Comparative Study between Using of Radiofrequency Versus Microdebrider (Shaver) in Partial Inferior Turbinectomy

Zaki Farouk Aref[a], Hadeer Abdelhady Abdelhameid[a*], Aida A. Abdelmaksoud[a]

[a]Otorhinolaryngology Department, Faculty of Medicine, South Valley University, Qena, Egypt

Abstract

Background: Inferior turbinate hypertrophy (ITH) significantly affect patients quality of life. Coblation and microdebrider-assisted turbinectomy can offer distinct mechanisms for precise tissue removal.

Objectives: To evaluate the efficacy and complications of bilateral partial inferior turbinectomy using shaver (microdebrider) versus coblation.

Patients and methods: this is a case-control clinical study included 40 patients with bilateral hypertrophied inferior turbinates, were devided into two groups, group A included 20 patients were underwent bilateral partial inferior turbinectomy using microdebrider.group B included 20 patients were underwent bilateral partial inferior turbinectomy using coblation. Postoperatively, all patients were followed at 1st,2nd,4th and 8th weeks to assess nasal obstruction, post-operative pain, snoring, hyposmia, headache, bleeding , blood loss, rhinorrhea and crustation.

Results: The significant improvement in nasal obstruction scores was observed in both groups postoperatively at 1st, 2nd, 4th, and 8th weeks, with Group A demonstrating a more substantial decrease at 1st week. Also post-operatively there were significant statistical difference in nasal obstruction between 2 groups in 1st,2nd,4th,8th weeks($p<0.0001$). Hyposmia in Group A significantly improved post-operatively , while Group B remained unchanged . Snoring and headache also significantly decreased in both groups, with no clear superiority of one technique over the other. Group B had significantly lower postoperative pain ($p=0.0187$). Notable differences were observed in bleeding rates, crustation occurrences emphasizing variations in outcomes.

Conclusion: this study reported that both therapies reduced nasal blockage although microdebrider is more effective than coblation. Microdebrider reduced hyposmia, both reduced snoring, while coblation is better in postoperative pain and reduced bleeding.

Keywords: Radiofrequency; Shaver; Turbinectomy

***Correspondence**: hadeerhady75@gmail.com

DOI: 10.21608/SVUIJM.2024.265596.1789

Received: 30 January, 2024

Revised: 23 February, 2024.

Accepted: 29 February, 2024.

Published: 13 October, 2025

Cite this article as Zaki Farouk Aref, Hadeer Abdelhady Abdelhameid, Aida A. Abdelmaksoud. (2025). Comparative Study between Using of Radiofrequency Versus Microdebrider (Shaver) in Partial Inferior Turbinectomy. *SVU-International Journal of Medical Sciences*. Vol.8, Issue 2, pp: 620-630.

Introduction

Inferior turbinate hypertrophy (ITH), linked to chronic rhinitis and allergic rhinitis, significantly affect patients quality of life with nasal obstruction, impaired breathing, and disrupted sleep **(Komshian et al., 2019).** There are surgical interventions like partial inferior turbinectomy with advanced technologies, as Coblation and microdebrider-assisted turbinectomy **(Komshian et al., 2019).**

Coblation utilizes bipolar radiofrequency electrosurgery and normal saline for precise tissue removal, ensuring safety with targeted reduction and subsequent fibrosis for improved long-term outcomes **(Furculița, 2023).** Microdebrider-assisted turbinectomy employs a powered cutting instrument, demonstrating efficacy in targeted tissue reduction with minimal damage, enhancing patient comfort and recovery. The technique's versatility provides surgeons with enhanced control **(Gül et al., 2019; Levy et al., 2022).**

The choice between Coblation and microdebrider-assisted turbinectomy depends on factors like hypertrophy severity, and surgeon expertise. Investigating outcomes in a comparative framework allows for a nuanced understanding of their benefits and limitations **(Kanesan et al., 2022).**

The main aim of the study was to evaluate the efficacy and complications of bilateral partial inferior turbinectomy using shaver (microdebrider) compared to bilateral inferior turbinate reduction using coblation in relieving nasal symptoms.

Patients and methods

This is a case-control clinical study included 40 patients with bilateral hypertrophied inferior turbinates, The patients were divided randomaly into two groups: Group A, comprising 20 patients who underwent bilateral partial inferior turbinectomy utilizing a shaver (microdebrider) (Medtronic xomed, inc. 6743 Southpoint drive north Jacksonville, fl32216, made in USA),; and Group B, consisting of 20 patients subjected to bilateral inferior turbinate reduction by coblation (Dr oppel, model: st-511 made in korea), (**Fig.1,2**).

