Section: Otorhinolaryngology

Original Research Article

A COMPARITIVE STUDY OF VARIOUS SURGICAL METHODS USED IN THE REDUCTION OF HYPERTROPHIED INFERIOR TURBINATE

Priyanka Gudepu[1], Mudassar Ahmed Shariff[2], Sushma Nayak[3], Lingaraju N[4], Abhishek MP[5]

[1]*Senior Resident, Department of Otorhinolaryngology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, India.*
[2]*Professor and Head, Department of Otorhinolaryngology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, India.*
[3]*Associate Professor, Department of Otorhinolaryngology, Adichunchunaguri Institute of Medical Sciences, Adichunchunaguri, India.*
[4]*Assistant Professor, Department of Otorhinolaryngology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, India.*
[5]*Assistant Professor, Department of Otorhinolaryngology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, India.*

Received *: 17/06/2026*
Received in revised form *: 08/08/2026*
Accepted *: 23/08/2026*

Corresponding Author:
Dr. Priyanka Gudepu,
Senior Resident, Department of Otorhinolaryngology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, India.
Email: priyagudepu@gmail.com

DOI: 10.70034/ijmedph.2026.3.571

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 3649-3655

ABSTRACT

Background: Inferior turbinate hypertrophy (ITH) is a common cause of chronic nasal obstruction and significantly affects quality of life. When medical treatment fails, surgical reduction of the inferior turbinate is indicated. Numerous techniques are available, but the optimal procedure remains debated. This study compared partial inferior turbinectomy, turbinoplasty, and submucous diathermy in patients with symptomatic inferior turbinate hypertrophy. Objectives: A randomized comparative study was conducted in the Department of Otorhinolaryngology at Chamarajanagar Institute of Medical Sciences. Seventy-eight patients aged 18–50 years with persistent nasal obstruction due to inferior turbinate hypertrophy unresponsive to medical therapy were enrolled and allocated equally into three groups: partial turbinectomy, turbinoplasty, and submucous diathermy. Preoperative assessment included anterior rhinoscopy, diagnostic nasal endoscopy, CT scan of the nose and paranasal sinuses, and SNOT‑22 scoring. Patients were followed for three months postoperatively and reassessed using the same parameters.

Materials and Methods: A randomized study was conducted over 1year 10 months, including 78 patients undergoing elective inferior turbinate reduction. Preoperative evaluation included CT scans to measure turbinate size, anterior rhinoscopy, diagnostic nasal endoscopy (DNE), and SNOT-22 scoring. Postoperative assessments were done using the same parameters to compare surgical outcomes
across the three groups.

Results: The mean age of participants was 32.47 years. Partial turbinectomy demonstrated the greatest reduction in turbinate size and the largest improvement in SNOT‑22 scores. Turbinoplasty showed substantial improvement with fewer complications. Submucous diathermy produced symptom relief but demonstrated comparatively less reduction in turbinate size. Postoperative complications such as synechiae, hemorrhage, and crusting were highest in the partial turbinectomy group and lowest in the submucous diathermy group.

Conclusion: Partial turbinectomy provided the most effective reduction of turbinate hypertrophy and the greatest symptomatic improvement, whereas turbinoplasty offered a favorable balance between efficacy and safety. Submucous diathermy was associated with the lowest complication rate but comparatively lower efficacy.

Keywords: (3–5 MeSH terms), Inferior turbinate hypertrophy, turbinectomy, turbinoplasty, submucous diathermy, nasal obstruction, SNOT‑22.

INTRODUCTION

The nose, especially the inferior turbinate, plays a vital role in nasal physiology, thereby helping to maintain nasal airflow. The inferior turbinate has various functions, such as humidification, filtration, and warming of the nasal cavities. These functions contribute to the nasal cycle and airflow in the nose.[1,2]

Inferior turbinate hypertrophy is an enlargement of the turbinate involving the mucosa and the bone. When the turbinate enlarges, it can cause nasal obstruction. Nasal obstruction is one of the most common symptoms that lead patients to Otorhinolaryngologists. It interferes with the quality of life and causes regular discomfort to patients. Though this condition has a high prevalence, the exact figures are not known; a study found that 72% of the patients had inferior turbinate hypertrophy, with 68% of them being eligible for surgical intervention.[3]

The causes for inferior turbinate hypertrophy are as follows:

- Septal deviation
- Chronic hypertrophic rhinitis
- Vasomotor rhinitis
- Allergic rhinitis.[4]

MATERIALS AND METHODS

Study population: Patients admitted to Chamarajanagar Institute of Medical Sciences, posted for elective inferior hypertrophied turbinate surgeries.

