

Original Research Article

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Powered endoscopic inferior turbinoplasty: clinical study

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ABSTRACT

Background: Nasal obstruction is a common complaint in ENT clinics and significantly affect the patient's quality of life. Inferior turbinate hypertrophy is one of the common causes of nasal obstruction, surgical reduction of inferior turbinate is indicated in refractory cases not responding to conservative measures and the optimal surgical technique is controversial. The aim of the study was to evaluate the clinical outcomes of powered endoscopic inferior turbinate reduction in the management of inferior turbinate hypertrophy.

Methods: An interventional study (single group clinical trial) was conducted and powered endoscopic inferior turbinate reduction was performed on 30 patients complaining of chronic nasal obstruction due to inferior turbinate hypertrophy and other causes of nasal obstruction were excluded.

Results: Assessed preoperatively and 1st week, 1st month and 3rd month postoperatively depending on subjective visual analogue scale scores for nasal obstruction, endoscopic grading system and complications. There was significant improvement in nasal obstruction and significant reduction in inferior turbinate size and mild complications that completely absent at the third month following the surgery.

Conclusions: Microdebrider-assisted inferior turbinate reduction as a safe, effective and reliable alternative method for inferior turbinate reduction.

Keywords: Inferior turbinate hypertrophy, Microdebrider, Endoscopic, Turbinoplasty, Nasal obstruction

INTRODUCTION

Nasal obstruction is a common complaint among patients presenting to otolaryngologists which disturbs the quality of life of the patient, resulting from anatomic abnormalities or mucosal sinonasal diseases.¹ Histologically, there are three layers of inferior turbinate, Medially there is thick mucosa overlying a basement membrane, then lamina propria, followed by bone.¹ The inferior turbinate (IT) is the main regulator of nasal airflow and thus normal respiration.² The head of inferior turbinate is the posterior limit of internal nasal valve that generates up to two-thirds of upper airway resistance.³

Inferior turbinate hypertrophy (ITH) which may result from different conditions like allergic rhinitis, vasomotor rhinitis chronic hypertrophic rhinitis or rhinitis medicamentosa or compensatory due to septal deviation is one of the most common causes of chronic nasal obstruction.^{1,4} Three different variations are often encountered of ITH and include: soft tissue turbinate hypertrophy (most common), bony turbinate hypertrophy, mixed inferior turbinate hypertrophy.⁵ First line treatment for inferior turbinate hypertrophy (ITH) is mostly conservative and surgery only indicated in refractory cases to at least 3 months of medical treatment.^{1,6,7} Although there are many options for turbinate reduction, there is no consensus on the best and most effective

technique.¹ The goals of any surgical treatment of the IT should be: Reduce size, improve symptoms, preserve function, avoid complications in the short and long term.^{1,2}

Powered instrumentation (microdebrider or shaver)

Microdebrider is a powered rotary shaving device, it provides atraumatic dissection by resecting tissue precisely, minimizing inadvertent mucosal trauma and stripping, it is a very useful piece of equipment for otolaryngology procedures; now form an essential part of the instrumentation required to perform endoscopic sinus surgery.^{8,9} The use of a microdebrider for the surgical treatment of hypertrophic turbinates was first reported by Davis and Nishioka in 1996.^{10,11} It consists of four components: handpiece, microdebrider blade, integrated power console and foot pedal.⁸

Powered endoscopic inferior turbinoplasty {also called microdebrider-assisted inferior turbinoplasty (MAIT)} was designed to preserve the medial wall of the inferior turbinate thereby preserving the airflow receptors. In addition the technique allows the inferior turbinate to be reduced in size by ~50% without leaving a raw surface for crusts to form in the postoperative period and it can be performed intratubally or extratubally.¹²⁻¹⁴

METHODS

This interventional study (single group clinical trial) was conducted in the Department of Otorhinolaryngology, Head and Neck Surgery during the period of January 2016 to January 2017, in Al-Sadar Medical City, Al-Najaf Governorate.

A total of 30 cases {17 males and 13 females, in age range 10-45 years; mean 28.5 ± 9.5 years} with unilateral inferior turbinate hypertrophy were included in this study, all of them complaining of chronic nasal obstruction not responding to at least 3 months of medical treatment. All other causes of nasal obstruction were excluded. All patients were subjected to detailed history taking, general and ENT examination & diagnostic nasal endoscopy. The preoperative parameters recording depends on subjective assessment of nasal obstruction and endoscopic grading of turbinate hypertrophy according to Al-Helo-Jumaa grading system.

