Indian Journal of Otolaryngology and Head & Neck Surgery
https://doi.org/10.1007/s12070-025-05353-3

ORIGINAL ARTICLE

Post-operative Complications after Different Turbinates Operations (Comparative Study)

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Received: 8 November 2024 / Accepted: 8 January 2025

Abstract

Purpose Since Inferior turbinate hypertrophy is on top list of the most common causes of nasal blockage, this study is trial for recording the exact incidence for the postoperative complications of two different procedures of turbinate reduction, thus comparing endoscopic submucosal diathermy and radiofrequency ablation.

Methods retrospective randomized comparative study involved forty patients with resistant bilateral nasal blockage due to hypertrophy of the inferior turbinates attending the outpatient clinic of Otorhinolaryngology of (XXXX) University Hospitals. Patients were assigned randomly into 2 groups. Group (1) $n=20$ which referred to the sub-mucosal diathermy procedure and Group (2) $n=20$ whome were treated by radiofrequency ablation, postoperative complications were assessed and quantified.

Results Comparison of the post-operative complications rates in each technique: there was a remarkable difference after one week with group (1) showed 11% rate, considering group (2) The complication rate was 5.5%. After one month, still significant difference with 9% in group (1), and only 3.5% in the second group. After six months, there was still a remarkable difference with 5%, in group (1) and only 2.7% of group (2).

Conclusion A significant improvement of nasal symptoms with less complications rate in radiofrequency technique in comparison with the sub mucous diathermy reduction of inferior turbinates.

Keywords Nasal obstruction– radiofrequency-ablation- sub-mucosal diathermy · Post-operative complications

Introduction

Hypertrophied Inferior Turbinates (HIT) is a frequent cause of resistant nasal blockage which can hinder patient's life. There is no certain approved cascade or even stepladder line on how to deal with this problem due to hypertrophied turbinates. Many methods are available to deal with nasal obstruction due to inferior turbinate hypertrophy, including medications like intranasal sprays, oral medications, electrocautery, immunotherapy, surgical pathway as turbinectomy, turbinoplasty, sub-mucous resection, radiofrequency energy tissue ablation and recently laser-assisted turbinoplasty [1].

Surgical turbinate reduction may give better outcome on the long-term but has a greater incidence of complications. So, less destructive endoscopic procedures as radiofrequency and sub mucous diathermy have been suggested [2].

The best procedure for turbinate reduction should be associated with least discomfort, complications and should preserve the normal function of the turbinates, so the main target of turbinate surgery should be preserving nasal mucosa with reduction of the sub mucosal layer [3].

The objective of this study is to compare the incidence of post-operative complications of hypertrophied inferior turbinate reduction by the two techniques, (sub-mucosal diathermy and radiofrequency ablation turbinoplasty as these are commonly used techniques.

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Published online: 15 February 2025

Patients and Methods

Prospective interventional randomized comparative study was performed on 29 man and 11 woman aged between 18 and 50 years old, totally 60 patients with resistant bilateral nasal blockage due to hypertrophied inferior turbinates attended to the outpatient clinic of departments of otorhinolaryngology at the hospitals of (XXX) university during the period from Feb. 2023 to Aug.2024.

Our Inclusion Criteria were as Follows

1. Patients with complete or partial nasal blockage that was not relieved after optimal medical treatment. Secondary to hypertrophied inferior turbinates.
2. Adult population aged from 18 to 50 years old.

On the Other hand, our Exclusion Criteria were as Follows

1. Patient with nasal polyps.
2. Patients with deviated septum.
3. Unilateral hypertrophied turbinates.
4. Patients with systemic disease, respiratory tract infection, or radiation therapy.
5. Patients with history of previous nasal surgery or tumor.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Patient Examination

After full history taking, preoperative evaluation of all patients was done endoscopic ally, the routine laboratory and radiologically by CT scan of nose and paranasal sinus. The inferior turbinate was examined by nasal endoscopy before and after administration of local decongestant. Grading the inferior turbinate was recorded as follows: grade 0: no identified turbinate, grade 1: the inferior turbinate $<25\%$ of nasal cavity, grade 2: inferior turbinate 25-50% of nasal cavity, grade 3: inferior turbinate 50-75% of the nasal cavity, grade 4: inferior turbinate 75–100% of the nasal cavity and even reaching the midline.

Operative Details

Under general anesthesia, patients were prepared in the standardized position of nasal surgery; sterilization of the skin was done by aqueous betadine, using (0° nasal endoscopes, 4 mm diameter, and 18 cm length, Karl Storz) and under guidance of video image. All patients were operated by the last author,

Patients were Assigned into 2 groups

- Group (1): Includes 20 patients treated by sub-mucosal diathermy.
- Group (2): Includes 20 patients treated by radiofrequency ablation.

