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Endoscopic Inferior Turbinoplasty Versus Radiofrequency Ablation for Treatment of Inferior Turbinate Hypertrophy

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ABSTRACT

Background: A variety of methods can be used to treat inferior turbinate hypertrophy that has not improved with the medical treatment including turbinectomy, laser and turbinoplasty as well as radiofrequency ablation.

Objectives: This study aimed to compare the results and outcome of radiofrequency ablation with that of endoscopic turbinoplasty in cases of inferior turbinate hypertrophy that are resistant to the medical treatment.

Patients and methods: Thirty-four patients having refractory inferior turbinate hypertrophy have been divided randomly into two groups. Group (A) included patients who underwent endoscopic inferior turbinoplasty, while group (B) contained patients who underwent radiofrequency ablation.

Results: Three-months postoperatively, within each group, there was a statistically significant decrease in the inferior turbinate hypertrophy grading, but with no statistically significant difference between the two groups. As well, there was a statistically significant improvement of the nasal symptoms VAS in each group. However, there was a statistically significant more improvement of the postoperative nasal obstruction VAS in the radiofrequency group than in the endoscopic turbinoplasty group. Whilst, there was a statistically significant more improvement of the postoperative sneezing VAS in the endoscopic turbinoplasty group than in the radiofrequency group.

Conclusion: Both techniques are effective for inferior turbinate reduction. Radiofrequency ablation is a minimally invasive technique and more effective than endoscopic turbinoplasty in relieving nasal obstruction.

Keywords: Endoscopic inferior turbinoplasty, Radiofrequency ablation, Inferior turbinate hypertrophy.

INTRODUCTION

When it comes to noses and breathing, the lower part of the turbinate is the most important part. It is made up of an osseous skeleton core and mucosal layers on both sides. One of the most significant functions of the inferior turbinate is that it regulates air temperature and humidity and filters out the foreign particles by mucociliary clearance, which protects the lungs from inhaled irritants [1, 2]. Asthma, allergies, or an evident distortion of the septum are the most common causes of inferotemporal turbinate hyperplasia. Otorhinolaryngologists consider nasal blockage as a prevalent symptom. Even while this isn't a life-threatening ailment, it has a negative impact on one's well-being because it makes it difficult to enjoy the little things [3].

Medications used to treat inferior turbinate hypertrophy include antihistamines used orally, decongestants applied topically and systemically, and corticosteroid sprays administered topically intranasal. Some patients' condition appears to be deteriorating, while other cases remain resistant to medical treatment. In such circumstances, surgical reduction of the inferior turbinate can be undertaken. An appropriate nasal airway for breathing as well as the preservation of the inferior turbinate physiological function are the primary goals of inferior turbinate surgery [4, 5].

Cryosurgery, monopolar or bipolar electrocautery, turbinectomy and turbinoplasty, as well as laser-assisted turbinoplasty, are only a few of the therapy possibilities for inferior turbinate hypertrophy. It's not clear what the best course of action is. In addition, the lack of long-term studies makes it impossible to suggest a particular strategy based on data [6].

Comparing radiofrequency ablation and endoscopic turbinoplasty in cases of inferior turbinate hypertrophy refractory to medicinal treatment was the goal of this study.

PATIENTS AND METHODS

Preliminary data from a prospective cohort study was gathered in the Oto-Rhino-Laryngology Department, Faculty of Medicine, Zagazig University, Egypt.

Ethical approval:

Research Ethics Council at Zagazig University approved the study as long as all participants provided informed consent forms. Ethics guidelines for human experimentation were adhered to by the World Medical Association's Helsinki Declaration.

Inclusion criteria: Medical treatment has failed to alleviate a patient's nasal obstruction due to hypertrophy of the inferior turbinate (antihistaminic via oral route and steroid sprays intranasal, as well as systemic decongestants) for a minimum of three months.

