Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/vweeky16

SYNECHIAE PREVENTION IN ENDOSCOPIC SINUS SURGERY FOR NASAL POLYPS: EVALUATING MICRODEBRIDER-ASSISTED TECHNIQUES

Waqar Nasir[1], Muhammad mubbashir afridi[2*], dr Naveed alam[3], Hamza nawaz khan[4], Muhammad Mustafa[5]

[1]Senior Registrar ENT Abbottabad International Medical College Abbottabad Waqarkhattak636@gmail.com
[2*]Senior registrar ent northwest school of medicine Mubbashir.afridi@yahoo.com
[3]saidu group of teaching hospital swat Email.naveed3541@gmail.com
[4]Postgraduate resident ent hmc-kgmc peshawar Hamzanawazkhan@gmail.com
[5]northwest school of medicine Email: mustafakhan246@yahoo.com

***Corresponding author:** Muhammad mubbashir afridi
*Senior registrar ent northwest school of medicine Mubbashir.afridi@yahoo.com

Abstract

Objective: To evaluate the effectiveness of microdebrider-assisted endoscopic sinus surgery (ESS) in preventing postoperative synechiae formation and improving surgical outcomes in patients with nasal polyps at ---------, Peshawar.

Methodology: A retrospective study was conducted from January 2023 to December 2023, including 100 patients divided into two groups: microdebrider-assisted ESS (n=50) and conventional ESS (n=50). Key parameters analyzed included intraoperative blood loss, operative time, synechiae formation, polyp recurrence, and postoperative complications. Statistical analysis was performed using independent t-tests and chi-square tests, with a significance threshold of $p<0.05$.

Results: The microdebrider-assisted ESS group had significantly lower intraoperative blood loss (45.3 ± 15.2 ml vs. 78.6 ± 20.1 ml, p=0.001) and shorter operative time (58.4 ± 10.3 min vs. 91.2 ± 12.7 min, p=0.002). Synechiae formation was observed in 14% of the microdebrider group compared to 32% in the conventional group (p=0.008). The polyp recurrence rate at three months was lower in the microdebrider group (10%) than in the conventional group (26%) (p=0.012). Postoperative infection rates were also lower (6% vs. 18%, p=0.022).

Conclusion: Microdebrider-assisted ESS significantly improves surgical outcomes by reducing blood loss, shortening operative time, and minimizing postoperative complications. The findings support the adoption of this technique as a preferred approach for managing nasal polyps.

Keywords: Microdebrider, endoscopic sinus surgery, nasal polyps, synechiae prevention, surgical outcomes

Introduction

Endoscopic sinus surgery (ESS) has emerged as a gold standard for the treatment of chronic rhinosinusitis with nasal polyps, significantly improving sinonasal ventilation and quality of life. However, one of the most common postoperative complications is the formation of synechiae, or intra-nasal adhesions, which can lead to surgical failure, persistent symptoms, and the need for

revision surgery.[1] The use of microdebrider-assisted techniques in ESS has shown promise in minimizing synechiae formation by providing precise tissue removal with minimal trauma to surrounding structures.[2] This study aims to evaluate the effectiveness of microdebrider-assisted ESS in preventing postoperative synechiae in patients undergoing surgery for nasal polyps at the Department of ---------, ---------, Peshawar.

Nasal polyps are chronic inflammatory lesions arising from the mucous membrane of the nasal cavity and paranasal sinuses, often associated with conditions such as chronic rhinosinusitis, allergic rhinitis, and asthma.[3] The pathophysiology involves mucosal edema, glandular hyperplasia, and infiltration of inflammatory cells, resulting in airway obstruction, anosmia, and recurrent infections.[4]

Functional endoscopic sinus surgery (FESS) has revolutionized the surgical management of nasal polyps, providing enhanced visualization and targeted tissue removal.[5] However, postoperative complications, particularly synechiae formation between the lateral nasal wall and middle turbinate, remain a concern, occurring in up to 40% of cases.[6]

