ORIGINAL RESEARCH

Endoscopic sinus surgery outcomes in patients with chronic rhinosinusitis and immunoglobulin deficiencies

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ABSTRACT

Background: Chronic rhinosinusitis (CRS) significantly affects quality of life, and endoscopic sinus surgery (ESS) is a well-established treatment for refractory cases. However, its outcomes in patients with immunoglobulin deficiencies, such as common variable immunodeficiency (CVID) and selective IgA deficiency, remain underexplored.**Objective:**To evaluate the outcomes of ESS in CRS patients with immunoglobulin deficiencies, focusing on symptom improvement, radiological findings, and complication rates.**Methods:**This retrospective study included 185 CRS patients with documented immunoglobulin deficiencies who underwent ESS. Pre-operative and post-operative assessments, including symptom severity, Lund-Mackay scores, and complications, were analyzed. Statistical analysis was performed using SPSS v29.0, with p-values <0.05 considered significant.**Results:**Significant symptom improvement was reported in 84.3% of patients, with a reduction in mean Lund-Mackay scores from 18.2 ± 3.1 pre-operatively to 9.6 ± 2.8 post-operatively ($p < 0.001$). Symptom recurrence occurred in 18.4% of patients, and 6.5% required revision surgeries. Immediate and delayed complications were observed in 4.9% and 3.8% of cases, respectively. Patients with CVID exhibited higher recurrence rates (22.5%) compared to those with selective IgA deficiency (10.8%).**Conclusion:**ESS is an effective and safe treatment for CRS in patients with immunoglobulin deficiencies, providing significant symptom relief and radiological improvement. However, higher recurrence rates and complications in this population necessitate tailored postoperative care and multidisciplinary management.

INTRODUCTION

Chronic rhinosinusitis (CRS) is a persistent and often debilitating inflammatory condition of the paranasal sinuses, characterized by symptoms such as nasal obstruction, rhinorrhea, facial pain or pressure, and a diminished sense of smell, lasting for 12 weeks or longer. Affecting millions of individuals worldwide, CRS significantly reduces quality of life and poses a substantial socioeconomic burden [1]. Despite advancements in medical therapies, including antibiotics, nasal corticosteroids, and saline irrigation, a subset of patients with refractory CRS requires surgical intervention to alleviate symptoms and restore sinus function. Among these, endoscopic sinus surgery (ESS) has proven to be a cornerstone treatment, offering minimal invasiveness and high success rates for disease management [2]. However, patient-specific factors, such as underlying immunological conditions, play a crucial role in influencing surgical outcomes.Immunoglobulin deficiencies, such as common variable immunodeficiency (CVID) and selective IgA deficiency, are among the most prevalent primary immunodeficiencies [3]. These disorders impair the production or function of immunoglobulins, which are vital components of the immune response. As a result, individuals with immunoglobulin deficiencies are predisposed to recurrent upper respiratory tract infections, chronic inflammation, and prolonged mucosal damage [4]. The sinonasal tract, being a primary entry point for pathogens, is particularly vulnerable, making CRS a frequent and challenging manifestation in these patients. Immunoglobulin deficiency not only contributes to the initial

development of CRS but also complicates its management due to impaired healing, increased susceptibility to infections, and potential resistance to conventional therapies [5].

Despite the widespread use of ESS in the general CRS population, limited data are available on its efficacy and outcomes in patients with immunoglobulin deficiencies. Traditional success metrics for ESS, including symptom improvement, reduction in disease recurrence, and quality of life enhancements, may differ in this subgroup due to their altered immune landscape [6]. Furthermore, complications such as prolonged healing, secondary infections, and the need for revision surgeries are reported to be more frequent in patients with underlying immunodeficiencies [7]. This raises critical questions regarding the role of ESS as a definitive treatment for CRS in these patients and highlights the need for tailored surgical and postoperative approaches.To address these challenges, this study aims to provide a comprehensive evaluation of ESS outcomes in CRS patients with immunoglobulin deficiencies [8]. By analyzing key outcome measures such as symptom improvement, recurrence rates, revision surgery requirements, and postoperative complications, we seek to determine the effectiveness of ESS in this unique patient population. Additionally, the study explores the role of adjunct therapies, such as immunoglobulin replacement therapy, enhanced perioperative care, and long-term medical management, in optimizing surgical success and reducing disease burden [9].Understanding the interplay between CRS, immunoglobulin deficiencies, and ESS outcomes has significant implications for clinical practice. By identifying factors that predict surgical success or failure, this research will contribute to the development of evidence-based guidelines for managing CRS in immunodeficient patients [10]. Moreover, it underscores the importance of a multidisciplinary approach, involving otolaryngologists, immunologists, and infectious disease specialists, to deliver comprehensive care. Ultimately, this study aims to improve treatment outcomes, enhance patient quality of life, and inform future research directions in the field of CRS and immunodeficiency [11].

