



Comparison of Balloon Sinuplasty Versus Functional Endoscopic Sinus Surgery (FESS) in the Management of Chronic Rhinosinusitis

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ABSTRACT:

Background: Chronic rhinosinusitis (CRS) had remained a common and challenging condition affecting patients' quality of life, often requiring surgical intervention when medical management failed. Functional Endoscopic Sinus Surgery (FESS) had long been the standard surgical approach, while Balloon Sinuplasty emerged as a minimally invasive alternative with promising outcomes. **Aim:** The study was conducted to compare the effectiveness, safety, and postoperative outcomes of Balloon Sinuplasty versus FESS in the management of CRS.

Methods: This prospective comparative study was carried out at Shifa International Hospital, Islamabad, from June 2024 to May 2025. A total of 80 patients diagnosed with CRS, unresponsive to medical

therapy, were included and equally divided into two groups: Group A underwent Balloon Sinuplasty, while Group B underwent FESS. Preoperative and postoperative outcomes were assessed using symptom scores, radiological evaluation, complication rates, and recovery parameters. Statistical analysis was performed to determine the significance of differences between the two techniques.

Results: Balloon Sinuplasty was associated with shorter operative times, reduced intraoperative bleeding, and quicker postoperative recovery compared to FESS. Patients in the Balloon Sinuplasty group reported lower pain scores and faster return to normal activities. However, FESS demonstrated greater efficacy in cases with extensive sinonasal disease and polyp formation. Both procedures



significantly improved quality of life scores and symptom relief, though the overall complication rate was lower in the Balloon Sinuplasty group.

Conclusion: The study concluded that both Balloon Sinuplasty and FESS were effective in the management of CRS. Balloon Sinuplasty proved advantageous in terms of safety, patient comfort, and recovery, making it suitable for selected cases with less extensive disease. FESS, however, remained superior in patients with advanced CRS and nasal polyposis. A tailored surgical approach based on disease severity was recommended to optimize patient outcomes.

Keywords: Chronic rhinosinusitis, Balloon Sinuplasty, Functional Endoscopic Sinus Surgery (FESS), Surgical outcomes, Minimally invasive surgery.

INTRODUCTION:

Chronic rhinosinusitis (CRS) had been recognized as a persistent inflammatory condition of the paranasal sinuses and nasal passages that lasted for more than 12 weeks, despite appropriate medical therapy. It had been associated with a considerable burden on patients, including nasal obstruction, facial pressure, postnasal drip, decreased sense of smell, and overall reduction in quality of life. The condition had also imposed a significant socio-economic impact through recurrent physician visits, prolonged medication use, decreased work productivity, and increased healthcare expenditures [1]. As a result, identifying effective and durable treatment strategies had remained an essential focus in otolaryngology.

Traditionally, medical management, which had included nasal corticosteroids, antibiotics, decongestants, and saline irrigation, had been considered the first line of treatment. However, a subset of patients who failed to respond adequately to medical therapy had required surgical intervention. Functional Endoscopic Sinus Surgery (FESS) had emerged in the 1980s as a revolutionary approach, replacing conventional open surgical techniques [2]. FESS had aimed to restore normal sinus ventilation and drainage by removing diseased mucosa and enlarging sinus ostia under direct endoscopic visualization. The technique had proven effective in improving symptoms, reducing infection recurrence, and enhancing overall sinus function. Nevertheless, FESS had been associated with risks such as bleeding, adhesions, cerebrospinal fluid leaks, and potential orbital injury. Moreover, the postoperative recovery period had been relatively prolonged, and the procedure had often required general anesthesia [3].

With advancements in minimally invasive techniques, Balloon Sinuplasty had been introduced in the early 2000s as an alternative to FESS. This technique had involved the insertion of a catheter with a small balloon into the sinus ostium, which was then inflated to dilate the natural sinus opening without removing mucosa or bone. The procedure had been designed to restore sinus drainage and function while preserving mucosal integrity [4]. Balloon Sinuplasty had gained attention due to its safety profile, shorter recovery time, and the



possibility of being performed under local anesthesia in an outpatient setting. Several studies had reported significant improvement in symptoms and quality of life following Balloon Sinuplasty, with lower complication rates compared to traditional FESS. However, some critics had argued that its efficacy might be limited in patients with extensive polyposis or severe mucosal disease, where tissue removal had been necessary [5].

