Inferior turbinate reduction; coblation versus microdebrider - a prospective, randomised study*

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Abstract

Objectives: We prospectively evaluated and compared the safety, subjective and objective efficacy of the coblation and microdebrider for inferior turbinate reduction.

Methods: We designed a prospective randomized trial recruiting 70 patients with symptomatic enlarged inferior turbinates. Forty had coblation and 30 had microdebrider. Objectively, we scored each inferior turbinate size from 1 to 3 pre- and post-operatively. Subjectively, patients completed a visual analogue scale (VAS) evaluating their nasal symptoms, before and after surgery.

Results: Both techniques resulted in subjective significant improvement in the VAS for nasal obstruction, and other nasal symptoms. Comparing both groups, coblation showed significantly less pain than the microdebrider. Postoperative bleeding and mucosal tears were less frequent with coblation than with microdebrider but this was nonsignificant. Patient satisfaction significantly improved after both techniques.

Conclusion: The submucous coblation is as effective as microdebrider for inferior turbinate reduction. It is easily performed with significantly less postoperative pain than the microdebrider. Both techniques produce significant reduction of the size of the turbinates and associated with a satisfactory improvement of the nasal obstruction, nasal secretion, crust formation, itching, sneezing and dryness. The side effects are minimal with both procedures with significant patient satisfaction postoperatively.

Key words: turbinates, nasal cavity, surgical procedures, vasomotor rhinitis, prognosis, coblation, microdebrider, turbinate reduction, turbinate hypertrophy.

Introduction

The inferior turbinates play an important role in the regulation of nasal air flow. Hypertrophy of the inferior turbinates is associated with reduction of nasal airflow causing chronic nasal obstruction [(1)]. Chronic nasal obstruction has a significant negative impact on the quality of life in addition to the associated mouth breathing, dryness of the mouth, nasal tone to the voice, disturbed sleep, restlessness, malaise and reduced lung volumes [(2,3)].
Inferior turbinate enlargement is most commonly caused by rhinitis. The rhinitis may be infective, allergic, vasomotor, hormonal or associated with abuse of local vasoconstrictive medication [(4)].
Compensatory unilateral hypertrophy is usually associated with nasal septal deviation. To achieve a satisfactory result following the septoplasty, surgical reduction of the enlarged turbinate is advisable [(5)].
Although chronic rhinitis is associated with hypertrophy of the mucosa of the entire nasal cavity, the inferior turbinates are central to the development of nasal obstruction [(6)].
Medical management of these disorders include antihistamines, sympathomimetics, anti-cholinergics, immunotherapy, and

corticosteroids either surface or intra-turbinal injection [7,8]. Unfortunately, long standing hypertrophy may become irreversible and does not respond to these medications anymore. This may be related to permanent changes to the venous sinusoids in the turbinate [9] (becoming varicose and unresponsive to sympathetic or medical stimuli) or because of fibrosis [10]. Additionally, adverse effects could occur, e.g. injections of corticosteroids provide a satisfactory relief of nasal obstruction in some patients, but have risk of severe complications [11].

Patients with hypertrophic turbinates often benefit from turbinate reduction when medical treatment fails [12]. Surgical techniques of turbinate reduction include turbinectomy [13], partial turbinectomy [14], inferior turbinoplasty [15], cryotherapy [16], electrosurgery [17], microdebrider reduction [18,19] and CO_2 laser turbinoplasty [20]. No technique is perfect and each procedure is associated with known short- and long-term complications such as bleeding, adhesions and atrophic rhinitis [21].
Any of those techniques ought to achieve optimal volume reduction with preservation of function with minimal adverse effects [22,23]. The variety of surgical techniques indicates the lack of consensus on the optimal technique [14].
Most of the techniques described involve treatment of submucosal tissue with sacrifice of mucosa for access to the target area. Techniques such as partial or total inferior turbinectomy, cryosurgery, trans-mucosal ablations (including: electrocautery, microdebrider, surface coblation and laser) all destroy or devitalize the turbinate mucosa, thereby interfering with nasal physiology [23]. Those surgical methods are associated with varying morbidity, and the outcome of those various procedures is variable [24].

