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Conventional Turbinectomy Versus Microdebrider Assisted Turbinoplasty-- A Comparative Study

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ABSTRACT
BACK GROUND : *Chronic nasal obstruction, as a consequence of inferior turbinate hypertrophy has been on the rise, attributing to the increase in the pollutants in the atmosphere, allergens in the food and in general, lifestyle changes.Multiple surgical modalities to reduce the size of turbinates, in medically unresponsive patients are in practice.Of these, we have attempted to compare the two most commonly preferred methods, i.e the Conventional turbinectomy, with the Microdebrider assisted turbinoplasty.*
AIMS AND OBJECTIVES : *To compare the result of microdebrider assisted turbinoplasty and conventional turbinectomy in the patients presenting with hypertrophied inferior turbinate with respect to Improvement of nasal airway, Post-operative hemorrhage, Synechiae formation, .Postoperative crust formation, Obstruction of nasolacrimal duct----Epiphora, Post-operative Rhinolalia aperta.*
MATERIALS AND METHODS: *This is a retrospective study, conducted in the Department of ENT ,Gayatri Vidya Parishad Institute of Health Care and Medical Technology (GVPIHC&MT),Visakhapatnam .*
A Total of 100 patients were selected and were divided into two groups of 50 patients each. The group in which conventional turbinectomy was performed is called the CTG Group and where the procedure of Microdebrider assisted turbinoplasty was performed is called the MTG Group. The patients were followed up monthly,for a period of 3 months and were evaluated for improvement of nasal patency and post -operative hemorrhage, crust formation, synechiae, epiphora and rhinolalia aperta.
OBSERVATIONS: *Age group of 31-40 years are the most affected population with turbinate hypertrophy, with M:F ratio of 2.9:1(74:26), male preponderance. 94 % patients of the total study had an improved nasal patency postoperatively, with 96% results in the MTG group and 92% results in the CTG group..2% and 4% patients of the study, respectively developed synechiae and crusting, these solely belonged to the CTG group as seen beyond a period of 3 months postoperatively..4% patients had postoperative hemorrhage within 1 month in the CTG group alone, which was not seen after 3 months.1% patients had complained of rhinolalia aperta, also belonging to the CTG group only.In both the techniques of turbinoplasty, no postoperative epiphora was encountered.*
CONCLUSION: *As a modality of surgical treatment of choice for inferior turbinate hypertrophy causing chronic nasal obstruction, in patients not responding to the medical route of treatment, Microdebrider assisted turbinoplasty is a better procedure when compared to conventional turbinectomy,with respect to important aspects such as, the improvement of nasal patency, reduced occurrence of postoperative hemorrhage, crust formation and appearance of rhinolalia aperta.*
KEYWORDS: *Turbinate Hypertrophy, Nasal Obstruction ,Turbinectomy, Microdebrider Turbinectomy.*

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I. Introduction

Inferior turbinate is an important anatomical structure, serving a vital role in the nasal physiology.It has many functions including, temperature regulation and humidification of inspired air, filtration,in addition to regulation of nasal airflow [(1)]

Inferior turbinate hypertrophy is one of the commonest causes of nasal obstruction [(2)].Passali et al[(3)] have stated that 20% of the population has the symptom of chronic nasal obstruction due to inferior turbinate hypertrophy.Causes being numerous, such as allergies, vasomotor dysfunctions, infections, medications etc[(4)].Various medical modalities of treatments such as the use of antihistamines, topical decongestants, and/or topical corticosteroids in combinations are used to relieve the symptom of nasal obstruction caused due to turbinate hypertrophy[(5)].However, there are some patients, with persistent symptoms, who are unresponsive to these medical modalities of treatment,in whom surgical reduction of turbinate is necessary[(6)].Though not life

threatening, this effect of nasal obstruction on respiratory function is clinically important because it has a significant impact on the quality of the life of the patients.

