ORIGINAL RESEARCH

Endoscopic and Microdebrider-assisted Partial Inferior Turbinectomy in Chronic Nasal Obstruction

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Abstract

Objectives:

- To study the role of endoscopic and microdebrider-assisted partial inferior turbinectomy in inferior turbinate hypertrophy.
- To study the improvement in symptoms and quality of life following the procedure.
- To study the complications of endoscopic and microdebrider-assisted partial inferior turbinectomy.

Materials and methods: A prospective study was conducted on 50 subjects over a period of 18 months. Subjects who presented with long-standing nasal obstruction secondary to hypertrophy of inferior turbinate also not responding to medical therapy were enrolled for the study. They were taken up for endoscopic microdebrider-assisted partial inferior turbinectomy. Saccharine transit test and modified spirometry were done and modified SNOT 10 questionnaire was administered preoperatively as well as in the 1st and 3rd postoperative months.

Results: On subjective assessment using SNOT 10 Questionnaire, it was seen that patients with headache, nasal obstruction, and anosmia had the highest benefit post-surgery. Out of 50 subjects reported with nasal obstruction preoperatively, only 16 had mild obstruction in the 3rd postoperative month which was statistically significant. Of 44 subjects with headache, only 17 had mild headache in the 3rd postoperative month. Only 8 of 43 subjects with anosmia still had mild symptoms during the 3rd month. On objective assessment using saccharine transit test, the mean time of 16.02 preoperatively decreased to 14.32 at 3 months after surgery. The rhinospirometry also showed a statistically significant improvement, 3 months after surgery when compared with preoperative values.

Conclusion: Endoscopic and microdebrider-assisted partial inferior turbinectomy proved to be a safe and one of the most effective treatments for chronic nasal obstruction secondary to inferior turbinate hypertrophy. The SNOT 10 questionnaire is an effective tool in the subjective assessment of patients undergoing partial inferior turbinectomy.

Clinical significance: Symptomatic inferior turbinate hypertrophy can be effectively treated by endoscopic and microdebrider-assisted partial inferior turbinectomy and the SNOT 10 questionnaire may act as an indicator.

Keywords: Endoscopic, Experimental study, Nasal obstruction, Partial turbinectomy.

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Introduction

Nasal obstruction is one of the most common symptoms in rhinology practice which can hamper the quality of life. The most common reason behind obstruction of the nasal airway is hypertrophy of the inferior turbinates in addition to nasal septal deviation. The inferior turbinate pathology can reduce the nasal airflow, which is well known in allergic, vasomotor rhinitis as well as in anatomic bony turbinate enlargement due to progressive ossification through adulthood. The inferior turbinates, with their sinusoidal erectile tissue is one of the main reason for nasal obstruction in chronic rhinitis.[1]

There are various surgical techniques for the reduction of hypertrophic inferior turbinates, including cryotherapy, submucosal diathermy, laser turbinoplasty, cauterization, cryotherapy, radiofrequency ablation, submucosal turbinectomy, and partial or total turbinectomy. As the surgery is more invasive, it is important that the surgical treatment results in unremitting improvement in the patient's quality of life. The risk associated with surgery includes bleeding or crusting in nose, nasal dryness, and nasal cavities may become abnormally patent. The surgical exposure is restricted, and there is difficulty in visualization of the hypertrophied posterior end of inferior turbinate, especially in patients with small nostrils.[2]

The ability of the clinician to differentiate between the contribution of mucosal and structural factors in producing airflow asymmetry and nasal blockage is difficult.[3] An objective tool is required for the documentation and to establish the efficacy of different procedures.

An objective measure of the nasal partitioning of airflow is measured by nasal spirometry as described by Hanif et al. in 2001. It overcomes many of the shortcomings of conventional measurements as rhinomanometry. It is a small, portable, hand-held machine that is very convenient to carry and easy to use. It measures the volume of air, and airflow through the nasal passages via a nosepiece, and can also measure each nasal passage separately.[4] Nasal spirometry is an accurate, reliable, and reproducible test.

