Powered turbinoplasty versus powered turbinectomy: a comparative study

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Objective
This study aimed to compare the outcomes of powered turbinoplasty with those of powered turbinectomy.
Materials and methods
Forty patients suffering from hypertrophied inferior turbinate that resisted ordinary medical treatment were randomly divided into two equal groups. One group was managed with powered turbinoplasty and the other with powered turbinectomy. The patients were followed up for 6 weeks postoperatively.
Results
After 6 weeks the total success in reducing the size of the turbinate and postoperative blood clots was the same (100%) for both groups but it was 100% for powered turbinoplasty and 80% for powered turbinectomy in the occurrence of postoperative crustations.
Conclusion
Powered turbinoplasty is a promising surgical procedure for inferior turbinate surgery. This procedure achieves optimum turbinate reduction with less complications in patients with respect to bleeding, occurrence of crustations, blood clots, and nasal discharge postoperatively.

Keywords:
nasal, obstruction, powered, turbinate, turbinectomy, turbinoplasty

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Introduction

Chronic nasal obstruction is one of the most common human problems and a very frequent symptom in otorhinolaryngology. Inferior turbinate hypertrophy is one of the main causes of chronic nasal obstruction [1].

A study of the nasal valve confirmed that most cases of nasal resistance occur at the level of the anterior end of the inferior nasal concha. Hypertrophy of the inferior turbinate may be due to allergies, pseudoallergies, infections, vasomotor functions, eosinophilic syndrome, medications, or due to iatrogenic rhinopathy. Hypertrophy of the inferior turbinate is classified into mucosal or bony; therefore, surgery has the upper hand in the management of cases with bony hypertrophy and in cases that do not respond to medical treatment [2].

Since the 1890s, at least 13 different surgical techniques for reduction of the inferior turbinate have been described. The ideal surgery of the inferior turbinate should accomplish a long-lasting reduction of the turbinate size with preservation of the turbinate function with minimal complications. Evidence is mounting that submucosal resection (turbinoplasty) combined with a lateral displacement of the remainder inferior turbinate is the nearest to this ideal [3].

Introduction of a microdebrider to nasal surgeries by Setcliff and Parsons [4] encouraged many surgeons to perform inferior turbinoplasty, utilizing the advantages of the powered system. Therefore, the common complications of standard submucosal resection of the inferior turbinates were largely avoided. In addition, this technique of turbinate reduction has been shown to be reliable, safe, and mucosal sparing, which provides more nasal function sparing with less postoperative complications [5].

In this study the aim was to compare the surgical outcome between powered turbinectomy and powered turbinoplasty as two surgical procedures in the treatment of hypertrophied inferior turbinate.

Materials and methods

Before commencing this study, we obtained the ethical committee approval and all patients signed a

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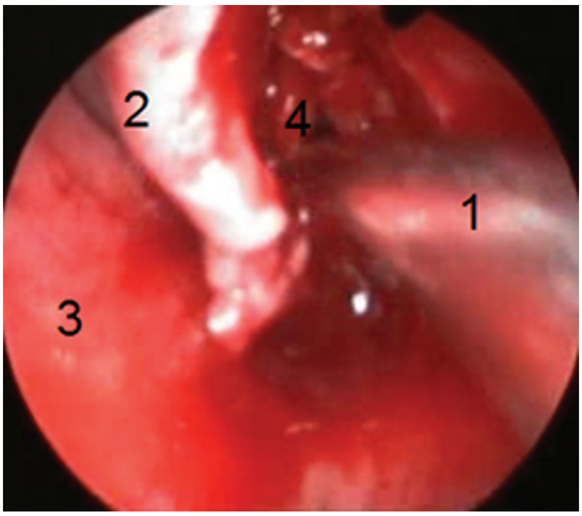
detailed consent. Forty patients suffering from hypertrophied inferior turbinate that resisted ordinary medical treatment with corticosteroids and local vasoconstrictors were enrolled in this study. Patients were divided into two groups. Group A (20 patients) was operated upon using the powered turbinectomy technique, whereas group B (20 patients) underwent the powered turbinoplasty technique. Forty patients were selected among those attending the ENT outpatient clinic, Kasr Al-Ainy Hospital, Cairo University. Randomization was done using the sealed envelope technique. This study was carried out between October 2013 and July 2014. The consent of patients to participate in this study was taken. The inclusion criteria were as follows: presence of hypertrophied inferior turbinate; resistance to medical treatment; and hypertrophied inferior turbinate associated with nasal septum deviation. The exclusion criteria were presence of associated chronic sinusitis, sinonasal polyposis, and need for revision turbinate surgery.