The patient discomfort, frequency and severity of complications related to those various procedures such as postoperative bleeding with the need of nasal packing, pain, nasal dryness, mucosal tears and crusting, foul odour, synaechia and bone necrosis should be considered [24]. Furthermore, the inadequate visualization of the surgical field can lead to inadequate control of intra- and/or post-operative bleeding, incomplete resection of the postero-inferior turbinate and subsequently to persistent nasal obstruction [25].

Endoscopic submucous coblation applied in a functional approach to inferior turbinates offers advantages regarding to fewer complications and mucosal preservation. This process uses radiofrequency energy between configured electrodes in saline to create a field of ionized sodium molecules capable of ablating tissues with minimal residual energy released meaning cold ablation, i.e. coblation [26,27]. The healing process induces fibrosis and wound contraction leading to tissue volume reduction [28]. The wands used in this procedure make submucosal tunnels through the turbinate by using ionized field ablation, and then a thermal lesion along this tunnel as it is withdrawn [18].
Powered instrumentation used in a functional approach to the hypertrophied inferior turbinate also offers advantages over traditional techniques with regard to complications and mucosal preservation [18,26].

We prospectively evaluated and compared the safety, subjective and objective efficacy and functional tolerance of the endoscopic assisted submucous coblation and microdebrider for inferior turbinate volumetric tissue reduction. We achieved this aim and report the side effects and complications.

Materials and methods

Study design

This study was a prospective randomized clinical trial recruiting patients with symptoms and signs of nasal obstruction and stuffiness related to enlarged inferior turbinates, who presented to the Department of Otolaryngology, Magrabi eye and ear institute, Riyadh, KSA. The study period was from December 2010 to May 2012. The study was approved by the institutional review board in Magrabi eye and ear institute. Once the diagnosis was made, the patients were invited to participate in the study and given an information sheet about it. A written informed consent was obtained from all patients who agreed to participate.

Inclusion criteria

Patients suffering from chronic nasal obstruction due to inferior turbinate hypertrophy were recruited to the study. We included any hypertrophy along the whole length of the inferior turbinate, i.e. hypertrophy affecting the anterior end, the middle portion or the postero-inferior end. Only subjects who had a history of failed medical treatment for at least 6 months were included in the study.

Exclusion criteria

Patients with hypertrophy of the inferior turbinates associated with severe septal deformity, ala nasi collapse, middle turbinate hypertrophy or concha bullosa media, nasal polyps, chronic sinusitis, previous turbinate surgery, nasal tumours, hormone therapy or radiation therapy were excluded from the study.

Clinical evaluation

Complete history taking and full otorhinolaryngological examination were done. Following the application of a local anaesthetic without any decongestants, the different parts of the inferior turbinates were evaluated by anterior rhinoscopy and nasal endoscopy using a 4 mm rigid endoscope. The nasal endoscopy was performed before and 6th months after the procedure. Objectively, we scored each inferior turbinate size from 1 to 3 according to the Friedman grading system [18]. A score of 1 was

defined as mild enlargement with no obvious obstruction. A score of 3 was complete occlusion of the nasal cavity by the hypertrophied inferior turbinate. The moderately hypertrophied turbinates with a size in between were scored 2. All of the turbinates were graded by the same author before and 6 months after surgery. Only patients with scores 2 and 3 hypertrophy were included in the study.
Subjectively, patients were requested to complete a standard visual analogue scale (VAS) regarding nasal symptoms preoperatively, during the first 48 hours after surgery, at the end of the 1st week, and 2nd and 6th months postoperatively. Nasal pain, discharge, obstruction and stuffiness, crusting and dryness, sneezing and itching and overall satisfaction were rated on a transverse graded lines marked 0-10 with 0 indicated no symptom at all and 10 indicated the worst symptom ever.

