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ORIGINAL ARTICLE

COMPARISON OF PARTIAL INFERIOR TURBINECTOMY AND SUBMUCOSAL DIATHERMY FOR HYPERTROPHIED INFERIOR TURBINATE IN ALLERGIC RHINITIS PATIENTS

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ABSTRACT: BACKGROUND: The inferior turbinate is the first point of contact of allergen in the nose. In patients with allergic rhinitis the turbinate hypertrophies and its mucosa becomes purplish edematous. This leads to significant obstruction of airway. Hence reduction of this hypertrophied inferior turbinate is essential. **AIM:** To analyze & evaluate the efficacy of sub mucosal diathermy and partial inferior turbinectomy in the treatment of symptomatic hypertrophied inferior turbinates in allergic rhinitis patients in a rural setup. **METHODS AND MATERIALS:** A prospective clinical study of 132 patients between age group of 15-55 years of either sex were enrolled in the study with bilateral Inferior. Turbinate Hypertrophy who had history of failed medical line of treatment. After informing, the patients were randomized into two groups to eliminate bias byallotting them alternately into the groups. Patients in Group I underwent. Submucosal diathermy and Group II patients underwent Partial Inferior. Turbinectomy. Postoperative follow up was done at regular intervals by objective& subjective assessment. **STATISTICAL ANALYSIS USED:** Friedman test and Chi Square test were used for statistical analysis. **RESULTS:** In group I significant improvement of nasal airflow was seen in 14% patients & 85.9% had moderate improvement. In group II 41.3% of patients had significant improvement & 58.6% had moderate improvement. Statistically by analyzing the ranks of subjective nasal obstruction and objective nasal obstruction of Group-I & Group-IIwe conclude that Group-II subjects showed more improvement than Group I. **CONCLUSIONS:** Various surgical methods have been tried for enlarged inferior turbinate secondary to allergic rhinitis. Of them the well-known techniques aresubmucosal Diathermy & Partial Inferior Turbinectomy. In this study Partial Inferior Turbinectomy was found to be more effective in relieving nasal obstructionin allergic rhinitis patients for longer duration. The procedure was simple, cost effective and with no major complications.

KEYWORDS: Inferior turbinate hypertrophy, Allergic rhinitis, Nasal obstruction, Submucosal diathermy and partial inferior turbinectomy.

INTRODUCTION: Allergic rhinitis has been known for over 150 years. The first recorded case of Allergic rhinitis (Catarrhusaestivus) was described by Sir John Bostock, who presented himself as a case report to the Medical and Surgical Society of London in 1819. He described classical symptoms of Allergic rhinitis in England.[1]

Allergic rhinitis is acknowledged as a significant health challenge on a global scale affecting 20% of total population, which can significantly impair quality of life and lead to a number of indirect costs.[2] It results in 3.5 million lost work days & 2 million lost school days annually in U.S.[3] Nasal obstruction due to inferior turbinate hypertrophy (ITH) in long standing cases is one of the most common symptoms in these patients. The medial mucosa in the turbinate enlarges by 82% & adds 64.4% to total increase in width of the turbinate.[4]

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The anterior & inferior portions of the lower turbinates are main determinants of nasal resistance & hence are the target of surgery. Poiseulle's Law states that the laminar flow rate of air along a pipe is proportional to the fourth power of the pipes radius. Therefore a small change in the inferior turbinate will dramatically affect nasal airflow, which is the physiological basis on which reduction of inferior turbinate tissue rests.[5]

The first surgical procedure for the treatment of enlarged inferior turbinate was reported by Heider & Crusel in 1845 when they described surface electrocautery using a galvanic current[6]. Latter Hol & Hiuzing evaluated 13 surgical techniques that have been used for inferior turbinectomy in last 130 years.[6] Surgical techniques for managing ITH vary widely & have evolved substantially in past 4 decades as new technologies have emerged.[7] Today many surgical options exists for the treatment of hypertrophied inferior turbinate directed primarily at the underlying nasal obstructive component.[8] These procedures addresses the bone, submucosa, mucosa or combination of these. Procedures like linear cautery, submucosal diathermy,[6] cryosurgery,[9] lateral outfracturing,[10] antrochonopexy,[11] submucosal resection, radiofrequency ablation,[12] partial turbinectomy,[9] total inferior turbinectomy,[13] laser turbinectomy,[14] mucosal trimming,[15] microdebriding,[16] coblation,[17] degloving[18] & submucosal stroma debriding[19] etc are the techniques which have been performed. There is no gold standard treatment for patients with refractory rhinitis & surgeons may select a variety of procedures based on patient's anatomy, severity of disease & comorbidities.[20]But with rural patients being more predominant, cost being a major issues we wanted to try simpler methods which did not require sophisticated, costly instruments & one which could be easily done at lesser cost. Hence this study was conducted to evaluate & analyze the impact of either of the two above mentioned procedures on nasal obstruction.

