Cosmetic

Management of the Droopy Tip: A Comparison of Three Alar Cartilage–Modifying Techniques

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The droopy tip is a common nasal deformity in which the tip is inferiorly rotated. Five hundred consecutive rhinoplasty cases were studied to assess the incidence and causes of the droopy tip deformity and to evaluate the role of three alar cartilage–modifying techniques—lateral crural steal, lateral crural overlay, and tongue in groove—in correcting such a deformity. The external rhinoplasty approach was used in all cases. Only one of the three alar cartilage–modifying techniques was used in each case, and the degree of tip rotation and projection was measured both preoperatively and postoperatively. The incidence of droopy tip was 72 percent, and the use of an alar cartilage–modifying technique was required in 85 percent of these cases to achieve the desired degree of rotation. The main causes of droopy tip included inferiorly oriented alar cartilages (85 percent), overdeveloped scrolls of upper lateral cartilages (73 percent), high anterior septal angle (65 percent), and thick skin of the nasal lobule (56 percent).

The lateral crural steal technique increased nasal tip rotation and projection, the lateral crural overlay technique increased tip rotation and decreased tip projection, and the tongue-in-groove technique increased tip rotation without significantly changing the amount of projection. The lateral crural overlay technique resulted in the highest degree of rotation, followed by the lateral crural steal technique, and then the tongue-in-groove technique. According to these results, the lateral crural steal technique is best indicated in cases with droopy underprojected nasal tip, and the tongue-in-groove technique in cases where the droopy nasal tip is associated with an adequate amount of projection. (Plast. Reconstr. Surg. 112: 1408, 2003.)

The nasal tip rotation reflects the position of the nasal tip along an arc with the radius maintained from the facial plane. The degree of rotation is usually evaluated by measuring the nasolabial angle and the tip rotation angle. The droopy nasal tip is a deformity in which the nasal tip is inferiorly rotated, leading to an increase in the length of the nose with contraction of the nasolabial angle. In addition to being cosmetically unattractive, the droopy tip deformity may interfere with the normal nasal functions by restricting the airflow through the nares. This can be demonstrated by the subjective improvement in breathing on manually lifting the droopy tip.

The pathogenesis of the droopy tip may be divided into two groups. The first group has an “abnormal” alar cartilage with excessively long lateral crura, vertically oriented lateral crura with high abutment to the pyriform aperture, or short, weak medial crura. The second group has a “normal” alar cartilage complex that is inferiorly displaced by the effect of extrinsic forces. These may be forces pushing from above, as in the case of long upper lateral cartilages, high anterior septal angle, and overdeveloped caudal septum, or forces pulling from below, as in the case of thick, heavy nasal skin, overactive depressor septi muscle, or the effect of gravity in cases with compromised nasal support as a result of aging or previous operations.

Correction of the droopy tip varies according to the cause of the problem; however, the ultimate goal of any corrective technique is to reposition the alar cartilages to attain a more cephalic orientation. This can be achieved through directly modifying the alar cartilages or by using adjunctive complementary procedures depending on manipulating structures closely related to the alar cartilages. These ad-
junctive procedures include excision of the caudal end of upper lateral cartilages, lowering of the anterior septal angle, and caudal septal cartilage excisions. The aim of such procedures is to eliminate the forces that inferiorly displace the tip, and to create areas of tissue void that allow the tip to travel superiorly during the healing phase. The aim of this study was to investigate the incidence and factors responsible for the droopy tip deformity in one patient population and to evaluate the role of three different alar cartilage-modifying techniques—the lateral crural steal, the lateral crural overlay, and the tongue-in-groove—in the management of this deformity.

