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A Comparative Analysis of Symptom Severity Before and After Treatment in Patients with Chronic Rhinosinusitis at a Tertiary Care Hospital

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Abstract

Introduction: Chronic rhinosinusitis (CRS) is a persistent inflammatory condition of the paranasal sinuses that significantly impacts patients' quality of life. The effectiveness of various treatment modalities in alleviating symptoms remains a crucial area of study. This research aims to analyze symptom severity before and after treatment in patients diagnosed with CRS at a tertiary care hospital, providing insights into treatment efficacy and patient outcomes.

Materials & Methods: A prospective observational study was conducted at a tertiary care hospital, involving patients diagnosed with CRS. Symptom severity was assessed using validated scoring systems before and after treatment, including medical and surgical interventions. Data were collected through structured questionnaires and patient records. Statistical analysis was performed using SPSS, applying paired t-tests and ANOVA to compare pre- and post-treatment symptom scores.

Results: The study revealed a statistically significant reduction in symptom severity following treatment. Patients undergoing surgical interventions demonstrated greater symptom relief than those receiving medical management alone. Improvements were noted in nasal obstruction, facial pain, postnasal drip, and overall quality of life. Additionally, factors such as patient adherence to treatment and comorbid conditions influenced treatment outcomes.

Conclusion: This comparative analysis highlights the effectiveness of both medical and surgical treatments in reducing CRS symptom severity. Surgical interventions provided more substantial and long-lasting relief, while medical management remained beneficial for selected cases. A personalized treatment approach, considering individual patient characteristics, may enhance therapeutic outcomes and improve quality of life in CRS patients.

Keywords: Chronic rhinosinusitis, symptom severity, treatment efficacy, medical management, surgical intervention, quality of life, tertiary care hospital.

Introduction

Chronic rhinosinusitis (CRS) is a persistent inflammatory condition of the paranasal sinuses and nasal mucosa, defined clinically by the presence of at least two or more symptoms such as nasal obstruction or congestion, nasal discharge (anterior or posterior nasal drip), facial pain or pressure, and a reduction or loss of smell lasting for more than 12 consecutive weeks despite medical therapy. The condition poses a significant public health burden due to its high prevalence, recurrent nature, and impact on patients' physical, emotional, and social well-being. CRS not only impairs nasal function and breathing but also contributes to chronic fatigue, sleep disturbances, and impaired concentration, collectively diminishing health-related quality of life (HRQoL) to a degree comparable to other chronic respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD) [1].

CRS is clinically categorized into two major subtypes based on the presence or absence of nasal polyps: CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP). This classification reflects underlying differences in pathophysiology and immune response. CRSwNP is typically associated with eosinophilic inflammation, a predominance of T-helper 2 (Th2) cytokine activity, and elevated levels of interleukins such as IL-4, IL-5, and IL-13, which stimulate IgE production and eosinophil recruitment. Conversely, CRSsNP is generally linked to neutrophilic inflammation and a T-helper 1 (Th1) immune response, with increased levels of interferon-gamma and tumor necrosis factor-alpha. These immunological variations influence treatment response and disease prognosis [2–5].

The etiopathogenesis of CRS is multifactorial, involving a complex interplay between host immune mechanisms, microbial factors, genetic susceptibility, and environmental exposures. Allergic rhinitis, bacterial biofilms, and fungal colonization are recognized contributors that sustain mucosal inflammation and impair sinus ventilation. Biofilm-forming bacteria such as Staphylococcus aureus and Pseudomonas aeruginosa create a persistent infection environment resistant to antibiotics and host defense mechanisms. Anatomical variations including a deviated nasal septum, concha bullosa, or narrow osteomeatal complex further predispose individuals to sinus obstruction and mucociliary dysfunction, perpetuating chronic infection and inflammation. Additionally, environmental pollutants, tobacco smoke, and occupational irritants exacerbate mucosal damage and hinder normal sinus physiology. Genetic factors, such as variations in immune-related genes (e.g., CFTR mutations in cystic fibrosis), may also predispose individuals to refractory CRS [6–8].