Surgical techniques
All cases were treated under general anaesthesia with laryngeal masks. The inferior turbinate procedure was performed solely under 4- mm zero-degree endoscopic guidance without the use of a nasal speculum.
For the coblation group A (40 cases), the inferior turbinates were injected with 1 to 2 ml of saline solution to expand mucosal tissue for better coblation-channeling and to provide a field of ionized sodium molecules needed for coblation in the submucosal plane. The procedures were done by the use of coblator® II system (ENTec, a division of Arthrocare®, Sunnyvale, CA, USA) with a voltage range of 96 to 312 voltage root-mean-square (Vrms) value at 100 kHz and the reflex UltraTM 45 plasma wand (ENTec, a division of Arthrocare®, Sunnyvale, CA, USA). After initial adjustment of the coblation controller setting at 4 (168-182 Vrms) to be increased up 6 if needed, the tip of the coblation wand was dipped in saline gel to give initial plasma field. The tip is advanced at an angle of 90° in the anterior end of the inferior turbinate submucosally with coblation active. Once the tip enters the submucosal level the coblation was stopped and the wand was advanced inactive in the whole length of the inferior turbinate until reaching the postero-inferior tip of the inferior turbinate under endoscopic control. The Reflex UltraTM 45 wand has 3 marks on its shaft; the proximal, middle and distal marks are 40, 28 and 16 mm from the tip. These marks give the position of the tip inside the turbinate as the shaft is introduced inside. When the position of the proximal mark was on the anterior end of the turbinate, the tip was approximately at the postero-inferior end of the inferior turbinate. Care was taken not to breach the mucosa of the turbinate as the wand advances to avoid bleeding, stripping of mucosa or crusting later on. The coblation was activated for 10 to 15 seconds to create the 1st lesion in the postero-inferior part. After coblation deactivated, the wand is withdrawn until the middle mark was seen at the anterior end of the turbinate and the 2nd lesion was made by the tip in the middle part of the turbinate by activating coblation for 10 to 15 seconds. After coblation deactivated, the wand is withdrawn until the distal mark was seen at the anterior end of the turbinate. The 3rd lesion was made by the tip in the anterior part of the turbinate by activating coblation for 10 to 15 seconds. The wand was withdrawn completely from the turbinate. According to the turbinate size, 2 to 3 coblation channels were made per inferior turbinate. Depending on the original turbinate size and the number of channels, a degree of volume reduction may be immediately visible.

For the microdebrider group B (30 cases), the inferior turbinates were injected with 1% lidocaine in 1/100,000 epinephrine in a submucosal plane with a 25-gauge, 3 1/2-inch spinal needle. We followed the technique published by Friedman et al. [18]. After medially fracturing the inferior turbinate with a Freer elevator, an incision was made with a #15 blade in a vertical manner in the anterior aspect of the inferior turbinate. A submucosal pocket was created with sharp dissection on the medial surface of the bony turbinate. The straight microdebrider (Medtronic, xomed, Jacksonville, FL, USA) with an inferior turbinate blade 2.9 mm tip was applied through the incision. The submucosal tissue was debrided at 3000-cps oscillating mode in a ventro-caudal manner. Debridement was performed with the blade positioned laterally from the submucosal plane. No lateral flap was created. At times when the bony turbinate was hard to debride, the turbinate bone was transected at its superior surface with long Stevens tenotomy scissors and removed. Particular attention was paid to preserve the mucosal flap. The incision was not closed. The reduction in size of the inferior turbinate was easily recognized immediately after the procedure.

For both procedures, no packing was intended to be used. If minor bleeding from the site of wand entry in the turbinate was noticed, a small 0.05% oxymetazoline HCl-soaked cottonoids wass applied on the site for few minutes to stop bleeding. Bacitracin-coated Merocel® with airway (Merocel, Inc., Mystic, CT, USA) was used for obvious non stoppable bleeding for 24 hours. Operative complications of bleeding, mucosal tears were monitored. Post-operative pain medications were given if pain was felt by a patient. Patients were told to avoid nose blowing in the 1st week and saline nasal spray was prescribed to help the healing process. Late complications of infection, crusting, foul odour, synaechia, and/or nasolacrimal duct injury were recorded.