Surgical Procedure

Group 1

A spinal needle (22-gauge, 7.5 cm length) was inserted longitudinally into the anterior end of the inferior surface of inferior turbinate. Introducing the probe up to the most accessible point of posterior end till occurrence of blanching of the anterior end with avoidance of necrosis. The technique was repeated on superior and medial surface then posterior part of the inferior turbinate with particular attention not to harm the ala or nasal septum.

Group 2

A “Binner” bipolar needle electrode was inserted under guidance of endoscopy into sub mucosal tissue of the medial surface of inferior turbinate for 6 s at 10 W output power in the three surfaces. Once blanching was detected, energy delivery was stopped.

Block Randomization

- Block randomization was employed by using the SAS 9.3 computer randomization software.
- Examination of patients and recording of data without giving any feed back to the main surgeon to keep it a randomized study.

Postoperative complications had been recorded for 1 week, 1 month, 3 months and 6 months postoperatively for each patient.

Patients Follow Up

Follow up was done endoscopically for each visit by the second author. Assessment of the outcome objectively was done by using the endoscopic grading system for detection of healing process and complications if present using the

endoscopic score of "Lund and Kennedy" [4]. Postoperative crustations and healing were assessed as follows:

Degree of Crustations [5]

- Grade 0: no crustations detected.
- Grade 1: Mild, filling the nasal cavity partially.
- Grade 2: Severe, filling almost all of nasal cavity.

Degree of Synechiae [5]

- Good: minimal crustations with no nasal synechiae.
- Moderate: Mild-to-moderate mucosal re-epithelization, but nasal synechiae present.
- Poor: Severe crustations with marked nasal synechiae, persistent inflammations, and infection.

Statistical Analysis

Data management and statistical analysis were done using SPSS version 28 (IBM, Armonk, New York, United States). Quantitative data were assessed for normality using the Shapiro-Wilk test and direct data visualization methods. According to normality, quantitative data were summarized as means and standard deviations. Categorical data were summarized as numbers and percentages. Quantitative data were compared between the studied groups.

using one-way ANOVA. All post hoc comparisons were Bonferroni adjusted. Categorical data were compared using the Chi-square test. All statistical tests were two-sided. *P* values less than 0.05 were considered significant.

Results

The mean age of 29 man and 11 woman patients was 33.5 ± 12 years (the range: 18 to 50), with no significant difference between groups.

Comparison between the two groups one week postoperatively shows significant difference in need for nasal packing after surgery, p value < 0.001 that only 10% patients in group (2) need packing while 40% of group (1) had needed postoperative packing, also after pack removal patients of radiofrequency group had no bleeding but those with diathermy had (10%) rate of bleeding after removal of nasal packs. Table 1.

Also radiofrequency patients showed very little manifestations of cacosmia, nasal, crustations, dryness. Postnasal discharge, adhesion, headache and roomy nose. while diathermy patients showed moderate increase in cacosmia, crustations, dryness, postnanal discharge, adhesions,

Table 1 Comparison of the complications rate between the two groups one-week post-operative

	Diathermy y(n=20)	Radio frequency (n=20)	Test of sig.	p
Nasal packing after operation	8b (40%)	2b (10%)	χ2=33 0.600*	<0.00 1*
Bleeding after pack removal	2b (10%)	0b (0%)	χ2=26 0.133*	<0.00 1*
Patient discomfort after pack removal	8b (40%)	2b (10%)	χ2=33 0.600*	<0.00 1*
Cacosmia	2b (10%)	0b (0%)	FET= 16.283*	<0.00 1*
Crustation	4b (20%)	1b (5%)	χ2=18 0.571*	<0.00 1*
Dryness	8b (40%)	4b (20%)	χ2=6. 667*	0.036 *
Post nasal discharge	5b (25%)	1b (5%)	χ2=10 0.398*	0.006 *
Adhesions	5a (25%)	0b (0%)	FET= 11.224*	0.005 *
Headache	2a (10%)	1a (5%)	FET= 4.768	0.122
Roomy nose	2b (10%)	0b (0%)	FET= 7.176*	0.031 *
Totalpercentageof complications	19%	5.5%		

χ2: Chi square test FET: Fisher Exact test p: p value for comparing between the three groups

*: Statistically significant at $p \leq 0.05$

Frequency with any Common letter (a-b) is not significant (OR Frequency with totally different letters (a-b) are significant)

Table 2 Comparison of the complications rate between the two groups one-month post-operative