METHODS & MATERIALS: This is a prospective clinical study of 132 outpatients who presented to our ENT Department with symptoms of Allergic Rhinitis, nasal obstruction being predominant in all of them. These patients were thoroughly examined with detailed history, clinical examination and relevant investigation were done.

Patients between age group of 15-55 years were selected for the study. Of 132 patients 47 were females and 85 were males. Patients with nasal polyposis, significant nasal deformity or other structural deformity like concha bullosa, double middle turbinate leading to nasal obstruction were excluded. Patients below age group of 15 years & above 55 years, along with pregnant & lactating patients were also excluded.

To avoid bias the patients were randomized into two groups by allotting them into Group I & Group II alternately. After randomization preoperative baseline symptoms scores were recorded in the symptoms diary. The scoring was explained to them and asked to maintain it throughout the study period.

Sl. No.	Grade	Symptoms
1	Absent	No Symptoms
2	Mild	Symptoms present but not troublesome.
3	Moderate	Symptoms frequently troublesome but not disturbing daily activity.
4	Severe	Symptoms disturbing daily normal activity

Table 1: Symptom scale

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1	Absent
2	1-5
3	6-10
4	11 or more

Table 2: Nasal Secretions Score (Average no of nose blowing per day)

1	Inferior turbinate occupying < 25 % of nasal fossa
2	Inferior turbinate occupying > 25 % to 50 % of nasal fossa
3	Inferior turbinate occupying > 50% but < 100 % of nasal fossa
4	Inferior turbinate touching the nasal septum – 100 %

Table 3: Objective Nasal obstruction score

Scores		**Improvement**
1	Symptoms free	Significant improvement
2	Symptoms persists but not troublesome.	Moderate improvement
3	Symptoms persists and frequently trouble some but not disturbing daily activity.	Mild improvement
4	Symptoms persist & disturbing daily normal activity	No improvement

Table 4: Post-Operative Subjective Score

Group I patients underwent submucosal diathermy, group II patients underwent partial inferior turbinectomy.

Submucosal diathermy uses a high frequency (0.25–3 MHz) electrical current. This is made to pass through the body between two electrodes. Diathermy produces very high local temperatures due to ohmic heating, resulting in tissue destruction by boiling & coagulation.[6] In patients with hypertropied inferior turbinate the superficial layer of lamina propria is significantly increased in size and there is increase in the submucosal glands & venous sinusoids.[21] SMD causes obliteration of these venous sinusoids leading to submucosal fibrosis & scarring of lamina which is thought to anchor the mucosa to the periosteum. The heat may also damage the terminal cholinergic nerve endings resulting in reduced glandular activity.[22]

This is performed by placing a spinal needle into the submucosal tissue of the turbinate longitudinally into the lower anterior part, staying parallel to but not touching the turbinate bone. An electrical current is applied for few seconds, usually till mucosal blanching is seen. Mechanism of action is hypothesized as to induce tissue destruction with vessel thrombosis & creation of scar tissue, which prevents the venous sinusoids in the turbinate mucosa from engorging. The nasal mucociliary clearance improves after 2 months of surgery.[23] Vaseline or neosporin ointment soaked pack is kept in the nasal cavity for few hours.[24]

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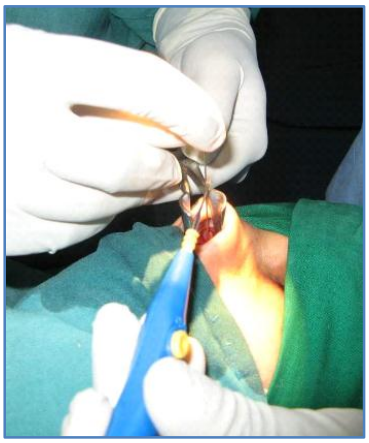