Methods of collection of data:

Study design: Randomised Study

Study period: 1 year 10 months, From July 2023 to April 2025.

Place of study: Place of study: In department of Otorhinolaryngology, Chamarajanagar Institute of medical sciences

Sample Size: The sample size was calculated by using prevalence:

Prevalence of hypertrophied inferior turbinate is 72%

The sample size was calculated by using the following formula:

$$n = \frac{(Z_{1-\alpha/2})^2 p(1-p)}{(d)^2}$$

where Z1−α/2 is the critical value of the normal distribution at α (e.g. for a confidence level of 95%), α is 0.05

the critical value is 1.96,

p is the expected prevalence = 72 % = 0.72

and d is the margin of error = 10%

n = (1.96) 2 × 0.72 × (1 − 0.72)÷ (0.10) 2

n = 78

The sample size is 78 according to the above-mentioned formula.

Patients were divided into three groups each of 26 according to the surgery performed

Inclusion Criteria

- Age more than 18 years and less than 50 years
- Both male and female patients were considered for study
- Adult patients with nasal obstruction and inferior turbinate hypertrophy not responding to medical treatment with or without septal deviation with or without allergic rhinitis
- Patient willing to participate with written informed consent

Exclusion Criteria

Nasal obstruction with inferior turbinate hypertrophy with

a. Sino nasal polyposis
b. Fungal sinusitis
c. Neoplasm

Ethics Approval

After ethical committee clearance and informed written consent have been taken, seventy-eight patients fulfilling the inclusion criteria, posted for elective turbinate surgeries were included in the study.

Confidentiality was maintained throughout the study. Written and informed consent were obtained from all the patients. There was no physical harm for the participants. Ethical considerations were adhered to throughout the study.

Surgical Procedures

The 3 surgical procedures done in our study are described as follows:

a. Partial inferior turbinectomy Using a 0-degree endoscope, local infiltration is given over the turbinate area to be excised. A mucosal incision is given, and an elevator is passed through it. The hypertrophied parts of the turbinate are excised, including the mucosa and the bone.
b. Submucous diathermy. After injecting local anaesthetic, an insulated Abbey needle is passed into the turbinate and diathermy is passed. The needle is passed into 2-3 positions of the turbinate. It is a monopolar technique. The mucosa is destroyed, leading to a reduction in size by fibrosis.
c. Turbinoplasty: After local infiltration, an incision is made over the border of the turbinate. The bony surface is exposed and excised, along with submucosal tissue and redundant mucosa. The excess mucosa is used to cover the bone. At the end of the procedure, the turbinate size is reduced, and the mucosa is preserved

Outcome Measures

Post operative period

Nasal packing is done post-procedure and removed at 1-2 days postsurgery.

Patients were started on oral antihistamines, analgesics and antibiotics.

Decongestant nasal drops were also given.

The following tests were repeated at 3 months

- Anterior rhinoscopy

- SNOT 22 questionnaire
- nasal endoscopy

As per the SNOT 22 scoring, nasal obstruction was considered as follows:
mild 8 to 17
moderate 22.5 to 48
severe 54 to 83

Statistical Analysis

For age distribution, mean, standard deviation was used along with one-way ANOVA test to find if age significantly differed between the three groups.

For sex distribution, frequency and percentage was used along with Pearson chi-square test to find if sex significantly differed between the three groups.

For Inferior turbinate size on A/R, DNE and CT, frequency and percentage was used along with Pearson chi-square test to find if the findings significantly differed between the three groups

For postoperative findings on synechiae hemorrhage and crusting, frequency and percentage was used along with Pearson chi-square test to find if the findings significantly differed between the three groups

All the analysis was computed on SPSS version 27 for windows.

