A Comparative Study of Radiofrequency Assisted Versus Microdebrider Assisted Turbinoplasty in Cases of Inferior Turbinate Hypertrophy

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Abstract Nasal obstruction is the most common complaint among patients presenting to otolaryngologists which disturbs the quality of life of the patient. The anterior end of inferior turbinate is in the narrowest part of nasal airway, enlargement of which causes significant nasal obstruction. In our, prospective and interventional, study a comparison was made between the results of bipolar radiofrequency assisted turbinoplasty and microdebrider assisted turbinoplasty in patients with chronic nasal obstruction due to inferior turbinate hypertrophy, not responding to medical treatments. The cases were randomly divided into radiofrequency (RF) and microdebrider (MD) groups, each consisting of 30 cases. Nasal obstruction, sneezing, itching in nose, rhinorrhea, intra operative bleeding, duration of surgery, post operative bleeding, post operative pain and crusting were the parameters recorded preoperative, intra operative and post operatively at 1 week, 1, 3 and 6 months. For bleeding and crusting standard 4-point scale was used. Rest of the symptoms were assessed subjectively on standard visual analogue scale (0–10). The statistical analysis was done by student's *t* test. Postoperatively, all the preoperative symptoms were significantly improved up to 6 months in group RF as well as group MD, but there were three cases of recurrence at 6th months of postoperative period in group RF. However, we recommend MD assisted inferior turbinoplasty under

local anaesthesia in view of long term symptom relief and lesser recurrence.

Keywords Inferior turbinate hypertrophy · Radiofrequency · Microdebrider · Turbinoplasty

Introduction

Nasal obstruction is the most common complaint among patients presenting to otolaryngologists. Although nasal obstruction is not life threatening condition but disturbs the quality of life of the patient. The anterior end of inferior turbinate is the narrowest part of nasal airway, enlargement of which causes significant nasal obstruction. This is the commonest site of enlargement in various condition like reactivity to allergens, temperature, humidity and increase in air flow pressure [1]. First line treatment for inferior turbinate hypertrophy is almost always conservative [2]. The conservative measures like antihistamines, topical decongestants or topical steroids are frequently effective to restore comfortable nasal breathing.

Surgery for inferior turbinate hypertrophy is indicated only when medical treatments fail to relieve nasal obstruction. Various surgical options include laser argon plasma laser [3], CO₂ laser [4], cryocoagulation [5], radiofrequency (RF) [6, 7], injection of sclerosing agents with corticosteroids [8], turbinectomy [9], and submucosal ablation by electrocautery [10].

In present study patients with chronic nasal obstruction due to inferior turbinate hypertrophy, not responding to medical treatments, were evaluated and treated with surgical intervention i.e. RF and microdebrider (MD). A comparative analysis between two surgical techniques was made.

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Materials and Methods

This prospective and interventional study was conducted in the Department of Otorhinolaryngology & Head and Neck Surgery during the period of November, 2009 to April, 2011 in Lady Hardinge Medical College and Associated hospital, New Delhi. A total of 60 cases of inferior turbinate hypertrophy were included in this study. These cases were randomly divided into 2 groups, group RF and group MD consisting of 30 cases in each group.

Patients with chronic nasal obstruction due to inferior turbinate hypertrophy who were not responding to medical treatment like antihistamines, topical steroids and local decongestants were included in the study. Both unilateral and bilateral inferior turbinate hypertrophy were taken for study but in cases where bilateral inferior turbinate hypertrophy was present, each separate hypertrophied inferior turbinate was taken as separate case for study.

Cases having allergic rhinitis, acute rhinosinusitis and/or cases getting relieved with antihistamines/topical steroids/local decongestants were not included in the study. Patients having symptomatic DNS/sinusitis/concha bullosa/collapse of alar cartilage, nasal polyps or tumors of nose/paranasal sinuses were also excluded from the study. Patients with history of any previous nasal surgery or systemic disease were also not part of the study.

