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RELATIONSHIP BETWEEN NASAL SEPTAL DEVIATION TYPE AND CHANGES IN SEVERITY OF NASAL OBSTRUCTION IN POST-SEPTOPLASTY PATIENTS

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ABSTRACT

Background: Nasal septal deviation is the most anatomical abnormality that causes nasal obstruction and affects the patient's life expectancy. Complaints of nasal obstruction are subjective and vary greatly in patients with nasal septal deviation. Septoplasty is a definitive therapy for correcting nasal septal deviation and can reduce complaints of nasal obstruction as assessed by the Nasal Obstruction Symptom Evaluation questionnaire.

Objective: To determine the relationship between the type of nasal septal deviation and changes in the severity of nasal obstruction in post-septoplasty patients.

Material and methods: This study is observational analytic with a longitudinal prospective design. The type of nasal septal deviation based on the Mladina classification is assessed using nasoendoscopy. The Nasal Obstruction Symptom Evaluation questionnaire was completed 1 day before and 4 weeks after septoplasty with/without turbinoplasty. The Evaluation score comparison test before and after septoplasty used the Wilcoxon test. Statistical tests between types of nasal septal deviation used the Kruskal-Wallis test.

Results: The sample consisted of 13 patients. Significant change in the severity of nasal obstruction only found in type 7 ($p < 0.05$). Nasal Obstruction Symptom Evaluation score before $p = 0.918$ and after septoplasty $p = 0.393$. This shows that there is no significant difference between the type of nasal septal deviation and the Nasal Obstruction Symptom Evaluation score. The difference in Nasal Obstruction Symptom Evaluation scores before and after septoplasty was found to be $p = 0.810$, so there was no relationship between the type of nasal septal deviation and changes in the severity of nasal obstruction.

Conclusion: There is no relationship between nasal septal deviation type and changes in the severity of nasal obstruction in post-septoplasty patients. Changes in the severity of nasal obstruction were only found in type 7.

KEYWORDS nasal septal deviation, nasal obstruction, NOSE, septoplasty, life expectancy.**INTRODUCTION**

Nasal septal deviation is an anatomical abnormality that can cause complaints of nasal obstruction [Saha M et al., 2014]. Nasal obstruction due to Nasal septal deviation can reduce the patient's quality of life and must be examined by an Otorhinolar-

ngologist - Head and Neck Surgery because it is subjective [Budiman B et al., 2014; Saha M et al., 2014]. Several classification systems have been developed to evaluate nasal septal deviation, one of which is the classification by Mladina (2008) which

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divides Nasal septal deviation into 7 types [Verhoeven S, Schmelzer B., 2016]. Patients with a deviated nasal septal do not always have symptoms of nasal obstruction and patients who experience nasal obstruction are not always caused by a Nasal septal deviation [Sandha L et al., 2021]. Septoplasty is a definitive therapy for correcting Nasal septal deviation and the successful rate of septoplasty can reach 83% in reducing complaints of nasal obstruction [Budiman B et al., 2014; Hsu H et al., 2016].

The Visual Analogue Scale has been used to assess the severity of nasal obstruction in patients with Nasal septal deviation, but is not specific because it is also used for many diseases, especially to assess pain [Shukla R et al., 2019]. The Nasal Obstruction Symptoms Evaluation (NOSE) questionnaire has been developed as a tool specific for nasal obstruction symptoms [Paramyta W et al., 2017]. The NOSE questionnaire is a short instrument and has five questions with a total score range from 0 to 100. This questionnaire has been validated in Indonesian and can be used to assess and evaluate the severity of nasal obstruction after septoplasty. Complaints of nasal obstruction after septoplasty are expected to decrease and there is a significant reduction in NOSE scores [Stewart M et al., 2004; Paramyta W et al., 2017]. Significant changes in complaints of nasal obstruction were obtained from the mean NOSE score at evaluation 3 months after septoplasty [Fettman N et al., 2009].

The relationship between the type of Nasal septal deviation and the severity of nasal obstruction has not been explained. A study in Serbia reported that there was no significant relationship between the type of Nasal septal deviation and the severity of nasal obstruction [Janovic N et al., 2020]. Another study in Bali states the opposite, that there is a significant relationship between the type and degree of Nasal septal deviation and the severity of nasal obstruction [Sandha L et al., 2021].