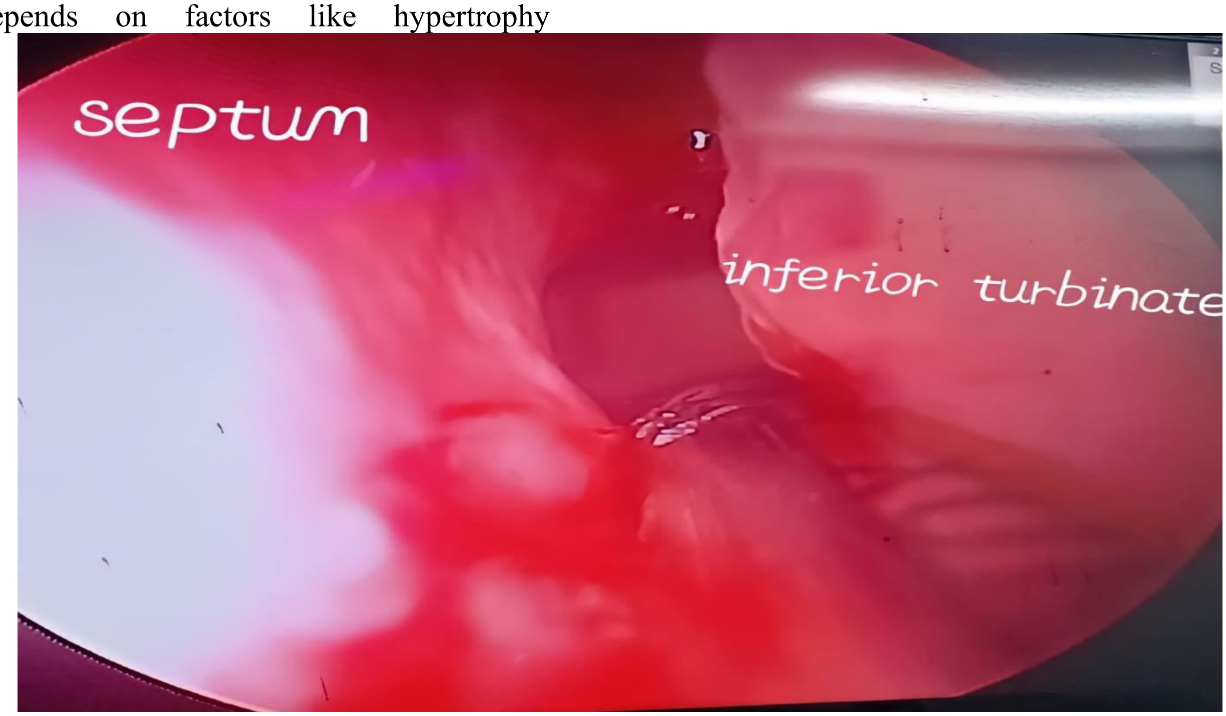

Fig. 1. Microdebrider blade is placed at the posterior part of left turbinate for microdebrider partial turbinectomy.

Fig.2. Left turbinate reduction by coblation.

Exclusion criteria precluded participation due to alternative causes of nasal obstruction such as infectious rhinitis, marked septal deviation, nasal polyps, sinusitis, or nasal tumors, as well as systemic diseases contraindicating surgical intervention.

Operational Design: The operational phase encompassed a comprehensive preoperative assessment. This involved eliciting a complete history, including personal and medical details such as the onset, course, and duration of the disease, intercurrent chronic diseases, history of previous nasal surgery, and family history. A complete physical examination ensued. Preoperative nasal examination included decongestion and topical anesthesia with 4% lidocaine and phenylephrine. Anterior rhinoscopy was performed using a head mirror and nasal speculum or nasal endoscope. The size of turbinates was assessed through the use of 4-mm rigid nasal endoscopes, which were passed along the floor of the nose into the nasopharynx, providing an overview of the inferior turbinate and meatus. Routine laboratory investigations encompassed complete blood count (CBC), coagulation profile, random blood sugar, and liver and renal function tests. Imaging consisted of computed tomography of the nose and para-nasal sinuses with coronal, sagittal, and axial cuts.

