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Endoscopic Sinus Surgery vs. Traditional Techniques: Comparative Outcomes in Chronic Rhinosinusitis Management

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ABSTRACT

Chronic rhinosinusitis (CRS) is a common inflammatory condition of the paranasal sinuses, often resistant to medical therapy, necessitating surgical intervention. Endoscopic sinus surgery (ESS) is favored for its minimally invasive approach, yet comparison with traditional techniques remains clinically relevant. **Objectives:** To compare pre-operative findings and post-operative results between ESS and traditional sinus surgery in patients with CRS. **Methods:** This study included 140 CRS patients, equally assigned to ESS and traditional groups. Baseline evaluation comprised history, examination, and Lund-Mackay CT scores. Postoperative outcomes assessed were SNOT-22 scores, operative time, blood loss, hospital stay, and complications. Data were analyzed using t-tests for continuous variables and Chi-square tests for categorical variables, with $p<0.05$ considered significant. **Results:** Patients in the ESS group had shorter operative time (69 ± 12 vs. 91 ± 17 min; $p<0.001$), less blood loss (57 ± 11 vs. 118 ± 23 mL; $p<0.001$), and reduced hospital stay (1.3 ± 0.4 vs. 3.0 ± 1.0 days; $p<0.001$). SNOT-22 scores at 12 weeks also favored ESS (17.1 ± 6.4 vs. 25.5 ± 7.6; $p=0.001$). Total complication rate was lower in ESS (17.1% vs. 44.4%; $p=0.001$). **Conclusions:** ESS seems to give better outcomes, faster recovery, and fewer complications compared with traditional methods for CRS. It should be the preferred option whenever facilities and skills are available.

INTRODUCTION

Chronic rhinosinusitis (CRS) is a persistent inflammatory condition in the paranasal sinus that lasts more than 12 weeks even after appropriate medical treatments. It affects around 10–12% people in the world and becomes difficult to cope with daily life activities, productivity at work, and total well-being [1, 2]. CRS can be divided broadly into CRS with nasal polyp (CRSwNP) or without it (CRSsNP), both of which are different in their pathophysiology, immune reaction, and management plan [3]. Etiological factors depend on many reasons, like dysfunction of the mucociliary, biofilms, allergy, or microbes' colonization [4]. The first line of treatment depends on a simple symptomatic approach, like nasal sprays, washing with saline, antibiotics, sometimes systemic steroids, or leukotriene changing agents [5]. When the symptomatic regime fails to work, then surgical interventions could be

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applied. Old surgical techniques, for example, Caldwell-Luc or outer ethmoidectomy, are commonly used in the management of the disease. While this work restores sinus drainage, it also causes many risks like altering the facial sensation, prolonging recovery, and post-traumatic tissue injuries [6]. Endoscopic sinus surgery (ESS) has changed the medical approach in CRS treatment. It provides a less invasive method, which only follows the tissue site-selected technique and removes the localized pathological area and keeps other mucosal lining and structures intact [7]. It can maintain better airflow and help in draining sinuses again, which restores mucociliary functions with minimal risk of complications. It's less invasive, so the chance of post-operative complications is significantly reduced with rapid recovery of the patient [8]. In accordance with the evidence of some studies, they also concluded that ESS is a significantly better option for the patients as compared with some old techniques. One review showed better symptom recovery, less reassurance, and improved life qualities in ESS compared with the usual surgeries before [9]. Also, modern tools like imaging guides and powered devices make ESS safer and provide an excellent visual field and maximum approach to the localized area during surgeries [10]. Now, surgeons not only target the sinus by imaging, but also use scales for patient scores, like SNOT-22 and other systems such as Lund-Mackey and Kennedy scoring, to evaluate the surgical outcomes [11]. These tools help to measure the post-operative complications and level of patient satisfaction on different follow-ups. ESS has many benefits, but still some reservations, like skilled surgeons, high-cost instruments, and patient selection. Still, due to these reservations, old techniques were used to facilitate the patients [12]. This research is for comparing endoscopic sinus surgeries and traditional techniques, on the basis of patients' compliance and surgical outcomes. The study provides a clear picture of the different surgical techniques used in Pakistan, and conveys the message to adopt the latest interventions and make them possible for every individual.

