Hockey-Stick Vertical Dome Division Technique for Overprojected and Broad Nasal Tips

C. W. David Chang, MD; Robert L. Simons, MD

Objectives: To discuss overprojected and broad nasal tips, to overview treatment options, and to relate our experience with the hockey-stick technique.

Design: A retrospective review (1975-2005) was conducted. Patients were selected from a computerized rhinoplasty database of operative cases. The database was used to extract a subset population that had received the hockey-stick tip procedure and had follow-up data for 1 year or more after surgery. Medical records and photographs were also analyzed in this review of results and complications.

Results: The hockey-stick modification of vertical dome division was used in 137 patients (9.9% of the rhinoplasties in the computerized database). Of these, 64 patients had 1 year or more of follow-up. Complications referable to the nasal tip (eg, bossae, persistent tip projection, and alar asymmetry) were seen in 8 patients (13%). Revisions for tip-related problems were performed in 4 patients (6%).

Conclusions: The hockey-stick technique is an effective method for nasal tip deprojection and narrowing via an endonasal approach. The length of follow-up in this patient population allows good long-term evaluation of this technique.


The overprojected nasal tip is a facial characteristic in which a disharmony exists in the anterior projection of the nose from the facial plane. Fundamentally, the diagnosis of overprojection can be made using one of several methods when analyzing the lateral view. According to Goode, a line to the nasal tip drawn perpendicular to a line from the nasion through the alar-facial junction should be 55% to 60% of the dorsal nasal length from the nasion to the tip. Crumley and Lanser describe the ideal nose as one in which the length of a line from the nasion to the vermilion-cutaneous junction of the upper lip compares with the length of a perpendicular from this line to the tip-defining point with a ratio of 0.2833. In a simplification of these mathematical techniques, Simons relates the length of the upper lip (from the subnasale to the labrale superius) as ideally equivalent to the length from the subnasale to the tip.

In addition, the base view of the nose provides another valuable evaluation of nasal harmony. From this view, the nose should ideally have the shape of an equilateral triangle. An overprojected nose, however, will commonly take on the shape of an isosceles triangle from the base view.

The etiology of nasal tip overprojection is multifactorial. A complex interplay exists among the shape of the lower lateral cartilages (LLCs), the quadrangular cartilage, and the nasal spine, all of which may be causative factors in a given patient. A large quadrangular cartilage, as manifested by a convex nasal dorsum or an elongated caudal septum, will project the anterior or posterior septal angle, respectively. The LLCs will, thus, be suspended farther away from the face. An elongated nasal spine provides a taller pedestal from which the medial crural feet are supported, again further projecting the tip. Oversized LLCs with long crura can thrust the tip forward and may even tent the overlying skin to such an extreme that the underlying cartilages themselves can be seen in bas-relief.

The wide, broad tip is a result of poor tip definition, but it may similarly be a result of excessive LLC length in the domes.
Consider the scenario in which an adequately projected nasal tip is wide, with flattened domal regions on the anterior view. In such a case, the portion of the LLC that constitutes the dome is excessive in length. Creating a defined dome high point will redistribute the excessive domal cartilage to either the medial crus, the lateral crus, or both. As a result, the medial and lateral crura are effectively lengthened, accentuating tip projection if no other compensatory maneuvers are performed. A deprojection technique is, therefore, necessary to reestablish harmony.

To effectively deproject the nose, length reduction of overdeveloped anatomical components is required. Although major and minor tip supports can be disrupted using various maneuvers (e.g., complete transfixion incision, lowering of the septal angle, reduction of the nasal spine), often some modification of the LLC is necessary. The hockey-stick approach to cartilage reduction has been a successful tool for correcting the overprojected nasal tip. Described by Brown and McDowell and later reintroduced by Smith, this technique involves vertical dome division and removal of excessive cartilage containing the dome and adjacent medial and lateral crural components to effect a change. We review our experience with this method.

METHODS

A retrospective review (1975-2005) was conducted. Patients were selected via a search of a computerized rhinoplasty database of operative cases performed by the senior author (R.L.S.). The database contains information regarding patient demographics, preoperative analysis, operative techniques, postoperative results, and complications. The medical records of all the patients had been entered into the database without previous consideration given to this study. The database was used to extract a subset population that had received the hockey-stick tip procedure and had follow-up data for 1 year or more after surgery. Medical records and photographs were also analyzed in this review of results and complications.

