

THE INFLUENCE OF RADIO FREQUENCY ON THE HYPERTROPHY OF INFERIOR TURBINATE *

Haluk Bilek¹, Viktorija Rimasauskaite Petraitiene², <u>Faruk Meric¹</u>, Yusuf Celik³

¹ - Dicle University, Faculty of Medicine, Department of Ear, Nose, Throat Diyarbakir (Turkey)

² – Lithuanian University of Health Sciences, Kaunas (Lithuania)

³ - Dicle University, Faculty of Medicine, Department of Biostatistics Diyarbakir (Turkey)

Corresponding author:

Prof.Dr. Faruk Meric, <u>meric@dicle.edu.tr</u>, D.U. Tip Fakultesi, KBB Anabilim Dali Ogr. Uyesi 21280 Diyarbakir, TurkeyGSM +905324729600

Abstract

Purpose

Inferior turbinate hypertrophy is one of the major causes of nasal airway obstruction. Controversy still exists which is the most appropriate method for reduction of the inferior turbinate. The goal of this study was to evaluate the effect of radiofrequency thermal ablation (RFA) on nasal obstruction caused by inferior turbinate hypertrophy.

Methods

The diagnosis of inferior turbinate hypertrophy was based on observations and findings of anterior rhinoscopy and nasal endoscopy before and after decongestion. The effect of RF application on nasal resistance was measured rhinomanometrically and symptoms of nasal obstruction were evaluated by visual analog scale (VAS) before and after (8 weeks) applied treatment. Results were analysed statistically.

Results

The study was accomplished at Otolaryngology department of Dicle University in the period between February 2006 and January 2011. Radiofrequency turbinate reduction was performed on 30 female and 32 male patients with inferior turbinate hypertrophy. The mean age was 28.2 ± 5.83 for former group, and it was 29.4 ± 6.45 for later one. Most of the patients reported good improvement in nasal breathing which was improving further with time. There were no reports of turbinate necrosis, atrophy or epistaxis. The nasal passage resistance and symptoms of nasal obstruction decreased comparing preoperatively and postoperatively periods. The differences were statistically significant (p<0.001).

Conclusion

The RFA effectively decrease subjective and objective symptoms of inferior turbinate hypertrophy. It appears to be a safe, reliable, easily applicable minimally invasive procedure with minor risk of side effects.

Keywords:

Inferior turbinate hypertrophy, radiofrequency ablation, nasal obstruction, nasal resistance, inferior turbinate reduction.

*The study was presented to the 5th World Congress for ENDOSCOPIC SURGERY of the BRAIN, SKULL BASE & SPINE combined with the 1st Global Update on FESS, THE SINUSES & THE NOSE, Vienna, March 29 - April 1, 2012



Introduction

Nasal obstruction is one of the most common reasons why patients visit an otorhinolaryngologist¹. Inferior turbinate accounts for 50% of airway resistance, thus inferior turbinate hypertrophy is one of the major causes of nasal airway obstruction². Medical treatment of hypertrophic inferior turbinates often gives insufficient improvement¹. Invasive management of inferior turbinate hypertrophy has been actively debated for more than a century and various techniques are currently performed to reduce the volume of the mucosal (and sometimes bony) tissues of the inferior turbinates. Controversy still exists which the best or most appropriate method is for reduction of the hypertrophied inferior turbinate $^{1-4}$ because no technique is perfect, and each is associated with known short- and long-term complications². Radiofrequency thermal ablation (RFA) is one of alternative minimally invasive surgical option in treatment of isolated inferior turbinate hypertrophy. The controlled low heat energy causes local necrosis of submucosal cells leading to fibrosis and decreases turbinate volume by developing scar tissue ⁵⁻⁹ while preserving nasal epithelial functions ^{1,9,10}. Previous reports reflected that RFA aims submucosal tissue volume reduction, an elimination of patient-reported nasal obstruction symptoms with more than 90% improvement being achieved in 8 weeks after treatment, and maintenance of nasal function with minimal complications ¹⁰. The goal of this study was to evaluate the effect of RFA on nasal obstruction caused by inferior turbinate hypertrophy.

Materials and methods

For our purpose, the effect of RF application on nasal resistance was measured rhinomanometrically (RhinoStream, Interacoustics) (Picture 1) and symptoms of nasal obstruction were evaluated by visual analog scale (VAS) before and 8 weeks after applied treatment. Each patient used a 100-mm



VAS to grade degree of nasal obstruction. Results were analysed statistically.

