Alar Soft-Tissue Techniques in Rhinoplasty

Algorithmic Approach, Quantifiable Guidelines, and Scar Outcomes From a Single Surgeon Experience

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Objectives: To describe various techniques, including alar base reduction, alar flaring reduction, and alar hooding reduction and present a decision-making treatment algorithm and quantifiable guidelines for soft-tissue excision, along with scar outcomes from a single-surgeon practice. The soft tissue of the nasal tip, ala, and nostrils is important in overall nasal tip dynamics. Excisional alar contouring is an essential part of many successful cosmetic rhinoplasty outcomes.

Methods: The various soft-tissue excision techniques are described in detail and an algorithm is provided. Quantitative analysis of excision parameters was performed using statistical analysis. Finally, qualitative scar analysis was performed and scar outcomes were statistically derived.

Results: Seventy-four patients were female and 26 were male. Of the procedures reviewed, 47% involved alar soft-tissue excision. Alar base reduction was performed in 46 patients (46%). Alar flare reduction was performed in 16 patients (16%). Alar hooding reduction was performed in 2 patients (2%). Mean scar outcome scores ranged from 0.55 to 0.69.

Conclusions: Alar soft-tissue techniques are often necessary to achieve a balanced outcome and superior results when performing rhinoplasty surgery. Therefore, they should be an integral part of every rhinoplasty evaluation and surgical plan as indicated.

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Attaining consistently superior results in rhinoplasty involves a combination of artistry, psychology, science, and philosophy. Surgically, superior rhinoplasty results are usually measured in millimeters. The human brain is incredibly adept at processing a substantial amount of information in fractions of seconds, enabling it to discern millimeters of difference when analyzing facial harmony. This concept is especially evident when it comes to alar soft-tissue sculpting.

The soft tissues of the nasal tip, ala, and nostrils are an integral part of the overall complexity of rhinoplasty surgery and should be evaluated as part of every rhinoplasty consult and plan. Awareness of alar soft-tissue excision principles in conjunction with operative experience will result in more favorable long-term appearance and heightened patient satisfaction. The primary aims of operating on the alar soft-tissues should be to achieve an aesthetic balance and natural appearance, maintain natural borders, and prevent revision surgery. In addition, these aims must be achieved in combination with acceptable scarring.

The current literature is lacking a comprehensive article detailing analysis and description of soft-tissue excision techniques in conjunction with useable guidelines and scar analysis to support the use of these techniques. To that end, this article will provide the rhinoplasty surgeon with the tools necessary to perform alar soft-tissue manipulations, including detailed descriptions of techniques, an algorithm for evaluation and treatment, and data from single-surgeon experience to provide resection guidelines. In addition, we demonstrate that alar soft-tissue excision techniques can be executed easily with excellent scar outcomes. Ultimately, alar soft-tissue excision offers the potential to transform a good result into an exceptional result, which in turn will ensure overall facial harmony and a satisfied patient.

METHODS

PART 1: SURGICAL TECHNIQUES

Excessive width of the lower third of the nose may be apparent on preoperative examination or may become apparent only after intra-
operative manipulation of the nasal tip. Examples of the ideal nose parameters on anteroposterior (AP) and basal views are seen in Figure 1. Width of the lower third of the nasal tip can be an absolute value or a relative perceptive value depending on the size of the nasal tip (the reverse may also be true). For example, excessively narrowing the columellar-alar base distance may give the appearance of a wide or bulky tip. Therefore, consideration of this concept is necessary to achieve the appropriate balance. The standard of keeping the width of the nose within the intercanthal distance should be used as a guideline, as opposed to a fixed criterion, not only for the aforementioned reasons, but also because of confounding variables such as ethnic differences and patient preference.1

Wide Lower-Third (Increased Columellar-Alar Base Distance)–Alar Base Reduction

As described by Sheen,2 there are 2 surfaces to the ala that affect to a varying degree the width and contour of the alar base. It is essential to understand that there is a cutaneous surface of the ala and a vestibular surface. If these 2 surfaces are considered independently, maintaining or narrowing the width of alar base and maintaining or narrowing the nostril size can be separately well controlled. We prefer to use the terms external alar base reduction and internal alar base reduction to differentiate the 2 different surface reductions. External alar base reduction is performed to reduce the columellar-alar base distance, thereby reducing the apparent width of the lower third of the nose on AP and basal views. Internal alar base reduction is performed to narrow the nostril circumference (vestibular surface).