All the procedures were performed using an endonasal rhinoplasty technique. After the appropriate dorsal profile had been achieved, the LLCs were delivered using a marginal incision combined with an intercartilaginous incision. The natural domal high point was determined by inserting a right angle hook behind the soft-tissue facet, impaling the anatomical apex of the LLC. The cartilage was delivered, cleaned of its overlying soft tissue, and then vertically divided on either side of the apex to resect a variable portion of the medial and lateral crura, generally no more than 2 mm on either side of the apex (Figure 1). Vestibular skin and mucosa were preserved. A 5-0 clear nylon suture was used to bring together the medial crural ends. The suture was placed in a specific manner as previously described. Although in early cases this suture was not always used, it has become standard in the current technique to narrow the tip and prevent the occurrence of bossae.

The hockey-stick modification of vertical dome division was used in 137 patients (approximately 10% of all the rhinoplasties in the computerized database); 64 of these patients had 1 year or more of follow-up (Table 1). Complications referable to the nasal tip were seen in 8 patients (13%). Bossae were noted in 4 patients (6%) (Table 2). We previously observed that predisposing factors to bossae formation include thin skin and widened interdomal distance (tip bifidity). Of these 4 patients, 2 had both contributing factors of thin skin and bifidity. However, in 1 patient, the tip-defining portions of the medial crura were not sutured together. The remaining 2 patients had normal skin, although 1 patient exhibited bifidity preoperatively. The domes were not initially sutured together in this patient. Two patients did not subjectively achieve adequate deprojection of the nasal tip. Alar asymmetries were noted in 2 other patients.

Revisions for tip-related problems were performed in 4 patients (6%). Reasons included the need for further deprojection (2 patients) and the correction of bossae (2 patients). Complications for other parts of the rhinoplasty (dorsal alignment, dorsal symmetry, nasal bone configuration, and others) were not addressed in this study.

### RESULTS

The hockey-stick modification of vertical dome division was used in 137 patients (approximately 10% of all the rhinoplasties in the computerized database); 64 of these patients had 1 year or more of follow-up (Table 1). Complications referable to the nasal tip were seen in 8 patients (13%). Bossae were noted in 4 patients (6%) (Table 2). We previously observed that predisposing factors to bossae formation include thin skin and widened interdomal distance (tip bifidity). Of these 4 patients, 2 had both contributing factors of thin skin and bifidity. However, in 1 patient, the tip-defining portions of the medial crura were not sutured together. The remaining 2 patients had normal skin, although 1 patient exhibited bifidity preoperatively. The domes were not initially sutured together in this patient. Two patients did not subjectively achieve adequate deprojection of the nasal tip. Alar asymmetries were noted in 2 other patients.

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### Table 1. Characteristics of Patients Undergoing Hockey-Stick Vertical Dome Division and at Least 1 Year of Follow-up

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, No. (%)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>9 (14)</td>
</tr>
<tr>
<td>F</td>
<td>54 (84)</td>
</tr>
<tr>
<td>Transgender (M→F)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Primary rhinoplasty, No. (%)</td>
<td>60 (94)</td>
</tr>
<tr>
<td>Revision rhinoplasty, No. (%)</td>
<td>4 (6)</td>
</tr>
<tr>
<td>Age, mean (range), y</td>
<td>31.8 (15-67)</td>
</tr>
<tr>
<td>Follow-up, mean (median) [range], y</td>
<td>4.7 (2) [1-24]</td>
</tr>
</tbody>
</table>

### Table 2. Characteristics of Patients With Bossae Formation

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Skin Thickness</th>
<th>Preoperative Bifidity</th>
<th>Sutured Domes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Thin</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Normal</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Thin</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
The overdeveloped LLCs can be surgically altered in the overprojected nose to improve nasal balance and to deproject the nose. The various surgical maneuvers to modify the LLCs can be categorized into techniques that alter the lateral or medial crura or that involve dome division or truncation.

Shortening of the lateral crus can deproject the nose and induce tip rotation. Webster\(^8\) advocated a lateral crural flap technique to effect controlled retrodisplacement of the tip. Instead of completely removing the cephalic aspect of the lateral crus, delineated by a rim strip incision, Webster preserved a portion of the cartilage as a lateral crural flap to provide better stability to the rim strip. Retrodisplacement could be effected by telescoping the rim strip with the flap or by excising a small portion of the flap to create a void, into which the LLC would telescope. Kridel and Konior\(^9\) would later describe a lateral crural overlay technique that involved vertically cutting the lateral crus at its middle aspect, then overlapping and suturing the cut ends to shorten the total length of the lateral crus.