The diagnosis of inferior turbinate hypertrophy was based on observations and findings of anterior rinoscopy and nasal endoscopy before and after decongestion. All patients were sufferers of nasal obstruction due to vasomotor rhinitis or allergic rhinitis refractory to medical therapy. The patients with septal deviation or nasal polyposis, as well as patients having nasal surgery during the same operation were excluded. Bipolar radiofrequency power unit (Gyrus G3, Olympus) equipped with a special RF electrode (SP1100) was used. Under local anesthesia with the aid of a 0° endoscope the heat energy of 350 joule was applied to each of 1/3 of inferior turbinate: to anterior, medial and posterior part. In addition, 500 joule was applied to the superior anterior region of inferior turbinate as shown in Picture 2. Hence totally 1550 joule heat energy was aimed at the region of each turbinate.

Results

The study was accomplished at Otolaryngology department of Dicle University Hospital in the period between February 2006 and January 2011. Radiofrequency turbinate reduction was performed on 30 female and 32 male patients with inferior turbinate hypertrophy. The mean age was 28.2 ± 5.83 for former group, and it was 29.4 ± 6.45 for later one.

RFA of the inferior turbinate was well tolerated by the majority of patients. Most of the patients reported good improvement in nasal breathing which was improving further with time. There were no reports of turbinate necrosis, atrophy or epistaxis. Only few patients complained of slight, bearable pain or pressure on the first days after operation. Except minimal crust, the detailed ENT examinations after 8 weeks exhibited no pathology requiring surgical correction.



The VAS scores of subjective nasal obstruction in the 8 weeks decreased statistically significantly (p<0.001) (Picture 3). The total nasal resistance diminished comparing preoperatively and postoperatively periods (Picture 4).

Discussion

RFA is minimally invasive and very effective treatment method for inferior turbinate hypertrophy. It enables otorhinolaryngologists to reduce submucosal tissue of inferior turbinate. Many surgical methods have been used for treatment of inferior turbinate hypertrophy when conventional treatments were unsuccessful. Invasive surgeries include partial, total or submucous turbinate resection when general anesthesia and hospitalisation are necessary. Even though total inferior turbinectomy is the most effective in terms of long term improvement of nasal obstruction, but it enlists a number of complications (postoperative hemorrhage, long lasting nasal crusts, synechiae and most importantly high percentage of atrophic rhinitis). Submucosal turbinate resection preserves mucous lever with mucociliary clearance and air conditioning and decreases the risk of hemorrhage; however it has tendency to relapse. As the inferior turbinates are very vascular structures patients with coagulopathies are clearly at increased risk of hemorrhage complications. Electrocautery, cryosurgery, laser surgery produce thermal insult to tissues and mucosal lesions ^{11,12}. Non-invasive (minimally invasive) procedures are more popular now as they can be done in the clinic under local anesthesia and the patient does not suffer any significant down-time. The aim of inferior turbinate hypertrophy treatment is to decrease tissue volume and maintain mucous function⁶. This was achieved at the present study applying RFA. Results showed that VAS evaluation improved significantly. This indicates that VAS used in this study is easily applicable, sensitive and reliable method observing subjective postoperative changes ^{7,13}. Whereas acoustic



International Journal of Basic and Clinical Studies (IJBCS) 2013;1(1): 197-205. Bilek H et al.

rhinomanometry enables objectively evaluate the treatment effect ^{10,14}. However, success of treatment should be primarily based on patient's feelings and satisfaction.

Our results are consistent with previous studies given in the literature ^{1,4,8,9,15} and support knowledge that the RF turbinate reduction gives result that is almost comparable with more invasive surgeries ^{9,12} but in the comparative studies RFA caused fewer side effects than the other methods ^{1,11,12}. In addition, this method has superiority over other methods in respect with easier application, patient co-operation and better toleration as well as lower post-operative complication rate. Still it has to be remembered that there is lack of knowledge about the long-term action of nasal RFA ^{1,12}.

Graphics



Picture 1. Rhinomanometer (RhinoStream, Interacoustics) and the moment of rhinomanometrical measurement procedure.



International Journal of Basic and Clinical Studies (IJBCS) 2013;1(1): 197-205. Bilek H et al.



Picture 2. Scheme showing points of electrode insertion and RF application areas on inferior turbinate. Heat energy was applied to the superior anterior region and to anterior, medial and posterior 1/3 part of inferior turbinate.



Picture 3. The diagram showing VAS scores preoperatively and postoperatively on each side. Symptoms of nasal obstruction evaluated by VAS scores decreased comparing preoperatively and postoperatively in the 8 weeks. The differencies were statistically significant (p<0.001).





Picture 4. The diagram showing preoperative and postoperative rhinomanometric measurements. The total nasal passage resistance diminished comparing preoperatively and postoperatively periods.



International Journal of Basic and Clinical Studies (IJBCS) 2013;1(1): 197-205. Bilek H et al.