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Spirometry results are comparable with the rhinomanometry results. This method is easy to handle, sensitive, clinically applicable, and recordable.[5]

Nasal mucociliary clearance (MCC) is the first line of defense in upper respiratory tract to clear locally produced debris, excessive secretions or unwanted inhaled particles.[6] The structural abnormalities of the nose like nasal septal deviation may impair the MCC mechanism, which can result in stasis of secretions and secondary infections.[7] There are several methods to measure the MCC either directly or indirectly and saccharine test is a simple, safe, reliable, and cheap method used by many researchers to gauge the MCC.[8]

Though the use of microdebrider in inferior turbinate surgery has been advocated by many, the role of same in reducing nasal resistance and improving the quality of life in the postoperative period remain unexplored.

The purpose of this study was to evaluate the objective and subjective improvement in nasal obstruction following endoscopic and microdebrider-assisted inferior turbinectomy.

Objectives of the Study

- To study the role of endoscopic and microdebrider-assisted partial inferior turbinectomy in inferior turbinate hypertrophy.
- To study the improvement in symptoms and quality of life following endoscopic and microdebrider-assisted partial inferior turbinectomy.
- To study the complications of endoscopic and microdebrider-assisted partial inferior turbinectomy.

Materials and Methods

Source of Data

All the patients who came to the Department of ENT, in a tertiary care hospital with chronic nasal obstruction with inferior turbinate hypertrophy refractory to medical management, were the candidates taken up for partial inferior turbinectomy.

A prospective, experimental study was done for a period of 17 months after obtaining institutional ethical committee clearance.

Inclusion Criteria

Subjects with chronic nasal obstruction with hypertrophy of inferior turbinates refractory to medical management and enrolled for partial inferior turbinectomy.

Exclusion Criteria

Patients with nasal obstruction due to causes other than inferior turbinate hypertrophy.

Patients who were not fit for/refuse surgery.

Method of Collecting Data

All the subjects were taken up for partial inferior turbinectomy. Relevant clinical data were obtained. A detailed clinical examination and relevant investigations were conducted.

Preoperative Assessment

All subjects underwent saccharine transit time (STT), modified spirometry.

All were asked to answer modified sino-nasal outcome test (SNOT 10) questionnaire (Table 1), adapted after discussion and approval from the Department and Board of studies, ENT.

Table 1: SNOT 10 questionnaire

Symptoms	*Nil (0)*	*Mild (1)*	*Moderate (2)*	*Severe (3)*
Nasal obstruction				
Running nose				
Sneezing				
Facial pain/headache				
Cough				
Need to blow nose				
Postnasal discharge				
Loss of smell/taste				
Thick nasal discharge				
Epistaxis				

Mild, complaints present, relieving on its own; moderate, complaints relieving with medications only; Nil, no complaints; severe, complaints not relieving with medication

Saccharine Transit Time

An hour in a stable environment which is free of dust and breeze with relative humidity was advised before the procedure. A saccharin particle measuring 1 mm in diameter was placed under direct vision, on the medial surface of the inferior nasal turbinate, at least 1 mm behind the anterior end of the turbinate. The position of the subject was sitting with head flexed at 10 degrees. The subject was instructed not to sniff, sneeze, cough, smoke, eat or drink during the test. Subjects were asked to report the taste as soon as it is noted. The time required for sensing the sweet taste after placement of the saccharin particle was recorded.

Spirometry

The Spirometer that was used in this study is RMS (Recorders & Medicare) Helios 401 model. It is a portable and a flow-sensing device.

Parameters Used for this Study

Forced vital capacity (FVC): Maximum volume of gas that can be expired when the patient exhales as forcefully and rapidly as possible after a maximal inspiration.

Forced expiratory volume (FEV): Volume of gas expired over a given time interval (T) from the beginning of the FVC maneuver. A subscript of FEV indicates the time interval.

The FVC, FEV1 (1st second) and FEV3 (3rd second) measurements were used.

Technique-mouthpiece of the spirometer was connected to a nasal mask in order that the mask snugly fits the nose. The opposite nose was occluded while evaluating the testing nose. The maneuver is displayed on a computer monitor screen and analyses the signal from the spirometer (Fig. 1).

