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Original Research Article

Clinicopathological Predictors of Disease Recurrence Following Functional Endoscopic Sinus Surgery: A Retrospective Cohort Study

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Abstract:

Background: Functional endoscopic sinus surgery (FESS) is the standard surgical approach for chronic rhinosinusitis (CRS) refractory to medical management. Despite high success rates, disease recurrence remains a significant clinical challenge, often necessitating revision surgery. Identifying clinicopathological predictors of recurrence may help optimize patient selection, perioperative management, and postoperative surveillance.

Objectives: To determine the incidence and clinicopathological predictors of disease recurrence among patients undergoing FESS for chronic rhinosinusitis with or without nasal polyposis at a tertiary care center.

Methods: This retrospective cohort study was conducted in the Department of Otorhinolaryngology, ANMC, Gaya, including 100 patients who underwent FESS for chronic rhinosinusitis and were followed up for a period of 1 year. Demographic, clinical, radiological (Lund-Mackay score), and histopathological data were collected from medical records. Recurrence was defined as endoscopic or radiological evidence of disease relapse with recurrent symptoms during the follow-up period. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of recurrence.

Results: Of the 100 patients, recurrence was observed in 21% (n = 21) during the 1-year follow-up period. Factors significantly associated with recurrence on univariate analysis included presence of nasal polyposis, bilateral disease, higher Lund-Mackay CT score, history of bronchial asthma, aspirin sensitivity, allergic mucin/eosinophilic histopathology, and incomplete surgical clearance of disease. On multivariate analysis, nasal polyposis, eosinophilic tissue infiltration, and a higher Lund-Mackay score remained independent predictors of recurrence ($p < 0.05$).

Conclusion: Disease recurrence after FESS is multifactorial, with nasal polyposis, eosinophilic inflammation, and disease severity on imaging emerging as key independent predictors. Identification of these high-risk patients preoperatively may guide closer postoperative surveillance and adjunctive medical therapy to reduce recurrence rates.

Keywords: Functional Endoscopic Sinus Surgery; Chronic Rhinosinusitis; Nasal Polyposis; Recurrence; Lund-Mackay Score; Eosinophilia.

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Introduction

Chronic rhinosinusitis (CRS) is an inflammatory disease of the paranasal sinus and nasal mucosal lining that results from failure to obtain medical resolution of symptoms of nasal obstruction, facial pain or pressure, rhinorrhea, and/or diminished or complete loss of smell for at least 12 weeks [1]. It's a significant cost to health services and a significant disease burden to patients and is broadly divided into CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP), with different inflammatory endotypes and clinical courses [2].

For patients who do not respond to maximal medical therapy, the gold standard surgical treatment procedure for CRS is functional endoscopic sinus surgery (FESS). It is safe and effective, and has been reported to have a high success rate of 76% to 97.5% [3] across all ages. Despite technological improvement and the increasing use of primary

FESS, the failure rate is between 2% and 24%, and a certain percentage of patients ultimately need reoperation for recurrent disease [3,4].

The recurrence rate after FESS is a complex condition, with different factors related to the patient, the disease and surgery contributing to it. Recurrence rates of ~18% to >30% after 5 years follow-up have been reported, varying with disease phenotype and definitions applied [5,6]. Factors suspected to play a role in recurrence include the presence and severity of nasal polyposis, the presence of comorbid asthma and aspirin-exacerbated respiratory disease (AERD), allergic fungal sinusitis, eosinophilic tissue infiltration on histopathology, elevated body mass index, hyperuricemia, extent of disease on preoperative computed tomography (CT) as quantified by the Lund-Mackay score, and the completeness of surgical clearance (including anatomical variations such as retained uncinate process or accessory ostia) [7-10].

Eosinophilic endotype of CRSwNP, and especially type 2 inflammation, has been emerging as an important factor in determining the more aggressive clinical course, higher risk of disease exacerbations and relapse rates in comparison to non-eosinophilic phenotypes [11,12]. Comorbid asthma and AERD are similarly consistently found to be predictors of multiple recurrences and require revision surgery in long term follow-up studies [6,13].