References

1. Hytönen ML, Bäck LJJ, Malmivaara A V, Roine RP. Radiofrequency thermal ablation for patients with nasal symptoms: a systematic review of effectiveness and complications. European archives of oto-rhino-laryngology^D: official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS)^D: affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery. 2009;266(8):1257–66. doi:10.1007/s00405-009-0914-y.

2. Sapçı T, Güvenç MG, Evcimik MF. Radiofrequency treatment for inferior turbinate hypertrophy. Kulak burun boğaz ihtisas dergisiz: KBB = Journal of ear, nose, and throat. 21(1):56–60. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21303320. Accessed April 5, 2013.

3. Li KK, Powell NB, Riley RW, Troell RJ, Guilleminault C. Radiofrequency volumetric tissue reduction for treatment of turbinate hypertrophy: a pilot study. Otolaryngology--head and neck surgery D: official journal of American Academy of Otolaryngology-Head and Neck Surgery. 1998;119(6):569–73. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9852527. Accessed April 5, 2013.

4. O'Connor-Reina C, Garcia-Iriarte MT, Angel DG, Morente JCC, Rodríguez-Diaz A. Radiofrequency volumetric tissue reduction for treatment of turbinate hypertrophy in children. International journal of pediatric otorhinolaryngology. 2007;71(4):597–601. doi:10.1016/j.ijporl.2006.12.009.

5. Passàli D, Lauriello M, Anselmi M, Bellussi L. Treatment of hypertrophy of the inferior turbinate: long-term results in 382 patients randomly assigned to therapy. The Annals of otology, rhinology, and laryngology. 1999;108(6):569–75. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10378525. Accessed April 5, 2013.

6. Utley DS, Goode RL, Hakim I. Radiofrequency energy tissue ablation for the treatment of nasal obstruction secondary to turbinate hypertrophy. The Laryngoscope. 1999;109(5):683–686. doi:10.1097/00005537-199905000-00001.

7. Coste A, Yona L, Blumen M, et al. Radiofrequency is a safe and effective treatment of turbinate hypertrophy. The Laryngoscope. 2001;111(5):894–9. doi:10.1097/00005537-200105000-00025.

8. Nease CJ, Krempl GA. Radiofrequency treatment of turbinate hypertrophy: a randomized, blinded, placebo-controlled clinical trial. Otolaryngology-head and neck surgery D: official journal of American Academy of Otolaryngology-Head and Neck Surgery. 2004;130(3):291–9. doi:10.1016/j.otohns.2003.11.003.



International Journal of Basic and Clinical Studies (IJBCS) 2013;1(1): 197-205. Bilek H et al.

9. Back LJJ, Hytonen ML, Malmberg HO, Ylikoski JS. Submucosal Bipolar Radiofrequency Thermal Ablation of Inferior Turbinates: A Long-Term Follow-up With Subjective and Objective Assessment. The Laryngoscope. 2002;112(10):1806–1812. doi:10.1097/00005537-200210000-00019.

10. Kizilkaya Z, Ceylan K, Emir H, et al. Comparison of radiofrequency tissue volume reduction and submucosal resection with microdebrider in inferior turbinate hypertrophy. Otolaryngology-head and neck surgery²: official journal of American Academy of Otolaryngology-Head and Neck Surgery. 2008;138(2):176–81. doi:10.1016/j.otohns.2007.10.035.

11. Sapçi T, Sahin B, Karavus A, Akbulut UG. Comparison of the effects of radiofrequency tissue ablation, CO2 laser ablation, and partial turbinectomy applications on nasal mucociliary functions. The Laryngoscope. 2003;113(3):514–9. doi:10.1097/00005537-200303000-00022.

12. Porter MW, Hales NW, Nease CJ, Krempl GA. Long-term results of inferior turbinate hypertrophy with radiofrequency treatment: a new standard of care? The Laryngoscope. 2006;116(4):554–7. doi:10.1097/01.MLG.0000201986.82035.6F.

13. Maxwell C. Sensitivity and accuracy of the visual analogue scale: a psycho-physical classroom experiment. British journal of clinical pharmacology. 1978;6(1):15–24. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1429397&tool=pmcentrez&rendertype =abstract. Accessed April 5, 2013.

14. FISHER EW. Acoustic rhinometry. Clinical Otolaryngology and Allied Sciences. 1997;22(4):307–317. doi:10.1046/j.1365-2273.1997.00021.x.

15. Yildirim B, Uysal IO, Polat C, Gök C. [The efficacy of radiofrequency ablation technique in patients with inferior turbinate hypertrophy]. Kulak burun boğaz ihtisas dergisi@: KBB = Journal of ear, nose, and throat. 18(2):90–6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/18628643. Accessed April 5, 2013.