Fig. 1: Intra operative photo of submucosal diathermy procedure

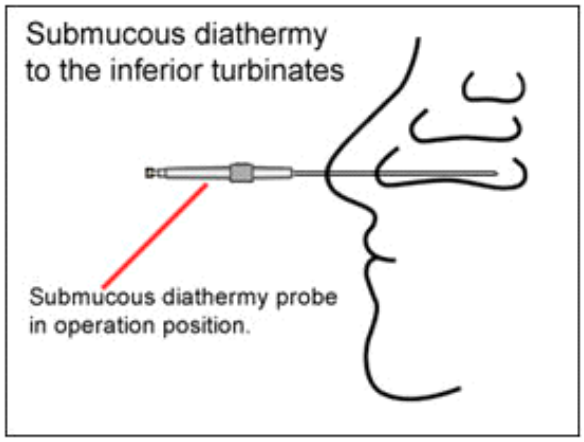

Fig. 2: Intra operative photo of submucosal diathermy procedure

Partial inferior turbinectomy is a procedure of resecting the mucosa & part of bone of the hypertrophied turbinate. After visual inspection, the turbinates are decongested with application of a decongestant. Using a Killians nasal speculum & Freer's elevator infracturing of turbinate is done. Then the angled Haymann's scissors are used for the procedure. One blade is inserted beneath the inferior turbinate & other on top of it. Resection includes the turbinate mucosa & part of the bone. The extent of resection depends on degree of hypertrophy. Hemostasis is achieved by nasal packing with neosporin coated gauze pack, which is left for 24- 48 hours.[9,25]

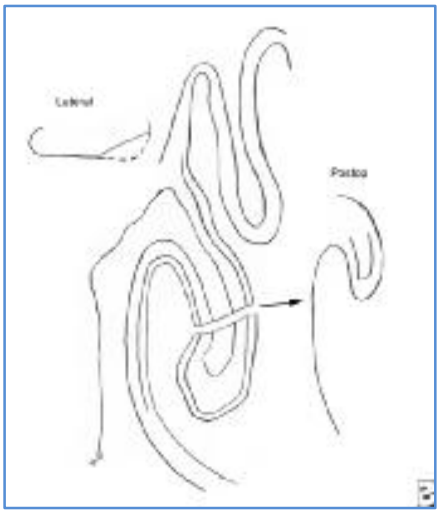

Fig. 3: Schematic diagram of PIT

All patients received antibiotics for 5 days. Nasal packs were removed on 2nd postop day. Patients were assessed subjectively & objectively at 2nd post op day, 2nd week, 3rd month & 6th month.

STATISTICAL ANALYSIS: Friedman test and Chi Square test were used for statistical analysis.

RESULTS: Of 132 patients 10 were lost for follow up & total number of patients accounted to 122.

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Group I had 64 patients & Group II had 58 patients. In Group I the mean symptom score improved from 3.67 to 1.86 at 6 months post operatively.

Score	Mean	Std. Deviation
S1NO*	3.67	.473
S2NO**	1.66	.479
S3NO***	1.86	.350

Table 5: Subjective nasal obstruction score

S1NO* symptom score of nasal obstruction preoperatively, S2NO** symptom score at 3rd month, S3NO*** symptom score at 6th month.

N*	64
Chi-square	118.076
Df**	2

Table 6: Statistical analysis.N* sample size, Df** Degrees of freedom

The objective score for nasal obstruction in group I improved from 3.63 to 1.91.

	Mean	Std. Deviation
O1NO*	3.63	.488
O2NO**	1.59	.495
O3NO***	1.91	.387

Table 7: Objective score for nasal obstruction

O1NO* objective assessment of nasal obstruction preoperatively, O2NO** at 3rd month postoperatively, O3NO*** at 6th month post-operatively.

N*	64
Chi-square	116.437
Df**	2

Table 8: Statistical analysis. Friedman test

N* sample size, Df** Degrees of freedom.

Group – I:

	N	Mean	Std. Deviation
S1NO*	58	3.74	.442
S2NO**	58	1.53	.503
S3NO***	58	1.59	.497

Table 9: Subjective Nasal Obstruction

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S1NO* symptom score of nasal obstruction pre-operatively. S2NO** symptom score at 3rd month, S3NO*** symptom score at 6th month post-operatively.

N*	58
Chi-square	108.032
Df**	2

Table 10: Friedman Test

N* sample size, Df** Degrees of freedom

Group – II:

	N	Mean	Std. Deviation
O1NO*	58	3.76	.432
O2NO**	58	1.29	.459
O3NO***	58	1.40	.493

Table 11: Objective Nasal Obstruction score

O1NO* objective assessment of nasal obstruction pre-operatively, O2NO** at 3rd month postoperatively, O3NO*** at 6th month post-operatively.

