International Journal of Otorhinolaryngology and Head and Neck Surgery
Jadhav SG et al. Int J Otorhinolaryngol Head Neck Surg. 2022 Oct;8(10):826-832
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20222443

Original Research Article

A comparative study between cobblator and microdebrider assisted inferior turbinate reduction surgery

Santosh Govindrao Jadhav[1], Balaji Shankarrao Mane[1]*, Kiran Bibhishan Naikwadi[2], Rushali Madhukar Gavali[3]

[1]Department of Otorhinolaryngology, Ashwini Rural Medical College and Hospital, Solapur, Maharashtra, India
[2]Department of Engineering Sciences & Allied Engineering, Bharati Vidyapeeth's College of Engineering For Women, Pune, Maharashtra, India
[3]Ashwini Rural Medical College and Hospital, Solapur, Maharashtra, India

Received: 15 August 2022
Revised: 13 September 2022
Accepted: 14 September 2022

***Correspondence:**
Dr. Balaji Shankarrao Mane,
E-mail: drbalajimane90@gmail.com

ABSTRACT

Background: Inferior turbinate hypertrophy (ITH) management includes medical and surgical line which reduces the size of the turbinate. The surgical line of management includes old partial and total turbinectomy to newer technique as submucous inferior turbinate reduction (ITR) using cobblation, microdebrider, radiofrequency ablation, diathermy, cryotherapy, and laser therapy.
Methods: Our study was duration based prospective observational study conducted between August 2021 to August 2022 in department of otorhinolaryngology at our institute with total of 160 patients who have undergone turbinate reduction surgery during 1 year duration. Half number of patients have undergone microdebrider assisted submucous inferior turbinate reduction surgery (group A) and remaining half number have undergone cobblator assisted submucous Inferior turbinate reduction surgery (group B). Comparison of pre-operative and postoperative data of each surgical technique was the aim of our study.
Results: On comparing the nasal obstruction symptom evaluation (NOSE) score using unpaired t test, between the two techniques on each follow up days respectively, it was found that cobblation provided better improvement than microdebrider on each day and the results were highly significant with p value <0.01. On comparing the pre-operative and post-operative (day 60) inferior turbinate size using paired t test, the result of the test was statistically significant with p value <0.01 in both nostrils using both the techniques.
Conclusions: Submucosal inferior turbinate reduction surgery for ITH using either microdebrider or cobblator technique shown better improvement in terms of NOSE score improvement, Inferior turbinate size reduction, mucocilliary transit time improvement.

Keywords: Microdebrider, Cobblator, Inferior turbinate hypertrophy, Submucosal, NOSE score

INTRODUCTION

The human nose serves the function of filtration of inspired air, warms and humidify inspired air which reaches to the pulmonary system. The nasal passage patency and intact mucocilliary clearance determines the optimal nasal airflow. Nasal obstruction may be caused by a wide range of anatomic, physiologic, and pathophysiologic factors.[1] Inferior turbinate hypertrophy (ITH) is the most common cause of nasal obstruction among various causes of nasal obstruction.[2] Inferolateral nasal wall has an attachment to a separate bone called inferior turbinate which is 50-60 mm in length, 7.5 mm in height, and 3.8 mm width.[3]

Nasal resistance and nasal diffusion are the two important functions with rest functions as nasal defence system, mucocilliary transport are served by the inferior turbinate. Inspiratory resistance contributes to the nasal resistance. higher nasal resistance leads to increased pulmonary ventilation and venous backflow to lungs during inspiration. Turbulence of airflow from lamellar airflow due to inferior turbinate obstructing at the level of nasal valve area leads to more interaction between air and nasal mucosa with resultant nasal diffusion function as humidification, warming up and cleansing of air. All these functions of nose need large amount of functional nasal mucosa, submucosa and inferior turbinate parenchyma.[4]