Statistical analyses
Qualitative variables were presented as frequency and percent. Quantitative variables were presented as mean and SD. The Kolmogorov test was performed to test normality. Parametric variables were compared between the studied groups using

independent sample t-test and compared within groups using Repeated Measures ANOVA. Non-parametric variables were compared between the studied groups using the Mann-Whitney test and compared within groups using the Kruskal-Wallis test. Comparison between the studied groups regarding qualitative variables was done using the Chi-square test and the Fisher exact test. Significance level used was 0.05. SPSS statistical package version 20 was used in data analysis.

The sample size calculation was based on a previous study on microdebrider of the inferior turbinate using VAS [19]. To get a power for the study of 80% and setting the significance level at α= 0.05, the calculated sample size needed was found to be 26 subjects.

Results

Seventy three patients were recruited to the study. Three patients declined to participate as they could not commit to the follow up period as they were planning to leave the area. The remaining 70 patients were included and randomized using ballot papers and brown envelopes containing a folded card with the name of the procedure in it. Forty patients were randomized to have coblation to the inferior turbinate and 30 patients were randomized to the microdebrider group. In the coblation group, there were 19 males and 21 females with an age range of 17-34 (mean = 23 years). In the microdebrider group, there were 15 males and 15 females with an age range of 17-34 (Mean = 24 years). Table 1, shows the distribution of patients in the study with no significant difference between the two groups indicating that both groups were matched.

Table 1. Patients profile.

Parameter	Coblation group*	Debrider group**	p-value
Sex			
Male (n)	19	15	> 0.05
Female (n)	21	15	> 0.05
Age (y)			
Range	17 : 34	17 : 34	
Mean	23	24	> 0.05
SD	4	3	

* = 40 cases; ** = 30 cases; n = number; y = years; SD = standard deviation

Analysis of the coblation group

The postoperative pain score in the 2nd postoperative day (score range 3-5) significantly improved with a score range of 0-1 one week postoperatively (p = 0.001). Table 2 shows the preoperative and the postoperative scores at the different periods of assessment for the nasal obstruction, nasal discharge, crusts formation & dryness, sneezing & itching, and patient satisfaction. Using the ANOVA test, there were significant improvements of the nasal discharge (p = 0.001), sneezing & itching (p = 0.001), crust formation & dryness (p = 0.03), and nasal obstruction (p = 0.001). The nasal obstruction scores improved slightly in the first 2 days postoperatively; improved scores were achieved in the following postoperative visits. Of note, the nasal secretion scores were found to worsen in the first 2 days postoperatively, then improved from the first week after the procedure.
The patient satisfaction scores improved by the end of the first week postoperatively and reached its best scores by 6 months postoperatively.
The objective scoring of both inferior turbinates' hypertrophy decreased significantly (p = 0.001; Table 2).

Preoperative and postoperative findings in the microdebrider group

The postoperative pain score in the 2nd postoperative day (score range 6-8) significantly improved with a score range of 0-1 one week postoperatively (p = 0.001). Table 3 shows the scores at the different periods of assessment before and after the surgery for the nasal obstruction, nasal discharge, crusts formation & dryness, sneezing & itching, and patient satisfaction. Using the ANOVA test, there were significant improvement of the nasal discharge (p = 0.01), sneezing & itching (p = 0.001), crust formation & dryness (p = 0.04), and nasal obstruction (p = 0.01). The improvement of the nasal obstruction took the same pattern as the coblation group with slight improvement initially, followed by better scores in the following postoperative visits. It was also noted that the nasal secretion scores were found to get worse in the first 2 days after surgery, then started to get better from the first week postoperatively. The patient satisfaction scores improved by the end of the first week postoperatively and reached its best scores by 6 months postoperatively.
The objective scoring of both inferior turbinates' hypertrophy decreased significantly (p = 0.001; Table 3).

