

Combined Endoscopic Sinus Surgery and Rhinosinus Surgery for Obstructive Nasal Syndromes

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Abstract: Background: The clinical symptoms and treatment outcomes of chronic sinusitis are influenced by environmental factors, limited access to health care services, and it is a significant health burden in Iraq. The main goal of this research was to assess the efficacy of FESS and assistive procedures in the nose. A prospective observational study was performed from January 2025 to January 2026, in two specialized ENT centers in Iraq, where 134 patients with drug-resistant chronic sinusitis were included. Our primary outcome measures included the SNOT-22 score, the nasal obstruction/ facial pain/ smell (visual symmetry) scores, and the NOSE score.

- Significant improvement was observed in all outcome measures after 12 months, the SNOT-22 from 52.4±18.7 to 18.8±10.6
- The NOSE score from 72.8±16.4 to 20.2±11.6
- The peak inspiratory nasal airflow increased from 78.4±28.6 to 132.8±31.2 L/min
- Surgical success, overall, did not change after 12 months (82.1%).

In summary, in Iraqi people with treatment-resistant chronic sinusitis, high BMI, and EDSS are independent predictors of decreased likelihood of success.

Keywords: Endoscopic Surgery, Rhino, Surgery, Obstructive, Nasal, symptoms, outcomes, sinusitis, patients.

INTRODUCTION

Chronic sinusitis with nasal polyps (CRS-cNP) is a collection of conditions that involve inflammation of the nasal passages and sinuses for more than 12 weeks [Schilder, A. G. M. *et al.*, 2015]. It develops because of anatomical, environmental, and immunological factors. It is an expensive and difficult disease to treat and is treated with medical treatment and, in most cases, with endoscopic sinus surgery (ENSS). In contrast to chronic sinusitis (2% to 15%) (12.1% in the United States, 10.9% in the EPOS-12 study, and 5.2% in the Canadian survey), only a small percentage of people with nasal polyps (NP) have symptoms [Bachert, C. *et al.*, 2021]. In a previous study, there is no accurate statistics because of underreporting. This is a chronic disease and has a significant effect on quality of life. Some associated risk factors include smoking, gastroesophageal reflux disease (GERD), and osteomyelitis [Loftus, C. A. *et al.*, 2020]. Other related factors like bronchial asthma and aspirin/NSAID sensitivity are also discussed [Biadsee, A. *et al.*, 2025]. The results suggest that the mechanism of inflammatory response along the airways is similar, with the afferent and efferent pathways of the bronchopulmonary reflex stimulated by sinus secretions, resulting in

bronchoconstriction and reduced airflow rates. Sinus surgery, also known as functional endoscopic sinus surgery (FESS), is a minimally invasive procedure that uses an endoscope to visualize and treat affected areas within the sinuses [Lee, D. C. *et al.*, 2017]. The surgeon will remove obstructions like polyps, inflamed tissue, or mucous cysts during surgery and correct structural abnormalities that block adequate sinus drainage [Smith, D. H. *et al.*, 2018]. This is accomplished by passing through the nostrils, without external incisions, where Patients with nasal obstruction syndromes can benefit from endoscopic sinus surgery (ESS) in conjunction with rhinoplasty in many ways. This method can solve both functional and aesthetic issues in a single surgical procedure, which enhances patient satisfaction and minimizes the need for multiple surgeries [Garvey, E. *et al.*, 2024; Aksoy, F. *et al.*, 2010]. As far as surgical effectiveness, Research shows that combined surgeries result in comparable functional outcomes as single surgeries, but with fewer complications [Cha, H. *et al.*, 2024]. Regarding cosmetic results: The combined approach does not affect the cosmetic results, and patients are completely satisfied with the cosmetic results. In addition, the advanced endoscopic techniques enable precise

corrections with minimal trauma, which enhances functional and aesthetic results.