Soft tissue, bony and mixed variations contribute to nasal obstruction due to inferior turbinate among which soft tissue hypertrophy is the most common and is seen in cases of chronic rhinitis like allergic rhinitis, nonallergic rhinitis with eosinophilic syndrome. Bony hypertrophy is caused by progressive ossification of bone leading to prominent inferolateral turn. Mixed soft tissue and bony hypertrophy is seen in chronic rhinitis cases.[5]

ITH management includes medical and surgical line with most cases managed medically using antihistaminic, topical decongestants, corticosteroids but certain non-responding patients' needs surgical treatment which reduces the size of the turbinate to decrease nasal blockage symptoms. The surgical line of management differs from each other based on the preservation of normal physiological function including old partial and total turbinectomy to newer technique as submucous inferior turbinate reduction (ITR) using cobblation, microdebrider, radiofrequency ablation, diathermy, cryotherapy, laser therapy. Partial or total turbinectomy were performed previously as short and easy procedures with less need for instruments or skill without preservation of normal physiological function leaving the cut surface prone to crust formation and synechiae and also associated with more bleeding.[6]

The newer techniques of submucous reduction of inferior turbinate preserves the normal physiological function among which submucosal diathermy still remains a popular technique due to ease and less complications but most of the surgeons have recently started using microdebrider after introducing microdebrider to rhinosurgery by Setliff et al.[7]

Submucosal inferior turbinate reduction using cobblator destroys and vaporize soft tissue leading to immediate volume reduction and long-term tissue fibrosis with resultant shrinkage of the inferior turbinates.[8]

So, there is need to compare the Inferior turbinate reduction surgery using microdebrider with cobblator so we have conducted the study with the aim to compare to compare these two surgical groups.

METHODS

Study design

Our study was duration based prospective observational study conducted between August 2021 to August 2022 in department of otorhinolaryngology at our institute with total of 160 patients who have undergone turbinate reduction surgery during 1 year duration. Screening of the patients coming to ear, nose and throat (ENT) outpatient department (OPD) with symptoms of persistent nasal blockade, sneezing, persistent nasal discharge and post nasal drip was done with anterior rhinoscopy and diagnostic nasal endoscopy. We have included in our study the patients with ITH due to any causes like persistent allergic rhinitis not relieved by medications, nonallergic rhinitis with eosinophilic syndrome. Exclusion criteria for our study were individuals with any other causes of nasal blockade other than ITH, patients with proven granulomatous infection of nose and previously operated nasal surgery patients. Those included patients were subjected to pre-operative assessment using nasal obstruction symptoms evaluation scale (NOSE score) (Table 1), endoscopic findings and mucociliary transit time (MTT) using saccharin test.[9] Diagnostic endoscopy performed in all patients to rule out any other endonasal pathology other than ITH and also to assess the nasal patency in terms of percentage at the level of internal nasal valve area. Mucociliary transit time (saccharin test) was performed with the patient in seating position, a saccharin granule was placed on the anterior part of inferior turbinate, and we have determined the time required to experience a sweet taste, then patient is asked to swallow every 30 seconds; immediately after the patients tasted the saccharin, the test was stopped. Time was measured in minutes. Out of 160 patients half number of patients have undergone microdebrider assisted submucous inferior turbinate reduction surgery (group A) and remaining half number of patients have undergone cobblator assisted submucous inferior turbinate reduction surgery (group B). All patients underwent a screening.

Table 1: Nose score (nasal obstruction symptoms evaluation scale) (9) using a questionnaire.

