Graduated Approach to Refinement of the Nasal Lobule

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Objective: To present a graduated approach to refining the nasal lobule (a frequent complaint during consultations for rhinoplasty) based on anatomic features and to discuss the casuistics of this procedure since we began performing it.

Methods: A retrospective evaluation of the medical charts of 1152 patients who underwent rhinoplasty from 2003 to 2006; 641 patients fulfilled the criteria for our study (55.6%). Outcomes were assessed by comparing preoperative and last follow-up photographs and considering the width, symmetry, and contour of the nasal lobule. Cases were allocated into 7 groups: (1) no surgery on nasal tip; (2) interdomal breakup; (3) cephalic trim; (4) domal suture; (5) shield-shaped graft; (6) vertical dome division; and (7) replacement of lower lateral cartilages.

Results: Of the 641 patients enrolled in the study, 435 were women and 206 were men. Mean follow-up period was 1.5 years. An asymmetric tip was present in 28 patients (4.4%), and a persistent width of interdomal space in 34 (5.3%). None presented overnarrowing of interdomal space. Surgical revision rate to enhance refinement of the lobule was 5.6%.

Conclusion: Our graduated approach has shown excellent outcomes, a high rate of patient satisfaction, and a low rate of revision.

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The nasal tip is one of the greatest challenges for the surgeon doing rhinoplasty owing to the wide interethnic and intraethnic anatomic variations of this structure, the complexity of its framework, and the difficulty in predicting its process of scarring. Width of the nasal lobule is a frequent complaint of patients during consultations for rhinoplasty. The shapes of the lower lateral cartilages and the overlying skin and soft tissue envelope (S-STE) are responsible for the width of the tip complex.

Procedures to achieve definition and refinement of the tip have evolved since modern aesthetic rhinoplasty was first reported in Europe in the 1800s. In the beginning, techniques to modify the tip were destructive and disrupted the supporting structures of the nasal tip; they consisted mostly of incising, scoring, crushing, and resecting cartilage. The primary disadvantages with these techniques included loss of projection of the tip, cartilaginous deformities, and an “overoperated” appearance at long-term follow-up. In recent decades, nondestructive techniques for modification of the tip have evolved. These methods achieve the desired aesthetic appearance while maintaining functional support and assuring excellent long-term results.

Of course, each patient has his or her own anatomic makeup and ethnic characteristics, and so the cornerstones of successful rhinoplasty are planning and early decision making. Owing to the multiplicity and complexity of deformities of the nasal tip, no single surgical technique will be sufficient to correct every anatomic presentation of the nasal lobule. Therefore, we present a graduated approach to refining the nasal lobule based on anatomic features. Using this approach, the surgeon can correct more modest deformities in thin-skinned patients using conservative techniques and use more aggressive techniques for more profoundly abnormal deformities of the tip in thick-skinned patients. In addition, we outline the casuistics of this graduated approach and discuss our results since we began using it.

Methods: From January 2003 to December 2006, we performed 1152 rhinoplasties at the Division of Facial Plastic Surgery, Department of Otolaryngology, Medical School, Federal University of Uberlandia. A retrospective evaluation of the charts of all these patients was performed, and 641 (55.6%) fulfilled the criteria for enrollment in the study. The single criterion for inclusion was rhinoplasty with or without sur-
Exclusion criteria were postoperative follow-up of less than 1 year, lack of follow-up data and/or photographs, and/or concurrent facial surgery. All preoperative and postoperative photographs were taken in the same studio and using the same digital camera (Sony CyberShot DSC-F717 [Sony Corporation, Tokyo, Japan] with an F2.0-2.4 lens). Outcomes were assessed by comparing the width of the nasal lobules and their symmetry and contour in preoperative and last follow-up photographs. Other parts of the rhinoplasty (projection and rotation of the tip, nasal base, and middle and upper thirds of the nose) were not addressed in the present study.