**Patients and Methods**

The medical records of 500 consecutive rhinoplasty patients, operated on by the author, were reviewed. All the cases presenting with droopy nasal tip deformity were selected, and their operative reports and the diagrammatic recordings of their intraoperative findings were thoroughly reviewed to detect the main factors responsible for the deformity. An objective assessment was performed for all cases in which the lateral crural steal technique, the lateral crural overlay technique, or the tongue-in-groove technique was used as the only tip-modifying technique, after exclusion of patients in whom any additional technique was adopted that may have altered the nasal tip position. The objective assessment of these patients included the measurement of the degree of nasal tip rotation and projection, both preoperatively and at a minimum of 12 months postoperatively using the computer-imaging method that we described in a previous article, after scanning in the preoperative and postoperative slides of each patient. The standard reference points needed for evaluating tip projection and rotation were all marked. These points included the glabella, the most anterior point of forehead in the midsagittal plane; the nasion, the most posterior point at the root of the nose in the midsagittal plane; the tip, the most projecting point of the nose; the columellar point, the most anterior point of the columella; the subnasale, the junction of the columella and upper lip; the labrale superius, the anterior most point of the upper lip; the pogonion, the most anterior point on the soft-tissue chin; and the alar point, a point on the alar-facial groove where a horizontal line passing through the tip intersects with a vertical line dropped from the nasion.

The nasolabial angle and the rotation angle were measured to evaluate nasal tip rotation. The nasolabial angle was measured at the intercept of the columellar point-to-subnasale line with the subnasale-to-labrale superius line, and the rotation angle was measured at the intercept of the tip-to-columellar point line with a line tangent to the columella. Nasal tip projection was measured using the Goode ratio and the nasofacial angle. The nasofacial angle was measured at the intercept of the glabella-to-pogonion line with the nasion-to-tip line, and the Goode ratio was calculated by dividing the distance between the alar point and the tip by the distance between the nasion and the tip.

At a minimum of 12 months after operation, the nasal tip projection and rotation were reevaluated and compared with their preoperatively recorded values. The paired t test was used to detect any significant difference between the preoperative and postoperative results of each individual technique, and whenever indicated, the one-way analysis of variance (F test) was used to detect significant differences among the three different techniques regarding the mean difference and the mean percent change in the measures of tip rotation and projection.

**Surgical Technique**

The external rhinoplasty approach was used in all patients. The exposure provided by this approach allows direct appraisal of tip cartilages in their natural, undistorted position and permits the alar cartilage-modifying techniques to be conducted in a precise manner under direct vision. An external rhinoplasty incision is used in which bilateral alar marginal incisions are connected by an inverted V-shaped transcolumellar incision. The columellar skin flap is elevated off the medial crura and the skin elevation is continued, in the suprapерichondrial avascular plane, upward over the bony cartilaginous framework until the nasofrontal angle is reached. Excessive subcutaneous fatty tissue, whenever found, is carefully excised, with care taken to not injure the subdermal vascular plexus. Any dorsal modifications needed are made before modification of the tip cartilages to avoid inadvertent disruption of the delicate reconstructed alar cartilages. If the medial crura are found to be weak
and buckled, they are strengthened by splinting them to a strong columellar strut, with care taken to ensure that the strut goes down to the anterior nasal spine and does not extend beyond the posterior half of the columella. This allows increased support and stability of the tip complex without affecting the position of the nasal tip. In patients with wide lateral crura, a conservative lateral crural cephalic trim is performed, leaving a strong intact caudal strip of 5 to 6 mm. At this stage, any projecting caudal ends (scrolls) of upper lateral cartilages are trimmed, to facilitate the upward movement of the tip cartilages by using any of the three alar cartilage-modifying techniques under evaluation.

The choice of the alar cartilage modifying technique used to correct the droopy tip was mainly a clinical decision based on the proper understanding of the surgical dynamics of each technique, the preoperative clinical assessment of nasal tip deformity, and the intraoperative findings related to the alar cartilages' anatomy and orientation.