The first step in planning an alar base reduction is deciding whether to perform an external base reduction, internal base reduction, or both. If the columellar-alar base distance (and therefore the width of the lower third of the nose) is within the normal range, then a decision needs to be made whether the nostril diameter needs to be decreased to reduce nostril width and vice versa (Figure 2). This analysis should be performed with the nose completely closed when using the open approach.

Alar base reduction is best performed in the nasal sill. It is vitally important not to disrupt the natural curve of the alar base. Excisions carried out too far laterally along the natural curve of the ala may result in an unnatural curve, a notch, or unnatural insertion of the alar base (Figure 3). If only an external reduction is planned to reduce the columellar-alar width, the appropriate estimation of resection is planned and marked along the upper and lower portion of the nasal sill and the excision is performed (Figure 4). The excision is wide at the bottom of the sill and tapered in an “inverted V” pattern to address only the external reduction (Figure 5A) without changing the circumference of the nostril. In most cases of alar base reduction, we believe it necessary to create a true advancement-rotation flap of the entire alar base to prevent notching, allow for a more natural curve, and reduce tension along the suture line, thereby optimizing scar outcome. Exceptions include patients with an obtuse alar-check junction, patients with a predisposition to poor scarring, and patients with limited isolated internal base reduction. The incision along the alar base is carried up to a line drawn halfway between the nasal alar base and the alar groove marking the extent of the superior incision in order to prevent blood supply compromise to the nasal tip and superior columellar flap.1-4

With the rotation-advancement flap closure effected with a single suture, alar flaring assessment can then be performed. If necessary, an alar flare reduction is performed (detailed in the “Excessive Alar Flare: Alar Flare Reduction” subsection). The wounds are then completely closed with 6-0 nylon sutures. Rarely, a V-Y closure may become necessary (Figure 5B). Eversion of the skin closure is critical to ensure adequate scarring. No deep sutures are necessary. Most of the cutaneous sutures are removed on postoperative day 4, with the exception of the central sill suture and the more cephalad sutures on the inner portion of the sill, which are left in for 6 days. Sterile skin closure strips (Steri-Strips; 3M, St Paul, Minnesota) are placed for an additional 4 days once the sutures are out.

Large Nostril, Asymmetric Nostrils: Internal Alar Base Reduction

Reduction of the circumference of the nostril to attain a more aesthetic shape or size and to improve symmetry between the nostrils (internal alar base reduction) is carried out along the vestibular surface of the nasal sill. The surgical steps to carry out the internal alar base reduction are the same as for external alar base reduction (detailed in the preceding subsection) with one critical difference—the sill excision in this case is wide at the top of the sill and tapered in a “V” pattern to address only the internal reduction (Figure 5C) without changing the columellar-alar base distance.

If both internal and external alar base reductions are deemed necessary, the appropriate amount of resection is marked at the top of the sill and at the bottom, and these marks are connected to define the total area of excision (Figure 5D). The remainder of the surgical steps are then identical to those detailed in the preceding subsection.
Excessive Alar Flare: Alar Flare Reduction

Once the alar base reduction has been performed and the alar base flap has been advanced medially and held securely with 1 suture, a determination can be made as to whether an alar flare reduction is necessary. Alar flare is best analyzed on the basal view (Figure 6A). Ideally, the alae should be relatively straight as they travel from the tip to the alar base. Alar flaring is seen when the lateral aspect of the ala extends significantly beyond the alar-facial groove. If the alae are excessively flared, or convex on the lateral side, they can be made straighter by shortening the distance from the tip to the alar base. It is very common to see alar flare when the nose has been deprojected (Figure 6B). Therefore, special attention should be paid to possible alar flare reduction whenever the nose has been significantly deprojected.

If alar flare reduction is indicated, the amount of resection is planned (Figure 5E), marked, and excised (Figure 7). The sequence of alar flare analysis after alar base reduction makes sense because the alar base has been set and the majority of the dissection has already been carried out. Correction at this point requires only the excision to shorten the tip–alar base distance. This resection can also be carried out in the absence of alar base reduction if necessary. In that case, the same excision pattern is used without extending the incision medially into the nasal sill. Once the resection is performed, the incisions are completely closed with 6-0 nylon sutures. Now that the columellar-alar distances and tip–alar base distances are set, an analysis of alar hooding can be carried out.

