Objective Comparison of Nasal Tip Contours in the Basal View Between Dome Binding and Hemitransdomal Tip Suture Techniques in Rhinoplasty

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IMPORTANCE  The dome binding suture (DBS) used for nasal tip refinement creates the unwanted effects of nasal tip pinching owing to shadowing and loss of alar support. The hemitransdomal suture (HTS), however, refines the nasal tip while maintaining a natural contour between the nasal tip and the alar lobule. To our knowledge, no objective comparison between the DBS and HTS techniques has been described in the literature to date.

OBJECTIVE  To determine whether the DBS or HTS technique results in an objectively satisfactory outcome in nasal tip contouring when assessed from the perspective of the basal view.

DESIGN, SETTING, AND PARTICIPANTS  Postoperative basal view photographs of cosmetic rhinoplasty procedures performed on 112 Hispanic/Mestizo patients (85 [76%] women, and 27 [24%] men) in a facial plastic surgery practice in Chile, from May 2013 to May 2015 were reviewed. Only patients who underwent either DBS or HTS were included. Follow-up ranged from 6-24 months. Comparison of the nasal contour to the ideal tip-lobule line was performed and classified as satisfactory or unsatisfactory.

MAIN OUTCOMES AND MEASURES  Satisfactory or unsatisfactory nasal tip contour in the basal view as analyzed by comparison with the ideal tip-lobule line.

RESULTS  A total of 143 rhinoplasty procedures were performed over a 2-year period (May 2013-May 2015). A total of 112 patients met inclusion criteria. Of the 112 participants, mean (SD) age was 30 (9) years; 22 patients underwent DBS and 90 underwent HTS. Of the patients who underwent DBS, 5 of 22 (22.7%) had satisfactory contours. Of the patients who underwent HTS, 84 of 90 (93.3%) had satisfactory contours.

CONCLUSIONS AND RELEVANCE  Comparison of nasal contour in the basal view with the ideal tip-lobule line demonstrates a statistically significant improvement in the rate of satisfactory outcomes using the HTS compared with the DBS technique. This study is the first, to our knowledge, to provide objective data to support the use of this technique when performing tip contouring in rhinoplasty.

LEVEL OF EVIDENCE  4.
Rhinoplasty is one of the most frequent cosmetic surgeries performed. The goal of cosmetic rhinoplasty is to create an aesthetically pleasing nose while maintaining function and minimizing surgical stigmata. This requires an understanding of the complex relationship between the external contours of the nose and the underlying anatomical structures. Several techniques have been described to achieve an ideal nasal tip including tip grafts, cartilage resection, and suture placement. Unfortunately, some of these commonly used techniques narrow the tip and create an undesirable pinched appearance owing to an unnatural contour between the tip lobule and the alar lobule. Toriumi revolutionized the concept of nasal contouring in 2006. In his detailed 3-dimensional analysis, he proposed that an ideal nasal tip arises from a smooth transition from the nasal tip to the alar margin, without any shadows or break in continuity.

Recently, new objective assessments of the lateral crura have been described. In addition to assessing the longitudinal axis of the lateral crura (Figure 1A), it is also important to assess the rotational axis (Figure 1B, C). Cakir et al described the “lateral crural resting angle” (LCRA), defined as the angle formed between the surface of the lateral crus and the upper lateral cartilage. The proposed ideal angle is 100°, with a more obtuse angle corresponding with a pinched nose appearance. Kovacevic et al described the “alar surface septal angle” (ASSA), defined as the angle of rotation of the lateral crus surface in relation to the sagittal upper septal margin. The proposed ideal ASSA is 105°-135°. We agree with Kovacevic’s assessment that measuring the ASSA is a superior method compared with the LCRA, because the LCRA can be affected by the configuration of upper lateral cartilage and the use of spreader grafts.

One technique to alter the shape of the nasal tip is the classic dome binding suture (DBS). This is a horizontal mattress suture placed on either side of where the new tip defining point is desired. With this technique the caudal edge of the lateral crus descends inferiorly and the cephalic edge rotates anteriorly. In addition, in patients with soft lower lateral cartilages, the DBS can result in a concavity of the lateral crus and sometimes even a buckling at the distal end. The combined effect of these changes results in a pinched appearance of the tip and loss of cartilaginous support at the alar margin (eFigure 2A in the Supplement). Further narrowing and pinching of the nasal tip occurs with the fibrosis and scarring that occur with healing. In the frontal view, the result is a rounding of the nasal tip owing to the dome region appearing isolated from the rest of the nose (Figure 2A). In the basal view, disruption of the continuity of the alar rim from the domes to the alar lobule produces a loss of triangular shape and a pinched, rounded tip (Figure 2B). To manage the undesired effects created by the DBS, alar rim grafts or lateral crural strut grafts have been utilized. Use of these grafts increase volume and support along the alar margin, while restoring the smooth continuity from the tip defining points toward the alar lobule. With the addition of alar rim or lateral crural strut grafts to the DBS technique, satisfactory results can be achieved. However, such grafting maneuvers require additional cartilage harvesting, which adds time and complexity to the operation.