Exclusion criteria: Patients younger than 14-years old, pregnant patients, chronic rhinosinusitis patients with nasal septal deviation, sinus tumour patients with granulomas, patients with sino-nasal polyposis, past history of inferior turbinate surgery, and patients who were unfit for general anesthesia.

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The following diagnostic process was utilised on every one of the sufferers:

- A thorough medical history.
- Nasal symptoms including rhinorrhea and sneezing were measured using a conventional visual analogue scale (VAS) to gauge the degree of obstruction in the nose. Patients were asked to rank his symptoms on a scale of 0–10, with 0 denoting no symptoms and 10 denoting the most severe symptoms, with mild symptoms scoring 0–3, moderate symptoms scoring 4–7, and severe symptoms scoring 8–10.
- A thorough examination of the ear, nose, and throat, which included a rigid nasal endoscopy. According to the inferior turbinate categorization system, the inferior turbinate was assigned a number between 1 and 4 by **Camacho *et al.*** [(7)] in which the inferior turbinate took up between 0 and 25% of the total airway space in grades 1, 2, and 3, and between 51 and 75% of the total airway space in grades 3, and between 76 and 100% of the entire airway space in grades 4.
- Nasal congestion can be used to distinguish between mucosal and bone enlargement of the inferior turbinate.
- Scan of the nose and sinuses without contrast using computed tomography (Figure 1).
- Performing the appropriate preoperative routine laboratory tests.

Figure (1): Nasal and paranasal sinus non-contrast computed tomography(coronal view) showing bilateral inferior turbinate hypertrophy.

Two groups of patients were created at random from the total population: Group A underwent endoscopic inferior turbinoplasty, and group B that underwent radiofrequency ablation of the inferior turbinate.

The operative technique:

Both surgeries were carried out with the patients in a supine position with their heads flexed around 30 degrees under general hypotensive anaesthesia. Topically applied 1% lidocaine and 1:200000 adrenaline-soaked cottonoids were applied to the patients' inferior meatus and inferior turbinates to prepare them.

Group A: Endoscopic inferior turbinoplasty: 5 ml of 1:200000 adrenaline was administered submucosally into each inferior turbinate's anterior head, medial surface, and inferior surface under the direction of a 4-mm nasal endoscope 0. A superior to inferior incision was made on the anterior aspect of the inferior turbinate through the mucosa down to the bone using a No. 15 blade, and the incision was extended posteriorly along the inferior surface of the turbinate. A dissector was utilised to remove the conchal bone's soft tissue and mucosa. The turbinate bone was removed and bleeding was managed with bipolar electrocautery while the medial flap was preserved. Re-stitching the flap with No. 0/4 Vicryl suture was then performed on the flap (Figure 2). Both inferior turbinates were managed. Then, one silastic stent was applied to each side of the septum, both stents were fixed together, and one Merocel nasal pack without airway was inserted into each nasal cavity.

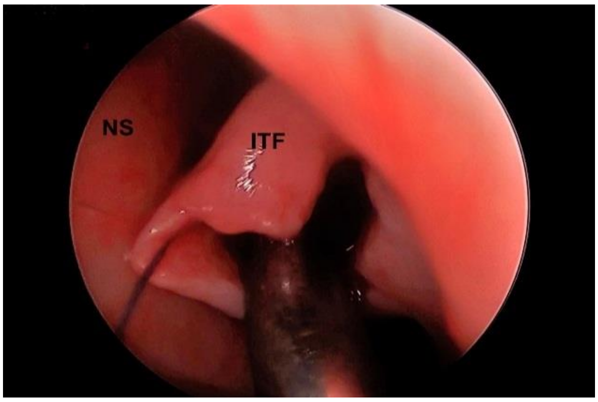

Figure (2): Endoscopic left inferior turbinoplasty (ITF = Inferior turbinate flap, NS = Nasal septum).

