

A comparative study of microdebrider and conventional instruments for nasal polypsis surgery

Nazal polipozis cerrahisinde mikrobebrider ve konvansiyonel aletlerin karşılaştırmalı analizi

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ABSTRACT

Aim: To evaluate the effects of conventional instruments and microdebrider use on surgical outcomes, complication rates, and quality of life following surgery for chronic rhinosinusitis with nasal polyps.

Methods: The clinical data of 72 patients with chronic rhinosinusitis with nasal polyps who underwent functional endoscopic sinus surgery were analysed retrospectively and allocated into two groups based on the instrument used in surgery: Punch Group (n = 39) and Microdebrider Group (n = 33). Preoperative and postoperative mucociliary clearance, olfactory function, synechia formation, and quality of life scores as measured by the Sino-Nasal Outcome Test-22 were assessed as outcome measures.

Results: The Microdebrider group exhibited significantly improved mucociliary clearance and lower synechia incidence compared to the Punch group postoperatively (p < 0.001, p = 0.046, respectively). However, analysis revealed no significant differences between the groups in olfactory function and overall total scores of Sino-Nasal Outcome Test-22, except for improvement in the rhinological subdomain in the Microdebrider Group (p = 0.047).

Conclusion: Microdebrider-assisted functional endoscopic sinus surgery may offer advantages in preserving mucociliary function and reducing synechia formation. However, similar results observed in subjective patient experience and quality of life scores suggest that while the microdebrider is a useful instrument for the surgeon, it is not an indispensable requirement in every case. This highlights the need to consider factors such as patient profile, the surgeon's experience, and cost when selecting the surgical method.

Keywords: Nasal polyps; quality of life; sinusitis; treatment outcome

ÖZ

Amaç: Nazal polipli kronik rinosinüzit cerrahisi sonrasında konvansiyonel aletlerin ve mikrobebrider kullanımının cerrahi sonuçları, komplikasyon oranları ve yaşam kalitesi üzerindeki etkilerini değerlendirmek.

Yöntemler: Fonksiyonel endoskopik sinüs cerrahisi uygulanan nazal polipli kronik rinosinüziti olan 72 hastanın klinik verileri retrospektif olarak analiz edildi ve cerrahide kullanılan alete göre iki gruba ayrıldı: Punch Grubu (n = 39) ve Mikrobebrider Grubu (n = 33). Preoperatif ve postoperatif mukosiliyer klirens, koku fonksiyonu, sineşi oluşumu ve Sino-Nasal Outcome Test-22 ile ölçülen yaşam kalitesi skorları sonuç ölçütleri olarak kullanıldı.

Bulgular: Mikrobebrider grubu, postoperatif dönemde Punch grubuna kıyasla anlamlı derecede daha iyi mukosiliyer klirens ve daha düşük sineşi insidansı gösterdi (sırasıyla p < 0.001, p = 0.046). Ancak, analiz sonuçları iki grup arasında koku fonksiyonu ve toplam Sino-Nasal Outcome Test-22 skorları açısından anlamlı bir fark ortaya koymadı; yalnızca Mikrobebrider Grubu'nda rinolojik alt boyutta iyileşme anlamlı bulundu (p = 0.047).

Sonuç: Mikrobebrider destekli fonksiyonel endoskopik sinüs cerrahisi, mukosiliyer fonksiyonun korunması ve sineşi oluşumunun azaltılması açısından avantajlar sağlayabilir. Ancak, subjektif hasta deneyimi ve yaşam kalitesi skorlarında gözlenen benzer sonuçlar, mikrobebriderin cerrah için yararlı bir araç olmakla birlikte her vakada vazgeçilmez bir gereklilik olmadığını düşündürmektedir. Bu durum, cerrahi yöntem seçilirken hasta profili, cerrahın deneyimi ve maliyet gibi faktörlerin dikkate alınması gerektiğini vurgulamaktadır.

Anahtar Sözcükler: Nazal polipler; sinüzit; tedavi sonucu; yaşam kalitesi

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Received/Geliş : 10.12.2025

Accepted/Kabul: 30.05.2026

Publication Date/Yayınlanma Tarihi: 29.09.2026

Acknowledgements: None.

Author Contributions: Concept: TT and KGT, Design: TT and KGT, Supervision: TT and KGT, Materials: TT and KGT, Data collection and/or processing: TT and KGT, Analysis and/or interpretation: TT and KGT, Literature search: TT and KGT, Writing: TT and KGT, Critical review: TT and KGT. All authors have read and approved the published version of the manuscript.

