Complications of Septal Extension Grafts in Asian Patients

Ji Yun Choi, MD, PhD; Il Gyu Kang, MD, PhD; Hedyeh Javidnia, MD; Jonathan M. Sykes, MD

Nasal tip-plasty of the nose in Asians differs markedly from that in whites because of differences in the anatomy of the nasal skin and infrastructure. Generally, the underlying anatomy of the Asian nose is characterized by a weak cartilaginous framework and a thick skin and soft-tissue envelope. A septal extension graft (SEG) can provide more reliable tip support for weak alar cartilages, which is a common condition in Asian patients, and therefore is a frequently used technique in Asian nasal tip surgery. However, as the incidence of using SEGs increases, so do complications with this technique. As such, this study attempts to investigate the problems resulting from nasal tip surgical procedures using an SEG.

METHODS

From January 2008 through March 2010, a total of 126 patients underwent rhinoplasty using the SEG method. All patients provided written informed consent, and institutional review board approval was received from Chosun University Medical Center. Our inclusion criteria were patients with regularly scheduled postoperative appointments and completed postoperative surveys for more than 1 year. Our exclusion criteria were patients who had the SEG procedure combined with a shield graft, alar batten graft, strut graft, spreader graft, septal reconstruction, or a bilateral SEG procedure. Patients with...
Table 1. Patient Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. (%)</td>
<td>33 (75.0)</td>
<td>11 (25.0)</td>
<td>44 (100)</td>
</tr>
<tr>
<td>Age, mean (range), y</td>
<td>30.9 (18-55)</td>
<td>28.6 (19-44)</td>
<td>30.3 (18-55)</td>
</tr>
<tr>
<td>Follow-up period, mean (range), mo</td>
<td>15.4 (12-31)</td>
<td>18.2 (12-37)</td>
<td>16.1 (12-37)</td>
</tr>
</tbody>
</table>

Anthropometric Measurements

To evaluate the outcomes, we measured nasal tip projection (defined as the straight line from the soft tissue at the base of the columella to the greatest projection point of the tip-dorsal intersection at a standard lateral view of the nose) and nasolabial angle (formed by the labial surface of the upper lip at the midline and the inferior border of the nose) preoperatively and postoperatively (at 3 months and 1 year).

Tip projection, nasolabial angle, and the distance between the lateral corner of the mouth (commisurine) and the upper margin of Cupid’s bow (rabrale superius) were measured (Figure 1). A computer program (Photoshop; Adobe Systems, Inc) was used for photograph measurements. Tip projection was standardized using the number of pixels in the digital images as a reference for the distance between the commissure and the rabrale superius. Measurements were carried out twice, and a mean was obtained.

The mean and standard deviation of each variable were calculated and compared for males and females (independent t test) and for preoperative and postoperative measurements (paired t test). Analysis of variance was used for comparing differences of complications among materials. For analysis of the correlation of each variable, a statistical program (SPSS, version 19.0; SPSS, Inc) was used (P < .05).

Techniques

Rhinoplasty was generally performed under general anesthesia on patient request. The anesthetic solution consisted of lidocaine, 1%, with 1:200 000 epinephrine. The mucoperichondrium and the septum were then infiltrated, and the nose was hyperinflated with the solution. In total, 15 to 20 mL of local anesthetic solution was used for infiltration of the nose, including the dorsal skin, nasal floor, and septum. An open rhinoplasty approach was used. A midcolumellar V-shaped incision was made, running along the rim of the lower lateral cartilage (LLC) at its caudal aspect. The columella and dorsal skin flap were elevated to the level of the perichondrium of the LLC with angled iris scissors.
The surgeon (J.Y.C.) used a 2-pronged skin hook to avoid pulling the fat off of the dermis when the skin flap was elevated. The upper lateral cartilage was then released from its attachment to the dorsal septum using scissors or a scalpel. The LLC was separated completely, the right and left LLCs were separated from each other, and the nasal septum was exposed. The nasal septal mucoperichondrium was elevated bilaterally to make mucoperichondrial pockets for insertion of the SEG. Septal cartilage was harvested. When septal cartilage was lacking or inadequate, autologous rib cartilage was harvested or cadaveric rib cartilage was used. Rib cartilage was designed as 2 cm long, 2 cm wide, and 1.5 to 2 mm thick on a grid plate. The prepared cartilage graft was inserted into the mucoperichondrial pocket of the septum and fixed to the septum with 5-0 PDS sutures at 3 or 4 points in an overlapping fashion. The degree of septal extension was dependent on preoperative tip projection and rotation but generally consisted of a 10- to 15-mm intraoperative projection. After fixation of the cartilage graft, the LLCs were suspended to the tip of the SEG and fixed in position with 5-0 PDS sutures. For more projection, 1 or 2 onlay grafts were done. Last, the nasal skin was closed with 6-0 nylon sutures. When the septum had been overresected in a previous rhinoplasty, a reinforcement procedure was performed using additional supportive cartilage grafts.

