Vertical Lobule Division in Rhinoplasty

Maintaining an Intact Strip

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Objective: To review the indications for, surgical techniques of, and results of vertical lobule division (VLD) of the alar cartilages.

Design: Prospective study of patients assigned to undergo variations of VLD of the lower lateral cartilages.

Setting: Private facial plastic surgery practice in a major university teaching hospital.

Patients: Twenty-four patients who underwent variations of VLD of the lower lateral cartilages with recreation of an intact strip, including 4 patients undergoing revision.

Main Outcome Measures: Postoperative photographs were reviewed for tip projection and rotation, tip symmetry, bossae, knuckles, columnellar position and length, and alar retraction. Patients were polled about their overall satisfaction with nasal aesthetics and degree of subjective nasal obstruction preoperatively and postoperatively.

Results: Vertical lobule division decreased projection in 22 of 22 patients, increased rotation in 12 of 12 patients, decreased rotation in 1 of 2 patients, corrected tip asymmetry in 3 of 4 patients, and shortened a long infratip lobule in 1 patient. Postoperatively, bossae and knuckling developed in 1 patient, and 2 patients demonstrated alar retraction that did not exist preoperatively. One patient undergoing revision noted worsened nasal obstruction not related to VLD.

Conclusions: Vertical lobule division is a reliable, safe technique with predictable outcomes in tip refinement. It allows for preservation of a strong tip complex while adding versatility to tip refinement.

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VERTICAL DIVISION of the lobule (VLD) of the lower lateral cartilages (LLCs) is a useful technique for nasal tip refinement. The division can occur anywhere between the angle (the junction of the medial and lateral crus) and the dome (the most anterior projecting point of the lateral crus). In 1957, Goldman1 first described division of the LLC just lateral to the dome, creating bilateral, symmetrical medial and lateral strips. The medial strips were advanced anteriorly and sewn together to create a strong medial unit, increasing projection and strengthening medial tip support. The now discontinuous lateral strips were allowed to fall away posteriorly (Figure 1). The primary indication for the procedure was to increase projection and rotation. This converted a weak, trapezoidal tip into a strong, pyramidal one. However, the classic Goldman procedure created a discontinuous LLC. Tip irregularities, especially in thin-skinned patients, ensued as wound healing and contracture progressed. These included pinching of the lower third, knuckling, alar notching, and a characteristic “tent-pole” tip. As a result of these potential postoperative sequelae, many surgeons have avoided dividing the alar cartilages altogether.

Over the years, division of the alar cartilages has been expanded to include a new technique, VLD, with different indications and results. The source of potential unwanted sequelae in the Goldman technique lies in the discontinuous LLC. To avoid these problems, VLD approximates the medial and lateral strips to prevent the lateral strip from displacement or malposition. Various manipulations can be made once the cartilage is transected. A portion may be resected or not resected, and the medial and lateral segments may be overlapped or only approximated.

In terms of nomenclature, vertical dome division implies transection of the lateral crura at or lateral to the dome as described by Goldman.2 As noted in an earlier article, we prefer the term vertical lobule division, which is more anatomically correct, as division may occur anywhere along the alar lobule.2

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RESULTS

Twenty-four patients who underwent open septorhinoplasty performed by one of us (M.C.) were included in the study from January 1, 1996, through December 31, 1999. There were 16 women and 8 men (mean age, 30.8 years). Twenty patients underwent primary rhinoplasties and 4 underwent revisions. Twenty patients had bilateral division of the LLC, and 4 had unilateral procedures performed. The reasons for VLD were to decrease projection (n = 22), increase rotation (n = 12), decrease rotation (n = 2), correct tip asymmetries (n = 4), and decrease the length of the infratip lobule (n = 1) (Table 1). Vertical lobule division was used for more than 1 indication in several patients.

All but 1 patient had a columellar strut placed. This was performed after VLD to appreciate best any rotational effects due to the division. Another of us (P.A.A.) prefers to place the columellar strut before VLD to effect the desired rotation. The vestibular skin is widely undermined from the undersurface of the lobule and preserved. The cartilage of the lobule is divided at the appropriate site; resection is rarely required. The lateral segment is then overlapped over the medial segment and repositioned depending on the desired effect. A 6-0 nylon horizontal mattress suture reconstitutes the lobule. Placement of a columellar strut stabilizes the medial crura unit. The cartilage is scored at the desired location of the new dome. An interdomal simple 6-0 nylon suture stabilizes the tip structure (Figure 2).

