International Journal of Otorhinolaryngology and Head and Neck Surgery
Varghese KA et al. Int J Otorhinolaryngol Head Neck Surg. 2023 Jan;9(1):33-38
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20223375

Original Research Article

Prospective study on the functional outcome of septoplasty

Kulina A. Varghese[1]*, Benjamin Alex[2]

[1]Department of Ear Nose and Throat, [2]Pushpagiri Institute of Medical Sciences, Thiruvalla, Kerala, India

Received: 12 November 2022
Revised: 12 December 2022
Accepted: 22 December 2022

***Correspondence:**
Dr. Kulina A. Varghese,
E-mail: drkulinaannvarghese@gmail.com

ABSTRACT

Background: A thorough assessment of nasal obstruction remains a matter of debate with no accepted subjective and objective measurement tools. The purpose of this study was to use a cost-effective tool for objective assessment of nasal obstruction and compare it with subjective scores.
Methods: This was a longitudinal, prospective study conducted at a tertiary care center on patients undergoing septoplasty for deviated nasal septum (DNS) from March 2016 to August 2017. All patients were assessed pre- and post-operatively at 3 months with nasal peak inspiratory flow, sino-nasal outcome test (SNOT-22) and nasal obstruction symptom evaluation (NOSE) questionnaire to determine post-operative improvement and correlation between objective and subjective scores.
Results: 64 patients were included in the study with 16 females and 48 males. Male patients had higher peak nasal inspiratory flow (PNIF) score post-operatively. Younger patients (less than 25 years) showed significant subjective improvement compared to older patients post-operatively using NOSE questionnaire. Significant improvement in PNIF, SNOT-22 and NOSE scores post-operatively using paired student-t test. There was moderate correlation between PNIF values and subjective scores before surgery and excellent correlation between the subjective SNOT-22 and NOSE scores before and after surgery.
Conclusions: PNIF is a cheap, portable, and convenient method for assessing nasal patency. Subjective and objective scores have good correlation, with improvement in all scores post-surgery. Men may show more objective improvement and early intervention at younger age may provide more subjective improvement.

Keywords: Peak nasal inspiratory flow, SNOT-22, NOSE questionnaire, Septoplasty

INTRODUCTION

Nasal obstruction being a common complaint has significant impact on quality of life.[1,2] The cause of nasal obstruction may be due to nasal septal deformity, inferior turbinate hypertrophy, nasal valve narrowing or a combination of these.[3,4] Identification of the cause of nasal obstruction is therefore critical before surgical intervention to avoid unsatisfactory outcomes.

Objective assessment of the nasal airway can provide additional information about the cause of nasal obstruction. Currently, indication for septoplasty is based on objective and subjective evaluation methods. Subjective evaluation is performed based on symptom scores such as a visual analog scale and quality of life as assessed using the nasal obstruction symptom evaluation (NOSE) scale.[5,6]

Objective evaluation is based on nasal tests, such as rhinomanometry, acoustic rhinometry, peak nasal inspiratory flow (PNIF), and computed nasal resistance.[7-9]

A thorough assessment of nasal obstruction remains a matter of debate because its objective assessment is

controversial and there is no agreement on an accepted measurement tool.[10-12]

Hence, our study aims at assessing patients undergoing septoplasty, subjectively by nasal obstruction and septoplasty effectiveness score and sino-nasal outcome test (SNOT-22) and objectively by measurement and comparison of PNIF before and after surgery to determine patient's quality of life and measure outcome of surgical intervention.

METHODS

Study type

It was an original research - self-funded, longitudinal and prospective study.

Study place

The study was conducted at Pushpagiri Institute of Medical Sciences, Thiruvalla, Kerala, India.

Duration

The duration of the study was from March 2016 to August 2017.

Sampling technique

Purposive sampling with inclusion and exclusion criteria was used.

Aim and objectives

Aim and objectives of the study were: to compare pre-operative and post-operative nasal peak inspiratory flow in patients undergoing septoplasty for deviated nasal septum at a tertiary care hospital in south Kerala; and to determine the subjective functional improvement after septoplasty for deviated nasal septum using SNOT-22 and nasal obstruction and septoplasty effectiveness score questionnaire.

Inclusion criteria

Patients undergoing septoplasty in the hospital from March 2016 to August 2017 were included in the present study.

Exclusion criteria

Patients with septoplasty in combination with sinus and other surgeries, age less than 18 years and more than 55 years, patients lost to follow up, patients on medications causing nasal congestion, and patients with obstructive and restrictive lung diseases were excluded.