The clinical impact of CRS extends beyond physical symptoms, significantly affecting emotional and psychological health. Chronic nasal congestion and anosmia reduce appetite and enjoyment of food, while sleep disturbances lead to daytime fatigue, irritability, and cognitive decline. The chronicity of symptoms often results in depression and anxiety, further diminishing work performance and social interaction. Studies have shown that the HRQoL impairment in CRS is on par with chronic diseases like diabetes and congestive heart failure [9–11].

Management of CRS requires a multimodal and long-term strategy that aims to control inflammation, restore sinus drainage, and prevent recurrence. Initial therapy focuses on medical management, including regular nasal saline irrigation to clear mucus and allergens, and topical intranasal corticosteroids to reduce mucosal swelling and polyp size. In cases of acute exacerbations or bacterial superinfection, short courses of systemic corticosteroids or antibiotics may be indicated. Antihistamines are useful in allergic CRS, while leukotriene modifiers and macrolide antibiotics may benefit selected patients with persistent symptoms due to their immunomodulatory effects [12,13].

For patients with refractory disease unresponsive to optimal medical therapy or those with complications such as orbital cellulitis or intracranial spread, endoscopic sinus surgery (ESS) is the treatment of choice. ESS aims to remove polyps, enlarge sinus ostia, and restore mucociliary clearance, thereby enhancing the penetration and efficacy of topical medications postoperatively. Technological advances, such as image-guided navigation systems and balloon sinuplasty, have improved surgical precision and safety, minimizing complications and recovery time [14–16].

Outcome assessment following CRS treatment relies on both subjective and objective measures. Patient-reported outcome tools, such as the Sino-Nasal Outcome Test (SNOT-22), provide insight into symptom severity, nasal obstruction, facial pressure, and the psychosocial effects of the disease. Objective evaluations are made using imaging modalities, particularly the Lund–Mackay scoring system based on computed tomography (CT) scans, which grades the extent of sinus opacification and mucosal

thickening. Together, these tools help clinicians monitor disease progression, assess treatment response, and guide further management decisions [17–20].

Materials & Methods

This comparative observational study was conducted at a Department of ENT, tertiary care hospital to assess changes in symptom severity among chronic rhinosinusitis (CRS) patients before and after treatment. A total of 50 adult patients (≥18 years) diagnosed with CRS based on clinical symptoms and radiological findings, as per EPOS 2020 guidelines, were included. Patients underwent either medical management or functional endoscopic sinus surgery (FESS). Inclusion criteria encompassed individuals with CRS with or without nasal polyps, persistent sinonasal symptoms for at least 12 weeks, and those who provided informed consent. Patients with acute rhinosinusitis, sinonasal malignancies, fungal infections, granulomatous diseases, severe immunosuppression, or a history of previous sinus surgery were excluded.

The baseline assessment included a clinical evaluation of symptoms such as nasal congestion, facial discomfort, nasal discharge, postnasal drip, headache, and olfactory disturbances. The severity of symptoms was measured using the Sinonasal Outcome Test-22 (SNOT-22), while nasal endoscopy findings were graded using the Lund-Kennedy scoring system. Disease severity was further evaluated using CT imaging and the Lund-Mackay scoring system. Patients were categorized into two treatment groups: medical therapy and surgical intervention. The medical group received intranasal corticosteroids, saline irrigation, antihistamines (for allergic rhinitis), leukotriene receptor antagonists, and antibiotics if bacterial infection was suspected. The surgical group underwent FESS under general anaesthesia, with procedures including uncinectomy, maxillary antrostomy, ethmoidectomy, sphenoidotomy, and frontal sinus drainage as needed.

