

## Original Article

# Clinicopathological study of nasal Polyposis

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### Abstract

**Introduction:** The histological study of nasal polyps does not reveal any specific lesions, but the infiltration of the mucosa by eosinophils seems to be a feature of nasal polyposis. The aim of this work is to study the possible links between histological and clinical aspects of nasal polyposis. Furthermore, we attempt to compare the quantification of tissue eosinophilia by number of eosinophils per field obtained with respect to the total percentage of inflammatory cells.

**Material and Methods:** A study group of fifty two consecutive patients of nasal polyposis were evaluated prospectively and compared with 26 controls who underwent septoplasty and minimal FESS or Endoscopic Sphenopalatine artery ligation. Lund Mackay scores were recorded in 50 patients and 26 controls. Correlations were assessed between symptom score, radiological score, endoscopic score and surgical scores. Histological aspects of polyps such as the frequency of metaplasia, fibrosis and degree of eosinophilic infiltration were also studied.

**Results:** The mean symptom scores, radiological score and surgical score was recorded and the scores were statistically significant. Tissue eosinophilia was observed in more number of patients with nasal polyposis compared to controls.. The measurement of tissue eosinophilia quantitatively (number of eosinophils per field) correlated with the percentage obtained (the total of inflammatory cells infiltrate).

**Conclusions:** We have seen the great utility of Lund Mackay staging as it offers valuable and concordant information on certain aspects of nasal polyposis. The scores obtained in radiological staging are fairly homogenous as they are always between 10-20 with possible range 0-22. One possible explanation is that involvement of anterior and posterior ethmoid sinuses, osteomeatal complex is almost constant in nasal polyposis where complete occupation of frontal, sphenoid sinuses were less frequent. Eosinophilic infiltration of the nasal mucosa, along with edema, constant histological feature of nasal polyposis and appear to be important in the clinical behavior of sinonasal polyposis.

**Keywords:** Nasal polyps, tissue eosinophilia, Lund Mackay score, histology

### Introduction

Nasal polyposis is the the most incapacitating illness of the nasal cavity and paranasal sinuses, of unknown etiology, not mediated by immunoglobulin E (IgE). Eosinophils seem to play an important role and the condition leads to formation of edematous polyps from sinuses to nasal cavity<sup>1</sup>. It is a chronic inflammatory disorder of the upper respiratory tract that affects 1% to 4% of the human population. Polyposis is found in wide variety of diseases like cystic fibrosis, chronic rhinosinusitis and aspirin hypersensitivity and has various histological components determined by the basic disease state<sup>2</sup>. The European Position Paper on Rhinosinusitis and Nasal Polyps considers the nasal polyposis as a type of

chronic rhinosinusitis, but recommended to exclude this entity other conditions such as cystic fibrosis, primary ciliary dyskinesia syndrome and autoimmune vasculitis like Churg Strauss syndrome. Histological examination of nasal polyps finds no special features; It shows that the epithelium is usually of ciliated type, but sometimes may have squamous metaplasia. The lamina propria is thickened by edema and shows infiltration of inflammatory cells mainly, eosinophils<sup>3</sup>. Nasal polyposis is associated with relative frequency with intrinsic asthma and intolerance to non steroidal anti inflammatory drugs (NSAIDs). When these three entities coexist in the same patient it is, called ASA triad syndrome<sup>4</sup>. In the clinical assessment of nasal polyposis it is considered important to ascertain the extent of the disease for which Lund Mackay staging can be used<sup>5</sup>. The aim of this work is to study possible correlations between some clinical and histo pathological aspects in 52 patients with idiopathic bilateral nasal polyposis.

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## Materials and Methods:

A consecutive series of 52 patients with nasal polyposis were evaluated prospectively and compared with 26 patients with no evidence of polyps at the department of otorhinolaryngology, tertiary medical centre. The procedures were performed in accordance with the ethical guidelines and had approval by Ethics Committee.