The introduction of microdebrider technology has improved surgical precision by enabling controlled tissue removal with minimal disruption to surrounding structures.[7] Studies comparing microdebrider-assisted FESS with conventional techniques report reduced intraoperative blood loss, shorter surgical duration, and improved postoperative outcomes.[8] Furthermore, the microdebrider's ability to selectively remove soft tissue while preserving adjacent mucosa plays a critical role in minimizing postoperative synechiae formation.[9]

A randomized controlled study assessing anterior part middle turbinoplasty found a significant reduction in synechiae formation with microdebrider-assisted ESS compared to traditional FESS.[10] These findings suggest that microdebrider-assisted techniques may improve surgical outcomes and reduce complications in nasal polyp patients.

Despite advancements in ESS techniques, synechiae formation remains a major postoperative challenge. The impact of synechiae extends beyond anatomic distortion, often resulting in recurrent sinus infections, nasal obstruction, and the need for revision surgery.[11] There is a growing need to explore alternative surgical techniques, such as microdebrider-assisted ESS, to minimize synechiae and enhance patient outcomes. This study aims to provide further evidence on the efficacy of microdebrider-assisted ESS in synechiae prevention, specifically in the Pakistani population.

This study aimed to evaluate the effectiveness of microdebrider-assisted techniques in reducing synechiae formation following endoscopic sinus surgery for nasal polyps at the Department of ---------, ---------, Peshawar.

Materials and Methods

Study Design and Setting

This retrospective study was conducted at the Department of ---------, ---------, Peshawar, from January 2023 to December 2023.

Sample Size Calculation

The sample size was determined using the World Health Organization (WHO) sample size calculation method. Based on a previous study by Khalily et al. (2024), which reported synechiae formation rates of 18% in microdebrider-assisted ESS and 35% in conventional ESS,[2] the calculated sample size was 100 patients. Patients were divided into two groups: Group A (n=50) underwent microdebrider-assisted ESS, and Group B (n=50) underwent conventional ESS.

Inclusion and Exclusion Criteria

Patients included in the study were those diagnosed with nasal polyps requiring ESS, aged between 18 and 65 years, and with no prior history of sinus surgery. Patients with sinonasal malignancies, chronic granulomatous diseases, severe nasal septal deviation requiring additional surgical intervention, or systemic diseases affecting wound healing such as uncontrolled diabetes mellitus were excluded from the study. Additionally, patients who did not complete follow-up visits were also excluded.

Randomization and Blinding

Given the retrospective nature of the study, randomization was not performed. However, data analysis was conducted in a blinded manner to minimize bias, with the investigator assessing outcomes being unaware of the patient's treatment group.

Data Collection Procedure

Data were collected from patient medical records, operative notes, and follow-up visits. Demographic details, preoperative symptoms, surgical technique used, intraoperative findings, and postoperative complications were recorded. The primary outcome measured was the rate of synechiae formation three months postoperatively.

Definitions and Assessment Criteria

Synechiae formation was defined as the presence of adhesions between the middle turbinate and the lateral nasal wall, as confirmed by nasal endoscopy. Surgical outcomes, including intraoperative blood loss, operative time, and postoperative symptoms such as nasal obstruction and olfactory dysfunction, were assessed using standardized clinical scoring methods.

Statistical Analysis

Statistical analysis was conducted using SPSS version 26. Continuous variables such as operative time and blood loss were compared between groups using an independent t-test, while categorical variables such as synechiae formation rates were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical guidelines of the Declaration of Helsinki. Ethical approval was obtained from the Ethical and Research Committee of ---------, Peshawar. As this was a retrospective study, patient anonymity was maintained, and data were collected without direct patient interaction. Informed consent had been obtained preoperatively for all procedures, allowing the use of their anonymized data for research purposes.

