Persistent Septal Deviation After Septoplasty: Causes and Surgical Management

Dong-Joo Lee

Pusan National University Hospital

Hyunju Jo

Pusan National University Hospital

Ha-Nee Kwon

Pusan National University Hospital

Ji-Hwan Park

Pusan National University Hospital

Sung-Dong Kim

Pusan National University Hospital

Kyu-Sup Cho (✉ choks@pusan.ac.kr)

Pusan National University Hospital

Research Article

Keywords: Nasal Obstruction, Nasal Septum, Nasal Surgical Procedures, Suture Techniques, Patient Outcome Assessment

Posted Date: March 2nd, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1354397/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Purpose: Septoplasty is one of the most common surgical procedures performed by otolaryngologist. There are various causes of persistent septal deviation after primary septoplasty. The purpose of this study was to identify the associated factors affecting the failure of the primary septoplasty, and to investigate operative techniques for correcting residual septal deviation, as well as surgical outcomes.

Methods: Seventy-four adult patients underwent revision septoplasty for persistent septal deviation was included. The level of hospital where primary septoplasty was performed, type of septal deviation, persistent deviated septal portion, and techniques used to correct the residual deviation were evaluated. Subjective outcomes using visual analog scale (VAS) and acoustic rhinometry data were assessed.

Results: The first septoplasty was performed mainly in primary and secondary hospital. C-shape was more common than S-shape deviation in the anteroposterior and cephalocaudal dimensions. The most common areas of persistent septal deviation were caudal septum (44.6%) followed by multiple sites (20.3%). Correcting techniques included excision of remnant deviated portion (70.3%), septal cartilage traction suture (27.0%), spreader graft (13.5%), and crossing suture (6.8%). There was significant symptomatic improvement in the VAS at 6 months postsurgery. The minimal cross-sectional area and nasal cavity volume of the convex side were significantly increased after revision septoplasty.

Conclusion: The patients underwent septoplasty in primary and secondary hospital were more likely to undergo revision septoplasty. Caudal septum was the most common sites of persistent septal deviation. Preoperative careful evaluation for caudal septal deviation characteristics and selection of the appropriate surgical techniques may lead to reduction of the need for revision septoplasty.

Introduction

Nasal obstruction is one of the most common symptoms which otolaryngologist may encounter during general practice. Although there are various etiologies for nasal obstruction, a deviated nasal septum is the most common cause of unilateral nasal obstruction [1]. It may cause difficulty breathing, frequent nosebleeds, repeated sinus infections, headaches, snoring, sleep disturbance, and worsening sleep apnea [2]. Various septoplasty techniques have been proposed to deal with the distinct sites of septal deviation. Septoplasty can be performed via an endonasal approach or open rhinoplasty approach.

Septoplasty is one of the most common surgical procedures performed by otolaryngologist [3]. However, more than 15% of patients who underwent primary septoplasty fail to relieve their symptoms [1, 5]. Persistent nasal obstruction after septoplasty may be attributed to the unrecognized nasal valve compromise, inappropriate management of turbinate hypertrophy, aggravation of allergic rhinitis, and residual or recurrent septal deviation [6]. However, incomplete correction of the septal deviation has been known as the main causes for persistent septal deviation after primary septoplasty.

This study examines our institution's long-term outcomes of revision septoplasty in a population of persistent nasal obstruction following septoplasty. We assessed the associated factors affecting the failure of the primary septoplasty, surgical techniques for correcting residual septal deviation, and postoperative outcomes using subjective symptoms and acoustic rhinometry.

Subjects And Methods

Subjects

We retrospectively reviewed and analyzed the medical records and endoscopic findings of 96 patients underwent revision septoplasty at Pusan National University Hospital from March 2011 through February 2020. Patients included in the study were 18 years or older and underwent revision septoplasty due to clinically significant residual septal deviation despite prior septoplasty. Exclusion criteria included a simultaneously performed endoscopic sinus surgery or nasal valve surgery, other nasal surgery such as polypectomy, and the history of facial trauma. Additional exclusion criteria were patients with a history of previous septal perforation, bleeding disorders or anticoagulant therapy, pregnancy, and the presence of a severe medical or neuropsychiatric disorder. This study protocol was approved by the Institutional Review Board of Pusan National University Hospital (H-2105-007-102).

Surgical Procedure

All revision septoplasty were performed under general anesthesia through an endonasal approach or an external rhinoplasty approach. The sole indication of external rhinoplasty approach was to maximize visualization and access for more complex septal reconstructing. Various surgical techniques were utilized for correction of residual septal deviation. Inferior turbinate out-fracture and volume reduction using microdebrider was carried out in patients with turbinate hypertrophy. Silicone nasal splints were inserted and removed at 7 days postoperatively. Routine postoperative saline nasal irrigation and debridement were performed.