### Results

#### Diagnosis
Among the 44 patients, 18 had a deviated nose, 13 had a flat nose, 6 had a short nose, 3 had a hump nose, 2 had a saddle nose, and 2 had a contracted nose.

#### Patient Satisfaction Levels
Twenty-six patients (59.1%) were very satisfied, 12 (27.3%) were satisfied, 6 (13.6%) were neither satisfied nor dissatisfied, and none were dissatisfied or very dissatisfied. The difference between males and females was not statistically significant ($P = .40$).

#### Materials Used
Materials included septal cartilage in 23 patients (52.3%), irradiated rib cartilage in 11 patients (25.0%), and autologous rib cartilage in 10 patients (22.7%).

#### Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Cartilage</th>
<th>Total No. (%)</th>
<th>$P$ Value for Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip decrease, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10</td>
<td>12</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>≥10 to &lt;50</td>
<td>8</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>≥50</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Stiffness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Without discomfort</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>With discomfort</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Deviation</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Revision</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 2. Changes in Tip Projection and Nasolabial Angle Before and After the Operation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Preoperation</th>
<th>3 mo</th>
<th>1 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip projection, pixels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>174.98 (20.48)</td>
<td>205.66 (17.25)</td>
<td>197.41 (16.91)</td>
</tr>
<tr>
<td>Female</td>
<td>162.62 (17.46)</td>
<td>194.38 (8.77)</td>
<td>181.06 (12.37)</td>
</tr>
<tr>
<td>Total</td>
<td>171.20 (20.20)</td>
<td>202.22 (15.93)</td>
<td>192.41 (17.27)</td>
</tr>
<tr>
<td>$P$ value</td>
<td>&lt;.001$^a$</td>
<td>&lt;.001$^c$</td>
<td></td>
</tr>
<tr>
<td>Nasolabial angle, degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>92.69 (8.58)</td>
<td>87.10 (7.38)</td>
<td>87.46 (6.45)</td>
</tr>
<tr>
<td>Female</td>
<td>88.54 (6.77)</td>
<td>87.67 (10.23)</td>
<td>89.21 (8.42)</td>
</tr>
<tr>
<td>Total</td>
<td>91.42 (8.20)</td>
<td>87.28 (8.20)</td>
<td>87.99 (7.03)</td>
</tr>
<tr>
<td>$P$ value</td>
<td>.001$^b$</td>
<td>.17</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Values are presented as mean (SD) unless otherwise indicated.

$^b$ The differences between preoperative and postoperative values are statistically significant.

$^c$ The differences between 3 months postoperative and 1 year postoperative values are statistically significant.
Stiffness of the Tip
Of the 20 patients (45.5%) with stiffness of the nasal tip, 12 (27.3%) appeared to have no discomfort and 8 (18.2%) appeared to experience discomfort (Table 3).

Deviation of the Tip
Five patients (11.4%) had deviation of the nasal tip, with 1 patient requiring revision surgery (Table 3).