Group B: Radiofrequency ablation of the inferior turbinates: Under guidance of 4-mm nasal endoscope 0°, 5 ml of 0.9% normal saline was injected submucosally along the anterior head, middle part, and posterior end of each inferior turbinate to permit the plasma field to form during insertion. Radiofrequency ablation was performed using Coblator II (ArthroCare ENT, RF8000E, Arthrocare Corporation, USA). The system has been set to a power of 6 W in the coblation mode and a power of 4 W in the coagulation mode. To construct a horizontal channel from the anterior to the posterior head of the inferior turbinate, the Reflex Ultra 45 coblation wand was inserted at the anterior head of the turbinate. The coblation was activated for 30 seconds after the wand had been progressed submucosally along the turbinate's length to the third mark. When the wand was retracted to the second mark, coblation was repeated for 30 seconds before being reapplied to the first spot. Activating coagulation mode was done with extreme caution so as not to damage the inferior turbinate mucosa (Figure 3).

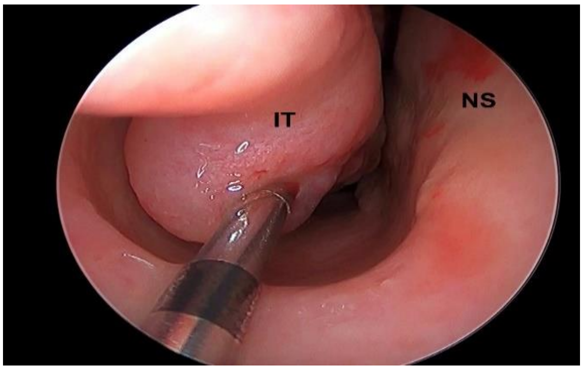

Figure (3): Insertion of Reflex Ultra 45 coblation wand into the right inferior turbinate (IT = Inferior turbinate, NS = Nasal septum).

Finally, submucosally, into the middle and posterior parts of the inferior turbinate, the wand's tip was put. The same stages were followed. In both inferior turbinates, radiofrequency energy was used. After that, each nasal cavity was filled with an antibiotic-infused Sofra-Tulle dressing.

Postoperative follow-up:
While the nasal pack was removed after 48 hours, the silastic nasal septal stents were removed after two weeks. On the day of surgery, the nasal pack was withdrawn from patients in group B. Both groups of patients received oral antibiotics, nasal decongestants, and analgesics for seven days and saline nasal sprays for 1-3 months. In the weeks and months following surgery, patients were checked in every two weeks until they were followed up every month. Rigid nasal endoscopy was conducted at each subsequent appointment to check for nasal airway patency and to document any sequelae. Using the same visual analogue scale, patients' symptoms were reassessed three months after surgery to determine whether either procedure had achieved the desired results. However, sequelae like bleeding, crust formation, pain, and atrophy were evaluated using a standard four-point scale, with 0 denoting absence, 1 denoting mild severity, 2 denoting moderate severity, and 3 denoting severe severity.

Statistical analysis
In order to analyze the data acquired, Statistical Package of Social Sciences (SPSS) version 20 was used to execute it on a computer. In order to convey the findings, tables and graphs were employed. The quantitative data was presented in the form of mean, median, standard deviation, and confidence intervals. The information was presented using qualitative statistics such as frequency and percentage. The student's t test was used to assess the data while dealing with quantitative independent variables. Pearson Chi-Square and Chi-Square for Linear Trend (X^2) were used to assess qualitatively independent data. The significance of P value of 0.05 or less was determined.

RESULTS
In this investigation, 34 patients with refractory hypertrophy of the inferior turbinates were included. They were divided into two groups 17 patients each, which were split at random. There were no unaccounted-for patients in this study. In group A (endoscopic turbinoplasty), the average age of the patients was 27.3 ± 8.61 years. There were nine female patients and eight male patients. Group B (radiofrequency coblation) patients had an average age of 26.7 ± 5.34 years. There were ten female patients and seven male patients. The age and sex differences between the two groups were not statistically significant (**Table 1**).