The cranial tip suture (CTS) was introduced by Kovacevic et al as a suturing technique that shapes the nasal tip while...
maintaining a natural nasal contour without the need for additional cartilage grafts. The key distinction between the DBS and the CTS is that the DBS is a horizontal mattress suture, while the CTS is a vertical mattress suture (in a plane parallel to the cephalic edge of the lateral crus). The principle effect of this suture is cephalic rotation of the caudal margin of the lateral crus, which achieves an improved rotational angle and maintains cartilaginous support at the alar margin.

An alternative suturing technique that can accomplish similar beneficial tip contour effects is the hemitransdomal suture (HTS) described by Dosanjh et al. This suture is similar to the CTS and is placed in the same location; however, instead of a vertical mattress it is a simple interrupted stitch. It is essentially a transdomal suture placed posterior (deep) to the most cephalic end of the dome. It was named a “hemitransdomal” suture because it only reduces the cephalic half of the dome. Similar to the CTS, the HTS has the overall desired outcome of everting the caudal margin of the lateral crus (Figure 1D). In addition, the HTS techniques preserve the facet triangle (Figure 1E) and cartilaginous support of the alar margin (eFigure 2B in the Supplement). Use of the HTS technique results in a smooth transition between the nasal tip and the alar margin, which is appreciated in both the frontal view (Figure 2C) and basal view (Figure 2D).

While the classic DBS and the HTS have been well described in the literature, there have been no objective head-to-head comparisons of nasal contour outcomes between these techniques. We objectively evaluated nasal contour outcomes between the 2 suture techniques by reviewing medical photography in the basal view. This article describes the DBS and HTS technique as performed by the senior author with objective analysis of postoperative nasal tip contour results.

Methods

Retrospective medical record review of operative notes and medical photography of patients who underwent cosmetic rhinoplasty by the senior author was performed. Ethics committee approval was obtained from San Vicente de Arauco Hospital (Concepción, Chile). Informed consent was obtained from patients whose photos are included in this publication, and they were not compensated for their participation.

A consecutive sample of patients was analyzed. The classic DBS technique was used between May 2013 and October 2013, whereas the HTS technique was used exclusively between October 2013 and May 2015. This was not a part of the study design, but rather, reflected a change in the senior author’s practice after subjective analysis of postoperative outcomes. The patients were not randomized to undergo 1 technique vs the other. Standard medical photography of patients was performed preoperatively and postoperatively. Patients were excluded from the study if additional techniques, such as alar rim grafting or crural repositioning were performed, because these would confound the effects created by just tip suture technique. In addition, patients were excluded if there was not adequate follow-up with photography.
A and B, Satisfactory outcomes: Triangularity of the nasal contour is evident, without pinching or shadowing between the dome and the alar lobule. C and D, Unsatisfactory outcomes: Frontal (C) and basal (D) views. Dome appears isolated from the rest of the nose. Nasal tip has lost the triangular shape owing to alar rim pinching and lack of structural support along the alar margin.

For the purpose of this study, the basal view postoperative photographs were evaluated by tracing a straight line from each tip-defining point to the ipsilateral alar lobule. This was named the “ideal tip-lobule line.” Nasal contour along the alar rim was then categorized as falling medial to the line or just along the line. The former category was considered an unsatisfactory nasal contour (Figure 2C), while the latter was considered satisfactory (Figure 2F). Comparison of patient demographics, suture technique used, and satisfactory or unsatisfactory outcome was performed. A P value less than 0.05 was considered statistically significant. Results were analyzed using Stata statistical software (Version 11.2, StataCorp).

Surgical Technique
Both suturing techniques (DBS or HTS) can be performed through an open or endonasal with delivery approach. The endonasal delivery approach is preferred in the senior author’s practice, however if on preoperative evaluation the lower lateral cartilages (LLC) appear weakened, or if a more difficult surgery is anticipated, an open approach is used. Once adequate exposure is obtained, analysis of the LLC with identification of where the new tip defining points should lie is performed. Next, any indicated cephalic trim of the lateral crus is performed, with only the minimum amount necessary to allow rotation of the lateral crus. This allows for a very conservative cephalic trim and the remaining amount of cartilage is not routinely measured.