Office notes from the most recent visit were reviewed to determine patients' satisfaction with the refinement of the lobules. Complications and rates of revision were also recorded. Ethical approval was obtained from the University's committee on ethics.

Cases were allocated into the following 7 groups based on the surgical technique used: group 1, no surgery on the nasal tip; group 2, interdomal breakup; group 3, cephalic trim; group 4, domal suture; group 5, shield-shaped graft; group 6, vertical dome division; and group 7, replacement of lower lateral cartilages.

**GROUP 1: NO SURGERY ON THE NASAL TIP**

In this group, no surgery was performed on the nasal tip because the patients had a well-defined tip for which no refinement was necessary. Thus, only intercartilaginous and (hemi) transfixional incisions were performed. Caudal septal reduction, reduction of a dorsal hump, and osteotomies were performed as indicated.

**GROUP 2: INTERDOMAL BREAKUP**

This group comprised thin-skinned patients with slightly divergent tip-defining points (30°-35°). We used iris scissors to make an intercartilaginous incision to break up the fibroareolar tissues between the domes, and this promoted discrete contraction of scars that pulled the domes together and refined the lobule (Figure 1). Bulbosity of the tip was a contraindication for this technique.

**GROUP 3: CEPHALIC TRIM**

We used cephalic trim when the only alteration needed was removal of the cephalic margins of the lateral crura. It was indicated when there was nearly normal intercrural distance and/or slight bulbosity. It was contraindicated in asymmetrical domes and thick-skinned patients. The main goal was to reduce the cephalic margins of the lateral crura to create a better-defined lobule with a supratip break. The cartilage-splitting approach was chosen to perform cephalic trim of the lower lateral cartilages in all of these patients, although retrograde (cartilage-
inversion), delivery, and open approaches are also acceptable for performing it.

Before making the incision, we drew anatomic landmarks (the lower lateral cartilages, each nasal tip-defining point, and placement of the incision). A needle-guided technique was used to match the topography of the nasal surface with its endonasal anatomic counterpart. Using a sharp, double-pronged retractor in the surgeon’s nondominant hand to evert the caudal edge of the alar rim, a cartilage-splitting incision was carried from medial to lateral, starting at the anterior end of the (hemi)transfixional incision. The skin was elevated off the cartilage to its junction with the upper lateral cartilage so that the amount of exposed cartilage could be compared bilaterally. The cartilage was then transected at the same level on each side, and the cephalic segment was separated from the overlying soft tissues and removed (Figure 2). This resection of the cephalic margins eliminated abutment of cephalic margins and allowed tip-defining points to move medially.

GROUP 4: DOMAL SUTURE

Suturing techniques were indicated for patients who needed the curvature of the lower lateral crus altered. This anatomic structure is responsible for a bulbous, balled, boxy, or asymmetrical tip. Patients chosen for domal suture had a tip with an increased angle of divergence (≥ 30°) and/or a widened crural dome arch (≥ 4 mm). Domal suture was the main technique for promoting refinement of the nasal lobule in thin-skinned and normal-skinned patients. It was contraindicated as an isolated procedure in thick-skinned patients; in those who were to receive secondary rhinoplasty with overresected cartilages; and in those receiving nasal repairs associated with cleft lip.

The domal suture procedure included trimming the upper border of the lateral crura of the lower lateral cartilages so as to leave a ring of at least 5 mm medially and 7 mm laterally; placing a transdomal double-transfixional suture (polyglactin 5-0) 2 to 3 mm from the level of the dome such that the knot was on the medial side of the dome; placing a posterior interdomal suture (polyglactin 5-0) between the cephalic edges 2 mm from the domes; and placing an anterior suture (polyglactin 5-0) in the middle crura 6 to 8 mm from the domes with an intercrural interposition of a columellar strut (Figure 3).