Table (1): The study group's characteristics

Variable	Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	*χ2*	*P-value*
Age				
Mean ± SD **Range**	27.3 ± 8.61 (18-36)	26.7 ± 5.34 (18-42)	**0.29**	**0.78** **NS**
Sex				
Male **Female**	8 (47.1%) 9 (52.9%)	7 (41.2%) 10 (58.8%)	**0.12**	**0.73** **NS**

The inferior turbinate hypertrophy in all patients included in the study was grade 3 or 4, and there was no statistical difference between the two groups. No statistically significant difference between the two groups was found at three months following surgery in patients who had shrunken inferior turbinates that were either entire or grade 1 or 2. However, within each group, there was a statistically significant decrease in the postoperative inferior turbinate hypertrophy grading **(Table 2, 3)**.

Table (2): Inferior turbinate hypertrophy grading

Inferior turbinate hypertrophy			Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17
Preoperative	**Grade 3**	**No. (%)**	8 (47%)	8 (47%)
	Grade 4	**No. (%)**	9 (53%)	9 (53%)
Postoperative	**Grade 1**	**No. (%)**	11 (65%)	10 (59%)
	Grade 2	**No. (%)**	6 (35%)	7 (41%)

Table (3): Inferior turbinate hypertrophy grading

Inferior turbinate hypertrophy grading		Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	Test	*P*-value
Preoperative	**Mean ± SD** **Median (Range)**	3.52 ± 0.51 4 (3-4)	3.53 ± 0.52 4 (3-4)	**t-test** **0.00**	**1.00** **NS**
Postoperative (3-months after surgery)	**Mean ± SD** **Median (Range)**	1.35 ± 0.49 1 (1-2)	1.41 ± 0.51 1 (1-2)	**MW** **0.35**	**0.75** **NS**
***P*-value**		**< 0.001**	**< 0.001**		

MW = Mann-Whitney test of non-parametric data

Both groups showed no statistically significant differences in the severity of their nasal obstruction VAS before surgery. A statistically significant decrease in the VAS for nasal obstruction was observed in both groups at three months post-operatively. Postoperative nasal obstruction VAS was significantly lower in group B patients than in group A **(Table 4)**.

Table (4): The nasal obstruction VAS in both studied groups

Nasal obstruction VAS		Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	Test	*P*-value
Preoperative	**Mean ± SD** **Median (Range)**	7.95 ± 0.97 8 (7-10)	7.73 ± 1.26 8 (6-10)	**t-test** **0.64**	**0.55** **NS**
Postoperative	**Mean ± SD** **Median (Range)**	2.35 ± 0.79 2 (1-4)	1.53 ± 1.01 1 (0-3)	**MW** **2.34**	**0.01** **S**
***P*-value**		**< 0.001**	**< 0.001**		

MW = Mann-Whitney test of non-parametric data

There was a statistically significant difference between the two groups in terms of preoperative rhinorrhea VAS severity, with all patients scoring in the moderate to severe range. In both groups, the rhinorrhea VAS decreased significantly three months after surgery. However, the VAS for postoperative rhinorrhea did not differ significantly between the two groups **(Table 5)**.

Table 5: The rhinorrhea VAS in both studied groups

Rhinorrhea VAS		Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	Test	*P*-value
Preoperative	**Mean ± SD** **Median** **(Range)**	6.24 ± 0.91 6 (5-8)	7.11 ± 1.0 7 (5-8)	**t-test** **2.34**	**0.03** **S**
Postoperative	**Mean ± SD** **Median** **(Range)**	2.0 ± 0.79 2 (1-3)	2.41 ± 1.12 2 (1-4)	**MW** **1.01**	**0.35** **NS**
***P*-value**		**<0.001**	**<0.001**		

MW = Mann-Whitney test of non-parametric data

There was no statistically significant difference between the two groups preoperatively regarding the sneeze VAS scores. Each group showed a statistically significant decrease in the postoperative sneeze VAS at three months postoperatively. However, the postoperative sneeze VAS in group A decreased significantly more than in group B **(Table 6)**.

