Original Article

Surgical Management VS Biologic Therapy with Nasal Polyps

Comparative Outcomes of Surgical Management Versus Biologic Therapy in Patients with Nasal Polyps: A Retrospective Study from a Tertiary Care Center

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ABSTRACT

Objective: This investigation aimed to evaluate and contrast outcomes of endoscopic sinus surgery and biologic treatment with respect to sinonasal symptom burden, health-related quality of life, and polyp recurrence in patients with relapsing CRSwNP.

Study Design: Retrospective observational study

Place and Duration of Study: This study was conducted at the Otorhinolaryngology and Head and Neck Surgery Division at a tertiary referral hospital in Alahsa City spanning July 2022 to July 2025.

Methods: One hundred and twenty adult CRSwNP patients were enrolled and allocated to two treatment arms: Arm A (n=60) received functional endoscopic sinus surgery (FESS), while Arm B (n=60) was managed with biologic agents (dupilumab or mepolizumab). Treatment response was quantified through SNOT-22 scoring, health-related quality of life instruments, and polyp recurrence documentation across a minimum observation window of 6–12 months.

Results: SNOT-22 scores declined meaningfully in both treatment arms; however, the magnitude of reduction was substantially greater in the biologic arm at the six-month assessment (22.1 ± 7.5 versus 28.6 ± 8.2; $p<0.01$). Patient-reported quality of life gains favored the biologic arm (72% vs. 55%; $p=0.03$). Polyp recurrence was markedly less frequent among biologic-treated patients (10%) relative to those who underwent surgery (30%; $p<0.01$). While surgery conferred more rapid early relief, biologics yielded superior durable disease suppression.

Conclusion: Biologic treatment demonstrated advantages in sustained symptom suppression, enhanced quality of life, and lower recurrence rates when measured against surgical management alone in CRSwNP patients. Surgery nonetheless retains clear utility as a strategy for prompt symptomatic relief. Clinical decision-making should adopt an individualized framework tailored to patient profile and disease characteristics.

Key Words: Chronic rhinosinusitis, nasal polyps, endoscopic sinus surgery, dupilumab, mepolizumab, biologic therapy, quality of life, SNOT-22

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INTRODUCTION

CRSwNP is a long-standing inflammatory condition of the sinonasal mucosa defined by non-malignant, fluid-filled tissue overgrowths that originate predominantly from the ethmoid region and nasal passages.

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Epidemiological data indicate a prevalence of roughly 2–4% across the general population, with the disease exerting considerable morbidity through symptoms including nasal blockade, loss of smell, facial congestion, and disrupted sleep[1]. Its pathophysiology centers on aberrant type 2 immune activation, characterized by elevation of cytokines including IL-4, IL-5, and IL-13, together with tissue eosinophilia of the nasal lining[2].

The wider impact of CRSwNP encompasses not only physical disability but also meaningful reductions in occupational performance, psychological health, and overall quality of life. Validated outcome instruments such as the 22-item Sinonasal Outcome Test (SNOT-22) have consistently shown that health-related quality of life deficits in CRSwNP patients are of a magnitude comparable to those seen in severe asthma and COPD[3].

The condition is also commonly complicated by co-occurring conditions, notably asthma and aspirin-exacerbated respiratory disease (AERD), which amplify disease complexity and heighten the risk of relapse[4].

Standard pharmacological management relies on intranasal glucocorticoid sprays and intermittent systemic steroid courses, which may alleviate symptoms transiently without resolving the immunological drivers of polyp development[5]. For patients unresponsive to medical therapy or with advanced disease, endoscopic sinus surgery (ESS) has historically represented the main interventional option, as it restores sinus aeration and optimizes drug penetration to mucosal surfaces. Nonetheless, postoperative recurrence poses a persistent clinical challenge, with reported relapse rates reaching 40–60% within several years of the procedure[6].

Over the past decade, targeted immunotherapy through biologic agents has transformed the treatment landscape for severe and recalcitrant CRSwNP. Among these, dupilumab, which blocks the shared receptor subunit for IL-4 and IL-13, and mepolizumab, an antibody directed against IL-5, interrupt core inflammatory circuits that sustain polyp growth[7]. Evidence from controlled trials has established that both agents produce meaningful reductions in polyp burden, restore nasal patency, improve olfactory function, and elevate patient-reported quality of life[8].