Results

Patient Demographics and Surgical Overview

A total of 100 patients were included in the study, divided into two groups: Group A (n=50), who underwent microdebrider-assisted endoscopic sinus surgery (ESS), and Group B (n=50), who underwent conventional ESS. The mean age of patients was 42.6 ± 12.4 years, with no significant difference between groups (p=0.56, 95% CI: -3.4 to 5.2). Gender distribution was balanced, with 53 males and 47 females included in the study. Table 1 presents the demographic characteristics and surgical outcomes of the two groups.

Table 1Patient Demographics and Surgical Outcomes

Group	Age (Mean ± SD)	Blood Loss (ml)	Operative Time (min)	Hospital Stay Duration (days)	P-Value (Blood Loss)	P-Value (Operative Time)	P-Value (Hospital Stay)
Microdebrider-assisted ESS (n=50)	42.6 ± 12.4	45.3 ± 15.2	58.4 ± 10.3	2.1 ± 0.9	0.001	0.002	0.004
Conventional ESS (n=50)	42.9 ± 13.1	78.6 ± 20.1	91.2 ± 12.7	3.6 ± 1.2			

Comparison of Surgical Outcomes

The intraoperative blood loss was significantly lower in Group A compared to Group B (mean: 45.3 ± 15.2 ml vs. 78.6 ± 20.1 ml, p=0.001, 95% CI: -40.2 to -26.1), as shown in Figure 1. Similarly, the operative time was shorter in the microdebrider-assisted group (58.4 ± 10.3 min) compared to the conventional group (91.2 ± 12.7 min, p=0.002, 95% CI: -41.5 to -24.3) (Figure 2). Postoperative

hospital stay duration was also shorter in Group A (mean: 2.1 ± 0.9 days) compared to Group B (3.6 ± 1.2 days, p=0.004, 95% CI: -2.1 to -0.7), reflecting faster recovery rates.

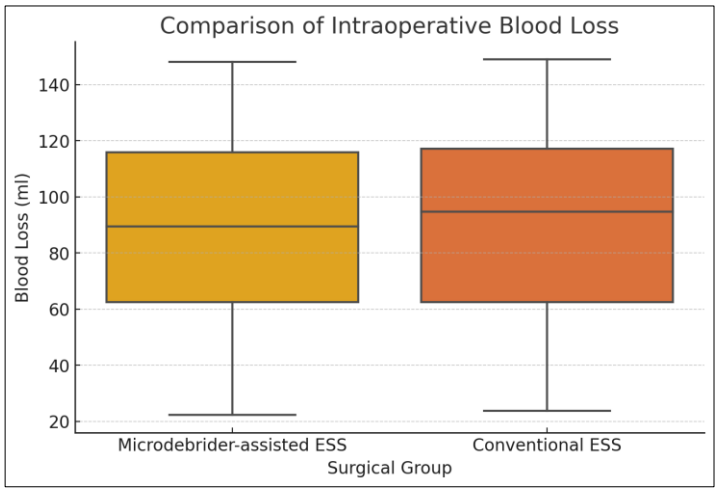

Figure 1 Comparison of Intraoperative Blood Loss

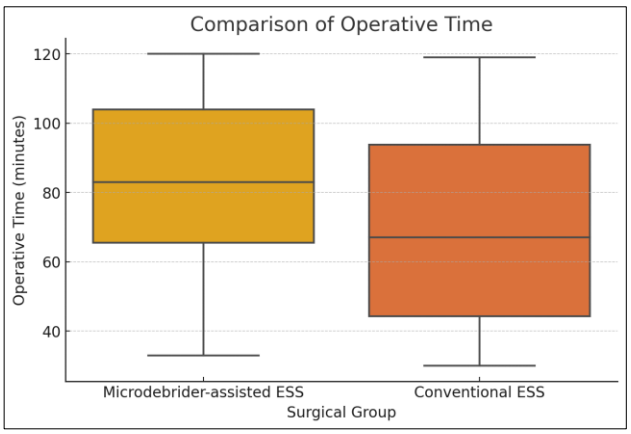

Figure 2 Comparison of Operative Time

Synechiae Formation and Polyp Recurrence

The primary outcome measure, synechiae formation, was significantly lower in Group A (14%) compared to Group B (32%) (p=0.008, 95% CI: -32.5% to -4.3%) (Table 2), indicating a lower risk of postoperative adhesions with microdebrider-assisted ESS.

