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Nasal obstruction: Comparison of radiofrequency with lateral displacement of the inferior turbinate and radiofrequency alone

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Abstract

Objective: To compare the outcomes of the nasal obstruction, the main symptom of the patients who underwent radiofrequency and lateral displacement of the inferior turbinate and patients who were treated with radiofrequency alone.
Methods: The prospective randomised study was conducted at the Department of Otorhinolaryngology and Head-Neck Surgery, Balikesir University Medical School, Balikesir, Turkey, between July and December 2012. It included 60 patients, diagnosed with allergic or non-allergic chronic rhinitis with inferior turbinate hypertrophy which was refractory to medical therapy. Half of the patients were treated with radiofrequency, and the rest with radiofrequency and lateral displacement. The main symptom of the patients was nasal obstruction. The frequency and degree of nasal obstruction were evaluated by patients' self-assessments using the standard 10-cm visual analogue scale. The evaluations were performed first pre-operatively and on the 1st, 3rd, 5th and 7th days post-operatively as well as at the end of the 4th week. SPSS 18 was used for statistical analysis.
Results: Nasal obstruction frequency and severity scores in patients treated with both radiofrequency and lateral displacement on post-operative days 3, 5 and 7 were found to be significantly lower ($p<0.001$) compared to the patients treated with only radiofrequency.
Conclusions: The study demonstrated that radiofrequency and lateral displacement together is an effective method to prevent inferior turbinate oedema in the early post-operative period.
Keywords: Concha hypertrophy, Radiofrequency, Lateral displacement, Treatment, Inferior turbinate.
(JPMA 64: 33; 2014).

Introduction

One of the most common causes of nasal obstruction, encountered often in an otorhinolaryngology clinic, is the hypertrophy of the inferior turbinate. Most patients are successfully treated with topical steroids and/or oral anti-histamines. In cases resistant to medical therapy, however, a number of surgical techniques are applied to the inferior turbinates, including turbinectomy, turbinoplasty, extramucosal or submucosalelectrocautery ablation, radiofrequency (RF) ablation, laser-assisted resection or ablation, and cryosurgery.[1,2] Although the best curative surgical technique has not yet been established, but the popularity of RF surgery has increased recently, due to the fact that it can repeatedly be performed as an ambulatory surgery, using local anaesthesia and without the need for nasal packing. The heat arisen from the RF energy is employed in this technique to elicit necrosis of the submucosa in a circumscribed manner, with a very limited injury to the neighbouring mucosa. This targeted submocal necrosis is eventually restored by fibroblasts, subsequently resulting in wound contraction, which provides a volume reduction in submucosal tissues without damaging the overlying mucosa, thereby relieving the nasal obstruction and enabling a continuous passage.[3-5] The use of RF has increased the success rates in the treatment of nasal obstruction caused by the hypertrophic inferior turbinates.[6] However, complications associated with RF surgery may give rise to serious patient discomfort as well as enhanced hospitalisation and costs. The oedema detected during the early post-

RF period is accepted to be a frequently seen complication in this treatment. Complete alleviation of the oedema can take 1 to 8 weeks. Especially during the first 7 days, oedema can be very disturbing for both the patient and the doctor. Therefore, in order to prevent excessive postoperative oedema, we performed lateral displacement (LD) of the inferior turbinate in the same session to a group of patients undergoing RF. Herein, we present the outcomes comparing the patients who underwent RF and LD in the same session with patients who were applied RF alone. To the best of our knowledge, this is the first study in the literature on this issue.

Patients and Methods

The prospective randomized study comprised 60 patients who were consecutively admitted to the Department of Otorhinolaryngology and Head-Neck Surgery at Balikesir University Medical School, Balikesir, Turkey, between July and December 2012 with either a diagnosis of allergic or non-allergic chronic rhinitis with severe inferior turbinate hypertrophy which was refractory to medical therapy. In order to identify an appropriate sample size to test the hypothesis, a power analysis was performed. The power analysis revealed that 29 patients were required for each study group, with a pre-determined 5% type-I error level and 95% power. For each patient in the study, the clinical diagnosis was based on medical history, clinical examination, nasal endoscopy, radiological examination and allergic testing. None of these patients were responsive to previous conventional medical managements. Patients were randomised into two different study groups. Patients who were admitted with odd registry numbers received RF only treatment, and those with even registry numbers received RF-LD treatment. Each patient received a detailed explanation of the RF treatment or RF treatment with LD (concha outfracturing) as well as possible related complications. An informed consent was obtained from each patient. Patients who had any systemic diseases anosmia, severe septal deviation, nasal polyposis, and upper respiratory tract infection within the preceding month were excluded. All procedures were conducted in compliance with the rules and decisions of the local ethics committee.