In powered turbinoplasty a microdebrider with a straight blade was used in oscillate mode to remove the soft tissue from the lateral aspect of the vertical portion of the inferior turbinate. The microdebrider was then set on forward in order to remove the majority of the soft tissue and turbinate bone, with care being taken to preserve the soft tissue medial from this bony lamella. Residual bone fragments were dissected free with a malleable probe and pediatric backbiter. After all the lateral mucosa and bone had been removed, the remaining mucosa was rolled on itself to cover all raw surfaces (Figs 1–2).

Figure 1



Powered turbinoplasty; Lt. Side. 1) The microdebrider. 2) The lateral mucosal flab. 3) Nasal septum. Submucosal layer and bony turbinate.

In powered turbinectomy after lateralization of the inferior turbinate by freer elevator, the microdebrider was used to remove the hypertrophied part of the inferior turbinate starting by mucosa, submucosa and the bone until the airway became widened with the microdebrider then as a haemostasis, nasal packing was done (Fig 3).

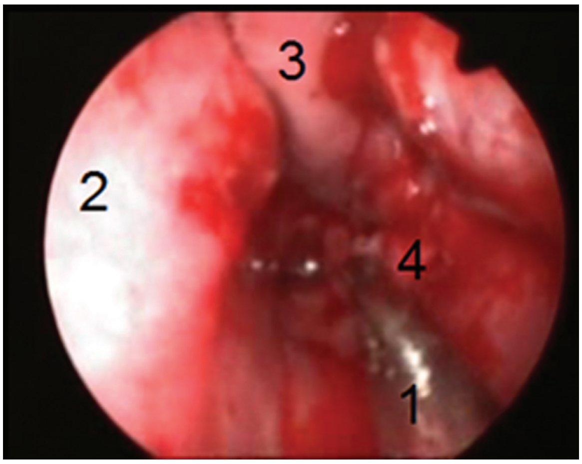
Patient assessment

Postoperative analysis

Subjective: symptoms questionnaire

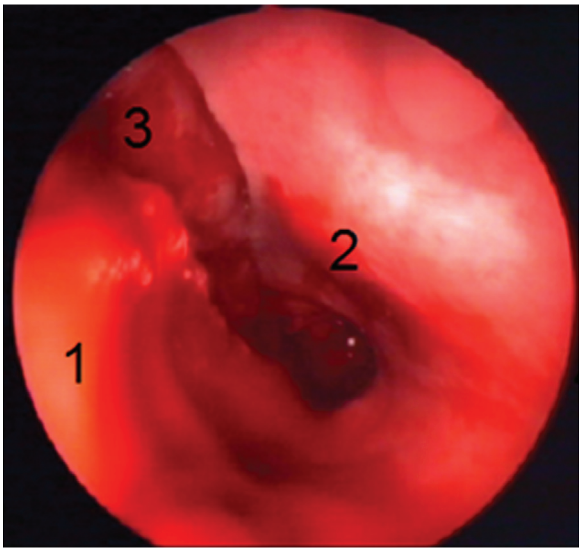
The first outcome measurement was subjective symptoms assessment. Nasal obstruction and nasal discharge are evaluated in the first week, the fourth

Figure 2



Powered turbinoplasty; Lt. Side (last view). 1) The microdebrider. 2) Nasal septum. 3) Middle turbinate. 4) Lateral mucosal flab covering raw area.

Figure 3



Powered turbinectomy; Rt. Side (after resection). 1) Raw area after inferior turbinectomy. 2) Nasal septum. 3) Middle turbinate.

week and the 12th week after the procedure using subjective scoring for each individual, using the scoring system developed by Wormald (2013).

(1) Nasal obstruction: 0=breathing freely; 1=intermittent blockage; 2=continuous blockage.
(2) Nasal discharge: 0=no discharge; 1=moderate discharge; 2=heavy discharge and postnasal drip [6].