Notwithstanding therapeutic advances on both fronts, the optimal selection between operative and pharmacobiologic strategies remains contested in clinical practice. Surgical intervention delivers prompt mechanical decompression, whereas biologic treatment provides ongoing modulation of mucosal inflammation at the expense of prolonged treatment duration and elevated cost burden[9]. Direct, real-world comparative evidence on patient-centered outcomes such as symptom severity and quality of life across these two modalities is still limited.

Against this backdrop, the present retrospective investigation was undertaken to directly compare clinical outcomes in CRSwNP patients managed with endoscopic sinus surgery versus those receiving dupilumab or mepolizumab at a tertiary referral center. Primary areas of inquiry included changes in symptom burden, quality of life outcomes, and polyp recurrence across a three-year observational horizon.

METHODS

Study Design and Setting: This investigation employed a retrospective observational design, drawing upon patient records from the Ear, Nose, Throat, Head and Neck Surgery Department at a tertiary-level hospital in Alahsa City, Kingdom of Saudi Arabia. Medical documentation spanning the period from July 2022 to July 2025 was reviewed.

Study Population: The study population comprised individuals with a confirmed diagnosis of CRSwNP who had previously undergone at least one session of functional endoscopic sinus surgery and subsequently received either operative or biologic intervention within the study timeframe.

Inclusion Criteria

- Adults aged ≥18 years
- Diagnosed with bilateral nasal polyps confirmed by nasal endoscopy and/or computed tomography (CT) scan
- Patients who underwent endoscopic sinus surgery or received biologic therapy (dupilumab or mepolizumab)
- Minimum follow-up duration of 6 months
- Positive history of functional endoscopic sinus surgery before at least 6 months
- Complete medical records available

Exclusion Criteria

- Patients with sinonasal malignancies
- Immunodeficiency disorders
- Previous sinonasal surgery within 6 months prior to study inclusion
- Incomplete or missing clinical data

Study Groups: Patients were categorized into two groups based on treatment modality. Both groups have a positive history of functional endoscopic sinus surgery before at least 6 months:

- Group A (Surgical Group): Patients who underwent functional endoscopic sinus surgery (FESS) under general anesthesia. The procedure aimed at removal of polyps, clearance of diseased mucosa, and restoration of sinus ventilation.
- Group B (Biologic Therapy Group): Patients treated with biologic agents, either:
    - Dupilumab administered subcutaneously (300 mg every 2 weeks) OR
    - Mepolizumab administered subcutaneously (100 mg every 4 weeks)

Treatment choice was based on clinician judgment, disease severity, patient preference, and availability of therapy.

Data Collection: Data were retrieved from electronic medical records and included:

- Demographic details (age, gender)
- Clinical presentation (nasal obstruction, anosmia, rhinorrhea, facial pain)
- Comorbid conditions (asthma, AERD)
- Treatment modality
- Baseline and follow-up symptom scores
- Quality of life assessments
- Recurrence and need for revision treatment

Outcome Measures

Primary Outcomes

1. **Symptom Improvement:** Measured using the 22-item Sinonasal Outcome Test (SNOT-22), a

validated tool assessing symptom severity and impact on daily life[10].

2. **Quality of Life (QoL):** Evaluated based on changes in SNOT-22 scores and patient-reported improvement in sleep, smell, and daily functioning.

Secondary Outcomes: Recurrence rate (defined as reappearance of nasal polyps on endoscopy requiring additional medical or surgical intervention)

- Time to recurrence
- Adverse events related to treatment

Follow-Up Protocol

Patients were followed at regular intervals:

- Baseline (pre-treatment)
- 3 months
- 6 months
- 12 months

Endoscopic examination and symptom scoring were performed at each visit.

Statistical Analysis: Data was analyzed using Statistical Package for the Social Sciences (SPSS) version XX.

