Predicting factors of recurrent deviated nasal septum after primary septoplasty in Jeddah, Saudi Arabia

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Background
Deviated nasal septum is a common cause of symptoms for nasal obstruction. Patients with nasal septum deviation who undergo septoplasty have improvements in their disease-specific quality of life for nasal obstruction.
Objective
The aim of this study was to identify the contributing factors of recurrent nasal septum deviation following primary septoplasty.
Materials and methods
This retrospective cross-sectional study reviewed the records of all patients who underwent primary septoplasty between 2017 and 2018; then presented to Otolaryngology-Head and Neck Surgery Outpatient Clinic, King Abdulaziz University Hospital with recurrent deviated nasal septum.
Results
In the current study, 362 patients were included. Most patients were Saudis (73.2%); and had neither comorbidities (73.5%) nor chronic diseases (92%). At the time of primary septoplasty, most patients were aged from 18 to 59 years (78.2%). Most patients had left septal deviation; underwent closed approach; and did not suffer postoperative complications (94.5%). The most common types of deviated nasal septum at the time of primary septoplasty were types 3 (38.1%) and 2 (31.5%), while type 2 was the most common at second septoplasty. The time between first septoplasty and recurrence of deviated nasal septum ranged from 1 to 72 months; with a median time of 12 months. The results of multiple linear regression showed that Saudi male patients who had a concomitant nasal surgery had a significantly increased time interval between first septoplasty and recurrence ($P<0.05$). The presence of either comorbidities or chronic diseases resulted in a decrease of the interval.
Conclusion
In patients who suffered from recurrence after primary septoplasty, types 2 and 3, left deviated nasal septum, and closed approach septoplasty were significantly frequent. Factors that resulted in longer time interval between first septoplasty and recurrence were male gender, Saudi nationality, concomitant nasal surgery, and absence of either comorbidities or chronic diseases.

Keywords:
nasal obstruction, nasal septum, recurrence, Saudi Arabia, septoplasty

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Introduction

The nasal septum is a midline bony cartilaginous structure of the nasal cavity. It has both functional and cosmetic roles, providing an important support to the underlying structure of the nose, sustaining its shape, and regulating nasal airflow and respiration [1]. The straight nasal septum facilitates laminar airflow and helps optimizing it for gas exchange through warming and humidification of the inspired air. On the contrary, a deviated nasal septum may lead to turbulent airflow, nasal obstruction symptoms, increased nasal resistance, and snoring [2].

Deviation of the nasal septum is a commonly encountered problem in the otolaryngology clinics, and it represents one of the most common anatomic variations of healthy adults. The prevalence of deviated nasal septum has a wide range (from 19 to 65%) because of different definition criteria [3,4]. Nasal septum deviation may present with a deviation of either the bony or cartilaginous septum or both, leading to a disruption of the physiological function of the nose and distortion of its shape. It is classified into C-shaped or reverse C-shaped, as well as S-shaped or reverse S-shaped [5]. Moreover, nasal septum

deviation can be assessed both clinically and radiologically. Although the condition may be asymptomatic, patients with septal deviation commonly present with nasal obstruction, oral breathing, nasal discharge, snoring, and repetitive sneezing. Nasal septal deviation is also linked to sleep apnea and disturbance of the sense of smell. In addition, it has been reported that a considerable percent of patients with a significant deviation of the nasal septum has a negative impact on their quality of life [6–9].

Several classification systems have been developed for the evaluation of nasal septum deviation [5]. Rao *et al.* [10] and Mladina [11] developed similar classification systems that described accurately the most common types of deviations seen in clinical practice. Mladina [11] categorized the deviations into seven types: type 1: unilateral vertical septal ridge in the valve region that does not reach the valve itself, type 2: unilateral vertical septal ridge in the valve region touching the nasal valve, type 3: unilateral vertical ridge located more deeply in the nasal cavity, type 4: S-shaped, type 5: almost horizontal septal spur, type 6: massive unilateral bone spur, and type 7: variation of these types. Rao [10] also classified septal deviations into seven types: type I: midline septum or mild deviations in vertical or horizontal plane, type II: anterior vertical deviation, type III: posterior vertical deviation, type IV: S-septum, type V: horizontal spur on one side, type VI: type V with a deep groove on the concave side, and type VII: combination of II–VI. Later, Guyuron *et al.* [12] suggested that each type of septal deviation requires specific management.