Post analysis, the tables were organized meaningful for clear understanding of results along with required interpretations and graphical representations.

RESULTS

1. The overall mean age in the study was 32.47 years. The individual groups had almost similar mean age with the Submucous Diathermy group having a lower mean age of 29.30 years and Turbinoplasty group with 35.5 years. There was no statistical relevance.
2. There was a dominance of males 57.7% over females 42.3% in the study. The same trend was seen in the 3 groups with no statistical relevance.
3. Pre operatively there was no significant difference among the 3 groups in terms of turbinate size when visualised on anterior rhinoscopy.
4. A significant reduction in the inferior turbinate size was seen post-surgery on anterior rhinoscopy. There was more reduction seen in patients who underwent partial turbinectomy followed by turbinoplasty and least in Submucous diathermy which had a comparatively lesser reduction.
5. There was no significant difference in the nasal endoscopy findings in terms of turbinate size on nasal endoscopy among the groups pre operatively.
6. There was a significant reduction in the turbinate size post-surgery, with maximum reduction in the group that underwent partial turbinectomy followed by and the least reduction in the patients who underwent Submucous diathermy as seen on nasal endoscopy.
7. On CT PNS. there was no statistically significant difference in the size of turbinates among the groups pre operatively. All 3 groups had a greater number of patients with Grade 4 turbinate followed by Grade 3.
8. SNOT 22 were similar among the 3 groups pre operatively. Hence there was no pre operative differences that could influence the post-surgical outcomes.
9. Post operatively it was seen that SNOT 22 scores improved in all groups with a significant reduction by partial turbinectomy. Turbinoplasty had reductions to some extent, and the group that underwent submucous diathermy had the least improvements.
10. 26.9% patients who underwent partial turbinectomy developed synechia and 7.7% of patients who underwent turbinoplasty developed synechia. None of the patients who underwent submucosal diathermy had synechiae formation post operatively.
11. Hemorrhage was seen in 23.1% of patients who underwent partial turbinectomy and in 11.5% of patients who underwent turbinoplasty. The patients who underwent submucous diathermy did not experience any bleeding.
12. Crusting was seen majorly in partial turbinectomy patients (30.8%) followed by turbinoplasty (11.5%) and the least in Submucous Diathermy group (3.3%).

Table 1: Comparison of Inferior Turbinate Size on Anterior Rhinoscopy before and After Surgery

Groups	Size of Inferior Turbinate on A/R	F/%	Pre-op	Post-op	Pearson chi-square test
Partial turbinectomy	Grade 1	F	0	22	$X^2 = 48.365$
		%	0.0%	84.6%	p = .001
	Grade 2	F	0	3	
		%	0.0%	11.5%	
	Grade 3	F	10	1	
		%	38.5%	3.8%	
	Grade 4	F	16	0	
		%	61.5%	0.0%	
Submucous Diathermy	Grade 1	F	0	13	$X^2 = 45.455$
		%	0.0%	50.0%	p = .001
	Grade 2	F	0	11	
		%	0.0%	42.3%	
	Grade 3	F	9	2	

		%	34.6%	7.7%	
	Grade 4	F	17	0	
		%	65.4%	0.0%	
Turbinoplasty	Grade 1	F	0	19	$X^2 = 40.00$ p = .001
		%	0.0%	73.1%	
	Grade 2	F	0	3	
		%	0.0%	11.5%	
	Grade 3	F	12	4	
		%	46.2%	15.4%	
	Grade 4	F	14	0	
		%	53.8%	0.0%	
Total	Grade 1	F	0	54	$X^2 = 133.158$ p = .001
		%	0.0%	69.2%	
	Grade 2	F	0	17	
		%	0.0%	21.8%	
	Grade 3	F	31	9	
		%	39.7%	9.0%	
	Grade 4	F	47	0	
		%	60.3%	0.0%	

Table 2: Comparison of SNOT-22 Scores Before and After Surgery among the Three Study Groups