All patients in inclusion criteria were assessed pre- and post-operatively at 3 months with the following parameters.

Nasal peak inspiratory flow measurement

Measured with in-check portable inspiratory flow meter pre-operatively and post-operatively at 3 months (Figure 1). Maximum inspiratory effort at the end of a full expiration with mouth closed, with mask in seated position. Highest of 3 values was taken.

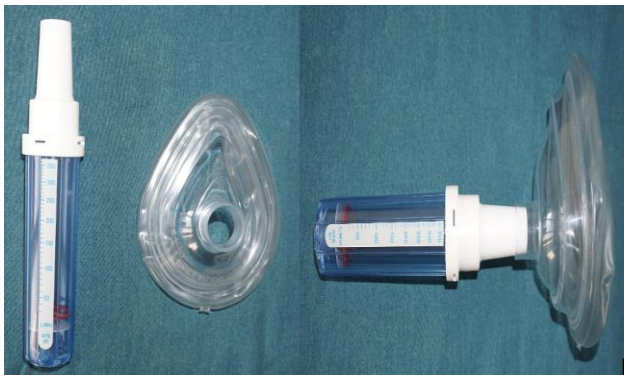

Figure 1: In-check portable inspiratory flow meter and face mask.

SNOT-22 questionnaire

This questionnaire has 22 symptoms. Patients rate each item from 0 (no problem) to 5 (problem as bad as it can be). The maximum points in the SNOT-22 is 22×5 = 110 points (Table 1).

NOSE

Patients rate five symptoms from 0 (not a problem) to 4 (severe) and total score calculated out of hundred by multiplying the points by 5 (Table 2).

For statistical analysis all the variables were categorized as follows - age group: less than 25, 25 to 40 and above 40 years; PNIF group: less than 150 and 150 and above; SNOT – 22 group [pre-operative]: 0-25, 26-50, above 50; NOSE QN group [pre-operative]: 0-25, 26-50, 51-75, 76-100; SNOT-22 group [post-operative]: less than 10 and more than or equal to 10; and NOSE QN group [post-operative]: less than 15, 15-25 and more than 25.

A two tailed paired sample t-test was done to analyze pre- and post-surgical values for NOSE and SNOT-22 scores. The preoperative and postoperative flow rates and SNOT-22 scores were compared using paired t-test. The responses of NOSE questionnaire were compared using Chi square test. P value of <0.05 was considered significant.

Table 1: SNOT-22 questionnaire.

Variables	Not a problem	Very mild problem	Mild problem	Moderate problem	Severe problem	As bad as it can get
Need to blow nose	0	1	2	3	4	5
Nasal blockage	0	1	2	3	4	5
Sneezing	0	1	2	3	4	5
Running nose	0	1	2	3	4	5
Cough	0	1	2	3	4	5
Post nasal discharge	0	1	2	3	4	5
Thick nasal discharge	0	1	2	3	4	5
Ear fullness	0	1	2	3	4	5
Dizziness	0	1	2	3	4	5
Ear pain	0	1	2	3	4	5
Facial pain / pressure	0	1	2	3	4	5
Decreased sense of smell/taste	0	1	2	3	4	5
Difficulty falling asleep	0	1	2	3	4	5
Wakes up at night	0	1	2	3	4	5
Lack of good sleep	0	1	2	3	4	5
Wakes up tired	0	1	2	3	4	5
Fatigue	0	1	2	3	4	5
Reduced productivity	0	1	2	3	4	5
Reduced concentration	0	1	2	3	4	5
Frustrated/restless/irritable	0	1	2	3	4	5
Sad	0	1	2	3	4	5
Embarrassed	0	1	2	3	4	5

Table 2: NOSE questionnaire.

Variables	Not a problem	Very mild problem	Moderate problem	Fairly bad problem	Severe problem
Nasal congestion or stuffiness	0	1	2	3	4
Nasal blockage or obstruction	0	1	2	3	4
Trouble breathing through the nose	0	1	2	3	4
Trouble sleeping	0	1	2	3	4
Unable to get enough air through nose during exercise or exertion	0	1	2	3	4

RESULTS

64 patients were included in the study with 16 females (25%) and 48 males (75%). 31 patients were below 25 years, 24 patients between 25 to 40 years and 9 patients above 40 years (Table 3).