There is still a lack of research on assessing nasal obstruction using the NOSE questionnaire in patients with Nasal septal deviation undergoing septoplasty in Indonesia and the NOSE questionnaire has never been used at Dr. Soetomo General Academic Hospital Surabaya. The aim of this study was to determine the relationship between the type of Nasal septal deviation based on the Mladina classification and changes in the severity of nasal obstruction using the NOSE questionnaire in patients undergoing septoplasty.

MATERIAL AND METHODS

This study is analytical observational with a prospective longitudinal design. Sampling was carried out by consecutive sampling who have met the criteria. Inclusion criteria were patients with deviated nasal septal with/without turbinate hypertrophy, aged ≥ 18 -60 years, who had complaints of nasal obstruction for 3 months or more, were willing to fill out the NOSE questionnaire, were willing to visit 4 weeks after septoplasty with/without turbinoplasty, and were willing to take part in the study by signing a statement of informed consent. The exclusion criteria are patients with history of chronic rhinosinusitis, allergic rhinitis, vasomotor rhinitis, external nasal valve disorders, nasal trauma/fracture, sinonasal tumors, nasal septal perforation, and patients who underwent septoplasty surgery simultaneously with functional endoscopic sinus surgery.

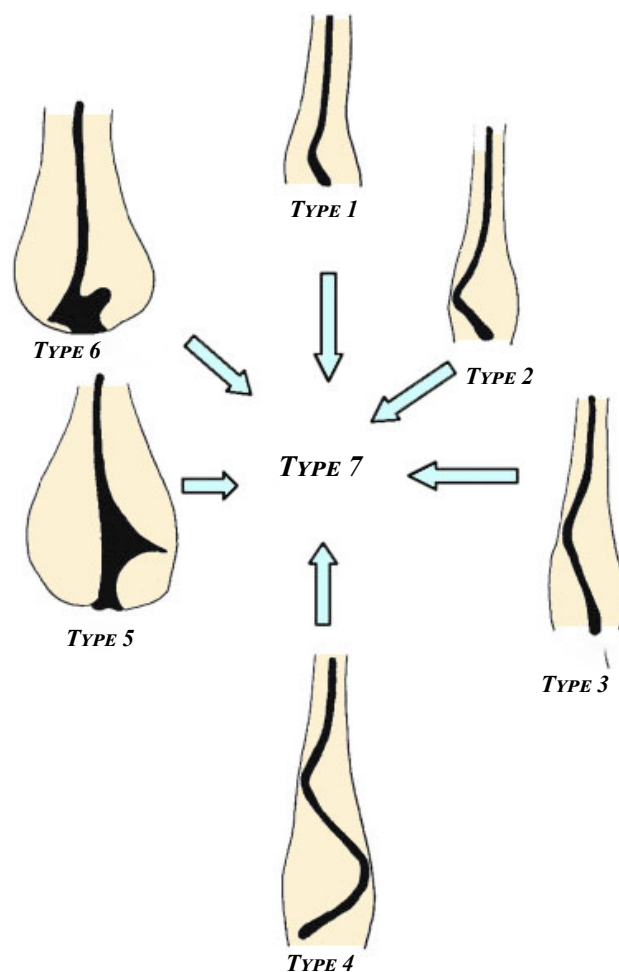


FIGURE. Scheme of 7 types of Nasal septal deviation (NSD). The first four types are presented in bird's eye view, while types 5 and 6 are in anteroposterior view [Mladina R et al., 2008].

The type of Nasal septal deviation was assessed via nasoendoscopy with a Storz brand nasal endoscope made by Karl Storz GmbH, Mittelstrabe, Tutlingen, Germany. According to Mladina, there are 7 types of Nasal septal deviation (Figure). Nasoendoscopy is performed before the patient is scheduled for surgery.

Nasal obstruction was assessed using the Indonesian version of the NOSE questionnaire. The NOSE questionnaire consists of 5 items related to nasal obstruction, each question has a scale of 0-4: “not a problem”=0; “very mild problem”=1; “moderate problem”=2; “fairly bad problem”=3 and “severe problem” = 4. The raw score range is from 0 to 20. Filling out the NOSE questionnaire takes 1 day before and 4 weeks after septoplasty.