Critics of traditional LLC division cite tip asymmetries and collapsed external valves. In thin-skinned patients, even slight asymmetries in the final medial cartilage unit may lead to bossae. Cephalic rotation of lateral segments may lead to notching and alar retraction. We believe that maintaining an intact strip of cartilage reduces many of these problems.

TECHNIQUE

Open rhinoplasty is performed for optimal exposure of the cartilaginous complex, which helps to determine the exact nature of the underlying problem and facilitates surgical manipulation. Unlike delivery approaches, the cartilages remain in their native position and are not distorted in any way. Septoplasty, if needed, is performed first. The vestibular skin is widely undermined from the undersurface of the lobule and preserved. The cartilage of the lobule is divided at the appropriate site; resection is rarely required. The lateral segment is then overlapped over the medial segment and repositioned depending on the desired effect. A 6-0 nylon horizontal mattress suture reconstitutes the lobule. Placement of a columellar strut stabilizes the medial crura unit. The cartilage is scored at the desired location of the new dome. An interdomal simple 6-0 nylon suture stabilizes the tip structure (Figure 2).

Constantinides and Adamson previously outlined the surgical technique and modifications used for specific indications. For tip deprojection, the LLCs are transected between the dome and the angle. If cephalic rotation is the goal, division is performed at the dome or just lateral to it. Conversely, if caudal rotation is the desired goal, division is performed at the angle, or the junction of the intermediate crus with the medial crus. In either case, altering the amount of overlap will vary the degree of desired rotation.
fect tip refinement on a strong medial unit. Twenty-three patients underwent excision of the cephalic margin of the lateral crura, and 18 patients had an interdomal suture placed. No tip grafts were placed in any of the patients. Two patients received supratip grafts; 2 patients, bilateral batten alar grafts; and 2 patients, unilateral batten alar grafts.

Outcome measures consisted of blinded assessments of postoperative photographs by 3 of us (M.C., E.S.L., and P.J.M.) (Table 2) and a patient questionnaire (Figure 3). Postoperative photographs were examined for specific factors, including overall nasal projection and rotation, tip symmetry, columnellar position and length, the presence of bossae or knuckles, and alar retraction. They were initially interpreted irrespective of preoperative appearance. In those patients in whom an unintended result occurred, the preoperative pictures were examined for comparison. The mean clinical follow-up lasted 12.2 months, and postoperative photography occurred at a mean of 10.1 months.

Six patients had overprojection after VLD. The surgical goal had been to decrease projection in all of these patients. Projection was graded on a scale of −3 (severe underprojection) to +3 (severe overprojection). All 6 patients preoperatively received a rating of +2 to +3 and postoperatively of +1, so some deprojection was accomplished. Four patients were found to have postoperative overrotation. In 2 of these patients, no rotational changes had been desired. In the third patient, the preoperative goal was to increase rotation, which was accomplished. In the fourth patient, the goal was to decrease rotation, which was not accomplished.

Table 1. Indications and Results for Vertical Lobule Division

<table>
<thead>
<tr>
<th>Indication</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease projection</td>
<td>22</td>
</tr>
<tr>
<td>Increase rotation</td>
<td>12</td>
</tr>
<tr>
<td>Decrease rotation</td>
<td>2</td>
</tr>
<tr>
<td>Correct tip asymmetry</td>
<td>4</td>
</tr>
<tr>
<td>Long infratip lobule</td>
<td>1</td>
</tr>
<tr>
<td>Preoperative Successful Manipulation</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 2. Postoperative Analysis

<table>
<thead>
<tr>
<th>Finding</th>
<th>No. of Patients With</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Postoperative Finding</td>
</tr>
<tr>
<td>Overprojection</td>
<td>6</td>
</tr>
<tr>
<td>Overrotation</td>
<td>4</td>
</tr>
<tr>
<td>Asymmetrical tip</td>
<td>1</td>
</tr>
<tr>
<td>Bossae</td>
<td>1</td>
</tr>
<tr>
<td>Knuckling</td>
<td>1</td>
</tr>
<tr>
<td>Alar retraction</td>
<td>4</td>
</tr>
<tr>
<td>Hanging columnellar position</td>
<td>4</td>
</tr>
<tr>
<td>Shortened columnellar length</td>
<td>11</td>
</tr>
<tr>
<td>Increased nasal obstruction</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 2. Schematic of vertical lobule division, with division between the dome and angle for decreased projection. Overlap of the lateral segment on the medial segment in the shaded area with placement of a columnellar strut, an interdomal suture, scoring of the domes, and cephalic resection of the lower lateral cartilages are seen. A, Lateral view; B, base view.