GROUP 5: SHIELD-SHAPED GRAFT

Criteria for the shield-shaped graft included those of group 4 but in patients for whom suturing techniques alone would not promote enough refinement and definition owing to thickness of the skin. Therefore, an association of suturing techniques and tip-grafting was demanded. An extended shield-shaped graft was placed anterior to the caudal edges of the middle crura, extending to the tip anteriorly and to the medial crura posteriorly. This graft provided further refinement of the tip and contouring of the infratip lobule. The graft was preferably harvested from the nasal septum and sculpted to 16 to 18 mm long and 6 to 8 mm wide in the larger superior portion and 2 to 3 mm wide in the inferior portion. To promote a symmetrical and stable fixation, 1 first suture (polyglactin 5-0) was used to attach the superior portion of the graft to the domes and an-
other 2 interrupted sutures were used to hold the graft and the medial crura together (Figure 4).10

GROUP 6: VERTICAL DOME DIVISION

Vertical division of the domes was selected for more complicated cases that required greater changes to effect refinement of the lobule than those achieved using the previous techniques. African American patients with Fitzpatrick skin type V or VI and with broad and amorphous noses were the best candidates for this technique.

The dome was sharply divided 4 to 5 mm lateral to the apex, with careful attention to cutting through cartilage only, leaving the underlying vestibular mucosa and skin intact. Vertical division in this manner disrupted the contour of the dome and allowed the new medial segment to straighten and spring anteriorly. The remaining medial crural segments were then reapproximated and fixed with suture. Middle and posterior aspects of both medial crura were sewn together using 2 additional polyglactin 5-0 horizontal mattress sutures.11 A columellar strut and an extended shield graft were added to provide additional structural support for increased definition and support of the tip (Figure 5).12

GROUP 7: REPLACEMENT OF LOWER LATERAL CARTILAGE

Lower lateral cartilage replacement was used in cases for which use of the previous techniques alone was not suitable. These were generally secondary rhinoplasty cases with overresected cartilages, nasal deformities associated with cleft lip, and/or destructive nasal disorders such as cancer, trauma, and/or granulomatous diseases (eg, leprosy or leishmaniasis). In these patients, principles of nasal reconstruction were followed. Advanced grafts to reconstruct the framework were necessary. Alar batten grafts13 or seagull wing grafts14 were selected to replace lower lateral cartilages. In some cases, the internal lining and skin also needed repair.

RESULTS

Of the 641 patients in this study, 435 (67.8%) were women and 206 (32.2%) were men. The mean (SD) age at the time of surgery was 25.2 (8.9) years (age range, 16-55 years). The mean follow-up period was 1.5 years (follow-up range, 1-4 years).

Table 1. Postoperative Outcomes Detailed for Each Group of Interventions

<table>
<thead>
<tr>
<th>Group</th>
<th>Patients, No.</th>
<th>Tip Asymmetry</th>
<th>Persistent Width</th>
<th>Overly Narrow</th>
<th>Tip Revision</th>
<th>Patient Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67 (100)</td>
</tr>
<tr>
<td>2</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>32 (100)</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>2 (3.9)</td>
<td>2 (3.9)</td>
<td>0</td>
<td>2 (3.9)</td>
<td>50 (98.3)</td>
</tr>
<tr>
<td>4</td>
<td>269</td>
<td>12 (4.5)</td>
<td>15 (5.6)</td>
<td>0</td>
<td>16 (5.9)</td>
<td>257 (95.5)</td>
</tr>
<tr>
<td>5</td>
<td>115</td>
<td>6 (5.2)</td>
<td>8 (7.0)</td>
<td>0</td>
<td>8 (7.0)</td>
<td>109 (94.8)</td>
</tr>
<tr>
<td>6</td>
<td>76</td>
<td>4 (5.3)</td>
<td>6 (7.9)</td>
<td>0</td>
<td>6 (7.9)</td>
<td>71 (93.4)</td>
</tr>
<tr>
<td>7</td>
<td>31</td>
<td>4 (12.9)</td>
<td>3 (9.7)</td>
<td>0</td>
<td>4 (12.9)</td>
<td>27 (87.1)</td>
</tr>
<tr>
<td>Total</td>
<td>641</td>
<td>28 (4.4)</td>
<td>34 (5.3)</td>
<td>0</td>
<td>37 (5.6)</td>
<td>613 (95.6)</td>
</tr>
</tbody>
</table>

