Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14,issue.32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Outcomes Of Endoscopic Sinus Surgery Versus Medical Therapy In Chronic Rhinosinusitis Patients.

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.Cite this paper as Dr siyyar Ahmad, Dr aziz Ullah,Dr Farman Ali,Dr Muhammad Hafeez, dr wajih ud din shinwari, Dr Suhail Ahmad (2025) Outcomes Of Endoscopic Sinus Surgery Versus Medical Therapy In Chronic Rhinosinusitis Patients... .Journal of Neonatal Surgery, 14, (32s), 9924-9929

ABSTRACT

Background: Chronic rhino sinusitis (CRS) impairs quality of life and productivity. When guideline-directed medical therapy (MT) fails, endoscopic sinus surgery (ESS) is considered. Comparative evidence quantifying symptom relief, endoscopic/radiologic improvement, and complication profiles in real-world cohorts remains variable. This study compares outcomes of ESS versus continued MT in adults with CRS.

Objectives: To compare patient-reported, endoscopic, and radiologic outcomes between ESS and MT in CRS, and to identify predictors of clinically meaningful improvement.

Study Design: A Prospective study.

Place and Duration of Study: Department of ENT Pak International Medical College Peshawar, from January 2024 to December 2024.

Methods: This Prospective study parallel-group cohort at a tertiary otolaryngology center. Adults with CRS meeting guideline criteria after maximal MT were allocated to ESS or continued MT based on shared decision-making. Outcomes: SNOT-22 change (primary), Lund-Kennedy endoscopic score, Lund-Mackay CT score, olfaction, and adverse events. Assessments at baseline and 3/6/12 months. Analysis used multivariable linear/logistic regression and propensity weighting.

Results: A total of N=patients (ESS n= MT n=) were analyzed (mean age ± years; **%** female). At 12 months, ESS showed greater SNOT-22 improvement than MT (mean Δ vs. adjusted mean difference [95% CI to], *p* =). ESS also improved endoscopic scores (Δ vs. *p* =) and olfaction (Δ*p*). Radiologic scores improved primarily in ESS. Complication rates were low and comparable. Predictors of response included baseline SNOT-22 and presence of nasal polyps.

Conclusion:
In adults with refractory CRS, ESS was associated with larger and clinically meaningful improvements in symptoms and objective measures compared with continued MT, with low complication rates. Baseline disease burden and polyp status modified treatment effect. Findings support ESS for appropriately selected patients after failure of guideline-based MT.

Keywords: *Chronic rhino sinusitis; Endoscopic sinus surgery; Medical therapy; SNOT-22; Lund-Mackay*

1. -. INTRODUCTION

Chronic rhino sinusitis (CRS) is a heterogeneous inflammatory disorder characterized by ≥12 weeks of sin nasal symptoms with objective evidence on endoscopy or CT. It is commonly classified as CRS with nasal polyps (CRSwNP) and without

nasal polyps (CRSsNP), reflecting differences in pathobiology and treatment response [1]. First-line management includes intranasal corticosteroids, saline irrigation, short courses of antibiotics for acute exacerbations when indicated, and treatment of comorbidities such as allergic rhinitis and asthma [2].When symptoms persist despite maximal medical therapy (MT), endoscopic sinus surgery (ESS) aims to restore sinus ventilation and access for topical therapy [3]. Randomized and prospective comparative data suggest ESS provides superior symptom relief and endoscopic improvement in selected patients; however, magnitude of benefit varies by phenotype, baseline disease severity, and adherence to postoperative care [4, 5].Patient-reported outcome measures (PROMs), particularly the 22-item Sino nasal Outcome Test (SNOT-22), are standard primary endpoints, with a minimal clinically important difference (MCID) often used to interpret individual benefit [6]. Objective endpoints include Lund-Kennedy endoscopic scores and Lund-Mackay CT scores, while olfactory testing quantifies a domain of high clinical relevance [7, 8].Given evolving perioperative protocols (e.g., steroid irrigations, office debridement's) and broadened MT options (e.g., topical steroid irrigations, macrolide courses), up-to-date real-world comparisons remain necessary [9]. We therefore compared outcomes in adults choosing ESS versus continued MT after guideline-directed therapy at a tertiary center, and explored predictors of clinically meaningful improvement

2. METHODS

This Prospective, parallel-group cohort conducted at the Department of Otolaryngology, Pak International Medical College Peshawar, from January 2024 to December 2024 . Adults (≥18 years) with CRS diagnosed per guideline criteria after maximal MT were offered ESS or continued MT through shared decision-making. Allocation reflected patient preference and surgeon recommendation; no randomization was performed. To mitigate confounding by indication, we used inverse probability of treatment weighting (IPTW) based on a propensity score including age, sex, polyp status, baseline SNOT-22, Lund-Mackay score, asthma/allergy, smoking status, and prior sinus surgery.

Inclusion Criteria

Adults with CRS (with/without polyps), persistent symptoms ≥12 weeks, objective evidence on endoscopy/CT, completed maximal MT, and available baseline plus ≥1 follow-up assessment.

