Assessment of safety and efficacy of extraturbinal microdebrider-assisted turbinoplasty versus partial inferior turbinectomy

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Objective
The aim was to compare the extraturbinal microdebrider-assisted turbinoplasty (MAT) with the partial inferior turbinectomy (PIT) based on subjective and objective parameters.
Patients and methods
A total of 18 patients with nasal obstruction owing to bilateral hypertrophied inferior turbinates were included in this study. All patients underwent extraturbinal MAT on one side of the nose and PIT on the other side in alternate manner. The patients were blinded to the technique used. This is a prospective blinded randomized trial was conducted. The study was conducted at a tertiary referral hospital.
Main outcome measures
Operative time, blood loss, subjective improvement of the nasal obstruction, degree of intranasal crustations, and degree of synechiae formation were the main outcomes recorded.
Results
The operative time and intraoperative blood loss were less in the extraturbinal MAT compared with PIT. At 2 weeks postoperatively, the sides with MAT had significantly better relief of nasal obstruction (P=0.007), less degree of nasal pain (P=0.002), less crustations (P=0.010), and better tissue healing (P =0.010) than sides with PIT. At 1 and 3 months postoperatively, the sides with MAT had statistically significant less crustations (P=0.040 and 0.032, respectively) and better tissue healing (P=0.010 and 0.010, respectively) compared with the sides with PIT; however, there were no statistically significant differences regarding relief of nasal obstruction and degree of nasal pain.
Conclusions
Extraturbinal microdebrider-assisted inferior turbinoplasty is more effective and safe compared with PIT, especially in short-term follow-up periods.

Keywords:
extraturbinal, microdebrider, turbinoplasty

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Introduction

The nasal passages are complex structures that serve several functions like filtration, humidification, heating, olfaction, and voice resonance. Humidification, filtration, and heating are aided by the function of inferior turbinate. Inferior turbinate hypertrophy is one of the most common causes of nasal obstruction that may be observed in allergic rhinitis, vasomotor rhinitis, and chronic hypertrophic rhinitis or as compensatory response to an evident septal deformity [1–3]. Chemical or microbial irritation leads to inflammatory response, which leads to swelling of the turbinates, primarily in the lamina propria where venous sinusoids reside.

Medical treatment options for inferior turbinate hypertrophy include antihistamines, systemic and local decongestant, and corticosteroids, with the aim to reduce the size of the inferior turbinate and to restore the nasal function [4]. However, some cases show only slight improvement whereas others are refractory to medical treatment.

In case of medical treatment failure, the turbinate reduction surgery is an effective treatment of nasal obstruction. Many techniques of turbinate reductions have been performed, including partial or total turbinate reduction, cauterization, cryotherapy, laser therapy, and radiofrequency ablation [5].

Partial inferior turbinectomy (PIT) is an old technique capable of solving nasal obstruction; however, the

common complications of standard resection of the inferior turbinates are excessive resection, postoperative bleeding, and crusting. A relatively new instrument in the field of inferior turbinoplasty is the microdebrider, which has been shown to be reliable and safe [6–8]. The aim of the study was to compare the efficacy of microdebrider-assisted turbinoplasty (MAT) and partial surgical inferior turbinectomy (PIT) in cases of chronic hypertrophic rhinitis regarding the improvement of nasal obstruction, degree of nasal pain, degree of intranasal crustations, and the degree of tissue healing and adhesion formation.

Patients and methods

The current study is a prospective comparative study that was done at the Department of Otorhinolaryngology, Minia University hospital, from May 2016 to June 2017 to evaluate the efficacy and safety of MAT with PIT in patients with chronic hypertrophic rhinitis causing nasal obstruction. The study was approved by the research ethics committee of Minia Faculty of Medicine, Minia University. An informed consent was taken from all patients.

