Chronic Eosinophilic Rhinosinusitis Clinical Implications

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Background: Eosinophilic Chronic Rhinosinusitis (ECRS) is clinically characterized by extensive disease and poor prognosis.

Objectives: To evaluate eosinophilic mucin in Chronic Rhinosinusitis (CRS).

Design: A Retrospective Study.

Setting: Bahrain Defence Force Royal Medical Services, Bahrain.

Methods: Fifty-nine patients with chronic rhinosinusitis with nasal polyps were included in the study. Clinical data, CT findings and histopathology were documented.

Results: Twenty-six (44.1%) patients were diagnosed with eosinophilic chronic rhinosinusitis (ECRS) with nasal polyps. Headache, bilateral nasal polyps, total sinus opacification and occluded ostiomeatal complex were more common in patients with ECRS compared to patients with non-eosinophilic CRS. P-value less than 0.05 was considered statistically significant.

Conclusion: Patients with ECRS are likely to have severe disease presentation compared to patients with non-eosinophilic CRS. Clinical findings could differentiate ECRS from non-eosinophilic CRS.

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Chronic rhinosinusitis (CRS) is one of the common health care problems, which have severe impact on lower airway disease, general health and medical expenses[1]. CT and endoscopy findings reveal more advanced disease presentation in patients with eosinophilic rhinosinusitis with nasal polyps than in patients with non-eosinophilic rhinosinusitis with nasal polyps[2]. The results of surgery for CRS are thought to be influenced by the presence or absence of eosinophils and nasal polyps. The likelihood of relapse is more common in patients with eosinophilic rhinosinusitis[3].

The aim of this study is to evaluate eosinophilic mucin in cases of CRS.

METHOD

Sixty-two patients diagnosed with CRS with polyps who underwent Endoscopic Sinus Surgery (ESS) were included in this study. All patients were assessed and managed by a single surgeon. Excised polyps from all patients were sent to the histopathology. Patients' data were documented including investigations.

Patients with CRS without polyps were excluded from the study. Missing data variables were documented. The study included twenty-six different variables. These variables included patients' symptoms, examination findings, Lund-Mackay CT score and histopathology diagnosis[4].

The analysis was conducted using SPSS version 10.1 and Microsoft Excel 2007. Frequencies, cross-tabulations and significances were computed. P-value less than 0.05 was considered statistically significant.

RESULT

Fifty-nine patients diagnosed with chronic rhinosinusitis with nasal polyps were included in the study. Fifty-one (86.4%) patients were males; male to female ratio was approximately 5:1. The age distribution ranged from 9 to 79 years with an average age of 24 years.

Nasal congestion was documented in 45 (76.2%) patients followed by rhinorrhea in 33 (55.9%) patients and hyposmia in 27 (45.8%) patients. Headache was documented in 24 (40.8%) patients, sneezing in 25 (42.4%), postnasal drip in 21 (35.6%),

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nasal itching in 19 (32.2%), facial pain in 15 (25.4%) and epistaxis in 5 (8.5%), see table 1.

Table 1: Symptoms in Patients with Sinonasal Polyposis

Symptom	Non-Eosinophilic CRS	Eosinophilic CRS	Allergic Fungal	Total
Nasal Congestion	22	22	1	45
Headache	11	12	1	24
Hyposmia	16	11	0	27
Sneezing	14	10	1	25
Postnasal Drip	13	8	0	21
Nasal Itching	11	7	1	19
Rhinorrhea	17	15	1	33
Facial Pain	7	7	1	15
Epistaxis	4	1	0	5

Histopathology results revealed non-eosinophilic polyps in 31 (52.5%). Non-eosinophilic polyps were defined as polyps with weak eosinophilic infiltration in the nasal polyp epithelium and lamina propria with the dominant cells in the stroma being lymphocytes and plasmocytes. Eosinophilic polyps were found in 26 (44%). Allergic fungal polyps were found in 2 (3.4%) patients. Techniques used in our labs for fungal identification included conventional fungus culture and identification, fungus examination-KOH preparation, GMS and PAS fungal stain, lactophenol aniline blue examination and direct microscopy.