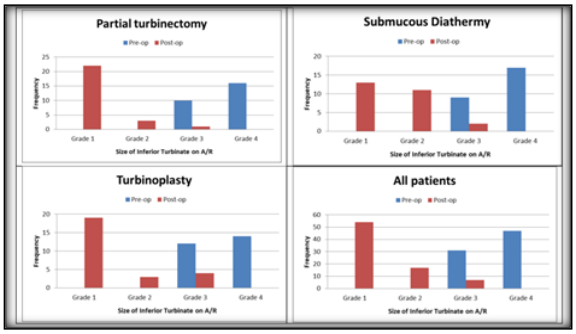
SNOT-22	Groups	Mean	SD	One-way ANOVA
Pre-op	Partial turbinectomy	72.31	14.72	F = 0.327 p = .722
	Submucous Diathermy	72.77	25.36	
	Turbinoplasty	76.77	23.99	
	Total	73.95	21.68	
Post-op	Partial turbinectomy	15.92	7.58	F = 14.405 p = .001
	Submucous Diathermy	33.65	16.37	
	Turbinoplasty	21.77	10.80	
	Total	23.78	14.09	
Repeated measure ANOVA - F(time)		F = 608.656; p = .001		
Repeated measure ANOVA F(time*groups)		F = 7.423; p = .001		

Table 3: Comparison of Inferior Turbinate Size on DNE Before and After Surgery

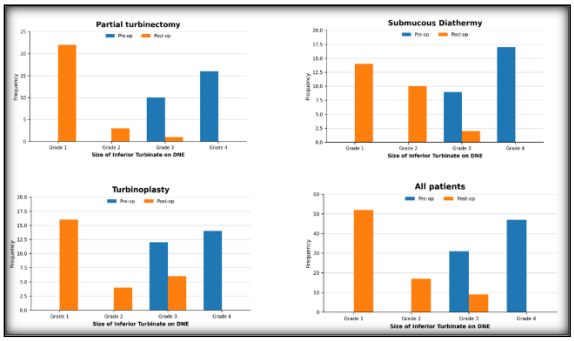
Groups	Size of Inferior Turbinate on DNE	F/%	Pre-op	Post-op	Pearson chi-square test
Partial turbinectomy	Grade 1	F	0	22	$X^2 = 48.33$ p = .001
		%	0.0%	84.6%	
	Grade 2	F	0	3	
		%	0.0%	11.5%	
	Grade 3	F	11	1	
		%	42.3%	3.8%	
	Grade 4	F	15	0	
		%	57.7%	0.0%	
Submucous Diathermy	Grade 1	F	0	14	$X^2 = 45.33$ p = .001
		%	0.0%	53.8%	
	Grade 2	F	0	10	
		%	0.0%	38.5%	
	Grade 3	F	10	2	
		%	38.5%	7.7%	
	Grade 4	F	16	0	
		%	61.5%	0.0%	
Turbinoplasty	Grade 1	F	0	16	$X^2 = 37.60$ p = .001
		%	0.0%	61.5%	
	Grade 2	F	0	4	
		%	0.0%	15.4%	
	Grade 3	F	9	6	
		%	34.6%	23.1%	
	Grade 4	F	17	0	
		%	65.4%	0.0%	
Total	Grade 1	F	0	52	$X^2 = 128.308$ p = .001
		%	0.0%	66.7%	
	Grade 2	F	0	17	
		%	0.0%	21.8%	
	Grade 3	F	30	9	
		%	38.5%	11.5%	
	Grade 4	F	48	0	
		%	61.5%	0.0%	

Table 4: Comparison of Post-operative Complications among the Three Study Groups

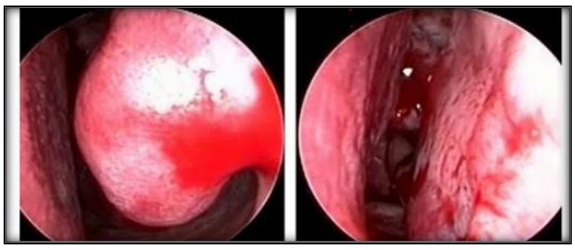
Complication	Status	F/%	Partial turbinectomy	Submucous Diathermy	Turbinoplasty	Pearson chi-square
Synechiae	No	F	19	26	24	$X^2 = 9.797$
		%	73.1%	100.0%	92.3%	p = .007
	Yes	F	7	0	2	
		%	26.9%	0.0%	7.7%	
Hemorrhage	No	F	20	26	23	$X^2 = 6.782$
		%	76.9%	100.0%	88.5%	p = .033
	Yes	F	6	0	3	
		%	23.1%	0.0%	11.5%	
Crusting	No	F	18	25	23	$X^2 = 7.681$
		%	69.2%	96.2%	88.5%	p = .021
	Yes	F	8	1	3	
		%	30.8%	3.8%	11.5%	



