

Treatment of Inferior Turbinate Hypertrophies: Low Temperature-Controlled Bipolar Radiofrequency Ablation (Coblation) Versus Monopolar Radiofrequency Probe

Baran Acar^{1,*}, Kenan Selçuk Tuncay¹, Hediye Pınar Günbey² and Rıza Murat Karaşen¹

¹Kecioren Training and Research Hospital, Department of Otorhinolaryngology, Ankara, Turkey

²Kecioren Training and Research Hospital, Department of Radiology, Ankara, Turkey

Abstract: *Objective:* Chronic nasal obstruction caused by inferior turbinate hypertrophies is a common clinical condition. The aim of this study was to compare the effectiveness and safety of Low Temperature-Controlled Bipolar Radiofrequency Ablation (Coblation) with Monopolar Radiofrequency Probe for patients with hypertrophic inferior turbinates.

Methods: Twenty four patients with chronic nasal obstruction due to hypertrophic inferior turbinates were enrolled. These patients were randomly assigned to receive Coblation of the inferior turbinate (Group 1) (n = 28) or Monopolar Radiofrequency probe (Group 2) (n = 20). Surgical-outcomes were evaluated objectively by (MRI).

Results: A significant recovery in inferior turbinates volumes that were evaluated with MRI were detected 12 weeks after treatment ($p < 0.05$) in group 1. No difference was found from three months after surgery ($P > 0.5$) in group 2. Postoperative complication depending on this application as epistaxis, infection, synechia, dryness, foul odour, pain and bone necrosis did not occurred in this study.

Conclusions: Coblation and monopolar Radiofrequency are both effective at relieving nasal obstruction due to the presence of hypertrophic inferior turbinates. Coblation is superior to monopolar radiofrequency with regard to decreasing the inferior turbinates volumes.

Keywords: Coblation, monopolar Radiofrequency, inferior turbinates.

INTRODUCTION

Nasal obstruction caused by extensive hypertrophy of the inferior turbinates is not an uncommon observation. Such hypertrophy of the inferior turbinates may be due to various causes including septal deviation (compensatory hypertrophy), allergic reaction, vasomotor rhinitis or drug-induced rhinitis [1].

Several cures have been used to treat this hypertrophy; cryotherapy, Radiofrequency thermal ablation (RFA), laser turbinoplasty, Radiofrequency thermal ablation (RFA), submucosal turbinectomy, and partial and total turbinectomy [2-8].

With RFA, the surgeon is able to direct the delivery of a specific amount of radiofrequency energy, measured in joules, to a specific site at a controlled temperature. Thermal energy is believed to cause a reduction in tissue amount through ablation by heat. This radiofrequency energy is delivered at relatively low power and voltage. The lesion created by RFA is consistent with tissue coagulation and results in congestion, edema, and an acute inflammatory

response within the first 24 hours. Over a period of 72 hours, the treated area progresses to tissue necrosis, which over the course of 10 days may change to fibrotic tissue [9]. Wound contraction leads to turbinate volumetric reduction and relief of nasal obstruction. The other intent of tissue volume reduction is to induce submucosal fibrosis of the turbinate, which adheres the mucosa to the turbinate periosteum and reduces blood flow to the turbinate, rendering it less prone to swelling and edema [10]. This technology has been successfully and extensively used in some fields in otolaryngology, inferior turbinate, soft palate, and tongue base applications.

The aim of the present study was to compare the objective efficacy of monopolar and bipolar radiofrequency thermal ablation (bRFA) by magnetic resonance imaging (MRI) in patients with nasal obstruction caused by turbinate hypertrophy resulting from noninfective chronic rhinitis.

MATERIAL AND METHODS

Before the initiation of this investigation, the study protocol was approved by the local ethics committee (Kecioren Training and Research Hospital, Ankara, Turkey). From January 2009 to June 2012 inclusively, 24 patient (6 male) with nasal obstruction resulting from

*Address correspondence to this author at the Kecioren Training and Research Hospital, Department of Otorhinolaryngology, Pınarbaşı mahallesi sanatoryum caddesi Ardahan sok.no:25, Keçiören, 06380, Ankara, Turkey; Tel: +90 312 356 90 00; Fax: +90 312 356 90 22; E-mail: drbaranacar@gmail.com

bilateral turbinate hypertrophy and refractory to medical therapy (topical corticosteroids, antihistamines) for at least three months were prospectively enrolled in this study. All patients provided written informed consent before being included in the study.

The exclusion criteria were a history of sinusitis or nasal surgery, any positive result of skin-prick test and radioallergosorbent test for specific allergens, nasal polyposis. Examination included anterior rhinoscopy and nasal endoscopy in all patients.

All surgical procedures were performed by the same surgeon. Both radiofrequency energy was performed under local anesthesia. In group 1 patients, the RF surgery of the inferior turbinates was performed using the bipolar device "Coblator II ENT" (Arthrocare Corp, Sunnyvale, CA); in the group 2, the monopolar device "Somnoplasty" (Somnus Medical Technologies, Inc, Sunnyvale, CA) was used.