Ethics Committee Approval: The ethical approval was granted by the Health Sciences Non-Interventional Research Ethics Committee of Balıkesir University (Decision no: 2024/191, date: 19.11.2024).

Informed Consent statement: Written informed consent was obtained from all participants for the use of their clinical data in this study.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Financial Disclosure: The authors received no financial support for the research.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Artificial Intelligence Statement: No artificial intelligence tools were used in the preparation of this manuscript.

Cite as: Tulacı T, Tulacı KG. A comparative study of microdebrider and conventional instruments for nasal polypsis surgery. Anatol Clin. 2026;31(3):370-377.



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INTRODUCTION

Chronic rhinosinusitis (CRS) is persistent inflammation of the paranasal sinuses and nasal mucosa lasting for at least 12 weeks (1). CRS is clinically categorized into two major subtypes: CRS with nasal polyps (CRSwNP) and CRS without nasal polyps. In cases of CRSwNP where symptoms cannot be adequately controlled despite prolonged and appropriate medical therapy, functional endoscopic sinus surgery (FESS) is considered the most effective treatment modality (2).

The goal of FESS is to remove pathological tissues and restore the physiological functions of the nose and the sinuses while preserving healthy mucosa without causing complications. This surgery can be performed using conventional instruments, as described by Stammberger and Messerklinger, or with the assistance of a microdebrider, as developed by Setliff and Parsons (3, 4). While the microdebrider offers advantages such as shorter operative time, precise tissue excision, and a relatively bloodless surgical field, conventional instruments are often preferred due to their ease of use, reliability, and widespread familiarity among surgeons. Nevertheless, current literature comparing the outcomes of both techniques has not demonstrated a decisive benefit of one technique over the other, and a consensus has yet to be established.

This study aims to assess and compare the impact of conventional instruments versus microdebrider use on surgical outcomes, complication rates, and patient-reported quality of life (QoL) in the treatment of CRSwNP.

MATERIALS AND METHOD

The study was conducted in accordance with the principles of the Declaration of Helsinki, and ethical approval was granted by the Health Sciences Non-Interventional Research Ethics Committee of Balikesir University (Decision no: 2024/191, date: 19/11/2024). The research was carried out retrospectively at a tertiary referral center. The demographic and clinical information of the patients was retrieved from their medical records. Consent for the use and analysis of medical data had been obtained from all patients included in the study.

The study included patients aged 19–65 who had been diagnosed with CRSwNP, did not respond to medical treatment, and underwent FESS surgery between 2018 and 2023. Exclusion criteria included a history of previous

nasal or paranasal sinus surgery, fungal sinusitis, immunosuppressive therapy, primary ciliary dyskinesia or cystic fibrosis, sinonasal tumors, Samter's triad, loss to follow-up, incomplete medical records, or cases in which comprehensive sinus surgery involving all paranasal sinuses was not performed.

Preoperative and early postoperative mucociliary clearance, olfactory function, synechiae formation, and quality-of-life scores measured using the Sino-Nasal Outcome Test-22 were evaluated as outcome measures.

Conventional cold steel instruments were used between 2018 and 2020, prior to the availability of a microdebrider at our institution. Following its acquisition, procedures performed between 2020 and 2023 were preferentially carried out using the microdebrider when the device was available. Accordingly, patients were grouped primarily based on the time period of surgery, with instrument selection determined by device availability rather than patient characteristics. Patients were classified into two groups according to the surgical instruments used during FESS: the Punch Group, consisting of patients treated with conventional cold steel instruments, and the Microdebrider Group, consisting of patients who underwent surgery using a microdebrider.

CRSwNP was diagnosed based on the criteria outlined in the 2012 European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2012)(5). All procedures were performed by a single surgeon experienced in FESS.

All patients received both systemic and topical corticosteroid therapy prior to surgery. Methylprednisolone as systemic steroid treatment was started at 1 mg/kg/day dose and reduced by 10 mg on alternate days with the total duration varying according to patient body weight and not exceeding 14 days. As topical therapy, 55 µg of fluticasone furoate was administered once daily into each nasal cavity (total daily dose: 110 µg).