Multiple techniques have been described for inferior turbinate reduction.These include Conventional turbinectomy,Microdebridder assisted turbinoplasty, submucosal resection, Laser-assisted turbinoplasty, cryosurgery, electrocautery with monopolar and/or bipolar techniques, radiofrequency volumetric tissue reduction or the use of different types of lasers and powered instruments,[7,8,9] . Many of these surgical methods provide satisfactory results relatively to one another, but certain adverse effects frequently observed postoperatively are, hemorrhage, crust formation, pain, synechiae or atrophy of the remnant inferior turbinates [9,10]. An ideal surgical procedure for inferior turbinate reduction should accomplish not only a long-lasting reduction of the turbinate size, but also should fulfil the goals of preservation of the turbinate functions, without or with minimal complications.[11]

Conventional turbinectomy on the other hand,though is a reliable age old technique,relatively straightforward and yielding good enough results, it poses the threat of a larger range of complications both intraoperatively and postoperatively. It calls for an increased need of nasal cleaning and maintenance postoperatively.But, it is still in practice for the reasons of ease of procedure or the unavailability of access to powered instruments.

Introduction of a microdebrider for nasal surgeries by Setcliff and Parsons encouraged many surgeons to perform inferior turbinoplasty, utilizing the advantages of this powered system[12] . Microdebrider assisted inferior turbinoplasty was designed to preserve the medial wall of the inferior turbinate thereby preserving the airflow receptors and hence function. In addition, the technique allows the inferior turbinate to be reduced in size by about 50% without leaving a raw surface for crusts to form in the postoperative period[13]

AIMS AND OBJECTIVES: To compare the result of microdebrider assisted turbinoplasty and conventional turbinectomy in the patients presenting with hypertrophied inferior turbinate with respect to

1.Improvement of nasal airway.
2.Post-operative hemorrhage
3.Synechiae formation
4.Post-operaative crust formation
5.Obstruction of nasolacrimal duct----Epiphora.
6.Post-operative Rhinolalia aperta.

II. Materials And Methods

This is a retrospective study, conducted in the Department of ENT ,Gayatri Vidya Parishad Institute of Health Care and Medical Technology (GVPIHC&MT),Visakhapatnam .A total of 100 subjects, between the age groups of 11-60 years were selected for this study

STUDY DESIGN : Retrospective study conducted over a duration of 18 months, from September 2019 to February 2021.

STUDY LOCATION : Done in the Department of ENT, Gayatri Vidya Parishad Institute Of Health Care & Medical Technology, Visakhapatnam, Andhra Pradesh.

SAMPLE SIZE : A Total of 100 patients were selected and were divided into two groups of 50 patients each.The group in which conventional turbinectomy was performed is called the CTG Group and where the procedure of Microdebrider assisted turbinoplasty was performed is called the MTG Group.

INCLUSION CRITERIA

1)Patients with symptomatic nasal obstruction with enlarged inferior turbinate.
2)Patients with septal deviation presenting with compensatory turbinate hypertrophy.
3)Patients not responding to medical treatment.

EXCLUSION CRITERIA

1)Patients with chronic sinusitis.
2)Patients with Sinonasal polyposis.
3) Patients with a previous history of inferior turbinectomy.

PROCEDURE

All patients attending our ENT out-patient department,with a chief complaint of chronic nasal obstruction, were subjected to clinical examination of ear, nose and throat, first with the help of a headlight later with both 0^o and 45^o degree nasal endoscopes.X-ray of Paranasal sinuses and chest were routinely done.If added symptoms pointing towards chronic sinusitis were present, CT paranasal sinuses was preferred.Complete blood

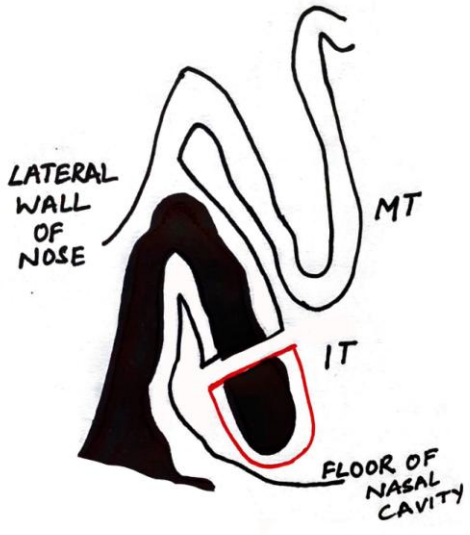
picture including absolute eosinophil count and ESR, bleeding and clotting time tests were done.Renal, liver profiles and surgical screening were done to achieve fitness for anaesthesia prior to surgery.

