Is Septoplasty Necessary When Using the Endoscopic Endonasal Transsphenoidal Approach for a Deviated Nasal Septum?

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Abstract

Objective This article describes the role played by endoscopic endonasal transsphenoidal approach (EETSA) to the sphenoidal process of the septal cartilage of a deviated nasal septum.

Design Case series with chart review.

Setting Tertiary referral center.

Participants Between 2009 and 2016, 177 patients with skull base tumors who underwent EETSA were included.

Main Outcome Measures In 8 cases, the conventional two nostrils–four hands technique was employed (group A). In 16 cases, we placed a right-side conventional nasoseptal flap and a left-side modified nasoseptal rescue flap (group B), and in 153 cases, bilateral modified nasoseptal rescue flaps (group C). The number of septoplasty-required cases and the change of nasal cavity area differences reflecting septal deviation were measured.

Results Septoplasty during EETSA was performed in two cases: one from group B and one from group C. There was no significant difference in the ratio of septoplasty-required cases among the three groups ($p = 0.127$). Between pre- and postoperative nasal cavity, the cross-sectional area difference at the anterior end of the middle turbinate level significantly decreased ($p = 0.045$). Also, the angle of deviation at the level of ostiomeatal unit significantly decreased after EETSA ($p < 0.001$).

Conclusion Separation of a deviated complex surrounding the sphenoidal process of the septal cartilage is the key to relieving a deviated nasal septum. EETSA combined with the two nostrils–four hands technique allows posterior septectomy (including removal of this deviated complex) to be performed. Thus, EETSA may commence without preceding septoplasty even in cases with severe nasal septum deviations.

Keywords

- septoplasty
- sphenoidal process
- endoscopic
- endonasal
- transsphenoidal

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Introduction

The transsphenoidal approach is the standard method for sellar tumors, and the endoscopic endonasal transsphenoidal approach (EETSA) has become more popular than the microscopic approach because the outcomes are similar, the complications fewer, the operative time and hospital stay shorter, and patient discomfort less.^{1,2} A major advantage of EETSA compared with the traditional approach is that the caudal end of the cartilaginous nasal septum is not destroyed.^{3,4} Also, most cases treated via EETSA do not require septoplasty (including nasal incision) or elevation of a mucoperichondrial flap from the septum. Moreover, in patients with relatively narrow nasal cavities, use of the two nostrils–four hands technique improves the manipulability of surgical instruments and increases access to the sellar region.⁵ However, when surgeons encounter deviated nasal septa during EETSA, the question of whether to perform septoplasty arises. This procedure is associated with risks of septal infection, septal hematoma, perforation, and saddle deformity. Also, the operative time increases.

The sphenoidal process of the septal cartilage plays an important role in the development of nasal septal deviation (▶Fig. 1).^{6,7} Severe septal deviation is associated with a long sphenoidal process.⁷ No study has yet explored whether septoplasty is needed during EETSA. In this study, we present our experience with EETSA, focusing on access to the sphenoidal process. Also, we check changes of septal deviation after EETSA using paranasal computed tomography (PNS CT). Our principal research question was, “Is septoplasty necessary during EETSA?”

Materials and Methods

This study and the retrospective chart review were approved by the institutional review board of Seoul St. Mary's Hospital (KC16RIS10442). Our Institutional Review Board approval waived the need for informed consent for this retrospective

Fig. 1 The sphenoidal process of the cartilaginous nasal septum.

