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Original Research Article

Clinical outcome following septoplasty with or without inferior turbinate reduction

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ABSTRACT

Background: Deviation of nasal septum towards one side is often associated with over growth of inferior turbinate, which occupies expansive space of contralateral nasal cavity. The enlargement of inferior turbinate can be due to mucosal elements or bony expansion. Many surgeons are of the belief if septoplasty is done, compensatory hypertrophy regresses on its own. There are others who argue that these changes are not spontaneously reversible and should be corrected in conjunction with nasal septal surgery. Otherwise surgery may relieve the obstruction on one side of nose but leave other side of obstructed because of relocation of septum towards hypertrophied turbinate.
Methods: A prospective interventional randomized comparative study is carried out from 1st November 2017 to 31th March 2019, with a sample size of 40 patients. Patients were divided in two surgical groups; group A, with conventional septoplasty done and group B, with reduction of inferior turbinate along with conventional septoplasty done. Post operatively patients' symptoms will be evaluated using nasal obstructions evaluation scale (NOSE) and nasal airway with nasal endoscopy at 1, 3 and 6 months, and compared with preoperative findings.
Results: Data is analyzed using percentage graph and tables. The comparisons of NOSE score at 1, 3- and 6-months interval showed the p value of 0.001 which was significant. Also comparison of two groups with NOSE score showed significant improvement in group B.
Conclusions: The study shows that hypertrophied turbinate need reduction along with septoplasty in cases of long standing nasal obstruction.

Keywords: Nasal septum, Turbinate hypertrophy, NOSE score, Nasal endoscopy

INTRODUCTION

Nasal septum deviation is a major cause of nasal obstruction which causes significant morbidity for the patients. For ages, surgeons have been trying to find the most appropriate remedy for its correction and relief for the patients.

Septum is the central structural element of the nose and functions as a tent pole. It provides suspension for the upper lateral cartilages and anchors the anterior nose to the facial skeleton. Functionally, the nasal septum forms part of the aerodynamic system of the nose which facilitates mass and heat transfer. Therefore, septal deformities affect the nasal resistance and the condition of the mucous membrane.[1,2]

Deviation of nasal septum towards one side is associated with overgrowth of inferior turbinate[3]on opposite side which occupies expansive space of contralateral nasal cavity. The inferior turbinate enlargement can be due to mucosal, bony or both elements.

Two parallel air streams pass through the nose during respiration. They interact according to the loss of fluid dynamics. The result is a functional inter-relation

between both nasal cavities. Therefore the septum also subdivides the nose into two functionally corresponding units.

The nasal cycle is a well-recognized physiological activity whereby each side of the nose alternates the phases of congestion and decongestion.[4] Vascular activity produces the changes, especially the volume of blood in capacitance vessels (venous sinusoids).

The nasal septum consists of a bony, cartilaginous and membranous portion. The bony portion is comprised of the perpendicular plate of the ethmoid bone, vomer, maxillary crest and palatine bone, rostrum of sphenoid, crest of nasal bones, nasal spine of frontal bone. The cartilaginous portion of the nasal septum is composed of the septal or quadrilateral cartilage. The quadrilateral cartilage is bound firmly by collagenous fibers to the nasal bones, perpendicular plate of the ethmoid and vomer. The septal cartilage is continuous with the upper lateral cartilages towards the bridge of the nose (Figure 1).

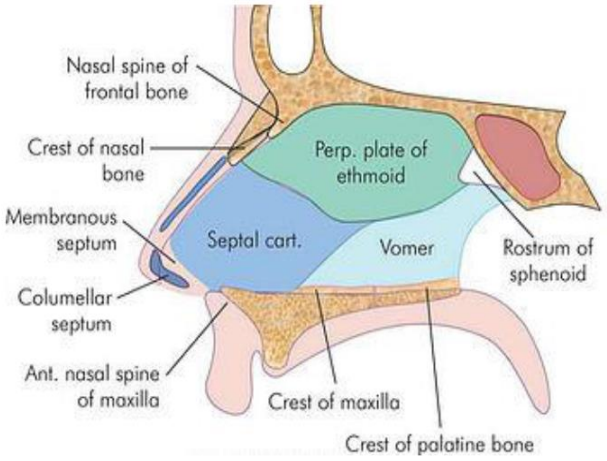

Figure 1: Anatomy of nasal septum.