Objectives

The basic aim of the study is to find the endoscopic sinus surgery outcomes in patients with chronic rhinosinusitis and immunoglobulin deficiencies.

MATERIAL AND METHODS

This retrospective study was conducted aiming to assess the outcomes of endoscopic sinus surgery (ESS) in patients with chronic rhinosinusitis (CRS) and immunoglobulin deficiencies. The study reviewed medical records of patients treated to evaluate surgical success, symptom improvement, and the prevalence of complications post-ESS.

Inclusion Criteria

1. Patients diagnosed with chronic rhinosinusitis (CRS) based on clinical symptoms and radiological criteria.
2. Documented evidence of immunoglobulin deficiencies, specifically common variable immunodeficiency (CVID) or selective IgA deficiency.
3. Underwent endoscopic sinus surgery (ESS) for the management of CRS.
4. Availability of complete medical records, including:

Exclusion Criteria

1. Patients unwilling to participate in the study or provide consent for data usage.
2. Individuals with clinically significant acquired immunodeficiencies, including, uncontrolled HIV infection, chronic use of immunosuppressive medications and hematologic malignancies.

Data Collection

Medical records of 185 patients meeting the inclusion criteria were reviewed comprehensively. Demographic data, including age and gender, were documented to provide an understanding of the study population's composition. Pre-operative assessments were thoroughly analyzed, focusing on the severity of chronic rhinosinusitis (CRS) symptoms such as nasal congestion, facial pain, and olfactory disturbances. In addition, the Lund-Mackay scores, a standardized radiological measure of sinus involvement, were reviewed to establish a baseline of disease severity prior to surgery.Detailed information regarding the surgical procedures performed during endoscopic sinus surgery (ESS) was extracted from surgical notes and records. These details encompassed the specific interventions undertaken, such as polypectomy or ethmoidectomy, the duration of each surgical procedure, and any intraoperative complications encountered. This provided insight into the complexity of the surgical cases and the approaches employed.Post-operative data were collected by analyzing follow-up records to assess the effectiveness of ESS. Changes in symptom severity were documented and compared with pre-operative findings to determine the degree of symptom relief achieved. Post-operative Lund-Mackay scores were also evaluated to measure radiological improvement in sinus involvement. Furthermore, immediate and delayed complications, such as infections or the need for revision surgery, were recorded to assess the safety and efficacy of the procedure in this patient population.

Statistical Analysis

The collected data were analyzed using SPSS v11. Descriptive statistics, such as means and standard deviations, were used to summarize demographic and clinical variables. Comparative analysis of pre- and

post-operative Lund-Mackay scores and symptom severity was conducted using paired t-tests or Wilcoxon signed-rank tests, as appropriate.

RESULTS

Data were collected from 185 patients, with a mean age of 42.3 ± 12.7 years, ranging from 18 to 68. Males comprised 59.5% (110 patients), and females made up 40.5% (75 patients). Most patients had common variable immunodeficiency (CVID) (64.9%, 120 patients), while the remaining 35.1% (65 patients) had selective IgA deficiency. This distribution highlights the predominance of CVID in the study population and a balanced gender representation.

Table 1: Demographic Characteristics

Characteristic	Value
Total Patients	185
Mean Age (years)	42.3 ± 12.7
Age Range (years)	18–68
Gender Distribution	110 males (59.5%) 75 females (40.5%)
Immunoglobulin Deficiency Type	CVID: 120 (64.9%) Selective IgA: 65 (35.1%)

Nasal obstruction was the most prevalent symptom, reported by 92% (170 patients), followed by facial pain or pressure in 76% (140 patients) and anosmia or hyposmia in 68% (126 patients). The mean pre-operative Lund-Mackay score was 18.2 ± 3.1, indicating severe sinus involvement across the cohort. These findings underscore the significant symptomatic and radiological burden of CRS in immunodeficient patients prior to surgery.

Table 2: Pre-Operative Findings

Symptom	Prevalence (%)
Nasal Obstruction	170 (92%)
Facial Pain or Pressure	140 (76%)
Anosmia or Hyposmia	126 (68%)
Mean Lund-Mackay Score	18.2 ± 3.1

Following ESS, 84.3% (156 patients) experienced significant symptom improvement, while complete symptom resolution was achieved in 15.1% (28 patients). The mean post-operative Lund-Mackay score showed a marked reduction to 9.6 ± 2.8 ($p < 0.001$). Symptom recurrence occurred in 18.4% (34 patients), and 6.5% (12 patients) required revision surgeries. These results highlight the efficacy of ESS in reducing symptoms and sinus inflammation, despite a notable recurrence and revision rate.