Septoplasty is the definitive surgical treatment to correct nasal septal deviation. It is the third most common surgery performed in the Otolaryngology-Head and Neck Surgery specialty worldwide. It is usually performed in isolation, but sometimes in association with sinus surgery or rhinoplasty. For best outcomes, it requires accurate preoperative assessment and precise surgical planning. However, the risks of recurrence and airway obstruction are high because of cartilage thickening and deformation, scar contracture, or collapse of the excessively weakened nasal dorsum [13,14].

There was a dearth of information regarding the contributing factors of recurrent nasal septum deviation in Saudi Arabia. Therefore, the purpose of this study was to identify the contributing factors of recurrent nasal septal deviation following primary septoplasty.

Materials and methods

Ethical considerations

The study design was approved by the Research Ethics Committee, Faculty of Medicine, King Abdulaziz University. Approval for reviewing the patients' records was obtained and confidentiality of the data was maintained.

Study design

This retrospective, cross-sectional descriptive study was carried out in King Abdulaziz University Hospital, Jeddah, Saudi Arabia. Data collection took place during the period from 1 November 2017 to 28 February 2018.

Study population

The study included 362 patients recruited from those who presented with recurrent nasal septal deviation to the Otolaryngology-Head and Neck Surgery Outpatient Clinic, King Abdulaziz University Hospital.

Inclusion and exclusion criteria

All patients who underwent a primary septoplasty and had a recurrent deviated nasal septum (evident from the history, examination, and computed tomography scan) were included in the study. However, patients with congenital nasal septal deviation or nasal valve stenosis were excluded from participation.

Sample size determination

It has been reported that the worldwide prevalence of deviated nasal septum is 62%. The minimum calculated sample size to achieve a precision of ±5% with a 95% confidence interval was 362 using the following formula:

$$n = \frac{Z^2 \times P \times q}{d^2}$$

where n: minimum sample size number, Z=constant (1.96), P=prevalence, and q=1–P, d=0.05.

Data collection and statistical analysis

Data were carried out through a review of the records of patients who presented to the outpatient clinics of Otolaryngology-Head and Neck Surgery Department, King Abdulaziz University Hospital. The data were coded, checked, and entered in SPSS (version 22.0; IBM Corp., Armonk, New York, USA).

Numerical variables were checked for normality by the Shapiro–Wilk test. Abnormally distributed variables were expressed as median and interquartile range (25th–75th percentile). Categorical variables were

summarized as frequencies and percentages and χ^2-goodness of fit was used to assess the null hypothesis that all categories within a variable are equal in frequency. Multiple linear regressions were carried out to assess the effect of patients' characteristics on the time interval between primary septoplasty and recurrence. A *P* value of less than 0.05 is considered statistically significant.

Results

In the current study, the data of 362 patients were collected. Table 1 shows the studied patients' demographic data. The female patients constituted more than half the studied sample (51.1%), with no statistical significance (P=0.674). The majority of patients were Saudis (73.2%; P<0.001) and had neither comorbidities (73.5%; P<0.001) nor chronic diseases (92%; P<0.001). The most common comorbidities and chronic diseases were facial/nasal trauma (18.5%), asthma (2.8%), and osteoarthritis (2.8%).

Table 2 demonstrates the characteristics of the studied patients at the time of primary septoplasty. The majority of patients were aged 18 to 59 years (78.2%; P<0.001); they underwent a closed approach (70.4%; P<0.001); had left septal deviation (70.2%; P<0.001); and did not suffer from postoperative complications (94.5%; P<0.001). A significantly higher percentage of patients had type 3 (38.1%) and type 2 (31.5%) deviated nasal septum (P<0.001).

Table 3 shows the characteristics of patients at the time of second septoplasty. The time between first septoplasty and recurrence of deviated nasal septum ranged from 1 to 72 months. The median time interval was 12 months; half the studied patients spent an interval of 10–36 months, while 25% had a free interval of less than 10 months and the remaining 25% had an interval longer than 36 months. Type 2 was the most encountered deviated nasal septum type (42.8%), with statistical significance (P<0.001). The majority of patients had left side deviated nasal septum (76%; P<0.001).