Disease manifestations were evaluated using the standard visual analog scale (VAS) to assess both nasal obstruction and hyposmia pre and postoperatively, as well as postoperative pain. The scale ranged from 0, indicating no symptoms and satisfaction with the situation, to 10, signifying the most severe symptoms with dissatisfaction.

Surgical procedures were conducted with patients positioned in a 15° head-up position all under oral general anesthesia. In Group A, bilateral partial inferior turbinectomy was performed using shaver (microdebrider), which included injecting local anesthesia, making an incision at the anterior end of the inferior turbinate, creating a submucosal pocket, and utilizing the microdebrider for tissue resection. In Group B, bilateral inferior turbinate reduction by coblation involved using a wand dampened with 9% normal saline to permit plasma field formation during insertion. The wand was inserted submucosally at the anterior head of the inferior turbinate and extended to the posterior portion, followed by ablation with controlled withdrawal at coagulation mode. Operation time, intraoperative blood loss, and postoperative procedures, including nasal packing with Merocel, antibiotic therapy with amoxicillin, and analgesia with acetaminophen, were meticulously recorded.

Postoperatively, all patients were followed at week one, and 2nd ,4th ,8th weeks.Postoperative pain was reassessed using the VAS, and nasal reexamination was conducted with anterior rhinoscopy and nasal endoscope to detect bleeding, nasal edema, and crustation.

Research Outcome Measures: The primary objective was to compare the efficacy of bilateral partial inferior turbinectomy using microdebrider and bilateral inferior turbinate reduction by coblation regarding operation time, intraoperative blood loss, post-operative bleeding, post-operative edema, post-operative pain, headache, crustation, and improvement of nasal obstruction. Secondary objectives involved the follow-up of outcomes, with a focus on persistence of nasal obstruction, adhesions, atrophic rhinitis and anosmia.

Administrative Design: The study adhered to a robust administrative design that included seeking approval from the Research Ethics Committee for the study protocol.

Ethical approval code: SVU-MED-ENT030-1-23-2-540.

Ethical considerations: Every participant was adequately informed about the study's objectives and benefits, with written consent obtained prior to inclusion.

Statistical analysis:

IBM SPSS version 22.0 was used to analyses computer-generated data. To express quantitative data, percentages and numbers were employed. Before utilizing the median in nonparametric analysis or the interquartile range in parametric analysis, it was required to perform Kolmogorov-Smirnov tests to ensure that the data were normal. We used the (0.05) significance threshold to establish the significance of the findings. The Chi-Square test is used to compare two or more groups. The Monte Carlo test may be used to adjust for any number of cells with a count less than 5. Fischer Chi-Square adjustment was applied to tables demonstrating non continuous data.

Results

This study included 40 patients divided into two groups A & B. The average age in Group A was 27.25 years ± 7.35 Standard deviation (SD), while in Group B, it was 28.4 years ± 6.79 SD, with no significant difference observed ($p = 0.7781$). In terms of gender distribution, both groups had an equal distribution of male and female participants, with 10 (50%) males and 10 (50%) females in each group ($p = 0.99$).

This study reported a highly statistical significant reduction in nasal obstruction in group A(microdebrider) compared to group B(coblation) in all follow up periods 1st,2th,4th and 8th weeks (p value<0.0001) .Pre-operative, both Group A (8.25 ± 0.77) and Group B (8.35 ± 0.65) had similar preoperative nasal obstruction scores VAS(p = 0.7391). Postoperatively, both groups showed significant reduction in nasal obstruction at each time point compared to preoperative values. At 1st week, Group A had a substantial decrease to 1.35 ± 0.48, while Group B had a significant decrease to

2.95 ± 0.8 (p < 0.0001). Similar results were observed at 2nd, 4th, and 8th weeks, with significant reductions in both groups (p < 0.0001). Within Group A, significant differences were noted between 1st and 2nd weeks (p = 0.0034), but no significant differences between 2nd and 4th weeks (p = 0.6222) or 4th and 8th weeks (p = 0.4833). Group B showed no significant changes between weeks 1 and 2, 2 and 4, or 4 and 8 (p = 0.0728, p = 0.2531, and p = 0.4585, respectively), despite significant preoperative-postoperative differences, (**Table.1, Fig.3).**