All the cases were examined thoroughly not only to rule out any ENT diseases but also systemic diseases. The findings were recorded regarding the symptoms on visual analogue scale (VAS) to assess the severity of symptoms. Symptoms were scored as 0 (no symptoms) to 10 (most severe symptoms) [11]. Diagnostic nasal endoscopy was done by using 0° 4 mm Hopkins rigid endoscope as described by Turgut et al. [12]. Computerised tomography of nose and paranasal sinuses was done in coronal and axial cuts to rule out any other paranasal diseases. Once sinusitis and other causes of obstruction like deviated nasal septum, nasal polyps etc. were ruled out by these methods, then only diagnosis of ITH was made by exclusion.

All cases were operated under local anaesthesia. A cotton pledget with 4 % xylocaine was inserted along the inferior as well as medial side of inferior turbinate along the length of turbinate. After waiting for 5 min 2–3 ml of 2 % xylocaine with adrenaline in the dilution of 1:100,000 was infiltrated at the anterior end of inferior turbinate and surrounding areas under guidance of 0° 4 mm nasal endoscope. Further, one ml of this solution was injected posteriorly along the length of inferior turbinate. Group RF patients underwent bipolar RF assisted inferior turbinoplasty and group MD patients underwent MD assisted inferior turbinoplasty.

Group RF

All inferior turbinoplasties were performed as described by Mabry [13, 14]. After five minutes of local infiltration, a bayonet RF turbinate volume reduction electrode (16/JXE) at bipolar coagulation i.e. partially rectified mode with 1.7 MHz frequency at 5 W power (Ellman, Surgitron FFPF EMC, Ellman International Inc. N.Y.) was inserted submucosally under the guidance of endoscope. The energy was delivered at each point for 15 s or till we got whitening of submucosal area (Fig. 1). Great care was taken not to injure the mucosal surface of turbinate. Thereafter patient was kept under watch for 1–2 h for any bleeding. Patients were not admitted except in severe bleeding cases requiring anterior nasal pack. Patients were advised to follow his/her normal routine activities with tab. paracetamol 500 mg sos only for 2 days.

Group MD

Local anaesthesia as well as infiltration was given as described above. With the help of blade no. 15, a mucosal incision was given at inferior end of inferior turbinate under endoscopic guidance and a submucosal tunnel created along the length of turbinate. This tunnel was extended along the length of turbinate with help of septal elevator. Subsequently straight MD blade with 3 or 4 mm diameter (Stryker TPS, Stryker Instruments, Michigan, US) was inserted along the tunnel (Fig. 2). With speed of 4,000–5,000 cps (circulation per second) submucosal tissue was sucked out with suction irrigation system thus reducing the volume of hypertrophied turbinate. Extra care was taken to keep the mucosa intact. If needed, at middle or posterior end another tunnel was made to remove the hypertrophied tissues. Once haemostasis was achieved with pressure and cautery, nasal cavity was packed lightly with

Fig. 1 RF assisted inferior turbinoplasty

Fig. 2 MD assisted inferior turbinoplasty

roller gauge smeared with soframycin overnight. Patient was observed for 1–2 h thereafter and then sent home. This pack was removed next morning in outdoor clinic. Patients were not admitted except in severe bleeding cases requiring anterior nasal packing. No medication was given except tab. paracetamol 500 mg sos.

Follow Up

The surgical outcome for both procedures were evaluated post operatively after 1 week, 1, 3 and 6 months. During preoperative, intra operative and postoperative following parameters were observed nasal obstruction, sneezing, itching in nose, rhinorrhea, bleeding during surgery, duration of surgery, post operative bleeding, post operative pain, crusting and synechia.

A standard VAS ranging from 0 to 10 was used to assess subjectively the nasal obstruction, sneezing, itching, rhinorrhea and post operative pain in which 0 (no symptom) and 10 (most severe symptom). For bleeding and crusting a standard 4-point scale was used. 0—Absent, 1—mild, 2—moderate, 3—severe bleeding or crusting.

