

Comparative study between Microdebrider-Assisted Inferior Turbinoplasty and Submucosal Diathermy Inferior Turbinate reduction

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Objective: To compare the results of Sub-Mucosal Diathermy of Inferior Turbinate (SMD) versus Microdebrider-Assisted Inferior Turbinoplasty (MAIT).

Methods: A total of 70 patients with hypertrophied inferior turbinates will be included in the study. group (A) will undergo SMD. And group (B) patient will undergo MAIT.

Results: Patients in group B showed less time in surgery, better post-operative nasal symptoms while patients in group A showed better in bleeding during and after surgery.

Conclusion: The current study revealed that MAIT is better than SMD regarding time of surgery, mucociliary clearance transport time, Visual Analog Scale and post-operative rhinomanometry. However SMD is better in intra-operative bleeding and post-operative nasal pack.

Keywords: Hypertrophied Inferior Turbinates, Submucosal Diathermy, Microdebrider Assisted Inferior Turbinoplasty.

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Introduction

Nasal obstruction is common in the adult population and may affect the patient's health by causing prolonged respiratory infections, secondary sinus involvement, diminution of the sense of smell, and sleep disorders. [1]

Hypertrophy of the turbinate is the second leading cause of nasal obstruction after septal deviation. [2]

Causes of turbinate hypertrophy can be allergic or pseudoallergic nasal hyper reactivity, nasal decongestant abuse and septal deviation. [3]

The first-line treatment of this disease is obviously pharmacological. With preservation of surgical reduction of the inferior turbinate for the resistance cases to medical treatment. [4]

Over the years, various surgical techniques have been developed to reduce hypertrophy of the inferior turbinates, However complications like nasal and postnasal discharge, headache, facial discomfort, empty nose syndrome, dryness, bleeding, postoperative pain, anosmia, foul smell, synechia may happen owing to damage of the nerve receptors complex covering the nasal mucosa. [5,6]

Currently, a technique that is giving us excellent outcomes is the microdebrider-assisted inferior turbinoplasty (MAIT). The microdebrider has been used since the 1990s in endoscopic rhinosinus surgery and has been introduced in turbinate surgery to offer a submucosal approach to preserving the integrity of nasal mucosa. [7]

Another technique capable of efficiently solving nasal obstruction without mucosal dysfunction and denervation is submucosal diathermy (SMD). The SMD technique is usually associated with rapid healing leading to early restoration of normal maxillary function, and many surgeons use SMD as the treatment of choice because of its relative lack of

complications. [8]

Aim of the work

The current study aims to compare the results of Sub-Mucosal Diathermy of Inferior Turbinate (SMD) versus Microdebrider-Assisted Inferior Turbinoplasty (MAIT) in terms of intra-operative bleeding, time of surgery, nasal pack, post-operative adhesions, post-operative improvement of nasal obstruction, mucociliary clearance and rhinomanometry. Both techniques are mucosal preservation.

Material and Methods

This study was conducted on (70 patients) with nasal obstruction due to hypertrophied inferior turbinates (who did not respond to medical treatment) attending the ENT clinic in the Cairo University Hospitals. The 70 patients were randomly divided into two groups. Group A who underwent SMD of the inferior turbinates under general anesthesia (GA), and group B who underwent MAIT of the inferior turbinates under GA. The study was approved from ORL ethical committee before conducting the study.

Cases with previous nasal surgery, deviated septum, sinusitis with or without polyps and /or adenoid hypertrophy were excluded from the study. All patients were subjected to the routine history with full endoscopic examination and CT scan imagining.

The surgical procedures:

Group A:

SMD was performed under general anesthesia. A diathermy needle inserted into the anterior end of the inferior turbinate and advanced submucosally until the posterior end of the inferior turbinate judged to have reached. The needle was withdrawn over a period of 10 seconds with the current applied. This procedure performed twice on each inferior turbinate. [9]

Group B:

MAIT was performed under general anesthesia. This

procedure was performed under 0-degree endoscopic guidance. The inferior turbinate size was reduced with an inferior turbinate 2.9-mm blade especially from the anterior head, taking great care to stay in the submucosal plane. [10]

Outcome

The patients in the two groups were compared early 1) Intraoperative for amount of blood loss, time of surgery and the need for nasal packing. And 2) Postoperatively for hospital stay, blood clots & synechiae in the first and second weeks and after one month to assess subjective nasal symptoms with a standard visual analogue scale and to estimate the mucociliary clearance with saccharin test. Then the two groups were compared later after 3 months to check the clinical symptoms of nasal obstruction and doing anterior rhinomanometry to analyse the degree of nasal airway obstruction, nasal airflow (mL/s) and nasal airway resistance.