Demographic variations

Significant difference was noted using Pearson chi-square test only in the post-operative PNIF with regards to sex of the patient (p value = 0.025), with male patient showing significant objective improvement. However, there were no significant differences noted in pre- and post-operative NOSE and SNOT-22 scores with respect to gender (Table 4). Significant improvement was noted in younger patients post operatively using NOSE questionnaire (p value= 0.037) by Pearson chi-square test (Table 5 and 6), however SNOT-22 and PNIF demonstrated no difference in outcome with respect to age.

Surgical outcome

Two tailed student – t test value was found to be 10.873, 10.789 and 15.237 for PNIF, SNOT - 22 and NOSE QN respectively with degree of freedom of 63 and p value of 0.001 for PNIF, SNOT-22 and NOSE QN demonstrating statistically significant improvement in all 3 scores after surgery (Table 7 and 8).

Correlations

The Pearson correlation between PNIF pre-operative and SNOT-22 pre-operative was -0.320 showing moderate correlation between the two tests. The Pearson correlation between PNIF pre-operative and NOSE QN pre-operative was -0.346 showing moderate correlation between the two

tests. The Pearson correlation between SNOT-22 and NOSE QN pre-operatively and post-operatively was found to be 0.719 and 0.660 respectively showing excellent correlation between the two subjective tests. The non-parametric spearman's correlation between SNOT-22 and NOSE QN pre-operatively and post-operatively was found to be 0.699 and 0.685 showing excellent correlation between the two subjective tests.

Table 3: Descriptive measures.

Parameters	Minimum	Maximum	Mean	Standard deviation
Age	17	53	28.12	9.792
PNIF pre-operative	50	250	105.16	44.757
SNOT pre-operative	2	75	24.66	16.868
NOSE pre-operative	10	100	50.62	24.454
PNIF post-operative	60	260	131.09	39.244
SNOT post-operative	0	24	7.14	5.631
NOSE post-operative	0	40	14.53	10.973

Table 4: Cross tabulation sex and PNIF.

Gender	PNIF pre-operative		PNIF post-operative	
	Less than 150	150 and above	Less than 150	150 and above
Female	15	1	15	1
Male	38	10	31	17
Total	53	11	46	18

Table 5: Cross tabulation age and NOSE QN pre-operative.

Age (years)	NOSE pre-operative				Total
	0-25	26-50	51-75	76-100	
Below 25	5	16	5	5	31
25- 40	5	6	6	7	24
Above 40	0	5	3	1	9
Total	10	27	14	13	64

Table 6: Cross tabulation age and NOSE QN post-operative.

Age (years)	NOSE score post-operative			Total
	Less than 15	15-25	More than 25	
Below 25	13	18	0	31
25–40	10	8	6	24
Above 40	5	3	1	9
Total	28	29	7	64

Table 7: Paired sample statistics.

Pairs	Mean	N	Standard deviation	Standard error mean
Pair 1				
PNIF pre	105.16	64	44.757	5.595
PNIF post	131.09	64	39.244	4.905
Pair 2				
SNOT pre	24.66	64	16.868	2.108
SNOT post	7.14	64	5.631	0.704
Pair 3				
NOSE pre	50.63	64	24.454	3.057
NOSE post	14.53	64	10.973	1.372

Table 8: Two tailed student - 't' test.

Pairs	Parameters	t	df	Sig. (2-tailed)
Pair 1	**PNIF pre - PNIF post**	-10.873	63	0.001
Pair 2	**SNOT pre - SNOT post**	10.789	63	0.001
Pair 3	**NOSE pre - NOSE post**	15.237	63	0.001

DISCUSSION

Deviated nasal septum causing nasal obstruction has significant impact on quality of life. The accepted objective methods of measuring the nasal airflow are costly and not readily accessible.

The present study comprised of 48 males and 16 females who underwent septoplasty after meeting the inclusion criteria with a male to female ratio of 3:1. The PNIF score in males showed significant improvement after septoplasty compared to females. There were no other significant sex related changes in the subjective or objective scores. Younger patients showed significant subjective improvement compared to older patients in post-operative assessment using NOSE questionnaire. There were no other age-related significant changes in the subjective or objective scores. Significant improvement in objective PNIF values and subjective (SNOT-22 and NOSE questionnaire) values was noted after septoplasty when compared to before surgery using paired student-t test, with significant improvement in quality of life for the patient similar to a study by Marais et al.[13]

There was moderate correlation between PNIF values and subjective scores before surgery and excellent correlation between the subjective scores (SNOT-22 and NOSE questionnaire) before and after surgery, which was in contrast to studies by Hsu et al and Manger et al which demonstrated no correlation between subjective and objective scores for nasal obstruction.[14,15]

While outcome of septoplasty using both subjective and objective scores showed significant improvement, younger patients had more subjective improvement using NOSE score compared to chronic patients even though objective PNIF values were comparable. Hence early intervention is advisable.