N*	58
Chi-square	111.297
Df**	2

Table 12: Friedman Test

N* sample size, Df** Degrees of freedom.

Statistical analysis shows that there is significant difference between all the three means. Hence null hypothesis (Ho) is rejected with $p<0.05$ & at 5% level of significance. By comparing the Ranks of Subjective Nasal Obstruction and Objective Nasal Obstruction of Group I & Group II we conclude that Group II subjects feel better than group I. The table shows a sharp decline in means of Group II as compared to Group I. Therefore the study reveals that partial inferior turbinectomy is superior as compared to nasal sub mucosal diathermy for nasal obstruction.

	Group I	Group II
Post-operative hemorrhage	0	3
Crusting	59	58

Table 13: Immediate Post-operative complications

Post-operative bleeding was noted in 3 patients undergoing PIT after pack removal which required repacking for 12 hours. Crusting was noted in both the groups.

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	Group I	Group II
Dryness of nose		
Adhesion		2
Atrophic rhinitis		

Table 14: Post-operative complications at 3th month

At 3rd month adhesion was seen in two patients who underwent partial inferior turbinectomy.

	Group I	Group II
Dryness of nose	-	1
Adhesion		-
Atrophic rhinitis		

Table 15: Post-operative complications at 6th month

At 6th month dryness was noted in 1 patients who underwent PIT.

DISCUSSION: Allergic rhinitis is most common health problem accounting for 20% of ENT OPD patients. Nasal obstruction is the hallmark complaint in Allergic rhinitis, accounting for one of the most common reasons for outpatient visits.[5] Hypertrophy of inferior turbinate has long been established as the central cause of symptomatic nasal obstruction in these patients. Allergic inflammation causes vasoreactive engorgement of the turbinate tissue & the associated inflammation of the mucosal lining. The mucosal epithelium of the inferior turbinate has been regarded as the central site for IgE mediated reaction & nasal eosinophilia. The first point of contact for allergen is the inferior turbinate & deposition in these areas results in localized inflammation stemming from submucosal structures.[5]

Medical line of management mainly aims in symptomatic relief than cure. Drugs used for treating allergic rhinitis act mainly in relieving the nasal discharge, sneezing, itching & have little effect on the nasal obstruction. And the effects are temporary. These drugs are usually accompanied by side effects. So finding a long lasting solution with less side effects, which would give better relief than drugs to these patients has become necessary.

The most common procedures performed to relieve nasal obstruction in patients with allergic rhinitis are those directed at reducing the size of inferior turbinates[26]. Hence we studied these surgical methods to treat the patients suffering from allergic rhinitis**.** The goal of surgery of the inferior turbinate is to minimize allergen effect through reducing bulky inflammatory tissue or inducing scar formation, while enhancing patency of the nasal fossa.[5]

There are many surgical techniques for reduction of inferior turbinate hypertrophy. But there is no gold standard method so surgeon may select a variety of procedures & techniques based on patient's anatomy, severity of disease & comorbidities.[20] An ideal procedure for turbinate reduction should reduce the turbinate effectively & be associated with minimal discomfort, complications and consequence. It should preserve the normal physiological function of the turbinate such as humidification & temperature regulation of the inspired air.[12]Hence these two simpler, less costly and easily performable techniques were chosen.

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The mean age of 132 subjects, who entered the study was 35 years. In this study males constituted 58% and females 42%. In the current study the most common & severe symptom was nasal obstruction with 70.4% patients having severe nasal obstruction & 29.5% patients having moderate nasal obstruction. This was followed by nasal discharge which was severe in 54% & moderate in 45.9% patients. Nasal itching was severe in 22.75% patients & was moderate in 77.27% patients. Sneezing was severe in 40.9% patients & moderate in 59% of patients. Headache was severe in 26.51% patients & moderate in 73.48% patients.

During early post-operative period nasal obstruction was exaggerated in both groups due to mucosal edema & crusting. This was relieved after 3-8 days in most of the patients. Following surgical treatment most of the patients had improvement in nasal breathing. At three months postoperatively, of 64 patients in group I who underwent submucosal diathermy 22 (34.3%) patients had significant improvement & rest 42 (75.7%) patients had moderate improvement. The size of inferior turbinate was reduce to grade I (<25 %) in 26 (40.6%) patients, remaining 38 (59.37%) patients had inferior turbinate size measuring grade II (25-50%) at three months.