Inclusion criteria

A total of 18 adult patients of both sexes were involved in the study. Patients were randomly assigned to turbinate reduction through MAT in one side and PIT in the other side. The patients were blinded to the technique used. We included in our study patients with bilateral nasal obstruction or stuffiness not responding to medical treatment for 3 successive months in the form of systemic antihistamines, systemic and local decongestants, and local corticosteroid sprays. All the included patients completed their follow-up visits up to 3 months postoperatively.

Exclusion criteria

We excluded from the study any patient with the following:

(1) Patients with other causes of nasal obstruction (e.g. marked deviated nasal septum, concha bullosa, chronic rhinosinusitis, or nasal polyps).
(2) Patients with previous nasal surgery.
(3) Patients with bleeding tendency or marked anemia.
(4) Patients lost to follow-up.

All patients were subjected to a detailed medical history with special emphasis on nasal obstruction. Patients recorded a questionnaire to grade their nasal obstruction according to visual analog score (VAS) as follow: 1–3=mild obstruction, 4–7=moderate obstruction, and 8–10=severe obstruction.

Nasal endoscopy (2.7 and 4 mm diameter, 0° nasal endoscope, Nasal Endoscope Storz, Germany) was used without the use of local decongestants to assess the actual turbinate size preoperatively and postoperatively according to the grading system described. Computed tomography was performed for each patient in coronal, axial, and sagittal views with the use of local decongestants 10 min before the computed tomography examination. The operations were performed under general hypotensive controlled anesthesia with the patients positioned in the 15° head up position

Partial inferior turbinectomy

The inferior turbinate was infiltrated with ephedrine (1 : 1000) up to the posterior end. The inferior turbinates were mediatized using a blunt freer type of turbinate elevator, and then mucosa was crushed at its attachment to lateral nasal wall using an intestinal clamp forceps. Using the turbinectomy scissors, the bulk of the anterior and mid-portion of the inferior turbinate was removed medial to the crush portion. Posterior end of the inferior turbinate was removed with a special scissor that crushes and then cuts the tissue [9].

Microdebrider inferior turbinoplasty

Extraturbinal turbinoplasty was done. The microdebrider unit was set at 3000-rpm oscillating mode, with an inferior turbinate 2-mm blade. The bone and hypertrophied mucosa of the inferior turbinate were trimmed with the osseous shaver system (Uniderive Storz, Ggermany, Endoscope Unidrive sIII Eco 40701420).

For hemostasis in both techniques, a Merocel nasal pack (Medtronic, Mystic, Connecticut, USA) was inserted in each nasal cavity and removed after 48 h. Patients were then followed for 24 h for any potential complications. Those who did not have any problems were dismissed and scheduled for control visits. Patients were instructed to rinse the nasal cavity 3–4 times daily for 2 weeks with sodium bicarbonate nasal douching.

Intraoperative parameters of assessment

(1) Operative time was defined as the time from the start of the technique to its end.
(2) Blood loss was calculated by subtracting the amount of saline used for irrigation from the total volume in the suction container.

Outcome parameters

In each postoperative visit, we assessed following parameters:

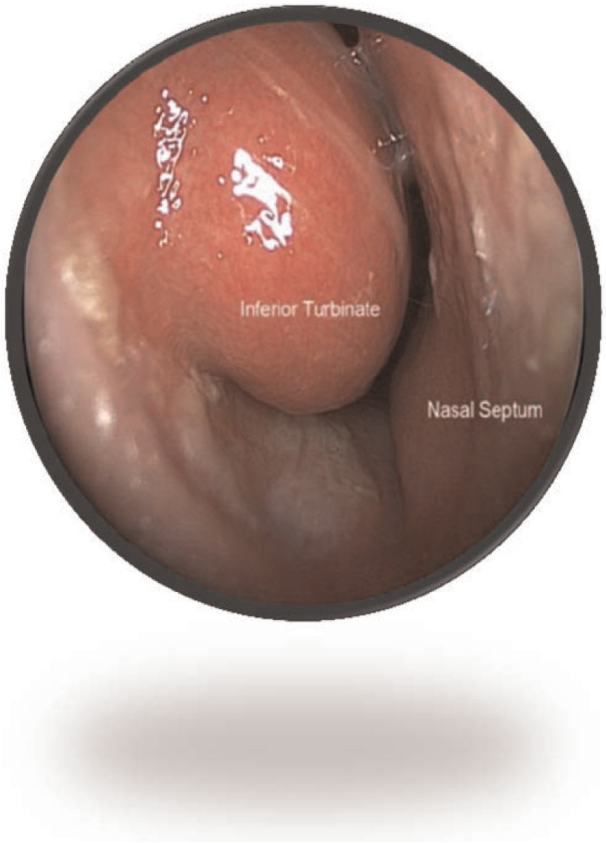
(1) Improvement of nasal obstruction was analyzed according to VAS from 1 to 10 as follow [7]: (a) no improvement, VAS=1–3; (b) partial improvement, VAS=4–7; and (c) complete improvement, VAS=8–10.
(2) Degree of nasal pain was also analyzed according to VAS from 1 to 10 as follow [8]: (a) mild pain, VAS=1–3; (b) moderate pain, VAS=4–7; and (c) severe pain, VAS=8–10.
(3) Extent of intranasal crustations was assessed according to endoscopic scoring of Lund and Kennedy [10] as follow: grade 0=absence of crustations, grade 1=mild crustations, partially filling the nasal cavity; and grade 2=severe crustations, fully filling the nasal cavity.
(4) Degree of tissue healing and adhesions formation was assessed according to endoscopic scoring of Lund and Kennedy [10] as follow: (a) good healing, that is, rapid mucosal re-epithelization, minimal crustations, no nasal synechiae, and the patient feel relief of nasal symptoms; (b) moderate healing, that is, mucosal re-epithelization, mild to moderate crustations, with nasal synechiae, and the patient feels relief of nasal symptoms; and (c) poor healing, that is, delayed mucosal re-epithelization, severe crustations and nasal synechiae, persistent inflammations and infection, and the patient does not feel relief of his/her nasal symptoms.

In all patients, follow-up was carried out at 2 weeks, 1 month, and 3 months postoperatively to assess previous parameters.

Statistical analysis

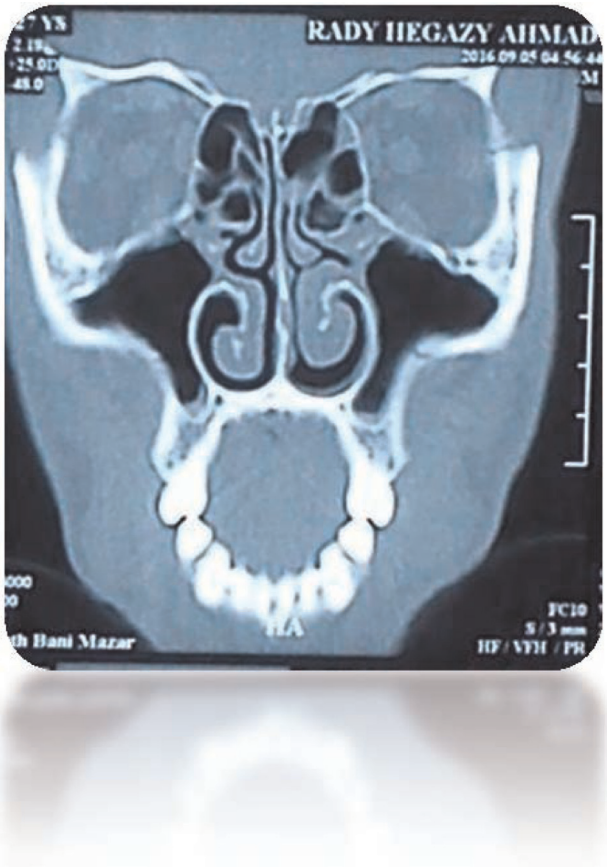
The statistical program SPSS was used (SPSS Inc., Chicago, Illinois, USA). Quantitative data were presented by mean and SD, whereas qualitative data were presented by frequency distribution. χ^2-Test was used to compare between two or more proportions. Student's *t*-test was used to compare two means. For all tests, probability (*P*) was considered significant if less than or equal to 0.05.Figs 1–6