The data obtained is displayed in tabular form and analyzed statistically. The NOSE score comparison test before and after septoplasty used the Wilcoxon signed rank test. The statistical test between types of nasal septal deviation used the Kruskal-Wallis test. The level of significance used is $\alpha = 0.05$. This research was approved by the Health Research Ethics Committee of Dr. Soetomo General Academic Hospital Surabaya.

RESULTS

The sample was obtained from the population of patients with Nasal septal deviation who underwent endoscopic septoplasty with/without turbino-plasty from 21 June 2022 to 21 January 2023. Samples were taken sequentially until the sample size was reached at 13 patients.

The number of male samples was greater than female, namely 8 male patients (61.54%) and 5 female patients (38.46%). The largest age group in this study was 18-30 years with 8 patients (61.54%). The most common type of Nasal septal deviation based on the Mladina classification was type 7 in 6 patients (46.17%) (Table 1). The NOSE score in this study used the total raw score (score range 0-20). Changes in the severity of nasal obstruction were assessed by the difference (delta) between the NOSE scores before and after septoplasty.

The total NOSE score before (pre) septoplasty ranged from 9-79, while the NOSE score after (post) septoplasty ranged from 0-7 (Table 2). The highest difference in NOSE scores between before and after septoplasty was found in Nasal septal de-

TABLE 1

Basic characteristic of samples		
Characteristic	n=13	%
Sex		
Male	8	61.54
Female	5	38.46
Age		
18-30	8	61.54
31-40	1	7.69
41-50	3	23.08
51-60	1	7.69
Nasal septal deviation (NSD) type		
1	0	0.00
2	2	15.38
3	2	15.38
4	1	7.69
5	1	7.69
6	1	7.69
7	6	46.17

TABLE 2

Pre and post septoplasty NOSE score based on nasal septal deviation (NSD) type

NSD type		NOSE score					Total
		Nasal congestion/stuffness	Nasal blockage/obstruction	Trouble breathing through my nose	Trouble sleeping	Unable to get enough air through my nose during exercise	
2	Pre	6	6	2	2	7	23
	post	1	1	0	0	2	4
3	Pre	2	4	4	3	4	18
	post	2	0	0	0	0	3
4	Pre	4	4	4	2	0	14
	post	0	0	0	0	0	0
5	Pre	3	3	2	1	3	12
	post	3	2	0	2	0	7
6	Pre	3	4	1	0	1	9
	post	1	0	0	0	0	1
7	Pre	19	16	15	10	19	79
	post	5	1	0	0	1	7

viation type 7 ($\Delta=72$), while the lowest difference was type 5 ($\Delta=5$). Comparative tests to assess changes in the severity of nasal obstruction before and after septoplasty were analyzed using the Wilcoxon signed rank test. Statistical tests can only be carried out on Nasal septal deviation types 2, 3 and 7 because the sample size for types 4, 5 and 6 of Nasal septal deviation is only 1 unit so it cannot be analyzed using statistical tests.

The Wilcoxon test results showed that a significant change in the severity of nasal obstruction was only found in type 7 Nasal septal deviation ($p<0.05$) (Table 3). The change in severity referred to is an improvement in complaints of nasal obstruction or a decrease in the NOSE score after septoplasty. NOSE scores before and after septoplasty based on the type of Nasal septal deviation were analyzed using the Kruskal-Wallis test.

The NOSE score before septoplasty was found to be $p=0.918$, while the NOSE score after septoplasty was found to be $p=0.393$ (Table 4). This shows that there is no significant difference between the type of Nasal septal deviation and the NOSE score, both before and after septoplasty ($p>0.05$).

A statistical test on the difference (Δ) in NOSE scores before and after septoplasty showed $p=0.810$ (Table 5), this shows that there is no relationship between the type of Nasal septal deviation and changes in the severity of nasal obstruction ($p>0.05$).

DISCUSSION

There were more male patients (62.54%) in this study than female patients (38.46%) with a ratio of 1.6:1. Budiman B. and co-authors reported that 7 patients with Nasal septal deviation were male (58%) and 5 female (42%) [Budiman B et al., 2014]. Another study in India in 2020 reported 30 patients with Nasal septal deviation, all of whom were men [Dutta A, Goyal L, 2020]. The tendency for men to have a higher incidence of Nasal septal deviation is associated with the theory that nasal deformities are often found because trauma cases are more common in men [Oliveira A et al., 2005; Paramyta W et al., 2017]. There is no significant difference between genders in complaints of nasal obstruction [Sandha L et al., 2021].