Next, either the DBS or HTS technique is performed. For the DBS, a 6-0 prolene suture is placed approximately 2 to 3 mm from the desired neodome along the intermediate crus, passed through to the lateral crus, and then back again to complete the horizontal mattress. For the HTS, a 6-0 prolene simple interrupted stitch is placed parallel to the cephalic margin of the intermediate crus, approximately 2 to 3 mm below the dome level. The suture exits at the lateral crus, at the same level of the dome and parallel to the cephalic margin. The knot is tied and an identical procedure is performed on the contralateral side.

In addition, because weakened medial crura is a common finding in the Mestizo patient population, a columellar strut is used in all patients (eFigure 2 in the Supplement). Lastly, an interdomal figure-of-eight suture is used (eFigure 2 in the Supplement).

Results
A total of 143 cosmetic rhinoplasties were performed by the senior author from May 2013 to 2015. All patients were of Hispanic/Mestizo ethnicity. The classic DBS was performed in the first 43 patients, from May 2013 to October of 2013. The HTS was performed in the next 100 patients, from October 2013 to May 2015. Follow-up with postoperative medical photography ranged from 6 months to 2 years. Patients who underwent additional techniques such as alar rim grafting or crural repositioning were excluded from the study. In addition, patients who did not have adequate postoperative photography or who were lost to follow-up were excluded. This left a total of 112 patients for inclusion in this study. A total of 22 patients underwent classic DBS and 90 underwent HTS.

Of the 112 total patients, 85 patients (76%) were women, and 27 (24%) were men. The average age was 30 years, with a standard deviation of 9 years. The endonasal delivery approach was performed in 68 patients (61%), whereas the open approach was performed in 44 patients (39%).

Postoperative medical photography in the basal view was analyzed. Straight lines were marked from the tip to the alar lobule and named the “ideal tip-lobule line.” Results were categorized as satisfactory or unsatisfactory. Of the 22 patients who underwent classic DBS, 5 of 22 (22.7%) had satisfactory contours whereas 17 of 22 (77.3%) had unsatisfactory contours. Of the 90 patients who underwent HTS, 84 of 90 (93.3%) had satisfactory contours compared with 6 of 90 (6.7%) who had unsatisfactory contours. A Fisher exact test was used to compare the results between the 2 groups, and the difference between rate of satisfactory contours in the HTS group (93.3%) compared with the DBS group (22.7%) was statistically significant (P < .001). Satisfactory postoperative outcomes using the HTS technique are demonstrated in the basal view (Figure 3).

There was also a statistically significant association between satisfactory outcome and use of endonasal approach: 86.7% of patients who had an endonasal approach had a satisfactory outcome, whereas only 68.2% of patients who had
an open approach had a satisfactory outcome ($P = .03$). No association between sex and satisfactory outcome: 78.8% of women had a satisfactory outcome, while 81.5% of men had a satisfactory outcome ($P = .76$). No association between age and satisfactory outcome was observed: the average age for patients who had satisfactory outcomes was 29.7 years, while the average age for patients who had unsatisfactory outcomes was 29.6 years ($P = .97$).

### Discussion

This study was inspired by the subjective analysis of postoperative nasal contour outcomes by the senior author. Although many patients were satisfied with the appearance of their nose postoperatively, the surgeon's analysis was that the nasal tips had a pinched appearance owing to the loss of natural continuity from the tip to the lobule. After using the HTS, the senior author started to exclusively use this technique. Subjective analysis was that the patients who underwent HTS had a more natural appearing nasal tip compared with those who underwent DBS.