chart review. Between February 2009 and February 2016, 546 patients with skull base tumors underwent surgery via EETSA at our hospital. Among them, 254 patients underwent 6 months' postoperative PNS CT. But, 77 patients with a history of previous sinonasal surgery or revision cases were excluded for PNS CT analysis. From 2009 to early 2010, we performed EETSA using the conventional two nostrils–four hands technique⁵ (group A) with creation of large posterior septectomy but without nasoseptal pedicle preservation, or the right-side conventional nasoseptal flap and left-side modified nasoseptal rescue flap approach (group B) making Hadad–Bassagasteguy flap (two parallel incisions were drawn following the sagittal plane of the septum one over the maxillary crest and the other 1 to 2 cm below the most superior aspect of the septum, and joined these incisions by a vertical incision anteriorly) on right nasal septum and designing left-side nasoseptal rescue flap (the curvilinear sagittal incision from the inferior border of the sphenoidal sinus ostium to one-third of the lower height of middle turbinate over the vomer for preservation of the nasoseptal pedicle).⁸ From mid 2010, we performed EETSA combined with placement of bilateral modified nasoseptal rescue flaps (group C) performing nasoseptal rescue flap bilaterally.⁹ The inferior, middle, and superior turbinates were lateralized and preserved, and the posterior bony septum (including a portion of the perpendicular plate of the ethmoid bone, the vomer, the sphenoidal process of the septal cartilage, and the anterior wall of the sphenoidal sinus) was removed.

PNS CT images were acquired in serial 0.6-mm-thick axial and 1-mm-thick coronal images were reconstructed. We used two methods to compare septal deviation. We measured cross-sectional area differences of each nasal cavity at the level of the anterior end of the inferior turbinate (the nasal valve) and the middle turbinate to compare pre- and postoperative septal deviation. Also, to calculate the angle of deviation, a line was drawn from the crista galli to the premaxilla, and a second line was drawn from the crista galli to most prominent point of the septal cartilage at the level of ostiomeatal unit.¹⁰ All images were magnified to ensure that the measurements were accurate. The borders of each nasal cavity were outlined (using a mouse) on bone window PNS CT images, and the corresponding areas measured (in mm²) using a picture archiving and communicating system (Marotech, Seoul, Korea).

All EETSA surgeries were performed by a single otolaryngologist (S.W.Ki.). After the approach procedure was concluded, two surgeons (Y.-K.H. and S.-S.J.) removed the tumor using the two nostrils–four hands technique. EETSA was performed with the aid of 4-mm-diameter 0° and 30° rigid wide-angle endoscopes (Karl Storz GmbH & Co., Tuttlingen, Germany). All data are expressed as means ± standard deviations. The paired Student's *t*-test was used to compare pre- and postoperative changes in the nasal cavity. Differences among the groups were analyzed using the Welch's test for analysis of variance. A *p*-value of less than 0.05 was considered to reflect statistical significance. All statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, North Carolina, United States).

Fig. 2 Changes in the right nasal passage: before (A) and after (B) separation of the deviated complex consisting of the sphenoidal process of the septal cartilage, the perpendicular plate of the ethmoid, and the vomer.

Results

The mean age of the 177 EETSA cases was 48.2 ± 14.5 years (range: 15–80 years); there were 87 (49.1%) males and 90 (50.8%) females. Classifying by the EETSA surgical methods, group A were 8 cases (4.52%), group B were 16 cases (9.04%), and group C were 153 cases (86.4%). Septoplasty during EETSA was performed in two cases: one from group B and one from group C. These two cases were very severe caudal septal deviation even after full shrinkage of the turbinate mucosa and lateralization of the turbinate. There was no significant difference in the ratio of septoplasty-required cases among the three groups ($p = 0.127$). Other deviated nasal septa were relieved to an extent (►Fig. 2), allowing EETSA to be performed via separation of the deviated complex consisting of the sphenoidal process of the septal cartilage, the perpendicular plate of the ethmoid, and the vomer. Pre- and postoperative PNS CT were completed in 177 patients. The degree of septal deviation changes were calculated using differences of each nasal cavity at the two levels and the angle of deviation of septal cartilage (►Fig. 3). The difference between each nasal cavity cross-sectional area

reflecting septal deviation was reduced at the anterior end of the inferior turbinate (the nasal valve), but not showing statistical significance ($p = 0.415$). However, at the anterior end of the middle turbinate postoperative nasal cavity area difference was significantly reduced, compared with preoperative difference ($p = 0.045$; ►Table 1). Also, the angle of deviation at the level of ostiomeatal unit were significantly decreased after EETSA (4.01 ± 2.15 vs. 2.85 ± 1.84 , $p < 0.001$; ►Table 1).