All surgical procedures were performed under endotracheal general anesthesia using a standardized cold steel functional endoscopic sinus surgery (FESS) technique in both groups. In the Punch Group, conventional cold steel instruments including Blakesley forceps, through-cutting forceps, and curettes were used for polyp removal and sinus ostium enlargement. In the Microdebrider Group, tissue removal was performed using a powered microdebrider system with straight and angled blades, operated in oscillation mode at 5000 rpm. To ensure surgical com-

parability between groups, all patients underwent a standardized comprehensive sinus surgery protocol, including complete anterior and posterior ethmoidectomy, maxillary antrostomy, sphenoidotomy, and frontal sinusotomy. The extent of surgery was determined preoperatively based on radiological findings and was applied uniformly regardless of the surgical instrument used. No nasal packing was applied in any case. The hospital stay lasted one day postoperatively for all patients. Upon discharge, a standardized postoperative treatment protocol was prescribed to all patients, including antibiotics and analgesic-anti-inflammatory medications.

For nasal cavity care, nasal irrigation with normal saline solution (0.9% NaCl) was recommended, using plastic squeeze bottles designed for nasal rinsing (240 mL). A video demonstration of the nasal irrigation technique was provided to the patients to ensure proper technique. Nasal irrigation was advised four times daily for one month.

Evaluation of disease

Preoperative computed tomography (CT) scans of all patients were assessed, and radiological severity was determined according to the Lund-Mackay (LM) scoring system (6). In this system, six regions (ostiomeatal complex, sphenoid, maxillary, anterior and posterior ethmoid, and frontal sinuses) on both sides were examined and scored based on the degree of opacification: 0 (none), 1 (partial), or 2 (complete) (7).

A detailed nasal examination was performed on all cases, including diagnostic endoscopic evaluation. Nasal polyps were graded using the Mackay and Lund endoscopic scoring system (8). According to this classification:

Stage I: Polyps extend to the level of the middle meatus.

Stage II: Polyps extend beyond the middle concha but do not reach the floor of the nasal passage.

Stage III: Polyps fill the entire nasal passage (8).

Additionally, formation of synechiae was recorded during postoperative follow-up through endoscopic examination and classified according to a standard synechia scoring system (9).

Assessment of QoL

The QoL of the patients was evaluated using SNOT-22, a reliable questionnaire with established validity in the local language (2, 10, 11). The scale consists of 22 questions scored on a 0–5 scale, where higher values indicate

more severe symptoms, yielding a total possible score of 110 (12). Higher scores indicate a greater deterioration in QoL (13). Additionally, the five subdomains of the questionnaire (rhinological, extranasal rhinological, ear/facial, psychological, and sleep) were analyzed separately. The SNOT-22 was administered to all patients preoperatively and at 1 month postoperatively.

Assessment of olfactory function

Olfactory function was evaluated in the preoperative and postoperative periods through a visual analog scale (VAS). Participants provided a self-assessment of their olfactory ability on a 0–10 scale, where 0 represented an absence of smell and 10 reflected normal olfactory function. The evaluation was conducted during routine follow-up visits both preoperatively and at 1 month postoperatively. During the assessment, patients were instructed to consider their average olfactory ability in daily life when providing their score.

Mucociliary function assessment

Mucociliary function was evaluated using the saccharin test both preoperatively and postoperatively. During the test, patients were seated in an upright position, and the environment was prepared to ensure that the physiological conditions of the nasal mucosa were maintained. A saccharin crystal of about 1 mm was applied to a site situated nearly 1 cm posterior to the leading edge of the inferior turbinate. Patients were instructed not to swallow the particle and to restrict tongue and palate movements. Time to sweet taste detection was recorded in minutes and considered the mucociliary clearance time.

Statistical analysis

Data analysis was performed using the SPSS software package (Windows version 30.0, SPSS Inc., Chicago, IL). Descriptive statistics were reported as mean $\pm$ standard deviation, as well as frequency and percentage values. The distribution of the variables was examined for normality by applying the Kolmogorov-Smirnov test. The dataset obtained from the study was evaluated using the independent-samples t-test (Student's t-test) for continuous variables, provided the assumptions of parametric tests were met. If parametric assumptions were not met, the Mann-Whitney U test was used for the analysis of continuous variables. Categorical variables were evaluated using the

Chi-square test, Yates' continuity correction Chi-square test, and Fisher's Exact test. A significance level of $p < 0.05$ was considered statistically significant.

Post-hoc power analysis was performed based on the effect sizes observed in our dataset. The postoperative mucociliary clearance and Δ MCC outcomes demonstrated large effect sizes (Cohen's $d = 0.82$ and $d = 0.69$, respectively), corresponding to achieved power values greater than 90% at $\alpha = 0.05$. Additionally, the distribution of synechia scores showed a medium chi-square effect size ($w = 0.33$), yielding an achieved power of approximately 75–80%. These findings indicate that the sample size of 72 patients provided sufficient statistical power for detecting clinically meaningful differences in the study's outcomes.