Subjective assessment

Nasal obstruction severity assessed individually and subjectively depending on visual analogue scale scores (VAS), in which each patient rates his/her symptom severity from a score 0-10, where;

- 0- no obstruction
- 1-3- mild obstruction
- 4-7- moderate obstruction
- 8-10- severe obstruction

Al-Helo-Jumaa grading system

Grade I: Inferior turbinate is occupying less than 25% of nasal cavity.

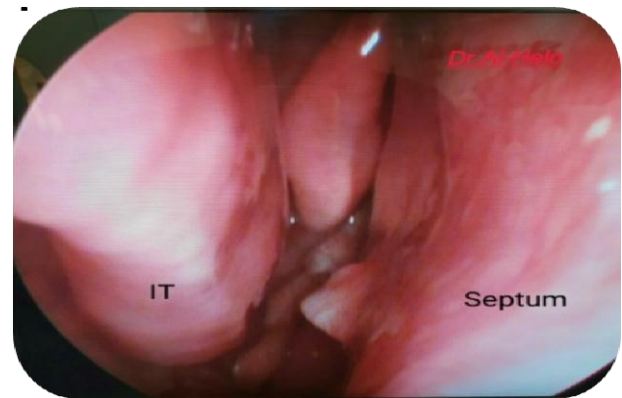


Figure 1: Right inferior turbinate with grade I.

Grade II: Inferior turbinate is occupying 25-50% of nasal cavity.



Figure 2: Right inferior turbinate with grade II.

Grade III: Inferior turbinate is occupying more than 50% of nasal cavity.



Figure 3: Right inferior turbinate with grade III.

Objective assessment

By using 0 degree 4mm Hopkins rigid endoscope, inferior turbinate was graded into I, II, and III on the basis of size of the inferior turbinate.¹⁵

Procedure

All the cases were operated on under general anesthesia (GA) and under the guidance of 0 degree 4 mm Hopkins rigid endoscope. The patients were placed in supine position with 15 degree head elevation. Surgical technique was done by extratubinal method in the following steps:

- *Infiltration*

The anterior end of the inferior turbinate is infiltrated with lidocaine 2% and 1:100 000 adrenaline, blanching the turbinal mucosa. A spinal needle attached to a 2mL syringe was used to infiltrate along the posterior inferior border of the inferior turbinate.

- *Medialization of IT*

The turbinate was fractured medially allowing space for the endoscope and powered microdebrider to be placed.

- *Soft tissue removal*

A straight blade (4 mm) was used to remove the soft tissue from the lateral aspect of the vertical portion of the inferior turbinate.

- *Bone removal*

Bone was dissected free from the medial surface of IT by Freer's elevator and removed by straight Blakesley forceps.

- *Rolling up medial portion of IT*

Once all the lateral mucosa and bone has been removed the remaining mucosa (medial surface) was rolled upon itself covering the raw area by using Freer's elevator.

- *Silastic sheets placement*

Silastic sheets were placed and sutured on each side of the nasal septum.

- *Packing*

Surgicel: A rectangular sheet of Surgicel was placed over the rolled turbinate to:

1. Keep IT in place and prevent mucosa from unrolling.
2. Provides degree of hemostasis.
3. Bactericidal effects or properties.

Sofratulle or merocel: Anterior nasal packing was placed in the nasal cavity for hemostasis.

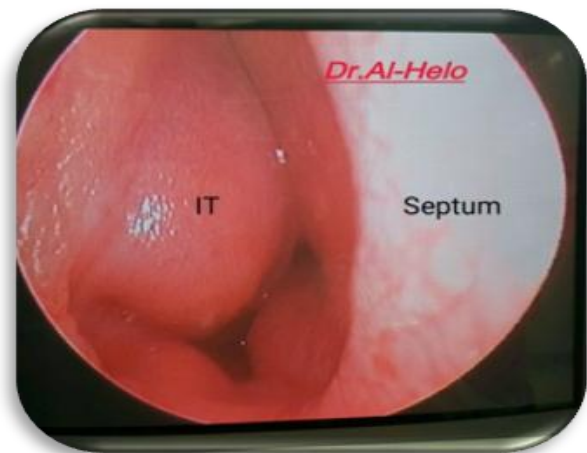


Figure 4: Pre-operative picture showing right ITH (grade III).