Objective

Endoscopic examination: The second outcome measurement was objective endoscopic assessment using rigid nasal endoscopy (0°). Each nostril was evaluated for the grading of turbinate hypertrophy, crusting, and blood clots. Evaluation was made in the first week, the fourth week, and the 12th week after the procedure. We used the scoring system developed by Wormald (2013). The diameter of the endoscopic lens is known to be 4 mm; in the light of this knowledge the endoscope's lens was used to estimate the space between the septum and the lateral nasal wall as follows:

Turbinate hypertrophy: 0=small turbinate with nasal airway greater than 6 mm (the endoscope's lens passed freely without touching the nasal septum or the inferior turbinate); 1=no turbinate hypertrophy with nasal airway 4–6 mm (the endoscope's lens passed freely but with touching the nasal septum or the inferior turbinate); 2=turbinate hypertrophy with nasal airway 1–4 mm (the endoscope's lens could not pass freely); 3=turbinate hypertrophy with nasal airway less than 1 mm [6].

(1) Crusting (0=no crustation, 1=a few isolated crusts, 2=<50% of turbinate crusted, 3=>50% of turbinate crusted) [6].
(2) Blood clots (0=no blood clots, 1=few blood clots, 2=several blood clots).

Rhinomanometry: Each patient underwent an evaluation of the nasal cavity 12 weeks postoperatively for the assessment of nasal obstruction.

Statistical analysis

Comparison of quantitative variables was made using the nonparametric Mann–Whitney test. For comparing categorical data, the χ^2-test was performed. The exact test was used instead when the expected frequency was less than 5. All statistical calculations were performed using SPSS (Statistical Package for the Social Sciences; SPSS Inc., Chicago, Illinois, USA), version 21.

Results

Forty patients suffering from hypertrophied inferior turbinate that resisted ordinary medical treatment were investigated. Regarding the overall patient population, there were 14 male (35%) and 26 female (65%) patients ranging in age between 22 and 35 years, with a mean age of 28.6 years. In group A there were eight male (40%) and 12 female (60%) patients ranging between 22 and 35 years, with a mean age of 30±4.54 years. In group B, there were six male (30%) and 14 female (70%) patients ranging between 22 and 35 years, with a mean age of 27.2±4.61 years.

Subjective symptoms

Nasal obstruction

The first week: In group A only four patients (20%) had intermittent blockage in the first week postoperatively, whereas 16 patients (80%) were breathing freely. In group B all 20 patients (100%) were breathing freely; however, the P value was nonsignificant (P=0.106).

The fourth week: In the fourth week only three patients (15%) in group A had intermittent blockage of the nasal airway and the other 17 patients (85%) had free breathing with no nasal obstruction. In contrast, in patients in group B two out of 20 (10%) had intermittent blockage, whereas 18 patients (90%) were breathing freely. The P value was 1, which means that there was no difference at all between the two groups in nasal obstruction in the fourth week.

The 12th week: In the 12th week only three patients (15%) in group A had intermittent blockage of the nasal airway and the other 17 patients (85%) had free breathing with no nasal obstruction. In contrast, in patients in group B three out of 20 (15%) had intermittent blockage, whereas the other 17 (85%) were breathing freely. The P value was 1, which means that there was no difference between the two groups (Table 1).

Nasal discharge

The first week: In group A only four patients (20%) had no nasal discharge in the first week postprocedurely. The other 16 patients (80%) had moderate nasal discharge. In contrast, none of the 20 patients in group B had nasal discharge in the first week. The P value was thus significant (P<0.001).

The fourth week: In the fourth week, in group A only one patient (5%) had no nasal discharge and the remaining 19 patients (95%) had moderate nasal discharge. However, in group B 18 patients (90%) had no nasal discharge in the fourth week and two

Table 1 Postoperative subjective analysis

		Turbinectomy		Turbinoplasty		*P* value
		Count	%	Count	%	
Nasal obstruction at week 1	Intermittent blockage	4	20.0%	0	.0%	0.106
	Breathing freely	16	80.0%	20	100.0%	
Nasal Discharge at week 1	Moderate	16	80.0%	0	.0%	<0.001
	No	4	20.0%	20	100.0%	
Nasal obstruction at week 4	Intermittent blockage	3	15.0%	2	10.0%	1.000
	Breathing freely	17	75.0%	18	90.0%	
Nasal Discharge at week 4	Moderate	19	95.0%	2	10%	<0.001
	No	1	5%	18	90.0%	
Nasal obstruction at week 12	Intermittent blockage	3	15.0%	3	15.0%	1.000
	Breathing freely	17	85.0%	17	85.0%	
Nasal Discharge at week 12	Moderate	12	60.0%	1	5%	<0.001
	No	8	40.0%	19	95.0%	

patients (10%) complained of moderate discharge. Therefore, the *P* value was significant ($P<0.001$).