The control group consisted of 26 patients who underwent septoplasty and minimal FESS(25) or endoscopic sphenopalatine artery ligation<sup>1</sup>. Though the 26 patients had symptoms suggestive of rhinosinusitis they had no significant endoscopic or CT scan findings which precluded them from being included in the study group. Our inclusion criteria were patients who did not show clinical evidence but had polyps on Diagnostic Nasal Endoscopy, patients with allergy, asthma and with allergic fungal sinusitis. Patients with granulomatous diseases of nose, malignancy of nose and paranasal sinuses, autoimmune disorders were excluded from the study. Besides a thorough otorhinolaryngological history and examination, all patients were evaluated for presence of allergy by absolute eosinophil count (AEC) and specific titres of Total Serum IgE. The study noted age and gender in all patients. The Lund Mackay score<sup>4,5</sup> is widely used in assessment of chronic rhinosinusitis. It was developed as a simple assessment tool to facilitate treatment decisions in the mid-1980s. It includes symptom scores, radiologic staging, endoscopy scores and surgical scores. Each participant was asked about the symptoms they were suffering from accordingly and scoring was done by Lund and Mackay staging system by visual analogue method for uniformity

TABLE 1 shows grading of symptom score

Facial pain	1-10
Headache	1-10
Nasal blockage or congestion	1-10
Nasal discharge	1-10
Olfactory disturbance	1-10
Overall discomfort	1-10
Total points	

Symptom not present; 0-10- degree of symptom severity, with 10 indicating greatest severity.

Endoscopic examination for measurement of polyp size was performed at each visit. Polyp size was rated on a Lund and Mackay four point scale (0, absent polyps; 1, polyps in middle meatus only; 2, polyps beyond middle meatus; 3, polyps obstructing the nose).

The determination of radiological staging was conducted by Lund and Mackay staging system. The opacification of the frontal, maxillary, anterior ethmoid, posterior ethmoid, and sphenoid

sinuses was evaluated: 0, no opacification; 1, partial opacification; 2, total opacification. The osteomeatal complex was similarly scored between 0 and 2 (non-opacified to opacified). Opacification of maxillary, ant. ethmoids, post. ethmoids, sphenoid frontal and osteomeatal complex on CT scan is noted and correlated with clinical findings

A numerical score was assigned for the maxillary sinus, anterior ethmoid sinus, posterior ethmoid sinus, sphenoid sinus, frontal sinus, and the ostiomeatal complex. Each side was graded separately, and the scores from each side were then added to determine the overall CT score.

All the patients underwent Functional Endoscopic Sinus Surgery (FESS) and the polyps were removed with microdebrider during FESS.

In all cases, surgically excised polyps were individually fixated, sectioned and histologically evaluated with H&E staining and with Periodic Acid Schiff stain in suspected cases of Allergic fungal sinusitis. The biopsies were taken from the normal nasal mucosa in controls. In patients with radiological evidence of fungal infection like speckled calcification or hyperdense shadows and presence of thick viscid secretions in the sinuses, fungal smear and culture was attempted. The histological variables studied were as follows:<sup>1</sup> Metaplasia, We classified the type of metaplasia observed as squamous or mixed mucoid.

Mucoid metaplasia was deemed to exist when a predominance of goblet cells was noted over mast cells.

Oedema type. We classified the type of Oedema observed into mild, moderate, severe

Type of epithelium - ciliate or squamous

Tissue eosinophilia. We quantified the average number of eosinophils per field in absolute

Terms.

The average number of eosinophils per field was quantified in absolute terms as percentage of the total number of inflammatory cells<sup>1</sup>.

Grade 1 - <5 per high power field, Grade 2 - > 5 per high power field<sup>1</sup>.

Grade 2 is considered for presence of tissue eosinophilia.

Statistical analysis was performed using chi-square test, Student's t Test, Spearman's rank correlation and Z Mann Whitney U test. Statistical package version 11.5 was used.

Comparisons have been made between the experimental group and control group, between clinical and radiological stages, between clinical groups, between allergic and nonallergic patients and between the quantification of eosinophils in absolute and percentage terms.