Table 1. Nasal obstruction evaluation through the study in both study groups

Variables		Group A (N = 20)	Group B (N = 20)	P. Value (A/B)
Preoperative nasal obstruction	Mean ± SD	8.25 ± 0.77	8.35 ± 0.65	0.7391[U]
Postoperative nasal obstruction				
1 Week	Mean ± SD	1.35 ± 0.48	2.95 ± 0.8	<0.0001*[U]
2 Week	Mean ± SD	0.8 ± 0.6	2.45 ± 0.86	<0.0001*[U]
4 Week	Mean ± SD	0.7 ± 0.64	2.15 ± 0.65	<0.0001*[U]
8 Week	Mean ± SD	0.55 ± 0.67	2.35 ± 0.96	<0.0001*[U]
Comparisons with Pre-operative Evaluation				
1 Week		<0.0001*[U]	<0.0001*[U]	
2 Week		<0.0001*[U]	<0.0001*[U]	
4 Week		<0.0001*[U]	<0.0001*[U]	
8 Week		<0.0001*[U]	<0.0001*[U]	
Comparison between every successive evaluation				
1 Week Vs. 2 Week		0.0034*[U]	0.0728[U]	
2 Week Vs. 4 Week		0.6222[U]	0.2351[U]	
4 Week Vs. 8 Week		0.4833[U]	0.4585[U]	

[X]: Chi Square test, [U]: MWU Test

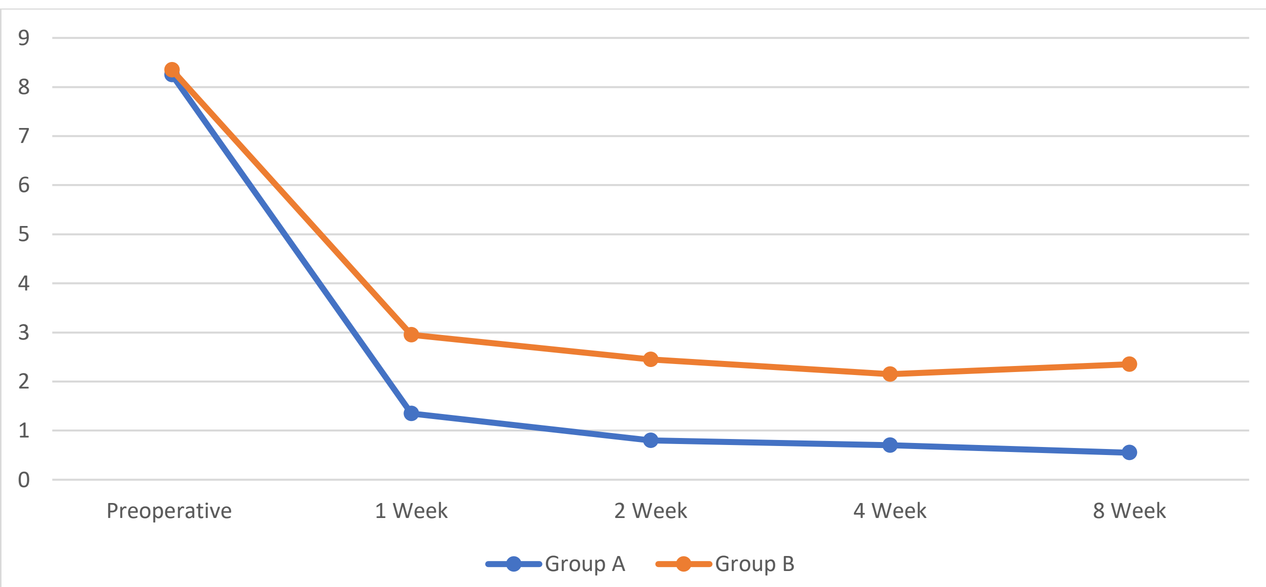

Fig.3. Nasal obstruction evaluation through the study in both study groups

Pre-intervention, Group A and Group B had similar preoperative hyposmia . Postoperatively, Group A showed a significant decrease , while Group B remained unchanged . Group A had a significant pre/post-operative hyposmia decrease, while Group B showed no significant change. Preoperative snoring mean scores were similar between Group A (6 ± 2.02) and Group B (5.4 ± 2.13) (p = 0.298). Postoperatively, both groups had significant snoring reductions (Group A: 0.75 ± 0.7, p < 0.0001; Group B: 4.75 ± 1.41, p < 0.0001). The P. Value confirmed significant pre/post-operative snoring decreases for both Group A (p < 0.0001) and Group B (p = 0.2755). Preoperatively, headache prevalence was similar in Group A (50%) and Group B (55%) (p = 0.759). Postoperatively, both groups showed a significant decrease to 20% (p = 0.99), with significant pre/post-operative headache decreases in both Group A (p = 0.0481) and Group B (p = 0.0219). (**Table.2)**