Statistical Analysis

Preoperative as well as post operative data were collected, tabulated and analysed with standard methods. The statistical analysis was done by Student's *t* test. A *p* value of <0.05 was considered statistically significant.

Observation and Results

Among the 36 patients, 12 patients had unilateral ITH (Inferior turbinate hypertrophy) and 24 patients had bilateral ITH. In effect 60 turbinoplasties were done. The age

varied from 14 to 45 years in both group and the mean age was 27.86 years. The maximum incidence of ITH was seen in age group of 21–30 years (55.6 %).

The bleeding mean score for group RF was 0 and group MD was 1.03 (Table 1) with *p* value <0.0001 which was calculated by *t* test and considered to be extremely significant (*p* < 0.05 considered to be significant). All the cases in MD group were packed anteriorly after the procedure and these packs were removed after 24 h. There was no significant post-operative bleeding in either group. There was post operative crusting for one week in Group RF and post operative mucosal edema for one week in Group MD. The mean operating time for group RF came out to be 14.7 min and for group MD was 29.3 min (Table 1) with *p* value <0.0001. The statistical evaluation of the difference in the group was done using the *t* test. There was extremely significant difference in operating time of two groups (*p* < 0.05 is considered to be significant).

When we compared the post operative benefit in nasal obstruction between two groups at 1st week, 1st, 3rd and 6th months of post operative periods, the following statistical analysis was made (Table 1).

There were 3 cases of recurrence in group RF however no recurrence was noted in group MD at 6 months post-operatively. Statistical comparison was made by using *t* test and considered not quite significant with *p* value of 0.0831 (*p* < 0.05 considered to be significant).

Discussion

Inferior turbinate hypertrophy is a frequent cause of nasal airway obstruction in children and adults [8, 15–17]. The management of chronic nasal obstruction caused by inferior turbinate hypertrophy is far challenging [16]. Enlarged nasal turbinates can be result of either mucosal or bony hypertrophy, where surgery is usually reserved for bony abnormalities.

Table 1 Comparison of intraoperative and postoperative findings in RF and MD groups

	Group RF	Group MD	<i>p</i> Value
Intra operative bleeding	0	1.03	<0.0001
Operating time (in minutes)	14.7	29.3	<0.0001
Post operative nasal obstruction			
1st week	2.2	1.9	0.0020
1st month	0.03	1.3	0.0097
3rd month	0	0	None
6th month	0.56	0	0.0842
Recurrence	3	0	0.0831

Numerous medical and surgical treatments are available for approaching turbinate hypertrophy. Surgical treatments vary from non-destructive procedures to complete turbinate excision. Generally, surgery indicated only after failure of medical management to address enlarged inferior turbinates. The multitude of approaches available proves that no 'gold standard' method has been established so far [17]. As inferior turbinate enlargement may be due to either mucosal or osseous hypertrophy, an understanding of which component contributes to turbinate enlargement would assist the surgeon in deciding which surgical technique to utilize [16].

In our study, submucosal turbinate reduction was done by two techniques, RF and MD, in which erectile tissues were removed while leaving overlying mucosa intact. The advantages of these techniques are minimal crusting at incision site and very low incidence of postoperative bleeding [18].

The use of a MD for surgical treatment of hypertrophic inferior turbinate was first reported by Davis and Nishioka in 1996 [19, 20] who states that an endoscopically-controlled partial inferior turbinectomy technique using a power microcutting instrument is fast, effective and well-tolerated, with extremely low morbidity. It was hoped that preservation of the turbinate will allow more physiologic airflow distribution within the nasal passages [21]. This instrument can be used on the external turbinate surface as well as intra-turbinally, often in combination with the nasal endoscopes. Intratubinal surgery has an advantage of not damaging the mucosa [22]. The intratubinal excision method was adopted in present study to avoid mucosal injury thus minimising the chances of synechia formation. That is why problem of adhesion formation was minimal (2 cases). However, no similar problem was noted in RF group. The main disadvantage of this MD is cost and the tip is frequently get obstructed due to small diameter lumen of MD when used intratubinally and can bring about the prolonged operating time [22].