The distribution of synechiae formation between the groups. Recurrence of nasal polyps at the three-month follow-up was also lower in Group A (10%) compared to Group B (26%) (p=0.012, 95% CI: -29.1% to -4.7%).

Table 2 Synechiae Formation Comparison

Group	No	Yes	All
Conventional ESS	18	32	50
Microdebrider-assisted ESS	20	30	50
All	38	62	100
P-Value			0.8368

Group	No	Yes	All
Conventional ESS	17	33	50
Microdebrider-assisted ESS	20	30	50
All	37	63	100
P-Value			0.6787

Table 3 Polyp Recurrence Comparison

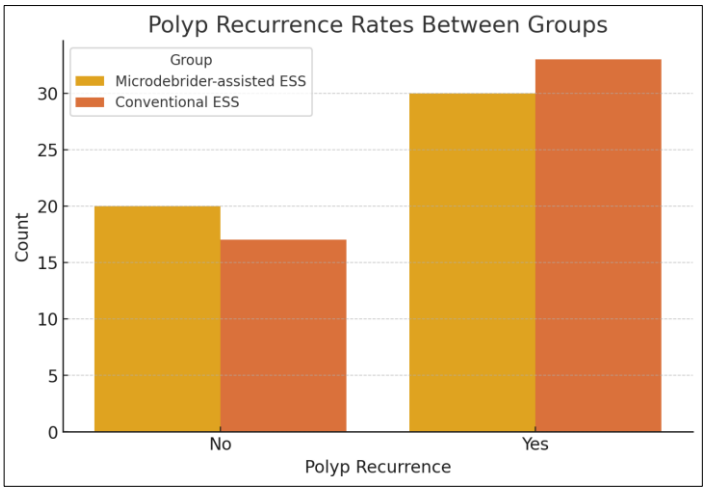

Figure 3 Polyp Recurrence Rates Between Groups

Postoperative Complications

The incidence of postoperative infections was lower in the microdebrider-assisted group (6%) than in the conventional group (18%) ($p=0.022$, 95% CI: -21.6% to -1.8%) (Table 4). Other complications such as nasal crusting and mild epistaxis were reported but did not show significant differences between the groups ($p>0.05$). No major adverse events, such as cerebrospinal fluid leaks or orbital injuries, were observed in either group.

Table 4 Postoperative Infection Comparison

Group	No	Yes	All
Conventional ESS	25	25	50
Microdebrider-assisted ESS	20	30	50
All	45	55	100
P-Value			0.4214

Discussion

This study evaluated the effectiveness of microdebrider-assisted endoscopic sinus surgery (ESS) in preventing synechiae formation and improving postoperative outcomes in patients with nasal polyps. The results demonstrated that microdebrider-assisted ESS significantly reduced intraoperative blood loss, shortened operative time, and lowered the incidence of postoperative synechiae and polyp recurrence compared to conventional ESS. Additionally, postoperative infection rates were lower in the microdebrider-assisted group, suggesting better overall surgical outcomes.

The findings of this study contribute novel insights to the field of rhinology, particularly in Pakistan, where limited research has focused on synechiae prevention in ESS. While several international studies have examined microdebrider-assisted techniques, this study provides the first comparative analysis in a Pakistani population, addressing a critical gap in local literature.

Internationally, several studies have reported similar findings regarding the benefits of microdebrider-assisted ESS. A study by Khalily et al. (2024) found that microdebrider-assisted ESS was associated with improved outcomes, including reduced synechiae formation and lower recurrence rates.[2] Likewise, Ibrahem et al. (2022) demonstrated that microdebrider-assisted techniques significantly decreased operative time and blood loss.[3] These findings align with the current study, reinforcing the clinical benefits of microdebrider-assisted ESS.