Parameters	Not a problem	Very mild problem	Moderate problem	Fairy bad problem	Severe problem
Nasal congestion or stuffiness	0	1	2	3	4
Nasal blockage or obstruction	0	1	2	3	4
Trouble breathing through my nose	0	1	2	3	4
Trouble sleeping	0	1	2	3	4
Unable to get enough air through my nose while exercise or exertion	0	1	2	3	4

All patients in group A and group B were followed up at 7th, 15th, 30th, 45th, and 60th postoperative day with same postoperative care. NOSE scores and diagnostic nasal endoscopy and documentation of all possible complications like postoperative crusting, synechiae were performed on the aforementioned follow-up days. MTT was performed at the end of 60th day. Above three parameters were compared pre-operatively and post-operatively between group A and group B. Both groups surgical procedures were performed under general anaesthesia with the patient in supine position followed by painting and draping. The size of the Inferior turbinate always assessed using zero-degree endoscope. Local infiltration of Inferior turbinate done with 2% lignocaine + adrenaline. In group A, longitudinal incision was taken over the anterior aspect of inferior turbinate of about 0.5 cm using no. 15 sterile surgical blade and a 4 mm microdebrider straight blade inserted into the inferior turbinate longitudinally through the incision site (Figure 1). Submucosal debridement of inferior turbinate along with shaving off a part of bony turbinate was done keeping the mucosa intact along the entire length of inferior turbinate the choana (Figure 2).

In group B, cobblator wand array 45 with 3 visual markings over it which are used to gauge the depth of penetration of the wand (Figure 3). The wand is inserted starting at the anterior head of the Inferior turbinate upto first, second and third markings are reached. Once third Mark has been reached cobblation was performed for a period of 10 seconds then wand withdrawn upto second mark and cobblation performed for 10 seconds followed with further withdrawal upto first mark and cobblation performed for another 10 seconds and finally the entry point cauterized with same wand. The procedure repeated at three levels depending on the extent of ITH (Figure 4).

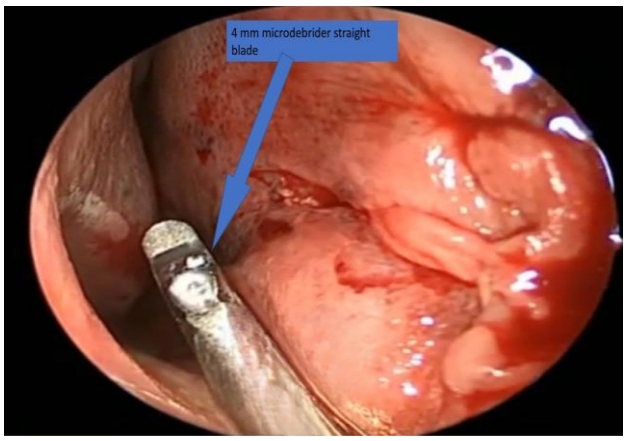

Figure 1: A 4 mm microdebrider straight blade within nasal cavity seen through zero-degree endoscope.

In both group A and B, at the end of procedures, nasal cavity was packed with roller gauze soaked with antibiotic and liquid paraffin. Nasal pack was removed after 48 hours and post operative nasal douching given for 15 days. Follow up was done on the 7th,15th, 30th, 45th and 60th day.

All the collected data was entered in Microsoft excel sheet. It was then transferred to statistical package for the social sciences (SPSS) version 17 software for statistical analysis. Pre-operative and postoperative data of each surgical technique was compared.

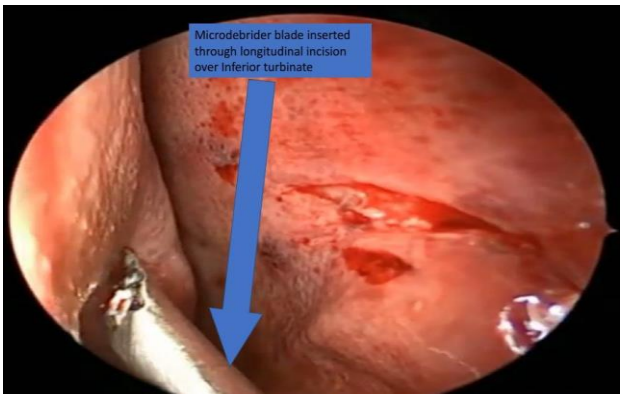

Figure 2: Insertion of a 4 mm microdebrider straight blade through longitudinal incision of 0.5 cm size over anterior part of Inferior turbinate.