Comparison of data form the two groups (coblation / microdebrider)

Objectively, there was no significant difference in the preoperative and the postoperative scores of the inferior turbinates (p = 0.786).
Although the duration of the surgical procedure was slightly less in the coblation group, there was no statistical significant difference in the two groups (Table 4).
Figures 1-6 show the subjective scores of the two groups for nasal discharge, nasal obstruction, postoperative pain, sneezing

Table 2. The patients' scores and their statistical analysis in the coblation group in the different assessment period.

Parameter	Visual analogue scale (0 – 10) Preop	2 days post-op	1 w post-op	2 ms post-op	6 ms post-op	p-value
Postop pain						
Range		3 – 5	0 - 1			
Mean		4	1			0.001
SD		0.25	0.55			
Nasal discharge						
Range	3 - 5	5 – 8	1 - 4	1 - 3	1 - 3	
Mean	4	6	2	1	1	0.001
SD	0.6	0.5	0.6	0.9	0.7	
Sneezing & itching						
Range	3 - 5		1 - 5	1 - 3	1 - 3	
Mean	4		3	1	1	0.001
SD	0.3		0.3	0.7	0.4	
Crust formation & dryness						
Range	0 - 3		1 - 3	1 - 6	1 - 6	
Mean	0		2	1	2	0.03
SD	0.8		0.3	0.9	0.4	
Nasal obstruction						
Range	7 - 9	6 - 8	2 - 5	1 - 5	1 - 5	
Mean	7	7	4	3	2	0.001
SD	0.7	0.2	0.2	0.3	0.7	
Patient satisfaction						
Range	7 - 9		3 - 6	2 - 5	1 - 5	
Mean	8		4	2	2	0.03
SD	0.2		0.4	0.9	0.1	
Rt turbinate size						
Range	2 - 3				1 - 2	
Mean	2.3				1.2	0.001
SD	0.6				0.7	
Lt turbinate size						
Range	2 - 3				1 - 2	
Mean	2.3				1.2	0.001
SD	0.5				0.6	

VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

Table 3. The patients' scores and their statistical analysis in the microdebrider group in the different assessment period.

Parameter	Visual analogue scale (0 – 10) Preop	2 days post-op	1 w post-op	2 ms post-op	6 ms post-op	p-value
Postop pain						
Range		6 – 8	0 - 1			
Mean		6	0.5			0.001
SD		0.9	0.5			
Nasal discharge						
Range	3 - 5	5 – 8	1 - 5	1 - 3	1 - 3	
Mean	4	6	3	2	1	0.01
SD	0.6	0.6	0.4	0.03	0.5	
Sneezing & itching						
Range	3 - 5		2 - 4	1 - 3	1 - 3	
Mean	4		3	1	1	0.001
SD	0.06		0.3	0.7	0.6	
Crust formation & dryness						
Range	0 - 3		2 - 3	1 - 5	1 - 5	
Mean	0		2	1	1	0.04
SD	0.9		0.3	0.7	0.8	
Nasal obstruction						
Range	7 - 9	6 - 8	2 - 5	1 - 5	1 - 5	
Mean	8	7	4	2	2	0.01
SD	0.7	0.2	0.2	0.3	0.7	
Patient satisfaction						
Range	7 - 9		3 - 7	2 - 5	1 - 5	
Mean	8		4	2	2	0.03
SD	0.3		0.8	0.9	0.2	
Rt turbinate size						
Range	2 - 3				1 - 2	
Mean	2.3				1.2	0.001
SD	0.5				0.6	
Lt turbinate size						
Range	2 - 3				1 - 2	
Mean	3				1.1	0.001
SD	0.4				0.6	

VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

Table 4. The surgical time in both procedures.

Parameter	Coblation group*	Debrider group**	p-value
Time of surgery (min)			
Range	3.5 : 6.5	4.5 : 7.5	
Mean	5	6	> 0.05
SD	0.5	0.9	

* = 40 cases; ** = 30 cases; SD = standard deviation; min = minutes.