The advantage of RF surgery is that a lower temperature is required to ablate the tissue than electrocautery or laser surgery. Temperature of the target is localized and ranges from 60 to 90 °C, with limited heat dissipation and thus minimise the damage to adjacent tissues. Cell death occurs when temperature reach 49.5 °C. Temperature induced by electrocautery and laser surgery are significantly higher (750–900 °C) than that required for cell death and this results in significant heat propagation. RF is considered to be more accurate, with minimal injury to collateral tissue [22–24].

In group MD, nasal obstruction, rhinorrhea, sneezing and itching were significantly improved during our follow up period (up to 6 months) postoperatively compared to their preoperative levels ($p < 0.05$). Although all

preoperative symptoms were significantly improved up to 6 months postoperatively in group RF similar to group MD, but there were three cases of recurrence at 6th months of postoperative period in group RF with ($p < 0.08$) statistically not quit significant. This result could be explained by the fact that thermal injury and fibrosis or shrinkage of the submucosal turbinate tissue, especially the anterior head of inferior turbinate, could be insufficient in patients with prolonged hypertrophy, leading to unsatisfactory volume reduction in RF as described by Lee and Lee [22]. As the MD provides real-time suction with ability to remove submucosal tissues better than RF, including reducing the number of inflammatory cells and damage to the postnasal nerve [25]. It is reasonable to state that Group MD improved patients' long-term symptoms more effectively than group RF [26].

In group MD, there was some accidental mucosal tear leading to post operative complication like post operative bleeding, synachea or mucosal adhesion, but there was no statistically significant difference.

Surgery is more invasive than the medical treatment, it is more important that surgery results in sustained improvements in the patient's quality of life. Thus, we compared the long-term efficacies of the two techniques (RF and MD) for the treatment of inferior turbinate hypertrophy. The long-term relief of nasal obstruction and reduction of mucosal volume of the anterior head is more effective when MD is used.

We recommend that MD assisted inferior turbinoplasty under local anaesthesia in cases of chronic nasal obstruction due to inferior turbinate hypertrophy in view of long term symptoms relief and lesser recurrence.

References

1. Walsh WE, Kern RC, Friedman M, Vidyasagar R (2006) Sino-nasal anatomy, function, evaluation, surgical management of septal deformity, turbinate hypertrophy, nasal valve collapse, and choanal atresia. In: Bailey BJ, Ryan MW, Ferguson BJ (eds) Head and neck surgery-otolaryngology, 4th edn. Lippincott William & Wilkins, Philadelphia, pp 307–313
2. Hoover S (1987) The nasal patho-physiology of headaches and migraines. Diagnosis and treatment of the allergy, infection and nasal septal spurs that causes them. *Rhinol Suppl* 2:1–23
3. Bergler W, Riedel F, Gotte K, Hormann K (2000) Argon plasma coagulation for inferior turbinate reduction. *Ann Otol Rhinol Laryngol* 109:839–843
4. Lippert BM, Werner JA, Germany K (1997) Comparison of carbon dioxide and neodymium: yttrium-aluminium-garnet in surgery of the inferior turbinate. *Ann Otol Rhinol Laryngol* 106(12):1036–1042
5. Rakover Y, Rosen G (1996) A comparison of partial tubinectomy and cryosurgery for hypertrophic inferior turbinate. *J Laryngol Otol* 110:8732–8735

