Research Article

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

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Abstract
Objective: To compare the extraturbinal microdebrider assisted turbinoplasty (MAT) with the partial inferior turbinectomy (PIT) based on subjective and objective parameters**. Design:** Prospective blinded randomized trial. **Setting:** Tertiary referral hospital. **Methods:** Eighteen patients with nasal obstruction due 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. **Main outcome measures**: Operative time, blood loss, subjective improvement of the nasal obstruction, degree of intranasal crustations and degree of synechiae formation. **Results:** The operative time and intra-operative blood loss were less in the extraturbinal MAT compared to PIT**.** At 2 weeks post operatively, 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 post-operatively; sides with MAT had statistically significant less crustations (P = 0.040 and P =0.032 respectively) and better tissue healing (P =0.010 and P = 0.010 respectively) with no statistically significant difference regarding relief of nasal obstruction and degree of nasal pain compared with sides with PIT. **Conclusions:** Extraturbinal microdebrider-assisted inferior turbinoplasty is more effective and safe compared to PIT especially in short-term follow up periods.
Key Words: microdebriderm, turbinoplasty, turbinectomy

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 that leads to swelling of the turbinates, primarily in the lamina propria where venous sinusoids reside.

Medical treatment options for inferior turbinate hypertrophy includes (antihista-mines, 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 while 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, cryo-therapy, laser therapy and radiofrequency ablation. [5]

Partial inferior turbinectomy is an old technique capable of solving nasal obstruction, however; the common complications of standard resection of the inferior turbinates are excessive resection, post-operative bleeding and crusting). A relatively new instrument in the field of inferior turbinoplasty is microdebrider which has been shown to be reliable, 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 intra-nasal crustations and the degree of tissue Healing and adhesions formation.

Patients and methods

The current study is a prospective comparative study that done at the department of Otorhinolaryngology, Minia University hospital from May, 2016 to June, 2017 to evaluate the efficacy and safety of microdebrider assisted turbine-plasty (MAT) vs. partial inferior turbinectomy (PIT) in patients with chronic hypertrophic rhinitis causing nasal obstruction. The study was approved from 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 anaemia.
4- Patients with lost follow-up visits.

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 analogue score (VAS) as follow: Mild obstruction: 1-3, Moderate obstruction: 4-7 and severe obstruction: 8-10.

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

Partial inferior turbinectomy (PIT):

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 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 which crushes and then cuts the tissue.[9]

Microdebrider inferior turbinoplasty (MAT):

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 (Karl storz- Endoscope Unidrive sIII Eco 40701420).

For hemostasis in both techniques, a Merocel® nasal pack (Medtronic, Mystic,

CY, USA) was inserted in each nasal cavity and removed after 48h. Patients were then followed for 24 hours 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:

A. **Operative time**: defined as time from the start of the technique to its end.
B. **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 1-10 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 1-10 as follow [8]: A- Mild pain: 1-3, B- Moderate pain: 4-7 and C- Severe pain: 8-10.

3. Extend 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: Rapid mucosal re-epithelization, minimal crustations, no nasal synechiae, patient feel relief of nasal symptoms. B-Moderate healing: Mucosal re-epithelization, mild to moderate crustations, with nasal synechiae, patient feels relief of nasal symptoms. C- Poor healing: Delayed mucosal re-epithelization, severe crustations and nasal synechiae, persistent inflammations and infection and patient doesn't 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. Quantitative data were presented by mean and standard deviation while qualitative data were presented by frequency distribution. Chi-Square test was used to compare between two or more proportions. Student t-test was used to compare two means. For all tests probability (P) was considered significant if ≤ 0.05.

Results

Twenty five patients were included in this study, 7 were lost to follow up so we were left with 18 patients; 5 (28%) were females and 13(72%) were 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.

Intraoperative assessment parameters (Table 1):

1-Operative time: the operative time of MAT ranged from 5-22 minutes (mean 10±5.03) in comparison to intraoperative time of PIT which ranged from 9-25minutes (mean 13.8±4.4) 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).

Two weeks of postoperative follow up (Table 2):

1-Degree of nasal obstruction: The mean pre-operative nasal obstruction VAS score was 8.4 on the PIT sides and 8.6 on the MAT sides (p= 0.78). Post-operatively: 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 post-operative bleeding or atrophic changes in either group up to 3 months post operatively.

Table 1: Intraoperative parameters.

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

*Mann-Whitney test: P ≤ 0.05 is significant.

Table 2: Comparison between both groups at 2 weeks postoperatively.

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

[&] Microdebrider assisted turbinoplasty.

[$] Partial inferior turbinectomy.

*Mann-Whitney test: P ≤ 0.05 is significant.

Table 3: Comparison between both groups at 1 month postoperatively.

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

[&] Microdebrider assisted turbinoplasty.
[$] Partial inferior turbinectomy.
*Mann-Whitney test: $P \leq 0.05$ is significant.

Table 4: Comparison between both groups at 3months postoperatively.

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

[&] Microdebrider assisted turbinoplasty.
[$] 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 rhino-sinusitis

or inferior turbinate hypertrophy. The inferior turbinate hypertrophy is either due to increased thickness of medial mucosal layer which occur due to hypertrophy of the lamina propria that houses subepithelial inflammatory cells; venous sinusoids and submucosal glands or it could be due to increase the size of the bony structure of the inferior turbinate.

There are many recorded surgical procedures for managing inferior turbinate hypertrophy 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 side 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 depend on assessment of the same patient to have more accurate interpretations as operative time, blood loss, subjective assessment of degree of nasal obstruction and the possible post-operative 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 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 firstly used by Davis and Nishioka in 1996 who stated that an endoscopically controlled partial inferior turbinoplasty 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 intra-turbinal 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 due to easier hemeostasis achieved through the shaving action of the microdebrider and no need for flap dissection.

Our study results showed that subjective relieve of nasal obstruction was significantly better in MAT side at 2 weeks postoperatively; however, this significant difference becomes non-significant at 1month and 3 months postoperatively. This initial worsening after PIT could be due to damage of the mucosa which usually needs about 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 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 synechia in 17 patients, but they were only temporary with no permanent complications. In Imad et al.[21] study; good nasal tissue healing was reported in 52% of PIT patients at the end of first postoperative month. This difference may be attributed to the fact that when the inferior turbinate transected, this usually expose the edge of the inferior turbinate bone resulting in continuing crusting until the bone is re-covered with a mucosal surface.[22] In our previous study[23]; we reported that PIT results is significantly comparable with 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 and less blood loss with 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; however our results 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 treatment for nasal obstruction caused by hypertrophied inferior turbinate with extraturbinal MAT is relatively better in avoiding complications as crustations formation and better tissue healing compared to PIT. Also 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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