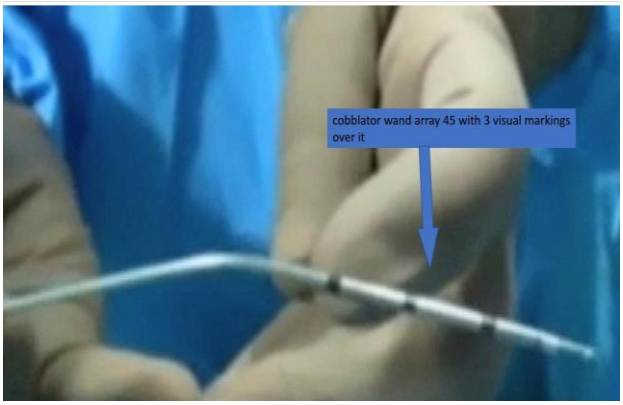

Figure 3: Cobblator wand array 45 with 3 visual markings over it which are used to gauge the depth of penetration of the wand.

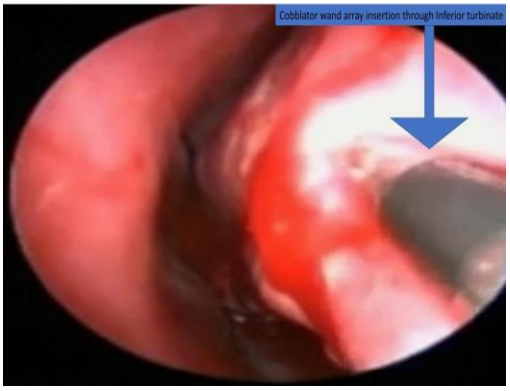

Figure 4: Sequential insertion starting at the anterior head of the Inferior turbinate upto first, second and third markings and cobblation done during withdrawal of wand with 10 seconds gap between markings till first marking is reached.

RESULTS

In our study we have assessed a total of 160 patients with study duration of 1 year. In group A, 80 patients were operated of which 60 were males and 20 were females. In group B, 80 patients were operated of which 62 were males and 18 were females. Overall, the maximum incidence was found in 3rd decade (35%), with minimum age of patient being 15 years and maximum being 59 years. Mean age in group A was 27.48 years and in group B was 25.28 years.

NOSE score

The mean pre-operative NOSE score in group A was 74 whereas in group B was 78. During post-operative follow up, mean NOSE score in group A on day 7th, 15th, 30th, 45th and 60th were 32.45, 28.3, 30.2, 34.35 and 30.45, respectively, and in group B on aforementioned days were 30, 26.25, 23, 18.45 and 16, respectively (Table 2). On comparing the pre-operative and post-operative (day 60) NOSE scores using paired t test, the result of the test was statistically highly significant with p value <0.01. So, there was definite improvement in NOSE score post-operatively. On comparing the NOSE score using unpaired t test, between the two techniques on each follow up days respectively, it was found that submucosal inferior turbinate reduction using cobblation provided better improvement than microdebrider on each day and the results were highly significant with p value <0.01.

Diagnostic nasal endoscopic findings

The percentage thickness of inferior turbinate at the level of internal nasal valve area was calculated on pre and post operative follow up days by nasal endoscopy. The maximum width of internal nasal valve area was considered to be 100% and percentage was calculated as width of valve area covered by inferior turbinate in each case for both nostrils separately (Figure 5). The pre-operative mean inferior turbinate size (%) in group A in right and left nostrils was 90.46 and 86.46% respectively. The pre-operative means inferior turbinate size (%) in group B in right and left nostril was 78.66% and 76.34%, respectively (Table 2). When comparison was made between pre-operative and post-operative (day 60) inferior turbinate size (in %), it was noted that there was significant reduction in size of inferior turbinate in both techniques in both nostrils, with mean day 60 inferior turbinate size being 42.22% (right side) and 40.45% (left side) in microdebrider while in cobblator cases, day 60 values were 56.22% (right side) and 50.26% (left side). On comparing the pre-operative and post-operative (day 60) inferior turbinate size using paired t test, the result of the test was statistically significant with p value <0.01 in both nostrils using both the techniques. On comparing the percentage size of inferior turbinate using unpaired t test, between the two techniques on each follow up days in both nostrils separately, it was found that both group A and B gave comparable results (p value >0.05) on post-operative day 7 with no technique being statistically better than other. But on further follow up days, the results showed microdebrider provided better reduction in the size of inferior turbinate as compared to cobblator on each follow up days and the results were highly significant with p value <0.01.