Data collection and outcome assessment

Based on medical records, we analyzed clinical parameters including age, gender, side of nasal obstruction, level of hospital where primary septoplasty was performed, time interval between the primary and revision septoplasty, surgical approach, combined procedures, techniques used to correct the residual deviation, and complications.

A type of septal deviation and persistent deviated septal portion were analyzed by computed tomography (CT) images. The type of septal deviation was divided into S- and C-shape in anteroposterior and cephalocaudal dimensions, respectively (Fig. 1). The locations of persistent septal deviation were divided into six subsites: caudal septum (caudal end of cartilaginous septum), anterior septum (cartilaginous septum except caudal septum), middle septum (septum around the cartilaginous and bony junction), posterior septum (bony septum), maxillary crest, and multiple sites (Fig. 2).

Each patient was evaluated preoperatively and at 6-month follow-up visits. Subjective outcomes were measured by visual analogue scale (VAS). VAS was recorded in the range of 0 through 10, with 0 being no obstruction and 10 being complete obstruction. Objective outcomes were evaluated by measuring minimal cross-sectional area (MCA) and the nasal cavity volume of both nasal cavities using acoustic rhinometry.

Statistical analysis

Data were presented as means $\pm$ standard deviation. Statistical significance was assessed by paired t test using the SPSS software package version 23.0 (SPSS Inc., Chicago, IL, <http://www.spss.com>). A *p*-value ≤ 0.05 was considered to indicate statistical significance.

Results

A total of 74 patients were enrolled in the study, including 66 males and 8 females from 18 to 70 years of age, with mean age of 37.5 years. The unilateral nasal obstruction was 39 (52.7%), and the bilateral obstruction was 35 (47.3%). The first septoplasty was performed in the primary (32/74, 43.2%), secondary (32/74, 43.2%), tertiary (10/74, 13.6%) hospital. The interval between primary and revision septoplasty was 11.30 ± 5.82 (range 1 ~ 39) years. Sixty-one patients (82.4%) received revision endonasal septoplasty and 13 patients (17.6%) received revision septoplasty with rhinoplasty using an external approach. Inferior turbinate out-fracture and turbinoplasty were combined in 45 patients (73.8%) of septoplasty and in 5 patients of septorhinoplasty (38.5%). Only one patient showed postoperative complications such as septal perforation during 6 months follow-up. The patients' characteristics are summarized in Table 1.

Table 1
Patient characteristics.

Age (years)	37.50 ± 14.76
Sex	
Male	66 (89.2)
Female	8 (10.8)
Nasal obstruction	
Unilateral	39 (52.7)
Bilateral	35 (47.3)
Type of hospital	
Primary	32 (43.2)
Secondary	32 (43.2)
Tertiary	10 (13.6)
Time between primary and revision surgery (years)	11.30 ± 5.82
Combined surgery	
Septoplasty	16 (21.6)
Septoplasty with turbinoplasty	45 (60.8)
Septorhinoplasty	8 (10.8)
Septorhinoplasty with turbinoplasty	5 (6.8)
Complication	
No complication	73 (98.6)
Septal perforation	1 (1.4)
Data are expressed as the number (percentage) except age and time (means ± standard deviation).	

Anteroposterior C-shape deviation was shown in 59 patients (79.7%) and S-shape deviation in 15 patients (20.3%). In cephalocaudal dimension, 65 patients (87.8%) had C- shape deviation and 9 patients (12.2%) had S-shape deviation. The most common locations of persistent septal deviation were caudal septum (44.6%), followed by multiple sites (20.3%), anterior septum (14.9%), middle septum (12.1%), posterior septum (6.8%), and maxillary crest (1.3%) (Table 2). Correcting techniques included excision of remnant deviated portion (70.3%), septal cartilage traction suture (27.0%), spreader graft (13.5%), and crossing suture (6.8%) (Table 3).

Table 2
Locations of persistent septal deviation.

Location	Number (%)
Caudal septum	33 (44.6)
Multiple sites	15 (20.3)
Anterior septum	11 (14.9)
Mid septum	9 (12.1)
Posterior septum	5 (6.8)
Maxillary crest	1 (1.3)

Table 3
Main operative techniques to correct the remnant septal deviation.

Technique	Number (%)*
Excision of remnant deviation (cartilaginous or bony portion)	52 (70.3)
Septal cartilage traction suture technique	20 (27.0)
Spreader graft	10 (13.5)
Crossing suture technique	5 (6.8)
* The numbers are not mutually exclusive.	