The comparison between Balloon Sinuplasty and FESS had therefore become a subject of growing interest. While both procedures had shared the common objective of restoring sinus function and alleviating symptoms of CRS, they had differed in terms of invasiveness, complication rates, costeffectiveness, and patient satisfaction [6]. Previous literature had presented varied findings, with some studies suggesting comparable outcomes, while others had indicated superior long-term efficacy with FESS, particularly in complex or advanced cases.

Given the increasing prevalence of CRS and the evolving surgical options, it had been important to evaluate and compare the clinical outcomes of Balloon Sinuplasty versus FESS. A systematic comparison had provided clarity regarding the relative benefits, limitations, and indications of each approach, thereby guiding clinicians in tailoring treatment to individual patient needs [7]. This study had been conducted to address this gap by analyzing and comparing the outcomes of Balloon Sinuplasty

and Functional Endoscopic Sinus Surgery in the management of chronic rhinosinusitis.

MATERIALS AND METHODS:

This study was conducted at Shifa International Hospital, Islamabad, over a duration of twelve months, from June 2024 to May 2025. The primary objective of the research was to compare the outcomes of Balloon Sinuplasty and Functional Endoscopic Sinus Surgery (FESS) in the management of patients with chronic rhinosinusitis (CRS). A total of 80 patients were enrolled in the study.

Study Design:

This research was designed as a prospective, comparative clinical study. Patients diagnosed with chronic rhinosinusitis who met the inclusion and exclusion criteria were randomly allocated into two groups: the Balloon Sinuplasty group (Group A) and the FESS group (Group B). Each group consisted of 40 patients. The study was conducted following ethical approval from the institutional review board, and informed consent was obtained from all participants prior to their enrollment.

Inclusion and Exclusion Criteria:

The inclusion criteria consisted of patients aged between 18 and 60 years who were diagnosed with chronic rhinosinusitis persisting for more than 12 weeks despite appropriate medical therapy. Patients with recurrent acute rhinosinusitis, nasal polyposis, or significant anatomical deformities requiring extensive surgical correction were excluded. Patients with a history of previous sinus surgery, sinonasal tumors, or systemic diseases such as cystic fibrosis or



immunodeficiency were also excluded to ensure uniformity of outcomes.

Patient Allocation:

After baseline evaluation, patients were randomly assigned to either Group A (Balloon Sinuplasty) or Group B (FESS). Randomization was performed using a computer-generated randomization sequence to minimize selection bias. Each patient underwent a thorough preoperative assessment, including detailed history, nasal endoscopy, and computed tomography (CT) scan of the paranasal sinuses, graded using the Lund-Mackay scoring system.

Surgical Procedures:

Patients in Group A underwent Balloon Sinuplasty using FDA-approved balloon catheter devices. The balloon was introduced into the target sinus ostium and gradually inflated to remodel the sinus opening without removal of mucosa or bony structures. This minimally invasive procedure aimed to restore sinus ventilation and drainage.

Patients in Group B underwent conventional Functional Endoscopic Sinus Surgery. Using endoscopic visualization, diseased tissue, polyps, and obstructive anatomical variations were removed to re-establish normal sinus drainage. Care was taken to preserve healthy mucosa whenever possible. Both procedures were performed under general anesthesia by experienced otolaryngologists to ensure uniform surgical standards.

Postoperative Care:

All patients received standardized postoperative care, including nasal saline irrigation, antibiotics, and

analgesics as required. Follow-up visits were scheduled at one week, one month, three months, and six months postoperatively. At each visit, patients underwent clinical evaluation, nasal endoscopy, and were assessed for symptom improvement and potential complications.

Outcome Measures:

The primary outcomes included symptomatic relief measured by the Sino-Nasal Outcome Test (SNOT-22) and objective findings based on nasal endoscopy and CT scans. Secondary outcomes included the incidence of complications, duration of surgery, intraoperative blood loss, and recovery time. Symptomatic improvement was recorded preoperatively and at three and six months postoperatively for comparison.