Diagnostic nasal endoscopy and CT nose and paranasal sinuses were done for all the patients prior to surgery (Figs 2 and 3).

The prospective candidates were taken up for surgery—endoscopic and microdebrider-assisted partial inferior turbinectomy.

Procedure

Under general anesthesia and visualization with 4 mm 0° endoscope, inferior turbinate was infiltrated with 2% lignocaine + 1:2,00,000. Adrenaline along its entire length under endoscopic visualization,

Fig. 1: Rhinospirometry procedure

Fig. 2: Diagnostic nasal endoscopy of right nasal cavity showing inferior turbinate hypertrophy

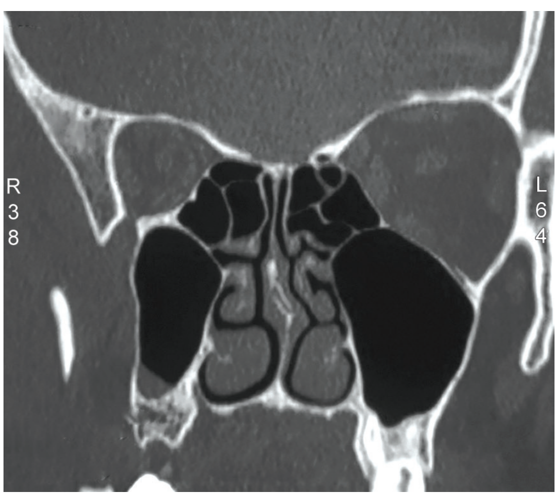

Fig. 3: CT of nose and paranasal sinuses showing bilateral inferior turbinate hypertrophy

using microdebrider, mucosa on inferior aspect of inferior turbinate was removed and bone was exposed. Mucosa over the medial part of inferior turbinate was elevated and the underlying turbinate bone

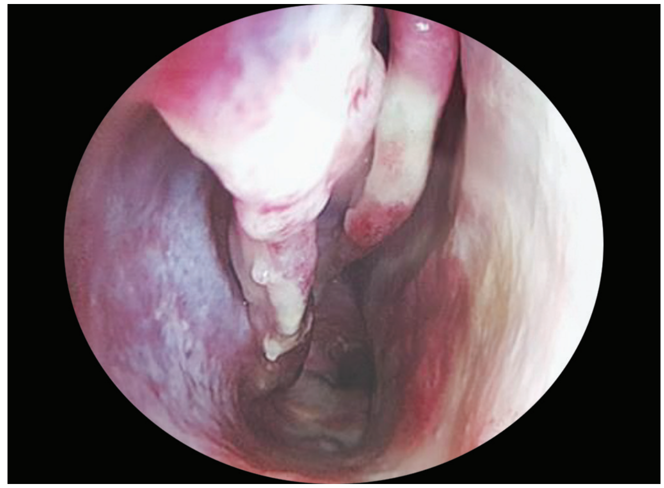

Fig. 4: Diagnostic nasal endoscopy post partial inferior turbinectomy

was resected as required. The remaining mucosa was rolled onto the remainder of the turbinate bone. Hemostasis was achieved. Anterior nasal packing was done.

Postoperative Treatment and Follow-up

Pack removal was done 48 hours after surgery. Each patient was put on a course of antibiotic, analgesic, and topical vasoconstrictor to prevent infection, and to control bleeding, nasal douching was given to prevent crusting.

Improvement in patient symptoms were assessed by modified SNOT 10 Questionnaire, Saccharine test, and Spirometry at 1 month, 3 months post-op and documented on the same proforma. Nasal endoscopic (Fig. 4) documentation of complications, such as bleeding, synechiae formation, crusting was done.

Statistical Analysis

A paired *t*-test was used to compare preoperative and postoperative results based on normality. A "*p*"-value < 0.05 was considered statistically significant.

Results

A total of 57 patients were taken up for the study but due to loss to follow-up, 50 patients with symptoms and signs of chronic nasal obstruction refractory to medical management undergoing partial inferior turbinectomy were studied.

The study included 17 males and 33 females.