Figure 1



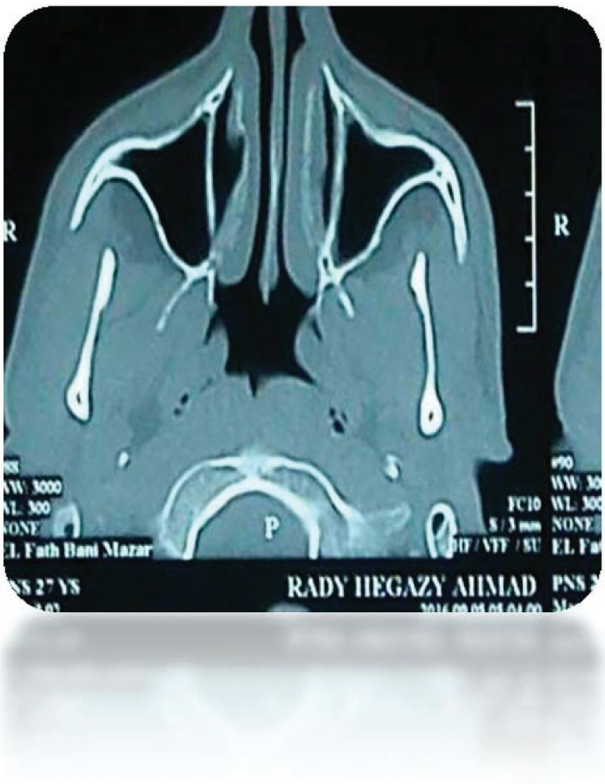
Preoperative endoscopic view showing hypertrophied inferior turbinate.

Figure 2



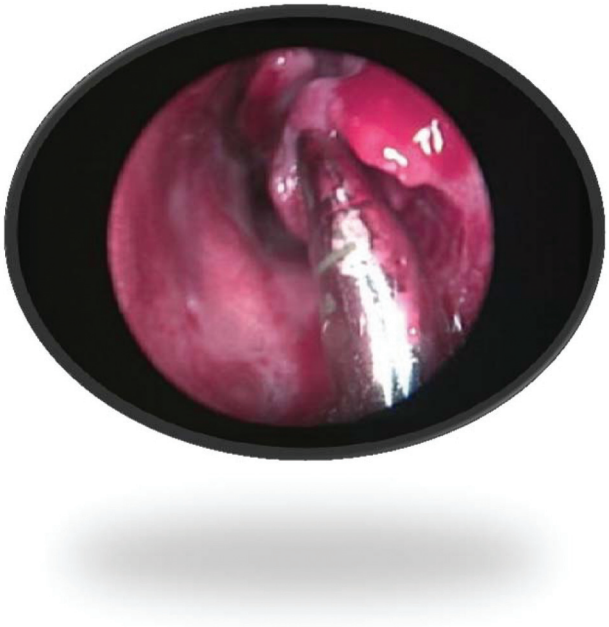
Preoperative computed tomography scan coronal cut showing hypertrophied inferior turbinate.

Figure 3



Preoperative computed tomography scan axial cut showing hypertrophied inferior turbinates.