Patients with Nasal septal deviation in this

study had a mean of 30.53 years, 61.54% of whom were in the 18–30-year age group. Dutta and Goyal reported that the age of patients with Nasal septal deviation ranged from 17-48 years with a mean age of 26 years [Dutta A, Goyal L., 2020]. Budiman and his colleagues reported that almost all respondents were less than 40 years old (83%). This can happen because complaints of nasal obstruction often appear and are complained of in young adults [Budiman B et al., 2014]. Aging may cause

TABLE 3

Changes in NOSE scores pre and post septoplasty based on nasal septal deviation type

NSD type	NOSE score (post-pre)				
	a	b	c	Total	p
2	2	0	0	2	0.180
3	1	0	1	2	0.317
7	6	0	0	6	0.028

NOTE: a = NOSE score post<pre; b = NOSE score post>pre; c = NOSE score post=pre. *Significant ($p<0.05$) by Wilcoxon signed-rank test

TABLE 4.

NOSE scores based on nasal deviation (NSD) type before and after septoplasty

NSD type	Pre septoplasty		Post septoplasty	
	mean	p	mean	p
2	6.75	0.918	9.5	0.393
3	5.25		6.75	
4	7.50		2.50	
5	6.00		13.00	
6	4.50		6.50	
7	8.17		6.08	

NOTE: Significant if $p<0.05$

TABLE 5

Relationship between the nasal septal deviation (NSD) type and changes in the severity of nasal obstruction

NSD type	n	NOSE score delta (mean)	p
2	2	6.00	0.810
3	2	6.25	
4	1	9.00	
5	1	3.00	
6	1	5.50	
7	6	8.17	

Note: Significant if $p<0.05$

changes in nasal physiology and appearance (size and shape); there is no significant age-related increase in complaints of nasal obstruction [Verhoveven S, Schmelzer B, 2016].

Most of the patients with Nasal septal deviation in this study had type 7 based on the Mladina classification, 6 patients (46.17%), followed by types 2 and 3, 2 patients each (15.38%), while types 4, 5 and 6 respectively - only 1 patient each (7.69%). In this study, there was no type 1 nasal septal deviation because the patients who came for treatment were patients with Nasal septal deviation who had complaints of nasal obstruction. In type 1, the septal protrusion is vertically unilateral and does not change the area of the nasal valve, so it does not cause complaints of nasal obstruction.

The results of this study are similar to Janovic, et al., in 2020 which reported that the most common type of Nasal septal deviation was type 7 (34.2%), followed by type 5 (26.2%) and type 3 (23.6%) [Janovic N et al., 2020]. This research is different from Dutta and Goyal, namely that the most common type of Nasal septal deviation is type 2 (36.67%) and the least is type 5 (0%) [Dutta A, Goyal L, 2020]. Another study in Denpasar, Bali, reported the highest type of Nasal septal deviation, namely type 3 (28%), followed by type 1 (14%) from 50 subjects [Sandha L et al., 2021]. The difference in the prevalence of types of Nasal septal deviation obtained in this study and several previous studies could be caused by variability in the procedure for examining Nasal septal deviation. Several simple procedures such as anterior rhinoscopy and nasoendoscopy are two procedures that are often used to diagnose Nasal septal deviation, but cannot accurately assess the degree of deviation, so several studies use CT-scans as a modality for examining Nasal septal deviation [Sandha L et al., 2021].

The total NOSE score before septoplasty in this study ranged from 9-79, while the NOSE score after septoplasty was between 0-7. The highest total NOSE score before septoplasty was obtained in type 7 nasal septal deviation and the lowest was obtained in type 6. The highest total NOSE score after septoplasty was obtained in types 5 and 7, the lowest score was obtained in type 4. The highest difference of NOSE score (delta) between before and after septoplasty is type 7, while the lowest

difference is type 5. The greatest change in severity or improvement in complaints of nasal obstruction is found in type 4 (mean = 14) because there is only 1 patients, while the fewest who experienced improvement in nasal obstruction were found in type 5 (mean = 5).