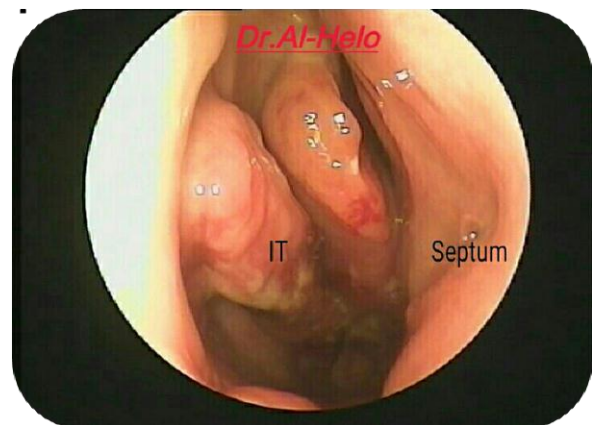


Figure 5: Post-operative picture (1st month) showing IT (grade I) after MAIT.

Post-operative care

1. Anterior nasal packing was removed 24 hours later after operation and all patients were then discharged from the hospital for further clinical follow-up.
2. All patients kept on saline nasal douche starting in the next day of operation and continued for one month post-operatively.
3. Systemic antibiotics and analgesia were given for 5 days.
4. Silastic sheets were removed at the 1st week post-operatively.

Post-operative assessment

All patients assessed postoperatively at 1st week, 1st month and 3rd months for:

- Severity of nasal obstruction according to VAS.
- Size of IT according to endoscopic grading system.
- Post-operative complications like bleeding, crusting, synechia, facial pain and/or headache & epiphora.

Statistical analysis was done by using SPSS (statistical package for social sciences) version 24.

RESULTS

A total of 30 patients had been enrolled in this study, with a mean age of 29.5 ± 9.5 (Range: 10-45) years, furthermore, only 7 patients (23.3%) aged 20 years or less. Males were the dominant, represented 56.7% of the studied group, (Table 1).

Table 1: Age and gender of the studied group (N=30).

Variables		No.	%
Age (in years)	≤20	7	23.3
	21-30	11	36.7
	>30	12	40.0
	Mean±SD*	28.5±9.5	-
	Range	7 - 45	-
Gender	Male	17	56.7
	Female	13	43.3

*SD: standard deviation of the mean

Table 2: Pre and post-operative degrees of nasal obstruction of the studied group (N=30).

Follow-up		No obstruction		Nasal obstruction					
				Mild		Moderate		Severe	
		No.	%	No.	%	No.	%	No.	%
Pre-operative		0	0.0	0	0.0	11	36.7	19	63.3
Post-operative	1st week	18	60.0	12	40.0	0	0.0	0	0.0
	1st month	23	76.7	7	23.3	0	0.0	0	0.0
	3rd month	26	86.7	4	13.3	0	0.0	0	0.0

P<0.001

Table 3: Pre and post-operative grading of ITH of the studied group (N=30).

Follow-up		No obstruction	Grade of ITH					
			Grade I		Grade II		Grade III	
			No.	%	No.	%	No.	%
Pre-operative			0	0.0	11	36.7	19	63.3
Post-operative	1st week	No obs*	18	60.0	0	0.0	0	0.0
		Mild obs.	12	40.0	0	0.0	0	0.0
	1st month	No obs.	23	76.7	0	0.0	0	0.0
		Mild obs.	7	23.3	0	0.0	0	0.0
	3rd month	No obs.	26	86.7	0	0.0	0	0.0
		Mild obs.	4	13.3	0	0.0	0	0.0

P<0.001; *obs: obstruction.

As it shown in Table 2, pre-operatively, nasal obstruction was moderate to severe in all patients, at the first post-operative week 18 patients (60.0%) had no obstruction, and 12 (40.0%) had mild obstruction, on the 1st post-operative month 23 (76.7%) patients had no obstruction and 7 patients still had mild nasal obstruction while on the 3rd post-operative month the total number of patients with no obstruction was 26 (86.7%) and only 4 patients remained with mild one.

Regarding the grading of ITH, pre-operatively, 11 patients (36.7%) had grade 2 and the remaining 19 patients (63.3%) had grade 3 while none had grade 1, post-operatively all the patients had grade 1 (Table 3).

(Table 4) summarizes the post-operative complications that reported among the studied group during the follow-up period.

Table 4: Post-operative complications of the studied group.