The study was not without limitations. The small sample size, lack of long-term follow-up, disproportionate gender distribution and purposive sampling with possibility of observer bias are some factors which may limit this study.

CONCLUSION

Peak nasal inspiratory flow measurement is a cheap, portable, and convenient method for assessing the nasal patency in patients with deviated nasal septum and to assess the improvement in nasal flow after septoplasty. PNIF measurement showed moderate correlation with the subjective scores for assessing nasal patency. There was significant improvement in the nasal flow following septoplasty using peak nasal inspiratory flow measurement in all patients although the difference was more marked in men. There was significant improvement in the quality of life of patients who underwent septoplasty for deviated nasal septum which was assessed using SNOT-22 questionnaire and NOSE questionnaire. However, we advise early intervention since younger patients had more subjective improvement by NOSE questionnaire compared to older chronic patients.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Udaka T, Suzuki H, Fujimura T, Hiraki N, Ohkubo J, Shiomori T, et al. Chronic nasal obstruction causes daytime sleepiness and decreased quality of life even in the absence of snoring. Am J Rhinol. 2007;21:564-9.
2. Rhee JS, Book DT, Burzynski M, Smith TL. Quality of life assessment in nasal airway obstruction. Laryngoscope. 2003;113:11181122.
3. Chandra RK, Patadia MO, Raviv J. Diagnosis of nasal airway obstruction. Otolaryngol Clin North Am. 2009;42:207-25.
4. Nurse LA, Duncavage JA. Surgery of the inferior and middle turbinates. Otolaryngol Clin North Am. 2009;42:295-309.
5. Stewart MG, Witsell DL, Smith TL, Weaver EM, Yueh B, Hannley MT. Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) scale. Otolaryngol Head Neck Surg. 2004;130:157-63.
6. Eccles R. Nasal airway resistance and nasal sensation of airflow. Rhinol Suppl. 1992;14:86-90.
7. Sipila J, Suonpa JT, Kortekangas AE, Laippala PT. Rhinomanometry before septoplasty: An approach to clinical material with diverse nasal symptoms. Am J Rhinol. 1992;6:17-22.
8. Lenders H, Scholl R, Brunner M. Akustischerhinometrie: Das fledermausprinzip in der nase. HNO. 1992;40:239-47.
9. Kimbell JS, Garcia GJ, Frank DO, Cannon DE, Pawar SS, Rhee JS. Computed nasal resistance compared with patient-reported symptoms in surgically treated nasal airway passages: A preliminary report. Am J Rhinol Allergy. 2012;26:e94-8.

10. Andrè RF, Vuyk HD, Ahmed A, Graamans K, NolstTrenité GJ. Correlation between subjective and objective evaluation of the nasal airways. A systematic review of the highest level of evidence. Clin Otolaryngol. 2009;34(6):518-25.
11. Stewart MG, Witsell DL, Smith L, Weaver EM, Yueh B, Hannley MT. Development and validation of the nasal obstruction symptom evaluation (NOSE) scale. Otolaryngol Head Neck Surg. 2004;130(2):157-63.
12. Pirila T, Tikanto J. Unilateral and bilateral effects of nasal septum surgery demonstrated with acoustic rhinometry, rhinomanometry and subjective assessment. Am J Rhinol. 2001;15(2):127-33.
13. Marais J, Murray JA, Marshall I, Douglas N, Martin S. Minimal cross-sectional areas, nasal peak flow and patients' satisfaction in septoplasty and inferior turbinectomy. Rhinology. 1994;32:145-7.
14. Hsu HC, Tan CD, Chang CW, Chu CW, Chiu YC, Pan CJ, et al. Evaluation of nasal patency by VAS/NOSE questionnaires and anterior active rhinomanometry after septoplasty: a retrospective one-year follow-up cohort study. Clin Otolaryngol. 2016;42(1):53-9.
15. Menger DJ, Swart KM, Nolst Trenité GJ, Georgalas C, Grolman W. Surgery of the external nasal valve: the correlation between subjective and objective measurements. Clin Otolaryngol. 2014;39(3):150-5.

Cite this article as: Varghese KA, Alex B. Prospective study on the functional outcome of septoplasty. Int J Otorhinolaryngol Head Neck Surg 2023;9:33-8.