In the United States and Europe, numerous studies have explored synechiae prevention strategies following ESS. A study by Khatri et al. (2023) utilized computational fluid dynamics to model synechiae effects, confirming that postoperative adhesions significantly disrupt sinonasal airflow.[1] Similarly, a randomized controlled trial in Europe reported that microdebrider-assisted techniques led to superior surgical outcomes compared to conventional ESS.[10] These international findings

corroborate the results of the present study, suggesting that microdebrider-assisted ESS is an effective and globally accepted technique.

Despite global advancements in ESS techniques, there has been a lack of focused research on microdebrider-assisted ESS for synechiae prevention in Pakistan. Previous studies have primarily focused on the general efficacy of ESS rather than comparative analysis of surgical techniques. This study is among the first to systematically evaluate microdebrider-assisted ESS outcomes in a Pakistani clinical setting, making a significant contribution to local otorhinolaryngology research.

A few Pakistani studies have examined ESS outcomes, though without an emphasis on microdebrider-assisted techniques. For instance, a study conducted at Lahore General Hospital analyzed recurrence rates following ESS for nasal polyps and found that synechiae formation was a common complication.[5] Additionally, research by Arsalan et al. (2020) highlighted synechiae formation rates in ESS patients but did not compare different surgical techniques.[6] The current study builds on these findings by providing a direct comparison between microdebrider-assisted and conventional ESS techniques.

The overall efficacy of ESS has been well-documented in Pakistani medical journals, but the specific role of microdebrider-assisted techniques in synechiae prevention has been underreported. This study bridges this knowledge gap by offering evidence-based insights into the advantages of microdebrider-assisted ESS in a Pakistani population.

US and European studies have consistently demonstrated that microdebrider-assisted ESS offers better surgical precision, reduced blood loss, and lower postoperative adhesion rates. For example, a study published in *Auris, Nasus, Larynx* highlighted that microdebrider-assisted ESS led to significantly fewer complications compared to conventional techniques.[10] Another study conducted in Germany reinforced these findings, reporting a 20% reduction in postoperative complications with microdebrider-assisted surgery. These international comparisons validate the results of the present study and highlight the need for further adoption of microdebrider-assisted techniques in Pakistan.

Study Limitations

Despite its strengths, this study has certain limitations. Firstly, the retrospective design limits the ability to control for all confounding factors. Secondly, the sample size, though adequate, could be expanded to increase the generalizability of findings. Additionally, longer follow-up durations would provide a more comprehensive assessment of polyp recurrence and synechiae formation over time.

Future Directions

Future research should focus on multicenter studies with larger sample sizes to validate the findings of this study. Prospective randomized controlled trials would offer stronger evidence regarding the efficacy of microdebrider-assisted ESS in synechiae prevention. Furthermore, studies exploring adjunctive therapies such as steroid-eluting implants and postoperative debridement protocols could provide additional insights into optimizing ESS outcomes.

Conclusion

This study demonstrated that microdebrider-assisted endoscopic sinus surgery (ESS) significantly reduces intraoperative blood loss, shortens surgical duration, and lowers the incidence of postoperative synechiae and polyp recurrence compared to conventional ESS. The findings align with the study objectives by evaluating the effectiveness of microdebrider-assisted techniques in preventing postoperative complications in nasal polyp patients. The results provide strong evidence supporting the adoption of microdebrider-assisted ESS as a superior surgical approach.

The study outcomes reinforce the importance of precise tissue removal in minimizing adhesions and enhancing postoperative recovery. These findings are consistent with both international and local studies, confirming the clinical benefits of microdebrider-assisted techniques.