This study aimed to compare pre-operative findings and post-operative results between ESS and traditional sinus surgery in patients with CRS

METHODS

This prospective comparative analytical study was conducted at the Department of ENT, Al-Tibri Medical College (ATMC), and other tertiary care centers in Karachi, where both endoscopic sinus surgery (ESS) and traditional surgical interventions are routinely performed. A total of 140 patients were included using a convenience sampling technique. All cases of diagnosed chronic rhinosinusitis (CRS) of both genders and all age groups were eligible. Patients were equally divided into two groups: those undergoing ESS and those receiving traditional surgical intervention. Inclusion criteria were based on medical history, clinical examination, nasal endoscopy findings, and CRS confirmed by CT Scan. Patients were excluded if they had undergone sinus surgery within the two years prior to enrollment (i.e., between September 2022 and September 2024), or if they had fungal sinusitis or sinonasal tumors. Institutional Ethical Review Committee, ATMCH approved (ATMC/IERC/13th (02-2024)/25) and this study was conducted from September 2024 to February 2025. The sample size was calculated using Cochran's formula for proportions $n_0 = (Z^2 \times p \times (1 - p)) / e^2$ as recommended in standard epidemiological texts [13], and computed through the Open Epi online calculator.", with an anticipated prevalence of chronic rhinosinusitis of 10% [14], a 95% confidence level, and a 5% margin of error. Where n is the required sample size, Z is the Z statistic for the desired confidence level (1.96 for 95% CI), p is the anticipated prevalence (0.10), and d is the absolute precision (0.05). The calculated size was about 139; participants were added to ensure adequate statistical power. These participants were equally distributed, with 70 patients in the Endoscopic Sinus Surgery (ESS) group and 70 patients in the traditional surgery group. Preoperative assessments included demographic data, patient history, and Lund-Mackay CT scores. Operative time, intraoperative blood loss, and length of hospital stay were recorded. Postoperative outcomes were assessed using the 22-item Sinonasal Outcome Test (SNOT-22), a validated disease-specific questionnaire for CRS. The instrument consists of 22 questions scored on a 6-point Likert scale ranging from 0 (no problem) to 5 (problem as bad as it can be), giving a total score of 0 to 110. Higher scores indicate more severe symptoms and poorer quality of life. The SNOT-22 has demonstrated high internal consistency (Cronbach's α>0.90), good test–retest reliability, and established validity in CRS populations [15]. SNOT-22 was administered preoperatively and at 12 weeks postoperatively, with lower postoperative scores interpreted as better symptomatic improvement. Written informed consent was taken. Statistical analysis was performed using SPSS version 25.0. The normality of data was assessed by the Kolmogorov-Smirnov and Shapiro–Wilk Statistic. The independent t-test was applied for continuous variables, as it compares mean differences between two independent groups (ESS vs. traditional surgery). The Chi-square test was used for categorical variables to assess differences in proportions of outcomes and complications between the groups.

RESULTS

In this study, 140 patients with chronic rhinosinusitis were equally divided between the Endoscopic Sinus Surgery

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(ESS) group and the traditional surgical group. Both Kolmogorov-Smirnov and Shapiro-Wilk tests demonstrated p-values >0.05 for all continuous variables, confirming normal distribution of the data and supporting the use of an independent t-test for group comparisons (Table 1).

Table 1: Normality Testing

Variables	Kolmogorov-Smirnov Statistic	df (KS)	p-Value	Shapiro-Wilk Statistic	df (SW)	p-Value
Age (Years)	0.072	140	0.200*	0.987	140	0.324
Operative Time (min)	0.081	140	0.176	0.981	140	0.176
Blood Loss (mL)	0.076	140	0.200*	0.984	140	0.242
Hospital Stay (days)	0.063	140	0.200*	0.991	140	0.472
Lund-Mackay CT Score	0.085	140	0.158	0.979	140	0.158
SNOT-22 Score (12 wks.)	0.078	140	0.200*	0.985	140	0.261

The baseline demographic and disease characteristics were comparable, with no statistically significant differences in mean age and preoperative Lund-Mackay CT scores (p>0.05 for all), confirming that both groups showed no significant difference preoperatively (Table 2).

Table 2: Demographic and Baseline Clinical Characteristics

Variables	ESS Group (n=70)	Traditional Surgery Group (n=70)	p-Value
Age (Years, mean ± SD)	42.3 ± 10.4	41.7 ± 9.6	0.61
Lund-Mackay CT Score (pre-op)	12.7 ± 2.2	12.5 ± 2.4	0.70

Independent t-test; significance <0.05

Intraoperative and postoperative outcome measures demonstrated a clear advantage of ESS, with significantly reduced operative time (p<0.001), reduced intraoperative blood loss (p<0.001), and short hospital stay (p<0.001) compared to traditional surgery. Furthermore, the ESS patients had noticeably better postoperative SNOT-22 scores at 12 weeks (p=0.001), showing an overall improved symptom relief compared to the traditional group (Table 3).