Table (6): The sneezing VAS in both studied groups

Sneezing VAS		Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	Test	*P*-value
Preoperative	**Mean ± SD Median (Range)**	5.18 ± 1.24 5 (4-6)	4.88 ± 0.69 5 (3-7)	**t-test 0.85**	**0.399 NS**
Postoperative	**Mean ± SD Median (Range)**	2.24 ± 0.82 2 (1-4)	2.88 ± 0.93 3 (1-5)	**MW 2.61**	**0.03 S**
***P*-value**		**< 0.001**	**< 0.001**		

MW = Mann-Whitney test of non-parametric data

Group A' operative time was significantly longer than in group B, with a statistically significant difference **(Table 7)**. Moreover, all patients of group A were in need for Merocel nasal packing and septal stents postoperatively.

Table (7): The operative time in both studied groups

Time (minutes)	Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	X^2	*P*-value
Mean ± SD Range	52.3 ± 7.41 (40-67)	9.31 ± 1.42 (8-12)	**23.4**	**< 0.001 HS**

Postoperatively, none of the radiofrequency coblation patients had bleeding, while bleeding occurred only in 5 patients (29.4%) of turbinoplasty group (*P*-value < 0.05). Bleeding was mild after 5-7 days, and has been controlled by Merocel nasal packing for 24 hours. Patients of radiofrequency coblation group had mild crusts, while the patients of turbinoplasty group had mild to moderate crusts (*P*-value < 0.05). Such crusts have resolved completely in both groups by the end of the 3rd month. Radiofrequency coblation of the inferior turbinates (58.8%) was associated with much less pain than endoscopic turbinoplasty (35.3%). However, no difference between the two groups was found to be statistically significant (**Table 8**). Atrophic change and synechiae had not been observed in any patient within the follow-up period.

Table (8): The postoperative outcome in the studied group

Outcome	Turbinoplasty group (A) N = 17	Radiofrequency group (B) N = 17	Test	*P*-value
Bleeding	5 (29.4%)	0 (0.0%)	**Fisher**	**0.04 S**
Crusts				
1 2	12 (70.6%) 5 (29.4)	17 (100.0%) 0 (0.0%)	**Fisher**	**0.04 S**
Pain score				
0 1 2	6 (35.3%) 8 (47.1%) 3 (17.6%)	10 (58.8%) 7 (41.2%) 0 (0.0%)	**4.11**	**0.13 NS**

DISCUSSION

Having an enlarged inferior turbinate might lead to a blocked nose. Up to 10–20% of allergy sufferers experience persistent nasal blockage as a result of hypertrophy of the inferior turbinates. Medical treatment works for the majority of people with inferior turbinate hypertrophy. Surgical turbinate reduction should be considered if medicinal treatment fails [8, 9]. In order to treat inferior turbinate hypertrophy, various surgical treatments have been reported. Nevertheless, there is no agreement on the best methods [10].

In the current study, the postoperative inferior turbinate grading decreased significantly compared to the preoperative grading in each group. A statistically significant difference between the two groups was not found despite this fact. **Mehta *et al.*** [11] observed considerable improvement in the size of the turbinate at the end of 1 and 3 months after radiofrequency ablation using the Reflex Ultra coblation wand. Our findings are consistent with their findings. As well, **Gül *et al.*** [6] reported that the postoperative mean inferior turbinate volumes were significantly lower than the preoperative mean inferior turbinate volumes in both radiofrequency ablation and microdebrider-assisted turbinoplasty groups. However, the postoperative mean inferior turbinate volumes were significantly lower in microdebrider-assisted turbinoplasty group as compared to the radiofrequency group. However, the preoperative inferior turbinate volumes did not significantly differ between the two groups.