Figure 5

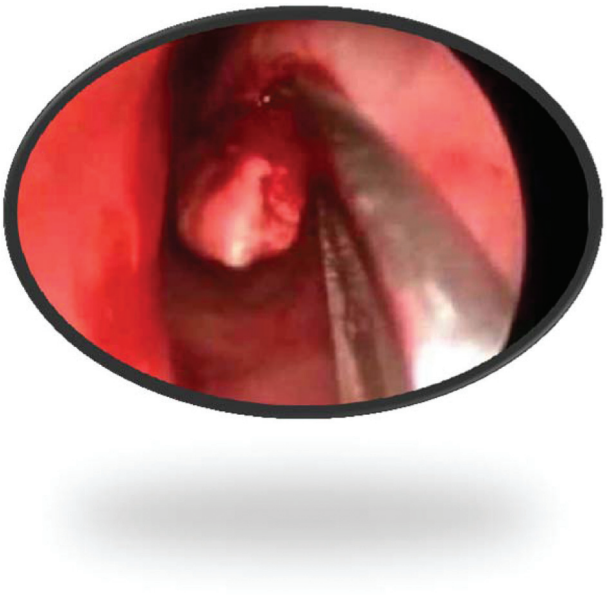


Endoscopic view showing intraoperative extraturbinal turbinoplasty.

Results

A total of 25 patients were included in this study. Of them, seven were lost to follow-up, so we were left with 18 patients, comprising five (28%) females and 13 (72%) males. Patients were in the age range 15–48 years (mean: 31.7±9.5), with no significant difference regarding the age and sex distribution.

Figure 4



Endoscopic view showing partial inferior turbinectomy (scissors cutting the inferior turbinate).

Figure 6

The microdebrider used for extraturbinal inferior turbinate reduction.

Intraoperative assessment parameters (Table 1):

(1) Operative time: the operative time of MAT ranged from 5 to 22 min (mean: 10±5.03) in comparison with the intraoperative time of 9–25 min (mean: 13.8±4.4) of PIT, with a statistically significant shorter time in MAT technique (P=0.023).
(2) The mean volume of blood loss in MAT vs. PIT sides was 41.7±10.1 vs. 46.8±8.8, respectively, with no statistically significant difference (P=0.117).

Table 1 Intraoperative parameters

	Extraturbinal (MAT)	PIT	*P* value
Operative time (in min)	10.1±5.03	13.8±4.4	0.023*
Blood loss (in ml)	41.7±10.1	46.8±8.8	0.117

MAT, microdebrider-assisted turbinoplasty; PIT, partial inferior turbinectomy. *Mann–Whitney test: $P \leq 0.05$ is significant.

Table 2 Comparison between both groups at 2 weeks postoperatively

	Extraturbinal MAT[a] [*n* (%)]	PIT[b] [*n* (%)]	*P* value
Nasal obstruction			
No improvement	0	0	0.007*
Partial improvement	6 (33)	11 (61)	
Complete improvement	12 (67)	7 (39)	
Pain			
Mild	10 (55.5)	4 (22)	0.002*
Moderate	6 (33)	6 (33)	
Severe	2 (11.5)	8 (45)	
Crustations			
Grade 0	0	0	0.010*
Grade 1	14(77.7)	6 (33)	
Grade 2	4 (22.3)	12 (67)	
Healing			
Good	14 (77.7)	6 (33)	0.010*
Moderate	4 (22.3)	12 (67)	
Poor	0	0	

MAT, microdebrider-assisted turbinoplasty; PIT, partial inferior turbinectomy. [a]Microdebrider assisted turbinoplasty. [b]Partial inferior turbinectomy. *Mann–Whitney test: $P \leq 0.05$ is significant.

Two weeks of postoperative follow-up (Table 2):

(1) Degree of nasal obstruction: the mean preoperative nasal obstruction VAS score was 8.4 on the PIT sides and 8.6 on the MAT sides (P=0.78). Postoperatively, patients had different degrees of improvement of nasal obstruction. Sides with MAT had significantly better relief of nasal obstruction than sides with PIT (P=0.007).
(2) Degree of nasal pain: sides with MAT had significantly less pain than sides with PIT (P=0.002).
(3) Degree of crustations: sides with MAT had significantly less crustations than sides with PIT (P=0.010).
(4) Degree of tissue healing: sides with MAT had significantly better healing (P=0.010) than sides with PIT. No adhesions were detected on both sides.