The 12th week: In the 12th week, in group A eight patients (40%) had no nasal discharge and the remaining patients (60%) had moderate nasal discharge. In group B 19 patients (95%) had no nasal discharge in the 12th week, but one patient (5%) complained of moderate discharge. The *P* value was thus significant ($P<0.001$) (Table 1).

Objective evaluation

Postoperative endoscopic findings

Turbinate size:

The first week: In the first week, all 40 patients in both groups A and B had a small turbinate with nasal airway greater than 6 mm.

The fourth week: In the fourth week, all 40 patients in both groups A and B had a small turbinate with nasal airway greater than 6 mm.

The 12th week: In the 12th week, all 40 patients in both groups A and B had a small turbinate with nasal airway greater than 6 mm.

Crustation:

The first week: In the first week, eight patients (40%) in the powered turbinectomy group had a few isolated crusts, another eight patients (40%) had less than 50% turbinate crusted, and four patients (20%) had no crusts. In contrast, none of the 20 patients of group B (powered turbinoplasty) had a crust. The *P* value was significant ($P<0.001$).

The fourth week: In the fourth week, eight patients (40%) of group A had a few isolated crusts and 12 patients (60%) had less than 50% of turbinate crusted. In contrast, none of the 20 patients of group B had a crust. The *P* value was highly significant ($P<0.001$).

The 12th week: In the 12th week, four patients (20%) of group A had a few isolated crusts and 16 patients (80%) had no crust. In contrast, none of the 20 patients of group B had a crust. The *P* value was nonsignificant ($P=0.106$).

Blood clots:

The first week: In the first week, all the twenty patients (100%) of group A (powered turbinectomy) had a few blood clots, whereas none of the 20 patients of group B (powered turbinoplasty) had blood clots. The *P* value was significant ($P>0.001$).

The fourth week: In the fourth week, 16 patients (80%) of group A had a few blood clots and four patients (20%) had no blood clots, whereas none of the 20 patients of group B (powered turbinoplasty) had blood clots. The *P* value was significant ($P>0.001$).

The 12th week: In the 12th week, none of the 40 patients in either group A or B had blood clots.

Rhinomanometry

Rhinomanometry was performed on all 40 patients in groups A and B in the 12th week.

In group A, inspiration ranged between 0.192 and 1.624 Pa · s/cc, and the mean inspiration was 0.635 ±0.525 Pa · s/cc. In group B inspiration ranged between 0.160 and 1.861 Pa · s/cc, and the mean inspiration was 0.586±0.669 Pa · s/cc. The *P* value was nonsignificant ($P=0.128$).

In group B, the maximum inspiration ranged between 0.013 and 1.123 Pa · s/cc and the mean maximum inspiration was 0.374±0.41 Pa · s/cc. In group B the maximum inspiration ranged between 0.012 and 0.433 Pa · s/cc and the mean maximum inspiration was 0.12± 0.163 Pa · s/cc. The *P* value was nonsignificant (*P*=0.128).

In group A, expiration ranged between 0.342 and 0.861 Pa · s/cc and the mean expiration was 0.487±0.195 Pa · s/cc. In group B expiration ranged between 0.293 and 1.599 Pa · s/cc and the mean expiration was 0.636± 0.506 Pa · s/cc. The *P* value was nonsignificant (*P*=0.227).

In group A, the maximum expiration ranged between 0.00 and 0.461 Pa · s/cc and the mean maximum expiration was 0.139±0.174 Pa · s/cc. In group B the maximum expiration ranged between 0.00 and 0.512 Pa · s/cc and the mean maximum expiration was 0.244±0.208 Pa · s/cc. The *P* value was nonsignificant (*P*=0.123).

Discussion

This study has shown that both powered turbinoplasty and powered turbinectomy are effective and equally successful operative techniques. However, powered turbinoplasty has many postoperative advantages over powered turbinectomy.