Medial crura shortening techniques have also been advocated for deprojection. Lipsett\(^10\) advocated splitting the LLC medial to the dome, resecting a length of the cartilage just lateral to the incision, and reshaping the lateral crus remnant using multiple scoring incisions on the cartilage to recreate a new dome. This was performed using a rim incision and a cartilage delivery technique. Modifications of the Lipsett technique by other authors include preserving the underlying vestibular skin, delivering the cartilage with a marginal incision, and morseling the cartilage.\(^11,12\) Guyuron\(^13\) and Spina et al\(^14\) suggested the excision of medial crura foot pods to deproject the nasal tip. Tobias\(^15\) advocated removal of a section of the medial crura while reshaping and binding the lateral crura to secure a stable “A-frame” complex.

To create deprojection of the nasal tip without altering tip rotation, the lateral and medial crura need to be equally shortened. Joseph\(^16\) and Safian\(^17\) described achieving deprojection by excising lateral and medial crura elements. This would be later modified to accommodate an external rhinoplasty technique. Close et al\(^18\) removed a calculated length of the medial and lateral crura. The remnants would be sutured together end to end. Later, Foda\(^19\) and Soliemanzadeh and Kridel\(^20\) combined medial and lateral crura overlay and suturing techniques to effect deprojection.

Vertical dome division continues to be a versatile means of effecting change to the nasal tip. The hockey-stick approach is one technique along the spectrum of vertical division techniques, which include the Goldman procedure and the Simons modification. Herein we demonstrate the hockey-stick modification as a useful technique for 2 main objectives: (1) nasal tip deprojection (Figure 2 and Figure 3) and (2) narrowing the nasal tip in the broad but adequately projected nose (Figure 4). Deprojection is achieved by excising the excessive cartilage comprising the dome and adjacent medial and lateral crural components. By modeling the nasal tip as a tripod, shortening each of the legs (2 legs formed by each lateral crus and the third leg by the combined medial crura) drops the nasal tip closer to the face. The vestibular mucosa beneath the excised dome serves as a scaffold to draw the medial ends of the lateral crus toward the new dome, preventing notching along the caudal aspect of the nostril rim. Tip narrowing is effected by sewing the ends of the medial crura together using a permanent suture. Subtle changes in tip rotation can be effected by selectively resecting more lateral than medial crus to cause increased rotation and vice versa for tip derotation.

Regarding the broad but adequately projected tip, simple incisional or suture shaping techniques are inappropriate. In the broad-tipped nose, the portion of the LLC that comprises the domal region is too generous.
Creating a defined dome high point will redistribute the excessive domal cartilage to the medial crura, the lateral crura, or both. As a result, the medial and lateral crura are effectively lengthened, accentuating tip projection.

However, by using the hockey-stick technique, this excessive region is excised, allowing just the adequate length of the medial and lateral crura to reapprose to form the tip.

Bossae formation was the most frequent complication in this series. To avoid this, we now advocate suturing together the medial crura in almost all patients. In addition to narrowing the tip, this suture also prevents the medial crural ends from splaying apart, a potential cause of bossae. When excising the dome, one must take care to include enough of the lateral crura so as not to allow the lateral crural ends to override the medial crural ends. Although the overlap of lateral crura over medial crura was advocated by Brennan,21 we believe that such a technique may also lead to bossae formation. The use of crushed cartilage placed in the infratip lobule region has been a mainstay when performing a vertical dome division maneuver such as the hockey-stick approach. The cartilage provides a cushion between the overlying thin skin and the tip-defining points of the LLC, minimizing the potential for irregularities or possible bossae formation.

We usually combine the hockey-stick technique with other adjunctive maneuvers to effect final tip deprojection. We begin the endonasal rhinoplasty with a complete and full transfixion incision. This provides access to the nasal spine, which may need to be reduced. The incision also disrupts the membranous septum, a minor tip-supporting mechanism. Other overprojected anatomical structures are addressed appropriately, including the anterior septal angle and the caudal septum. Finally, the LLC is delivered and truncated via the hockey-stick technique to provide the necessary reduction of excessive LLC length and create deprojection. A weak chin can also accentuate an overprojected nasal profile. The addition of a mental implant helps to offset this disharmony, balancing out nasal projection with adequate chin projection (Figure 5).

In conclusion, overprojected and broad nasal tips require deprojecting maneuvers to reestablish proportional harmony to the nose. The hockey-stick vertical dome division technique is suited to reducing the excessively long components of the LLC while reshaping the tip appropriately. The length of follow-up in this patient population allows good long-term evaluation of this technique.

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Correspondence: C. W. David Chang, MD, Department of Otolaryngology–Head and Neck Surgery, University of Missouri, One Hospital Drive, MA 314, Columbia, MO 65212 (changda@health.missouri.edu).

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REFERENCES


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