Post-operative complications		1st week		1st month		3rd month	
		No.	%	No.	%	No.	%
Bleeding	Yes	2	6.7	0	0.0	0	0.0
	No	28	93.3	30	100.0	30	100.0
Crusting	Yes	26	86.7	5	16.7	0	100.0
	No	4	13.3	25	83.3	30	100.0
Facial pain and/or headache	Yes	7	23.3	0	0.0	0	0.0
	No	23	76.7	30	100.0	30	100.0
Synechia	Yes	0	0.0	0	0.0	0	0.0
	No	30	100.0	30	100.0	30	100.0
Epiphora	Yes	0	0.0	0	0.0	0	0.0
	No	30	100.0	30	100.0	30	100.0

Bleeding that occurred post-operatively where only 2 (6.7%) patients developed bleeding at the first post-operative week and none at the next follow up periods.

Crusting, it was reported in 26 (86.7%) patients at the first post-operative week and the number changed to 5 (16.7%) patients at the first month while at the end of follow up period, (3rd month) no patient had crusting.

Facial pain and/or headache that occurred post-operatively where only 7 (23.3%) patients developed this complication at the first post-operative week and none at the next follow up periods.

DISCUSSION

In present study, the improvement in nasal patency was studied in form of symptomatic relief depending on visual analogue scale scores (VAS) and improvement in endoscopic grading scores for inferior turbinate size. We focused in our study on relief of nasal blockage depending on VAS, as it was noted to be dependable and reliable in other studies.^{16,17} Ciprandi et al noted that a significant and strong correlation observed between VAS for allergic symptoms and nasal airway resistance by rhinomanometry, they concluded that VAS especially for nasal blockage regarded as a good and reliable predictor if objective nasal examinations are absent, their study supports the use of VAS in researches or clinical practice.¹⁸

Demographic distribution

In our study, there were 17 (56.7%) males and 13 (43.3%) females, this male predominance is comparable with other studies, Cury et al their study showed tendency to male gender in inferior turbinate hypertrophy where noted male in 65.2% and female in 34.8% of cases.¹⁹ The age of our patients with a mean of 29.5±9.5 (Range: 10-45) years and most of our cases were in (<20–30) years age group, this figure was inconsistent with Cury et al, where most of their cases was in (10–40 years) age group and this may be due to environmental and genetic causes

as well as small sample size in current study in comparison to their larger sample size.¹⁹

Nasal obstruction

In our study, all the 30 patients (100%) had some degree of nasal obstruction preoperatively; it was moderate in 11 (36.7%) cases and severe in 19 (63.3%) cases. At the 1st week post-operatively 18 (60.0%) patients had no obstruction, and 12 (40.0%) had mild obstruction. This statistically significant ($p < 0.001$) improvement in nasal obstruction degree during the first week after the operation might be due to the action of microdebrider that directly removes the enlarged submucosal and bony tissue of the turbinate causing instant relief of symptoms, and those with mild obstruction (40.0%) might be contributed to postoperative crusting, congestion and inflammatory edema. Cingi et al performed their study on 124 patients presented with nasal obstruction and hypertrophied inferior turbinate refractory to medical treatment treated with microdebrider, they noted significant improvement in nasal obstruction at the first post-operative week.²⁰ Hesham et al, performed their study on 30 patients complaining of bilateral nasal obstruction due to inferior turbinate hypertrophy treated with MAIT, they noted significant improvement in degree of nasal obstruction post-operatively.¹⁰ Gupta et al, reported that all 20 patients with ITH treated by powered turbinoplasty, experienced significant improvement in nasal obstruction degree by postoperative day 5, and the findings of the current study were consistent with them.²¹ After the first week, this statistically significant ($p < 0.001$) improvement in nasal obstruction continued during the first month and persisted for 3 months, where in the 1st month post-operative visit where 23 patients (76.7%) had no obstruction and 7 patients (23.3%) with mild obstruction and on the 3rd month post-operative visit 26 patients (86.7%) had no obstruction and only 4 patients (13.3%) remained with mild obstruction and this might be due to persistent subjective feeling of nasal blockage. Lee et al, performed their study on 30 patients diagnosed with perennial allergic rhinitis, presented with nasal obstruction