a Unless otherwise noted, data are reported as number (percentage) of patients.
Outcomes of refinements of the nasal lobule were measured by comparing preoperative photographs with the most recent follow-up photographs (following any revision). Asymmetry of the tip was present in 28 patients (4.4%). Persistent width of the interdomal space was found in 34 (5.3%). No patient presented overnarrowing of the interdomal space. The combined rate of revision to enhance refinements of the tip for all patients was 5.6%. Outcomes of other parts of the rhinoplasty (projection and rotation of the tip, nasal base, and middle and upper thirds of the nose) were not addressed in the present study. The overall rate of patient satisfaction (gleaned from the last office note after any revision) was 95.6%. A stratified evaluation for each group is detailed in Table 1.

**COMMENT**

The nasal tip is the most challenging part of a rhinoplasty. The complexity of its framework (cartilaginous elements of varying shapes set in an “antigravity” position, deficient blood supply carried by terminal branches, thickness of overlying skin that depends on ethnicity, and impact of surgical maneuvers on tip support) makes the final shape of the tip difficult to predict.

Thick skin will prevent any extensive work on the underlying framework from being seen on the surface, while thin skin will show any small surgical defect left by the surgeon. Excessive resection of tissue over the lateral crura of the lower lateral cartilages may cause an external valve collapse in later years. Scarring over thick skin will cause a surgically thinned tip to widen again. Characteristics of the patient’s anatomy and of the surgical technique can be reflected in long-term changes.

The nasal lobule is a complex 3-dimensional shape of great visual importance. Most important, an uninterrupted arch should be visible when the nose is viewed from the base, with a subtle shadow cephalad to that arch. The lateral crura should be flat, and the aesthetic line of...
the brow-tip should exhibit a gentle curve. Structures responsible for refinement of the nasal lobule include the skin, subcutaneous tissue (including the nasal superficial muscular aponeurotic system, ligaments, and fat), and individual crura (for both shape and direction).15

To achieve refinement of the nasal lobule, every surgeon must practice the principles of skeletal conservation, repositioning of cartilage, and highly precise surgical technique. Due to anatomic variations, especially of the lower lateral cartilages and the overlying S-STE, different techniques are described to refine the nasal lobule. Although rhinoplasty is one of the most challenging procedures in facial plastic surgery, it can be made less intimidating and can have better postoperative outcomes by using a systematic approach to preoperative planning.16 We herein describe a graduated approach to refinement of nasal lobule, progressing from simple to complex repair, depending on the anatomic diagnosis. We have shown that this graduated approach has excellent outcomes and a high rate of patient satisfaction with low rates of revision.

In patients in group 1, no surgery on the nasal tip was necessary, so patient satisfaction was 100% (Figure 6). In group 2, patients presented with only a slight divergence of the domes that could be corrected with interdomal breakup, so again there was 100% satisfaction (Figure 7). Patients in group 3 needed cephalic trim of the lower lateral cartilages for refinement of their nasal lobules, which could be performed through a cartilage-splitting approach; they had a high rate of satisfaction (98.3%) (Figure 8). Patients in these 3 groups presented with the classic leptorrhine nose: excellent medial and lateral support, long and strong medial crura that spanned the length of the columella, and adequate length

Figure 8. An 18-year-old thin-skinned woman presented with nearly normal intercrural distance, slight bulbosity, underrotation, wide bony pyramid, and dorsal convexity (A-C). During the operation, cephalic trimming of the lateral crura via a cartilage-splitting approach, caudal septal reduction, reduction of the dorsal hump, and lateral osteotomies were performed. Eighteen months postoperatively (D-F), reduction of the cephalic margins of the lateral crura created a better-defined lobule with a supratip break and allowed tip-defining points to move. There was a straight dorsum and good rotation and projection of the tip.