## Results

### Clinical Data

The average age of patients was 37.51 years. The youngest patient was 21 years old and the eldest 72. The average age in the control group was 35.61 years, with values ranging between 21 and 80. The group with nasal polyposis consisted of 25 women and 27 men, and the control group, 11 women and 15 men. Twenty one patients (40.4%) were diagnosed as having allergy, compared to 2 (7.7%) in non-allergic patients. The incidence of asthma is 5.8% which is relatively less and statistically significant association is not seen. No patients had history of aspirin sensitivity or history of congenital respiratory diseases.

Table 2 illustrates the Lund Mackay scores in 50 patients and 26 controls.

TABLE 2 LUND MACKAY SCORES

	group	N	Mean	Std. Deviation	Z
SXS	Control	26	23.1923	7.98007	2.45400
	Study	51	28.7843	9.34947	p=.014 sig
RR	Control	26	2.1154	2.45482	4.40800
	Study	50	5.9800	3.70598	p<0.001 vhs
RL	Control	26	2.0000	2.72764	5.18000
	Study	50	6.5800	3.22674	p<0.001 vhs
RTO	Control	26	4.1154	4.89348	5.26500
	Study	50	12.5600	6.33152	p<0.001 vhs
SR	Control	26	3.5769	1.79272	2.76700
	Study	50	4.6000	1.57791	p=.006 hs
SL	Control	26	3.8077	1.32723	2.73700
	Study	50	4.6000	1.62882	p=.006 hs
STO	Control	26	7.3846	2.68443	2.94700
	Study	50	9.2000	2.88557	P=.003hs

SXS – symptom score, RTO – total radiological score, STO – total surgical score, SR, SL- surgical score right, left, RR, RL – radiological score right, left

The mean symptom score was 28.78 in study group and 23.19 in control group. It was statistically significant. p=0.014. The mean radiological scores noted were 12.56 in study group. This score ranges from. 0–22. control group score was 4.11 Radiological scores are statistically highly significant. p<0.001.

Mean surgical score score was 9.2 in study group and 7.38 in controls. In our study most of the patients have undergone Functional Endoscopic sinus surgery. The association is statistically significant. p = 0.003

### Correlations

#### Duration

As the duration of the disease increased, symptom score has not increased. There was no significant association. (p 0.806) between the symptoms and duration, radiological score and duration (p=0.895) surgical score and duration (p=0.826) in study group and control group.

#### Symptom score

Symptom score association between study group and control group is significant. Correlation by Spearman's correlation coefficient was done. Association between Symptom score and surgical score, (p= 0.031), symptom score and radiological score (p=0.003) was statistically significant.

#### Radiological score

As the radiological score increase, surgical score had increased. Association was highly significant. (p=0.003)

TABLE 3 depicted that endoscopic scores in our study are highly significant.

		Group		Total
		Control	Study	
0--2	Count	23	27	50
	%	92.0%	55.1%	67.6%
2-4	Count	0	19	19
	%	0%	38.8%	25.7%
4--6	Count	2	3	5
	%	8.0%	6.1%	6.8%
Total	Count	25	49	74
	%	100.0%	100.0%	100.0%

a. X<sup>2</sup>=13.166, p=.001 highly significant

Majority of patients in both study (55.1%) and control groups (92%) had total endoscopic scores score range between 0-2. 38.8% of patients in study group had scores between 2-4. Few patients (6.1%) had 4-6 scores. It indicates that polyps in most of our patients are confined to middle meatus. In our study, all controls had minimum endoscopic scores

## Histology Data

The common epithelia seen in majority of patients in polyps were respiratory i.e ciliated epithelium, 48.1% and pseudostratified columnar (48.1%) in study group. The common epithelium in control group is ciliated. p value is highly significant. In the nasal polyp group, we found 8 cases (15.4%) with squamous metaplasia, 44(84.6 %) without metaplasia and 7 (17.5%). Therefore, among the 52 cases where we have been able to study the epithelium, 15.4% showed metaplasia where it was absent in the control group (Table 1). The association was significant statistically. Fibrosis was present in 44.2% of patients compared to 46.2% in controls. This parameter could not be determined in 5 patients in study group and 3 patients in control group p value is not significant. Oedema was present on histopathology in all patients. Moderate oedema and severe oedema was present in nasal polyposis. In controls in nasal mucosa mild oedema was present. When associated with infection moderate oedema was present. P value was highly significant. Assessment could not be done in 3 cases and 3 controls. Mucous gland hyperplasia was present in few patients with polyposis (21.1%). It was almost absent in controls. In our study, tissue eosinophilia was observed in maximum no of patients with nasal polyposis. 50% of controls also had tissue eosinophilia. Association is not significant.