Discussion

Development of the nasal septum from the medial wall of the nasal capsule begins between the seventh and eighth week of gestation. At birth, the primitive nasal septum is entirely composed of cartilage.¹¹ The superior portion of the cartilaginous septum ossifies into the perpendicular plate of the ethmoid, and the posteroinferior portion to the vomer; the anteroinferior portion persists as quadrilateral cartilage.¹² As the vomer merges with the ossifying perpendicular plate of the ethmoid, a Y-shaped bony structure is formed in the coronal plane, and this moves from the posterior to the

Fig. 3 Coronal images of paranasal computed tomography (PNS CT). Preoperative (A) and postoperative (B) differences of each nasal cavity at the levels of the anterior end of the middle turbinate, and preoperative (C) and postoperative (D) angle of deviation of septal cartilage at the level of ostiomeatal unit.

Table 1 Change of nasal cavity cross-sectional area differences reflecting septal deviation ($n = 177$)

Nasal cavity difference, mm ²	Pre		Post		p-Value
	Mean	SD	Mean	SD	
Inferior turbinate	9.72	48	7.16	50.52	0.415
Middle turbinate	11.85	59.37	2.63	49.47	0.045*
Angle of deviation at OMU, °	4.09	1.33	2.81	1.12	< 0.001*

Abbreviations: OMU, ostiomeatal unit; Post, postoperative; Pre, preoperative; SD, standard deviation.

* $p < 0.05$ for the test.

anterior region along the suture line between the perpendicular plate of the ethmoid and the vomer.¹³ The cartilage between the two bones (the sphenoidal process) remains as a cartilaginous tail strip, which sometimes extends to the sphenoid bone.⁶ Several reports have explored the role played by the sphenoidal process in nasal septal deviation.^{6,7,14,15} This process is key in terms of septal deviation.⁷

The nasoseptal flap introduced by Hadad et al¹⁶ and the nasoseptal rescue flap,¹⁷ and variations thereof,^{8,9,18} were developed to overcome cerebrospinal fluid (CSF) leakage during EETSA; these procedures include exposure and removal of the posterior bony septum (a portion of the perpendicular plate of the ethmoid bone, the vomer, and the anterior wall of the sphenoidal sinus).^{8,9,16–18} Thus, the nasal septum (including a complex consisting of the sphenoidal process of the septal cartilage) is exposed during surgery, and removal of the deviated complex relieves nasal septal deviation.

In most cases of severely deviated nasal septum, it is possible to secure the space with preservation of the inferior, middle, and superior turbinates via lateralization when approaching the sphenoidal process of the septal cartilage. Also, it is possible to perform surgery on patients with relatively narrow nasal passages using the two nostrils–four hands technique.⁵ In fact, only two patients (1.1%) required septoplasty during our 7-year experience with EETSA employing the two nostrils–four hands technique. Thus, EETSA is well-suited for patients with nasal septal deviations; septoplasty is seldom needed. It is appropriate to proceed with EETSA without an initial septoplasty plan even in cases with severe nasal septal deviations. Only a few cases will require septoplasty.

However, our study has a limitation. Clinical decision to perform septoplasty could not be decided by preoperative image. Because, it is determined after full shrinkage of the turbinate mucosa and full lateralization of the inferior and middle turbinate intraoperatively. But, as shown in our study, nasal septal deviation decreased after separating a deviated complex during posterior septectomy. This result informed surgeons that they may push ahead with the endonasal transsphenoidal approach first in the cases of severely deviated nasal septum.

Note

The English in this document has been checked by at least two professional editors, both native speakers of English.

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