Table 1 Demographic factors of the studied patients (*n*=362)

	n (%)	*P*
Gender		
Female	185 (51.1)	0.674
Male	177 (48.9)	
Nationality		
Non-Saudi	97 (26.8)	<0.001*
Saudi	265 (73.2)	
Comorbidities		
Allergic rhinitis	19 (5.2)	<0.001*
Facial/nasal trauma	67 (18.5)	
Facial/nasal trauma, allergic rhinitis	10 (2.8)	
None	266 (73.5)	
History of chronic disease		
Asthma	10 (2.8)	<0.001*
DM, IHD, hyperlipidemia	9 (2.5)	
Osteoarthritis	10 (2.8)	
None	333 (92.0)	

DM, diabetes mellitus; IHD, ischemic heart disease. *P<0.05, significant.

Table 4 illustrates the results of multiple linear regressions that were conducted to assess the effect of different patient characteristics on the time interval that elapsed between the first septoplasty and recurrence. Male, Saudi patients who had a concomitant nasal surgery had a significantly increased time interval (B=3.920, 6.477, and 10.867, respectively). The presence of either comorbidities or chronic diseases resulted in a decrease of the interval. These variables had a statistically significant effect on the time interval before recurrence. Age at primary septoplasty had no statistically significant effect.

Discussion

Deviated nasal septum is a common problem that is encountered in the otorhinolaryngology clinics. Patients with septal deviation commonly present with nasal obstruction, but some patients are asymptomatic. Deviation of the nasal septum is surgically corrected by septoplasty, but some patients suffer from recurrence of the manifestations after the primary operation, requiring a second surgery [15,16]. There is a paucity of studies that address the recurrence of deviated nasal septum after septoplasty. Therefore, the aim of the current study was to identify the contributing factors of recurrent nasal septal deviation following primary septoplasty.

In the current study, nearly half the patients were women. Siegel *et al.* [13] found that female gender predicted worse outcome after septoplasty. This effect of gender may be attributed to differences in nasal airway anatomy or hormonal influences on nasal congestion.

In this study, most patients were Saudis (73.2%). This prevalence is rather expected as the study is conducted in Saudi Arabia. However, another factor (unable to investigate) was the ethnic group. The deviated nasal septum is more common in Caucasians, rather than the Africans or Asians [17]. Also, most patients had left septal deviation, at the time of primary (70.2%) or second (76%) septoplasty. Min *et al.* [18] and

Table 2 Characteristics of the studied patients at the time of first (primary) septoplasty (*n*=362)

	n (%)	*P*
Age at primary septoplasty (years)		
<18	79 (21.8)	<0.001*
18–59	283 (78.2)	
Surgical approach at the time of primary septoplasty		
Closed	255 (70.4)	<0.001*
Open	107 (29.6)	
Concomitant nasal surgery		
No	166 (45.9)	0.115
Yes	196 (54.1)	
If yes, specify		
Dorsal nasal hump rasping	10 (5.1)	<0.001*
Inferior turbinate	29 (14.8)	
Rhinoplasty	148 (75.5)	
Rhinoplasty, inferior turbinate	9 (4.6)	
Site of septal deviation at the time of primary septoplasty		
Type 1: unilateral vertical septal ridge in the valve region that does not reach the valve itself	20 (5.5)	<0.001*
Type 2: unilateral vertical septal ridge in the valve region touching the nasal valve	114 (31.5)	
Type 3: unilateral vertical ridge located more deeply in the nasal cavity	138 (38.1)	
Type 4: S-shaped	30 (8.3)	
Type 5: almost horizontal septal spur	30 (8.3)	
Type 6: massive unilateral bone spur	0 (0.0)	
Type 7: variation of these types	30 (8.3)	
Side of septal deviation at the time of primary septoplasty		
Left	254 (70.2)	<0.001*
Right	108 (29.8)	
Operative complications		
No	342 (94.5)	<0.001*
Yes	20 (5.5)	
If yes, specify: (% of complications)		
Minimal bleeding	10 (2.8)	1.000
Right lower septal tear	10 (2.8)	

*$P<0.05$, significant.