Under local or general anesthesia, using a spinal needle attached to a 2ml syringe,the anterior end of the inferior turbinate, also along its posterior inferior border is infiltrated with 2% lidocaine in a ratio of 1 : 80,000 or 2% lidocaine with adrenaline in the ratio of 1: 1 00,000.Technique of infiltration is common for both the surgical methods.

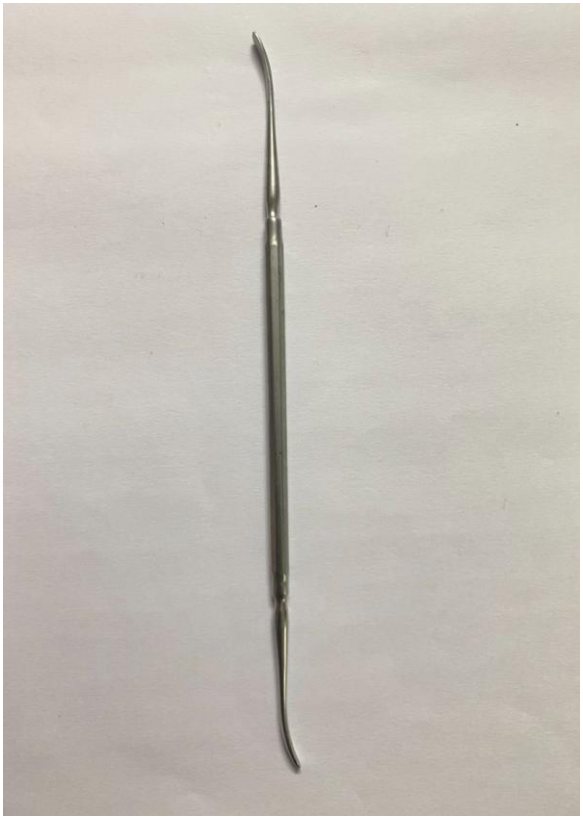
In the procedure of Conventional turbinectomy, after infiltration, a Freer's septal elevator is used to mobilise the inferior turbinate medially, after which a Birkett's straight artery forceps is used to delineate the line of surgical resection by compression, this inturn also minimises the bleeding intropera tively.Care is taken to prevent injury to the nasolacrimal duct area.Heymann's turbinectomy scissors is used to resect the necessary amount of medial portion of the inferior turbinate, to achieve adequate nasal airway.A thin strip of surgicel is placed in the floor of the nasal cavity in contact with the raw area created after resection.Hemostasis is secured using bipolar cautery when necessary.

In the procedure of Microdebrider assisted turbinoplasty, the microdebrider is used to shave the mucosa of the head of the inferior turbinate, which is the most important part of the inferior turbinate contributing to nasal valve obstruction . The inferior border and lateral surface of the rest of the inferior turbinate is then shaved, again making sure the bone is exposed. This is done until the posterior end of the inferior turbinate is approached, but stopped about 1 cm from the posterior end so as to not injure the blood vessels that enter the posterior end and supply blood to the turbinate. A sharp elevator is used to identify and establish the subperiosteal plane to gain access to the bone of the inferior turbinate .The medial mucosal flap is established at the anterior end of the inferior turbinate bone. With the bone removed and the cauterization of any bleeding points , the medial mucosal flap can now be rolled laterally to produce a new turbinate that is usually about half the size of the original turbinate This highly effective turbinoplasty preserves the medial functional mucosa of the inferior turbinate while still creating a significant airway. The rolled medial mucosal flap is held in place by a thin strip of surgicel.