To reduce potential selection bias inherent to the retrospective design, baseline demographic and clinical characteristics were compared between the two groups to assess group comparability prior to outcome analyses (Table 1).

RESULTS

Initially, 111 patients were enrolled in the study. However, 39 patients were excluded due to incomplete medical data and non-compliance with postoperative treatment and follow-up.

The Punch group consisted of 39 patients, while the Microdebrider group included 33. Demographic and clinical variables were comparable between the two groups, with no significant differences detected (Table 1).

Olfactory function

Preoperative and postoperative olfactory scores did not differ significantly between the groups ($p = 0.107$ and $p = 0.876$, respectively). When comparing the change in olfactory scores between the preoperative and postoperative periods for both groups, although the change was numerically greater in the Microdebrider group, the difference failed to achieve statistical significance ($p = 0.181$). (Table 2)

Mucociliary clearance

Preoperative saccharin clearance times did not differ significantly between the two groups ($p = 0.995$). In postoperative measurements, the Punch group had a mean of 10.6 ± 6.3 minutes, while the Microdebrider group had a mean of 6.5 ± 3.5 minutes; this difference was statistically significant ($p < 0.001$). Preoperative-to-postoperative

changes in mucociliary clearance times were significantly greater in the Microdebrider group than in the Punch group ($p = 0.006$) (Table 2).

Synechia scores

Postoperative synechia distribution was evaluated, and a statistically significant difference was observed between the groups; synechia rates were lower in the microdebrider group ($p = 0.046$). (Table 3)

Disease severity

To assess the preoperative severity of the disease, the distribution of preoperative Lund and Mackay endoscopic polyp scores and preoperative Lund-Mackay scores were compared between the two groups. All endoscopic evaluations were performed by the operating surgeon using standardized scoring systems. No significant difference was found between the groups ($p = 0.108$ and $p = 0.078$, respectively). (Table 4, Table 1)

QoL (SNOT-22 scores)

Evaluations of preoperative and postoperative SNOT-22 results demonstrated a decrease in total scores one month after surgery in both groups. Although the reduction was more pronounced in the Microdebrider group (32.5 ± 23.3) compared to the Punch group (24.8 ± 20.5), the difference failed to achieve statistical significance ($p = 0.062$). However, when SNOT-22 subdomains were analyzed, the Microdebrider group showed a significantly greater improvement in rhinological symptoms compared to the Punch group (8.9 ± 6.2 vs. 5.9 ± 7.4 , $p = 0.047$). Comparison of the two groups revealed no statistically significant differences across the extranasal rhinological, ear/facial, psychological, and sleep subdomain scores ($p = 0.201$, $p = 0.747$, $p = 0.646$, and $p = 0.080$, respectively). (Table 5).

DISCUSSION

This study aimed to comprehensively compare the effects of microdebrider and conventional cold steel instrumentation on early surgical outcomes in patients with CRSwNP undergoing FESS. Postoperative assessments for detecting surgical outcomes were scheduled at 1 month in order to evaluate early mucosal healing, mucociliary recovery, and initial quality-of-life changes, while minimizing the influ-

Table 1. Baseline demographic and clinical characteristics of patients

Characteristic	Punch group (n=39)	Microdebrider group (n=33)	p-value
Age, mean $\pm$ SD (years)	43.1 $\pm$ 16.1	40.7 $\pm$ 12.1	0.852*
Sex (M/F)	20 / 19	21 / 12	0.291**
Preoperative Lund-Mackay Score (mean $\pm$ SD)	15.5 $\pm$ 4.5	18.0 $\pm$ 6.1	p=0.078*
Preoperative SNOT-22 total score (mean $\pm$ SD)	50.1 $\pm$ 20	52.8 $\pm$ 23.5	p=0.611*

n: Number, SD: Standard deviation, M: Male, F: Female, SNOT-22: Sino-Nasal Outcome Test-22

*p-values indicate comparison with Mann-Whitney U test

**p-values indicate comparison with Chi-square test

Table 2. Comparison of olfactory function and mucociliary clearance between groups