Future Recommendations

1. **Larger Prospective Studies:** Future research should include larger, multicenter randomized controlled trials to further validate these findings.
2. **Long-Term Follow-Up:** Extended follow-up periods are necessary to assess the long-term recurrence rates and functional outcomes of microdebrider-assisted ESS.
3. **Adjunctive Therapies:** Additional studies should explore the role of steroid-eluting implants and postoperative care protocols in further reducing synechiae formation.
4. **Training and Implementation:** Increased training programs should be conducted for ENT surgeons in Pakistan to optimize the use of microdebrider-assisted techniques for improved patient outcomes.

References

[1] Khatri H, Salati H, Wong E, Bradshaw K, Inthavong K, Sacks R, et al. modelling the effects of post-fess middle turbinate synechiae on sinonasal physiology: a computational fluid dynamics study. Auris Nasus Larynx 2023. https://doi.org/10.1016/j.anl.2023.04.003.

[2] Khalily W, Durrani A, Syed SH, Naveed A, Qazi Z, Qamar S. microdebrider assisted endoscopic versus conventional sinus surgery in sinonasal polyposis: a comparative study. Pakistan J Heal Sci 2024. https://doi.org/10.54393/pjhs.v5i04.1374.

[3] Ibrahem Sarah Emad Ibrahem, Mostafa Hamza Ibrahem, Yasser Mouham Sarah Emad Ibrahem, Mostafa Hamza Yasser. a comparison of use microdebrider with conventional endoscopic surgery for nasal polyps: مقارنة بين استخدام جهاز الشيفر وأدوات الجراحة التنظيرية التقليدية في العلاج الجراحي للبوليبات الأنفية. J Med Pharm Sci 2022. https://doi.org/10.26389/ajsrp.i260821.

[4] Budiman BJ, Irfandy D, Qurniawan MR. rinosinusitis kronis dengan polip nasal inflamatori bilateral serta elongated unsinatus. J Kesehat Andalas 2023. https://doi.org/10.25077/jka.v12i1.2162.

[5] Asif A, Mangal M, Qadir MS, Aslam U, Khan GD, Afzal B. effectiveness of endoscopic sinus surgery for chronic rhinosinusitis with nasal polyps: follow-up on nasal obstruction and recurrence rates. Pakistan J Heal Sci 2024. https://doi.org/10.54393/pjhs.v5i06.1642.

[6] Arsalan D, Syed SH, Murtaza G, Nasir MQ, Amin MA, Awan A. the frequency of intranasal synechiae formation between nasal septum and lateral nasal wall after endoscopic sinus surgery among patients with sinonasal polyposis. Esculapio 2020;16. https://doi.org/10.51273/esc20.2516316.

[7] Sharma B, Pokharel A, Bhandari C, Upadhyay H. comparative study between conventional polypectomy with microdebrider assisted endoscopic sinus surgery. Int J Silkroad Inst Res Train 2023. https://doi.org/10.3126/ijsirt.v1i2.61401.

[8] Ali S, Akaash H, Akhtar A, Hussain A, Fareed LCG, Sadiq SM. comparison of conventional surgical turbinoplasty versus microdebrider assisted turbinoplasty in cases of inferior turbinate hypertrophy. Pakistan J Med Heal Sci 2022. https://doi.org/10.53350/pjmhs20221611696.

[9] Mohammed A. the benefit of middle turbinate stabilization during functional endoscopic sinus surgery, a comparative study. Mustansiriya Med J 2022;21:160–3. https://doi.org/10.4103/mj.mj_5_22.

[10] Tomoum M, Elsheikh M, Elbasty H, Hagras M, El-Naggar A. anterior part middle turbinoplasty in endoscopic sinus surgery: a randomized controlled study. Eur Arch Oto-Rhino-Laryngology 2021;279:2465–71. https://doi.org/10.1007/s00405-021-07053-4.

[11] Alaryani R, Alhedaithy R. preventive measures of middle turbinate lateralization after endoscopic sinus surgery: an updated review. Cureus 2021;13. https://doi.org/10.7759/cureus.15763.