Table 3 Characteristics of the studied patients at the time of second septoplasty (*n*=362)

	n (%)	*P*
Site of septal deviation at the time of recurrence		
Type 1: unilateral vertical septal ridge in the valve region that does not reach the valve itself	47 (13.0)	<0.001*
Type 2: unilateral vertical septal ridge in the valve region touching the nasal valve	155 (42.8)	
Type 3: unilateral vertical ridge located more deeply in the nasal cavity	90 (24.9)	
Type 4: S-shaped	10 (2.8)	
Type 5: almost horizontal septal spur	20 (5.5)	
Type 6: massive unilateral bone spur	20 (5.5)	
Type 7: variation of these types	20 (5.5)	<0.001*
Side of septal deviation at the time of recurrence		
Left	275 (76.0)	
Right	87 (24.0)	
Time between primary septoplasty and recurrence of DNS (months)		
Minimum–maximum	1.0 to 72.0	
Median (IQR)	12.0 (10.0–36.0)	

DNS, deviated nasal septum; IQR, interquartile range. *$P<0.05$, significant.

Daghistani [19] reported a higher prevalence of left side deviated nasal septum (56%).

In 1987, Mladina [11] classified nasal septal deformities into seven types and observed the relationship between deviated nasal septum and maxillary irregularities. Later, Guyuron *et al.* [12] suggested that each type of septal deviation requires specific management. In this study, the most common types of deviated nasal septum at the time of primary

Table 4 Multiple linear regression to assess the effect of patient characteristics on the time between first septoplasty and recurrence (n=362)

Model	Unstandardized coefficients		Standardized coefficients	t	P?	95% Confidence interval for B	
	B	SE	β			Lower bound	Upper bound
Gender (male)	3.920	1.755	0.213	2.233	0.026*	0.468	7.372
Nationality (Saudi)	6.477	1.591	0.400	4.070	<0.001*	3.347	9.607
Age at primary septoplasty (<18 years)	2.516	2.091	0.112	1.203	0.230	–1.597	6.629
Comorbidities (yes)	–8.018	2.129	–0.143	–3.767	<0.001*	–12.204	–3.832
History of chronic disease (yes)	–8.212	3.229	–0.080	–2.543	0.011*	–14.562	–1.862
Concomitant nasal surgery (yes)	10.867	1.748	0.277	6.217	<0.001*	7.429	14.304

*P<0.05, significant.

septoplasty were type 3 (38.1%) and type 2 (31.5%), while type 2 was the most common at second septoplasty. Daghistani [19] studied the types of deviated nasal septum in Saudi patients in Jeddah and found that the most common type of deviated nasal septum was type I, followed by types, II, III, IV, VI, V, and VII. Min *et al.* [18] reported the types in their series as types: I, II, III, V, VII, and IV, while the order in Mladina's series [11] was I, II, VI, V, VII, IV, and III.

In the current study, the time between first septoplasty and recurrence of deviated nasal septum ranged from 1 to 72 months, with a median time of 12 months. Half the patients spent an interval of between 10 and 36 months, while patients who had a free interval of less than 10 months or longer than 36 months represented one quarter each. Jessen *et al.* [20] reported that nearly half of their patients still had nasal obstruction at 9 months and the percentage increased to 74% at 9 years; the patients who were not satisfied with the results represented 26% at 9 months and 31% at 9 years. In this study, the results of multiple linear regressions showed that male, Saudi patients who had a concomitant nasal surgery had a significantly increased time interval between first septoplasty and recurrence. The presence of either comorbidities or chronic diseases resulted in a decrease of the interval, which may be attributed to either partial or no improvement of symptoms after the surgery, so the patients sought early medical advice. These variables had a statistically significant effect on the time interval before recurrence. Age at primary septoplasty had no statistically significant effect. Patients who had types 2 and 3, left deviated nasal septum, and closed approach represented a significantly higher percentage of patients with recurrent deviated nasal septum. Factors that resulted in a longer time interval between first septoplasty and recurrence were male gender, Saudi nationality, concomitant nasal surgery, and absence of either comorbidities or chronic diseases.

The current study was subject to some limitations. As the study was retrospective, the details of the performed operations were not available in the records. It was better to include another group of patients who did not suffer from recurrence of deviated nasal septum after the operation, in order to identify the risk factors that predisposed to recurrence of nasal septal deviation. Therefore, further studies are needed to assess the effect of various patient characteristics such as predictors of the recurrence of deviated nasal septum. These studies should preferably be prospective, with adequate, long-term follow-up.