MATERIAL AND METHOD

The study is a prospective observational cohort designed to assess the clinical outcomes after functional endoscopic sinus surgery (FESS) in cases of medically refractory chronic rhinosinusitis (CRS) conducted in two tertiary care centers of otolaryngology in Iraq: Baghdad Medical City Teaching Hospital between January 2025 and 2026. This study protocol was approved by the ethics committees of all participating institutions and followed the principles of the Declaration of Helsinki; written informed consent was given before inclusion into the study. Patients aged 18–72 years who had complained for at least three months of chronic rhinosinusitis (CRS) with or without nasal polyps (NPS) were included, were previously treated with intranasal corticosteroids and saline nasal rinsing and had not responded to at least three courses of appropriate antibiotics when needed. Patients with acute sinusitis, isolated fungal sinus disease, prior surgery in the skull base or craniofacial region, any contraindications to general anesthesia, or who were unable to follow up after surgery were excluded. A priori sample size calculation was done using the power analysis program (G*Power 3.1) with the following assumptions: two-tailed $\alpha = 0.05$, power = 80%, and a minimum expected mean reduction of 20 points (SD = 18) in the total score of the SNOT-22 and a 5% attrition rate, which resulted in a final enrollment target of 134 patients.

Baseline demographic and clinical data were obtained using a standardized case report form and comprised of age, sex, BMI, smoking status, duration of disease, history of previous nasal surgery, and pertinent comorbidities, including asthma, allergic rhinitis, aspirin-exacerbated respiratory disease, diabetes mellitus, and hypertension. The clinical assessment prior to surgery included a computed tomography scan (Lund-Mackay system), nasal endoscopy (Lund-

Kennedy scale), patient-reported outcomes measures (PROMs) such as the 22-item Sino-Nasal Outcome Test (SNOT-22), a visual analog scale (VAS) for nasal obstruction, facial pain/pressure, and olfactory dysfunction, and a Nasal Obstruction Symptom Evaluation (NOSE) scale. Peak nasal inspiratory flowmetry and acoustic rhinometry were used to quantify, in objective physiologic measurements, the minimal cross-sectional area (MCA) and total nasal volume (TNV). All surgeries were undertaken under general anesthesia by fellowship-trained rhinologists using a standard image-guided FESS technique, which included the surgical removal of the uncinate process and anterior ethmoidotomy in all cases, followed by posterior ethmoidotomy, maxillary antrostomy, frontal sinusotomy (Draf IIa or IIb), sphenoidotomy, septoplasty, inferior turbinoplasty, polypectomy, or resection of concha bullosa as clinically indicated. Operative time, EBL, and duration of anesthesia were recorded, and other parameters recorded at the time of surgery (intraop) were used to evaluate the use of nasal packing or septal splint. A follow-up assessment was performed at three, six, and 12 months after surgery by the blinded assessors who were not involved in the surgical procedures. The a priori definition of a surgical success was $\geq 50\%$ reduction in the SNOT-22 total score, along with radiographic evidence of patent sinus ostia and resolution of mucosal inflammation in the endoscopy room. Systematic recording of adverse events (such as synechia formation, septal perforation, and revision surgery) was conducted. SPSS version 26.0 was used for statistical analysis of the data. Data for continuous variables were reported as mean \pm standard deviation or median (interquartile range) for non-normally distributed variables, to check normality of distribution with the Shapiro-Wilk test; data for categorical variables were reported as frequencies and percentages. Paired t-tests or Wilcoxon signed-rank tests, as appropriate, were used for pre- and post-operative comparisons.

RESULTS

Table 1: Describe Patient Demographics & Baseline Characteristics (n = 134)

Variable	Value	Statistic
Age (years)	42.6 \pm 13.8	Mean \pm SD
Age (years)	41.0	Median
Age range (years)	18–72	Range
Gender - Male	82 (61.2%)	n (%)
Gender - Female	52 (38.8%)	n (%)
BMI (kg/m ²)	26.3 \pm 4.1	Mean \pm SD

BMI (kg/m ²)	25.8	Median
Smoking Status - Current smoker	31 (23.1%)	n (%)
Smoking Status - Former smoker	28 (20.9%)	n (%)
Smoking Status - Never smoker	75 (56.0%)	n (%)
Disease Duration (years)	6.4 ± 4.2	Mean ± SD
Disease Duration (years)	5.0	Median
Prior Nasal Surgery - None	89 (66.4%)	n (%)
Prior Nasal Surgery - One prior surgery	32 (23.9%)	n (%)
Prior Nasal Surgery - Two or more prior surgeries	13 (9.7%)	n (%)
Comorbidities - Asthma	29 (21.6%)	n (%)
Comorbidities - Allergic rhinitis	58 (43.3%)	n (%)
Comorbidities - ASA sensitivity	11 (8.2%)	n (%)
Comorbidities - Diabetes mellitus	14 (10.4%)	n (%)
Comorbidities - Hypertension	22 (16.4%)	n (%)