As nasal obstruction was the main symptom of these patients, the frequency and degree of nasal obstruction according to each patient's assessment (hereafter called the "subjective symptoms") were recorded pre-operatively and post-operatively on days 1,3,5,7 as well as at the end of the 4th week, using the standard 10-cm visual analogue scale (VAS). In the evaluation process of the frequency of nasal obstruction on a VAS scale, a score of 0 represented no episodes of nasal obstruction, and 10 indicated constant, unremitting nasal obstruction. Similarly, when the degree of nasal obstruction was evaluated according to the VAS scale, 0 represented no obstruction and 10 represented complete nasal obstruction. Findings of oedema on the inferior turbinate relevant to the applied surgical treatment were assessed on post-operative days 1, 3, 5, 7 and at the end of the 4th week.

All patients were first sedated using appropriate anaesthetics and then local anaesthesia was applied to all patients who underwent either of the surgical procedures. First, a 4% lidocaine-soaked cotton pledget was placed in the anterior portion of the inferior turbinate for 10 minutes. Then, 1% lidocaine was injected to the anterior and medial parts of the inferior turbinate with the help of a 24-gauge needle. The RF generator (G3, Gyrus ENT, Bartlett, USA) was set to deliver 300 joules, with a target temperature of 75ºC. The active portion of the needle electrode was inserted longitudinally (0º endoscopic view) into the submucosa of the anterior, middle and posterior parts of the inferior turbinate, from an inferior-medial approach. In the other patient group, RF was followed by LD of the concha as defined by Goode et al. in 1998.[7] The turbinate was first fractured upward and inward toward the septum. Then the instrument was placed on the free lateral edge of the turbinate and subsequently outfractured toward the lateral wall. When necessary, a cotton plug, which was removed within the next 24 hours, was positioned.

Statistical analyses were performed using SPSS version 18. The variables were investigated using

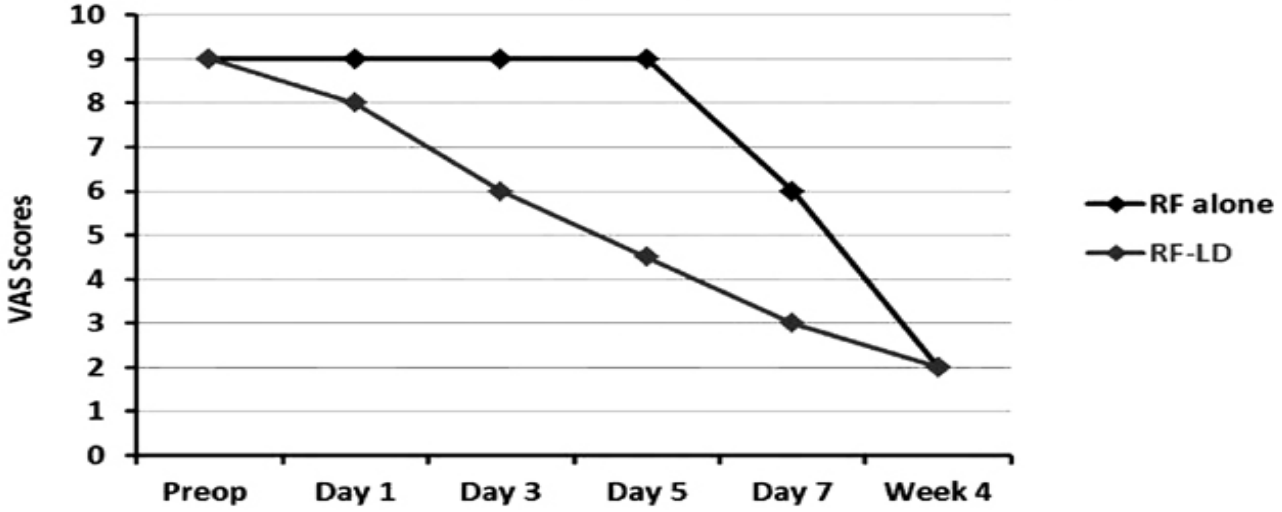
visual (histograms, probability plots) and analytical methods (Kolmogorov-Simirnov/Shapiro-Wilk's test) to determine whether they were normally distributed or not. Friedman tests were conducted to test whether there was a significant change in the repeated variables in each study group, due to violations of parametric test assumptions (non-normal distribution and low number cases, respectively). The Wilcoxon tests were performed to test the significance of pairwise differences using Bonferroni correction to adjust for multiple comparisons. The Mann-Whitney U tests were used to compare variables between the two independent groups. An overall 5% type-I error level (a p value of less than 0.05) was used to infer statistical significance.