Infection
Two patients (4.5%) had infection: 1 patient with a contracted nose who had autologous rib cartilage and 1 patient with a short nose who had septic cartilage. Both patients were treated successfully with oral antibiotic therapy (Table 3 and Figure 3).

Revision
Four patients (9.0%) underwent revision surgery. Reasons for revision included a decrease of projection in 2 patients, correction of a nasal obstruction and septal deviation in 1 patient, and dissatisfaction with the cosmetic appearance (nose looked too long) in 1 patient (Figure 4 and Figure 5).

Discussion
Although nasal tip correction procedures comprise an important part of rhinoplasty, they can be problematic because the support structures of the nasal tip may be weak and complex, and disruption of accompanying nasal attachments may cause changes to the shape of the tip, making it difficult to predict the final postoperative shape.1-2 This is especially true for Asian patients, who tend to have thick skin and weak, underdeveloped cartilages. Techniques for nasal tip correction can be limited in this patient population.3

There have been many surgical methods for raising the nasal tip. Although strut and onlay grafts using autologous cartilage have been widely adopted in Asian patients, as the desire for a more prominent nasal tip has increased, these procedures have not been sufficient for nasal tip augmen-
tion. Furthermore, these methods can lead to unnatural-looking results from excessive upward rotation of the nasal tip. In addition, if an onlay graft is used for nasal tip protrusion, it can often result in an unnatural shape since only the tip is being raised, which can result in an abnormal tip to columella ratio.

Many methods have been attempted to sufficiently raise the nasal tip and to overcome these limitations. In 1997, Byrd et al. introduced the SEG as a new surgical method for maintaining the nasal tip. This graft is anchored to the caudal septum in 3 configurations, and it can stably maintain the nasal tip.

Septal extension grafts can provide more reliable tip support for weak alar cartilages, which is common in Asian nasal tips, and therefore is now a standard method for Asian nasal tip surgery. The advantages of an SEG are that it does not over-

Figure 3. Infection in a 20-Year-Old Woman After Tip-Plasty Using a Septal Extension Graft

A, Preoperative view. B, One-month postoperative frontal view: tip was lengthened and projected. C, One-month postoperative basal view shows tip and columellar infection.

Figure 4. Preoperative, 6 Months Postoperative, and 1 Year After Revision Operation in a 26-Year-Old Male Patient With a Deviated Tip After Tip-Plasty Using a Septal Extension Graft

A and D, Preoperative views: crooked nose and depressed tip shown. B and E, Six-month postoperative view: tip was lengthened and projected but with a deviated nose and exaggerated columellar deviation. C and F, One year after revision operation. Columellar and dorsal deviations were corrected.
cation. In such cases, autologous rib cartilage can be considered. However, it is still quite common for young female patients to refuse rib cartilage harvesting because they desire a less invasive procedure or have concerns about chest scarring. In such cases, irradiated homologous costal cartilage, ear cartilage, or Medpore grafts can be a useful alternative. In this study, nasal septal cartilage was used most often (52.3%).

When SEG was not sufficient for nasal tip augmentation, an additional onlay graft was performed for nasal tips that were too tense. Jin and Won emphasized that an SEG and onlay graft are the main surgical methods that should be used for Asian patients. Kang and Ryu stated that an SEG can result in an overly sharp and pointed nasal tip, which can be prevented with a supplemental wide onlay graft, and a smoother look can be achieved by adding soft tissues. In this study, when more projection was desired, 1 or 2 onlay grafts were done after the SEG procedure. An SEG proved very useful for Asian patients with a hump that required major raising of the nasal tip.

Analysis of postoperative patient satisfaction showed that 86.4% of patients were “very satisfied” or “satisfied” with their results, and there were no dissatisfied patients. As such, a high level of satisfaction was observed overall. Stiffness of the nasal tip and a decrease of projection were the most prevalent complications at 45.5% each. Jin and Won reported that stiffness of the nasal tip resulting from an SEG procedure gradually became softer over time. In this study, patients were informed before their operation of the possibility of stiffness of the nasal tip. A decrease of projection can be attributed to the support or anchoring of the cartilage being too weak, excessive tension in the skin and soft tissues, or fracture of cartilage caused by trauma.