Symptomatic Improvement Distribution using SNOT 10 (Table 2)

The mean preoperative SNOT 10 questionnaire score for 50 patients was 8.56. Postoperatively in the 1st month, it came down to 5.34 and in the 3rd month to 3.48 which was statistically significant (*p*-value < 0.001).

As given in Table 3, before surgery, out of 50 subjects, 28 had severe nasal obstruction. And 17 had moderate. By the end of 1st postoperative month, the number of patients having severe nasal obstruction was reduced to 5. In the 3rd postoperative month, none had severe nasal obstruction, but 16 had mild nasal obstruction. The *p*-value was found to be less than 0.05 showing the significance.

Preoperatively 24 patients had severe headache and 6 patients were symptom-free (Table 3). Number of symptom-free patients increased from 6 to 12 during the 1st month and 33 during the 3rd month and was statistically significant.

It was also found that 43 patients had complaints of loss of smell preoperatively, among which 5 had severe complaints and 20 had moderate complaints (Table 3). In the 1st postoperative month, there were no patients with severe loss of smell, and by 3rd month, there were no patients with moderate symptom and only 8 patients with mild loss of smell. Values were statistically significant.

When looking into running nose (Table 3), it was found that preoperatively seven patients had severe running nose, 25 patients with mild and 16 patients with no complaint. It came down to 0 with severe complaint in the 1st postoperative month and 3rd month which was of statistical significance, p-value < 0.05. But still, 6 patients had moderate and 20 had mild running nose at the end of 3 months.

Twenty-six patients had complaints of sneezing preoperatively, and 25 out of 26 had only mild complaints. And 3 months after surgery, 21 patients still had mild complaints.

Table 2: Mean SNOT 10 score distribution

	Mean SNOT 10 score
Preoperative	8.56
Postoperative 1st month	5.34
Postoperative 3rd month	3.48 (p-value < 0.001)

Table 3: Comparison of symptoms

	Pre-op	*Post-op1*	*Post-op3*
Nasal obstruction			
Nil (0)	0	10	34
Mild (1)	5	9	16
Moderate (2)	17	26	0
Severe (3)	28	5	0
Headache			
Nil (0)	6	12	33
Mild (1)	7	37	17
Moderate (2)	13	1	0
Severe (3)	24	0	0
Anosmia			
Nil (0)	7	35	42
Mild (1)	18	9	8
Moderate (2)	20	6	0
Severe (3)	5	0	0
Running nose			
Nil (0)	16	18	24
Mild (1)	25	25	20
Moderate (2)	2	7	6
Severe (3)	7	0	0

There were 13 patients with mild cough preoperatively and rest 37 patients were symptom-free. By 1st month after surgery, number of subjects with mild cough reduced to 6 and at 3 months, only 3 patients had cough. Improvement in symptoms after 3 months was found to be statistically significant.

Preoperatively, 35 patients had to blow nose complaint out of which 9 patients had moderate degree. Among these, during the 3rd postoperative month, all had symptomatic relief which was statistically significant.

Preoperatively 22 patients had complaints of mild postnasal discharge. By the 3rd month, postoperatively, 12 patients still had the same complaint.

There were 34 subjects with complaints of mild thick nasal discharge preoperatively, which reduced to none postoperatively. Both postnasal discharge and thick nasal discharge improved significantly in the 3rd postoperative month (p-value < 0.05).

Out of 3 subjects with complaints of mild epistaxis who underwent surgery, postoperatively, 1 patient continued to have mild epistaxis and was not significant.

Mucociliary Clearance Distribution Using Saccharine Transit Time (Table 4)

The mean STT preoperatively was 16.02 minutes which decreased to 15.98 minutes in the 1st postoperative month, and to 14.32 in the 3rd postoperative month, which was statistically significant (p-value < 0.05).

Nasal Resistance Distribution Using Rhinospirometry (Table 5)

The mean FEV1-R (right nasal cavity) preoperatively was 1.46 L which improved to 1.75 L in the postoperative 1st month and to 1.94 L in the 3rd month which was statistically significant (p-value < 0.001). The mean FEV1-L (left nasal cavity) preoperatively was 1.46 L which improved to 1.66 L in the postoperative 1st month and to 1.85 L in the 3rd month.