Table 2. snoring and headache evaluations pre and post-operative in both study groups

Variables		Group A (N = 20)	Group B (N = 20)	P. Value
Snoring evaluation				
Preoperative	Mean ± SD	6 ± 2.02	5.4 ± 2.13	0.298[t]
Postoperative	Mean ± SD	0.75 ± 0.7	4.75 ± 1.41	<0.0001*[U]
P. Value (Pre/Post)		<0.0001*[U]	0.2755[w.t]	
Headache evaluation				
Preoperative	N (%)	10 (50%)	11 (55%)	0.759[X]
Postoperative	N (%)	4 (20%)	4 (20%)	0.99[X]
P. Value (Pre/Post)		0.0481*[X]	0.0219*[X]	

[t]: T- test, [W.t]: Welch's t-Test, [U]: MWU Test

Postoperative pain (VAS score) was lower in Group B (3.1 ± 1.26) compared to Group A (4.2 ± 1.33) with a significant difference (P = 0.0187), reflecting notable improvement in Group B. while Rhinorrhea was in Group A (55%), Group B (50%) showed no significant difference (p = 0.759). (**Table .3).**

Table 3. Post-operative VAS score (post-operative pain) and Complications occurrence in both study groups

Variables	Group A (N = 20)	Group B (N = 20)	P. Value
VAS Score	4.2 ± 1.33	3.1 ± 1.26	0.0187*[t]
Complications			
Rhinorrhea	11 (55%)	10 (50%)	0.759[X]

[X]: Chi Square test, [t]: T- test

Intraoperatively, bleeding occurred in 70% of Group A and significantly less, 15%, in Group B, with a (P= 0.0002). Postoperatively, 50% of cases in Group A experienced bleeding, while in Group B, it was 15%, resulting in a significant difference with a (P= 0.0176). (**Table.4)**

Table 4. Bleeding evaluation intra and post-operative in both study groups

Variables	Group A (N = 20)	Group B (N = 20)	P. Value
Intraoperative	14 (70%)	3 (15%)	0.0002*[X]
Postoperative	10 (50%)	3 (15%)	0.0176*[X]

[X]: Chi Square test

At 1st week postoperatively, Group A reported crustation in 35% of cases, while Group B had a significantly higher occurrence at 85%, with (P= 0.0008*). Similar findings were observed at 2nd week, with Group A at 20% and Group B at 65%, showing a significant difference with a (P= 0.0032). At 4th week, Group A reported crustation in 25%, and Group B had 50%, with no significant difference (P = 0.1077). However, by 8th week, the occurrence decreased to 20% in Group A and to 30% in Group B, indicating no significant difference with (P= 0.4652). (**Table.5, Fig.4).**

Table 5. Post-operative crustation occurrence in both study groups through follow up.

Variables	Group A (N = 20)	Group B (N = 20)	P. Value (A/B)
1 Week	7 (35%)	17 (85%)	0.0008*[X]
2 Week	4 (20%)	13 (65%)	0.0032*[X]
4 Week	5 (25%)	10 (50%)	0.1077[X]
8 Week	4 (20%)	6 (30%)	0.4652*[X]
P. Value Comparison with first week evaluations			
2 Week	0.3002[X]	0.1516[X]	
4 Week	0.5027[X]	0.0176*[X]	
8 Week	0.3002[X]	0.0004[X]	