Headache was found to be more common in patients with eosinophilic polyps compared to patients with non-eosinophilic polyps, P-value less than 0.01. The majority of the patients with non-eosinophilic polyps complained of hyposmia, sneezing, postnasal drip, nasal itching and rhinorrhea, P-value less than 0.01. Facial pain and epistaxis were more common in non-eosinophilic polyps, not significant statistically. No statistical significance between nasal congestion and the histologic subtypes of sinonasal polyps, see table 1.

Illnesses associated with sinonasal polyposis included nasal allergy, bronchial asthma, aspirin sensitivity and atopy. The most common illness was allergic rhinitis in approximately 34 (57.6%), followed by bronchial asthma in 7 (11.9%), Aspirin sensitivity was found in 1 (1.7%) and atopy in 1 (1.7%). Bronchial asthma and aspirin sensitivity were found to be more common in patients with eosinophilic polyps, see table 2. The association between bronchial asthma and eosinophilic polyps was weak, P-value of 0.06. No statistical significance between eosinophilic polyps and aspirin sensitivity, P-value 0.3. Allergic rhinitis was more common in patients with non-eosinophilic polyps, P-value 0.0006.

Table 2: Sinonasal Polyps with Associated Diseases

Associated Illnesses	Non-Eosinophilic CRS	Eosinophilic CRS	Allergic Fungal	Total
Allergic Rhinitis	18	15	1	34
Bronchial Asthma	2	5	0	7
Aspirin Sensitivity	0	1	0	1
Atopy	1	0	0	1
Non Documented Associated Illnesses	10	5	1	16
Total	31	26	2	**59**

Nine (15.3%) patients with polyps were smokers. The distribution of smoking among different histologic types of sinonasal polyps is shown in table 3, no statistical significance.

Table 3: Sinonasal Polyps and Smoking

Smoking	Non-Eosinophilic CRS	Eosinophilic CRS	Allergic Fungal	Total
Yes	4	5	0	9
No	15	13	2	30
Non Documented Smoking	12	8	0	20
Total	31	26	2	**59**

Bilateral nasal polyps were more common in patients with allergic fungal rhinosinusitis and patients with ECRS. Two patients with allergic fungal rhinosinusitis and 18 (30.5%) patients with ECRS had bilateral nasal polyps compared to 14 (23.7%) of patients with non-eosinophilic polyps, see table 4, P-value of 0.002.

Table 4: Association of Non-Eosinophilic CRS, ECRS and AFRS with Unilateral and Bilateral Polyposis

Histology	Unilateral Polyp	Bilateral Polyps	Non Documented Unilateral or Bilateral	Total
Non-Eosinophilic	9 (15.2%)	14 (23.7%)	8 (13.5%)	31 (52.5%)
ECRS	1 (1.6%)	18 (30.5%)	7 (11.6%)	26 (44%)
AFS	0 (0%)	2 (3.3%)	0 (0%)	2 (3.3%)
Total	10 (16.9%)	34 (57.6%)	15 (25.4%)	**59 (100%)**

Lund-Mackay scoring system was used for CT scans. Total opacification of the sinuses and occluded ostiomeatal complex were more common in patients with eosinophilic polyps compared to patients with non-eosinophilic polyps, P-value 0.02. Tables 5 to 7 demonstrate the Lund-Mackay score for individual sinuses in each histologic type of sinonasal polyposis.