The mean FEV3-R (right nasal cavity) preoperatively was 1.82 L which came down to 1.77 L in the postoperative 1st month, later increased to 2.17 L in the 3rd month. The mean FEV3-L (left nasal cavity) preoperatively was 1.69 L which improved to 1.86 L in the postoperative 1st month and to 2.05 L in the 3rd month which was statistically significant (p-value < 0.001).

One patient came back with synechiae, was released following which splint was placed and was symptomatically better later. Other than this, no significant complications were observed.

Table 4: Saccharine transit time

	Mean STT (in minutes)
Preoperative	16.02
Postoperative 1st month	15.98 (p-value = 0.908)
Postoperative 3rd month	14.32 (p-value < 0.05)

Table 5: Rhinospirometry distribution

	FEV1-R	*FEV3-R*	*FEV1-L*	*FEV3-L*
Preoperative	1.46	1.82	1.46	1.69
Postoperative 1st month	1.75 (p-value < 0.001)	1.77 (p-value = 0.666)	1.66 (p-value < 0.001)	1.86 (p-value < 0.001)
Postoperative 3rd month	1.94 (p-value < 0.001)	2.17 (p-value < 0.001)	1.85 (p-value < 0.001)	2.05 (p-value < 0.001)

Discussion

Among the various surgical techniques for the treatment of hypertrophic inferior turbinates. we opted endoscopic and microdebrider-assisted partial inferior turbinectomy in this research. Here, we have used both subjective as well as objective analysis by using Modified SNOT 10, Spirometry, and STT as evaluation tools.

Nagle SK and Kelkar RS in March 2007 used maximum breathing capacity as a parameter to assess the functional average patency of nasal passage and they concluded that spirometry is a useful test for nasal respiratory function and provides objective assessment of nasal airway patency.[5]

Unsal O et al. conducted a study to know the effects of inferior turbinate reduction surgery on nasal and pulmonary function and found out that the inferior turbinate ablation not only resulted in a rise in the mean cross-sectional area and volume of the nose, but also in the forced vital capacity, forced expiratory volume in 1 s, forced, and peak expiratory flow of the patients.[9]

In this study, nasal flow volume curve was used to calculate the FEV1 and 3 (forced expiratory volume at 1 second and 3 seconds). All the parameters showed a significant improvement in the 3rd postoperative month. Hence, partial inferior turbinectomy had improved the airway in patients with chronic nasal obstruction when assessed objectively.

In this research, we observed a significant improvement in the 3rd month after surgery as compared with that in the 1st month. This could be due to the edema and crusting immediately after surgery which got completely healed by 3 months.

Sapci et al. compared the consequences of CO_2 laser ablation, radiofrequency tissue ablation, and partial turbinectomy on mucociliary functions of nasal cavity. Rhinoscintigraphy was used to measure the nasal mucociliary transport time of subjects before and 12 weeks after surgical procedures. As per their observation, laser ablation of the turbinate disturbed the mucociliary function significantly, as compared with other techniques.[10]

Ohashi et al. observed in their study, the complete regeneration of the nasal mucosa at sixth week following mechanical injury. Nasal surgical procedures impair the MCC during the immediate postoperative period which will improve with the regeneration of mucosa.[11]

In a study done by Sakallıoğlu et al. in 2012, it was found that there was no significant improvement in STT following septoplasty in the 1st month after surgery. But there was a significant improvement in the MCC, 3 months after surgery.[12]

In this research also, we observed the same finding and this may be due to the inflammatory edema and mucosal damage in the immediate postoperative period and mucosal regeneration at the 3rd month.

Out of 50 patients in this study, 28 patients had severe and 17 patients had moderate nasal obstruction according to SNOT 10 questionnaire, out of which all these patients had symptomatic relief at the postoperative 3rd month which was a significant improvement.

This was proved in a study conducted by Rai S et al. where there was improvement in nasal obstruction in 100% of cases as evaluated using a SNOT 22 questionnaire at both the 1st and 3rd month using endoscopic partial inferior turbinectomy. According to the questionnaire, sneezing was present only in 8% of cases postoperatively and nasal discharge was absent in all the cases post-turbinectomy.[13]

In this study, 26 out of 50 patients, had sneezing out of which 1 had moderate while 25 patients had mild sneezing. At the postoperative 3rd month, the number of patients with sneezing came down to 21 with no patients with moderate symptom. And 34 patients had mild thick nasal discharge which was completely relieved in all patients in the postoperative 3rd month.