Exclusion Criteria

Cystic fibrosis, primary biliary dyskinesia, invasive fungal disease, sin nasal tumors, pregnancy, immunodeficiency, recent acute infection (<2 weeks), or incomplete baseline data.

Ethical Approval

Approved by the Institutional Review Board according to Declaration of Helsinki. Written informed consent obtained from all participants.

Data Collection

ESS group: Standardized FESS tailored to disease extent; postoperative saline and topical steroid irrigations; scheduled debridement.MT group: Optimized intranasal corticosteroids, saline irrigations, short macrolide course when appropriate, and management of comorbidities.

Assessments at baseline, 3, 6, and 12 months by blinded outcome assessors when possible.

Statistical Analysis

Analyses performed in SPSS v24.0. Continuous variables summarized as mean ± SD or median (IQR), categorical as n (%). Between-group differences estimated using IPTW-adjusted linear models for continuous outcomes and logistic regression for binary outcomes. Sensitivity analyses included multivariable regression without weighting and subgroup analyses by polyp status (CRSwNPvsCRSsNP). Missing data handled via multiple imputation if >5%. Two-sided α=0.05. Effect sizes reported with 95% CIs. MCID responder analyses used chi-square/weighted logistic regression.

3. RESULTS

A total of 100 patients were enrolled, including 50 undergoing ESS and 50 managed with MT. The mean age was 38.6 ± 9.4 years, with 54% male and 46% female participants. Baseline demographic and disease characteristics were comparable between groups, including polyp status, symptom duration, and comorbidities. At 12 months, patients in the ESS group demonstrated significantly greater improvement in SNOT-22 scores compared with MT (mean reduction: 24.3 ± 11.5 vs. 11.2 ± 9.8; p=0.001). Similarly, endoscopic scores improved more markedly in the ESS group (mean Δ Lund-Kennedy score: −3.6 ± 1.5 vs. −1.2 ± 1.0; p<0.01). Radiologic assessment showed a significant reduction in Lund-Mackay scores in ESS patients (mean Δ: −5.2 ± 2.1 vs. −1.4 ± 1.3; p<0.01).Olfactory function also improved significantly in the ESS group, whereas minimal changes were observed in MT patients. Complications were minor and infrequent, including postoperative bleeding in 2 ESS patients and transient nasal crusting in MT patients. No serious adverse events occurred. Overall, ESS provided

greater symptom relief and objective improvement compared with MT, particularly among patients with nasal polyps or higher baseline disease burden.

Table 1. Baseline Characteristics of Patients in the ESS and MT Groups

Variable	ESS Group (n=50)	MT Group (n=50)	*p*-value
Age (years), mean ± SD	38.6 ± 9.4	37.9 ± 8.7	0.68
Sex (Male/Female)	27 / 23	27 / 23	1.00
Duration of symptoms (months), mean ± SD	24.3 ± 7.8	23.6 ± 8.1	0.72
CRS with nasal polyps, n (%)	28 (56%)	26 (52%)	0.68
Asthma comorbidity, n (%)	12 (24%)	10 (20%)	0.63
Allergic rhinitis, n (%)	18 (36%)	20 (40%)	0.68
Smoking status, n (%)	9 (18%)	8 (16%)	0.79

Table 2. Comparison of Symptom Outcomes (SNOT-22 Scores) Between Groups

Outcome	ESS Group (n=50)	MT Group (n=50)	*p*-value
Baseline SNOT-22, mean ± SD	55.4 ± 12.3	54.9 ± 11.8	0.81
12-month SNOT-22, mean ± SD	31.1 ± 10.8	43.7 ± 12.6	0.001
Mean change (Δ), mean ± SD	−24.3 ± 11.5	−11.2 ± 9.8	0.001
Patients achieving MCID*, n (%)	40 (80%)	22 (44%)	<0.001

Table 3. Objective Endoscopic and Radiologic Outcomes

Outcome	ESS Group (n=50)	MT Group (n=50)	*p*-value
Baseline Lund-Kennedy, mean ± SD	6.4 ± 2.2	6.3 ± 2.0	0.82
12-month Lund-Kennedy, mean ± SD	2.8 ± 1.4	5.1 ± 1.9	<0.01
Mean change (Δ)	−3.6 ± 1.5	−1.2 ± 1.0	<0.01
Baseline Lund-Mackay CT, mean ± SD	14.8 ± 4.3	14.5 ± 4.1	0.74
12-month Lund-Mackay CT, mean ± SD	9.6 ± 3.7	13.1 ± 4.0	<0.01
Mean change (Δ)	−5.2 ± 2.1	−1.4 ± 1.3	<0.01

Table 4. Complications and Adverse Events

Complication / Event	ESS Group (n=50)	MT Group (n=50)	*p*-value
Postoperative bleeding, n (%)	2 (4%)	—	0.15
Infection requiring antibiotics, n (%)	3 (6%)	2 (4%)	0.64
Nasal crusting, n (%)	5 (10%)	4 (8%)	0.73

Revision surgery, n (%)	2 (4%)	—	0.15
Serious complications (orbital/CSF leak)	0 (0%)	0 (0%)	—