At six months 9 patients (14%) had significant improvement in symptoms & 55 patients (85.9%) had moderate improvement in symptoms. Eight patients (15.8%) had turbinate shrunk to grade I & 54 patients (84.3%) had turbinate shrunk to grade II. There were 8 (12.5%) cases with recurrence of nasal obstruction from no symptom to mild symptom at 6 months. Similar success rates were observed by Fradis et al (2002),[24] where nasal breathing had improved post submucosal diathermy by 89%. Shahinian[6] reported a good outcome of 412 patients undergoing submucosal diathermy. Another study by Fradis[27] et al (2000) showed 78% success rate at one year postoperatively. Eighty four percent of success rate was observed by Abdul Aziz Ashoor at end of 1 month postoperatively.[28] Irfan et al reported 60% improvement in their patients at 1 year.[29] Further studies have shown improvements in nasal airflow between 75-96%.[30,31]

Partial inferior turbinectomy (PIT) was found to be more effective in reducing the nasal obstruction in all 58 patients. At 3rd month 27 patients (46.55%) had complete relief from nasal obstruction & 53.4% of patients had moderate improvement. At 6th month 24 patients (41.34%) had complete relief from nasal obstruction & 43 patients (58.6%) had moderate improvement. The size of inferior turbinate was reduce to grade I (<25 %) in 41(70.68%) patients, remaining 17 (29.31%) patients had inferior turbinate size measuring grade II (25-50%) at three months. At six months thirty five patients (60.3%) had turbinate shrunk to grade I & 23 patients (39.6%) had turbinate shrunk to grade II. There were 4 (6.8%) cases with recurrence of nasal obstruction at end of six months in this group.

This was in accordance with other studies by Yoseph Rakover, MD, Gabriel Rosen MD, FACS[25] who showed 87% improvement in nasal obstruction at 1 year & 77% rate at 2-5 years. Ophir et al (1992)[32] showed 82% success even after 10-15 years. 75% success rate was observed in the study by SamyElwany. MD, Robert Harrison.MD. (1990).[9]

All the surgical methods mainly aim at reducing the size of turbinate to relieve nasal obstruction. But few studies have shown that surgical methods are known to reduce nasal discharge, improve hyposmia, decrease the attacks in asthmatic & also reduce sneezing attacks.[33] Apart from nasal obstruction there was improvement in nasal discharge, itching & sneezing in both techniques more in group I. At six months 36 (56.25%) patients in group I showed significant improvement in nasal discharge. Fradiset al[27] (2000) showed 57% in SMD group had some improvement in nasal discharge. M Talaat, E. EL-Sabawy, F. A. Baky & A. A. Raheem (1987)[29] observed 30% improvement in

nasal discharge by SMD in their study. Similar results were studied by Jones.[34] Of 64 patients having sneezing in group I 37 (57.8%) patients had improvement. Nasal itching was reduced significantly in 35 (54.68%) patients undergoing SMD. Twenty seven (42.18%) patients in group I had significant relief from headache. Shahinian[6] had reported that SMD had ameliorated sneezing, in his study on 412 patients. Other studies by Simpson JF & Groves J,[35] Talaat, Sabawy, Baky[29]& Fradis[27] et al have also shown similar results.

Of 58 patients 30 (51.72%) patients in group II showed moderate improvement in nasal discharge. Thirty (51.72%) patients showed improvement in sneezing episode. Nasal itching also improved moderately in 33 (56.89%) patients. Thirty six (62.06%) patients who had headache in this group showed moderate improvement. Fourty percent improvement was seen in nasal discharge by S. Elwany & Robert Harrison.[9]

CONCLUSION: Allergic rhinitis is the most common immunological disease experienced by human. Various surgical methods have been tried for enlarged inferior turbinate secondary to allergic rhinitis, the most well-known techniques are SMD & PIT. Surgical treatment mainly aims at increasing the nasal airway volume, which will lead to better functional nasal airflow & improvements of symptoms. Both the surgical methods in our study were found to be effective in reducing the nasal obstruction in allergic rhinitis due to hypertrophied inferior turbinates. At six months turbinate size was better reduced by Partial inferior turbinectomy than SMD. Both techniques were found to reduce other symptoms of allergic rhinitis like rhinorrhea, sneezing, itching & headache. Both the techniques preserve the nasal physiology but PIT is more effective in reducing nasal obstruction for long duration.

Hence it can be concluded that both procedures have advantages, disadvantages & their own complications. Hence the choice of surgery can be individualized according to many factors. Inferior turbinate surgeries are an evolving operative concept more prospective controlled studies are needed with both objective & subjective outcome measures.

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