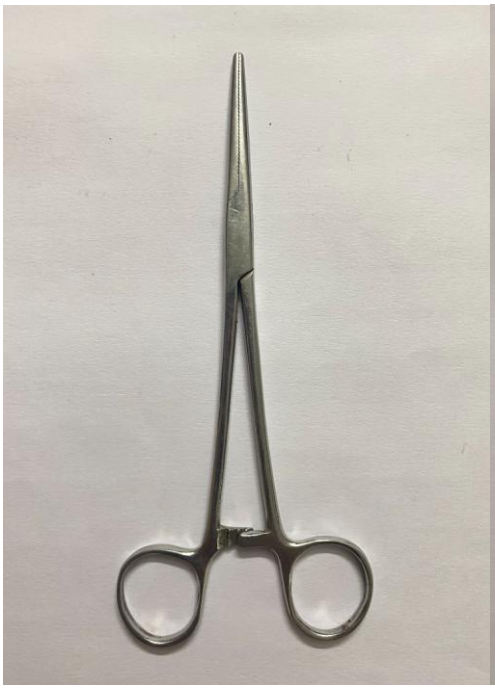
The patients were followed for a period of 3 months and were evaluated for improvement of nasal patency and post -operative hemorrhage, crust formation, synechiae, epiphora and rhinolalia aperta.



CONVENTIONAL TURBINECTOMY



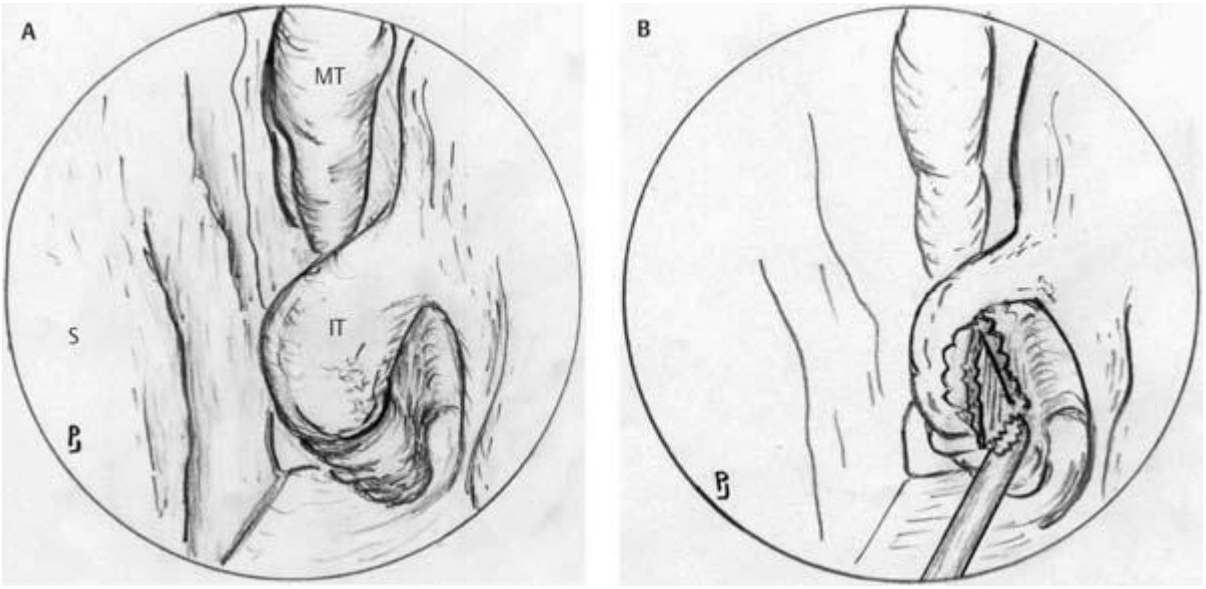
FREER'S SEPTAL ELEVATOR



BIRKETT'S STRAIGHT ARTERY FORCEPS

HEYMANN'S TURBINECTOMY SCISSORS

MICRODEBRIDER WITH WAND



PRESERVATION OF MEDIAL MUCOSAL FLAP DURING MICRODEBRIDER ASSISTED TURBINOPLASTY

III. Results

A Total of 100 patients were selected for this study, for 50 patients belonging to CTG Group conventional turbinectomy was performed and for 50 patients belonging to MTG Group Microdebrider assisted turbinoplasty was performed.