Figure 9. A 31-year-old normal-skinned woman presented with a boxy nose tip, increased angle of divergence, widened crural dome arch, asymmetric nostrils, a deviated nose, and dorsal convexity (A-C). Marginal and intercartilaginous incisions were made to deliver the tip. After cephalic trimming of the lateral crura, transdomal, interdomal, and columella-septal sutures were applied with interposition of an intercrural columellar strut. Also, placement of bilateral alar rim grafts, septrhoplasty, reduction of the dorsal hump, and medial and lateral osteotomies were performed. Sixteen months postoperatively (D-F), there was improvement in bulbosity of the tip and dorsal aesthetic lines, with a straight nose and symmetric nostrils.
of the nasal spine. Thus, good tip support was present, and no loss of tip projection was expected postoperatively. These patients (23.4% in this study) are not common in our practice owing to the ethnic diversity of the area’s population; more often, our patients want us to address excess tip width, and more sophisticated refinement of the nasal lobules is necessary.

In patients in group 4, the underlying lower lateral cartilages had an abnormally large angle of divergence between the medial or intermediate crura. The accepted angle of divergence is up to 30°. The acceptable interdomal width, between tip-defining points, is up to 4 mm. Suturing techniques to address this problem have been described since early in the 20th century. In 1931, Joseph described the first direct interdomal suture reported in the literature, sutures to treat the “boxy undefined tip” and other tip deformities. In 1985, McCollough and English described their “double dome” method to increase definition and projection of the nasal tip, which used a horizontal mattress suture through a morcellized pair of domes, including all 4 crura in 1 suture. Tardy and Cheng modified their technique in 1987 by excising the interdomal soft tissue and positioning the knot medially in the interdomal space. We have used the technique described by Pedroza and achieved a high rate of patient satisfaction (95.5%) (Figure 9).

In group 5, weakness of the lower lateral cartilages and thickness of the skin required use of an extended shield...
graft to achieve refinement of the lobule. The use of skeletal repositioning maneuvers like dome-suturing techniques is insufficient to achieve long-term satisfactory results. We prefer to stretch out the skin by augmenting the overall nose to the upper limits of normal.

Cartilage grafts then press against the skin to provide the best possible refinement. The precise placement of an extended shield graft, extending from the base of the columella to the domes, has provided a high rate of patient satisfaction (94.8%) (Figure 10).

Group 6 was composed primarily of thick-skinned African American patients. The use of vertical dome division was an excellent technique to refine the nasal tip in these patients, as we have reported elsewhere. In the present study, patient satisfaction was 93.4%, which we consider extremely high for this challenging nose (Figure 11). The main drawbacks of the dome-dividing technique (overnarrowing, nasal pinch, and valvular insufficiency) were virtually nonexistent in this kind of patient and should not be a concern to the surgeon.

On the other hand, the thicker the skin, the more patience it requires to achieve the final result because the tip retains some edema for years after surgery.

In group 7, previous surgery or congenital malformations were the main causes of overresection or absence of the lower lateral cartilages. Alar batten grafts or