Table 5: Lund-Mackay Score for ECRS

	Right			Left		
Sinuses	**0**	**1**	**2**	**0**	**1**	**2**
Frontal	6 (10%)	4 (6.7%)	5 (8.4%)	7 (11.8%)	3 (5%)	5 (8.4%)
Maxillary	3 (5%)	5 (8.4%)	7 (11.8%)	3 (5%)	6 (10%)	6 (10%)
Anterior Ethmoid	3 (5%)	5 (8.4%)	7 (11.8%)	4 (6.7%)	4 (6.7%)	7 (11.8%)
Posterior Ethmoid	3 (5%)	5 (8.4%)	7 (11.8%)	4 (6.7%)	4 (6.7%)	7 (11.8%)
Sphenoid	5 (8.4%)	4 (6.7%)	6 (10%)	7 (11.8%)	3 (5%)	5 (8.4%)
Missing Data	12 (20.3%)	12 (20.3%)	12 (20.3%)	11 (18.6%)	11 (18.6%)	11 (18.6%)
Ostiomeatal Complex	**Right**			**Left**		
2 (Occluded)	12 (20.3%)			12 (20.3%)		
0 (Not Occluded)	3 (5%)			3 (5%)		
Missing Radiology Report	12 (20.3%)			11 (18.6%)		

Table 6: Lund-Mackay Score for Allergic Fungal Rhinosinusitis

	Right			Left		
Sinuses	**0**	**1**	**2**	**0**	**1**	**2**
Frontal	8 (13.5%)	2 (3.3%)	2 (3.3%)	8 (13.5%)	3 (5%)	1 (1.69%)
Maxillary	2 (3.3%)	8 (13.5%)	2 (3.3%)	1 (1.69%)	9 (15.2%)	2 (3.3%)
Anterior Ethmoid	3 (5%)	5 (8.4%)	4 (6.7%)	2 (3.3%)	5 (8.4%)	5 (8.4%)
Posterior Ethmoid	5 (8.4%)	3 (5%)	4 (6.7%)	4 (6.7%)	4 (6.7%)	4 (6.7%)
Sphenoid	6 (10%)	2 (3.3%)	4 (6.7%)	7 (11.8%)	1 (1.69%)	4 (6.7%)
Missing Data	0	0	0	0	0	0
Ostiomeatal Complex		**Right**			**Left**	
2 (Occluded)		1 (1.69%)			2 (3.3%)	
0 (Not Occluded)		1 (1.69%)			0	

Table 7: Lund-Mackay Score for Non-Eosinophilic Chronic Rhinosinusitis

	Right			Left		
Sinuses	**0**	**1**	**2**	**0**	**1**	**2**
Frontal	8 (13.5%)	2 (3.3%)	2 (3.3%)	8 (13.5%)	3 (5%)	1 (1.69%)
Maxillary	2 (3.3%)	8 (13.5%)	2 (3.3%)	1 (1.69%)	9 (15.2%)	2 (3.3%)
Anterior Ethmoid	3 (5%)	5 (8.4%)	4 (6.7%)	2 (3.3%)	5 (8.4%)	5 (8.4%)
Posterior Ethmoid	5 (8.4%)	3 (5%)	4 (6.7%)	4 (6.7%)	4 (6.7%)	4 (6.7%)
Sphenoid	6 (10%)	2 (3.3%)	4 (6.7%)	7 (11.8%)	1 (1.69%)	4 (6.7%)
Missing Data	19 (32.2%)	19 (32.2%)	19 (32.2%)	19 (32.2%)	19 (32.2%)	19 (32.2%)
Ostiomeatal Complex		**Right**			**Left**	
2 (Occluded)		8 (13.5%)			11 (18.6%)	
0 (Not Occluded)		4 (6.7%)			1 (1.69%)	
Missing Radiology Report		19(32.2%)			19(32.2%)	

DISCUSSION

Eosinophilic polyps were defined as polyps with strong eosinophilic infiltration in the surface layer[6]. Kountakis et al described more advanced disease presentation in patients with eosinophilic rhinosinusitis with nasal polyps[2]. The eosinophilic chronic rhinosinusitis (ECRS) clinically characterized by extensive disease and poor prognosis compared to the non-eosinophilic group[6]. Our results revealed similar findings.

In our study, headache was more common in patients with eosinophilic polyps. Bilateral nasal polyps were more common in patients with eosinophilic chronic rhinosinusitis compared to patients with non-eosinophilic polyps. Total sinus opacification and occluded ostiomeatal complex were more common in patients with eosinophilic polyps compared to patients with non-eosinophilic polyps.