Table 1
Age distribution of patients

Age (YEARS)	CTG	MTG	TOTAL (%)
11-20	4	4	8%
21-30	18	16	34%
31-40	22	24	46%
41-50	4	4	8%
51-60	2	2	4%

Age group of 31-40 years are the most affected population with turbinate hypertrophy, while the least affected group is between the ages of 51-60 years.

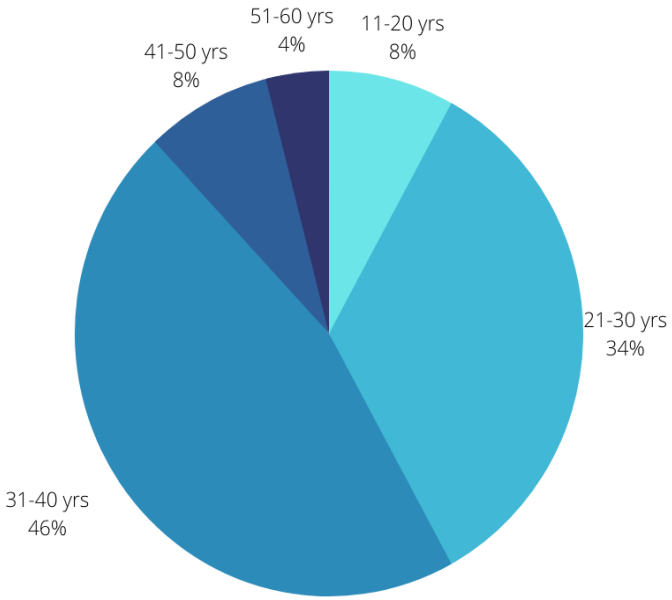


TABLE 2
Gender distribution of patients

GENDER	CTG	MTG	TOTAL %
MALE	38	36	74%
FEMALE	12	14	26%
TOTAL	50	50	

Male:female ratio is about 2.9:1(74:26), with clear male preponderance.

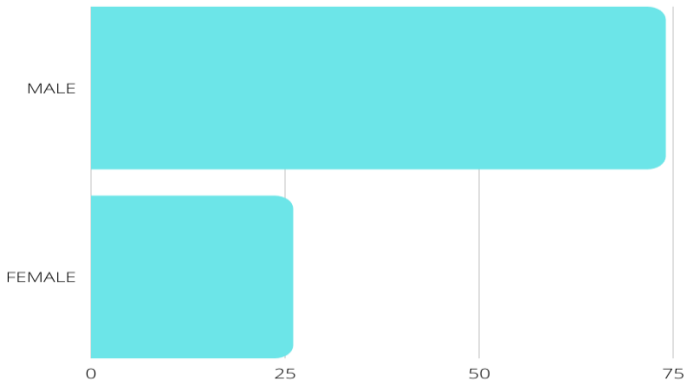


TABLE 3
DURATION OF NASAL OBSTRUCTION

GROUP	< 6 MONTHS	> 6 MONTHS
CTG	12	38
MTG	10	40

TOTAL%	22 %	78 %

78% patients have had the symptom of nasal obstruction over a period of 6 months, while in the remaining 22% patients, the duration of nasal obstruction was less than 6 months.

TABLE 4
POST OPERATIVE NASAL PATENCY IMPROVEMENT

GROUP	AFTER 1 MONTH	AFTER 3 MONTHS
CTG	42	46(92%)
MTG	44	48(96%)
TOTAL%	86%	94%

Of the entire study, 94 % patients had an improved nasal patency on follow up after a period of 3 months, of which MTG(96%) group had better results than the CTG(92%) group.

Success rate CTG vs MTG

TABLE 5
POST OPERATIVE SYNECHIAE

GROUP	AFTER 1 MONTH	AFTER 3 MONTHS
CTG	6	2[2%]
MTG	2	0

Only 2 % patients of the study had postoperative synechiae,as reviewed after a postoperative duration of 3 months.This was only observed in the CTG group.

TABLE 6
POST OPERATIVE CRUST FORMATION

Group	AFTER 1 WEEK	AFTER 1 MONTH	AFTER 3 MONTHS
CTG	28	8	4(4%)
MTG	16	2	0

The complication of post-operative crust formation as studied for 3 months duration, was seen to be more common in the CTG group when compared to the MTG group.
At the end of 3 months , 4 % patients of the study had postoperative crust formation, which was seen only in the CTG group.