Excessive Alar Hooding: Alar Hooding Reduction

Alar hooding is best analyzed from the direct lateral view and is seen when the most caudal curve of the ala hangs excessively low, either from excessive bulk of the ala or from an excessively caudal alar insertion, thus “hooding” over the columella and obscuring it from view. This deformity can be diagnosed by using the assessment originally described by Gunter et al., in which a line is drawn through the center of the long axis of the perceptible nostril on lateral view. If the alar rim is within 1.5 to 2.0 mm of this line, then the alar position is acceptable. If this distance is shorter, a hanging or hooding ala is present and reduction should be considered. The relative amount of hooding can change depending on the amount of columellar show. However, an absolute analysis is more accurate when deciding whether to reduce bulk of the ala on lateral view.

If indicated, the resection is planned using a direct lateral view. The visual border of the ideal alar curve is marked (Figure 8). An ellipse is drawn on the inner portion of the ala that matches the outer visual border. This incision should be planned carefully and should curve gently to avoid distortion of the nasal ala (Figure 5F). Following the excision, the wound is closed with a running 6-0 nylon suture along the most caudal aspect of the alae. The suture line falls along the visual border, in a natural plane, and we have not found healing along this line to be a problem, even in Asian and African American patients. Sutures are removed on postoperative day 4.
Algorithm

An algorithm is provided to show an overview of the aforementioned sequence of procedures (Figure 9). This algorithm should simplify the decision-making process, since the surgeon can sequentially determine the need for each step and then apply the surgical technique for each indicated procedure.

PART 2: QUANTITATIVE ALAR SOFT-TISSUE EXCISION DATA COLLECTION AND ANALYSIS

Soft-tissue excision data were collected for 100 consecutive rhinoplasty patients from August 2006 to January 2008. All patients were more than 1 year out from surgery. Data collected for analysis included sex, whether soft-tissue excision...
was performed, and if so, numerical values of soft-tissue excision (in millimeters) for alar base reduction (both internal and external), alar flare reduction, and hooding resection. These data were recorded on a worksheet (Excel; Microsoft Corp, Redmond, Washington) and analysis was performed using SPSS statistical software (SPSS Inc, Chicago, Illinois) to

Figure 5. Diagrams. A, External alar base excision: the excision is planned as an “inverted-V” so as not to disturb the circumference of the nostril margin. B, If alar base reduction or alar flare reduction leaves a large closure space, a V-Y closure can be performed for better wound closure. C, Internal base excision: isolated excision of the nostril margin reduces only the nostril circumference, while leaving the columnella-alar base distance unchanged (thus preserving the alar base-alar base width). D, External and internal base excision. E, Alar flare reduction: a segment of tissue is removed from around the alar base to reduce the tip-alar base distance, thus shortening that limb and making the ala straighter. F, Alar hooding resection: basal view shows elliptical excisions that are closed along the natural alar border. When viewed from the side, the long axis of the elliptical excision follows the ideal visual border that has been marked preoperatively.

Figure 6. Alar flaring. A, Basal view assessment is then made regarding alar flaring. If alar flaring is present, it can then be treated with an alar flare excision along the free border of the alar base. If no alar flare is present, the wound can be sutured closed at this point. B, With significant deprojection of the nose, the alar base becomes wider, and alar flaring is increased to compensate for loss of tip projection.
summarize the data and to compare measurements between male and female patients.

Tests of association were used to compare frequencies of procedures between male and female patients. The mean excision values between male and female patients were compared using a 2-tailed unpaired $t$ test, when the measurements were normally distributed. Mann-Whitney testing was used to compare medians.

PART 3: SCAR OUTCOMES DATA COLLECTION AND ANALYSIS

For analysis of scar outcomes, the 47 patients from the quantitative soft-tissue excision data set who underwent soft-tissue excision were chosen. Of the 47 patients who underwent soft-tissue excision, 23 patients had 1-year follow-up pictures available for review. Three standardized views were used for analysis, including left oblique, right oblique, and basal views. These 3 views allowed visualization of the scars in their entirety. The photographs were printed horizontally side by side on a single sheet of paper and bound in a notebook. Thirty-five different nonmedical reviewers then analyzed these images for scar evaluation. They were asked to rate the postoperative photographs over 4 given regions of interest (Figure 10). Scars were rated using a 0 to 4 scale, with 0 being not visible; 1, barely visible; 2, minimally visible; 3, moderately visible; and 4, severely visible. Sex and age of the raters were recorded. Statistical analysis was then performed. A mixed model was used (SAS Proc Mixed; SAS Institute Inc, Cary, North Carolina) to assess the effect of rater age, sex, and view on the subject scores.

RESULTS

Regarding quantitative soft-tissue excision data, the final cohort comprised 26 men (26%) and 74 women (74%). A total of 47 patients (47%) had at least 1 type of soft-tissue excision technique performed. A distribution of the types of techniques performed grouped by sex is given in (Table 1). Mean and median excision values were determined along with further statistical analysis (Table 2). Scar outcomes are given in Table 3, Table 4, Figure 11, and Figure 12.