The result of surgery for CRS is influenced by the presence or absence of eosinophils and nasal polyps[3]. The presence of eosinophilic mucin in CRS has been associated with higher frequency of polyp reappearance[3].

Sakuma et al concluded that blood eosinophilia, asthma complications, and CT findings could distinguish between ECRS patients from non-ECRS patients[7].

Nasal polyps do not occur with increased frequency in allergic patients compared to non-allergic subjects[8]. Niels et al concluded that there is no supporting evidence to indicate that allergy would result in the development nasal polyps. In our study, allergic rhinitis was more common in patients with non-eosinophilic polyps. Immunotherapy has not demonstrated any value in the management of nasal polyps and the need for sensitivity assessment tests is doubtful. Although several theories have been suggested as to the development of eosinophilic nasal polyps, the etiology remains unknown[8,9].

In a study, higher prevalence of smoking and atopy were found in patients with eosinophilic chronic rhinosinusitis with polyps compared to the non-eosinophilic type[10]. In our study, the distribution of smoking and atopy in ECRS compared to non-eosinophilic CRS polyps was not statistically significant.

ECRS is a systemic disease due to systemic dysregulation of immunological controls. Unilateral disease is not seen[11]. In our study, one (3.8%) patient with eosinophilic rhinosinusitis had unilateral sinonasal polyps and 18 (69.2%) had bilateral polyps.

Furthermore, patients with aspirin sensitivity and allergic fungal sinusitis had a higher rate of developing nasal polyps[12]. Aspirin sensitivity and allergic fungal sinusitis are characterized by an inflammatory reaction involving eosinophils; the degree of which is associated with an increased frequency of nasal polyps recurrence[12]. In non-eosinophilic types of inflammatory reactions which may occur in diseases, such as cystic fibrosis and ciliary dyskinesia, other inflammatory processes may be considered[8]. Our results showed aspirin sensitivity and allergic fungal sinusitis to be more common in patients with ECRS compared to non-eosinophilic CRS.

ECRS has significantly higher association with asthma and higher incidence of aspirin sensitivity[13,14]. In our study, bronchial asthma and aspirin sensitivity were found to be more common in patients with eosinophilic polyps; the association of bronchial asthma and eosinophilic polyps was weak; and no significant statistical association between eosinophilic polyps and aspirin sensitivity. ECRS is more severe sinus disease compared with non-eosinophilic chronic rhinosinusitis patients. Therefore, eosinophilic mucus may mark a more severe and distinct form of sinus disease[15]. In our study, CT of the sinuses revealed that patients with ECRS had significantly higher rate of total opacification of the sinuses and a higher rate of occluded ostiomeatal complex. This finding is similar to other studies[4]. In our study, patients with ECRS had a higher rate of bilateral nasal polyposis compared to patients with non-eosinophilic chronic rhinosinusitis with polyps.

ECRS is not a single entity. It is associated with several co-morbid conditions, particularly asthma[16,17]. Bearing in mind the close association of allergic rhinitis and bronchial asthma, a unified line of management should be considered. That would be more cost effective and beneficial to the patient[18,19,20].

The limitations of this study are missing information from the data sheet due to incomplete documentation of clinical findings and missing or unreported CT scan films.

CONCLUSION

Patients with ECRS are likely to have severe disease presentation compared to patients with non-eosinophilic chronic rhinosinusitis. Clinical findings could differentiate

eosinophilic chronic rhinosinusitis from non-eosinophilic chronic rhinosinusitis.

Patients with ECRS are more likely to present with symptoms, such as headache and bilateral nasal obstruction. Bilateral nasal polyps are more common in ECRS patients. Clinically, one could differentiate ECRS from non-eosinophilic chronic rhinosinusitis based on history and physical examination. ECRS are more likely to have more extensive disease as seen on CTs. ECRS require more targeted treatment due to increased severity of the disease.

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