Graph 1: Comparison of Inferior Turbinate Size on Anterior Rhinoscopy before and After Surgery

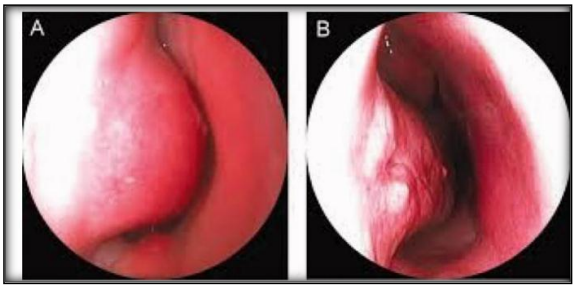


Graph 2: Comparison of Inferior Turbinate Size on Diagnostic Nasal Endoscopy Before and After Surgery



Figure/image 1: pre op and post op images of partial turbinectomy

Figure/image 2: pre and post op images of submucosal diathermy



Figure/image 3: pre op and post op images of turbinoplasty

DISCUSSION

A randomised study was conducted in the Department of Otorhinolaryngology, Chamarajanagar Institute of medical sciences, over a period of 1 year 10 months in patients undergoing elective surgeries for inferior turbinate reduction. A total of 78 patients were included. The study involved assessment of nasal obstruction using SNOT 22 scores pre operatively and comparing it with the SNOT 22 post reduction of IT surgery. Also, the nasal endoscopic findings were compared pre and post operatively. The outcomes in the 3 groups who underwent the 3 different types of surgeries (Partial inferior turbinectomy, Turbinoplasty and Submucous diathermy) in these terms are discussed.

Pre and post operative findings on Anterior rhinoscopy:

Preoperatively, there was no significant difference among the 3 groups in terms of turbinate size when visualised on anterior rhinoscopy. This implies that our groups were comparable preoperatively in terms of turbinate sizes. If, however, there were significant differences between the groups preoperatively in turbinate size, the veracity of results postoperatively may have been compromised. However, a significant reduction in the inferior turbinate size was seen post-surgery. More reduction was seen in patients who underwent partial turbinectomy followed by turbinoplasty, and the least in Submucous diathermy, which had a comparatively lesser reduction. This difference could be due to more resection of turbinate tissue seen in partial turbinectomy than submucosal diathermy. The

submucosal diathermy of the turbinate is a mucosal sparing technique where a thin diathermy needle is inserted into the turbinate and an electric current is applied. This doesn't reduce the volume of the turbinate as much as other procedures used in our study.

Pre and post operative findings on nasal endoscopy:

There was no significant difference in the nasal endoscopy findings in terms of turbinate size on nasal endoscopy among the groups pre operatively. In other words, like in anterior rhinoscopy, our groups were comparable with regard to the size of the inferior turbinates on nasal endoscopy preoperatively.

However, there was a significant reduction in the turbinate size post-surgery, with maximum reduction in the group that underwent partial turbinectomy followed by and the least reduction in the patients who underwent Submucous diathermy. A study by Bhagat PR et al compared nasal endoscopic findings pre and postoperatively in patients who underwent submucous diathermy and other methods such as coblation and found reduction in the endoscopic grading of IT size in all groups post operatively.[5] As seen in our study, a reduction in turbinate size is seen in all methods. However, the partial turbinectomy methods showed better reduction, probably due to more extensive removal of turbinate tissue and not just at the mucosal level. Partial turbinectomy removes the entire hypertrophied part of the turbinate. Using an elevator the turbinate it is repositioned medially, and the hypertrophied portions usually at the posterior end are dissected out using turbinectomy scissors. This method is very effective at reducing turbinate volumes.