**Lateral Crural Steal**

In the lateral crural steal technique, the vestibular skin is undermined from the undersurface of the alar cartilages for about 5 mm on each side of the native domes (Fig. 1, center). This allows the lateral crura to be mobilized freely without being tethered by their skin attachments. The lateral crus, on each side, is then advanced medially in a curvilinear fashion onto the medial crus and fixed in its new position using a 5-0 Prolene mattress-type suture. Additional narrowing and refinement are accomplished by bringing the newly created domes together using a 6-0 Prolene transdermal mattress suture (Fig. 1, right).

**Lateral Crural Overlay**

In the lateral crural overlay technique, the midportion of the lateral crus, on each side, is transected by a vertical incision extending from the cephalic to the caudal crural margins (Fig. 2, center). Before the cartilage cut is made, the vestibular skin is elevated from the undersurface of the lateral crus for at least 5 mm on each side of the planned cartilaginous incision. The cut ends of the lateral crura are then overlapped to the desired extent and fixed with 5-0 Prolene, transcartilaginous, mattress-type sutures (Fig. 2, right).

**Tongue in Groove**

In the tongue-in-groove technique, full transfixion incision in the membranous septum is performed, followed by elevation of the mucoperichondrial flaps on both sides of the caudal septum. A pocket is fashioned by retrograde dissection between the medial crura, and the medial crura are advanced upward onto the caudal septum, which fits in the created pocket. Once the desired relationship of the medial crura to the septum is achieved, these structures are fixed in place by a series of 4-0 chromic septocolumellar sutures (Fig. 3, below). Bilateral trimming of any redundant membranous septum is performed before closure of the transfixion incision.

At completion of the nasal tip-modifying technique, the nasal skin is redraped to its normal anatomic position, and the external rhinoplasty incisions are meticulously closed. Careful taping is performed to maintain...
proper positioning of the reconstructed tip complex, and a metal splint is positioned over the nasal dorsum. The splint is removed after 1 week and the nose is retaped for another 5 days to help support the tip while new fibrous attachments are being developed between the skin and the underlying nasal framework.

RESULTS

Of the 500 patients reviewed in this study, 360 (72 percent) had variable degrees of droopy nasal tip. The mean age was 26.5 years with a female-to-male ratio of 2:1. The cause of the droopy tip deformity was studied by correlating the clinical and intraoperative findings in each patient. It was not uncommon to find more than one factor in the same patient contributing to the droopiness of the nasal tip. These factors included inferiorly oriented alar cartilages in 85 percent of cases, overdeveloped scrolls of upper lateral cartilages in 73 percent of cases, high anterior septal angle in 65 percent, and thick heavy skin of the nasal lobule in 56 percent.

In 306 (85 percent) of the patients with droopy nasal tip, an alar cartilage modifying technique was necessary to achieve the desired degree of rotation. The tongue-in-groove technique was used in 143 cases (47 percent), the lateral crural steal technique in 111 cases (36 percent), and the lateral crural overlay in 52 cases (17 percent). The effects of the three alar cartilage-modifying techniques on the degree of nasal tip rotation and projection were evaluated by comparing the preoperative and postoperative values of the nasolabial angle, rotation angle, Goode ratio, and nasofacial angle.

Effects on Nasal Tip Rotation

The lateral crural steal, lateral crural overlay, and tongue-in-groove techniques all resulted in an increase in the degree of nasal tip rotation as evidenced by the significant increase in the postoperative values of both the nasolabial angle and rotation angle (Table I and Fig. 4). The F test was used to detect significant differences among the three techniques regarding the mean difference and the mean percent change in the nasolabial angle and the rotation angle. The analysis showed that the lateral crural overlay technique resulted in significantly more rotation than the lateral crural steal technique, which in turn resulted in significantly more rotation than the tongue-in-groove technique. The F values for mean difference in nasolabial angle and rotation angle and for mean percent change in nasolabial and rotation angles were significant at $p < 0.001$.