4. DISCUSSION

The present study compared outcomes of endoscopic sinus surgery (ESS) with continued medical therapy (MT) in patients with chronic rhino sinusitis (CRS) refractory to initial management. Our results demonstrated that ESS provided significantly greater improvements in symptom burden, quality of life, endoscopic scores, and radiologic findings compared with MT. These findings are consistent with and add to a growing body of literature supporting the effectiveness of ESS in carefully selected CRS patients. Patient-reported outcome measures, particularly the SNOT-22, remain the gold standard for evaluating treatment response in CRS. In our cohort, patients undergoing ESS achieved a mean reduction exceeding the minimal clinically important difference (MCID), while MT patients demonstrated modest improvement. These results mirror those of Smith et al., who reported that ESS produced superior quality-of-life improvements compared with continued MT at 12 months in a large multicenter cohort [10]. Similarly, Rudnick and Solar demonstrated sustained symptom reduction in ESS patients up to 5 years postoperatively, whereas MT patients experienced progressive deterioration [11]. Collectively, these findings highlight that ESS not only produces immediate symptomatic benefit but also confers long-term stability.Objective endoscopic and radiologic outcomes further reinforced the superiority of ESS. We observed significant reductions in both Lund-Kennedy and Lund-Mackay scores among ESS patients, consistent with the findings of Decode et al., who reported substantial endoscopic improvement following surgery compared with MT [12]. Kennedy et al. also documented durable radiologic benefits, with postoperative CT scores showing marked decreases in sinus pacification [15]. Such objective measures provide important corroboration of subjective symptom relief and suggest that ESS addresses the underlying inflammatory and anatomic contributors to CRS.Olfactory function is another clinically relevant outcome, as hyposmia or anosmia significantly impairs quality of life. Our study demonstrated significant olfactory recovery in the ESS group, whereas MT patients showed little change. Hopkins et al. previously found that olfaction improved more in surgical patients, particularly those with nasal polyposis [14]. Soler et al. similarly emphasized that the presence of polyps strongly predicts olfactory outcomes, with ESS enabling partial or complete restoration of smell [15]. These results suggest that ESS has an important role in restoring sensory function, especially in patients with CRSwNP.The safety profile of ESS in our cohort was favorable, with only minor complications such as postoperative bleeding and crusting, and no major adverse events. These findings align with a systematic review by Ramakrishna et al., which reported low complication rates for ESS compared to historical open sinus procedures [16]. Moreover, our results reinforce the notion that ESS, when performed by experienced surgeons, is both safe and effective. One area of ongoing debate is the role of MT in refractory CRS. While ESS demonstrated superior outcomes, some patients in our MT group still experienced symptomatic benefit, likely due to optimized use of intranasal corticosteroids, saline irrigations, and macrolide therapy. Tokens et al., in the EPOS consensus, emphasized that MT remains foundational in all CRS management, even after surgery [18]. Our findings support this recommendation, as both groups continued MT adjunctively, with ESS providing an additive benefit. Another important consideration is healthcare utilization and cost-effectiveness. Rudnick et al. showed that ESS significantly reduces long-term healthcare use, absenteeism, and indirect costs compared with MT [17]. Our study did not directly evaluate cost outcomes, but the superior quality-of-life improvements with ESS suggest potential economic advantages. Furthermore, Smith and colleagues emphasized that early surgical intervention may be more cost-effective in patients with severe baseline symptoms [18].Predictors of treatment response deserve attention. We observed that higher baseline SNOT-22 scores and the presence of nasal polyps were associated with greater improvement after ESS. This is consistent with prior reports identifying baseline disease burden and phenotype as critical determinants of outcome [19]. Such insights can guide individualized treatment decisions, helping clinicians identify patients most likely to benefit from surgery. Finally, while biologic therapies targeting type 2 inflammation are emerging for CRSwNP, access and affordability remain challenges, particularly in low- and middle-income countries. Our findings reinforce that ESS continues to be a practical, effective, and widely accessible treatment option for refractory CRS [20].

5. CONCLUSION

Endoscopic sinus surgery provided superior improvements in symptom control, quality of life, endoscopic appearance, and radiologic outcomes compared with continued medical therapy in chronic rhino sinusitis patients. The procedure was safe and effective, particularly for patients with nasal polyps or higher baseline burden, supporting its role after failed guideline-directed medical management.

6. LIMITATIONS

This study was limited by its single-center design, modest sample size, and non-randomized allocation, which may introduce selection bias and limit generalizability. Follow-up duration was restricted to one year, precluding assessment of long-term outcomes. Further multicenter, randomized controlled trials are warranted to validate these findings across diverse patient

populations.

7. FUTURE FINDINGS

Future studies should explore long-term outcomes of ESS beyond one year, including cost-effectiveness and healthcare utilization. STUDY into predictors of surgical success, role of biologic therapies, and comparative effectiveness of hybrid treatment approaches may optimize individualized management strategies for chronic rhino sinusitis and refine evidence-based treatment guidelines worldwide.

Disclaimer: Nil

Conflict of Interest: Nil

Funding Disclosure: Nil

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Final Approval of version:**All Mention Authors Approved the Final Version**

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