Results

Of the 60 patients, 18 (30) had allergic chronic rhinitis, while 42 (70%) had the non-allergic variety. The RF group consisted of 19 (63.3%) males and 11 (36.66%) female patients with a median age of 33.2 years (range: 24-50). The RF-LD treatment group consisted of 17 (56.6%) male and 13 (43.3%) female patients with a median age of 36.1 years (range: 21-51). In the RF group, 19 (63.3%) patients had mild bleeding at the site of needle insertion after the application of the treatment. However, no packing was required in these patients. In addition, 7 (23%) patients in the group reported mild discomfort or sensation of heat during the treatment; of these, only 1 (3.3%) patient required post-operative pain medication. In the RF-LD group, mild bleeding at the site of operation was observed in 22 (73%) patients. Three (10%) of these patients required post-operative nasal packing. Moreover, 17 (57%) patients complained of either mild discomfort or sensation of heat during the procedure. In contrast to the RF group, 8 (26.6%) patients in the RF-LD group required post-operative (one-day) pain medication.

According to the VAS scores, the severity and frequency of nasal obstruction in the RF group began to improve significantly with the post-operative day 7 (Figure 1 and 2).

A

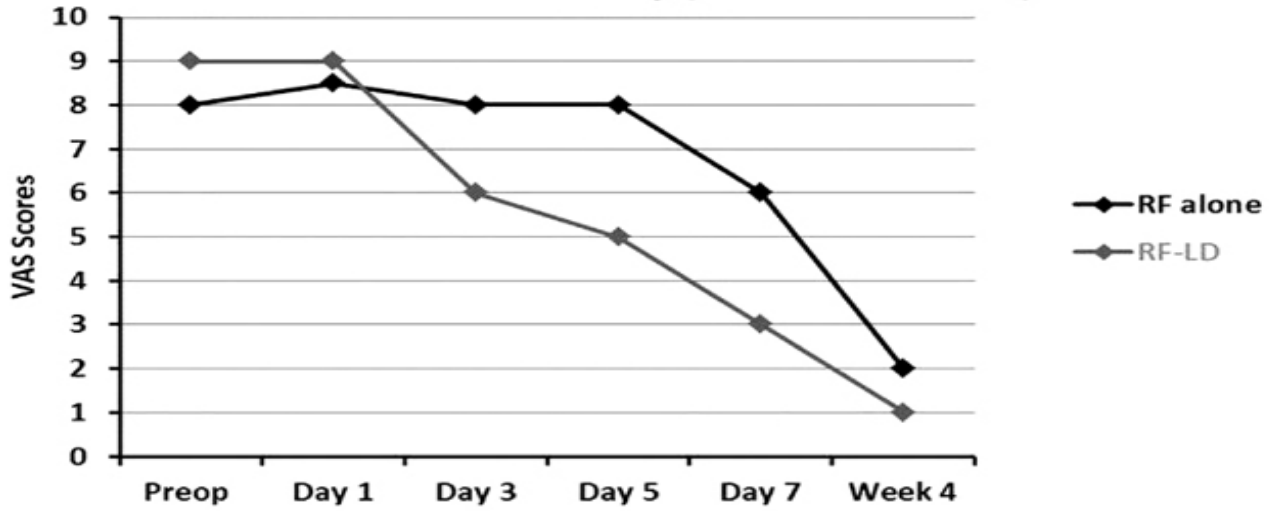


B

	RF alone *Median (Min-Max)*	RF-LD *Median (Min-Max)*	p Value
Preoperative	9 (7-10)	9 (7-10)	0,974
Day 1	9 (7-10)	8 (6-10)	0,330
Day 3	9 (7-9)	6 (4-9)	***<0,001***
Day 5	9(7-9)	4,5 (2-8)	***<0,001***
Day 7	6 (4-6)	3 (2-8)	***<0,001***
Week 4	2 (0-6)	2 (1-6)	0,437