While multiple descriptions in the literature of various suturing and grafting techniques used to alter the nasal tip exist, to our knowledge, there have been no objective comparisons between the DBS and the HTS. Therefore, this study was created to objectively compare the nasal contour outcomes between these 2 techniques. Evaluation from the basal view was chosen because this was the most practical way to objectively analyze the contour from the nasal tip to the alar lobule. As described in the results section, we found a statistically significant higher rate of satisfactory outcomes (93%) using the HTS compared with the DBS (23%). This demonstrates that the HTS technique is superior to the DBS in creating satisfactory contours of the nasal tip as assessed from the basal view. Additional satisfactory postoperative results are demonstrated (Figure 4 and eFigure 3 in the Supplement).
The satisfactory outcome using the HTS can be explained by the improved rotation of the lateral crus along its rotational axis. As described previously, the lateral crus can be analyzed along its 2 axes: a longitudinal axis between the 2 crura in relationship to each other and a rotational axis, corresponding to the position or angle of the lateral crus with respect to the sagittal midline (ASSA). The ideal ASSA is approximately 105°, with an obtuse angle resulting in several undesirable cosmetic and functional results. Cosmetically, there is increased fullness in the supratip region, a pinched appearance of the nasal tip, and shadowing lateral to the tip that leads to a lack of continuity from the tip to the alar margin. Functionally, if the caudal edge of the lateral crus is rotated inferiorly, support along the alar rim is lost.

There were 6 patients who underwent HTS and had unsatisfactory results. On further subjective analysis of the frontal view, they had cephalic malposition of the lateral crus, which likely contributed to the unsatisfactory outcome (Figure 3). With cephalic malposition there is lack of structural support along the alar margin. Despite the use of HTS, the alar rim support is still insufficient. Therefore, in the subset of patients with cephalically oriented LLC, HTS may not be sufficient to achieve a satisfactory outcome. Additional techniques such as lateral crus repositioning or grafting may be required. The success of the HTS technique may also be diminished by the presence of weak cartilage. Patients with weak cartilage, as assessed preoperatively, may represent another subset of patients who may benefit from additional tip contouring techniques. Another criticism of the HTS is that it can lead to considerable concavity lateral to the domes and cause the dome complex itself to rotate. These effects would counteract the desired effects of the HTS; however, in our experience with these 112 patients, we did not see this undesired outcome.

An unexpected finding was the statistically significant difference in satisfactory outcomes between the open vs endonasal approach. This may be explained by the fact that if an operation was subjectively deemed to be more difficult at the preoperative visit, an open approach was chosen. The senior author's preference is to perform the endonasal approach, however, in patients with weak cartilage, complex anatomy, or significant asymmetry, the open approach is used.

Limitations
Limitations of this study include the fact that the method used to assess a satisfactory outcome has not previously been described or validated. Comparing the nasal contour with the ideal tip-lobule line was introduced as a simple technique that could easily be performed and reproduced in analysis of postoperative photography. In addition, only the basal view was evaluated in this study. Alternatively, the ASSA or the longitudinal angle, which are previously established angles to objectively assess lateral crus rotation, could have been measured. However, there were not sufficient intraoperative photographs to allow for measurement of these angles. In addition, the nasal tip is best assessed in all views (frontal, oblique, and basal) for a comprehensive 3-dimensional evaluation. In particular, the nasal tip contour from the frontal view is one of the most important views. However, for the purpose of this study only the basal view was chosen owing to the ease of objective assessment and analysis using the ideal tip-lobule line. Additional limitations include that patients were not randomized to receive 1 technique vs the other. As previously described, the transition from use of DBS to HTS was based on the preference of the senior author rather than study design. Lastly, comparison of the preoperative nasal tip contour with the postoperative result was not evaluated. The main outcome measure of this study was to objectively analyze postoperative nasal tip contour appearances between the DBS and HTS to better assess which technique leads to more satisfactory outcomes. The goal of this study was not to make measurements or comparisons of the nasal tip contour from before and after surgery.

Future directions of this study include performing cadaveric dissections of the nasal tip through an open approach. The ASSA will be measured at baseline, after placement of a DBS, and after placement of an HTS. The goal will be to provide additional objective evidence to support the findings in this study. In addition, because the CTS and HTS have not been compared directly, we would also like to objectively analyze the effects on nasal tip contour between these 2 techniques. One critique of the HTS has been that having only a single loop results in more pinching of the dome, less flattening of the lateral crus, and less overall evasion of the caudal border of the lateral crus as compared with the CTS.6 We hypothesize that the overall effect on the nasal tip contour by performing a CTS or HTS is similar despite those differences; however, additional studies must be performed prior to making this conclusion.

Conclusions
Creating a smooth transition from the nasal tip to the alar lobule is essential for a natural appearing outcome in cosmetic rhinoplasty. While several techniques exist to achieve this goal, we believe the hemitransdomal suture is the most simple and effective way. Results from this study demonstrate that more satisfactory outcomes are achieved using the hemitransdomal suture compared with the classic dome binding suture when nasal tip contour is assessed in the basal view. The hemitransdomal suture technique is simple to execute and can serve as a powerful tool in creating a natural appearing, aesthetically pleasing nasal tip.
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