Parameter	Punch (mean $\pm$ SD)	Microdebrider (mean $\pm$ SD)	p-value
Preop olfactory score (VAS)	3.4 $\pm$ 3.4	2.2 $\pm$ 3.3	0.107*
Postop olfactory score (VAS)	7.1 $\pm$ 3.0	7.0 $\pm$ 3.4	0.876*
Δ Olfactory score (VAS)	3.7 $\pm$ 3.7	4.7 $\pm$ 3.3	0.181*
Preop MCC (min)	12.4 $\pm$ 7.1	12.4 $\pm$ 5.5	0.995**
Postop MCC (min)	10.6 $\pm$ 6.3	6.5 $\pm$ 3.5	<0.001*
Δ MCC (min)	-1.8 $\pm$ 7.1	-5.9 $\pm$ 4.7	0.006**

MCC = Mucociliary clearance, Δ = change (postoperative-preoperative values), SD: Standard deviation, Preop: Preoperative, Postop: Postoperative, VAS: Visual Analog Scale, min: Minutes.

*p-values indicate comparison with Mann-Whitney U test

**p-values indicate comparison with independent sample t-test

Table 3. Distribution of synechia scores between groups

Synechia score	Punch (n, %)	Microdebrider (n, %)	p *
0	17 (43.6%)	17 (51.5%)	0.046
1	6 (15.4%)	10 (30.3%)	
2	6 (15.4%)	5 (15.2%)	
3	10 (25.6%)	1 (3.0%)	
Total	39 (100%)	33 (100%)	

n: Number, %: Percentage, *p-values indicate comparison with chi-squared test

Table 4. Comparison preoperative Lund-Kennedy polyp scores

Parameter	Punch (n, %)	Microdebrider (n, %)	p*
LK polyp score = 1, n (%)	14 (35.9%)	5 (15.2%)	0.108
LK polyp score = 2, n (%)	14 (35.9%)	13 (39.4%)	
LK polyp score = 3, n (%)	11 (28.2%)	15 (45.5%)	

LK: Lund-Kennedy, n: Number, %: Percentage, *p-values indicate comparison with chi-squared test

Table 5: Changes in total and subdomain SNOT-22 scores between the preoperative period and 1-month postoperative follow-up

Change in parameter (n = 72)	Punch (n=39) (mean $\pm$ SD)	Microdebrider (n=33) (mean $\pm$ SD)	P value
Total score change	24.8 $\pm$ 20.5	32.5 $\pm$ 23.3	0.062*
Rhinological score	5.9 $\pm$ 7.4	8.9 $\pm$ 6.2	0.047*
Extranasal rhinological score	4.2 $\pm$ 3.3	5.1 $\pm$ 3.5	0.201*
Ear facial score	2.7 $\pm$ 3.2	3.0 $\pm$ 3.4	0.747**
Psychological score	9.0 $\pm$ 8.2	9.4 $\pm$ 8.2	0.646*
Sleep score	3.1 $\pm$ 5.1	5.2 $\pm$ 6.6	0.080*

n: Number, SD: Standard deviation.

*p-values indicate comparison with Man-Whitney U.

**p-values indicate comparison with independent t-test

ence of long-term medical therapy and disease recurrence. The results demonstrated that the use of a microdebrider was associated with improved mucociliary function and a lower incidence of postoperative synechiae in the early postoperative period. However, no clinically meaningful differences were observed between the two techniques in most subjective outcome measures, including olfactory function and overall quality of life, with the rhinological subdomain of the SNOT-22 being the only exception.

An important aspect of this investigation is that surgical efficacy was assessed not only through functional and anatomical measures, such as mucociliary clearance and postoperative synechia formation, but also through subjective symptom scores. According to the available literature, most comparative studies have relied on visual analogue scale scores only when evaluating the subjective surgical outcomes of microdebrider and conventional instrumentation in the management of CRSwNP (4, 8, 14, 15). In this context, the present study contributes to the existing literature by providing a more detailed and multi-dimensional assessment of surgical outcomes through the use of the SNOT-22.

As a widely used parameter for evaluating nasal function after FESS, mucociliary clearance was significantly better in the microdebrider group in the early postoperative period in the present study, in accordance with the existing literature. This finding may be related to the microdebrider's ability to enable more precise tissue excision with fewer manipulations and reduced surgical trauma, thereby better preserving mucosal integrity.