Figure-1: A) VAS scores obtained from patients in two study groups at different time points, demonstrating obstruction frequency. Due to the fact that the scores are not normally distributed, median values are depicted. B) Table showing the median and min-max values of VAS scores obtained from patients in two groups at different time points. P values indicate the degree of significance between the two study arms at each time point, according to the Mann-Whitney U Tests performed.

A



B

	RF alone *Median (Min-Max)*	RF-LD *Median (Min-Max)*	p Value
Preoperative	8 (7-9)	9 (7-10)	0,130
Day 1	8,5 (7-9)	9 (7-9)	0,323
Day 3	8 (7-9)	6 (3-8)	***<0,001***
Day 5	8 (7-9)	5(2-7)	***<0,001***
Day 7	6 (5-8)	3 (1-7)	***<0,001***
Week 4	2 (0-8)	1 (1-7)	0,443

Figure-2: A) VAS scores obtained from patients in two study groups at different time points, demonstrating obstruction severity. Due to the fact that the scores are not normally distributed, median values are depicted. B) Table showing the median and min-max values of VAS scores obtained from patients in two groups at different time points. P values indicate the degree of significance between the two study arms at each time point, according to the Mann-Whitney U Tests performed.

However, both the severity and frequency of nasal obstruction in the RF-LD group began to improve significantly with the post-operative day 3. The recovery was still prominent 4 weeks after the operation. In the RF group, both the severity and the frequency of nasal obstruction were completely recovered in 27 (90%) of 30 patients at the end of 4 weeks after the treatment (VAS score ? 3).

Similarly in the RF-LD group, both the severity and the frequency of nasal obstruction were completely recovered in 28 (93.3%) of 30 patients at the end of 4 weeks after the treatment (VAS score ? 3). The subjective symptoms slightly worsened in this group during the post-operative first day and began to improve close to the end of the second day.

Pre-operative obstruction frequency and severity scores were not found to differ between the two treatment groups (Mann-Whitney U test, p=0.974 and p=0.130 respectively). In the RF group, a significant reduction in VAS obstruction frequency scores were observed on post-operative day 7 as well as the post-operative 4th week with respect to the pre-operative scores (Post-hoc Wilcoxon Sign Rank tests for post-operative day 1: p=0.157; for day 3: p=0.564; for day 5: p=0.157; for day 7: p<0.001 and for day 28: p<0.001, respectively). In the same group, a significant reduction in VAS obstruction severity scores was observed on post-operative day 7 as well as the post-operative 4th week with respect to the pre-operative scores. For the post-operative day 1, it was p=0.157; for day 3, p=0.317; for day 5, p=0.157; for day 7, p<0.001; and for day 28 p<0.001, respectively. In contrast, both the VAS obstruction frequency and the severity scores were found to decrease significantly on post-operative day 3, 5, 7 and the post-operative 4th week compared to the pre-operative scores only in the group of patients who were treated with RF and LD (p<0.001 for both obstruction frequency and severity. Obstruction frequency scores were found not to differ on post-operative day 1 compared to the pre-operative scores in patients who were treated with either RF alone or RF and LD (Wilcoxon Sign Rank Test: p=0.157, and p=0.457 respectively). Similarly, both groups were not found to have significantly reduced the obstruction severity scores on post-operative day 1 compared to the pre-operative scores (Wilcoxon Sign Rank Test: p=0.157 vs. p=0.617). Obstruction frequency scores on post-operative days 3, 5 and 7 were found significantly lower in patients who were treated with both RF and LD in comparison to the patients treated with only RF (Mann-Whitney U test: p<0.001 for all time points). Similarly, obstruction severity scores on post-operative days 3, 5 and 7 were found to be significantly lower in patients treated with both RF and LD in comparison to the patients treated with only RF (Mann-Whitney U test: p<0.001 for all time points).