	Diather my(n=20)	Radio frequency(n=20)	Test of sig.	p
Bleeding	4a (20%)	0a (0%)	FET =6.115	0.062
Crustation	3b (15%)	0b (0%)	FET =10.784*	0.004 *
Smell affection	4a (20%)	2a (10%)	FET =4.889	0.099
Dryness	3b (15%)	2b (10%)	$\chi2$=1 0.133*	0.006 *
Post nasal discharge	4a (20%)	1a (5%)	FET =3.211	0.305
Adhesions	2a (10%)	0a (0%)	FET =4.471	0.144
Headache	1a (5%)	0a (0%)	FET =4.639	0.115
Roomy nose	3a (15%)	0a (0%)	FET =4.471	0.144
Total percentage of complications	14%	3.5%		

$\chi2$: Chi square test FET: Fisher Exact test p: p value for comparing between the three groups

*: Statistically significant at $p \leq 0.05$

Frequency with any Common letter (a-b) is not significant (OR Frequency with totally different letters (a-b) are significant)

Table 3 Comparison of the complications rate between the two groups three months post-operative

	Diathermy(n=20)	Radio frequency(n=20)	FET	p
Bleeding	0a (0%)	0a (0%)	4.329	0.100
Crustation	2a (10%)	0a (0%)	4.239	0.150
Smell affection	2b (10%)	0b (0%)	7.449*	0.021*
Dryness	2b (10%)	0b (0%)	11.490*	0.002*
Postnasal discharge	1a (5%)	0a (0%)	3.111	0.310
Adhesions	2a (10%)	0a (0%)	3.030	0.353
Headache	1a (5%)	(10%) 2a	2.063	0.478
Roomy nose	2a (10%)	0a (0%)	4.239	0.150
Nasal obst	5a (25%)	(15%) 3a	1.602	0.572
Total percentage of complications	9.4%	2.7%%		

FET: Fisher Exact test, p: p value for comparing between the three groups*: Statistically significant at $p \leq 0.05$ Frequency with any Common letter (a-b) are not significant (OR Frequency with totally Different letters (a-b) are significant)

headache and roomy nose. with 19% in diathermy group and 5.5% in radiofrequency group. Table 1.

As regard to the first month after surgery with total complication percentage rate 14%in diathermy group and only 3.5%in radiofrequency group. The Comparison between the two types of surgery still shows significant difference in bleeding after surgery pvalue 0.062 as no patients in radiofrequency but little in diathermy **(3)**. Also radiofrequency patients showed very little manifestations of cacosmia, nasal crustations, dryness, postnasal discharge, adhesions, headache and roomy nose. while diathermy patients showed mild increase in cacosmia, crustations, dryness, postnanal discharge, adhesions, headache and roomy nose. Table 2.

After three months' the ratio subsided with total complication percentage rate 9.4%in diathermy group and only 2.7%in radiofrequency group. The two types of surgery show non-significant difference in bleeding after surgery as no patients in radiofrequency and diathermy p value 0.100 Also radiofrequency patients showed no manifestations of cacosmia, nasal crustations, dryness, Postnasal discharge, adhesions and roomy nose except headache (2) and nasal obstruction (3). while diathermy patients showed little manifestations in cacosmia, crustations, dryness, postnanal discharge, adhesions, headache and roomy nose but more patients suffered from recurrent nasal obstruction (4). Table 3.

After six months radiofrequency patients had no manifestations except two patients were suffering from headache with 2.7% overall complications, while diathermy patients showed complication rate 7% with little manifestations of cacosmia, crustations, dryness, postnasal discharge, adhesions, headache and roomy nose but five patients gave history of nasal obstruction. Table 4.

As regard In mucociliary activity following post turbinectomy in both groups, the tracer placed on mucosal surface was transported either laterally along the lateral wall or superior surface of the inferior turbinate or medially along the under surface of the middle turbinate to detect The average velocity, time and direction of Mucociliary Clearance at 6 months postoperativly as shown in Table 5.

Table 4 Comparison of the complications rate between the two groups six months post-operative

	my(n =	Diather 20)	Radio frequency(n=20)	FET	p
Bleeding	1a (5%)		0a (0%)	1.276	1.000
Crustation	(10%)	2a	0a (0%)	3.030	0.353
Smell affection	1a (5%)		0a (0%)	1.921	0.766
Dryness	(10%)	2a	0a (0%)	4.471	0.144
Post nasal discharge	0a (0%)		0a (0%)	1.851	1.000
Adhesions	(10%)	2a	0a (0%)	3.030	0.353
Headache	1a (5%)		(10%)	2a	2.063	0.478
Roomy nose	(10%)	2a	0a (0%)	4.239	0.150
Nasal obst	(20%)	4a	(15%)	3a	1.602	0.572
Total complications percentage of	7%		2.7%			