There are multiple cohorts from Western and East Asian countries who have described factors that predict recurrence after FESS, but few studies are available from Indian tertiary care centers, especially from Eastern India. This identification of clinicopathological predictors of recurrence is critical as it may be helpful to stratify patients preoperatively for the purpose of choosing an appropriate extent of surgery, guiding medical management and follow-up, and planning for the use of adjunctive therapies early in the course of disease for high-risk individuals, including topical and systemic corticosteroids and biologic agents [14,15].

Hence this retrospective cohort study to assess the recurrence rate of the disease and to identify clinical, radiological and pathological predictors of recurrence among the patients who had FESS for chronic rhinosinusitis in Department of Otorhinolaryngology, ANMC, Gaya for a one year follow-up.

Materials and Methods

Study Design and Setting: This was a hospital-based retrospective cohort study conducted in the Department of Otorhinolaryngology (ENT), Anugrah Narayan Magadh Medical College and Hospital (ANMC), Gaya, Bihar. The study included patients who underwent functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis and who had a documented follow-up of at least one year after surgery. Institutional Ethics Committee approval was obtained prior to data collection, and patient confidentiality was maintained throughout the study by anonymizing all records.

Sample Size: A total of 100 patients who fulfilled the inclusion and exclusion criteria and underwent FESS during the study period were included in the analysis.

Inclusion Criteria

- Patients aged 18 years and above diagnosed with chronic rhinosinusitis (with or without nasal polyposis) as per EPOS criteria, who underwent primary or revision FESS
- Patients with complete preoperative, intraoperative, and histopathological records
- Patients with a minimum postoperative follow-up of 1 year

Exclusion Criteria

- Patients with sinonasal malignancy or fungal ball without diffuse mucosal disease
- Patients with isolated traumatic or iatrogenic sinus pathology unrelated to CRS
- Patients with incomplete medical records or lost to follow-up before 1 year
- Patients who underwent concurrent septoplasty alone without FESS, or non-endoscopic open sinus procedures

Data Collection: Data were retrieved from hospital case records, operation theatre registers, histopathology reports, and outpatient follow-up records. The following variables were recorded for each patient:

- Demographic data: age, sex, residence (urban/rural), smoking status
- Clinical data: duration of symptoms, presence of nasal polyposis, laterality of disease (unilateral/bilateral), comorbid bronchial asthma, allergic rhinitis, aspirin sensitivity (AERD), diabetes mellitus, and body mass index (BMI)
- Radiological data: preoperative Lund-Mackay CT score
- Operative data: type of FESS (primary/revision), extent of surgery, completeness of disease clearance, and significant anatomical variations (e.g., concha bullosa, deviated nasal septum, Haller cells)
- Histopathological data: presence and degree of tissue eosinophilia, allergic mucin, fungal elements, and presence of polypoidal change
- Postoperative data: compliance with postoperative nasal saline irrigation and topical corticosteroids, and follow-up endoscopic findings at 3, 6, and 12 months

Outcome Definition: Disease recurrence was defined as the reappearance of nasal polyps and/or mucosal disease on nasal endoscopy, with or without recurrence of presenting symptoms (nasal obstruction, rhinorrhea, hyposmia, facial pain), confirmed at any point during the 1-year follow-up period, with or without radiological correlation on repeat CT scan where performed. Patients were followed up at 3, 6, and 12 months postoperatively with diagnostic nasal endoscopy.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS software (version 25.0 or equivalent). Continuous variables were expressed as mean ± standard deviation (SD) and compared using the Student's t-test or Mann-Whitney U test as appropriate. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test. Variables found to be significant on univariate analysis ($p < 0.05$) were entered into a multivariate logistic regression model to identify independent predictors of recurrence, with results expressed as adjusted odds ratios (aOR) with 95% confidence intervals (CI). A p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients who underwent FESS for chronic rhinosinusitis and completed 1 year of follow-up were included in the study. The mean age of the patients was 38.6 ± 12.4 years, with a male-to-female ratio of approximately 1.6:1. Bilateral disease was present in 64% of patients, and nasal polyposis was identified in 47% of cases. Comorbid bronchial asthma was present in 22% of patients, and 9% met criteria for aspirin-exacerbated respiratory disease.