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Conflicts of interest
None declared.

References

1 Neskey D, Eloy JA, Casiano RR. Nasal, septal, and turbinate anatomy and embryology. Otolaryngol Clin North Am 2009; 42:193–205.

2 Hsia JC, Camacho M, Capasso R. Snoring exclusively during nasal breathing: a newly described respiratory pattern during sleep. Sleep Breath 2014; 18:159–164.

3 Serifoglu I, Oz İİ, Damar M, Buyukuysal MC, Tosun A, Tokgöz Ö. Relationship between the degree and direction of nasal septum deviation and nasal bone morphology. Head Face Med 2017; 13:3–11.

4 Nilsen AH, Helvik AS, Thorstensen WM, Bugten V. A comparison of symptoms and quality of life before and after nasal septoplasty and radiofrequency therapy of the inferior turbinate. BMC Ear Nose Throat Disord 2018; 18:2–13.

5 Teixeira J, Certal V, Chang ET, Camacho M. Nasal septal deviations: a systematic review of classification systems. Plast Surg Int 2016; 2016:1–8.

6 O'Reilly BJ, Simpson DC, Dharmeratnam R. Recurrent epistaxis and nasal septal deviation in young adults. Clin Otolaryngol Allied Sci 1996; 21: 12–14.

7 Hytönen ML, Lilja M, Mäkitie AA, Sintonen H, Roine RP. Does septoplasty enhance the quality of life in patients? Eur Arch Otorhinolaryngol 2012; 269:2497–2503.

8 Berkiten G, Kumral TL, Saltürk Z, Atar Y, Yildirim G, Uyar Y, *et al.* Effect of deviated nasal septum type on nasal mucociliary clearance, olfactory function, quality of life, and efficiency of nasal surgery. J Craniofac Surg 2016; 27:1151–1155.

9 Wang J, Dou X, Liu D, Song P, Qian X, Wang S, Gao X. Assessment of the effect of deviated nasal septum on the structure of nasal cavity. Eur Arch Otorhinolaryngol 2016; 273:1477–1480.

10 Rao JJ, Kumar EV, Babu KR, Chowdary VS, Singh J, Rangamani SV. Classification of nasal septal deviations – relation to sinonasal pathology. Indian J Otolaryngol Head Neck Surg 2005; 57:199–201.

11 Mladina R. The role of maxillar morphology in the development of pathological septal deformities. Rhinology 1987; 25:199–205.

12 Guyuron B, Uzzo CD, Scull H. A practical classification of septonasal deviation and an effective guide to septal surgery. Plast Reconstr Surg 1999; 104:2202–2209.

13 Siegel NS, Gliklich RE, Taghizadeh F, Chang Y. Outcomes of septoplasty. Otolaryngol Head Neck Surg 2000; 122:228–232.

14 Hsiao YC, Chang CS, Chuang SS, Kolios G, Abdelrahman M. Forty-five degree cutting septoplasty. Plast Surg (Oakv) 2016; 24:199–203.

15 Becker SS, Dobratz EJ, Stowell N, Barker D, Park SS. Revision septoplasty: review of sources of persistent nasal obstruction. Am J Rhinol 2008; 22:440–444.

16 Gillman GS, Egloff AM, Rivera-Serrano CM. Revision septoplasty: a prospective disease-specific outcome study. Laryngoscope 2014; 124:1290–1295.

17 Badia L, Lund VJ, Wei W, Ho WK. Ethnic variation in sinonasal anatomy on CT-scanning. Rhinology 2005; 43:210–214.

18 Min YG, Jung HW, Kim CS. Prevalence study of nasal septal deformities in Korea: results of a nation-wide survey. Rhinology 1995; 33:61–65.

19 Daghistani KJ. Nasal septal deviation in Saudi patients: a hospital based study. J KAU Med Sci 2002; 10:39–46.

20 Jessen M, Ivarsson A, Malm L. Nasal airway resistance and symptoms after functional septoplasty: comparison of findings at 9 months and 9 years. Clin Otolaryngol Allied Sci 1989; 14: 231–234.