TABLE 7
POST OPERATIVE RHINOLALIA APERTA

GROUP	AFTER 1 MONTH	AFTER 3 MONTHS
CTG	1	1(1%)
MTG	0	0

At the end of 3 months duration, 1% patients had complained of rhinolalia aperta and these belonged to the CTG only.

TABLE 8:
POST-OPERATIVE HEMORRHAGE

GROUP	WITHIN 1 MONTH	AFTER 1 MONTH
CTG	2(4%)	0
MTG	0	0
TOTAL %	8	0

4% patients had postoperative bleeding within 1 month of the procedure, belonging to the CTG group, while no such complaints were seen in the MTG group.
After 3 months, neither of the groups reported complaints of hemorrhage.

TABLE 9
POST-OPERATIVE EPIPHORA

GROUP	AFTER 1 MONTH	AFTER 3 MONTHS
CTG	0	0
MTG	0	0
TOTAL%	0	0

In both the techniques of turbinoplasty, no postoperative epiphora was encountered.

IV. Discussion

In patients not responding to medical treatment for nasal obstruction due to inferior turbinate hypertrophy, many surgical methods have been described so far, including Conventional inferior turbinectomy,Microdebrider assisted turbinoplasty, submucosal diathermy,Laser-assisted turbinoplasty, cryosurgery, electrocautery with monopolar and/or bipolar techniques, radiofrequency volumetric tissue reduction or the use of different types of lasers and powered instruments .[,11,14,15,16)]

The powered instrument, microdebrider has been in use since the 1990s , later it has been introduced into turbinate surgery to offer a submucosal approach to inferior turbinate resection, which allows the preservation of nasal mucosal integrity.[17,18,19)]

The preliminary surgeons to use the microdebrider for the reduction of hypertrophied inferior turbinates were Davis and Nishioka[20)] in 1996.Later in 2004 authors Lee and Chen[21)] reported that this powered instrument assisted turbinoplasty is no only a safe and a minimally invasive technique, it is also effective in the treatment of hypertrophic rhinitis and hypertrophied inferior turbinates.Studies by Gupta et al[22)] in 2001 and Cingi[23)] et al in 2010, been done almost a decade apart showed data and time and again reinforced the effectiveness of this technique for the the resolution of nasal obstruction and recovery of respiration.The importance of preserving the mucociliary function by respecting the nasal turbinate mucosa during Micro debrider assisted turbinoplasty was further emphasised by Neri et al[4)] in their study, an showed the importance of the same in achieving long-term resolution of nasal obstruction and its symptoms associated , respecting mucociliary function

Keeping in mind, the various techniques and outcomes reported by various surgeons in the previous years.In our study we have attempted to compare the most primary method of turbinate surgery, the conventional turbinectomy, with the most advanced method, the microdebrider assisted turbinoplasty, to establish whether this method has stood the test of time.

In this study the age groups most commonly affected with symptoms of nasal obstruction due to inferior turbinate hypertrophy are between 31-40 years(46%), followed by 21-30 years(34%).The least affected age group is between 51-60 years(4%).A definite male preponderance M:F = 2.9:1(74:26) was noted.

94 % patients of this study of 100 participants had showed an improved nasal patency on follow up after a period of 3 months, of which MTG(96%) group compared to the CTG(92%) had better results.Van et al[16] reported an overall achieved overall success rate of 93% using the microdebrider turbinoplasty method.We have received a slightly higher success rate in comparison to this study, where the success rate of the MTG group, where microdebrider was used for turbinoplasty, was 96%.

Authors such as Goode RL et al[24], Salanzo FA et al [25,26,27],Mathai J et al [28] in owed the complications seen in their studies postoperatively,such as dryness & crusting, pain, foul smell, bleeding, atrophy of turbinates as well as nasal hyporeactivity to the damage to the nerve receptors complex covering the nasal mucosa. Van et al[17] also reported in his study, that few patients from his study had complications such as above, but they were temporary and there were no permanent complications.This correlates with our study, where there were no long term complications.