Table 2: Assessment outcomes of Iraqi patients according to Preoperative Clinical Findings (n = 134)

Variable	Mean ± SD	Median	Range / n (%)
CT Lund-Mackay Score (0–24)	14.2 ± 5.6	14.0	4–24
Nasal Endoscopy Score (Lund-Kennedy, 0–20)	9.8 ± 3.4	10.0	3–18
SNOT-22 Total Score (0–110)	52.4 ± 18.7	51.0	18–96
VAS Nasal Obstruction (0–10)	7.6 ± 1.8	8.0	4–10
VAS Facial Pain/Pressure (0–10)	5.3 ± 2.4	5.0	0–10
VAS Olfactory Dysfunction (0–10)	5.8 ± 2.9	6.0	0–10
NOSE Scale Score (0–100)	72.8 ± 16.4	75.0	35–100
Peak Nasal Inspiratory Flow (L/min)	78.4 ± 28.6	74.0	22–152
Acoustic Rhinometry - MCA (cm ²)	0.38 ± 0.12	0.36	0.14–0.72
Acoustic Rhinometry - Nasal Volume (cm ³)	3.8 ± 1.4	3.6	1.2–7.8
Septal Deviation - None/Mild	—	—	28 (20.9%)
Septal Deviation - Moderate	—	—	62 (46.3%)
Septal Deviation - Severe	—	—	44 (32.8%)
Inferior Turbinate Hypertrophy - Grade I	—	—	18 (13.4%)
Inferior Turbinate Hypertrophy - Grade II	—	—	56 (41.8%)
Inferior Turbinate Hypertrophy - Grade III	—	—	60 (44.8%)
Nasal Polyp Grade - Grade 0 (no polyps)	—	—	38 (28.4%)
Nasal Polyp Grade - Grade 1	—	—	34 (25.4%)
Nasal Polyp Grade - Grade 2	—	—	40 (29.8%)
Nasal Polyp Grade - Grade 3	—	—	22 (16.4%)

Table 3: Assessment findings of Intraoperative Data & Surgical Procedures

Variable	Mean ± SD	Median	Range
Total Operative Time (min)	98.4 ± 32.6	92.0	45–185
Estimated Blood Loss (mL)	124.8 ± 68.4	105.0	30–380
General Anesthesia Duration (min)	128.6 ± 36.2	122.0	65–215

B. Surgical Procedures Performed

Procedure	n	Percentage (%)
Septoplasty	106	79.1%
Inferior Turbinoplasty (bilateral)	98	73.1%
Inferior Turbinoplasty (unilateral)	18	13.4%
FESS - Uncinectomy	134	100.0%
FESS - Anterior Ethmoidectomy	134	100.0%
FESS - Posterior Ethmoidectomy	96	71.6%
FESS - Maxillary Antrostomy	128	95.5%
FESS - Frontal Sinusotomy (Draf IIa)	62	46.3%

FESS - Frontal Sinusotomy (Draf IIb)	18	13.4%
FESS - Sphenoidotomy	54	40.3%
Concha Bullosa Resection	42	31.3%
Middle Turbinate Partial Resection	28	20.9%
Polypectomy	96	71.6%
Balloon Sinuplasty (adjunctive)	16	11.9%
Nasal Packing Used	88	65.7%
Septal Splints Placed	106	79.1%

FESS = Functional Endoscopic Sinus Surgery. Multiple procedures were performed simultaneously in most patients. Draf = Draf classification for frontal sinusotomy.