The compensatory hypertrophy of the inferior turbinate in patients with septal deviation to one of the nostrils is considered to protect the airways from the excess of air that could enter through the nostril and its potential negative effects such as dryness, alteration of air filtration, mucociliary flow, or lung involvement.[5]

According to some authors once septoplasty is done compensatory hypertrophy regresses on its own while others had opinion that these changes are not spontaneously reversible and should be corrected along with nasal septal surgery. Otherwise surgery may relieve the symptoms on one side of nose but leave other side remain obstructed.[6]

By doing this study we want to find out whether reduction of hypertrophied inferior turbinate should be considered along with septoplasty or septoplasty alone can treat nasal obstruction in patients with DNS.

METHODS

The study was conducted in department of otorhinolaryngology at PGIMER & Dr. Ram Manohar Lohia hospital, New Delhi. 40 patients (20 patients with septoplasty alone and 20 patients with septoplasty along with inferior turbinate reduction) from 1 November 2017 to 31 March 2019. Ethical clearance was taken from institutional ethical committee. Written informed consent was obtained from patients. Detailed history and examination was carried out.

Patients underwent all routine investigations, X-ray PNS water's view and nasal endoscopy before surgery. Patients filled questionnaires relating to severity of their symptoms using nasal obstruction symptom evaluation (NOSE) scale.

Patients were then randomly divided into two groups by simple randomization technique. In group A, only conventional septoplasty under LA was performed. In group B, reduction of inferior turbinate was performed to treat hypertrophied inferior turbinate together with conventional septoplasty under LA.

Post-operative patient's symptoms were again evaluated using NOSE at 1, 3 and 6 months. Inferior turbinate reduction in our study was done by radiofrequency ablation.[7,8] Nasal airway was evaluated at 1, 3- and 6-months post-surgery with nasal endoscope and compared with preoperative findings.

Statistical analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Descriptive statistics included computation of percentages, means and standard deviations. The independent t test (for quantitative data within two groups) and paired t test (for quantitative data to compare before and after observations) used for quantitative data comparison of all clinical indicators. Chi-square test used for qualitative data whenever two or more than two groups were used to compare. Level of significance was set at $p \leq 0.05$.

RESULTS

Age wise distribution of the study

In our study 40 patients were taken based on our inclusion criteria. Mean age of these patients was 24.45 years with standard deviation of 7.08. Mean duration of nasal obstruction symptoms was 5.42 years with standard deviation of 4.25.

Gender wise distribution of the study

Out of total patients selected 5 (12.5%) were female and 35 (87.5%) were males.

Comparison of side of obstruction

17(42.5%) out of 40 patients had bilateral nasal obstruction, 16 (40%) patients had left sided nasal obstruction and 7 (17.5%) patients had right sided nasal obstruction.

Diurnal variation in nasal obstruction

Out of 40 patients chosen for the study 22 (55%) patients reported worsening of nasal obstruction in night, two patients reported worsening of symptoms in day (5%) and one (2.5%) patient reported worsening of nasal obstruction in early morning. 15 (37.5%) patients had no diurnal variation of nasal obstruction.

Distribution of side of deviation

20 out of 40 patients (50%) had left sided deviation of nasal septum, 2 (5%) patients had left sided nasal septum deviation along with spur to right side and 1 (2.5%) patient had left sided DNS with left side spur, 1 (2.5%) patient also had left DNS with caudal dislocation to right side. Ten patients had right sided septal deviation and 6 patients had right sided septal deviation with spur to left side.