Synechiae is a common postoperative complication following FESS, with reported incidence rates ranging from 6% to 27% (16). In the present study, the incidence of postoperative synechiae was significantly lower in the microdebrider group. Similar findings supporting a lower incidence of synechiae with microdebrider use have been reported in the literature by Saafan et al. (8), whereas other studies have demonstrated comparable synechiae rates between microdebrider and conventional techniques (15, 17). This variability in reported outcomes suggests that surgical technique, surgeon experience, and postoperative care may influence adhesion formation.

Analysis of postoperative outcomes demonstrated a significant improvement in SNOT-22 scores in both groups. However, intergroup comparisons revealed no significant postoperative differences, except for the rhino-

logical subdomain, which encompasses core nasal symptoms including nasal obstruction, rhinorrhea, sneezing, postnasal drip, and loss of smell or taste (Table 5). An additional aspect of this study is the inclusion of SNOT-22 as a patient-reported outcome measure in the comparison of microdebrider use and conventional instrumentation during FESS. The SNOT-22 is a widely used, validated, and reliable tool for assessing symptom burden and quality of life in patients with chronic rhinosinusitis (2, 11). Previous comparative studies have primarily focused on endoscopic findings, surgical feasibility, or complication rates (8, 15, 18), whereas patient-reported outcomes have been less frequently emphasized. In this context, the present study adds complementary information by integrating more detailed subjective symptom assessment with anatomical and functional outcome measures.

In our study, similar improvements were observed in olfactory VAS scores in both groups. Olfactory function is known to be related to the presence of nasal polyps, mucosal edema, and the patency of the upper nasal passage. The similar improvements in olfactory VAS scores observed in both groups suggest that the effectiveness of polyp removal was adequately achieved regardless of the technique used. This improvement may be related to better preservation of the olfactory mucosa, which could have contributed to the successful outcomes in both techniques.

The intraoperative advantages of the microdebrider, including shorter operative times, reduced bleeding, and improved visualization, have been well documented in the literature (15, 19, 20). Although intraoperative parameters were not specifically measured in the present study, existing evidence supports the notion that microdebrider use facilitates surgical performance. However, its higher cost and the requirement for surgical expertise remain important limitations. From a clinical perspective, the findings suggest that microdebrider use may be particularly meaningful in patients in whom early mucosal recovery and the prevention of postoperative synechiae are prioritized, such as patients who may have difficulty adhering to postoperative care or follow-up visits. Given that postoperative synechiae may necessitate revision surgery, microdebrider use may be of particular value in patients with comorbidities associated with increased surgical risk. However, as subjective outcomes and overall quality of life improved similarly with both techniques, conventional cold steel instruments remain an effective option for many patients.

Therefore, the choice of instrumentation should be individualized, taking into account patient characteristics, surgical goals, surgeon experience, and resource availability.

This study has several limitations, including a relatively small sample size, and larger multicenter studies with more diverse populations are needed to enhance the generalizability of the findings. The lack of multivariable adjustment and non-random, time period-based grouping represent limitations inherent to the retrospective design and may have introduced selection bias; however, statistically evaluated baseline characteristics were comparable between groups (Table 1). In addition, the study focused on early postoperative outcomes, and longer follow-up is required to evaluate long-term parameters such as polyp recurrence, sinus patency, and the persistence of olfactory function. The absence of blinded endoscopic assessments, largely attributable to the retrospective nature of the study, may have introduced observer bias. Furthermore, olfactory function was assessed using a visual analogue scale, which is subjective and less sensitive than objective olfactory testing.

CONCLUSION

Both microdebrider and conventional cold steel instrumentation resulted in significant clinical improvement in patients with CRSwNP undergoing FESS. Microdebrider use was associated with improved early mucociliary clearance and a lower incidence of early postoperative synechiae, whereas no meaningful differences were observed in olfactory function or overall quality of life, except for rhinological symptoms. These findings suggest that while microdebrider-assisted FESS may offer advantages in selected patients, conventional instrumentation remains an effective option, and instrument selection should be individualized based on patient characteristics, surgical goals, and resource considerations. Future studies with longer follow-up periods are needed to validate these early functional outcomes.

Acknowledgements: None.

Author Contributions: Concept: TT and KGT, Design: TT and KGT, Supervision: TT and KGT, Materials: TT and KGT, Data collection and/or processing: TT and KGT, Analysis and/or interpretation: TT and KGT, Literature search: TT and KGT, Writing: TT and KGT, Critical review: TT and KGT. All authors have read and approved the

published version of the manuscript.

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Financial Disclosure: The authors received no financial support for the research.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Artificial Intelligence Statement: No artificial intelligence tools were used in the preparation of this manuscript.

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