In our study, 2 % patients had postoperative synechiae, at the end of 3 months.This was only observed in the CTG group.The complication of postoperative crust formation also seend after the same duration was seen to be more common in the CTG group when compared to the MTG group. 4 % patients of the study had postoperative crust formation, seen only in the CTG group.Crusting was seen to be more common in conventional turbinoplasty,because of exposed inferior edge of inferior turbinate bone, which takes about 6 weeks to heal.[13,29]

At the end of 3 months post-operatively, 1% patients had complained of rhinolalia aperta and these belonged to the CTG only.In our study we have not come across the complication of nasolacrimal duct damage with epiphora in both the techniques

In our study, 4% patients had postoperative bleeding within 1 month of procedure, belonging to the CTG group, while no such complaints were seen in the MTG group.After 3 months, neither of the groups reported complaints of hemorrhage.In microdebrider assisted turbinoplasty, not only is mucosal preservation better, the risk of damage of the sphenopalatine artery branches is also lower.This ultimately results in minimal postoperative bleeding[30] .Krouse et al.[31] reported a non-randomized trial comparing a group of patients who underwent microdebrider assisted turbinoplasty(MAT) with another group of patients who had undergone traditional conventional turbinectomy surgery, in which they have found that the surgical bleeding was reduced by more than half in the microdebrider assisted turbinoplasty group, and attributed this result to the precision of this powered instrument while resecting tissues which diminished unintended tissue trauma and stripping.

Since times and for some more time to come,the microdebrider will be considered as an essential instrument in the surgical field of rhinology, specially in turbinate surgery.This fact time and again being proved by varied authors such as for eg: Friedman et al[8] and Lee et al.[14] , who also reported satisfactory results with the use of microdebrider intraturbinally.

V. Conclusion

Microdebrider assisted turbinoplasty is a better procedure in the management of nasal obstruction caused as a consequence of hypertrophied inferior turbinates when compared to conventional turbinectomy,with respect to improvement of nasal patency, postoperative hemorrhage, crust formation and appearance of rhinolalia aperta, these facts being supported by our results.Epiphora due to the injury to the nasolacrimal duct area does not arise as a complication in either of the methods, when the surgical anatomy is kept in mind and careful resection of inferior turbinate is performed.

INFORMED CONSENT: Informed consent was obtained from all individual participants included in the study.

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CONFLICTS OF INTEREST: There are no conflicts of interest.

References

[1]. Scheithauer M.O. Surgery of turbinates and empty nose syndrome. GMS curr top otorhinolaryngol head neck surg.2010;9
[2]. Gottarelli P.Modified inferior turbinoplasty;Italy: Rhinoplasty Surgeon bologna;2012.3-50
[3]. Tasman AJ. Die untere Nasenmuschel. Dysregulation und chirurgische Verkleinerung. *Laryngorhinootologie* 2002;81:822-833
[4]. Neri G, Mastrnardi V,Traini T, et al. Respecting nasal mucosa during turbinate surgery end of the dogma? *Rhinology?* 2013;51:368-375
[5]. Aslan G. Post Nasal drip due to inferior turbinate perforation after radiofrequency turbinate surgery: a case report. Allergy Rhinol