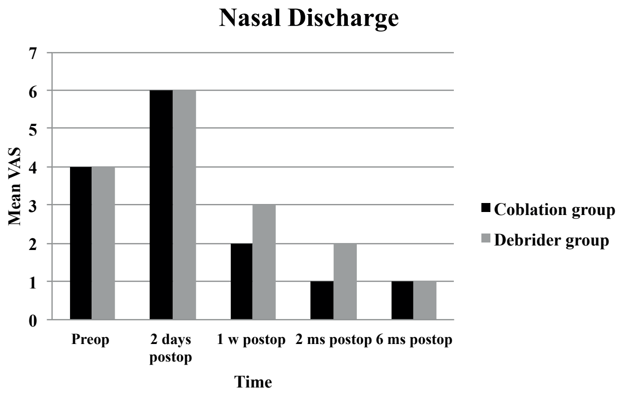

Figure 1. The nasal discharge scores in both groups in the different assessment periods. VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

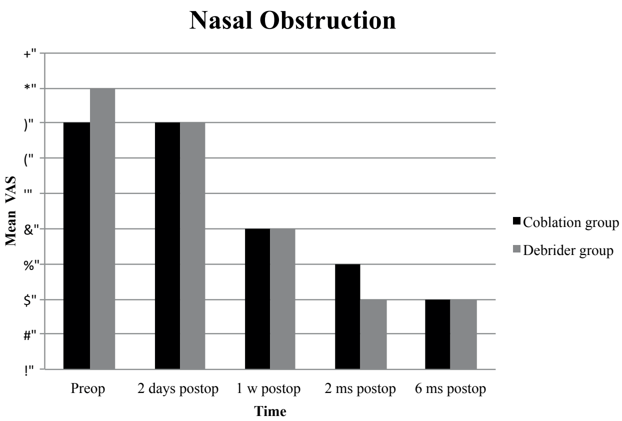

Figure 2. The nasal obstruction scores in both groups in the different assessment periods. VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

and Itching, crust formation and dryness, and patient satisfaction during the different periods of assessment.

The postoperative pain during the first 48 hours after the procedure was higher in the microdebrider group with an average of 6 (range 6-8) when compared with the score in the coblation group (average 4, range 3-5). This difference was significantly different (p = 0.0001). There was no other significant difference between the two groups on comparing all the other subjective scores.

Side effects / complications

The patients in the two groups were evaluated for the side effects associated with the procedure. Altough it appeard that postoperative bleeding was less frequent in the coblation group (4 patients, 10%) than the microdebrider group (8 patients, 26.7%), it did not reach statistical significance (p = 0.67). None of the coblation group patients needed nasal packing. Two patients in the microdebrider group needed Merocel® packing for 24 hours with no further bleeding after the removal of the packs. Mucosal tears were observed in those patients who had postoperative bleeding (less frequent in the coblation group), without any statistical difference between the two groups. Adhesions between the inferior turbinate and the septum seemed higher in the microdebrider group (5 patients, 16.7%) when compared to the coblation group (2 patients, 5%), but the difference was not statistically significant (p = 0.130).

Discussion

This study showed that both the endoscopic assisted submucous coblation and microdebrider for inferior turbinate volumetric tissue reduction are effective in improving nasal obstruction and congestion secondary to turbinate hypertrophy. In the coblation group, there was a significant improvement of the nasal obstruction in the first week postoperatively. This effect further improved and was maintained over the following 2 and 6 months postoperatively. The objective assessment of the size of the inferior turbinates showed significant reduction in their scores with a p value of 0.001. These findings are similar to the results reported by previous studies [26,27,29] that showed beneficial short-term and long-term outcomes using radiofrequency treatment to the inferior turbinates.