Symptomatic VAS scores for nasal obstruction significantly decreased from 7.84 ± 1.92 to 2.70 ± 2.62 at 6 month postoperatively ($p < 0.001$). The mean MCA and nasal cavity volume of the convex side were significantly increased from $0.39 \pm 0.24 \text{ cm}^2$ and $5.38 \pm 2.20 \text{ cm}^3$ to $0.66 \pm 0.19 \text{ cm}^2$ and $8.04 \pm 3.57 \text{ cm}^3$ at 6 months postsurgery, respectively ($p = 0.002$ and $p = 0.025$, respectively). However, there were no significant difference in the mean MCA and nasal cavity volume of the concave side between the preoperative and postoperative scores (Table 4).

Table 4
Changes in subjective and objective outcomes after revision septoplasty.

Parameter	Preop	6 Mo	P Value
VAS	7.84 ± 1.92	2.70 ± 2.62	< 0.001
MCA (cm ²)			
Convex	0.39 ± 0.24	0.66 ± 0.19	0.002
Concave	0.98 ± 0.57	1.60 ± 1.99	0.237
NCV (cm ³)			
Convex	5.38 ± 2.20	8.04 ± 3.57	0.025
Concave	8.51 ± 2.95	10.00 ± 3.74	0.273
Data are expressed as means ± standard deviation. MCA = minimal cross sectional area; Mo = month; NCV = nasal cavity volume.			

Discussion

Septoplasty is most commonly indicated when the patients complain of unilateral or bilateral nasal obstruction caused by structurally deviated cartilaginous or bony portions of the nasal septum. Although various surgical techniques have been introduced for correction of septal deviation, success rate for primary septoplasty varies from 43 to 85% [1, 5, 7, 8]. The most common cause of septoplasty failure is residual or recurrent septal deviation due to incomplete correction of the septal deformity [6]. Revision septoplasty may be performed in patients with ongoing nasal obstruction and persisting septal deviation despite prior septoplasty. In this study, patients underwent septoplasty in primary and secondary hospital were more likely to undergo revision septoplasty. The higher failure rate of septoplasty in primary and secondary than tertiary hospital may be attributed to the incomplete correction of septal deviation due to lack of surgical skills or concerns about cosmetic complications such as tip ptosis and saddle nose deformity.

A few studies have described sites of persistent septal deviation after primary septoplasty. Gillman et al. [1] reported that residual deviation was most commonly identified at the dorsal septum. However, Becker et al. [4] found that multiple sites of deviation was the most common in revision surgery, and caudal septal deviation was the second. Another study showed that the middle septum was the most common site of persistent deviation, followed by caudal septum [6]. In the present study, C-shape was more common than S-shape deviation in the anteroposterior and cephalocaudal dimensions by CT findings. Furthermore, the most common area of persistent septal deviation were caudal septum, followed by multiple sites, anterior septum, and middle septum.

Caudal septal deviation is defined as deviation of the anterior most portion of the nasal septum [9]. Caudal septal deviation may be a major cause of nasal obstruction and cause significant cosmetic

deformities of the nasal base [10, 11]. Deviated caudal septum may change the lobular and columellar relationship and has a significant effect on tip position and symmetry [10]. However, the correction of caudal septal deviation may be difficult because small residual deviation may cause severe nasal obstruction and the intrinsic cartilage-bending memory is hard to overcome [11]. Furthermore, weakening of the caudal septum and separation from the anterior nasal spine can lead to complications, including overcorrection, saddle nose deformity, and tip ptosis [12]. Although various techniques have been reported to manage caudal septal deviation, this part is one of the most difficult to surgically correct with high septal deviation.

The surgical approach to revision septoplasty can be performed through a standard endonasal approach or open rhinoplastic approach. Many different techniques, such as swinging door method, septal batten graft, spreader graft, cutting and suture technique, and extracorporeal septoplasty have been proposed for correction of residual septal deviation, depending on the septal deviation characteristics and surgeon preferences [6, 13, 14]. Previous studies reported that open approach was more commonly used than endonasal approach [4, 6]. However, 61 (82.4%) patients underwent an endonasal approach and 13 (17.6%) underwent an open approach in this study. To correct remnant septal deviation, careful excision of remnant deviated cartilaginous or bony portion was most commonly performed. Septal cartilage traction suture technique introduced by Seo et al. [15] was applied in 20 cases and crossing suture technique described by Joo et al. [16] was used in 5 cases of the deviated caudal septum. Spreader graft was done in 10 patients to correct the deviation of anterior septum reaching dorsum, which was accomplished by the open approach. Our revision septoplasty techniques significantly improved subjective symptoms measured by VAS scale score for nasal obstruction. Furthermore, objective improvement in nasal obstruction was measured with acoustic rhinometry. MCA and nasal cavity volume in the convex side were significantly increased at 6 months postsurgery. However, the MCA and nasal cavity volume of the concave side was also increased, which is thought to be due to volume reduction of the inferior turbinate.