Side of Inferior turbinate hypertrophy

Twenty seven out of 40 (67.5%) patients had right sided inferior turbinate hypertrophy, 11 (27.5%) patients had left sided inferior turbinate hypertrophy and 2 (5%) patients showed bilateral inferior turbinate hypertrophy.

Comparisons of NOSE score at different time intervals

When we compare NOSE score in all patients who underwent surgery for DNS the results are as follow (Table 1). Mean NOSE score in 40 patients selected for surgery was 14.47 out of 20, after 1 month of surgery, there were 39 patients in follow up and 1 patient was lost to follow up. Mean NOSE score after 1 month of surgery (irrespective of with or without inferior turbinate reduction) was 7.30 out of 20, after 3 months of surgery we had 38 patients in follow up and 2 patients were lost to follow up. Mean NOSE score after 3 months follow up in them was 3.94 and at 6 months of post-operative period we had 37 patients under follow up and 3 patients were lost to follow up. Mean NOSE score after 6 months of follow up was 2.13.

In all the above calculations, p value was 0.001 which was significant.

Table 1: Comparison of NOSE score at different time interval.

		N	Mean	Std. deviation	P value
Pair 1	Pre-operative	40	14.47	2.8	0.001*
	1 month	39	7.30	3.32	
Pair 2	Pre-operative	40	14.47	2.8	0.001*
	3 month	38	3.94	3.18	
Pair 3	Pre-operative	40	14.47	2.8	0.001*
	6 Month	37	2.13	2.94	

*Significant

Comparison of two groups with NOSE score

In this we compared NOSE score in patients who underwent septoplasty only (group A) with those who underwent septoplasty with inferior turbinate reduction (group B) at 1, 3 and 6 months of post-operative period (Table 2). Pre-operatively there were 20 patients in each group.

Table 2: Comparison of two groups with NOSE score.

	Surgery	N	Mean	Std. dev	P value
Baseline (before surgery)	Septoplasty(A)	20	14.25	3.006	0.61
1 month	Septoplasty with IRT(B)	20	14.7	2.63	0.001 (S)*
	Septoplasty(A)	20	9.4	2.62	
	Septoplasty with IRT(B)	19	5.105	2.46	
3 months	Septoplasty(A)	19	6.26	2.6	0.001 (S)*
	Septoplasty with ITR(B)	19	1.61	1.67	
	Septoplasty(A)	18	4.16	3.11	
6 months	Septoplasty with ITR(B)	19	0.21	0.41	0.001 (S)*

*Significant

Mean value of NOSE score in patients who underwent septoplasty alone was 14.25 with standard deviation of 3.006 and in patients who underwent septoplasty along with inferior turbinate reduction was 14.70 with standard deviation of 2.63. After 1 month post-operative period, mean value of NOSE score in group A was 9.4 and in group B was 5.105. After 3 months of post-operative period, mean value of NOSE score in group A was 6.26 and in group B was 1.61. After 6 months of post-operative period, mean value of NOSE score in group A was 4.16 and in group B was 0.21.

Table 3: Comparison of surgery with osteomeatal complex at pre-operative time.

			Bilateral clear	Could not be visualised on DNE	Right side clear/left could not be visualised	Total
Surgery	Septoplasty	No.	17	3	0	20
		%	85.0	15.0	0	100.0
	Septoplasty with ITR	No.	16	3	1	20
		%	80.0	15.0	5.0	100.0
Total		No.	33	6	1	40
		%	82.5	15.0	2.5	100.0

P value=0.59

Table 4: Comparison of OMC in follow up.