A striking difference between the two techniques was the relative absence of postoperative blood clots and crusting after turbinoplasty when compared with turbinectomy. Crusting is a well-known postoperative complication in turbinate surgery and is caused by direct mucosal damage [7]. Turbinoplasty is unlikely to be associated with a significant impairment of mucociliary clearance because all soft tissue medial to the turbinate bone is kept untraumatized. The amount of tissue destruction in turbinectomy is more difficult to measure and can affect the mucociliary epithelium to a significant degree [8]. Being an atraumatic technique, meticulous removal of all bony fragments, and careful appositioning of the mucosal flap are all important factors in preventing postoperative crusting after turbinoplasty.

Surgical reduction of the turbinate size is the treatment of choice for symptomatic hypertrophy of the inferior turbinates that is unresponsive to medication. A large variety of surgical procedures have been described, each with its own advantages and imperfections. Any technique destroying the turbinate mucosa (surface electrocautery, cryosurgery, total turbinectomy) is more likely to lead to a loss of turbinate function, crusting, and adhesions [7]. Some techniques of submucosal tissue reduction (Submucous Cauterization (SMC), injection of steroids or sclerosing agents) can preserve turbinate function but are generally found to offer only a limited or short-term result [3].

A tailored resection of submucosal soft tissues and part of the turbinate bone (turbinoplasty) has been reported to provide the best long-term results in a large prospective comparative trial by Passali *et al.* [7].

A number of techniques for turbinoplasty have been described. Since it was first reported by Davis and Nishioka [9], most authors prefer powered instruments and visualization by means of a rigid endoscope [10]. The extent of resection includes bone, submucosa, and lateral/inferior mucosa in most studies [10]; however, some authors avoid mucosal damage and only resect bone or submucosa [11]. Regardless of these variations, all authors agree that turbinoplasty is a superior technique for the management of inferior turbinate hypertrophy, producing a lasting and adequate decrease in turbinate size with low morbidity.

A study conducted at the Otorhinolaryngology Department, Faculty of Medicine, Suez Canal University, Ismailia, Egypt, in 2012 compared the management of inferior turbinate hypertrophy using turbinoplasty assisted by a microdebrider with a 980 nm diode laser. Results of that study showed no significant difference between the two procedures apart from isolated crustation in a patient who was operated upon by means of laser in the first week postoperatively, which improved in the third week of follow-up [12].

That study concurs with ours in that there was no statistically significant difference between the results of the two procedures after 1 month of operation. However, neither study achieved a long-term follow-up.

Another study was performed in 2006 at the Department of Surgery – Otolaryngology Head and Neck Surgery, Adelaide and Flinders Universities, Adelaide, Australia. The study compared submucosal cauterization with powered reduction of the inferior turbinates. The results of that study showed that powered turbinoplasty was superior to submucosal cauterization in all aspects of the assessment noted for postoperative crusting, endoscopical scoring of turbinate size, and acoustic rhinometry measurements of nasal cavity volume and mean area at the level of the nasal valve. In addition to that the long-term follow-up showed that submucosal cauterization was associated with a recurrence of turbinate hypertrophy [13].

The study of Joniau and colleagues concurs with ours in that powered turbinoplasty had significantly less postoperative patient morbidity during the post-operative healing period. Patient complaints of crustation, nasal obstruction, and nasal discharge were significantly fewer when compared with those of submucosal cauterization in the study of Joniau and colleagues or with those of powered turbinectomy in the present study. Unfortunately, the study of Joniau *et al*. [13] was superior to this study in the long-term follow-up of 5 years postoperatively.

As mentioned before in this discussion a long-term follow-up of both groups will give us more information about both procedures – for example, about unidentified complications (such as atrophic rhinitis) or possibility of recurrence of the turbinate hypertrophy. This could be investigated in following studies or in this study itself in the future.

Conclusion

At the end of this study we came to a conclusion that both powered procedures for turbinate surgery are effective for achieving optimum reduction of the turbinate (bone and soft tissue) but the powered turbinoplasty technique was superior in terms of fewer crustations and blood clots in the early postoperative period. Unfortunately, for reasons beyond our control, it was impossible to follow up our patients for a longer period. Therefore, we are not able to comment on the long-term outcomes of these two techniques.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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