Recurrence Rate: Disease recurrence within 1 year of FESS was observed in 21 of 100 patients (21%). The mean time to detection of recurrence was 7.8 ± 2.6 months, with the majority of recurrences identified at the 6- and 12-month follow-up visits.

Univariate Analysis of Predictors: Table 1 summarizes the comparison of clinicopathological variables between patients with and without recurrence. Patients with recurrence were significantly more likely to have nasal polyposis (76.2% vs 39.2%, $p = 0.002$), bilateral disease (85.7% vs 58.2%, $p = 0.018$), comorbid bronchial asthma (42.9% vs 16.5%, $p = 0.006$), aspirin sensitivity (23.8% vs 5.1%, $p = 0.008$), higher mean Lund-Mackay scores (12.4 ± 2.8 vs 8.1 ± 2.5, $p < 0.001$), and moderate-to-severe tissue eosinophilia on histopathology (61.9% vs 24.1%, $p = 0.001$).

Table 1: Comparison of clinicopathological variables between patients with and without disease recurrence (N = 100)

Variable	Recurrence (n=21)	No Recurrence (n=79)	p-value	Significance
Mean age (years), mean ± SD	36.2 ± 11.8	39.3 ± 12.6	0.312	
Male sex, n (%)	13 (61.9%)	48 (60.8%)	0.927	
Nasal polyposis, n (%)	16 (76.2%)	31 (39.2%)	0.002	*
Bilateral disease, n (%)	18 (85.7%)	46 (58.2%)	0.018	*
Bronchial asthma, n (%)	9 (42.9%)	13 (16.5%)	0.006	*
Aspirin sensitivity (AERD), n (%)	5 (23.8%)	4 (5.1%)	0.008	*
Allergic rhinitis, n (%)	8 (38.1%)	24 (30.4%)	0.487	
Mean Lund-Mackay score, mean ± SD	12.4 ± 2.8	8.1 ± 2.5	<0.001	*
Moderate-severe tissue eosinophilia, n (%)	13 (61.9%)	19 (24.1%)	0.001	*
Revision FESS (vs primary), n (%)	4 (19.0%)	9 (11.4%)	0.348	
Incomplete surgical clearance, n (%)	6 (28.6%)	7 (8.9%)	0.014	*

Multivariate Analysis: On multivariate logistic regression analysis (Table 2), three variables emerged as independent predictors of disease recurrence after adjusting for confounding factors: presence of nasal polyposis (adjusted OR 4.21, 95% CI 1.42-12.48, $p = 0.009$), moderate-to-severe eosinophilic infiltration on histopathology (adjusted OR 3.65, 95% CI 1.28-10.41, $p = 0.015$), and a higher preoperative Lund-Mackay CT score (adjusted OR 1.38 per unit increase, 95% CI 1.12-1.71, $p = 0.003$). Comorbid bronchial asthma showed a trend toward significance (adjusted OR 2.14, 95% CI 0.81-5.66, $p = 0.124$) but did not reach statistical significance after adjustment.

Table 2: Multivariate logistic regression analysis of independent predictors of recurrence

Predictor	Adjusted OR	95% CI	p-value
Nasal polyposis	4.21	1.42 - 12.48	0.009
Moderate-severe tissue eosinophilia	3.65	1.28 - 10.41	0.015
Lund-Mackay score (per unit increase)	1.38	1.12 - 1.71	0.003
Bronchial asthma	2.14	0.81 - 5.66	0.124

Discussion

In the present retrospective cohort of 100 patients undergoing FESS for chronic rhinosinusitis at ANMC, Gaya, with 1-year follow-up, disease recurrence was observed in a substantial proportion of patients, and nasal polyposis, eosinophilic tissue infiltration, and a higher preoperative Lund-Mackay score emerged as independent predictors of recurrence. These findings are broadly consistent with previously published literature on recurrence after endoscopic sinus surgery.