Postnasal drip was a complaint in 22 patients in our study which was mild in nature, which reduced to 12 patients postoperatively in the 3rd month. This was established by Huang TW and Cheng PW in a study conducted on perennial allergic rhinitis subjects to know the efficacy of inferior turbinoplasty using endoscope and microdebrider. Thy concluded that not only nasal obstruction but also rhinorrhea, sneezing, and postnasal drip improved significantly post-turbinoplasty.[1]

In another study done by Elwany and Harrison using a postoperative questionnaire, nasal obstruction was the symptom that responded best after partial inferior turbinectomy. The questionnaire also revealed an 80% increment in the smell acuity of the patients who underwent partial inferior turbinectomy.[14]

In a study conducted by Damm M et al. on olfactory changes following septoplasty with partial inferior turbinectomy, the results suggested excellent outcome for majority of the patients in terms of subjective rating of olfactory sensitivity as 80% had improved olfactory function with respect to odor identification and 70% had improved odor discrimination.[15]

This was confirmed in our study where all of the 25 subjects with severe and moderate loss of smell had improvement at 3 months postoperatively.

Out of 50 patients in this study, 44 patients complained of facial pain/headache, 24 had severe and 13 with moderate headache. At 3 months post-surgery, it came down to 17 patients with mild headache. And 27 patients were completely symptom-free. This was inferred in a study by Mathai J in 75 patients, where out of 45 patients who had headache prior turbinectomy, 30 patients had complete relief postoperatively.[16]

In our study, we also analyzed the postoperative morbidity. The main complication of partial inferior turbinectomy is postoperative bleeding.[1] All the 50 patients were packed with Merocel intraoperatively which was removed after 48 hours to reduce the risk of postoperative bleeding. None of the subjects had significant bleeding after pack removal. Only 1 patient reported with synechiae formation. No cases of postoperative infection were reported. In a study conducted by Rakover Y and Rosen G on comparison of partial inferior turbinectomy and cryosurgery, it was seen that out of 26 patients who underwent partial inferior turbinectomy, only 1 patient had synechiae formation which shows that synechia formation is a rare complication of partial inferior turbinectomy.[17] One of the major advantages of this surgical technique is that major bulk of the turbinate is reduced while retaining the functional mucosa.

Summary

The study was conducted in the Department of ENT, tertiary care hospital, including 50 patients with chronic nasal obstruction due to inferior turbinate hypertrophy and were taken for endoscopic and microdebrider-assisted partial inferior turbinectomy.

All the patients underwent STT and Modified Spirometry for objective evaluation and a Modified SNOT 10 questionnaire was used for subjective assessment preoperatively as well as in the 1st and 3rd month postoperatively.

On subjective evaluation, there was statistically significant improvement in the patient's symptoms and was established objectively by a statistically significant postoperative improvement in STT and rhinospirometry. Due to precise removal of tissue with microdebrider and preservation of turbinate mucosa to cover the bone, the postoperative complications were minimal.

Conclusion

Microdebrider-assisted partial inferior turbinectomy is a safe and effective treatment modality in the treatment of chronic nasal obstruction secondary to turbinate hypertrophy.

Patients with headache, nasal obstruction, and anosmia had highest benefit from this surgery according to SNOT 10. Hence, the patients with these symptoms with hypertrophied inferior turbinate can be considered for endoscopic microdebrider-assisted partial inferior turbinectomy for the improvement in the quality of life.

SNOT 10 Questionnaire is an effective tool helping in the subjective assessment of patients undergoing partial inferior turbinectomy.

Clinical Significance

Endoscopic microdebrider-assisted partial inferior turbinectomy results in the precise mucosal preservation and reduction of submucosal and bone tissues resulting in minimal complications.

Chronic nasal obstruction can be effectively managed by this and SNOT10 questionnaire may be used preoperatively as an indicator for the procedure.

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