Nasal blockage, rhinorrhea, and the sneezing VAS all were improved significantly in both groups three months after surgery. This is consistent with **Bakshi *et al.*** [10] who found statistically significant improvement in the overall nasal symptom scores in both radiofrequency ablation and endoscopic surgery groups. **Akagün *et al.*** [12] also found that postoperative improvement in nasal obstruction, rhinorrhea, and sneezing was seen in both the radiofrequency ablation and microdebrider-assisted turbinoplasty groups**.**

Preoperative nasal obstruction and sneezing VAS were not statistically different between the two groups in our study. While, the preoperative rhinorrhea VAS showed a statistically significant difference between the two groups. A statistically significant improvement in the nasal obstruction VAS was seen in the radiofrequency group, while a statistically significant decrease in the postoperative sneeze VAS was found for those who underwent endoscopic surgery. However, the VAS for postoperative rhinorrhea did not differ significantly between the two groups.

By the third month after surgery, radiofrequency ablation improved nasal blockage more than endoscopic turbinoplasty, a finding that was statistically significant, which is consistent with **Bakshi *et al.*** [10]**.** There was statistically significant improvement in rhinorrhea and sneezing after six months in the endoscopic turbinoplasty group versus one year in the radiofrequency ablation group. The improvement of rhinorrhea and sneezing was not statistically significant between the two groups. However, the improvement of nasal obstruction was considerably greater in the microdebrider-assisted turbinoplasty group than in the radiofrequency ablation group.

Endoscopic turbinoplasty took more time to perform than radiofrequency in our study, and the difference was statistically significant. Our findings are in agreement with that of **Vijay Kumar *et al.*** [13] who found a highly significant difference in the operative time as the mean operative time for the radiofrequency group was 14.7 minutes, while the operative time for the turbinoplasty group was 29.3 minutes.

In the present study, 5 patients of endoscopic turbinoplasty group had mild bleeding postoperatively, while none of the radiofrequency patients group had postoperative bleeding. However, **Bakshi *et al.*** [10] reported that 9 patients (20.45%) in the endoscopic turbinoplasty group and 11 patients (26.19%) and in the radiofrequency ablation group reported bloody nasal discharge, which was resolved within the first postoperative week in both groups.

In the present study, the radiofrequency ablation group had mild crusts, while 12 patients of the endoscopic turbinoplasty group had mild crusts and 5 patients had moderate crusts. Such crusts have resolved completely in both groups by the end of the 3rd month. Our findings are in line with those of **Bakshi *et al.*** [10] who found that crusting was a significant issue in the turbinoplasty group, with 15 patients (35.71%) developing crusting in the immediate postoperative period, with three of these patients continued to develop crusting for six months postoperatively. In contrast, only 3 patients (6.81%) in the radiofrequency group developed crusting.

In the present study, radiofrequency ablation of the inferior turbinates was associated with less pain than endoscopic turbinoplasty, but there was no statistically significant difference between both groups. There was no significant difference between the radiofrequency group and the turbinoplasty group in terms of postoperative pain or discomfort, as described by **Cavaliere *et al.*** [14]**.**

With minimal postoperative complications, radiofrequency ablation protected nasal mucosa and enhanced nasal function. Radiofrequency ablation, on the other hand, was ineffective in the treatment of bone hypertrophy. It is possible to remove the obstructed soft tissue and bulky bone of the inferior turbinate with minimal damage to the delicate nasal mucosa when using endoscopic turbinoplasty. The sample size was small, and the follow-up period was short, so there were some drawbacks to this study.

CONCLUSION

In the treatment of inferior turbinate hypertrophy, both methods are successful, however radiofrequency ablation is less intrusive and more effective in alleviating nasal obstruction than endoscopic turbinoplasty with little postoperative bleeding and less crusting and pain. It also has the advantage of being a day care treatment.

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