Saha, et al., reported that type 4 showed an improvement in nasal obstruction complaints of 89.5% at follow-up 6 weeks after septoplasty and the greatest improvement in nasal obstruction complaints was found in type 5 nasal obstruction complaints (100%) because there was only 1 patient [Saha M et al., 2014]. Gerecci, et al., reported that there was no significant difference in preoperative NOSE scores, but there was a significant increase in nasal obstruction severity scores [14]. Patients' perceptions of nasal obstruction are complex and can be influenced by a variety of physiological and psychological factors. Surgical technique, condition of blood vessels and nerve supply as well as patient expectations from surgery can influence the perception of nasal obstruction and surgical results [Kahveci O et al., 2012]. The NOSE questionnaire is currently the most used instrument to report outcomes after septorhinoplasty. The ideal duration of follow-up after septoplasty is still debated [Gerecci D et al., 2018].

The results of this study showed that statistically significant changes in the severity of nasal obstruction were only found in type 7 ($p < 0.05$). This study is different from studies in India which showed significant improvement in complaints of nasal obstruction in all types of Nasal septal deviation after septoplasty [Saha M et al., 2014; Dutta A, Goyal L, 2020]. The benefits of septoplasty vary greatly at different levels of satisfaction [Saha M et al., 2014]. The effect of septoplasty in improving nasal obstruction is very strong despite the relatively small sample size; a change of 0.8 times the standard deviation from the mean preintervention score is considered a clinically important effect [Stewart M et al., 2004].

The results of this study also showed that there was no significant difference between the type of Nasal septal deviation and the severity of nasal obstruction, both before and after septoplasty ($p > 0.05$), and there was no relationship between the type of Nasal septal deviation and changes in the severity of nasal obstruction ($p > 0.05$). These

results are different to Sandha, et al., which reported that there was a significant relationship between the type and degree of Nasal septal deviation and the severity of obstruction. Deviations in the nasal valve area play an important role in the severity of the patient's nasal obstruction. This is related to the mechanism of airflow resistance in patients with deviated nasal septal. Disturbances in the nasal valve area cause narrowing of the valve area which increases airflow resistance. When combined with narrowing in the middle area of the nasal cavity which is often found in type 7, the severity of nasal obstruction can be more severe. Type 5 can also increase the severity of nasal obstruction due to bony spurs which cause obstruction of air flow and disturbances in the speed of air distribution in the nasal cavity which causes symptoms of nasal obstruction [Sandha L et al., 2021].

The results of this study are similar to research by Verhoeven and Schmelzer in 2016 and Janovic, et al., in 2020, that there was no significant relationship between the type of Nasal septal deviation and the severity of nasal obstruction [Verhoeven S, Schmelzer B, 2016; Janovic N et al., 2020]. Complaints of nasal obstruction can vary between patients with the same type of Nasal septal deviation, so the classification of the type of Nasal septal deviation cannot predict the severity of nasal obstruction felt by the patient [Verhoeven S, Schmelzer B, 2016].

Most of the samples in this study had turbinate hypertrophy so they underwent septoplasty with turbinoplasty (84.62%), while the rest underwent

septoplasty alone. Some researchers argue that after septoplasty is performed, compensatory turbinate hypertrophy will decrease by itself, but other researchers claim that the turbinate hypertrophy involves the bone as well as the mucosa and argue that these changes are not spontaneously reversible and must be corrected simultaneously with septoplasty [Kumar R, Rajashekar M, 2016]. The ideal duration of follow-up after septoplasty is still debated. The success rate of septoplasty is between 63%-85% depending on the duration of follow-up and method of outcome assessment. Studies using the NOSE questionnaire report variable post-septoplasty follow-up, ranging from 1 month to 4 years. Gerecci, et al., found a significant increase in nasal obstruction severity scores in the follow-up time interval of 1-3 months after septoplasty [Gerecci D et al., 2018].

The limitations of this study are that complaints of nasal obstruction are not differentiated between those caused by Nasal septal deviation alone and those accompanied by turbinate hypertrophy and the type of surgery performed is mostly septoplasty accompanied by turbinoplasty, so it can be used as a reference for further research.

CONCLUSION

There is no relationship between Nasal septal deviation type and changes in the severity of nasal obstruction in post-septoplasty patients. Changes in the severity of nasal obstruction were only found in type 7 nasal septal deviation.

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