			Follow up		Total
One month			**Bilateral clear**	**Loss to follow up**	
Surgery	Septoplasty (A)	No.	20	0	20
		%	100.0	.0	100.0
	Septoplast with ITR(B)	No.	19	1	20
		%	95.0	5.0	100.0
Total		No.	39	1	40
		%	97.5	2.5	100.0
P value =0.31					
Three months					
Surgery	Septoplasty	No.	19	1	20
		%	95.0	5.0	100.0
	Septoplast with ITR(B)	No.	19	1	20
		%	95.0	5.0	100.0
Total		No.	38	2	40
		%	95.0	5.0	100.0
Six months					
Surgery	Septoplasty	No.	18	2	20
		%	90.0	10.0	100.0
	Septoplast with ITR(B)	No.	19	1	20
		%	95.0	5.0	100.0
Total		No.	37	2	40
		%	92.5	7.5	100.0

P value=0.54

Status of osteomeatal complex before surgery

Out of 20 patients who underwent septoplasty 17 (85%) had bilaterally clear osteomeatal complex and in 3 (15%)

patients both osteomeatal complexes could not be visualized on nasal endoscopy (Table 3).

Out of 20 patients who underwent septoplasty with inferior turbinate reduction, 16 (80%) had bilaterally clear osteomeatal complex. In 1 (5%) patient right osteomeatal complex was clear but left was not visualized and in 3 (15%) patients both osteomeatal complexes were not visible on nasal endoscopy.

Comparison of osteomeatal complex in two groups after surgery

After 1 month of surgery osteomeatal complex was found bilaterally clear in 100 percent patients of group A. In group B, 5 percent patients were lost to follow up and remaining 95 prcent patients had bilaterally clear OMC (Table 4).

After 3 months of surgery, 95 percent patients had bilaterally clear osteomeatal complex whereas 5 percent patients were lost to follow up in group A. In group B also 95 percent patients had bilaterally clear OMC and 5 percent patients were lost to follow up.

After 6 months of surgery, 90 percent patients had bilaterally clear osteomeatal complex whereas 10 percent patients were lost to follow up in group A. In group B 95 percent patients had bilaterally clear OMC and 5 percent patients were lost to follow up.

DISCUSSION

Deviated nasal septum is one of the most common causes of nasal obstruction in adult patients, as well as a frequent complaint in rhinology practice. Deviation of nasal septum towards one side is often associated with an over growth of inferior turbinate, which occupies expansive space of contralateral nasal cavity.

Many authors argued that once septoplasty is done compensatory hypertrophy regresses on its own while other group of authors argued that these changes are not spontaneously reversible and should be corrected in conjunction with nasal septal surgery.

Thus the present study was conducted with the aim of comparing the outcome of septoplasty alone and septoplasty combined with inferior turbinate reduction in 40 patients of deviated nasal septum with inferior turbinate hypertrophy (unilateral or bilateral). The study population chosen was scrutinized with proper implementation of the inclusion and exclusion criteria.

Demography

The mean age of our study population was 24.45 years. The age group included in our study was between 18-40 years. This age group was particularly chosen because of the reliability of the answers to the questionnaires put forward and to decrease the morbidity of the procedure in extremes of age group.

They were distributed in 2 groups of 20 each. Group A had those patients who underwent septoplasty alone and Group B had those patients who underwent septoplasty along with inferior turbinate reduction.40 patients were chosen for our study out of which 87.5% were males and 12.5% were females. A similar study was conducted in Dr M.G.R medical university Tamil Nadu, India where they had 72% males and 28% females in their study.

With this we can conclude that symptoms of DNS are more in males as compared to females. This can be attributed to the fact that males are involved more in outdoor activities, sports and trauma due to road traffic accidents that makes them prone to nasal trauma and development of DNS.

Symptomatology

Mean duration of nasal obstruction in our study was 5.42 years. This long duration can be attributed to the fact that in patients undergoing septoplasty surgery (with or without inferior turbinate reduction) medical management was tried first, failure of which indicated surgical intervention.

In our study 42.5% patients had bilateral nasal obstruction, 40% patients had left sided nasal obstruction and 17.5% patients had right sided nasal obstruction.

Thus we can conclude that most of the patients with deviated nasal septum with inferior turbinate hypertrophy show bilateral nasal obstruction which can be due to the deviation of septum and volume of nasal cavity occupied by the hypertrophied turbinate.