Table 3: Intraoperative and Postoperative Outcome Measures

Parameters	ESS Group (n=70)	Traditional Surgery Group (n=70)	p-Value	Effect Size (Cohen's d)
Operative Time (min)	69 ± 12	91 ± 17	<0.001*	1.45
Blood Loss (mL)	57 ± 11	118 ± 23	<0.001*	3.05
Hospital Stay (days)	1.3 ± 0.4	3.0 ± 1.0	<0.001*	2.06
Post-op SNOT-22 (12 Weeks)	17.1 ± 6.4	25.5 ± 7.6	<0.001*	1.16

Independent t-test; significance <0.05

In the analysis of postoperative complications, there was a statistically significant reduction in synechiae formation (p=0.04), infection rates (p=0.02), and also the total complication rate (p=0.001) in patients who underwent ESS. Postoperative bleeding (p=0.05) and facial complications (p=0.06) didn't reach the conventional significance level, but they still showed a clear trend towards better outcomes in ESS. All these results suggest that the improvements seen with ESS in perioperative parameters and postoperative recovery are not just clinically meaningful, but in most cases statistically convincing as well, which goes on to highlight the procedure's role as a safer and more effective option for managing chronic rhinosinusitis (Table 4).

Table 4: Percentage of Postoperative Complications

Complications	ESS Group (n=70)	Traditional Surgery Group (n=70)	p-Value
Synechiae	6 (8.6%)	14 (20.0%)	0.04*
Postoperative Bleeding	3 (4.3%)	9 (12.9%)	0.05
Facial Complication	1 (1.4%)	5 (7.1%)	0.06
Infection	3 (4.3%)	10 (14.3%)	0.02*
Total Complication Rate	12 (17.1%)	31 (44.3%)	<0.001

Chi-square test; significance <0.05

DISCUSSIONS

The findings from this study reinforce that endoscopic sinus surgeries (ESS) were evidence with better outcomes than the old traditional surgery methods for managing chronic rhinosinusitis (CRS). The patients treated with ESS got rapid relief in symptoms after surgery, with minimal complications; all these findings are totally in agreement with the recent studies and literature [15, 16]. One main advantage of ESS is its being less invasive in nature; it maintains the lining mucosa and makes it easy to drain the sinuses, also restoring the other adjacent tissues. It provides the fastest healing, improves the mucociliary clearance, and reduces the risk of post-operative complications [7, 10]. The study from Miglani *et al.* concluded that the reduced post-operative complications in patients treated with ESS procedures were greater than in those who received conventional surgical interventions [6]. Improvements in patients' clinical presentation were noted as they were evaluated by using a valid tool like SNOT-22 after application of the ESS surgical technique. This type of scale is frequently used to assess patient satisfaction and the success rate of surgical outcomes [8, 17]. In accordance with other studies, which also documented a similar pattern of results as we concluded in this study, ESS patients had the fastest rate of recovery with minimal complications and better patient compliance [11]. ESS also shortened hospital stays and enabled earlier return to daily activities. This is consistent with cost-effectiveness analyses showing that while ESS may involve higher initial expenditures, it reduces long-term healthcare costs through fewer complications and recurrence [2, 17]. Smith *et al.* and Kar *et al.* emphasized that ESS is not only clinically effective but also

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economically advantageous [2, 7]. Nevertheless, ESS is without limitations. It requires advanced training, image-guided systems, and surgical expertise, which might not be available in all healthcare settings, especially in low- and middle-income countries [16]. Alsaleh *et al.* noted that equipment cost and surgeon expertise remain barriers to universal adoption of ESS despite its clinical advantages [17]. Symptom recurrence remains a concern, particularly in patients with CRSwNP or comorbid conditions like asthma or aspirin-exacerbated respiratory disease (AERD). Such patients often need extended postoperative care and adjunct therapies [18]. Imai *et al.* emphasized that ESS, while effective, should be part of a comprehensive management plan that includes long-term medical therapy for select patients [18]. Individualizing surgical choice based on CRS subtype, anatomical variations, and comorbidities is essential. Appropriateness criteria and phenotypic profiling can help identify candidates who are more likely to benefit from ESS [19]. Smith et al. found that phenotyping helped predict long-term outcomes and recurrence risk, supporting a more tailored surgical approach [20]. Finally, emerging technologies such as balloon sinuplasty and drug-eluting stents hold promise in supplementing or enhancing traditional ESS, especially for patients with mild to moderate disease [21]. However, long-term comparative studies are still needed to establish their effectiveness.

CONCLUSIONS

ESS demonstrates higher safety compliance, effectiveness, and patient satisfaction compared to traditional sinus surgeries for CRS. Where resources and expertise permit, it should be the preferred surgical intervention. Continued advancements in technology and patient selection criteria will further optimize its utility.

Authors Contribution

Conceptualization: AW, AMN
Methodology: AW, VKK, ZA, MRD, GSM, AMN
Formal analysis: AW, MRD, GSM, AMN
Writing review and editing: VKK, ZA, ABM

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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