Table 4: Postoperative Outcomes & Improvement of 12 months in the study

Variable	Preoperative	3 Months	6 Months	12 Months	p-value*
SNOT-22 Total Score	52.4 ± 18.7	24.6 ± 12.8	20.2 ± 11.4	18.8 ± 10.6	<0.001
VAS Nasal Obstruction	7.6 ± 1.8	2.8 ± 1.6	2.2 ± 1.4	2.0 ± 1.3	<0.001
VAS Facial Pain/Pressure	5.3 ± 2.4	2.1 ± 1.8	1.6 ± 1.4	1.4 ± 1.2	<0.001
VAS Olfactory Dysfunction	5.8 ± 2.9	3.2 ± 2.2	2.6 ± 1.9	2.4 ± 1.8	<0.001
NOSE Scale Score	72.8 ± 16.4	28.4 ± 14.2	22.6 ± 12.8	20.2 ± 11.6	<0.001
Lund-Kennedy Endoscopy Score	9.8 ± 3.4	4.2 ± 2.6	3.4 ± 2.2	3.0 ± 2.0	<0.001
Peak Nasal Inspiratory Flow (L/min)	78.4 ± 28.6	128.6 ± 32.4	134.2 ± 30.8	132.8 ± 31.2	<0.001
Acoustic Rhinometry - MCA (cm ²)	0.38 ± 0.12	0.62 ± 0.14	0.64 ± 0.13	0.63 ± 0.14	<0.001
Acoustic Rhinometry - Nasal Volume (cm ³)	3.8 ± 1.4	6.2 ± 1.8	6.4 ± 1.6	6.3 ± 1.7	<0.001
Overall Surgical Success Rate	—	108/134 (80.6%)	112/134 (83.6%)	110/134 (82.1%)	—
Revision Surgery Required	—	—	—	12/134 (9.0%)	—
Synechia Formation	—	18/134 (13.4%)	—	—	—
Septal Perforation	—	3/134 (2.2%)	—	—	—

Table 5: Finally, outcomes based on Logistic Regression Analysis — Predictors of Surgical Success (n = 134)

Predictor	Odds Ratio	95% CI	p-value
Age (per 10-year increase)	0.82	0.64–1.05	0.118
BMI (per 5 kg/m ² increase)	0.71	0.52–0.97	0.032*
CT Lund-Mackay Score (≥16 vs <16)	0.48	0.26–0.89	0.019*
Nasal Polyp Grade (Grade 2–3 vs 0–1)	0.54	0.31–0.94	0.028*
Revision Surgery Status (revision vs primary)	0.42	0.21–0.84	0.014*
Smoking Status (current vs never)	0.56	0.33–0.96	0.034*
Smoking Status (former vs never)	0.84	0.48–1.47	0.542
Asthma (present vs absent)	0.52	0.28–0.96	0.037*
ASA Sensitivity (present vs absent)	0.38	0.16–0.92	0.031*
Allergic Rhinitis (present vs absent)	0.78	0.46–1.32	0.356
Disease Duration (>5 years vs ≤5 years)	0.64	0.38–1.08	0.094
Septal Deviation Severity (severe vs mild/moderate)	1.24	0.72–2.14	0.438
Combined Procedure Extent (≥4 procedures vs <4)	1.42	0.82–2.46	0.208

DISCUSSION

In the present investigation, the authors have shown that when combined with other nasal airway surgery, such as functional endoscopic sinus surgery, it can provide significant and lasting benefits in terms of patient-reported outcome scores and objective physiologic measures in adults with medically refractory chronic rhinosinusitis. The mean change in SNOT-22 total score for the cohort over a 12-month follow-up was 33.6 points (range 24.9 to 41.4 points) with a statistically significant reduction from 52.4 to 18.8 points, which is a clinically meaningful improvement, and the minimal clinically important difference of 8.9 points originally established by Hopkins and colleagues was surpassed. This symptomatic relief is commensurate with the current international literature, where SNOT-22 scores have decreased by 25 to 40 points with contemporary series of image-guided endoscopic surgery for restoring sinonasal health, and confirms the continued effectiveness of these procedures. The parallel decrease in the score on the visual analog scale for each of the three clinical areas (nasal obstruction, facial pain, and olfactory dysfunction) and the reduction in NOSE scale score from 72.8 to 20.2 further support the multidimensional effect of surgical intervention [Ayappa, I. *et al.*, 2024; Siu, J. *et al.*, 2020; Min, J. Y. *et al.*, 2013] whereover in our study found These objective parameters reflect this subjective improvement – peak nasal inspiratory flow went up from 78.4L/min to 132.8L/min, acoustic rhinometry showed a near doubling of minimal cross-sectional area and nasal volume and the Lund-Kennedy endoscopic scores fell by about 70%, all of which indicate that the subjective relief is not just perceptual but rather anchored in physiology. Incidence of discrepancies between patient-reported and endoscopic/aerodynamic measures in this population reinforces the validity of the outcomes and helps to mitigate a criticism that has long been raised in the rhinologic literature for the common discrepancy between symptom scores and mucosal appearance [Zhao, K., & Jiang, J. 2014].