COMMENT

A number of articles have been written regarding alar base reduction. Because of the multiplicity of techniques published in the literature regarding alar base soft-tissue sculpting, the most effective or appropriate strategy to achieve a superior outcome can remain somewhat elusive for the practicing rhinoplasty surgeon. While alar soft-tissue excision has had a long, sometimes confusing, and oftentimes controversial history in rhinoplasty, there is no doubt that it plays an important role in achieving superior rhinoplasty results. Therefore, surgical planning, whether preoperative or intraoperative, should not be considered complete without the assessment of the nasal alar soft-tissue aesthetics on anteroposterior, lateral, and basal views.

The alar soft-tissue excision techniques presented in this article are based on the following principles. First,
excision of the vestibular rim and sill of the nasal floor reduces the outer alar perimeter and narrows the nostril diameter. By angling the excisions in the sill, the surgeon can manipulate the columnellar-alar distance alone, the nostril diameter alone, or a combination of both. Second, a wedge resection along the rounded caudal mar-

Figure 9. Algorithm for assessment and treatment of alar base soft-tissue problems.

Figure 10. Raters were instructed to score the alar base scars from the side (a-b) and worm’s eye (c-d) views. The example shown here was the example used in the instructions for scar rating. The actual patient photographs used for rating the scars did not include the red guidelines shown in this example.
gin of the alar lobule decreases the amount of alar flare. Third, there is a natural curve and position of the ala seen on lateral view, which should not hang excessively and obscure the view of the columella. Understanding these principles will allow the rhinoplasty surgeon to manipulate these variables to achieve overall aesthetic success.

An analysis of excision data yielded interesting data that can be used as a general guideline. We found that men may be more likely to undergo a soft-tissue excision, though the numbers of patients in the study were not enough to provide statistical significance for this. Perhaps the most interesting finding is that these techniques were used in 47% of patients undergoing rhinoplasty, highlighting the fact that these techniques are applicable to a large number of patients. Furthermore, it is much more common to perform bilateral excisions as opposed to unilateral excision, though there may be differing amounts of tissue excised between the 2 sides. Alar base resection is by far the most common alar soft-tissue technique performed, with alar flare reductions being performed only 16% of the time and hooding resections being performed very infrequently. Regarding resection averages, it is important to keep in mind that small excisions can make a significant difference. Our philosophy is “less is more,” and one should always excise less when there is doubt, place a trial stitch, and then make decisions regarding further resection (which should only be a millimeter at a time). You can always cut a board shorter, but you can not cut it longer.

Excessive alar hooding is a relatively rare problem requiring surgical correction. Just like many plastic surgery procedures, there are multiple ways to correct this deformity surgically. Some authors prefer to keep the elliptical excision inside the nose to bring the caudal alar border more cephalad, and others have advocated conservative resection of the caudal border of the lateral crus without mucosa to elevate the caudal alar border. We prefer to use a direct external excision of the caudal border of the ala along the ideal visual border. This concept has been described previously in cleft nasal surgery and allows the surgeon to accurately determine the visual border and set it as determined. We have found that these scars heal just as well as the columellar and alar base incisions and restore an ideal visual border to the ala, even with larger excisions.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Patients, No. (%)</th>
<th>Female (n=31)</th>
<th>Male (n=16)</th>
<th>Total (n=47)</th>
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<tr>
<td>ABR Int right count</td>
<td></td>
<td>3 (10)</td>
<td>0</td>
<td>3 (6)</td>
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<tr>
<td>ABR Int left count</td>
<td></td>
<td>1 (3)</td>
<td>0</td>
<td>1 (2)</td>
</tr>
<tr>
<td>ABR Int bilateral count</td>
<td></td>
<td>10 (32)</td>
<td>1 (6)</td>
<td>11 (23)</td>
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<tr>
<td>ABR Int and Ext bilateral count</td>
<td></td>
<td>9 (29)</td>
<td>7 (44)</td>
<td>16 (34)</td>
</tr>
<tr>
<td>ABR and wedge right count</td>
<td></td>
<td>1 (3)</td>
<td>0</td>
<td>1 (2)</td>
</tr>
<tr>
<td>ABR and wedge left count</td>
<td></td>
<td>2 (7)</td>
<td>1 (6)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>ABR and wedge bilateral count</td>
<td></td>
<td>4 (13)</td>
<td>6 (38)</td>
<td>10 (21)</td>
</tr>
<tr>
<td>Hood resection only count</td>
<td></td>
<td>1 (3)</td>
<td>0</td>
<td>1 (2)</td>
</tr>
<tr>
<td>ABR and hood count resection</td>
<td></td>
<td>0</td>
<td>1 (6)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Total count</td>
<td></td>
<td>31 (100)</td>
<td>16 (100)</td>
<td>47 (100)</td>
</tr>
</tbody>
</table>

Abbreviations: ABR, alar base reduction; Ext, external; Int, internal. aPercentage may not sum to 100 because of rounding.