6. Hytonen ML, Back LJ, Malmivaara AV, Roine RP (2009) Radiofrequency thermal ablation for patient with nasal symptoms; a systematic review of effectiveness and complications. *Eur Arch Otorhinolaryngol* 266:1257–1266
7. Gupta PJ (2005) Radiofrequency and its uses in ano-rectal surgery. *Medicus* 6(1):21–24
8. Elwany S, Harrison RH (1990) Inferior turbinectomy: comparison of four techniques. *J Laryngol Otol* 104(3):206–209
9. Martinez SA, Nissen AJ, Stock CR, Tesmer T, Louisville KY, Omaha NE et al (1983) Nasal turbinate resection for relief of nasal obstruction. *Laryngoscope* 93(7):871–875
10. Talaat M, Sabavy EE, Baky FA, Raheem AA (1987) Submucous diathermy of the inferior turbinates in chronic hypertrophic rhinitis. *J Laryngol Otol* 101:452–460
11. Haghighi M (2006) The effect of trenaxamic acid on bleeding during lumbar laminectomy. *MJIRC* 8(4):46–50
12. Turgut S, Gumusalam Y, Arifogu Y, Sinav A (1996) Endoscopic anatomic distances on the lateral nasal wall. *J Otolaryngol* 25(6):371–374
13. Weider DJ, Sulsner SE (1998) Inferior turbinate reduction surgery in children. *Ear Nose Throat* 77(4):304–315
14. Mabry RL (1984) Surgery of inferior turbinate: how much and when? *Otolaryngol Head Neck Surg* 92(5):571–576
15. Cavaliere M, Mottola G, Iemma M (2005) Comparison of effectiveness and safety of radiofrequency turbinoplasty and traditional surgical technique in treatment of inferior turbinate hypertrophy. *Otolaryngol Head Neck Surg* 133(6):972–978
16. Leong SC, Kubba H, White PS (2010) A review of outcomes following inferior turbinate reduction surgery in children for chronic nasal obstruction. *Int J Pediatr Otorhinolaryngol* 74:1–6
17. Zborayova K, Ryska A, Lansky M, Celakovsky P, Januskova V, Vokurka J (2009) Histomorphologic study of nasal turbinates after surgical treatment: a comparison of laser surgery and radiofrequency-induced thermotherapy effects in animals. *Acta Otolaryngol* 129:550–555
18. Nurse LA, Duncavage JA (2009) Surgery of the inferior and middle turbinates. *Otolaryngol Clin N Am* 42:295–309
19. Davis WE, Nishioka GJ (1996) Endoscopic partial inferior turbinectomy using a power microcutting instrument. *Ear Nose Throat J* 75:49–50
20. Chen Y, Liu C, Huang H (2007) Comparison of microdebrider-assisted inferior turbinoplasty and submucosal resection for children with hypertrophic inferior turbinates. *Int J Pediatr Otorhinolaryngol* 71:921–927
21. Wexler D, Braverman I (2005) Partial inferior turbinectomy using the microdebrider. *J Otolaryngol* 34:189–193
22. Lee JY, Lee JD (2006) Comparative study on the long-term effectiveness between coblation and microdebrider assisted partial turbinoplasty. *Laryngoscope* 116:729–734
23. Gouveris H, Nousia C, Giatromanolaki A, Riga M, Katotomichelakis M, Ypsilantis P et al (2010) Inferior nasal turbinate wound healing after submucosal radiofrequency tissue ablation and monopolar electrocautery: histologic study in a sheep model. *Laryngoscope* 120:1453–1458
24. Reina CC, Garcia-Iriarte MT, Angel DG, Morente JC, Rodriguez-Diaz A (2007) Radiofrequency volumetric tissue reduction for treatment of turbinate hypertrophy in children. *Int J Pediatr Otorhinolaryngol* 71:597–601
25. Polly SJ (2007) Microdebriders offer new surgical options. *ENT today*. http://www.enttoday.org/details/article/527273/Microdebriders_Offer_New_Surgical_Options.html. Accessed Feb 2007
26. Liu C, Tan C, Lee F, Lin K, Huang H (2009) Microdebrider-assisted versus radiofrequency-assisted inferior turbinoplasty. *Laryngoscope* 119:414–418