TABLE 4 demonstrated the tissue eosinophilia in our patients from which the following results were derived.

	Group		Total
	Control	Study	
EOSINO 1.00 Count	13	24	37
%	50.0%	46.2%	47.4%
2.00 Count	13	28	41
%	50.0%	53.8%	52.6%
Total Count	26	52	78
%	100.0%	100.0%	100.0%

a.  $X^2=103$   $p=.748$  ns

Table 5 depicted the correlation between tissue eosinophilia and severity of the disease assessed by endoscopic grading. We observed that (66.7 %) of patients with tissue eosinophilia had total polyp scores ranging from 0-2 and 47.4% of patients with tissue eosinophilia had polyp scores between 2-4. The correlation is not significant in study group.

Table 5 Correlation between tissue eosinophilia and endoscopic score.

Group	ENDSCR1			Total
	0-2	2-4	4-6	
Control	EOSINO 1.00 Count	11	2	13
	%	47.8%	100.0%	52.0%
	2.00 Count	12	0	12
	%	52.2%	.0%	48.0%
	Total Count	23	2	25
	%	100.0%	100.0%	100.0%
Study	EOSINO 1.00 Count	9	10	22
	%	33.3%	52.6%	100.0%
	2.00 Count	18	9	27
	%	66.7%	47.4%	.0%
	Total Count	27	19	49
	%	100.0%	100.0%	100.0%

ENDSCR- endoscopic score

Eosino - eosinophils

In control group, correlation is not significant. 52.2% of controls with tissue eosinophilia had minimum Endoscopic scores.

## Discussion

Nasal polyposis is the benign protrusion of soft tissue in to nasal cavity with multifactorial origin. we studied possible links between certain histological and clinical aspects in nasal polyposis. The radiological staging was done by means of computerized tomography (CT) according to the staging proposed by Lund etal<sup>4</sup>. The recent studies<sup>4,5,6</sup> on Lund Mackay staging found association between Lund Mackay score and extent of surgery performed. They found no correlation between Lund -Mackay and SNOT -22 scores. The Lund - Mackay scores increased with increasing grade of polyposis. The results of these studies correlated well with our study except symptom scores. This was due to the difference in clinical questionnaire applied in both studies. Some authors used Sino nasal Outcome Test-20 (SNOT-20) where as in our study symptom severity was assessed by Visual analogue scale (1- 10). In our study as the duration of the disease increased, symptom score has not increased. There was no significant association. (p 0.806) between the symptoms and duration, radiological score and duration, (p=0.895) surgical score and duration (p=0.826) in study group and control group. Furthermore, patients who present with facial pain or pressure are as likely to have either normal or abnormal results on CT scans as patients who present without these symptoms. Moreover, no significant relationship was found between duration of symptoms and severity of radiological findings. These results suggested that a higher symptom score does not

predict demonstration of more extensive disease on CT scans..They concluded that the initial management of sinusitis is a clinical decision tempered by the patient's subjective response to therapy and CT should not be used as a primary diagnostic tool in the determination of extent of paranasal sinus disease.

Total Endoscopic score is highly significant in our study. Majority of patients in both study and control groups had total score range between 0-2. 38.8% of patients in study group had scores between 2- 4. Few patients (6.1%) had 4- 6 scores. It indicates that polyps in most of our patients are confined to middle meatus. Other studies<sup>1</sup>. quoted the distribution by endoscopic staging as stage 2, 10 patients (25%); stage 3, 25 patients (65%); stage 4, 5 patients (10%). We have seen the great utility of endoscopy and CT staging since they offer valuable and concordant information on many aspects of nasal polyposis. The scores obtained in Radiological staging are fairly homogenous as they are always between 10-20 with possible range 0-22. One possible explanation is that involvement of anterior and posterior ethmoid sinuses, osteomeatal complex is almost constant in nasal polyposis where complete occupation of frontal, sphenoid sinuses were less frequent.