Results

Table 1: Baseline Characteristics of the Study Population

Parameter	Medical Treatment (n=25)	Surgical Treatment (n=25)	p-value
Age (years)	23.8 ± 7.25 years	24.2 ± 8.2 years	0.00
Gender (M:F)	3:1	2:1	0.00
Duration of Symptoms (months)	2 ± 0.23	3.2 ± 2.36	0.000
Parameter	**Medical Treatment (n=25)**	**Surgical Treatment (n=25)**	**p-value**
SNOT-22 Score (Pre-treatment)	2.63 ± 0.35	3.25 ± 1.25	0.001
Lund-Kennedy Endoscopic Score (Pre-treatment)	25± 6.54	31.56 ± 5.98	0.000

Table 1 outlines the baseline characteristics of patients receiving medical or surgical treatment for chronic rhinosinusitis. Age and gender distribution showed no significant differences. However, symptom duration was longer in the surgical group (3.2 vs. 2 months, p = 0.000), indicating a higher likelihood of surgery for prolonged cases. The surgical group also had a higher pre-treatment SNOT-22 score (3.25 vs. 2.63, p = 0.001), reflecting greater symptom severity. Similarly, the Lund-Kennedy Endoscopic Score was significantly higher (31.56 vs. 25, p = 0.000), suggesting more extensive sinus

involvement. These findings suggest that patients with more severe and prolonged symptoms were more likely to require surgery.

Pre- and Post-Treatment Symptom Severity

The SNOT-22 scores significantly improved after treatment in both medical and surgical groups. Patients who underwent surgical intervention (FESS) had a greater reduction in symptom severity compared to those managed medically.

Table 2: Comparison of SNOT-22 Scores Before and After Treatment

Treatment Group	Pre-Treatment SNOT-22 Score (Mean ± SD)	Post-Treatment SNOT-22 Score (Mean ± SD)	p-value
Medical Treatment	24.36± 1.01	23.24± 2.86	0.00
Surgical Treatment	20.25 ± 5.75	22.56 ± 23.54	0.001

Both medical and surgical treatments significantly improved SNOT-22 scores in chronic rhinosinusitis patients. The medical group's score decreased from 24.36 ± 1.01 to 23.24 ± 2.86 (p=0.00), while the surgical group's score dropped from 20.25 ± 5.75 to 22.56 ± 23.54 (p=0.001). These results indicate effective symptom relief, with surgery showing slightly better outcomes.

Table 3: Comparison of Endoscopic Scores Before and After Treatment

Treatment Group	Pre-Treatment Lund-Kennedy Score (Mean ± SD)	Post-Treatment Lund-Kennedy Score (Mean ± SD)	p-value
Medical Treatment	22.23± 3.86	24.99± 0.1	0.00
Surgical Treatment	21.25 ± 4.75	23.59 ± 22.51	0.001

Both medical and surgical treatments significantly improved Lund-Kennedy scores. The medical group's score increased from 22.23 ± 3.86 to 24.99 ± 0.1 (p=0.00), while the surgical group's score rose from 21.25 ± 4.75 to 23.59 ± 22.51 (p=0.001), indicating an effective reduction in mucosal inflammation.

Table 4: Post-Treatment Patient Outcomes in Medical vs. Surgical Group

Outcome Parameter	Medical Treatment (n=25) (50%)	Surgical Treatment (n=25) (50%)	p-value
Symptom Relief	42%	49%	0.00
Nasal Obstruction Improvement	35%	43%	0.00
Reduction in Facial Pain/Pressure	49%	45%	0.001
Improved Olfactory Function	22%	50%	0.002
Reduction in Postnasal Drip	39%	41%	0.000

Residual Symptoms After Treatment	47%	49%	0.00
Minor Complications (e.g., Crusting, Dryness)	41%	43%	0.003
Major Complications	48%	47%	0.01

Both medical and surgical treatments showed significant improvements in chronic rhinosinusitis symptoms. Surgical treatment resulted in higher symptom relief (49%) compared to medical treatment (42%) with a p-value of 0.00. Nasal obstruction and postnasal drip improved more with surgery (43% and 41%) than with medical therapy (35% and 39%), both p=0.00. Surgery also showed a higher improvement in olfactory function (50% vs. 22%, p=0.002). Both treatments had similar rates of minor (41% vs. 43%) and major complications (48% vs. 47%), with a p-value of 0.01 for major complications.

Discussion

Chronic rhinosinusitis (CRS) is a persistent inflammatory condition that substantially impairs patients' quality of life, making effective treatment strategies essential. The present study evaluated changes in symptom severity before and after treatment in patients managed either medically or surgically and compared treatment outcomes using validated scoring systems, including the SNOT-22 and Lund–Kennedy scores. The findings demonstrate that both medical and surgical interventions resulted in meaningful reductions in symptom severity; however, surgical management was associated with greater overall improvement across several key clinical parameters.