Discussion

Perennial allergic rhinitis and non-allergic rhinitis are the two most common causes of significant hypertrophic mucosal changes of the inferior turbinate, which eventually result in prolonged nasal obstruction.[8] Initial treatment of patients with chronic rhinitis generally comprises conservative therapeutic approaches such as anti-histamines, topical nasal steroid sprays, allergy desensitisation, mast cell stabilisers, or systemic decongestants. When adequate relief is not provided, surgical procedures like laser cautery, cryocautery, submucosal turbinectomy, or electrocautery are indicated.[8,9] However, these are not usually well-tolerated by patients under local anaesthesia, probably due to the depth of the tissue injury, often resulting in prolonged rhinorrhea, worsening of nasal obstruction secondary to oedema, or crusting.[10]

RF has several applications in otorhinolaryngology. It is useful for the treatment of nasal obstruction, through reducing the volume of the turbinates.[3,5] RF can also be beneficial for both reducing the soft palate and the base of the tongue, thus in the treatment of snoring and sleep apnoea, respectively.[11,12] The purpose of tissue volume reduction is to induce a healing process of the damaged target tissue that culminates in the submucosal fibrosis of the turbinate, causing the adhesion of the mucosa to the turbinate periosteum and a reduction in the blood flow to the turbinate, lessening the predisposition to swelling and oedema.[3,4] To avoid damage to the surrounding tissue, the temperature of the target tissue is usually maintained between 60°C and 90°C with relatively low energy.[4]

Several advantages of RF have been previously established in different studies.[3-5,13] These advantages

include the ability to perform the procedure in office-based settings with minimal patient discomfort, reduced costs, decreased thermal insult to tissues (laser and cautery techniques use temperatures at 800°C in contrast to 90°C employed by RF), as well as diminished post-operative crusting and care.[6,14,15]

In the study, while post-operative oedema decreased by the 7th day in patients treated with only RF, there was a statistical decrease in oedema in patients treated with RF and LD by the 3rd day. It was previously reported that patient discomfort due to post-operative oedema generally began to improve at the end of the first week. However, during this one-week period, the quality of life of the patients might even get worse than that of the pre-operative period. A study which evaluated the outcome of inferior turbinoplasty surgery by using either microdebrider or RF, suggested that the outcome was better in the microdebrider arm at the end of the post-operative first week.[16] It pointed out that this was due to the oedema developing after RF treatment. Similarly, another study reported a post-operative 5-day oedema rate of 64% in patients treated with RF. It indicated that patients with allergic rhinitis benefited more from RF treatment than topical nasal steroid treatment.[17]

The results of RF-LD treatment in patients with nasal obstruction as an alternative solution to oedema occurring in the early post-operative period were evaluated in the current study. The patients were also seen to benefit from this transient favourable effect of the LD of the inferior turbinate, which is a minimally destructive procedure. This technique is easy to perform and the surgical risk of bleeding is minimal. [7,18] The outfracturing of the inferior turbinates is believed to be a minimally invasive method which can be either used alone or as an ancillary procedure. This method is also thought to preserve the nasal epithelium and does not interfere with mucociliary function. However, there is only limited and ambiguous data in the literature about its predictability and durability.[19-21] Only minor improvement is generally provided with the lateral displacement of the inferior turbinate due to the tendency for re-positioning.[19,22,23] Thomas et al. (1988) evaluated the efficiency of lateral displacement of the inferior concha by rhinomanometry and demonstrated that there was no improvement in the nasal air flow.[24] In contrast, another study published better results in patients with concomitant concha lateralisation and submucosal resection in comparison to patients with sole submucosal resection.[25,26] Data supporting our findings was previously obtained in a study which carried out submucosalelectrocautery ablation with and without lateral fracturing, and assessed nasal breathing with VAS. It demonstrated that the addition of outfracturing yielded better clinical results.[27] The VAS offers a reproducible quantifiable evaluation of patients' symptoms, which may give more reliable information than simply asking if the patient is better, the same or worse.[28] A study reported that there was no correlation between nasal obstruction symptoms and nasal resistance after examining patients' nasal obstruction using 100mm VAS.[29]

Conclusion

RF and LD together represent an effective method to prevent inferior turbinate oedema in the early post-operative period.

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