Sino nasal polyps are benign mucosal swellings that occur in different histological patterns. The literature stated<sup>7,8,9</sup> that the most common type is the edematous eosinophilic nasal polyp, which constitutes 85-90% of nasal polyps. The edematous polyp is morphologically characterized by edema, goblet cell hyperplasia of the epithelium, thickening of the basement membrane, and of numerous leukocytes, predominantly eosinophils. The second histological type is a fibro inflammatory polyp characterized by chronic inflammation and metaplastic changes of the overlying epithelium. In our study common epithelia seen in majority of patients in polyps were respiratory i.e ciliated epithelium, 48.1% and squamous epithelium (48.1%) in study group. The common epithelium in control group is ciliated. 15.4% of specimens showed squamous metaplasia on histopathology of polyp. it was absent in controls (0%).

Marked differences in the distribution of epithelium and goblet cell density were found between the studies illustrating that the epithelium constantly changes under the influence of air current, contact with other polyps, infection, growth, and age of the polyp as well as other unknown factors<sup>8</sup>. Fibrosis was present in 44.2% of

patients and 46.2% of controls. In our study fibrosis was not statistically significant. This correlates with other studies<sup>3</sup> where authors emphasized the fact that remodeling and fibrosis are features of intrinsic asthma. They noted that proportion of fibrous tissue tends to be higher in early endoscopic stages. So, ultimate inference is that type of tissue in nasal polyposis did not present any significant fibrosis because predominant tissue is lax and in general there was decrease of both fibres and cells in tissue. Oedema was present on histopathology in all patients. In 84.6% of patients with polyps moderate oedema was present. Severe oedema was present in 5.8% of patients. So, we agree in line with other authors that lamina inherent to almost all polyps presents intense oedema, resulting in abundant areas of pseudocystic appearance thus diminishing density of all elements, both fibres and tissue cells.

There is no unanimity among authors in method of quantification of eosinophils. Some used quantification in absolute values and some others in relative values<sup>1,3,10,11</sup>. We used absolute terms and the results were shown as number of eosinophils per high power field. In our study, tissue eosinophilia was observed in 53.85 of patients in study group and 50% of controls and the association is not significant. According to our study, though the association is not statistically significant, tissue eosinophilia was observed in significant number of patients with polyposis (53.8%) compared to controls (50%) i.e, clinically significant. Similar studies<sup>12,13, 14,15</sup>. confirmed that eosinophil infiltration is a striking feature of nasal polyposis. They reported that patients with chronic sinusitis showed less than 10% of eosinophils whereas 88% of patients with nasal polyps showed more than 10% eosinophils which the percentage was higher than our study. Some authors<sup>1,3,16</sup> found statistically significant association between sinonasal polyposis and tissue eosinophilia. We found high prevalence of tissue eosinophilia in control group due probable higher incidence of allergy in this geographic area and the difference in grading system applied for eosinophil quantification. Thus, a link might exist between clinical presentation and eosinophil infiltration. Eosinophils appear as a link between nasal polyps, asthma and aspirin intolerance. Correlation was done between tissue eosinophilia and endoscopic score in our study. We observed that (66.7 %) of patients with tissue eosinophilia had total polyp scores ranging from 0-2 and 47.4% of

patients with tissue eosinophilia had polyp scores between 2-4. The correlation is not significant in study group. Majority of patients in study group had endoscopic score between 0-2. Tissue eosinophilia was observed in 66.7% of patients in our study. Literature<sup>1,3,16,17</sup> showed Tissue eosinophilia in endoscopic stage 2 was significantly lower than in stages 3 and 4 ( $P=0.048$ ). There were no significant differences between endoscopic stages 3 and 4. Their opinion is that Eosinophil infiltration of the nasal mucosa is, together with oedema, the most constant histological characteristic of nasal polyposis and seems to be an important factor in the clinical behaviour of sinonasal polyposis.

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