Data Collection and Analysis:

All data were systematically collected using structured forms. Statistical analysis was performed using SPSS version 26.0. Continuous variables, such as symptom scores, were presented as mean $\pm$ standard deviation and compared using the Student's t-test. Categorical variables, such as complication rates, were analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations:

The study was carried out in compliance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the institutional ethics review board of Shifa International Hospital. Written informed consent was obtained from each



participant, ensuring voluntary participation and confidentiality of patient data throughout the study.

RESULTS:

The study was conducted at Shifa International Hospital, Islamabad, over a period from June 2024 to May 2025. A total of 80 patients with chronic rhinosinusitis were enrolled and randomly allocated into two groups: Balloon Sinuplasty (n = 40) and Functional Endoscopic Sinus Surgery (FESS) (n = 40). The demographic and baseline characteristics of the patients, as well as postoperative outcomes, were recorded and analyzed.

Table 1: Baseline Characteristics of Patients Undergoing Balloon Sinuplasty and FESS:

Variable	Balloon Sinuplasty (n=40)	FESS (n=40)	p-value
Mean Age (years)	37.8 ± 8.4	38.5 ± 9.1	0.72
Gender (Male/Female)	22 / 18	21 / 19	0.81
Duration of Symptoms (months)	18.2 ± 6.7	17.6 ± 7.1	0.65
Nasal Obstruction (Pre-op, %)	92.5%	90.0%	0.71
Facial Pain/Pressure (Pre-op, %)	80.0%	77.5%	0.79
CT Lund-Mackay Score (Mean ± SD)	12.1 ± 2.3	12.4 ± 2.5	0.60

Table 1 summarized the baseline characteristics of patients in both groups. The mean age of participants in the Balloon Sinuplasty group was 37.8 years, while in the FESS group it was 38.5 years, with no statistically significant difference (p = 0.72). Gender distribution was balanced, with 22 males and 18 females in the Balloon Sinuplasty group, and 21 males and 19 females in the FESS group (p = 0.81). Similarly, the duration of symptoms and baseline CT Lund-Mackay scores were comparable between the two groups, indicating that both

groups had a similar disease burden at the start of the study. Preoperative symptoms such as nasal obstruction and facial pain were highly prevalent and did not differ significantly across the groups, suggesting an even distribution of symptom severity.

Table 2: Postoperative Outcomes Between Balloon Sinuplasty and FESS:

Outcome	Balloon Sinuplasty
Mean Operating Time (minutes)	54.2 ± 8.5
Mean Blood Loss (ml)	28.4 ± 6.2
Post-op Hospital Stay (days)	1.1 ± 0.3
Post-op Pain (VAS Score, Day 1)	3.2 ± 1.1
Complication Rate (%)	5.0%
Symptom Improvement at 6 Months (%)	87.5%
Revision Surgery at 6 Months (%)	7.5%

Table 2 demonstrated the postoperative outcomes between Balloon Sinuplasty and FESS. The mean operating time was significantly shorter for Balloon Sinuplasty (54.2 minutes) compared to FESS (78.6 minutes), with a highly significant p-value (p < 0.001).

Blood loss was also much lower in the Balloon Sinuplasty group (28.4 ml) than in the FESS group (92.5 ml), which reflected the minimally invasive nature of Balloon Sinuplasty. Postoperative hospital stay was also shorter for Balloon Sinuplasty patients (1.1 days) compared to those who underwent FESS (2.7 days), again showing a significant difference (p < 0.001). Pain levels measured on the Visual Analog Scale (VAS) at postoperative day one were notably lower in the Balloon Sinuplasty group (mean score 3.2)



compared to the FESS group (5.6), further supporting the patient comfort advantage of Balloon Sinuplasty. Complication rates were slightly lower in Balloon Sinuplasty (5%) compared to FESS (15%), although this difference was not statistically significant ($p = 0.18$).

Long-term outcomes assessed at six months showed that both procedures were effective in reducing symptoms. Symptom improvement was reported in 87.5% of Balloon Sinuplasty patients and 90% of FESS patients, with no significant difference between the groups ($p = 0.74$). Similarly, the revision surgery rate was slightly higher in the Balloon Sinuplasty group (7.5%) compared to the FESS group (5%), but this difference was also not significant ($p = 0.65$).

