the relation of mucosal eosinophilia with postoperative recurrence and disease severity in nasal polyps.¹⁹⁻²²

The presence of mucosal eosinophilia is frequently associated with more severe disease and recurrence of nasal polyps after surgery.²³ Several studies have investigated the relationship between the number of mucosal eosinophils and surgical outcomes, but few studies have considered the level of tissue eosinophil density required to define mucosal eosinophilia. Mucosal eosinophilia was defined as >10 eosinophils or HPF and patients with eosinophilia showed significantly less improvement in quality-of-life outcomes.²⁴

In contrast, patients with CRS with mucosal eosinophilia showed significantly higher polyp recurrence.

On the other hand, patients with non-eosinophilic with NP did not have a high polyp recurrence rate. The present study indicates that mucosal eosinophilia is a more important prognostic factor than the presence of nasal polyps in terms of the surgical outcome. Consequently, we conclude that mucosal eosinophilia is a more important factor for classifying CRS than nasal polyps.

Nakayama et al divided patients into four groups as follows: those having eosinophilic CRS (ECRS) with nasal polyps (ECRSwNP), those having ECRS without nasal polyps (ECRS without NP), those having non-ECRS with nasal polyps (NECRSwNP), and those having non-ECRS without nasal polyps (NECRS without NP).²⁰ They determined a significantly higher recurrence rate in patients with mucosal eosinophilia, regardless of the presence or absence of nasal polyps.

There are various evidences regarding the prevalence of the recurrent NP in patients who had been under endoscopic sinus surgery due to unilateral or bilateral polyposis. It has been estimated that the recurrence rate of sinonasal polyposis varied from 15% to 25%.²⁵

In conclusion, based on the articles studied in this review, the incidence of polyposis recurrence after the surgical intervention is known to be common but several conditions can increase this recurrence. Although the surgical tools have shown considerable success in diminishing the sinonasal polyposis, history of previous Surgeries and the severity of polyposis before the surgery, the pathology of nasal polyposis and etc., are factors which increase the recurrent polyposis rate or the requirement for revision surgery.

CONCLUSION

After finishing the research it was concluded that about 1 out of each 3 patients recorded polyps recurrence after

excision. Recurrence was more among males with Eosinophilic types of polyps but age had no effect. Recurrence rate of eosinophilic polyps was predominant at patients exceeded the age of 30 years.

Researchers recommended that more attention should be paid for patients with polyps to avoid recurrence by periodic check-up specially if the polyps are of Eosinophilic type and the patient was male above 30 years.

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