CT PNS findings: Pre operatively CT PNS was done to measure the size of the IT pre operatively. There was no statistically significant difference in the size of turbinates among the groups pre operatively. All 3 groups had a greater number of patients with Grade 4 turbinate followed by Grade 3. There aren't any studies in the literature comparing CT findings among the 3 methods. However, most patients had grade 3 -4 turbinate size prior to surgery. Our study also suggests that a higher grade of turbinates requires surgical intervention for better outcomes.

In a study by Mrig et al., the inferior turbinates on CT PNS preoperatively showed maximum hypertrophy in the middle part. The average mean measurement was 10.01 mm in the patients with ITH compared to 5.58 mm in a normal control group.[6] Jha AK et al in their study, on CT PNS evaluated certain measurements such as total mucosal thickening, medial mucosal thickness, bone thickness lateral mucosal thickness by comparing the hypertrophied turbinates with a control group of non-hypertrophied turbinates on the opposite side of the same patients. They found a positive correlation between medial mucosal thickening and bone thickness in turbinate hypertrophic group.[7] Therefore, certain measurements and findings on CT are helpful to assess the turbinates pre operatively and plan for surgical management.

Pre operative and post operative SNOT 22 scores: Here too there were similar scores among the 3 groups pre operatively. Hence there was no pre operative differences that could influence the post-surgical outcomes. However, postoperatively, it was seen that SNOT 22 scores improved in all groups significantly, with a better reduction by partial turbinectomy. Turbinoplasty had reductions to some extent, and the group that underwent submucous diathermy had the least improvement compared to the other two groups. A study by Ganagraj SS et, assessed outcomes by using VAS scores. They found that the group that underwent partial inferior turbinectomy had better scores than the group that underwent submucosal diathermy.[8]

However, in a study by Bhagat PR et al the mean SNOT 22 score reduced from 39.33 pre operatively to 10.4 post operatively at 3 months in the group that underwent submucous resection.[5] We see that reduction in turbinate size provides a better quality of life. A reduction in turbinate size surgically provides better SNOT scores post operatively as seen in most studies irrespective of the type of method used. Hence, a surgical intervention should be recommended in patients with ITH refractory to other lines of treatment. SNOT-22 is one of the commonly used questionnaires that helps us understand the improvement in QoL pertinent to sinus and nose related problems.

Post operative findings: During the post operative follow up, though partial turbinectomy showed better reduction in turbinate size it had the maximum synechiae formation. 26.9% patients who underwent partial turbinectomy developed synechia and 7.7% of patients who underwent turbinoplasty developed synechia. None of the patients who underwent submucosal diathermy had synechiae formation post operatively. And this finding was significant statistically as well. Mucosal sparing techniques which cause minimal to no disruption of the mucosa overlying the bone tend to cause less of synechia. Intranasal synechiae develop as a result of improper healing of the 2 exposed surfaces during rhino surgical procedures. Any manipulations on the lateral wall and mucosal surfaces of the turbinates can lead to adhesions between them. The cell cytokine balance is hampered leading to synechiae formation.[9]

In a study by Ganaraj SS et al only few patients who underwent partial inferior turbinectomy developed synechiae and none in the submucosal diathermy group.[8]

Hemorrhage was seen in 23.1% of patients who underwent partial turbinectomy and in 11.5% of patients who underwent turbinoplasty. The patients who underwent submucous diathermy did not experience any bleeding. Similarly in a study by Akbar a et al, there was lesser bleeding in the submucosal diathermy group when compared to the group that underwent partial inferior turbinectomy

[10]. These findings are in accordance with our study. Similar findings were also seen in a study by Gangaraj SS et al with the partial inferior turbinectomy group having comparatively more bleeding the submucous diathermy group [8]. A study by El-Magd EA also followed the same trend [11]. Here, also, submucous diathermy performs better in relation to other techniques.

The inferior turbinate is mainly supplied by the sphenopalatine artery and its main branch, the posterior lateral nasal branch. Its surface is covered with a rich network of blood vessels, so any minor damage can lead to haemorrhage. The high vascularity contributes to the haemorrhage, which may be immediate or occur later due to dislodgement of the crusts. Patients with anticoagulants or hypertension are at risk of nasal bleeds. Finally, trauma to the nose during pack removal or forceful sneezing can lead to minor bleeds.