[X]: Chi Square test

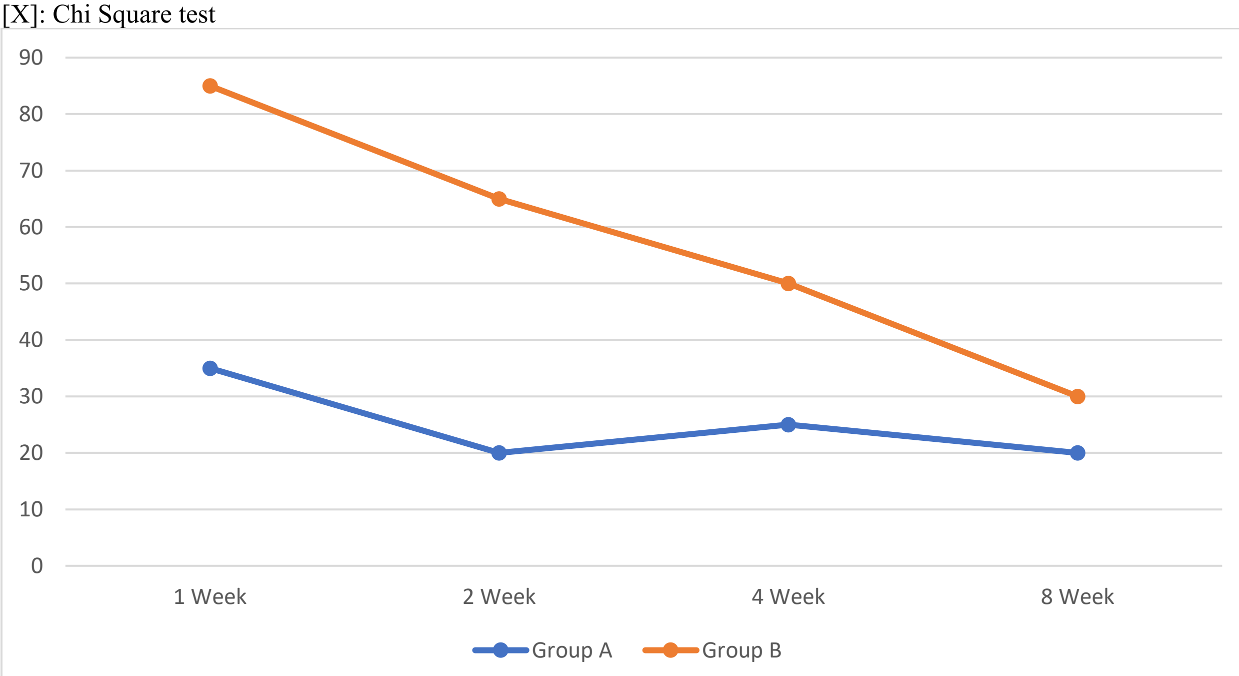

Fig.4. Post-operative crustation occurrence in both study groups through follow up

Discussion

Inferior turbinate hypertrophy (ITH), linked to chronic rhinitis and allergic rhinitis, significantly affect patients quality of life with nasal obstruction, impaired breathing, and disrupted sleep **(Komshian et al., 2019).** There are surgical interventions like partial inferior turbinectomy with advanced technologies, as Coblation and microdebrider-assisted turbinectomy **(Komshian et al., 2019).**

In this study Group A mean age was 27.25 years ± 7.35 Standard deviation (SD), whereas Group B was 28.4 years ± 6.79 SD, with no significant difference (p = 0.7781). Males and females were equally divided in both groups (p = 0.99).

Unlike this research, **Singh et al. (2020)** compared Coblation and Microdebrider-Assisted Turbinoplasty with 33 participants (17 A, 16 B). Mean age was 31.45 years (SD 11.10) and 96.3% male. Regional and sample size may affect gender discrepancies.

Chaudhry et al. (2021) studied radiofrequency ablation in a balanced gender distribution (52% men, 47% females) with a mean age of 51 years ±17 SD Methodological differences may explain age discrepancies.

In this study there were substantial differences between the microdebrider and coblation groups, similar to that reported by **Çukurova et al** who reported that The microdebrider,which removes soft tissue, reduces postoperative nasal blockage more effectively and quickly than coblation, which focuses on submucosal tissue (**Çukurova et al., 2023).**

Results of the study agree with that done by **Gupta et al. (2001)** who reported that microdebrider-assisted turbinoplasty reduces nasal blockage. And also agree with **Cingi et al. (2010)** who claimed that microdebrider-assisted partial turbinoplasty expands the nasal airway. In contrast **BADRAN et al** reported 86.6% microdebrider success and 90% surgical success **BADRAN et al. (2011)**.

Mirza et al. (2020) preferred Microdebrider Assisted Turbinoplasty to Radiofrequency for sustained and better results. **Singh et al. (2020**) found that MAT (microdebider-assisted turbinectomy) and CAT (coblation-assisted turbinectomy) considerably improved nasal symptoms, which is similar to the results of this study.

Our results agree with **Ali et al. (2022)** who found that Microdebrider-assisted inferior turbinoplasty cleared all 30 patients with nasal blockage.And **Jadhav et al. (2022)** who found that microdebrider outcomes improved with time, whereas coblator results improved.