In the microdebrider group the nasal obstruction significantly improved as well with an effect noticed by the patients in the first two days after surgery but the improvement was even higher in the three postoperative study periods (1 week, 2 months, and 6 months). There was also significant reduction in the scores of the inferior turbinates postoperatively (p = 0.001). Huang et al. [2], in their study of nasal resistance after microdebrider for the inferior turbinates, reported significant improvement of the nasal obstruction with a better quality of life. They also found an objective reduction in the nasal resistance observed 12 months postoperatively.

We also found that both procedures have significantly improved

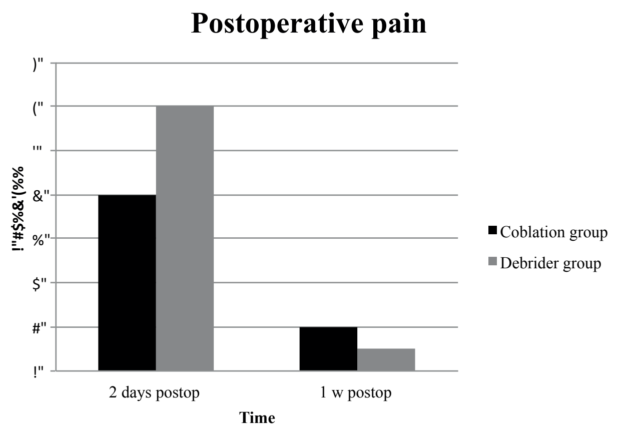

Figure 3. The postoperative pain scores in both groups. VAS = Visual Analogue Score. w = week, postop = postoperative.

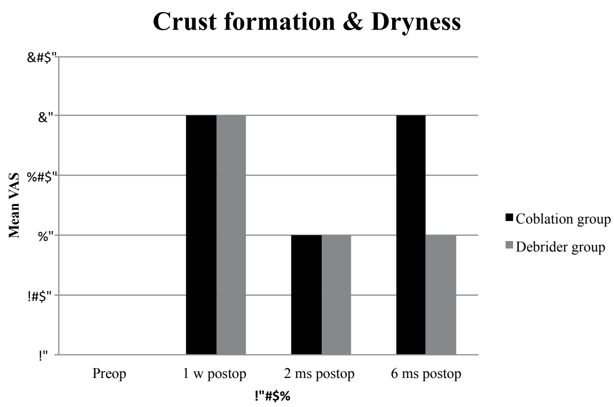

Figure 5. The crust formation and dryness scores in both groups in the different assessment periods. VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

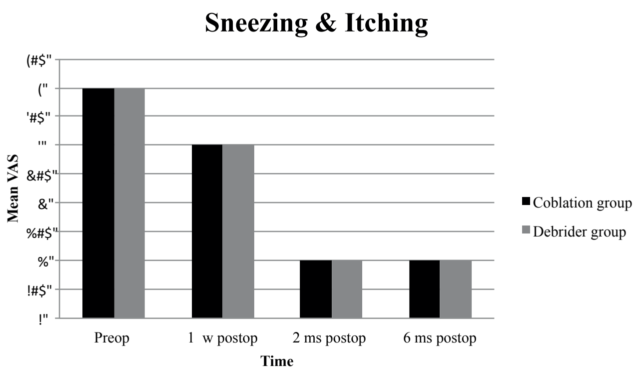

Figure 4. The sneezing and itching scores in both groups in the different assessment periods. VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

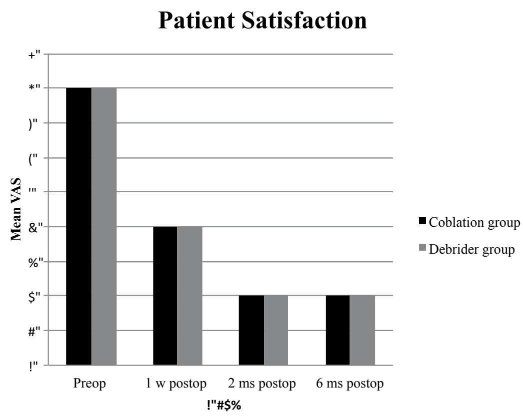

Figure 6. The patient satisfaction scores in both groups in the different assessment periods. VAS = Visual Analogue Score. w = week, ms = months, preop = preoperative, postop = postoperative.