- Continuous variables were expressed as mean ± standard deviation (SD)
- Categorical variables were expressed as frequencies and percentages
- Independent t-test was used to compare means between groups
- Paired t-test was used for within-group comparisons
- Chi-square test was used for categorical data
- A p-value of <0.05 was considered statistically significant

Ethical Considerations: The study was conducted following approval from the Institutional Ethics Committee. As this was a retrospective study, informed consent was waived. Patient confidentiality and data privacy were strictly maintained in accordance with institutional guidelines.

RESULTS

Across the study period, 120 patients with confirmed CRSwNP satisfied all eligibility requirements and were enrolled in the final analytical cohort. Within this cohort, 60 individuals (Group A) underwent functional endoscopic sinus surgery, and the remaining 60 (Group B) were treated with either Dupilumab or Mepolizumab. Average follow-up duration across both groups was 12.4 ± 3.6 months.

Pre-treatment demographic and clinical profiles were well-matched between groups, with no statistically meaningful intergroup differences detected at baseline. Surgical group patients had a mean age of 43.1 ± 10.8 years; the biologic group mean was 41.9 ± 11.6 years. Male patients constituted the majority in both cohorts. The most prevalent presenting complaints were nasal obstruction, loss of smell, rhinorrhea, and facial pressure or fullness. Concurrent asthma was documented in roughly one-third of participants in each group.

Table No. 1: Baseline Demographic and Clinical Characteristics

Parameter	Surgery Group (n=60)	Biologic Group (n=60)	p-value
Mean Age (years)	43.1 ± 10.8	41.9 ± 11.6	0.58
Male (%)	66.7%	63.3%	0.71
Nasal Obstruction (%)	95%	93%	0.65
Anosmia (%)	78%	82%	0.59
Asthma (%)	35%	38%	0.72
AERD (%)	12%	15%	0.64

Symptom amelioration as captured by SNOT-22 was observed in both treatment arms by the six-month assessment, though the extent of improvement diverged considerably between groups. Pre-treatment SNOT-22 values were comparable (Group A: 58.2 ± 10.4; Group B: 57.5 ± 9.8; $p > 0.05$). At six months, scores declined in both arms; however, the biologic group achieved a lower mean score (22.1 ± 7.5) relative to the surgical group (28.6 ± 8.2), and this difference reached statistical significance ($p < 0.01$).

Table No. 2: Comparison of SNOT-22 Scores

Time Point	Surgery Group	Biologic Group	p-value
Baseline	58.2 ± 10.4	57.5 ± 9.8	0.72
3 Months	35.4 ± 9.1	28.9 ± 8.3	<0.01
6 Months	28.6 ± 8.2	22.1 ± 7.5	<0.01

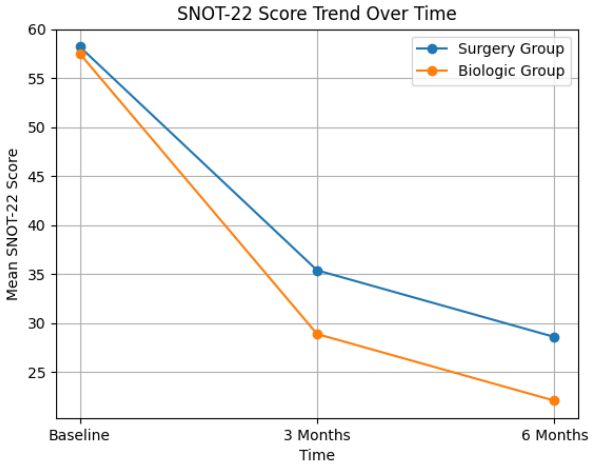

Figure No. 1: Temporal trajectory of mean SNOT-22 scores across the observation period for both the surgical and biologic treatment groups. Both cohorts exhibited meaningful symptomatic improvement, with the biologic arm demonstrating a more pronounced and durable decline in SNOT-22 values.

Quality of life gains were reported across several domains in both treatment groups, encompassing improvements in sleep, daily activities, and emotional functioning. Notably, biologic-treated patients achieved significantly greater restoration of olfactory capacity and more sustained relief over the long term. At the twelve-month evaluation, a marked quality of life improvement was reported by 72% of biologic group patients versus 55% of surgical group patients (p = 0.03).