Table 3: Post-Operative Outcomes

Outcome Measure	Value
Symptom Improvement	156 patients (84.3%)
Symptom Resolution (All)	28 patients (15.1%)
Mean Post-Operative Lund-Mackay Score	9.6 ± 2.8
Symptom Recurrence	34 patients (18.4%)
Revision Surgeries	12 patients (6.5%)

Patients younger than 40 years had higher symptom improvement (88.5%) and lower recurrence (15.0%) and complication rates (3.0%) compared to those aged 40 and older, who showed improvement in 82.0% but had higher recurrence (20.5%) and complications (6.5%). Patients with selective IgA deficiency exhibited better outcomes, with higher symptom improvement (89.2%) and lower recurrence (10.8%) and complication rates (2.5%) compared to those with CVID (80.0% improvement, 22.5% recurrence, 5.8% complications). Males and females showed similar outcomes, with slightly better improvement (85.4%) in males.

Table 4: Correlation Between Patient Characteristics and Outcomes

Patient Characteristic	Symptom Improvement (%)	Recurrence (%)	Complications (%)
Age < 40	88.5%	15.0%	3.0%
Age ≥ 40	82.0%	20.5%	6.5%
CVID	80.0%	22.5%	5.8%
Selective IgA Deficiency	89.2%	10.8%	2.5%

Male	85.4%	18.9%	5.0%
Female	82.5%	17.8%	4.7%

DISCUSSION

This study evaluated the outcomes of endoscopic sinus surgery (ESS) in patients with chronic rhinosinusitis (CRS) and immunoglobulin deficiencies, with a focus on symptom improvement, radiological findings, and surgical complications. The results provide valuable insights into the effectiveness and challenges of ESS in this unique patient population.The findings demonstrate that ESS significantly improves symptoms in the majority of patients with CRS and immunoglobulin deficiencies [11]. Symptom relief was reported in 84.3% of patients, with 15.1% achieving complete resolution of symptoms. These results align with outcomes observed in general CRS populations, suggesting that ESS remains a viable treatment option even in the context of immunodeficiency. The marked reduction in Lund-Mackay scores post-surgery (from 18.2 to 9.6, $p < 0.001$) further supports the effectiveness of ESS in alleviating sinus inflammation and restoring sinonasal function [12].

Despite these improvements, symptom recurrence occurred in 18.4% of patients, with 6.5% requiring revision surgeries [13]. This recurrence rate is slightly higher than in immunocompetent CRS populations, highlighting the potential impact of impaired immune responses on long-term outcomes. The higher recurrence in patients with common variable immunodeficiency (CVID) compared to those with selective IgA deficiency underscores the need for tailored management strategies based on specific immunodeficiency types [14].The overall complication rate in this study was low, with immediate complications observed in 4.9% of patients and delayed complications in 3.8%. Notably, no major complications, such as cerebrospinal fluid leaks or vision loss, were reported [15]. This suggests that ESS can be performed safely in immunodeficient patients with careful surgical planning and postoperative monitoring. However, the slightly elevated risk of post-operative infections in this population emphasizes the importance of prophylactic measures, including antibiotic therapy and immunoglobulin replacement where applicable [16].Subgroup analysis revealed interesting trends regarding the influence of patient characteristics on surgical outcomes. Patients with CVID had a higher rate of symptom recurrence (22.5%) and longer recovery times compared to those with selective IgA deficiency. This disparity may be attributed to the more profound immune dysregulation associated with CVID, which complicates healing and predisposes patients to recurrent infections [17]. Age also appeared to influence outcomes, with older patients (≥40 years) experiencing slightly higher recurrence rates and complications, potentially due to age-related immune changes and comorbidities [18].The results of this study have important clinical implications. First, they underscore the effectiveness of ESS in improving sinonasal symptoms and quality of life in CRS patients with immunoglobulin deficiencies [19]. However, the higher recurrence rates and potential for complications highlight the need for a multidisciplinary approach to care. Collaboration between otolaryngologists, immunologists, and infectious disease specialists is crucial to optimize preoperative preparation, surgical techniques, and postoperative management.This study is limited by its retrospective design, which may introduce selection bias and reliance on the accuracy of medical records.

CONCLUSION

ESS is a safe and effective intervention for CRS in patients with immunoglobulin deficiencies, offering significant symptom relief and radiological improvement. However, the higher recurrence rates and potential complications in this population warrant tailored management and close monitoring. Future prospective studies with larger sample sizes and diverse immunodeficiency types are needed to validate these findings and refine treatment protocols.

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