One month of postoperative follow-up (Table 3):

(1) Degree of nasal obstruction: both sides had no statistically significant difference (P=0.353) regarding degree of nasal obstruction at 1 month postoperatively.
(2) Degree of nasal pain: both sides had no statistically significant difference (P=0.123) regarding degree of nasal pain at 1 month postoperatively.
(3) Degree of crustations: sides with MAT had statistically significant less crustations than sides with PIT (P=0.040).
(4) Degree of tissue healing: sides with MAT had significantly better healing than sides with PIT (P=0.10). No adhesions were detected on both sides.

Three months postoperative follow-up (Table 4):

(1) Degree of nasal obstruction: both sides had no statistically significant difference (P=0.342) regarding degree of nasal obstruction at 3 month postoperatively.
(2) Degree of nasal pain: both sides had no statistically significant difference (P=0.541) regarding degree of nasal pain at 1 month postoperatively.
(3) Degree of crustations: sides with MAT had statistically significant less crustations than sides with PIT (P=0.032).
(4) Degree of tissue healing: both sides had no statistically significant difference (P=0.002) regarding degree of tissue healing at 1 month postoperatively. No adhesions were detected on both sides.

We did not encounter any postoperative bleeding or atrophic changes in either group up to 3 months postoperatively.

Table 3 Comparison between both groups at 1 month postoperatively

	Extraturbinal MAT [*n* (%)]	PIT [*n* (%)]	*P* value
Nasal obstruction			
No improvement	0	0	0.353
Partial improvement	6 (33)	5 (28)	
Complete improvement	12 (67)	13 (72)	
Pain			
Mild	16 (89)	14 (78)	0.123
Moderate	2 (11)	4 (22)	
Severe	0	0	
Crustations			
Grade 0	3 (17)	0	0.040*
Grade 1	12 (66)	8 (44)	
Grade 2	3 (17)	10(56)	
Healing			
Good	16 (89)	9 (50)	0.010*
Moderate	2 (11)	9 (50)	
Poor	0	0	

MAT, microdebrider-assisted turbinoplasty; PIT, partial inferior turbinectomy. [a]Microdebrider assisted turbinoplasty. [b]Partial inferior turbinectomy. *Mann–Whitney test: $P \leq 0.05$ is significant.

Table 4 Comparison between both groups at 3 months postoperatively.

	Extraturbinal MAT [*n* (%)]	PIT [*n* (%)]	*P* value
Nasal obstruction			
No improvement	0	0	0.342
Partial improvement	2 (11)	3 (17)	
Complete improvement	16 (89)	15 (83)	
Pain			
Mild	17 (94)	16 (89)	0.541
Moderate	1 (6)	2 (11)	
Severe	0	0	
Crustations			
Grade 0	14 (78)	2 (11)	0.032*
Grade 1	4 (22)	13 (72)	
Grade 2	0	3 (17)	
Healing			
Good	17 (94)	13 (72)	0.002*
Moderate	1(6)	5 (28)	
Poor	0	0	

MAT, microdebrider-assisted turbinoplasty; PIT, partial inferior turbinectomy. [a]Microdebrider-assisted turbinoplasty. [b]Partial inferior turbinectomy. *Mann–Whitney test: $P \leq 0.05$ is significant.

Discussion

Nasal obstruction is one of the commonest chronic nasal symptoms. The common causes are septal deviation, nasal valve pathologies, or mucosal diseases such as allergic rhinitis and chronic rhinosinusitis or inferior turbinate hypertrophy. The inferior turbinate hypertrophy occurs owing to either increase in the thickness of medial mucosal layer, which occurs because of hypertrophy of the lamina propria that houses subepithelial inflammatory cells, venous sinusoids, and submucosal glands, or increase in the size of the bony structure of the inferior turbinate.