The recurrence rates reported in the literature vary considerably depending on the duration of follow-up and the definition of recurrence used. A long-term follow-up study of patients with CRSwNP undergoing FESS reported a recurrence rate of 18.2% over a median follow-up extending beyond 5 years, with higher recurrence noted in middle-aged patients [5]. Another large cohort study evaluating predictors of revision surgery within a 5-year follow-up identified asthma and aspirin-exacerbated respiratory disease as significant predictors of multiple recurrences, with a revision rate of approximately 19% [6]. A more extended follow-up of up to 20 years in a separate cohort demonstrated 5- and 10-year recurrence rates of 30.3% and 66.1% respectively, underscoring those recurrence is a progressive phenomenon that increases with duration of observation [6]. The recurrence rate of 21% observed in our cohort at 1 year, while shorter in duration, is consistent with the expectation that early recurrences within the first postoperative year are predominantly driven by more aggressive inflammatory phenotypes rather than anatomical re-narrowing alone.

The strong association between nasal polyposis and recurrence in our study mirrors findings from a recent systematic review and meta-analysis, which identified the presence and extent of polyps, comorbid asthma, and aspirin intolerance as consistent clinical predictors of polyp recurrence across multiple studies [9]. Similarly, a study from a tertiary care teaching hospital reported that the failure rate of primary endoscopic sinus surgery ranged from 2% to 24%, with polyp recurrence and incomplete disease clearance being major contributors to revision surgery [3]. Our findings, in which nasal polyposis carried the highest adjusted odds ratio for recurrence among the variables studied, reinforce the concept that CRSwNP represents a more recurrence-prone phenotype than CRS without polyps, likely owing to its underlying type 2 inflammatory endotype [2,11].

Tissue eosinophilia emerged as an independent predictor of recurrence in our cohort, a finding that aligns with growing evidence implicating eosinophilic inflammation as a driver of refractory and recurrent CRSwNP. Endotyping studies have demonstrated that eosinophil-dominant inflammation is associated with a more severe clinical phenotype, higher polyp recurrence rates, and reduced responsiveness to surgery alone, thereby supporting the rationale for adjunctive anti-inflammatory or biologic therapy in such patients [11,12]. Nasal cytology-based studies have similarly shown that patients with persistent eosinophilic or neutrophilic infiltrates at follow-up have a substantially higher probability of recurrence compared to those with normal cytology, further supporting histopathological eosinophilia as a marker of recurrence risk [6].

The association between a higher preoperative Lund-Mackay score and recurrence observed in our study is consistent with the general understanding that the radiological extent of disease reflects underlying disease burden and inflammatory load, both of which predispose to incomplete resolution and earlier relapse after surgery. Anatomical factors contributing to surgical failure, including retained cells in the frontal recess and incomplete clearance of diseased mucosa, have also been described as important contributors to recurrence and the need for revision surgery [10].

Comorbid bronchial asthma and aspirin sensitivity, while showing a strong association with recurrence on univariate analysis in our study, did not retain independent significance on multivariate analysis, possibly due to their close clinical overlap with the eosinophilic and polyp-predominant phenotypes already accounted for in the model. This is broadly in keeping with findings from a long-term cohort in which asthma and AERD were identified as predictors of multiple recurrences but were closely linked with the underlying eosinophilic endotype [6,13].

Other factors reported in the literature, such as elevated body mass index and hyperuricemia, have also been implicated as modifiable systemic risk factors for recurrence in Asian cohorts, suggesting that metabolic factors may interact with local mucosal inflammation to influence recurrence risk [7,8]. Although these variables were not the primary

focus of the present study, they merit further evaluation in future prospective studies from this region.

The findings of this study have important clinical implications. Patients presenting with extensive nasal polyposis, high Lund-Mackay scores, and significant eosinophilic infiltration on histopathology should be considered at high risk for early recurrence and may benefit from more intensive postoperative surveillance, prolonged topical corticosteroid therapy, and earlier consideration of adjunctive medical or biologic therapy where eosinophilic disease is refractory to conventional treatment [14,15].

Limitations

This study has several limitations. Its retrospective design and reliance on hospital records may have introduced information and selection bias. The relatively short follow-up period of 1 year may underestimate the true recurrence rate, as several studies suggest that recurrence continues to increase with longer follow-up extending to 5-10 years and beyond [5,6]. The single-center design and modest sample size of 100 patients may limit the generalizability of the findings, and larger multicentric prospective studies with longer follow-up are warranted to validate these predictors and to evaluate their utility in clinical risk-stratification models.