Statistics

The clinical and laboratory data were statistically analyzed by using Microsoft Excel 2010 and SPSS v19.0 to obtain Descriptive statistics and Analytical studies using for these Wilcoxon test, Chi-square test, Pearson correlation and

Spearman correlation.

Results

This study included a total of seventy patients with nasal obstruction due to hypertrophied inferior turbinates and did not respond to medical treatment who underwent inferior turbinates reduction either by SMD or MAIT. Our study included 18 males and 52 females. The age ranged from 19 till 24 years old. (Table 1).

The results showed that Group A with SMD was better than Group B with MAIT in the amount of blood loss during surgery and needs for nasal packing after surgery with only significant p value <0.001 in the amount of blood loss. (Table 1).

While Group B with MAIT was better than Group A with SMD in time of surgery, visual analogue scale (i.e relief of nasal obstruction), mucociliary clearance and the post operative rhinomanometry for nasal resistance with significant p value <0.001, 0.001, <0.001 and <0.001 respectively. Nasal adhesion Postoperatively was much less with MAIT Group than SMD Group but without significant statistically value. (Table 1).

Table 1 Shows comparison between Group A & Group B regarding age, sex, amount of blood loss during surgery, time of surgery, needs for nasal packing, Post-operative adhesion, visual analogue scale, mucociliary clearance and Post-operative rhinomanometry

		Group A (SMD)		Group B (MAIT)		P value
		Number	%	Number	%	
		Rang		Rang		
Sex	Male	11		7		
	Female	24		28		
Age		19-23		19-24		0.501
Amount of blood loss		5-30 mL		35-110 mL		<0.001*
Time of surgery (In minutes)		15-30 min		5-15 min		<0.001*
Nasal packing	yes	12	34.3%	21	60%	0.031
	no	23	65.7%	14	40%	
Adhesions	Yes	6	17.1%	2	5.7%	0.259
	No	29	82.9%	33	94.3%	
Visual analogue scale (Relief of nasal obstruction)		2-5		1-6		0.001*
Mucociliary Clearance (min.)		17-27 min		12-22 min		<0.001*
Postoperative Rhinomanometry (Pa/mL s)		0.081-0.191		0.051-0.171		<0.001*

*Significance level obtained (p < 0.05).

SMD = Submucosal diathermy – MAIT = Microdebrider-Assisted Inferior Turbinoplasty.

Discussion

Since the early 1900 s, the inferior turbinates have been subjected to surgical manipulation to solve the problem of nasal obstruction and thereby to improve breathing. Given the important role in the physiology of the nasal turbinate, both for the dynamic ventilator and for the important functions of the covering mucosa. [11] Therefore, the aim of turbinate surgery should be to reduce the volume of the inferior turbinate while retaining the nasal mucosa to comply with the function of heating and humidification of inhaled air of the turbinates. [12]

The microdebrider, initially used since the 1990 s in endoscopic sinonasal surgery, was introduced into turbinate surgery as a submucosa corridor with the advantage of not altering the function of the nasal mucosa. [13,14]

Submucosal diathermy (SMD) is a simple and effective way of carrying out reduction surgery on the hypertrophied inferior turbinate. It was found to be very effective in alleviating chronic nasal obstruction due to hypertrophy of the inferior turbinate. SMD of inferior turbinates was first documented in 1907. It works by shrinking the bulky space occupying by hypertrophied inferior turbinate in the nasal cavity. [15]

This study compared two alternative surgical modalities for turbinate surgery with mucosal preservation and their effects with regard to nasal obstruction, intra-operative bleeding, nasal pack, time of surgery, post-operative adhesions, nasal mucociliary transport time and active anterior rhinomanometry in a patient population affected by hypertrophy of the inferior turbinates.

In this study, both groups showed no significant difference in sex, both groups showed no significant difference in age, this means that both groups are nearly similar, hence that results of comparison would be reliable.

In this study, the time of surgery is significantly longer in group A than group B, the average time in group A was 20.7 minutes and in group B was 9 minutes. In agreement with that El Henawi et al., 2011 who concluded the average time of surgery in MAIT was 11.1 minutes as the same in the present study. [16]

Bleeding intra-operatively was significantly more in group B than group A, the average in group B was 63 ml while in group A was 18 ml, due to the diathermy made coagulation of the blood vessels of the inferior turbinates during the surgery. Fradis, et al, 2002 in a study on 90 patients showed that the bleeding intra-operatively was minimal in SMD while Henawi et al., 2011 showed that the bleeding intra-operatively in MAIT was 57 ml in average. [9,16]

In this study, there is significantly difference in nasal packing post-operatively, in group B (60.0%) more than group A, And this made good relation between bleeding intra-operatively and post-operative nasal packing. Which made the need of post-operative nasal pack more in cases with a lot of intra-operative bleeding.