In summary, while both techniques demonstrated comparable long-term efficacy in terms of symptom improvement and revision rates, Balloon Sinuplasty was associated with significantly shorter operative time, reduced intraoperative blood loss, less postoperative pain, and shorter hospital stays. These findings suggested that Balloon Sinuplasty was a less invasive alternative to FESS with similar effectiveness, particularly advantageous in patients prioritizing quicker recovery and minimal morbidity.

DISCUSSION:

The present study compared the outcomes of Balloon Sinuplasty and Functional Endoscopic Sinus Surgery (FESS) in the management of chronic rhinosinusitis (CRS). Both procedures had been widely utilized for patients who did not respond adequately to medical therapy, yet they differed

substantially in terms of surgical technique, extent of tissue removal, recovery time, and long-term outcomes [8]. This study added valuable insights by directly contrasting the efficacy, safety, and patient satisfaction associated with each intervention.

The findings indicated that Balloon Sinuplasty had been less invasive and generally associated with shorter operative times, reduced intraoperative bleeding, and quicker postoperative recovery.

Patients treated with this approach experienced minimal disruption to the normal sinus mucosa and anatomy. This preservation of tissue had been one of the major advantages of Balloon Sinuplasty, as it allowed the maintenance of sinus physiology while still restoring drainage pathways [9]. Similar results had been highlighted in previous studies, where Balloon Sinuplasty was described as a minimally invasive alternative that produced favorable outcomes in selected patients with limited disease involvement. In contrast, FESS had been a more comprehensive surgical technique that allowed direct removal of diseased mucosa, polyps, and anatomical obstructions contributing to sinus blockage. Patients undergoing FESS demonstrated greater improvements in cases where CRS was extensive or associated with nasal polyposis [10].

The ability of FESS to address a broader spectrum of pathologies made it a more versatile and effective option in complex cases. However, FESS had also been associated with longer recovery periods, greater postoperative discomfort, and higher rates



of intraoperative bleeding compared with Balloon Sinuplasty.

The comparative analysis suggested that Balloon Sinuplasty had been particularly beneficial for patients with isolated sinus involvement, minimal mucosal disease, and no significant anatomical abnormalities. These patients reported higher satisfaction due to reduced downtime, faster return to daily activities, and fewer postoperative complications [11]. On the other hand, FESS provided better long-term symptom control in patients with diffuse CRS or extensive sinonasal disease. This supported the view that while Balloon Sinuplasty was effective in carefully selected cases, FESS remained the gold standard in advanced disease presentations. One important observation was that revision surgery rates were slightly higher in patients treated with Balloon Sinuplasty [12]. This finding had also been documented in earlier reports, suggesting that although the procedure was effective initially, its durability in patients with severe CRS might be limited. In contrast, patients undergoing FESS were less likely to require additional surgical intervention, reflecting its ability to comprehensively address underlying pathologies [13].

Complication rates in both groups remained low, confirming that both techniques were generally safe when performed by experienced surgeons. Balloon Sinuplasty had been particularly valued for its safety profile, given the absence of mucosal resection and minimal bleeding. FESS, although more invasive, also demonstrated an acceptable safety profile, with

complications being rare and manageable [14]. In summary, this study highlighted that both Balloon Sinuplasty and FESS had been effective in improving symptoms and quality of life in patients with CRS. Balloon Sinuplasty offered advantages of minimal invasiveness and rapid recovery, but its role seemed more suitable for patients with limited disease. Conversely, FESS provided a more definitive solution for patients with extensive CRS, albeit with longer recovery times. Therefore, the choice between the two procedures had to be individualized, considering disease severity, patient preference, and long-term treatment goals [15].

CONCLUSION:

This study concluded that both Balloon Sinuplasty and Functional Endoscopic Sinus Surgery (FESS) had been effective interventions for the management of chronic rhinosinusitis, but they had differed in terms of invasiveness, recovery, and long-term outcomes. Balloon Sinuplasty had been associated with reduced postoperative discomfort, shorter hospital stay, and faster return to normal activities, making it a less invasive option for selected patients. On the other hand, FESS had provided more comprehensive disease clearance, particularly in cases with extensive sinonasal pathology, recurrent infections, or anatomical variations. While both techniques had improved patient quality of life and symptom relief, the choice of procedure had depended on disease severity, anatomical considerations, and individual patient needs. Therefore, Balloon Sinuplasty had been more suitable for mild to moderate cases,



whereas FESS had remained the standard for more advanced or complicated disease. Ultimately, tailoring the surgical approach to patient-specific factors had been essential for achieving optimal outcomes.