Effects on Nasal Tip Projection

The lateral crural steal technique resulted in an increase in tip projection as evidenced by the significant increase in the postoperative values of both the Goode ratio and the nasofacial angle (Table II and Fig. 5), whereas the use of the lateral crural overlay technique was associated with a decrease in nasal tip projection as evidenced by the significant decrease in the postoperative values of Goode ratio and nasofacial angle. Finally, using the tongue-in-groove technique resulted in an insignificant increase in projection.

The degree of projection and rotation was evaluated in a sample of 30 patients (13
tongue-in-groove, 11 lateral crural steal, and six lateral crural overlay recipients) at a minimum of 4 years postoperatively (range, 4 to 7 years). There were no considerable changes from the values recorded at the 1-year follow-up evaluation.

DISCUSSION

The droopy nasal tip is a common nasal deformity. In the current study, the incidence of droopy nasal tip was 72 percent. Essential to the repair of any form of droopy nasal tip is the accurate diagnosis of the underlying anatomic abnormalities contributing to the development of such deformity.

More than one contributing factor was found in most of the patients with severe tip ptosis, but the most constant finding was the inferiorly oriented alar cartilages, which was present in 85 percent of the patients with droopy nasal tip. This was mainly due to long lateral crura, weak buckled medial crura, or vertically oriented lateral crura with a high insertion on the pyriform aperture. Other contributing factors that were frequently found included long upper lateral cartilages with projecting scrolls, high anterior septal angle, and

### TABLE I

Effects of Lateral Crural Overlay, Lateral Crural Steal, and Tongue-in-Groove Techniques on Nasal Tip Rotation

<table>
<thead>
<tr>
<th>Technique</th>
<th>Nasolabial Angle Difference</th>
<th>Rotation Angle Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Lateral crural overlay</td>
<td>11.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Lateral crural steal</td>
<td>8.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Tongue-in-groove</td>
<td>7.1</td>
<td>4.6</td>
</tr>
</tbody>
</table>

* $p < 0.001$.  

![Fig. 3. Schematic diagram of the tongue-in-groove technique: (above) the preoperative relationship of medial crura and caudal septum, and (below) the medial crura advanced onto the caudal septum and sutured to it. Modified from Kridel, R. W. H., Scott, B. A., and Foda, H. M. T. The tongue-in-groove technique in septorhinoplasty: A ten year experience. Arch. Facial Plast. Surg. 1: 246, 1999.](image)

![Fig. 4. Effect of the lateral crural steal (LCS), lateral crural overlay (LCO), and tongue-in-groove (TIG) techniques on the nasal tip rotation, assessed by the change in the mean value of (above) the nasolabial angle (NLA) and (below) the rotation angle (RA). Preoperative, ■; postoperative, □.](image)
thick heavy skin of the nasal lobule. These contributing factors, whenever found, were corrected as the first step in the management of the droopy tip by using adjunctive maneuvers, such as performing a conservative cephalic trim of the lateral crura, excision of the overdeveloped scrolls of upper lateral cartilages, or lowering of the high anterior septal angle. Such adjunctive maneuvers aim at eliminating the extrinsic forces pushing the tip downward, thus allowing the alar cartilages the freedom to move upward, during the healing phase, and to rest in a more cephalic orientation. In the current study, adopting these adjunctive maneuvers alone was sufficient to correct the droopy tip in 15 percent of the patients, most of whom had mild degrees of underrotation. However, in the majority of cases (85 percent), use of an alar cartilage-modifying technique was necessary to achieve the desired degree of nasal tip repositioning.