There was no significant difference between the two groups in the present study according to post-operative adhesions, which were 17.1% in group A and 5.7% in group B. And that is a good indication for mucosal preservation in both surgical techniques.

However, White A. and Murray J. A. M., 1988 reported that the intranasal adhesion formation after Submucosal Diathermy inferior turbinates reduction were 9.5 %, while Henawi et al., 2011 reported that the intranasal adhesion formation after Microdebrider-Assisted Inferior Turbinoplasty were 9.6 %. As in the present study. [17,16]

There was marked improvement in nasal obstruction according to Visual Analog Scale (VAS) in both groups and it was more in group B than group A in the present study. Which were 2.63 in average one month post-operatively in MAIT and 3.54 in average one month post-operatively in SMD.

In agreement with that Chen Yu-Lin and LIU Chia-Ming, 2007 who concluded that the typical symptoms related to nasal obstruction were significantly reduced from 1 month after surgery in MAIT according to VAS. Which were 2.65 in average one month post-operatively and 1.4 in average three months post-operatively. [12]

While Romano et al., 2015 reported the typical symptoms related to nasal obstruction were significantly reduced from 3 months after surgery in MAIT. Which were 1.15 in average three months post-operatively. All the subjective nasal symptoms were lower. [10]

Also Gomaa et al., 2015 reported the nasal obstruction according to VAS post-operatively in SMD were 3 in average

one month after surgery and 2.5 in average three months after surgery which are similar in this study. [18]

The saccharin test is a useful method to evaluate the relative effectiveness of nasal mucociliary transport due to the technique's relative simplicity and reproducibility. [19] In this study, the normalization of nasal mucociliary clearance one month after the surgery is a sign of how both techniques reversibly damage the nasal mucosa and do not cause loss of function.

The time of nasal mucociliary clearance was more in group A than in group B. Which were 21.2 minutes in average in group A one month after surgery and 15 minutes in average in group B one month after surgery. And that means MAIT is more in mucosal preservation than SMD.

In agreement of that Chen Yu-Lin and LIU Chia-Ming, 2007 reported that the average nasal mucociliary clearance time were 15 minutes one month post-operatively and 14 minutes three months post-operatively in MAIT. Which are similar in the present study. [12]

Also Romano et al., 2015 reported that the mean nasal mucociliary transport time slightly increased after 1 week of surgery (MAIT) and then restabilized to preoperative values at 3 months' follow-up. Which were 14.9 minutes in average one week after surgery and 14.62 minutes three months after surgery. [10]

While Lorenz K. J. and Maier H, 2013 reported that the average nasal mucociliary clearance time were 11.1 minutes one month after surgery in Microdebrider-Assisted Inferior Turbinoplasty which are near to the results in this study. [20] Although rhinomanometry has been proposed as an objective method for evaluating the relative level of nasal patency, the correlation between nasal obstruction symptoms and total nasal resistance remains somewhat controversial. [21]

In this study, the rhinomanometrically assessed level of nasal resistance to air passage in both groups were significantly in normal range according to Pallanch and John F, 1985. [22] Which was in average 0.133 Pa/mL s three months after surgery in group A and in average 0.082 Pa/mL s three months after surgery in group B.

In agreement with this study Romano et al., 2015 reported at 3 months after the surgery, the rhinomanometric result significantly improved in Microdebrider-Assisted Inferior Turbinoplasty. Which was in average 0.2 Pa/mL s three months after surgery. [10]

Although Chen Yu-Lin and LIU Chia-Ming, 2007 reported the total mean nasal resistance in the normal controls was 0.18 Pa/mL s. Rhinomanometric testing showed no significant decrease in either surgical group at 1 week and 1 month after surgery, However, the total mean nasal resistance was significantly decreased at 3 months post-operatively. Which was in average 0.16 Pa/mL s three months after surgery in MAIT. [12]

In agreement with Jones A. S. et al., 1989 that SMD produced a reduction in nasal resistance three months post-operatively which in average was 0.19 Pa/mL s as in the present study. [23]

In contrast to the SMD, MAIT appears to offer several advantages. Firstly, it allows a definitive, controlled-volume reduction of the nasal turbinates and associated mucosa, and the resection procedure can be tailored to the anatomical variations of the individual recipient. Secondly, MAIT results

in significantly better preservation of the turbinate mucosa compared to SMD, providing more-rapid healing, fewer complications and greater preservation of the humidification and mucociliary transport properties of the nasal mucosa.

Conclusion

The current study revealed that MAIT is better than SMD regarding time of surgery, mucociliary clearance transport time, VAS and post-operative rhinomanometry. However SMD is better in intra-operative bleeding and post-operative nasal pack.

Due to the short post-operative follow-up period of this study, further research is needed to determine the period of time of the recurrence for which offered by these two surgical procedures are likely to last.

Compliance with ethical standards.

Funding

No funding was received.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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