This study shows that the SEG technique is useful for increasing tip projection and lengthening the nose. However, a decrease of projection was found at the 1-year follow-up compared with 3 months after the operation. But at the 1-year postoperative follow-up, projection greater than the preoperative state was still maintained, and the nasolabial angle was not changed. When an extension graft is fixated to the caudal septum for lengthening and projection of the nose, the summation force (including the generated reaction force, the postoperative scar contraction force, and gravity) may provide a decrease of projection. So, to maintain tip projection, additional support to the SEG is required. As such, we now prefer supplemental support (a strut graft between the SEG and the anterior nasal spine or posterior septal angle of the caudal septum on the opposite side) in addition to the SEG. This study showed deviation of the tip in 11.4% of patients. External force can shift the cartilage grafts to either side of the caudal septum and subsequently lead to collapse and deviation of the nasal tip or

Figure 5. Preoperative, 12 Months Postoperative, and 6 Months After Revision Operation in a 21-Year-Old Female Patient With Tip-Plasty Using a Septal Extension Graft
failure of nasal elongation. Care should be taken in the case of a deviated nose or caudal septal deviation since the SEG can exaggerate these deviations (Figure 4). In these situations, the septum can be anchored to the anterior nasal spine, with additional cartilage reinforcement, such as a batten graft or a bilateral SEG. When excessive cartilage is harvested, a deviated nasal septum can occur due to the resistance of the nasal tip, with the center of the septum becoming bent; this can be prevented by leaving at least 10 mm of the dorsal and caudal septum. In this study, infection occurred in 2 patients, which we believe may have been due to excessive extension of the nose (contracted nose or short nose) and the difficulty in suturing the soft triangle area. Fortunately, both patients were treated successfully with oral antibiotics. In Asian patients, the mouth is usually protruded and the jaw may be set back in appearance. In such cases, even if the absolute location of the nasal tip is ideal, the nasal tip may appear to be relatively derotated. Generally, lengthening of the nose using an SEG has produced good outcomes. However, for a patient with a retrusive chin, derotation of the nasal tip using an SEG can result in a nose that looks too long and lacks harmony with the overall face (Figure 5).

To prevent these types of complications, the tension of the nasal tip skin needs to be evaluated carefully, and excessive raising of the nasal dorsum and tip should be avoided when there is not a sufficient amount of nasal tip skin. When the cartilage is too weak or unstable, or a deviation is present, care needs to be taken during the operation to prevent deviation or asymmetry, and additional supportive grafts are often needed. To prevent inflammation, the skin and mucous membranes must be sufficiently separated and not overly extended, and the soft-tissue triangle area needs to be properly sutured, which prevents infection and graft extrusion. In these cases, autologous grafting is preferred to minimize the chances of infection. It is advisable that the patient be informed before the operation of the possibility of stiffness at the nasal tip. However, additional cases and ongoing follow-up observations are needed for obtaining optimal results from this surgical technique.

Conclusions

Nasal tip-plasty using an SEG method can result in successful outcomes, and this procedure is very useful for Asian patients. However, care needs to be taken to prevent complications such as hardness, postoperative loss of tip projection, and deviation and infection of the nasal tip.

ARTICLE INFORMATION

Accepted for Publication: September 30, 2013.

Published Online: February 13, 2014.

Author Contributions: Drs Choi and Sykes had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Choi, Javidnia, Sykes.

Acquisition of data: Choi, Kang.

Analysis and interpretation of data: Choi, Sykes.

Drafting of the manuscript: All authors.

Critical revision of the manuscript for important intellectual content: Choi, Javidnia, Sykes.

Statistical analysis: Choi.

Administrative, technical, or material support: Choi, Javidnia, Sykes.

Study supervision: Kang, Sykes.

Conflict of Interest Disclosures: None reported.

REFERENCES