Table No. 3: Quality of Life Improvement at 12 Months

Outcome	Surgery Group	Biologic Group	p-value
Marked Improvement (%)	55%	72%	0.03
Moderate Improvement (%)	30%	20%	0.18
Minimal/No Improvement (%)	15%	8%	0.21

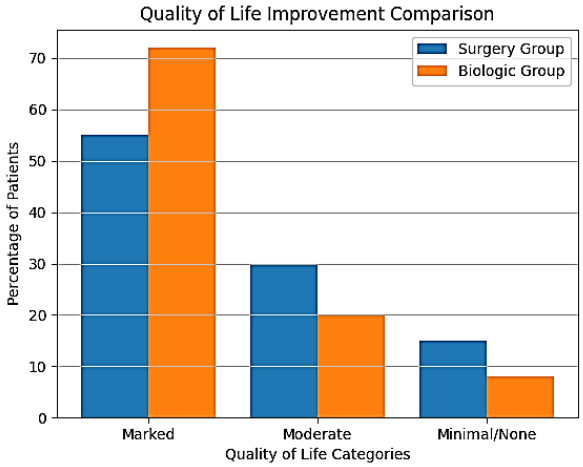

Figure No. 2: Bar chart illustrating comparative quality of life outcomes between the surgical and biologic therapy cohorts. A greater proportion of patients receiving biologics reported marked overall improvement, while a smaller proportion experienced negligible benefit relative to surgically treated counterparts.

Polyp regrowth was substantially more prevalent in the surgically managed cohort than in the biologic therapy cohort. Over the observation period, 18 of 60 surgical patients (30%) developed recurrence necessitating further medical or surgical management, in contrast to only 6 of 60 biologic patients (10%), yielding a statistically significant difference (p < 0.01). The interval preceding recurrence was also considerably shorter among surgical patients (mean 8.2 ± 2.1 months) compared to those on biologics (11.6 ± 1.8 months).

Table No. 4: Recurrence Rates and Time to Recurrence

Parameter	Surgery Group	Biologic Group	p-value
Recurrence (%)	30%	10%	<0.01
Time to Recurrence (months)	8.2 ± 2.1	11.6 ± 1.8	<0.01

With respect to tolerability, both interventions were generally well-accepted by patients. Minor surgical complications arose in the operative group, including postoperative hemorrhage in 8% and nasal crusting in 15% of cases. The biologic group experienced a distinct but mild adverse event profile, predominantly consisting of injection site discomfort (10%) and transient cephalgia (5%), with no serious systemic events documented in either group.

Table No. 5: Adverse Events

Adverse Event	Surgery Group	Biologic Group
Bleeding	8%	-
Nasal Crusting	15%	-
Injection Site Reaction	-	10%
Headache	-	5%

In aggregate, surgical treatment afforded more immediate symptomatic benefit, whereas biologic therapy achieved superior outcomes across measures of sustained disease control, patient-reported quality of life, and long-term polyp recurrence prevention throughout the study horizon.

DISCUSSION

This retrospective investigation examined treatment outcomes in CRSwNP patients who received either surgical or biologic intervention at a tertiary care institution across a three-year period. The data reveal that, although both modalities confer meaningful improvements in symptom scores and quality of life measures, biologic-based management demonstrates clear superiority with regard to durable disease suppression, lower recurrence frequency, and more favorable patient-reported outcomes. These findings align with current paradigm shifts recognizing CRSwNP as a predominantly type 2 inflammatory disorder for which targeted immunological interventions are increasingly appropriate[11].

A prominent observation in this study was the significantly larger decline in SNOT-22 scores among patients receiving biologic treatment. While surgical decompression yielded earlier relief, particularly of nasal obstruction, the biologic cohort maintained more consistent and durable improvement over successive follow-up intervals. This is consistent with findings from prospective randomized trials confirming that agents such as Dupilumab and Mepolizumab

substantially reduce mucosal inflammatory burden and sustain nasal functional recovery[12]. The pharmacological rationale lies in direct blockade of the IL-4, IL-5, and IL-13 signaling axes that perpetuate polyp pathology, in contrast to surgery, which removes polyp tissue but leaves the inflammatory milieu intact[13]. Quality of life data from this study further corroborate the benefit of biologic treatment. Patients in the biologic arm reported substantially greater gains in olfactory perception, sleep architecture, and functional daily capacity at twelve months. Smell impairment, a defining symptom of CRSwNP, tends to persist after surgery when underlying mucosal inflammation is not adequately controlled. Biological agents, by attenuating eosinophil-driven inflammation and resolving mucosal swelling, facilitate more robust olfactory recovery, a finding corroborated by earlier published investigations[14].