Again, crusting was also seen majorly in partial turbinectomy patients (30.8%), followed by turbinoplasty (11.5%), and the least in the Submucous Diathermy group (3.3%).Similarly, in a study by Akbar et al, there was more crusting seen in the partial turbinectomy group than the submucosal diathermy group, as seen in our study [10]. Nasal crusts are formed when dried-up mucus and debris collect after surgery. They can cause nasal blockage, pain, and discomfort. Crust formation also delays the mucosa's healing process.[12] Also, in a study by Ganaraj SS et al, higher crusting was seen in the partial turbinectomy group than submucosal diathermy group.[8]

CONCLUSION

In a randomized control study that compared partial turbinectomy, turbinoplasty and submucous resection in patients who underwent surgical intervention as they were refractory to medical treatment observed that partial turbinoplasty has better surgical outcomes in terms of reducing turbinate size. The complications seem to be more with partial turbinectomy too. However, considering the nature of the complications such as post operative bleed, synechiae formation and crusting, it can be managed without much stress or surgical requirements. Hence partial turbinectomy can be considered as the first choice in patients undergoing IT reduction surgeries followed by turbinoplasty and last option being submucous diathermy.

REFERENCES

1. Scheithauer MO. Surgery of the turbinates and “empty nose” syndrome. GMS current topics in otorhinolaryngology, head and neck surgery. 2011 Apr 27;9:Doc03.
2. Juniper EF. Impact of upper respiratory allergic diseases on quality of life. Journal of allergy and clinical immunology. 1998 Feb 1;101(2):S386-91.
3. Clark DW, Del Signore AG, Raithatha R, Senior BA. Nasal airway obstruction: prevalence and anatomic contributors. Ear, Nose & Throat Journal. 2018 Jun;97(6):173- 6.
4. Harju T, Kivekäs I, Numminen J, Rautiainen M. Eustachian tube dysfunction–related symptoms in chronic nasal obstruction caused by inferior turbinate enlargement. Annals of Otology, Rhinology & Laryngology. 2017 Dec;126(12):798-803.
5. Bhagat PR, Bathla M, Doshi H, Solanki K, Gajjar R. A study of comparison of outcomes of submucous diathermy, coblation and micro-debrider assisted inferior turbinoplasty in patients having inferior turbinate hypertrophy. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024 Jun;76(3):2548-56.
6. Mrig S, Agarwal AK, Passey JC. Preoperative Computed Tomographic Evaluation of Inferior Nasal Concha Hypertrophy and its Role in Deciding Surgical Treatment Modality in Patients with Deviated Nasal Septum. International Journal of Morphology. 2009 Jun 1;27(2).
7. Jha AK, Ghimire P, Shrestha S. Radiological Evaluation of Inferior Turbinate in Patients with Deviated Nasal Septum using Computed Tomography. Nepalese Journal of Radiology 2020;10(16):16-21.
8. Gangaraj SS, Thomas S. Partial inferior turbinectomy versus submucosal diathermy in hypertrophied inferior turbinates. Int J Otorhinolarngol Head Neck Surg. 2020;6(11):2011-6.
9. Bassiouni A., Naidoo Y., Wormald P.J. Does mucosal remodeling in chronic rhinosinusitis result in irreversible mucosal disease? Laryngoscope. 2012;122:225–229.
10. Akbar A, Umer M, Majeed AI, Afzal A. Comparison of Submucosal Diathermy and Partial Inferior Turbinectomy in Patients of Inferior Turbinate Hypertrophy. Annals of PIMS ISSN. 1815;2287
11. El-Magd EA, Rezk I, Sobh KM. A comparative study between sub mucous diathermy with or without inferior partial turbinectomy. International Journal of Otolaryngology and Head & Neck Surgery. 2017 Dec 28;7(1):26-33.
12. Curran K, Adepoju A, Pinheiro-Neto C, Peris-Celda M, Kenning T. Nasal crust-related morbidity and debridement after endoscopic skull base surgery. International Archives of Otorhinolaryngology. 2023 Jun 9;27(2):336-41.