It was seen in our study that 62.5% patients had diurnal variation of symptoms of which 55% had aggravated symptoms in night, 5% had aggravated symptoms in day and 2.5% had aggravated symptoms in early morning. 37.5% patients had no diurnal variation of symptoms.

Side of deviation of nasal septum and side of inferior turbinate hypertrophy

In our study 60% patients had left sided DNS and 40% had right sided DNS. 2.5% patients had left DNS with left spur and, 2.5% patients had left sided DNS with right caudal dislocation. 5 percent patients had DNS to left with spur to right. 15% patients had DNS to right with spur to left.

Also 27 out of 40 (67.5%) patients had right sided inferior turbinate hypertrophy, 11 (27.5%) patients had left sided inferior turbinate hypertrophy and 2 (5%) patients showed bilateral inferior turbinate hypertrophy.

Out of 27 patients with right inferior turbinate hypertrophy, there were 20 patients of left DNS, 1 patient of left DNS with right spur, 1 patient of left DNS with right caudal dislocation, 1 patient of left DNS with left spur, 4 patients of right DNS with left spur.

11 out of 40 patients had left sided Inferior turbinate hypertrophy. Out of these 11 patients, 10 were of right sided DNS and 1 was of right DNS with spur to left.

2 patients also had bilateral inferior turbinate hypertrophy. One of these patients had left DNS with right sided spur while the other had right DNS with left sided spur. Generally Side of inferior turbinate hypertrophy was opposite to side of DNS in majority cases while in a few case it was on the side of DNS. Those cases where inferior turbinate hypertrophy was on the side of DNS, had spur on opposite side that was causing more severe obstruction than DNS.

In 5% cases there was bilateral inferior turbinate hypertrophy. In them, DNS and spur were in opposite nasal cavities and were causing approximately similar obstruction on both sides.

Thus majority of our patients had left sided DNS with right sided inferior turbinate hypertrophy.

Comparison of NOSE score between preoperative and postoperative period (irrespective of group)

In our study we calculated NOSE score before surgery, after 1 month, 3 months and 6 months of surgery and found that there was a significant reduction in NOSE score after surgical intervention in all of them. With this result we conclude that septoplasty (with or without inferior turbinate reduction) should be the modality of treatment for symptomatic patients of deviated nasal septum. In our study we have chosen only those patients in whom medical measures failed to relieve the symptoms.

A systematic review study was conducted at Common Cold Centre, Cardiff University, Cardiff, UK, on Objective evidence for the efficacy of surgical management of the deviated septum as a treatment for chronic nasal obstruction. Seven studies (460 participants) involving rhinomanometry, six studies (182 participants) with acoustic rhinometry and one study (22 participants) using nasal peak inspiratory flow were included in the review. All the studies reported an objective improvement in nasal patency after septal surgery. This study shows that surgical management of DNS in symptomatic patients is effective where medical management fails to relieve symptoms. Our study also concludes clinical improvement in outcomes following septal surgery.[9]

Kahveci OK et.al, conducted a similar study on The efficiency NOSE scale on patients with nasal septal deviation in which 27 patients underwent septoplasty and showed a significant improvement in NOSE score (60.2 versus 11.28) after surgical intervention in symptomatic patients of DNS.[10] In our study also there was a significant improvement in NOSE score (14.47 versus 2.13) after 6 months of surgery.

Stewart MG et al. conducted a prospective observational outcomes multicenter study with 14 sites and 16 investigators, including private practice and academic settings. Patients with septal deviation completed NOSE scale before and after 3 and 6 months of septoplasty, with or without partial turbinectomy. In the study 59 patients underwent surgery and in them there was a significant improvement in mean NOSE score at 3 months after septoplasty (67.5 versus 23.1, $p<0.0001$), and this improvement was unchanged at 6 months.[11] In our study also there was a significant improvement in NOSE score (14.47 versus 7.30) after 1 month of surgery which further improved (14.47 versus 3.94) after 3 months of surgery and further improved (14.47 versus 2.13) after 6 months of surgery.