Three different alar cartilage-modifying techniques were used to correct the droopy nasal tip in the current study. On objectively evaluating the effects that each technique had on the degree of tip projection and rotation (Figs. 4 and 5), it was found that the lateral crural steal technique increased tip projection and rotation, that lateral crural overlay increased tip rotation but decreased tip projection, and that the tongue-in-groove technique increased tip rotation without significantly changing the amount of projection. These results conform very well with the tripod theory, in which the cartilaginous framework of the nasal tip is simulated to a tripod, with two upper legs formed by the lateral crura on each side and one lower leg formed by the conjoined medial crura. According to the tripod analogy, the lateral crural steal technique, which shortens the lateral crura and lengthens the medial crura, should move the tip upward and forward, resulting in an increase in both tip rotation and tip projection. On the other hand, the lateral crural overlay technique, which shortens the lateral crura, should pull the tip upward and backward, leading to an increase in rotation and a decrease in projection. Finally, the tongue-in-groove technique, which moves both alar cartilages (the whole tripod) upward and fixes them to the caudal septum, will move the tip upward, thus increasing the amount of tip rotation. In addition, adopting the tongue-in-groove technique almost eliminated the need for any caudal septal excisions that were described by others as a method of increasing tip rotation. This is due to the fact that in the tongue-in-groove technique, the degree of rotation is controlled by varying the depth and length of the pocket.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Goode Ratio Difference Mean (SD)</th>
<th>Paired t</th>
<th>Nasofacial Angle Difference Mean (SD)</th>
<th>Paired t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral crural overlay (n = 52)</td>
<td>-0.06 (0.03)</td>
<td>-14.4*</td>
<td>14.4*</td>
<td>-21.1*</td>
</tr>
<tr>
<td>Lateral crural steal (n = 111)</td>
<td>0.07 (0.02)</td>
<td>36.9*</td>
<td>3.2</td>
<td>28.1*</td>
</tr>
<tr>
<td>Tongue-in-groove (n = 143)</td>
<td>0.02 (0.04)</td>
<td>6</td>
<td>0.4</td>
<td>5.3</td>
</tr>
</tbody>
</table>

* p < 0.001.
Fig. 6. (Left) Preoperative views of a patient with a broad, droopy, underprojected nasal tip. (Right) Postoperative views of the same patient 3 years after an operation using the lateral crural steal technique, showing increases in nasal tip projection, rotation, and definition. Additional maneuvers included minimal lowering of the nasal dorsum and lateral osteotomies.
FIG. 7. (Left) Preoperative views of a patient with an overprojected droopy nasal tip and a deflected columella due to caudal septal dislocation. (Right) Postoperative views of the patient 18 months after the lateral crural overlay technique was performed to rotate and deproject the nasal tip. Spreader grafts were used to correct nasal valve collapse, and septoplasty was performed to correct the caudal septal dislocation.
Fig. 8. (Left) Preoperative views of a patient showing a broad droopy nasal tip with an adequate amount of projection and hanging columella. (Right) Postoperative views 2 years after using the tongue-in-groove technique, which increased tip rotation without altering tip projection and eliminated the excessive columellar show without trimming the caudal septum. Additional maneuvers included rasping of the bony hump, lateral osteotomies, and septoplasty to correct right-sided nasal deviation.
dissected between the medial crura into which the caudal septum will be fitted.

The reevaluation of a sample of patients at a minimum of 4 years postoperatively showed that the position of the nasal tip was well maintained. We believe that for the repositioned tip to permanently maintain its final position, a strong nasal tip support is essential. Therefore, whenever indicated, the medial crura were sutured together or the posterior two thirds of the medial crura were splinted to a columellar strut that goes down to the anterior nasal spine to increase the strength and stability of the alar cartilage complex. This is of special importance in revision cases with poor tip support and in cases with thick heavy skin of the nasal lobule after thinning out of the skin by direct excision of the excessive subcutaneous tissue, making sure to stop short of the subdermal vascular plexus. The external rhinoplasty approach allowed such a debulking maneuver to be conducted safely under direct vision.

Finally, based on the objective evaluation of the three techniques used in this study, it can be concluded that the lateral crural steal technique is best indicated in cases of droopy underprojected nasal tip (Fig. 6), the lateral crural overlay in cases of droopy overprojected nasal tip (Fig. 7), and the tongue-in-groove technique in cases in which the droopy nasal tip is associated with an adequate amount of projection (Fig. 8).

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