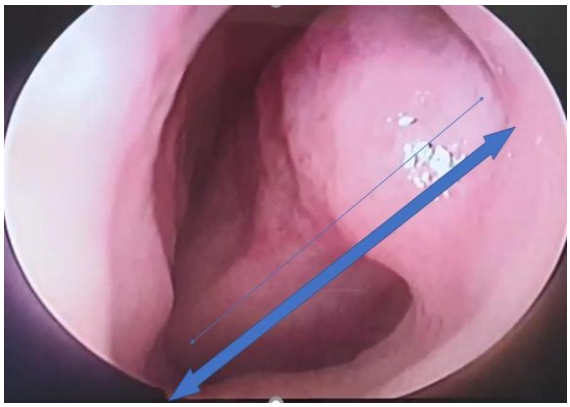

Figure 5: Inferior turbinate thickness in percentage (length of thin upper line in mm) as compared to maximum width of inferior nasal valve area (length of thick lower line in mm) in left nostril of pre-operative patient.

Saccharin test

The mean MTT in pre-operative and post-operative (day 60) cases was 12.25 minutes and 13.35 minutes in group A, whereas 12.57 minutes and 13 minutes in group B (Table 2). On comparing the preoperative and postoperative (day 60) MTT using paired t test, there was significant increase in transit time in case of microdebrider (p value <0.05). But there was no significant prolonging in case of cobblator.

Post-operative evaluation along with NOSE score, nasal endoscopy and saccharin test, patients were also followed up for post-operative complications like crusting and synechiae.

Minimal bleeding (few drops) was seen in few patients post-operatively after nasal pack removal which stopped spontaneously after few minutes. There was no significant difference between the two groups in terms of nasal bleeding.

Presence or absence of nasal crusting was noted in all patients during post-operative follow-up days. Overall, 75/80 patients in patients in microdebrider presented with nasal crusting and 70/80 patients operated with cobblator presented with nasal crusting on day 7 follow-up. There was significant reduction in number of cases showing nasal crusting in further follow-up days with almost all the cases free of crusting in both techniques on day 60.

Table 2: Comparative study between preoperative and postoperative findings in patients undergoing microdebrider and cobblator assisted inferior turbinate reduction surgery.

Surgical technique used	Mean preope-rative NOSE score	Mean postoperative NOSE score					Mean IT size (%)				Mean MTT (minutes)	
		At POD					Preoperative		Postoperative		Preope-rative	Postope-rative
		7	15	30	45	60	Right	Left	Right	Left		
Group A	74	32.45	28.30	30.20	34.35	30.45	90.46	86.46	42.22	40.45	12.25	13.35
Group B	78	30	26.25	23	18.45	16	78.66	76.34	56.22	50.26	12.57	13

Group A-Turbinate reduction surgery microdebrider assisted inferior patients who underwent; group B- patients who underwent cobblator assisted Inferior turbinate reduction surgery; NOSE=nasal obstruction symptom evaluation scale, IT=inferior turbinate, MTT=mucocilliary transit time using saccharin test

Post-operative synechiae formation is seen in both techniques in early post-operative period and required follow-up minor procedure like synechiae release. In microdebrider cases, 34.35% had synechiae formation on post-operative day 7 in comparison to 24.22% in cobblator. On further follow up, negligible cases showed synechiae formation on day 15, with no evidence of synechiae on day 30, 45 and 60 in both techniques.