We also agree with **Mirza et al. (2020**) who found that microdebrider-assisted nasal obstruction treatment improved VAS ratings in early and late surgical follow-ups.And **Ali et al. (2019)** who showed that Microdebrider-Assisted inferior turbinates reduction surgery relieved nasal congestion better than Partial Inferior Turbinoplasty.

Over three years, microdebrider-assisted inferior turbinoplasty (MAIT) maintained a statistically significant volume gain, suggesting its long-term success compared to other methods, according to **Harju and Numminen (2022)** which agree with our study**.**

In this study, pre-operatively both groups exhibited similar levels of hyposmia. Postoperatively, the microdebrider group showed a significant improvement, whereas the coblation group showed no statistically significant difference from the preoperative score. This suggests that microdebrider technique more positive impact on hyposmia compared to coblation.

Results of the study agree with **SAYED et al. (2018)**, where hyposmia grades improved significantly post-operatively for both microdebrider and coblation. With insignificant differences among them .Similarly, both groups showed similar levels of snoring preoperatively. Postoperatively, significant reductions in snoring were observed in both groups, with no significant difference between them.

We agree with both **Kizilkaya et al. (2008)** who reported significant improvement in snoring in the microdebrider group from 6 months to 3 years postoperatively, outperforming the coblation group and **SAYED et al. (2018)** who reported significant snoring improvement for microdebrider and surgical groups.

Regarding postoperative pain in this study , the coblation group had significantly lower pain scores compared to the microdebrider group, indicating less postoperative pain with coblation. This in agreement with **Svistushkin et al. (2021) and Zhang et al. (2023**), attributing the lower pain to coblation healing process.

Singh et al. (2020) reported comparable pain management efficacy for both Microdebrider-Assisted Turbinoplasty and Coblation. In this study, the evaluation of headache prevalence indicated similar preoperative levels in both groups, with significant postoperative decreases, suggesting effectiveness without clear technique advantage.

Consistent with findings of this study, **Singh et al. (2020**) reported headache reduction from the 1st week to the 3th month for both techniques. The assessment of complications occurrence showed no significant differences, indicating comparable safety between microdebrider and coblation.

Our results agree with both **Lee and Chen (2004)** who noted postoperative bleeding in microdebrider intraturbinoplasty but attributed it to immunological differences. And **Mirza et al. (2020)** who highlighted bleeding as a common microdebrider complication. The assessment of postoperative crustation occurrence showed early coblation-related crustation, decreasing over time, becoming comparable between groups. **Ali et al. (2019**) also observed better tissue healing with microdebrider,

Joniau et al. (2006) emphasized microdebrider turbinoplasty efficacy in relieving nasal obstruction without crusting which is similar to our study.

Conclusion

In this study comparing bilateral partial inferior turbinectomy with microdebrider and coblation yielded useful insights into their results. Both techniques reduced postoperative nasal blockage, although the microdebrider group improved faster. The microdebrider method also improved hyposmia. While both methods decreased snoring, coblation lowered postoperative pain better. Coblation also reduced bleeding and blood loss, however crustation increased briefly postoperatively. This research highlights the complex advantages of each technique, which help choosing the best intervention for patient-specific objectives and results. We recommend more researches in large sample are needed.

References

- **Ali BH, Awad OGAN, Ibrahim A, Azez AAA (2019).** Assessment of safety and efficacy of extraturbinal microdebrider-assisted turbinoplasty versus partial inferior turbinectomy. The Egyptian Journal of Otolaryngology, 35(1): 17-24.
- **Ali S, Akaash H, Akhtar A, Hussain A, Fareed LCG, Sadiq SM (2022).** Comparison of Conventional Surgical Turbinoplasty Versus Microdebrider Assisted Turbinoplasty in Cases of Inferior Turbinate Hypertrophy. Pakistan Journal of Medical & Health Sciences, 16(11): 696-696.
- **BADRAN H, FATHI A, ATTIA M, HESHAM A (2011).** Microdebrider Assissted Partial Inferior Turbinectomy; Advantages Over the Conventional Method. Medical Journal of Cairo University, 79(1): 729-732.
- **Chaudhry S, Maresco-Pennisi D, Cervin A (2021).** Radiofrequency ablation in the treatment of inferior turbinate hypertrophy. Australian Journal of Otolaryngology, 4(2021): 5-16.
- **Cingi C, Ure B, Cakli H, Ozudogru E (2010).** Microdebrider-assisted versus radiofrequency-assisted inferior turbinoplasty: a prospective study with

objective and subjective outcome measures. ACTA otorhinolaryngologica italica, 30(3): 138-143.