Although this study has the inherent limitations of a retrospective review, we believe that our prospectively collected data composed of validated outcome measurements do offer further support to the benefit of revision septoplasty in patients with persistent nasal obstruction following septoplasty. Additional well-designed randomized controlled prospective studies are needed to confirm our findings.

Conclusion

The patients underwent septoplasty in primary and secondary hospital were more likely to undergo revision septoplasty. Incomplete correction of the caudal septal deviation was the main reasons for persistent septal deviation after primary septoplasty. Therefore, careful evaluation for caudal septal deviation characteristics and selection of the appropriate surgical techniques at the primary surgery may lead to reduction of the need for revision septoplasty.

Declarations

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

The authors did not receive support from any organization for the submitted work.

human ethics statement

All methods were carried out in accordance with relevant guidelines and regulations

Informed consent was waived by the Institutional Review Board of Pusan National University Hospital (H-2105-007-102)

References

1. Gillman, G. S., Egloff, A.M., Rivera-Serrano, C.M. Revision septoplasty: a prospective disease-specific outcome study. *Laryngoscope*. **124**, 1290-5 (2014).
2. Teixeira, J., Certal, V., Chang, E.T., Camacho, M. Nasal septal deviations: a systematic review of classification systems. *Plast Surg Int*. **2016**, 2016:7089123 (2016).
3. Manoukian, P.D., Wyatt, J.R., Leopold, D.A., Bass, E.B. Recent trends in utilization of procedures in otolaryngology-head and neck surgery. *Laryngoscope*. **107**, 472-7 (1997).
4. Becker, S.S., Dobratz, E.J., Stowell, N., Barker, D., Park, S.S. Revision septoplasty: review of sources of persistent nasal obstruction. *Am J Rhinol*. **22**, 440-4 (2008).
5. Siegel, N.S., Gliklich, R.E., Taghizadeh, F., Chang, Y. Outcomes of septoplasty. *Otolaryngol Head Neck Surg*. **122**, 228-32 (2000).
6. Jin, H.R., Kim, D.W., Jung, H.J. Common sites, etiology, and solutions of persistent septal deviation in revision septoplasty. *Clin Exp Otorhinolaryngol*. **11**, 288-92 (2018).
7. Illum, P. Septoplasty and compensatory inferior turbinate hypertrophy: long-term results after randomized turbinoplasty. *Eur Arch Otorhinolaryngol*. **254**, Suppl 1:S89-92 (1997).
8. Fjermedal, O., Saunte, C., Pedersen, S.. Septoplasty and/or submucous resection? 5 years nasal septum operations. *J Laryngol Otol*. **102**, 796-8 (1988).
9. Voizard, B., Theriault, M., Lazizi, S., Moubayed, S.P. North American survey and systematic review on caudal septoplasty. *J Otolaryngol Head Neck Surg*. **49**, 38 (2020).
10. Sedwick, J.D., Lopez, A.B., Gajewski, B.J., Simons, R.L. Caudal septoplasty for treatment of septal deviation: aesthetic and functional correction of the nasal base. *Arch Facial Plast Surg*. **7**, 158-62 (2005).
11. Jang, Y.J., Yeo, N.K., Wang, J.H. Cutting and suture technique of the caudal septal cartilage for the management of caudal septal deviation. *Arch Otolaryngol Head Neck Surg*. **135**, 1256-60 (2009).

12. Kim, D.Y., Nam, S.H., Alharethy, S.E., Jang, Y.J. Surgical outcomes of bony batten grafting to correct caudal septal deviation in septoplasty. *JAMA Facial Plast Surg.* **19**, 470-5 (2017).
13. Atespare, A., Boyaci, Z. The use of spreader grafts in revision septoplasty. *J Craniofac Surg.* **27**, 1656-60 (2016).
14. Sillers, M.J., Cox, A.J., Kulbersh, B. Revision septoplasty. *Otolaryngol Clin North Am.* **42**, 261-78 (2009).
15. Seo, H.S. *et al.* Septal cartilage traction suture technique for correction of caudal septal deviation. *Laryngoscope.* **130**, E758-63 (2020).
16. Joo, Y.H., Cho, H.J., Jeon, Y.J., Kim, S.W. Use of a crossing suture to correct caudal septal deviations. *Int Forum Allergy Rhinol.* **9(8)**, 939-43 (2016).

Figures

Figure 1

Type of nasal septal deviation. Axial (A, B) and coronal (C, D) computed tomography images show S-shape (A, C) and C-shape (B, D) deviation in the anteroposterior and cephalocaudal direction shown, respectively

Figure 2

Classification of the nasal septum. The locations of persistent septal deviation were divided into caudal (1), anterior (2), middle (3), posterior (4), and maxillary crest (5)