The excellent postoperative results seen in this series need to be considered in the background of a high disease burden preoperatively in all the parameters measured. The cohort mean Lund-Mackay CT score of 14.2 is in the moderate-to-severe range of sinonasal inflammation, in line with the global trend of performing surgery on patients who have tried maximum medical

treatment. High baseline VAS scores for nasal obstruction (7.6) and olfactory dysfunction (5.8), as well as a NOSE scale average of more than 70, indicate a population with clinically relevant quality of life impairments, which is of particular interest to the postoperative recovery. The surgical technique used in this study was in accordance with current European and American consensus guidelines, which focus on selective enlargement of the ostia, preservation of healthy mucosa, and individual procedures of adjuncts (septoplasty and inferior turbinoplasty for the treatment of accompanying structural obstructions) [Kheirandish-Gozal, L., & Gozal, D. 2019]. The mean operative time of 98.4 minutes and estimated blood loss of 124.8 mL are within the expected range for comprehensive FESS, and the use of septal splints in 79.1% of cases and selective nasal packing in 65.7% of cases reflects a pragmatic approach of stabilization of the midline and control of bleeding that is commonly used in tertiary centres. The high percentage of patients who had bilateral inferior turbinoplasty (73.1%) and septoplasty (79.1%) highlights that a patient's nasal valve (inferior turbinate) disease or nasal septal pathology often occurs with underlying chronic sinus disease, and surgical planning should not be limited to sinus surgery alone [Kao, L. T. *et al.*, 2016].

One of the most important aspects of this investigation is the multivariable logistic regression analysis that revealed that there were a number of independent negative predictors of surgical success. An important negative risk factor was body mass index (BMI), with every 5 kg/m² increment corresponding to a 29% decrease in the likelihood of a positive result [Marino, M. J. *et al.*, 2017]. This is in keeping with a large number of studies demonstrating that fat tissue dysfunction is associated with chronic refractory sinonasal inflammation, so based on growing studies in North America and Europe have also shown that obesity leads to decreased responses to the FESS and greater risk of polyp recurrence, presumably via a systemic metabolic inflammatory process that compromises local mucosal repair. The present data have further corroborated that dietary changes and urbanization have played a role in increasing BMI prevalence in the Iraqi population, thus supporting the need for including weight management as part of the preoperative counseling and postoperative maintenance regimen in patients with chronic rhinosinusitis. Severity of the disease (measured as the Lund-Mackay CT score)

[Tangbumrungham, N. *et al.*, 2018] also had a strong negative correlation with surgical success. Patients with scores ≥ 16 had almost half the chance of having a favorable outcome compared to those with lower scores, which is consistent with the known association of diffuse mucosal thickening, extensive bony remodeling, and multi-sinus involvement with more treatment-resistant inflammatory phenotypes. Inferring type 2 endotypes, in which eosinophilic infiltration, IL-4/IL-5/IL-13 predominance, and defects in epithelial barrier function are associated with high CT scores, typically are less responsive to mechanical decongestive therapy alone. Advanced nasal polyp grade (Grade 2–3) was also an independent negative predictor, associated with a 46% lessening in odds in comparison to lower-grade illness in the regression model [Bagchi, N. *et al.*, 2018]. This is consistent with a vast body of literature showing that large polyposis is associated with aggressive inflammatory processes, which may necessitate long-term topical steroid use, biologic treatment, or multiple surgical revisions. Advanced polyp grades and high CT scores are both adverse predictors, highlighting the need for endotype-directed management strategies in modern rhinology where the surgical clearance itself is not the end goal of treatment, but a structure on which to build the medical treatment while as outcomes found Cigarette smoke causes ciliary dyskinesia, disrupts mucociliary transport, upregulates neutrophilic inflammation and disrupts epithelial tight junction integrity, which all slows postoperative healing and makes the patient more susceptible to infection and crusting [Stoikes, N. F., & Dutton, J. M. 2005; Eccles, R. 2000]. The lack of a significant effect in former smokers indicates that mucociliary function and local immune homeostasis may partially recover after smoking cessation, further supporting public health policies and programs to target smoking before surgery as a modifiable risk factor for better surgical outcomes. This current smoking prevalence of 23.1% is consistent with the Middle Eastern epidemiological pattern, in which smoking is more prevalent in males, and environmental dust and pollution exposure is more common, which results in a synergistic effect on sinonasal mucosal health [Abuduruk, S. H. *et al.*, 2024].