FET: Fisher Exact test

p: p value for comparing between the three groups

Frequency with any Common letter (a-b) is not significant (OR Frequency with totally different letters (a-b) are significant)

Table 5 The average velocity and time and direction of Mucociliary Clearance at 6 months postoperativly

	First group	Second group
Abnormal pathway	0%	0%
Average speed mm/min	1.4 mm/min	1.1 mm/min
Average time in minutes	7 min	9 min
Towards the nasopharynx from anterior to posterior	95%	92%

FET: Fisher Exact test

p: p value for comparing between the three groups

Frequency with any Common letter (a-b) is not significant (OR Frequency with totally different letters (a-b) are significant)

Discussion

Although many studies have been introduced to compare different methods of turbinate reduction, we couldn't find any similar work that discusses the complications incidence in each technique. This study is just important as it is the first one to compare the true rate of complications in each technique.

The critical point in this study is that patients included in the study were radiologically with similar or even equal structure component of the hypertrophied turbinate then doing the procedure by the same senior specialist that is why, comparing rate of complications in each technique of the two would be more realistic in determination of incidence of that particular complication.

Lukka VK et al., in their study mentioned that Authors reported that may be the needle of the diathermy or the radiofrequency probe did not even touch the turbinate's posterior end which could be reasons for the different outcome [6].

So in this work, we delivered the needle to the most posterior part till reduction in size is obtained. And not causing necrosis that to accomplish the equality of techniques as much as possible.

When comparing the complications outcome of different surgical techniques, several studies provide valuable insights with types of complication does not rate as recorded in this study.

About endoscopic partial inferior turbinectomy: The rate of significant postoperative bleeding is reported to be around 10.7%. The primary complications include postoperative bleeding, which occurs in approximately 100% of cases at time of nasal pack removal There is also a risk of more severe complications like atrophic rhinitis and "empty nose syndrome" due to excessive tissue removal about 20%. other complications as Crusting and Dryness about20%, Smell affection, Post nasal discharge, Adhesions, Headache, Roomy nose about 14.5%.

In this study the average complication rate recorded was 30.98% which is relatively high in comparison to other discussed two techniques.

For sub mucous diathermy of the inferior turbinate, previous studies have recorded that the average complications rate occur in approximately 5–10% of cases [7], while in this study complications rate recorded was 18.6%, with the most common issues being minor bleeding, infection, and nasal crusting. Specific complication rates include: Postoperative Bleeding: Reported in about 5% of cases. Crusting and Dryness about10%, Smell affection, Post nasal discharge, Adhesions, Headache, Roomy nose about9.4% Overall, sub mucous diathermy is considered a safe procedure with a favorable risk profile, particularly when compared to more invasive techniques like Partial inferior turbinectomy. In Radiofrequency ablation (RFA) for inferior turbinate reduction the complication rate is has a relatively low [8].

Hytönen et al. [9] found that postoperative pain is the commonest complain in 35 studies. Bhattacharyya in his study had declared that there was No reported bleeding as a serious complication in the literature [10]. Sapçı T, et al., reported two instances of epistaxis of 24 patients, only one of the patients needed nasal packing [11]. Sapçi T et al. [1].

In a study comparing mucociliary activity in patients undergoing partial turbinectomy, co2 laser ablation and RFA they have shown that there was no impairment to the mucociliary function in patients who had RFA with overall complication rate 3.6%for RFA. Starting with Postoperative bleeding with avery low incidence rate 1%. Common minor complications include temporary crusting and nasal dryness about 2%, headache2.5%, Smell affection, Post.

nasal discharge, Adhesions, Headache, and Roomy nose about 1.5%. No cases reported synechiae 0%. However, these are much less frequent compared to more invasive surgical options like partial turbinectomy or sub mucous diathermy.

Overall, RFA is considered an effective and safe method for reduction of hypertrophic inferior turbinates with favorable safety and lower complication rates compared to other surgical techniques.

Study Constraints

The primary limitation of this study is the small sample size, which may affect the broader applicability of these results. Further research with larger numbers is mandatory to validate and expand the results.

Conclusion

The study reveals that the three procedures are effective in relieving nasal blockage due to hypertrophied inferior turbinate. These techniques are widely utilized and safe with less complications rate in radiofrequency technique in comparison with the sub mucous diathermy in reduction of hypertrophied inferior turbinates.

Funding No funding was received for this work.

Data Availability The data underpinning the findings and interpretations of this study can be obtained from the corresponding author upon submission of a justified request.

Declarations

Ethics Approval The study was approved by the Research Ethics Committee, Faculty of Medicine (Approval no: Rc 2-5-2023).

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest No conflict of interest.

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