There are many recorded surgical procedures for managing inferior turbinate hypertrophy, but there is no completely effective therapy [11]. In assessing the different methods of turbinate reduction, one should consider the function of the turbinate. All methods should be judged by the efficacy of the technique in improving nasal obstruction and the possible adverse effects that may occur in the short and long term [12].

The aim of this study was to compare the results of PIT with that of extraturbinal MAT, and to achieve that goal, we depended on the assessment of the same patient to have more accurate interpretations, such as operative time, blood loss, subjective assessment of degree of nasal obstruction, and the possible postoperative complications.

PIT is directed at relieving nasal obstruction, and it is preferred by many surgeons, as the amount of turbinate excised can be altered according to the degree of symptomatology [13]. Since 1990s, the microdebrider was initially used in turbinate surgery as a submucous corridor with the advantage of not altering the nasal mucosa [14,15]. It was first used by Davis and Nishioka in 1996 who stated that an endoscopically controlled PIT using microdebrider is fast, effective, and well tolerated with extremely low morbidity [16,17]. Most of the authors used the microdebrider intraturbinally, with the exception of few others who used it extraturbinally [15,18,19] but none compared the extraturbinal technique and PIT. We believe that most of the authors used different techniques of turbinate reduction merely on personal preference, so we tried in this study to use objective parameters for recommending either of them.

The main reported disadvantage of microdebrider is prolonged operative time especially with intraturbinal technique which could be attributed to the time taken for dissection of the flap with great care to preserve the mucosa [19]. Our results showed that operative time is significantly shorter with extraturbinal MAT and the amount of blood loss is also relatively lower. The shorter time could be owing to easier hemostasis achieved through the shaving action of the microdebrider and no need for flap dissection.

Our study results showed that subjective relief of nasal obstruction was significantly better in MAT side at 2 weeks postoperatively; however, this significant difference becomes nonsignificant at 1 month and 3 months postoperatively. This initial worsening after PIT could be owing to damage of the mucosa, which usually needs approximately 3 months to regenerate. Salzano *et al.* [20] in comparing PIT with hot procedures (radiofrequency, high frequency, and electrocautery) reported that PIT is effective in improving nasal obstruction.

Our study showed that the degree of postoperative intranasal crustations was significantly less and tissue healing was significantly better in sides with extraturbinal MAT at 2 weeks, 1 month, and 3 months postoperatively. Van Delden *et al.* [15]. used the microdebrider extraturbinally and reported complications such as bleeding, crust formation, and synechiae in 17 patients, but they were only temporary, with no permanent complications. In the study by Imad *et al.* [21], good nasal tissue healing was reported in 52% of PIT patients at the end of the first postoperative month. This difference may be attributed to the fact that when the inferior turbinate is transected, this usually exposes the edge of the inferior turbinate bone, resulting in continued crusting until the bone is re-covered with a mucosal surface [22]. In our previous study [23], we reported that PIT results are significantly comparable to other techniques regarding the degree of nasal obstruction and tissue healing throughout the 3 months post-operative follow-up period.In this study, we selected the extraturbinal MAT technique as a relatively rapid and easy technique for beginner otolaryngology surgeons. Hesham *et al.* [24] reported that extraturbinal microdebrider-assisted inferior turbinoplasty is as effective and safe as the intraturbinal one, with shorter operative time, less blood loss, and similar morbidity. In the present study, we did not encounter problematic intranasal synechiae after both techniques.

Although our study represents a relatively small sample of patients, they showed that extraturbinal MAT had more advantages than PIT. This study may open a new era for multi-institutional study with more objective assessment parameters of nasal air flow and longer duration of follow-up.

Conclusion

Both MAT and PIT are effective treatments for nasal obstruction caused by hypertrophied inferior turbinate, with extraturbinal MAT being relatively better in avoiding complications such as crustation formation and better tissue healing compared with PIT. Moreover, extraturbinal MAT could be a good option for all cases of inferior turbinate hypertrophy for patients with possible delay of mucosal regeneration.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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