DISCUSSION

The most common cause of nasal blockade in patients coming to otorhinolaryngology department is ITH which commonly seen in patients with allergic rhinitis, nonallergic rhinitis with eosinophilic syndrome, or iatrogenic rhinopathy.[10] The basic mechanism for ITH is usually due to submucosal swelling because of venous sinusoidal dilatation which responds to antihistaminics or local decongestants and occasionally due to submucosal fibrosis leading to incapable decongestion of turbinate which later on needs surgical intervention.[11]

Till date there is no effective therapy for management of ITH apart from various surgical techniques. The methods for Inferior turbinate reduction needs to fulfil two basic criteria that is efficacy of technique in reducing nasal obstruction and its ability of preservation of nasal mucosa ensuring the humidification and purification of air along with maintenance of physiological airway resistance.[12] Among 13 surgical techniques used over past 130 years, the intraturbinal turbinate reduction is the method of choice for ITH as per study done by Hol and Huizing. The trend of using powered instruments like microdebrider for ITH started from mid 1990s.[13]

The physiology of the inferior turbinate is mainly maintained by applying surgical techniques to inferomedial portion of inferior turbinate with sparing of the lateral portion which is rich in glandular tissue.[5]

In our study, males (122) were more in number than females (38) with male: female ratio of 3.2:1. Overall, the maximum incidence was found in 3rd decade (35%), with minimum age of patient being 15 years and maximum being 59 years. Similar study done by Hassoun et al in Iraq reported a male: female ratio of 1.7:1. It can be postulated that more occupational exposure to pollutants in Indian setting, increases the chances of allergic rhinitis induced ITH in males also the explanation for higher trend in middle aged group can be due to more occupational exposure to allergen in middle aged working population.[6]

Submucosal inferior turbinate reduction using cobblator destroys and vaporize soft tissue leading to immediate volume reduction and long-term tissue fibrosis with resultant shrinkage of the inferior turbinates and anchors the mucosa to the periosteum decreasing the congestion. The sustained improvement after cobblation technique is due to reduction in erectile tissue of inferior turbinate and due to disruption of receptors and sensorineural fibres of nasal mucosa, reduction of inflammatory cells. According to Back et al, the most beneficial method is wand entry method which is minimally invasive and involves 3 small entries at 90-degree angle to the mucosa to reduce the mucosal damage as much as possible.[8] In our study, we have made submucosal introduction of the wand to treat all turbinate compartments (head, superior, medial, inferior, and posterior) from only one entry to minimize the mucosal irritation.

In general, patients tolerated both surgical techniques in our study with comparatively better reduction in size of Inferior turbinate with microdebrider in turn better nasal patency but no significant differences found in terms of NOSE score, mucociliary transit time, postoperative synechiae. Faster and statistically more significant relief of nasal blockage was seen after microdebrider than after cobblator due to relief of long-lasting and more severe inflammatory oedema after microdebrider and also, we cannot predict the postoperative healing and fibrosis in cobblator because there is no volumetric reduction in this technique. Similar study done by Friedman et al showed that the turbinate reduction under visual identification combined with the elimination of symptoms means effective turbinate reduction.[12] Similar study done by Joniau et al shown that powered turbinoplasty was superior to submucosal cauterization in all aspects of the assessment.[14] Similar study done by Mahlon et al involves

the microdebrider assisted turbinoplasty and achieved postoperative improvement in nasal patency in 93% of the patients, whereas study done by Lee and Chen showed improvement in nasal obstruction in 91% cases in study done by Lee and Chen whereas Friedmann and Hegazy et al showed that microdebrider assisted turbinoplasty has early improvement of nasal symptoms within 2 months.[15,16]