nasal discharge in the microdebrider group (p = 0.01) and in the coblation group (p = 0.01). The sneezing and itching has significantly improved as well. The aim of these surgical treatments is not only to widen the airway, but also to preserve the integrity and the physiological function of the turbinate mucosa maintaining the normal mucociliary clearance. From the pathological point of view, Berger et al. [30] showed that the hypertrophied inferior turbinate shows dilated venous sinusoids, with very thin walls, marked subepithelial cell infiltrate and fibrosis of the lamina propria. The effect of these techniques on nasal secretion, sneezing and itching might be related to their influence on the pathological changes in the hypertrophied turbinates. The thermal lesions created by the coblation and the submucosal microdebrider reduction of the inferior turbinate, remove or reduce the size of the submucosal fibrotic areas and would induce reduction of the size of the sinusoids consequently improving the function of turbinates.

In our study, the postoperative pain associated with both techniques significantly improved within a week after the surgery. However, comparing both techniques, the microdebrider group showed more pain scores (6-8) in the first two days postoperatively when compared with the coblation group where the score range was 3-5. This was found to be statistically significant (p = 0.0001). This might be related to the controlled thermal injury associated with coblation technique, producing minimal mucosal damage therefore inviting less inflammatory reaction during the healing process. This finding is important in the completion of the informed consent so that the patient would know what to expect after the procedure. We confirm that, although coblation was found to be as good as microdebrider in improving the symptoms associated with inferior turbinate hypertrophy, it is associated with statistically significant less discomfort and pain postoperatively. The postoperative bleeding and adhesions were less in the coblation group but it did not reach statistical significance. Lee et al. [25] showed that the microdebrider surgery showed better long term outcome when compared to coblation surgery. Their study was not randomised and each group reported significant improvement at 12 months postoperatively. In our study, both surgical procedures were associated with a statistically significant improvement of the patient's satisfaction as early as the 1st week postoperatively with further improvement in the subsequent visits.

We have used the visual analogue scales (VAS) as they are simple and directly reflect the patient's views on their response to the surgery. A large number of previous studies used it and we based our power calculation on it to evaluate the effect size.
The large number of procedures available to use for turbinate hypertrophy indicates that there is no standard procedure and each surgeon needs to use the available technology and compare the results of different techniques before offering them to the patient. In the literature, there are few comparison studies [31,32] comparing coblation and microdebrider, however, these studies were not randomized. To our knowledge, our study is the first randomized study with a statistical power calculation, comparing coblation and microdebrider surgery for inferior turbinate hypertrophy.
There was no unilateral turbinate enlargement in our study as we excluded patients who need septoplasty, which is usually associated with a unilateral turbinate enlargement on the concave side.

Although our study has shown that coblation would be a valid alternative to microdebrider surgery for the inferior turbinate hypertrophy, but further research in the form of multicenter prospective randomized controlled trials are required to compare the other techniques available.

Conclusion
The endoscopic assisted submucous coblation is as effective as microdebrider for inferior turbinate volumetric tissue reduction. It is easily performed with significantly less postoperative pain than the microdebrider turbinate surgery. Both techniques produce significant reduction of the size of the inferior turbinates and associated with a satisfactory improvement of the nasal obstruction, nasal secretion, crust formation, itching, sneezing and dryness. The side effects are minimal with both procedures with significant patient satisfaction postoperatively.

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Authorship contribution
HMH participated in setting the project, literature review, performing the procedures, collection of data, analysis of data and writing and revising the manuscript.
MRE participated in setting the project, literature review, review of data, analysis of data and writing and revising the manuscript.
AB participated in setting the project, literature review, review of data, analysis of data and writing and revising the manuscript.

Conflicts of Interest
We declare that there is no conflict of interest related to this research project.

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