secondary to ITH, they concluded that there was significant improvement in degree of nasal obstruction at the end of 3rd month post MAIT.¹⁴ Bouetel et al reported that subjective nasal obstruction improvement was statistically significant between preoperative and post-operative (1st and 3rd month) patients treated with MAIT.²² Wu et al performed their study on 70 patients complaining of nasal obstruction due to ITH, treated by endoscopic microdebrider-assisted inferior turbinoplasty, they concluded that there was statistically significant improvement in VAS score post-operatively.²³ Lorenz et al, Cingi et al, Kizilkaya et al, they found significant improvement in nasal obstruction in patients treated with MAIT at the first and third post-operative month.^{13,20,24} Wormald et al, there was significant improvement in nasal obstruction in the immediate (first 3 weeks) post-operatively in 19 patients treated by powered endoscopic inferior turbinoplasty.¹² Kassab et al, they carried out their study on 20 patients with bilateral nasal obstruction due to ITH, they reported that the total success rate was 90% post-operatively. Our present study was correlated with them.²⁵

Endoscopic grading of ITH

In our study, we used a 3 grades system and all the patients were in grade 2 and 3 preoperatively, grade 2 in 11 (36.7%) and grade 3 in 19 (63.3%). There was significant improvement ($p < 0.001$) in turbinate hypertrophy grades (inferior turbinate size) where all the patients (100%) had grade 1 post-operatively during the follow up period from the 1st week to the 3rd month, and this is in agreement with VAS of nasal obstruction.

Hesham et al performed their study on 30 patients complaining of bilateral nasal obstruction due to inferior turbinate hypertrophy treated with MAIT, they noted significant improvement in turbinate grade post-operatively compared with its preoperative values. Assanasen et al found that the turbinate size reduction was significantly observed after MAIT.²⁶ Romano et al they carried out their study on 79 patients with hypertrophied inferior turbinate treated with MAIT, they reported that the turbinate size was decreased significantly from the first week to the third month post-operatively.²⁷ Ozcan et al they used MAIT for treatment inferior turbinate hypertrophy in 12 turbinates of 9 patients, they found the endoscopic grading revealed that the inferior turbinates were significantly smaller in the postoperative period.²⁸ Chen et al performed their study on 60 patients with bilateral ITH treated by MAIT, they reported significant reduction in IT size during the follow up period (1st week, 1st month and 3rd month).²⁹ So, our results were consistent and comparable to these studies.

Post-operative complications

We did not report severe bleeding during or after the surgery, and the mild postoperative bleeding or blood stained discharge reported in only 2 (6.7%) cases at the

end of 1st week and significantly reduced with time to be completely disappeared at end of 1st month and these were consistent with other studies, Hesham et al, Cingi et al, Chieh-Feng et al, Friedman et al.^{10,20,30,31}

At 1st week following the surgery, we observed mild crusting which was mostly along the inferior aspect of IT in 26 patients and then gradually reduced with time where present in only 5 patients at the 1st postoperative month and no patient had crusting at 3 months following the procedure. This gradual decrement in crusting might be due to mucosal preservation of the medial surface of IT and meticulous treatment (saline nasal douche) that was given to the patients during the post-operative period, and our results correlated with the following studies: Wormald et al, there was statistically significant decrease in nasal crust formation at 3 weeks post-operatively in patients treated powered endoscopic inferior turbinoplasty.¹² Romano et al, Friedman et al noted that crusting was not observed after surgery during the follow up period (1st week and 3rd month).^{27,31} Hesham et al reported no post-operative complications.¹⁰ Cingi et al concluded that no crusting was observed post-operatively.²⁰

The postoperative facial pain and/or headache reduced gradually with time where it was trivial and in only 7 (23.3%) of cases at the first week of the procedure and disappeared completely in all the cases at the first month postoperatively. Cingi et al, Chieh-Feng et al, Albu et al, all of them reported that gradual decrement in postoperative pain and no patient had pain at 1 and 3 months following the surgery and this was comparable to our study.^{20,30,32}

No synechiae was reported during the follow up period after surgery, this might be due to placement of surgical and silastic sheets (no raw area), and this agreed with Cingi et al, Hesham et al.^{10,20}

No epiphora was observed from the 1st week to the 3rd month following the surgery, this might correlated with Barham et al, Hesham et al.^{10,33}

CONCLUSION

In the management of inferior turbinate hypertrophy with chronic nasal obstruction, powered endoscopic inferior turbinoplasty is regarded as:

- Effective and reliable for short term improvement.
- Safe.
- Short healing time (fast postoperative healing).
- Minor postoperative complications.
- Using of MAIT as a procedure in inferior turbinate reduction.

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