Our study showed significant improvement of NOSE scores ($p<0.001$) and reduction of inferior turbinate size at 60th day during the postoperative period by using both microdebrider and cobblator with these outcomes comparable to other previous studies demonstrated promising results of both these treatments. Microdebrider produced excellent reduction in the size and provided symptomatic relief at 7th, 15th, 30th day and which persisted till 60th day. Cobblator technique produced comparable results with microdebrider which was not able to prevent the symptoms from recurring at 60th day. It has to be considered that neither the symptoms nor the size of the turbinate in this group has increased to the preoperative size in the group who underwent cobblator. When compared with other group at the same point of time, the results were statistically variable. This indicate the requirement of repeating the procedure in at least a few cases. The possible explanation of this could be the fact that microdebrider shaves off both turbinate bone and soft tissue whereas cobblator causes just submucosal soft tissue fibrosis. Reduction of the bone creates more space, whereas surgery on submucosal tissue creates scarring that minimizes the engorgement of the inferior turbinates of patients with rhinitis.[17]

Ciliary function which determines the MTT forms an important defence mechanism that protects the respiratory system. As also shown in other previous studies, saccharine transit time showed a significant impairment in patients where cobblator was used because of thermal mucosal damage caused in cobblator as compared to microdebrider.[18,19] Preservation of mucosa also improves the chances for continued function of the inferior turbinates to warm and humidify the inspired air.[20]

In terms of post-operative surgical complications, microdebrider produced significantly more crusting and synechiae formation as compared to cobblator in early post-operative period till 30th day and required surgical intervention like synechiae release procedure and suction clearance of crustings. However, during 45th day and 60th day follow ups there was no difference noted in the two techniques in terms of crusting and synechiae formation, with nasal mucosa healthy in almost all cases operated by both microdebrider and cobblator. In some cases of cobblator (about 3%), mucosal changes similar to atrophic rhinitis were noted which may be related to excessive cauterization of nasal mucosa leading to roomy nasal cavity due to over shrinkage of inferior turbinate following fibrosis. But these changes were only evident during 60th day follow up and further follow up should be done to look for chronic changes in nasal mucosa in operated cases of inferior turbinate reduction by both microdebrider and cobblator. The main disadvantage in cobblator is the high cost for the procedure as wand is for single use only, hence less affordable. Microdebrider using microdebrider blade can be done in any surgical setting & is less costly compared to cobblator. Cobblator has an edge over microdebrider in attaining both symptomatic relief and lesser post-operative complications over a long period. Microdebrider provides comparable postoperative reduction without postoperative worsening of symptoms and signs. Cobblator is also technically more demanding and requires surgical skills as compared to microdebrider.

Limitation of this study was that we have included ITH due to any cause in our study but we have not taken into consideration different etiological causes for inferior turbinate reduction. Another limitation of this study was that we have not used objective methods of nasal patency assessment like rhinomanometry due to cost restrains. In future a more elaborative and larger studies with randomisation are needed to confirm the same.

CONCLUSION

Submucosal inferior turbinate reduction surgery done for ITH using either microdebrider or cobblator technique shown better improvement in terms of NOSE score improvement, Inferior turbinate size reduction, mucocilliary transit time improvement. In terms of NOSE score, cobblator technique shown better improvement than microdebrider. In terms of inferior turbinate size reduction, no significant difference between two techniques was found during immediate postoperative duration but shown better reduction in size during follow up duration using microdebrider. In terms of mucocilliary transit time, there was significant increase in transit time in case of microdebrider without significant prolongation in case of cobblator. In terms of postoperative complications, no significant difference between the two techniques found during follow up duration.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Hsu DW, Suh JD. Anatomy and physiology of nasal obstruction. Otolaryngologic Clin N Am. 2018;51(5):853-65.
2. Hesham A, Badran H, Hussein A, Amin S, Salah M. Intraturbinal versus extraturbinal Microdebrider-assisted inferior turbino-Plasty: Preliminary results. Egyp J Ear, Nose, Throat Allied Sci. 2013;15:10.
3. Lund VJ, Stammberger H, Fokkens WJ, Beale T, Bernal-Sprekelsen M, Eloy P, et al European position paper on the anatomical terminology of the internal