| Table 2. Division Into Groups on the Basis of Anatomic Features With Proposed Techniques to Refine the Nasal Lobule |
|---|---|---|---|
| Group | Anatomic Features | Selected Technique for Refinement | Techniques Usually Associated |
| 1 | Satisfactory refinement of the nasal lobule | None | Caudal septal reduction, dorsal hump reduction, lateral osteotomies |
| 2 | Slightly divergent tip-defining points and thin skin | Interdomal breakup | Caudal septal reduction, dorsal hump reduction, lateral osteotomies |
| 3 | Nearly normal intercrural distance, slight bulbosity, and thin skin | Cephalic trim of LLC | Caudal septal reduction, dorsal hump reduction, lateral osteotomies |
| 4 | Box, balled, bulbous, or asymmetrical tip, increased angle of divergence and/or widened crural dome arch, and thin or normal skin | Domal suture | Lateral crural steal, intercrural columellar strut, alar rim grafts, dorsal hump reduction, lateral osteotomies |
| 5 | Box, balled, bulbous, or asymmetrical tip, increased angle of divergence and/or widened crural dome arch, and thick skin | Shield-shaped graft | Lateral crural steal, intercrural columellar strut, alar rim grafts, dorsal augmentation, lateral osteotomies |
| 6 | Broad and amorphous tip, African American, Fitzpatrick skin type V or VI, thick skin | Vertical dome division | Caudal extension graft, shield-shaped graft, alar rim grafts, dorsal augmentation, lateral osteotomies |
| 7 | Overresected or weak LLC, (secondary rhinoplasty, cleft lip nasal deformity, cancer, trauma, and/or granulomatous diseases) | Replacement of LLC (alar batten or seagull wing grafts) | Caudal extension graft, spreader grafts, alar rim grafts, dorsal augmentation, lateral and medial osteotomies |

Abbreviation: LLC, lower lateral cartilages.
seagull wing grafts\textsuperscript{14} were the preferred methods for re-
placing these cartilages and refining the lobule. A satis-
faction rate of 87.1\% was considered fair owing to the
difficulty of these operations (Figure 12).

Overall, a patient satisfaction rate of 95.6\% and a re-
vision rate of 5.6\% were considered excellent results for
refinement of the nasal lobules. Other aesthetic features of
the nose like rotation and projection of the tip, alar
base, and upper and middle thirds were not considered
in the present study. Obviously, a thorough evaluation of
the other parts of the rhinoplasty would present other
complications and other causes of revision.

We created this graduated approach because in more
than 70\% of our patients, the main complaint is exces-
sive width of the nasal lobule.\textsuperscript{3} Thus, a systematic ap-
proach was necessary both to assist us in choosing the
appropriate technique for our patients and to teach resi-
dents and fellows (Table 2). We consider it as only the
initial step of preoperative planning for a rhinoplasty. Af-
ter defining which group each patient belongs to, other
techniques should be selected to correct other defor-
mities. For example, in group 4, we usually add a lateral
crural steal to rotate the nasal tip. In group 5, we gen-
ernally place an extended shield graft over the domes to
project the tip. In group 6, it is usually necessary to use
a conchal autograft to increase the nasal dorsum and to
reset the alar base. Associated lateral crura spanning su-
tures,\textsuperscript{16} alar strut grafts,\textsuperscript{21} and alar contouring grafts\textsuperscript{22} are
useful, especially in a vertically oriented\textsuperscript{23} or exces-
sively convex lateral crus.\textsuperscript{3}

The option of selecting closed, delivery, or transcolu-
mellar approaches should be at the preference of the sur-
gon. For example, in group 3 we can perform the ce-
phalic trim through retrograde (cartilage inverting),
delivery, or open approaches, with the same outcomes.
In group 4, domal suture has been reported as a reliable
method of refinement of nasal lobules either through
closed\textsuperscript{15,19} or open\textsuperscript{4,5,10} approaches. Finally, we emphasize the importance of thickness of
the skin when choosing the appropriate technique to
achieve refinement of the nasal lobule. We consider the
greatest pitfall in surgery on the nasal tip to be neglect-
ing the evaluation of the nasal S-STE.

In conclusion, refinement of the nasal lobule can be per-
formed with predictable outcomes, as demonstrated here.
Surgical maneuvers should be selected on the basis of ana-
tomic features, especially the lower lateral cartilages and
the S-STE. The graduated approach we present has shown
excellent outcomes and a high rate of patient satisfac-
tion with a low rate of revision. We expect that this gradu-
ated approach will assist students of rhinoplasty in devising
an operative course and formulating a systematic approach
to refinement of the nasal lobule.

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