Provid 2013;4(1)e17-20
[6]. Friedman M, Vidyasagar R. Surgical management of septal deformity, turbinate hypertrophy, nasal valve collapse and choanal atresia. In: Bailey BJ, Johnson JT, Newlands SD, editors. Head & neck surgery – otolaryngology. Philadelphia: Lippincott Williams & Wilkins 2006. 1:328–330.
[7]. Endoscopic Sinus surgery peter-john wormold fourth edition thieme publishers pg no 33-34
[8]. Huizing EH, de Groot JAM. Surgery of the nasal cavity- turbinate surgery. Functional reconstructive nasal surgery. 2nd ed. Thieme: Stuttgart; 2003. p. 276-82.
[9]. Bergmark RW, Gray ST. Surgical management of turbinate hypertrophy. Otolaryngol Clin North Am 2018;51(5):919-28
[10]. Friedman M, Tanyeri H, Lim J, Landsberg R, Caldarelli D. A safe, alternative technique for inferior turbinate reduction. *Laryngoscope* 1999; 109:1834-1837
[11]. Mol MK, Huizing EH. Treatment of inferior turbinate pathology: a review and critical evaluation of the different techniques. Rhinology 2000; 38:157–166.
[12]. Setcliff RC, Parsons DS. The hummer: new instrumentation for functional endoscopic sinus surgery. 8:275–277.
[13]. Elwany Samy, Harrison Robert. Inferior turbinectomy: comparison of four techniques. The journal of laryngology and otology 1990;104(3):206-9.
[14]. Batra PS, Seiden AM, Smith TL. Surgical management of adult inferior turbinate hypertrophy: a systematic review of the evidence. *Laryngoscope* 2009;119:1819-1827
[15]. Passali D, Lauriello M, Anselmi M, et al. Treatment of hypertrophy of inferior turbinate: long-term results in 382 patients randomly assigned to therapy. *Ann Otol Rhinol Laryngol* 19999;569-575
[16]. Jackson LE, KOCH rj. Controversies in the management of inferior turbinate hypertrophy: a comprehensive review. *Plast Reconstr Surg* 1999;103:300-312
[17]. Van delden MR, Cook PR, Davis WE. Endoscopic partial inferior turbinoplasty. *Otolaryngol Head Neck Surg* 1999; 121:406-409
[18]. Yanez C.New technique for turbinate reduction in chronic hypertrophic rhinitis, intraturbinate stroma removal using microdebrider. *Operat Tech Otolaryngol Head Neck Surg* 1998;9:135-137
[19]. Ikeda K, Oshima T, Suzuki M, et al. Functional inferior turninosurgery for the treatment of resistant chronic rhinitis. *Acta Otolaryngol* 2006;126:739-745
[20]. Davis WE, Nishioka GJ. Endoscopic partial inferior turbinectomy using a power microcutting instrument. *Ear Nose Throat J* 1996;75:49-50
[21]. Lee CF, Chen TA. Power microdebrider-assisted modification of endoscopic inferior turbinoplasty: a preliminary report.*Chang Gung Med J* 2004;27:359-365
[22]. Gupta A, Mercurio E, Bielamowicz S, Endoscopic inferior turbinate reduction: an outcomes analysis. *Laryngoscopr* 2001;111:1957-1959
[23]. Cingi C, Ure B, Cakli H, et al. Microdebrider-assisted versus radiofrequency-assisted inferior turbinoplasty: a prospective study with objective and subjective outcome measures. *Acta Otorynolaryngol Italy* 2010;30:138-143
[24]. Goode RL, Diagnosis and tratment of turbinate dysfunction: a self-instructional package Washington DC: American Academy of Otolaryngology; 1977:36-52
[25]. Salanzo FA, Mora R, Dellepiane M, et al. Radiofrequency, high frequency, and electrocautery treatments vs partial inferior turbinotomy: microscopic and macroscopic effects on nasal mucosa *Arch Otolaryngol Head Neck Surg* 2009;135:752-758
[26]. Salanzo FA, Mora R, Penco S, et al.Nasal tactile sensitivity in allergic rhinitis. *Acta Otolaryngol* 2011;131:640-644
[27]. Salanzo FA, Guastini L, Mora A, et al. Nasal tactile sensitivity in elderly *Acta Otolaryngol* 2010;130:1389-1393
[28]. Mathai J. Inferior turbinectomy for nasal obstruction review of 75 cases. *Indian J Otolaryngol Head Neck Surg* 2004;56:23-26
[29]. Martinez SA, Nissen AJ, Stock CR, et al. Nasal turbinate resection for relief of nasal obstruction. Laryngoscope 1983;93(7):871-5.
[30]. Percadoni J, Nicollas R, Dessi P, et al. Partial lower turbinectomy in children: indications, technique, results. Revue de laryngologie otology rhinology 1996;117(3):175-8.
[31]. Krouse HJ,Parker CM, Purcell R, Krouse JH, Christmas DA. Powers functional endoscopic sinus surgery. AORN J 1997;66(3):405-14

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