- **Çukurova İ, Cingi C, Konstantinidis I (2023).** Inferior Turbinate Hypertrophy. In Airway diseases (pp. 1-9). Springer.
- **Furculița D (2023).** CONTEMPORARY MANAGEMENT OF HYPERTROPHY OF THE INFERIOR NASAL TURBINATES. Publishing House "Baltija Publishing". 1(4): 122-146.
- **Gül Z, Aydoğdu D, Ülkü Ç (2019).** Comparison of radiofrequency and microdebrider-assisted turbinoplasty for treatment of isolated inferior turbinate hypertrophy. Eur J Rhinol Allergy, 2(2): 51-56.
- **Gupta A, Mercurio E, Bielamowicz S (2001).** Endoscopic inferior turbinate reduction: an outcomes analysis. The Laryngoscope, 111(11): 1957-1959.
- **Harju T, Numminen J (2022).** The long-term effect of inferior turbinate surgery techniques on nasal obstruction and quality of life. Annals of Otology, Rhinology & Laryngology, 131(9): 933-940.
- **Jadhav SG, Mane BS, Naikwadi KB, Gavali RM (2022).** A comparative study between cobblator and microdebrider assisted inferior turbinate reduction surgery. International Journal of Otorhinolaryngology and Head and Neck Surgery, 8(10): 826.
- **Joniau S, Wong I, Rajapaksa S, Carney SA, Wormald PJ (2006).** Long-term comparison between submucosal cauterization and powered reduction of the inferior turbinates. The Laryngoscope, 116(9): 1612-1616.
- **Kanesan N, Norhayati MN, Hamid SSA, Abdullah B (2022).** Microdebrider-assisted inferior turbinoplasty versus other surgical techniques. ACTA otorhinolaryngologica italica, 42(5): 415-426.
- **Kizilkaya Z, Ceylan K, Emir H, Yavanoglu A, Unlu I, Samim E et al (2008).** Comparison of radiofrequency tissue volume reduction and submucosal resection with microdebrider in inferior turbinate hypertrophy. Otolaryngology–Head and Neck Surgery, 138(2): 176-181.
- **Komshian SR, Cohen MB, Brook C, Levi JR (2019).** Inferior turbinate hypertrophy: a review of the evolution of management in children. American journal of rhinology & allergy, 33(2): 212-219.
- **Lee CF, Chen TA (2004).** Power microdebrider-assisted modification of endoscopic inferior turbinoplasty: a preliminary report. Chang Gung medical journal, 27(5): 359-365.
- **Levy E, Ronen O, Sela E, Layos E, Eisenbach N, Ibrahim N et al (2022).** Inferior turbinate reduction: comparing post-operative bleeding between different surgical techniques. The Journal of Laryngology & Otology, 136(5): 427-432.
- **Mirza AA, Alandejani TA, Shawli HY, Alsamel MS, Albakrei MO, Abdulazeem HM et al (2020).** Outcomes of microdebrider-assisted versus radiofrequency-assisted inferior turbinate reduction surgery: a systematic review and meta-analysis of interventional randomised studies. Rhinology, 58(6): 530-537.
- **Neri G, Mastronardi V, Traini T, D'Orazio F, Pugliese M, Cazzato F (2013).** Respecting nasal mucosa during turbinate surgery: end of the dogma. Rhinology, 51(4): 368-375.
- **SAYED MM, SAYED MK, IBRAHIM MAF, FATMA M (2018).** A Comparative Study of Conventional Surgical Turbinoplasty Versus

Microdebrider Assisted Turbinoplasty Versus Radiofrequency Assisted Turbinoplasty in Cases of Inferior Turbinate Hypertrophy. The Medical Journal of Cairo University, 86(1): 3069-3076.

- **Singh S, Ramli RR, Mohammad ZW, Abdullah B (2020).** Coblation versus microdebrider-assisted turbinoplasty for endoscopic inferior turbinates reduction. Auris Nasus Larynx, 47(4): 593-601.
- **Svistushkin VM, Starostina SV, Toldanov AV (2021).** Possibilities of coblation in otorhinolaryngology: Analytical review. European Archives of Oto-Rhino-Laryngology, 279(2022): 1655-1662.
- **Zhang K, Pipaliya RM, Miglani A, Nguyen SA, Schlosser RJ (2023).** Systematic review of surgical interventions for inferior turbinate hypertrophy. American journal of rhinology & allergy, 37(1): 110-122.