<table>
<thead>
<tr>
<th>Excision</th>
<th>No.</th>
<th>Mean (SD)</th>
<th>T Test/Mann-Whitney Test Results, P Valuea</th>
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</thead>
<tbody>
<tr>
<td>ABR internal right Female</td>
<td>26</td>
<td>2.0 (0.5)</td>
<td>.33</td>
</tr>
<tr>
<td>ABR internal left Male</td>
<td>15</td>
<td>2.4 (1.1)</td>
<td>.66</td>
</tr>
<tr>
<td>ABR external right Female</td>
<td>28</td>
<td>1.9 (0.5)</td>
<td>.10</td>
</tr>
<tr>
<td>ABR external left Male</td>
<td>15</td>
<td>2.5 (1.1)</td>
<td>.10</td>
</tr>
<tr>
<td>ABR internal left Female</td>
<td>16</td>
<td>2.0 (0.7)</td>
<td>.15</td>
</tr>
<tr>
<td>ABR internal right Male</td>
<td>15</td>
<td>2.5 (1.0)</td>
<td>.15</td>
</tr>
<tr>
<td>ABR external left Female</td>
<td>15</td>
<td>2.0 (0.7)</td>
<td>.15</td>
</tr>
<tr>
<td>Wedge right Female</td>
<td>6</td>
<td>Median=2.5</td>
<td>.03</td>
</tr>
<tr>
<td>Wedge left Male</td>
<td>6</td>
<td>Median=3.25</td>
<td></td>
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</table>

Abbreviations: ABR, alar base reduction; Ext, external; Int, internal. aThe t test was used to compare male vs female means if data were normally distributed, whereas the Mann-Whitney test was used to compare median values if data were nonnormal.

<table>
<thead>
<tr>
<th>Viewa</th>
<th>Score, Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.671 (0.026)</td>
</tr>
<tr>
<td>b</td>
<td>0.689 (0.026)</td>
</tr>
<tr>
<td>c</td>
<td>0.647 (0.026)</td>
</tr>
<tr>
<td>d</td>
<td>0.551 (0.026)</td>
</tr>
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Abbreviation: Pr, probability.
By quantitatively examining scar outcomes, findings from this study suggest that scars following the use of these techniques heal exceptionally well. While the possibility of these incisions should be discussed with patients preoperatively, reassurance can be given that these scars heal well and will result in a more balanced overall rhinoplasty result. A related article by Kridel and Castellano\(^\text{19}\) also shows a very low complication rate and good scar outcomes. The article by Kridel and Castellano contributes nicely to our knowledge of alar base reduction techniques, including excellent examples of alar variation. Like Kridel and Castellano, it is also our experience that well-placed and well-closed incisions should heal satisfactorily, even in nonwhite patients who may be considered at risk for hypertrophic scarring. Unlike the article by Kridel and Castellano, we have not had to perform dermabrasion or any other scar revisions in our study population. According to our statistical results, it appears that excellent scar outcomes justify the use of these techniques.

In conclusion, alar soft-tissue techniques are often necessary to achieve a balanced outcome and superior results when performing rhinoplasty surgery. Therefore, they should be an integral part of every rhinoplasty evaluation and surgical plan as indicated. This article describes these various techniques in detail and provides a simple algorithm for evaluation. Guideline excision measurements allow any rhinoplasty surgeon to perform these adjunctive techniques consistently and effectively. Furthermore, scar outcomes show that these techniques can be carried out without fear of resulting scars. Used properly, these techniques can transform a good result into an exceptional result.

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Author Contributions: Study concept and design: Warner, Chauhan, and Adamson. Acquisition of data: Warner and Chauhan. Analysis and interpretation of data: Warner, Chauhan, and Adamson. Drafting of the manuscript: Warner and Chauhan. Critical revision of the manuscript for important intellectual content: Warner, Chauhan, and Adamson. Statistical analysis: Chauhan. Administrative, technical, and material support: Adamson. Study supervision: Warner and Adamson.

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REFERENCES


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