Comparison of two groups with NOSE score

Two groups were divided in our study. Patients who underwent septoplasty only (GROUP A) and patients who underwent septoplasty with inferior turbinate reduction (Group B). Pre-operatively there were 20 patients in each group. Mean value of NOSE score in group A was 14.25±3.006 and in group B was 14.70±2.63. So the mean value of NOSE score pre-operatively was comparable in both groups.

After 1 month post-op period, mean value of NOSE score in group A was 9.4 and in group B was 5.105. So we conclude that at 1 month of post op period there was a significant difference in the relief of symptoms between the two groups. Patients in group B had more relief of symptoms than group A. After 3 months of post-op period, mean value of NOSE score in group A was 6.26 and in group B was 1.61. So we conclude that after 3 months also there was a significant difference in the relief of symptoms between the 2 groups. After 6 months of post-op period, mean value of NOSE score in Group A was 4.16 and in group B was 0.21. Again we have a significant difference in NOSE score among 2 groups.

The p value in all the above comparisons were significant. Thus septoplasty along with inferior turbinate reduction is significantly better in relieving symptoms as compared to septoplasty alone.

It was observed in our study that 3 patients in group B developed synachiae at 1 month of follow up. Synachie in all of them were on the side of inferior turbinate reduction that could be because of iatrogenic trauma on both medial and lateral walls of nasal cavity at same level and their approximation after removal of nasal packs. These patients although had reduced NOSE score when compared to their pre-op values but when we compare to other patients of group B at 1 month follow up period, they had relatively higher NOSE score. After removal of synachiae these patients had significant improvement in NOSE score.

A similar study was done in Dokuz Eylul University, Turkey in 2010-11, on 42 patients of DNS with contralateral turbinate hypertrophy. Patients were divided in two groups. Group A underwent submucous resection of contralateral hypertrophied turbinate together with septoplasty. Group B, underwent only septoplasty. The subjective symptoms were better in group A than group B between postoperative first to sixth months.[12] The result of this study was similar to our study. In our study, patients who underwent septoplasty alone were included in Group A while those who underwent septoplasty along with inferior tubinate reduction were included in group B. The subjective symptoms were evaluated based on nose score (maximum score=20). The subjective symptoms were better in group B after 1 month (5.105 versus 9.4), 3 months (1.61 versus 6.26) and 6 months (0.21 versus 4.16).

A similar prospective comparative study of improvement of nasal symptoms following septoplasty with partial inferior turbinectomy versus septoplasty alone in adults by NOSE scale was conducted by Kumar and Rajashekar

at department of ENT and head-neck surgery, Navodaya medical college hospital and research centre, Raichur, Karnataka, India. They took 60 cases with septal deviation and contralateral inferior turbinate hypertrophy. NOSE scale was used for evaluating nasal symptoms. Patients were alternatively divided into two surgical groups, group A underwent Septoplasty with partial inferior turbinectomy and group B underwent septoplasty alone. Post-operative patient's symptoms evaluated by NOSE scale at 1, 3 and 6 months. This study showed that hypertrophied turbinate need to be addressed addition to septoplasty.[13] The conclusion of this study was similar to our study.

Limitations

Results of our study were mainly based on NOSE scale which is a subjective tool. Objective methods like rhinomanometry and nasal flow meter for comparing outcomes after surgery was not available.

Development of synachiae in patients who underwent septopasty with inferior turbinate reduction has altered our result to some extent. Long term follow up (more than 6 months) could have given better understanding of post-op symptoms.

Larger sample size could have been considered for a better comparison between the two groups.