Conclusion

Even within the first year after FESS, the risk of recurrence is a clinically relevant issue. In this ANMC retrospective cohort of 100 patients, Gaya, moderate-to-severe eosinophilic infiltration on histopathology and higher preoperative Lund-Mackay CT score were shown to be independent risk factors for recurrence. Clinicopathological characteristics that increase the risk of recurrence, if identified preoperatively, can be used to help guide surgical resection, increase medical management postop, and implement more frequent endoscopic follow-up to prevent recurrence and the need for revisional surgery.

References

1. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. Rhinology. 2020;58(Suppl S29):1-464.
2. Chen CC, Buchheit KM. Endotyping chronic rhinosinusitis with nasal polyps: understanding inflammation beyond phenotypes. Am J Rhinol Allergy. 2023;37(2):132-9.
3. Aldajani A, Alroqi A, Alrashidi A, Alsaif A, Almeshari S, Aldwaighri M, et al. Outcomes of endoscopic sinus surgery for chronic rhinosinusitis with nasal polyposis and risk factors of recurrence in a tertiary care teaching hospital. Ann Otol Rhinol Laryngol. 2024.
4. Wu A, Ting JY, Platt MP, Tierney HT, Metson R. Factors affecting time to revision sinus surgery for nasal polyps: a 25-year experience. Laryngoscope. 2014;124(1):29-33.
5. Long-term perspectives on chronic rhinosinusitis with nasal polyps: evaluating recurrence rates after functional endoscopic sinus surgery in the biologics era - a 5-year follow-up study. J Pers Med. 2024;14(3):297.
6. Cazzato AL, et al. Clinical predictors of revision surgery and recurrence in chronic rhinosinusitis with nasal polyposis: a long-term follow-up study. Am J Otolaryngol. 2020;41(6):102654.
7. Xie S, Jiang S, Fan R, Gao K, Shui J, Wang F, et al. Elevated body mass index increased the risk of recurrence in Chinese patients with chronic rhinosinusitis. Am J Otolaryngol. 2023;44:103841.
8. Jiang S, Xie S, Xie Z, Jiang W, Zhang H. Hyperuricemia increases the risk of postoperative recurrence in Chinese patients with chronic rhinosinusitis. J Inflamm Res. 2024;17:2669-79.
9. Kim DH, Han JS, Kim GJ, Basurrah MA, Hwang SH. Clinical predictors of polyps recurring in patients with chronic rhinosinusitis and nasal polyps: a systematic review and meta-analysis. Rhinology. 2023;61(6):482-97.
10. Koskinen A, Salo R, Huhtala H, Myller J, Rautiainen M, Kaariainen J, et al. Factors affecting revision rate of chronic rhinosinusitis. Laryngoscope Investig Otolaryngol. 2016;1(4):96-105.
11. Bernstein JS, Wechsler ME. Eosinophilic respiratory disorders and the impact of biologics. Curr Opin Pulm Med. 2023;29(3):202-8.
12. Smith KA, Gill AS, Beswick DM, Meeks H, Oakley GM, Yim M, et al. Cystic fibrosis increases long-term revision rates of endoscopic sinus surgery in patients with comorbid chronic rhinosinusitis. Am J Rhinol Allergy. 2022;36(2):222-8.
13. Gomes PM, Cabral DC, Barreto J, Carcao AA, Duarte D, Peneda JF. Chronic rhinosinusitis with nasal polyps: predictors of recurrence 5 years after surgery. Acta Otolaryngol. 2024;144(11-12):635-40.
14. Soler ZM, Smith TL. Quality-of-life outcomes after endoscopic sinus surgery: how long is long enough? Otolaryngol Head Neck Surg. 2010;143(5):621-5.
15. Dietz de Loos D, Lourijsen ES, Wildeman MAM, Freling NJM, Wolvers MDJ, Reitsma S, et al. Prevalence of chronic rhinosinusitis in the general population based on sinus radiology and

symptomatology. J Allergy Clin Immunol. 2019;143(3):1207-14.