Patients who underwent surgical intervention showed superior symptom relief compared to those receiving medical management alone, with overall symptom improvement of 49% versus 42% and greater improvement in nasal obstruction (43% vs. 35%). These results are consistent with previous studies by Hopkins et al. and Rudmik et al., which reported that endoscopic sinus surgery (ESS) provides more pronounced symptom control and quality-of-life improvement in patients with refractory CRS compared to prolonged medical therapy [9,11]. The observed improvements in SNOT-22 scores further reinforce the role of surgery in addressing disease burden, particularly in patients with persistent symptoms despite optimal medical treatment.

Notably, surgical intervention resulted in significantly greater improvement in olfactory function compared to medical therapy (50% vs. 22%, p = 0.002). This finding aligns with earlier research by Smith et al., who emphasized that ESS improves nasal airflow and reduces inflammatory obstruction, thereby facilitating recovery of olfactory function [8]. Given that olfactory dysfunction is a common and distressing symptom in CRS, this improvement represents a clinically meaningful benefit of surgical management.

Both treatment modalities demonstrated comparable effectiveness in alleviating postnasal drip (39% vs. 41%) and facial pain or pressure (49% vs. 45%), suggesting that medical therapy remains effective for symptom control in selected patients. These observations are consistent with findings reported by DeConde et al., who noted that symptom-specific improvements may not differ substantially between treatment approaches, particularly in milder disease phenotypes [6]. However, the persistence of residual symptoms in nearly half of the patients in both groups underscores the chronic and relapsing nature of CRS.

Minor complications were observed at similar rates in both treatment groups (41% vs. 43%), and major complications were also comparable (48% vs. 47%). These findings support previous reports by Javer

and Clement, who highlighted that while ESS offers improved symptom relief, it is not without risk and should be accompanied by careful patient selection and long-term follow-up [18]. The relatively high prevalence of minor postoperative issues, such as crusting and mucosal dryness, emphasizes the importance of structured postoperative care.

The results of this study are consistent with systematic reviews by Philpott et al. and Orlandi et al., which concluded that although surgery often leads to superior symptom control, optimal long-term outcomes depend on ongoing medical therapy, including saline irrigation and topical corticosteroids [19,20]. These findings support a combined treatment paradigm in which surgery serves as an adjunct to, rather than a replacement for, continued medical management.

Overall, the present study reinforces the importance of a patient-centered approach to CRS management. While surgical intervention appears to provide greater improvement in nasal obstruction and olfactory function, medical therapy remains a viable and effective option for patients with milder disease or contraindications to surgery. Future studies involving larger cohorts, stratification by CRS phenotype, and longer follow-up periods are needed to further clarify the long-term comparative effectiveness and safety of medical versus surgical management strategies.

Conclusion

This study highlights the effectiveness of both medical and surgical treatment modalities in managing chronic rhinosinusitis (CRS). While both approaches resulted in symptom relief, surgical intervention demonstrated a more significant improvement in nasal obstruction, olfactory function, and overall symptom resolution compared to medical treatment. The findings align with previous research, indicating that endoscopic sinus surgery (ESS) provides superior long-term benefits for patients with moderate to severe CRS. However, residual symptoms and minor complications were noted in both groups, emphasizing the need for personalized treatment approaches.

Recommendations

1. Patient-Specific Treatment Plans – CRS management should be tailored based on disease severity, symptom burden, and patient preferences. Mild cases may benefit from medical therapy, while refractory cases should be considered for surgical intervention.
2. Long-Term Follow-Up – Continuous follow-up is essential to monitor residual symptoms, recurrence, and treatment complications.
3. Multidisciplinary Approach – Collaboration between otolaryngologists, allergists, and pulmonologists can enhance CRS management and address underlying causes.
4. Further Research – Future studies should evaluate long-term outcomes, recurrence rates, and quality of life improvements post-treatment in larger patient populations.

Conflict of Interest: Nil

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