Polyp recurrence represents one of the most formidable obstacles in CRSwNP management. In this cohort, the surgical group exhibited a recurrence rate threefold higher than the biologic group (30% vs 10%), with a meaningfully shorter interval to recurrence. These observations are concordant with published data documenting post-ESS recurrence frequencies approaching 40–60%, particularly in patients with eosinophil-predominant disease or concurrent asthma[15]. The comparatively low recurrence rate in the biologic arm highlights the therapeutic significance of suppressing systemic inflammatory pathways, which drive ongoing polyp regrowth beyond the immediate postoperative period[16].

Notwithstanding the advantages of biologic therapy demonstrated herein, surgical management retains an important position in the CRSwNP treatment algorithm. FESS delivers immediate decompression of the obstructed sinonasal passages, enhances sinus drainage, and augments penetration of topically administered medications. In settings with restricted access to biologic agents or in patients with acute, severe symptom burden, operative management represents a practical first-line intervention[17]. Moreover, surgery may function synergistically with subsequent biologic therapy in patients presenting with extensive polypoid disease.

The adverse event patterns documented in this study were broadly consistent with the established safety literature. Complications following surgery were predominantly minor and resolved without intervention, whereas biologic treatment produced a distinct but equally mild side effect profile characterized by local injection site reactions and headache. Crucially, neither treatment arm was associated with serious adverse events, affirming the acceptable safety profile of both management strategies[18].

The adoption of biologic agents is nonetheless constrained by practical considerations. The high acquisition cost, requirement for indefinite administration, and restricted availability in many healthcare systems represent meaningful barriers, particularly in lower-resource settings. Economic modeling studies have indicated that the favorable cost-utility of biologics is most evident in patients with severe, relapsing, or surgically recalcitrant disease[19]. Appropriate patient stratification is therefore essential to maximize therapeutic value while ensuring judicious resource allocation.

This analysis adds to the accumulating corpus of real-world data comparing operative and biologic treatment approaches in CRSwNP. The results underscore an ongoing transition toward precision therapeutics, wherein individualized treatment planning accounts for disease endotype, severity, comorbidity burden, and patient preferences. Collaborative engagement of otolaryngology, allergy and immunology, and respiratory medicine specialists is central to achieving optimal outcomes for this complex patient population.

Several methodological limitations warrant acknowledgment. The retrospective framework introduces inherent risks of selection and information bias, and restriction to a single institutional site constrains the external validity of the findings. Furthermore, while the follow-up period was sufficient to capture short- and medium-term clinical trajectories, extended observation will be necessary to fully characterize long-term recurrence dynamics and disease progression. Well-designed prospective, multicenter investigations with extended follow-up periods are warranted to substantiate the present findings and inform evidence-based treatment protocols.

In conclusion, the data from this study indicate that biologic treatment confers superior durable outcomes relative to surgery in CRSwNP management, with particular advantages in disease control sustainability, patient quality of life, and protection against polyp recurrence. Surgery nonetheless maintains a well-defined therapeutic role, especially where early symptomatic relief is the treatment priority. An individualized, patient-centered approach guided by disease severity, phenotype, and clinical context remains the optimal framework for managing this chronic airway condition

CONCLUSION

Surgical and biologic approaches each offer meaningful clinical benefit in the treatment of CRSwNP. Notwithstanding, the present data indicate that Dupilumab and Mepolizumab achieve superior long-term disease suppression, greater quality of life gains, and reduced polyp recurrence compared to operative intervention. Surgery retains its role as an effective strategy for prompt relief of sinonasal obstruction, yet treatment selection should be individualized, incorporating disease severity, inflammatory

phenotype, and patient-specific factors within a multidisciplinary decision-making framework.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ibrahim K. Aljabr
Drafting or Revising Critically:	Ibrahim K. Aljabr
Final Approval of version:	The above author
Agreement to accountable for all aspects of work:	The above author

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