The preoperative and postoperative inferior turbinate volumes we calculated with paranasal sinus MRI investigation. All patients were scanned on a 1.5 T MR scanner (Philips Achieva, Netherlands. Slew rate 40 mT/m) with an eight channel head coil. The imaging protocol include T2-weighted spin-echo sequence on axial (TR/TE = 3993/100 ms; slice thickness, 4 mm; Field of view (FOV) 195x220; matrix 252x 152 mm,; acquisition time, 59,9 s) and coronal planes (TR/ TE =

391/100 ms; slice thickness, 4 mm;FOV 195 x 220; matrix 256x175 mm,; acquisition time, 1.07 s). All images were transferred to a workstation. Inferior turbinate volumes were calculated according to Cavalieri method by multiplying slice thickness with area of inferior turbinate in each slice ($\text{Volume (mm}^3\text{)} = \text{slice thickness (mm)} \times \text{area of inferior turbinate (mm}^2\text{)}$) [11, 12]. Boundaries of inferior turbinates drawn manually in each slice on Workstation (Figure 1).

Statistical Analysis

Statistical analysis was performed by a specialized company using the statistical software package SPSS for Windows, version 15.0 (SPSS, Inc. Chicago, IL). Student's *t* test were used, and a *P* value of less than .05 was considered to be statistically significant.

RESULTS

An initial enrollment of 24 subjects was obtained. There were 6 men and 18 women in this group, with 24 right inferior turbinate and 24 left inferior turbinate involved. A total of 48 inferior turbinate were available for the final analysis (24 treated by coblator and 20 treated by monopolar radiofrequency).

For the objective assessment of the effectiveness of the surgical procedures, the preoperative and postoperative the amount and percentage of the



Figure 1: The calculation of magnetic resonance of inferior turbinates volume.

Table 1: Comparison of Inferior Turbinate Volumes Reduction in for All Groups

		No	Mean	Minimum	Maximum	SD
Group 1						
Inferior Turbinate Volume	Reduction	28	458,714	22.370	895.059	1125,297
Group 2						
Inferior Turbinate Volume Reduction	20	-152,850	-408.544	102,844	546,337	

decrease in inferior turbinate (mm^3), calculated using magnetic resonance imaging (MRI) preoperatively and at the postoperative 3-month period, were compared.

The mean value of the preoperative volumes was $3904.50 \pm 1800.5 \text{ mm}^3$, whereas the mean value of the postoperative volumes was $3445.79 \pm 1459.01 \text{ mm}^3$ for the group 1. However, the mean value of the preoperative volumes was $3647.85 \pm 1119.119,47 \text{ mm}^3$, whereas the mean value of the postoperative volumes was $3800.70 \pm 1179.73 \text{ mm}^3$ for the group 2. When the mean inferior turbinate volumes were compared at the postoperative 3-month period, there was a statistically significant difference between groups 1 ($P = .04$; $P < .05$), but there was no significant decrease in group 2 ($P > .05$).

The values in Table 1 clearly show the inferior turbinate volume results in both surgical procedures of all patients imaged.

DISCUSSION

An ideal procedure for turbinate reduction is to obtain an improvement in nasal-breathing ability for recipients while at the same time preserving the physiological function of the nasal passages and mucosa, and eliciting minimal discomfort or adverse effects [8]. Thus, the ideal turbinate-surgery preserve the physiologic function of the turbinate, such as regulating the humidification and temperature of the inspired air.

Sapci T *et al.* reported that radiofrequency tissue ablation to the turbinate are effective in improving nasal obstruction objectively and in preserving nasal mucociliary function [13]. In most recent years, the use of a radiofrequency thermal ablation for the surgical treatment of hypertrophic turbinates has been reported by several authors [14]. Bipolar radiofrequency technology is also known as Coblation. The coblation energy excites the electrodes in a conductive medium, usually made of saline solution, to create a plasma field of highly ionized particles that is able to break down

intercellular bonds in the tissue, causing minimal damage to the surrounding healthy tissue because of the low temperature. This technology makes it possible to extract significant amounts of tissue without causing necrosis and scar contraction at the tissue.

There have been only a small number of reports describing the bipolar radiofrequency tissue ablation for patients with hypertrophic inferior turbinates. Bäck LJ found that 80% (32/40) patients who underwent a bipolar radiofrequency procedure to relieve nasal obstruction reported an improvement 1 year after tissue ablation[15]. However, Cavaliere M *et al.* reported that patients who underwent the bipolar radiofrequency had no superiority 20 months after surgery concerning the nasal symptoms compared to monopolar radiofrequency techniques for the treatment of adults with hypertrophic inferior turbinates [16]. In our study, the mean inferior turbinate volumes decreased significantly after surgery in the group 1 but not in the group 2. The observed improvements gradually continued until three months in group 1.

Differences between our results and results from previous research may be due to subjective evaluations in their study design. The inherent irregularity and individual variances of turbinate shapes creates difficulties of volume calculations with usual methods. In a previous study, sapci *et al.* have used ellipse volume for calculating of inferior turbinates. However this method may not reflect the real volumes that does not fit with real shape [13]. We believe that selection of Cavalieri method with drawing of turbinate shapes on each slice is likely to improve the diagnostic accuracy [11, 12].

In group 1, we found a increasing of the inferior turbinate volumes, our clinical results support suspicious the investigations about monopolar radiofrequency thermal ablation.

CONCLUSION

The monopolar and bipolar radiofrequency thermal ablation (bRFA) are surgical procedures that use

radiofrequency heating to improve nasal obstruction in patients with hypertrophic inferior turbinates. However, the inferior turbinate Coblation operation provides superior volume reduction in patients with the nasal obstruction caused by inferior turbinate hypertrophies, which does not lead to serious complications. Further studies are needed to evaluate the period of time for which the surgically realized decreases in nasal obstruction offered by these two surgical procedures are likely to last.

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Received on 24-06-2013

Accepted on 17-07-2013

Published on 24-12-2013

DOI: <http://dx.doi.org/10.12970/2308-7978.2013.01.02.4>

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