nose and paranasal sinuses. Rhinology Suppl. 2014;24:1-34.
4. Lund VJ, Stammberger H, Fokkens WJ, Beale T, Bernal-Sprekelsen M, Eloy P, et al European position paper on the anatomical terminology of the internal nose and paranasal sinuses. Rhinology Suppl. 2014;24:1-34.
5. Berger G, Balum-Azim M, Ophir D. The Normal inferior turbinate: histomorphometric analysis and clinical implications. Laryngoscope. 2003;113(7):1192-8.
6. Hassoun YL. Comparison and evaluation Effect between microdebrider assisted turbinopalsty and submucosal diathermy of the inferior tubinates techniques. Am J Res Comm. 2015;3(7):47-56.
7. Ragab A, Elbanhawy O, Khashba A, Ali A, AbdelAziz M. Microdebrider-assisted turbinoplasty against submucosal cauterization In inferior turbinate hypertrophy. Menoufia Med J. 2016;29(3):504.
8. Bäck LJ, Hytönen ML, Malmberg HO, Ylikoski JS. Submucosal bipolar radiofrequency thermal ablation of inferior turbinates: a long-term follow-up with subjective and objective assessment. Laryngoscope. 2002;112(10):1806-12.
9. Stewart MG, Witsell DL, Smith TL, Weaver EM, Yueh B, Hannley MT. Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) scale. Otolaryngol Head Neck Surg. 2004;130(2):157-63.
10. Lorenz KJ, Maier H. Minimally invasive technique for the treatment of nasal airway obstruction caused by enlarged turbinates. HNO. 2013;61(3):240-9.
11. Hol MK, Huizing EH. Treatment of inferior Turbinate pathology: a review and critical evaluation of the different techniques. Rhinology. 2000;38(4):157-66.
12. Scheithauer MO. Surgery of the turbinates And "empty nose" syndrome GMS Curr Top Otorhinolaryngol Head Neck Surg. 2010;9:3.
13. Hackman TG, Ferguson BJ. Powered instrumentation and tissue effects in the nose and paranasal sinuses. Curr Opin Otolaryngol Head Neck Surg. 2005;13(1):22-6.
14. Joniau S, Wong I, Rajapaksa S, Carney SA, Wormald PJ. Long-term comparison Between submucosal cauterization and Powered reduction of the inferior turbinates. Laryngoscope. 2006;116(9):1612-6.
15. Lee CF, Chen TA. Power microdebrider Assisted modification of endoscopic inferior Turbinoplasty: a preliminary report. Chang Gung Med J. 2004;27(5):359-65.
16. Hegazy HM, El Badawy MR, Hassan AA. Endoscopic Submucous Inferior Turbinate Reduction with Microdebrider – A Study of 50 Case. Tanta Med Sci J. 2007;2(1):194-9.
17. Zeynep K, Kursat C. Comparison of radiofrequency tissue volume reduction and sub-Mucosal resection with microdebrider in Inferior turbinate hypertrophy. Otolaryngol Head Neck Surg. 2008;138:176-81.
18. Kesornsukhon N. Radiofrequency volumetric Tissue reduction for treatment of inferior Turbinate hypertrophy. Region 6-7 Med J. 2007;26(2):197-204.
19. Kesornsukhon N. Comparison of RFTVR and SMRM in treatment of inferior turbinate Hypertrophy. Chachoengsao Hospital J. 2008;96:97-104.
20. Friedman M, Tanyeri H, Lim J, Landsberg R, Caldarelli, D. A safe, alternative technique for inferior turbinate reduction. Laryngoscope. 1999;109(11):1834-7.

Cite this article as: Jadhav SG, Mane BS, Naikwadi KB, Gavali RM. A comparative study between cobblator and microdebrider assisted inferior turbinate reduction surgery. Int J Otorhinolaryngol Head Neck Surg 2022;8:826-32.