CONCLUSION

Our study was a prospective interventional randomized comparative study where 40 patients of DNS with inferior turbinate hypertrophy were taken and divided into 2 groups of 20 each. Group A had those patients who underwent septoplasty alone and Group B had those patients who underwent septoplasty along with inferior turbinate reduction. Mean value of NOSE score was calculated before surgery, after 1 month, 3 months and 6 months and found that there was a significant difference between NOSE score between the 2 groups in post-operative period till 6 months. Patients who underwent septoplasty with inferior turbinate reduction had more relief in symptoms and lesser NOSE score than those who underwent septoplasty alone. Also we have seen in our study that there was an overall significant difference between mean NOSE score of patients before and after surgical intervention.

Recommendations

Patients who underwent septoplasty with inferior turbinate reduction had more relief in symptoms and lesser NOSE score than those who underwent septoplasty alone. Also we have seen in our study that there was an overall significant difference between mean NOSE score of patients before and after surgical intervention.

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REFERENCES

1. Hildebrandt T, Heppt WJ, Kertzscher U, Goubergrits L. The concept of rhinorespiratory homeostasis - a new approach to nasal breathing. Facial Plast Surg. 2013;29(2):85-92.
2. Hildebrandt T. Das Konzept der Rhinorespiratorischen Homöostaseeinneuertheo-retischer Ansatzfür die Diskussionphy-siologischer undphysikalischer Zusammenhängebei der Nasenat-mung. Freiburg imBreisgau, Germany; Albert-Ludwigs-Universität. 2011.
3. Chiesa EC, Rivera ST, Ossa ECC, Betances RFA, Osorio VA, Santidrian HC. Compensatory hypertrophy of the contralateral inferior turbinate in patients with unilateral nasal septal deviation. A computed tomography study. Otolaryngol Pol. 2015;69(2):14-20.
4. Jun BC, Kim SW, Cho JH, Park YJ. Is turbinate surgery necessary when performing a septoplasty. Eur Arch Otorhinolaryngol. 2009;266(7):975-80.
5. Gaur K, Kasliwal N, Bhandari AB, Gupta AVP, and Gupta R. Changing trends in otorhinolaryngological diseases at a non-government clinic in Jaipur. Indian J Otolaryngol Head Neck Surg. 2009;61(3):173-8.
6. Mathai J. Inferior turbinectomy for nasal obstruction review of 75 cases. Indian Journal of otolaryngology and Head and Neck surgery. 2004;56(1):23-6.
7. De Corso E, Bastanza G, Di Donfrancesco V, Guidi ML, MorelliSbarra G, Passali GC, et al. Radiofrequency volumetric inferior turbinate reduction: long-term clinical results. Acta Otorhinolaryngol Ital. 2016;36(3):199-205.
8. Bhattacharya N, Kepnes LJ. Clinical effectiveness of coblation inferior turbinate reduction. Otolaryngology- Head and Neck Surgery. 2003;129(4):365-71.
9. Moore M, Eccles R. Objective evidence for the efficacy of surgical management of the deviated septum as a treatment for chronic nasal obstruction: a systematic review. ClinOtolaryngol. 2011;36(2):106-13.
10. Kahveci OK, Miman MC, Yucel A, Yucedag F, Okur E, Altuntas A. The efficiency of Nose Obstruction Symptom Evaluation (NOSE) scale on patients with nasal septal deviation. AurisNasus Larynx. 2012;39(3):275-9.
11. Stewart MG, Smith TL, Weaver EM, Witsell DL, Yueh B, Hannley MT, et al. Outcome after nasal septoplasty: Results from the nasal obstruction septoplasty effectiveness (Nose) study. Otolaryngology and Head and Neck surgery. 2004;130(3):283-90.
12. Devseren NO, Ecevit MC, Erdag TK, Ceryan K. A randomized clinical study: outcome of submucous

resection of compensatory inferior turbinate during septoplasty. Rhinology. 2011;49(1):53-7.
13. Rajendran DK, Rajashekar M. Comparative study of improvement of nasal symptoms following septoplasty with partial inferior turbinectomy versus septoplasty alone in adults by NOSE scale: A Prospective Study. Indian J Otolaryngol Head Neck Surg. 2016;68(3):275-84.

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