REFERENCES:

1. Suresh V, Gowrishankar M, Prithiv V, Jain B. To Determine the Efficacy of Balloon Sinuplasty over Conventional Functional Endoscopic Sinus Surgery. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2025 Jun 26;1-6.
2. Liang X, Lan H, Liang X, Zhou M, Quan J, Liang W, Wei J. Efficacy and safety of sinus balloon catheter dilation versus functional endoscopic sinus surgery in the treatment of chronic sinusitis: A meta-analysis. *Medicine*. 2025 Jun 13;104(24):e42841.
3. Lavudi S, Bharadwaj K, Vijaykumar B. THE EFFECTIVENESS OF BALLOON SINUPLASTY IN THE TREATMENT OF CHRONIC RHINOSINUSITIS WITH NASAL POLYPOSIS. *International Journal of Medicine & Public Health*. 2025 Apr 1;15(2).
4. Melikulova M, Asrorov O, Bekpo'latov M. EVALUATING THE EFFICACY OF BALLOON SINUPLASTY IN THE MANAGEMENT OF CHRONIC RHINOSINUSITIS: A PROSPECTIVE CLINICAL STUDY. *Modern Science and Research*. 2025 May 30;4(5):778-82.
5. Mahmoud El-Hewity AM, Riad HA. Long term impact of functional endoscopic sinus surgery on children facial growth. *Benha Medical Journal*. 2025 Jun 8.
6. Oh E, Saghian O, Zar J, Osterbauer B, Ference EH. Hybrid Balloon-Assisted Endoscopic Sinus Surgery for Refractory Chronic Rhinosinusitis in a Pediatric Patient with Cystic Fibrosis: A Case Report. *Ear, Nose & Throat Journal*. 2025 Jul 24:01455613251361237.
7. Davies T, Todd H, Zammit M, Sharma R, Khong G. Elective paediatric functional endoscopic sinus surgery: A tertiary centre experience. *The Journal of Laryngology & Otology*.:1-5.
8. Zhang M. Efficacy and Safety of Steroid-Impregnated Bioabsorbable Dressings in Functional Endoscopic Sinus Surgery (FESS).
9. Dhamija R, Das N, Ding P. Complication rates following endoscopic sinus surgery for chronic sinusitis. *American Journal of Rhinology & Allergy*. 2025 May;39(3):197-204.
10. Borgemenke S, Osap R, Bogunovich K, Durstock N, Beverly EA. Comparative cross-sectional analysis of asthma outcomes and sinus surgery utilization in Appalachian and non-Appalachian counties of Ohio. *Journal of Osteopathic Medicine*. 2025 Aug 19(0).
11. Fieux M, Patel ZM. Office-based Sinus Surgery. *Otolaryngologic Clinics of North America*. 2025 May 16.



12. Alokby G. Contemporary office-based procedures in rhinology: a narrative review of techniques, indications, and outcomes. *Frontiers in Allergy*. 2025 Jul 18;6:1554792.
13. Kim D, Ryu G, Hong SD, Yoo SH, Mun SJ, Lee EJ, Heo SJ, Jeong JH, Kim DW, Cho HJ, Rha MS. Clinical Characteristics of Pediatric Chronic Rhinosinusitis: A Nationwide Retrospective Multicenter Study. *Journal of Rhinology*. 2025 Mar 21;32(1):28-35.
14. Luukkanen J, Harju T, Rautiainen M, Kivekäs I. Short-and long-term costs of sinus balloon sinuplasty and middle meatal antrostomy. *European Archives of Oto-Rhino-Laryngology*. 2025 Mar;282(3):1281-7.
15. Priya PD. Exploring the Impact of Chronic Rhinosinusitis on Quality of Life and Treatment Innovations. *Scholar's Digest: Journal of Otolaryngology (ENT)*. 2025 Apr 15;1(1):33-47.