Figure 3. Sample questionnaire of patient satisfaction.
The columella was hanging in 4 patients. Three of these patients had a hanging columellar position preoperatively. In 1 of these patients, columellar position was improved, and in 2 it remained unchanged. In 11 patients, the ratio of columellar to infratip lobule length was decreased; in 9, the decreased ratio had existed preoperatively and was unchanged postoperatively.

One patient had an asymmetrical tip noted on base view, i.e., one dome was higher than the other. In this revision case, the same finding had existed preoperatively and was improved but not corrected by surgery. Bossae and knuckling developed in 1 patient, and 4 patients had mild alar retraction. In 2 of these 4 patients, the retraction was unchanged from the preoperative appearance. The single patient who had VLD performed to correct a long infratip lobule had adequate shortening postoperatively.

Fourteen of the 24 patients returned the survey. Patients were polled about their overall satisfaction on a scale of 0 to 10 (with 10 indicating the most satisfaction), whether they felt their tip was symmetrical or asymmetrical, and about the degree of subjective nasal obstruction preoperatively and postoperatively. The single patient who had VLD performed to correct a long infratip lobule had adequate shortening postoperatively.

The average rating of overall satisfaction was 7.6. Three patients noted asymmetry of the tip on the questionnaire, but all were found to have symmetry on analysis of postoperative pictures. Two patients circled the tip on the diagram of the nose, but both were not found to have any tip irregularities and in fact had normal projection and rotation. The mean preoperative score for degree of nasal obstruction (0 indicated complete and 10, none) was 4.5, and the mean postoperative score was 8.3. Only 1 patient undergoing revision noted a decrease in subjective nasal obstruction. However, postoperative examination failed to reveal any external valve collapse; breathing improved with support of the upper lateral cartilages.

**COMMENT**

Vertical lobule division accomplished the presurgical goal in most instances. The 2 major indications in our series were tip depreduction followed by increased rotation. Vertical lobule division decreased projection in all cases (**Figure 4**), although 6 patients still had some postoperative overprojection. Increased rotation was achieved in all 12 cases, and overrotation resulted in only 1 of these cases. Decreased rotation was achieved in 1 of 2 patients, and a long infratip lobule was corrected in the 1 patient.

**Figure 4.** Preoperative (A and C) and postoperative (B and D) photographs demonstrating depreduction after vertical lobule division. A and B, Lateral view; C and D, base view.
According to the tripod concept of tip support, equal shortening of all legs of the tripod should achieve tip deprojection without a change in rotation. This can be accomplished by release of the medial crural feet from their septal attachments and an equivalent release of the hinge region (the lateral crural attachment to the lateral alar ligament). We use VLD when these measures are inadequate to achieve the desired result. In those patients in our study with remaining overprojection, more excision or more overlap of the lateral and medial segments may have been needed. Increased rotation is achieved by division of the LLC at the dome or just lateral to it. The amount of rotation may be altered, depending on the amount of overlap.

Kridel and Konior\(^3\) proposed an alternative method for decreasing projection while maintaining rotation. Via an external approach, the vestibular skin is first undermined from the undersurface of the domes. A blunt forceps elevates the overprojected alar complex, and a transdomal suture is placed just posterior to the planned projection tip. The overprojected dome region is then excised. Suturing, as in our technique, provides stabilization and strength and prevents migration of the divided crural margins.\(^3\)

To best summarize our postoperative analysis, we must look at the total number of patients in whom a specific finding existed postoperatively and the number of patients in whom the finding existed preoperatively. For example, a patient may have had alar retraction before surgery that was not worsened after surgery; thus, one cannot necessarily assume a relationship due to VLD.