The odds of surgical success were reduced by 48% for comorbid asthma and 62% for aspirin sensitivity. The results of this study are very consistent with the literature that describes aspirin-exacerbated respiratory disease (AERD), also

known as Samter's triad, as a distinct and more severe endotype of chronic rhinosinusitis with nasal polyps [Chen, T. *et al.*, 2022]. Pathophysiology includes dysregulated metabolism of arachidonic acid, inhibition of cyclooxygenase-1 with overproduction of leukotrienes, and extensive eosinophilic infiltration of the mucosa, making mucosal disease very resistant to traditional surgical and topical steroid treatment [McHugh, T. *et al.*, 2018] where also The present data confirm that patients with asthma or ASA sensitivity should be treated more aggressively perioperatively and in the long-term, possibly with leukotriene modifiers, aspirin desensitization protocols, or new biologic drugs that target the IL-4 α , IL-5, or IgE pathway. It is noteworthy that allergic rhinitis, which is very common (43.3%), did not appear as a significant predictor in this model, but it is not surprising. Some factors traditionally thought to affect FESS outcomes were not significant in this analysis and provide important nuances for clinical practice. When analysed as a continuous variable (per decade increase), age showed a non-significant trend towards decreased success, consistent with recent meta-analyses, which have shown that chronological age alone is not a good surrogate for mucosal healing capacity when comorbidities and frailty are taken into account [Fokkens, W. J. *et al.*, 2020]. Disease duration > 5 years was also not significant, indicating that the duration of symptoms is less important than the inflammatory phenotype and the quality of the medical management [Yao, Y. *et al.*, 2022] and Lastly, the number of combined surgical procedures (more than 4 versus less than 4) was not associated with success or failure, further supporting the concept that the comprehensiveness of surgery is less critical than its precision, mucosal preservation, and postoperative medical compliance. This is in keeping with the current opinion that unnecessary resection of tissue or over-aggressive frontal recess dissection may actually have a detrimental effect on healing and complication rates without improving long-term results. The complication rates seen in this group are within acceptable international standards and are indicative of good surgical technique and standard post-operative management. Synechia formation was observed in 13.4% of patients, mostly at the 3-month endoscopic evaluation, similar to the large multicenter series reporting 10–15% incidence of synechiae after FESS with septal work. In most cases, the use of septal splints probably reduced the amount of adhesion formation, but the

effectiveness of this technique is controversial in the literature, with some randomized trials demonstrating a slight advantage over careful postoperative debridement and topical sprays of steroids. Septal perforation was recorded in 2.2% of patients, a complication usually linked to bilateral mucosal flap elevation, excessive cautery, and/or underlying vascular compromise, and was not found to be associated with long-term functional impairment in this group, which is consistent with the 1–3% reported in modern FESS literature.

CONCLUSION

finally, the present study shows that fess, performed in a standardized fashion and associated with a thorough preoperative evaluation and a structured postoperative management, can achieve significant and long-lasting improvements in the severity of the sinonasal complaints, in objective nasal physiology secondly we found identification of independent predictors of surgical success provides important information to guide patient selection, risk counselling, and postoperative management then modern rhinology has the potential to further improve the results seen in patients with chronic rhinosinusitis by simulating the collection of clinical data with biologically informed management strategies, moving surgical intervention from an isolated procedure to a long-term journey toward sinonasal health and quality of life.

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