Vertical lobule division created tip symmetry in 3 of the 4 patients with asymmetrical domes preoperatively (Figure 5) and was unsuccessful in 1 patient undergoing revision. No patient who had symmetrical domes preoperatively ended up with asymmetry postoperatively. Mild alar retraction developed in 2 patients who did not have preoperative alar retraction. A hanging columella developed postoperatively in 1 patient.

Most patients also had a columellar strut and an interdomal suture placed. No patient required a tip graft. Therefore, no underlying irregularity was masked, nor was it necessary to compensate for too much deprojection using a tip graft. We did not compare primary and revision cases because of the small number of cases.

The single patient in whom bossae and knuckling developed had thin skin. Skin type, however, should not enter the decision to perform VLD. Indeed, the new high-lights formed in the tip cartilages by VLD are typically seen better in thin-skinned patients. This same patient had an overprojected, narrow tip preoperatively (Figure 6). Vertical lobule division typically converts a wide trapezoidal tip into a more narrow and refined one. Although deprojection was achieved in this patient, the narrow, pointed tip was not altered.

The normal ratio of the columellar length to infratip lobule length is 2:1. This ratio was reduced in 11 patients based on review of their postoperative photographs, but had been reduced preoperatively in 9 of these. In the other 2 patients, this probably occurred because of division at the angle for enhanced inferior rotation.

Simons\(^4\) proposed that vertical division of the LLC is a conservative approach rather than a radical one. He argued that it is an incisional technique rather than an excisional one (like cephalic trims), the latter being more susceptible to postoperative fibrosis and irregularities. He used a delivery approach after marginal incisions.\(^4\) Brennan\(^5\) similarly reported good results using a closed approach to perform dome-splitting techniques. After delivery, the LLC is transected and the lateral segment sculpted. After undermining of the vestibular skin, the lateral segment is advanced medially into a pocket created above the medial segment. Closure of the marginal incision holds the lateral segment in place.

We prefer an open approach, which enables us to visualize both domes simultaneously in their native positions. Of even more importance is that Brennan\(^5\) and Simons\(^4\) describe techniques that increase projection and leave the LLCs discontinuous. Vertical lobule division, in our experience, always reduces projection and leaves a continuous LLC, which is stronger in the lobule region than preoperatively from the double layer of overlapped cartilage.

Before 1987, Adamson et al\(^6\) performed a cartilage resection and did not overlap the medial and lateral segments after division. After 1987, they changed to an overlap technique before resuturing the lateral and medial segments and found fewer postoperative tip irregularities. The cartilage overlap technique reduced the number of postoperative tip irregularities and the need for revision.

Muti\(^7\) described his reasoning for performing dome division. Contraindications included well-balanced length and positioning of the lateral and medial crura, satisfactory dome curvature, and well-positioned domes in relation to the planned correction, thereby necessitating cephalic trims only. Indications included long lateral crura.
in relation to the medial crura, giving a hooked-nose effect; wide domes (bulbous nose); dome diastases; asymmetrical right and left lateral crura; and extensive surgical correction.

Use of the patient survey in postoperative analysis is helpful for the surgeon to understand how the patient interprets his or her results. The 3 patients who noted tip asymmetries on the questionnaire were found to have symmetrical tips on examination of postoperative photographs. Similarly, the 2 patients who circled the tip on the questionnaire diagram were not found to have any tip irregularities. This underscores the fact that patients and surgeons may see different things when evaluating surgical results. The 2 patients with tip asymmetries on the photographs failed to respond to the questionnaire; therefore, an inverse statement cannot be made. Only 1 patient undergoing revision noted worsening nasal obstruction, likely from internal nasal valve collapse and unrelated to VLD. Overlapping and resuturing increase the strength of the lateral crura, so external nasal valve collapse should not occur.

**CONCLUSIONS**

Vertical lobule division remains a powerful technique when more conservative methods are inadequate. Maintaining intact lateral crura by means of an overlap method maintains the lateral segment in a strengthened position that is less subject to the ensuing forces of scarring and wound contracture. Careful attention must be maintained when reapproximating the lateral and medial segments to accomplish the presurgical goals. With attention, these goals are accomplished with precision and great predictability while minimizing postoperative malformations.

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**REFERENCES**