Hemitransdomal versus Dome-Binding Suture

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Abstract

The dome-binding suture (DBS) and hemitransdomal suture (HTS) are suture techniques used to narrow and define the nasal tip. The DBS can create a pinched, unnatural appearance, while the HTS puts the lateral crus in a more favorable orientation. This allows a natural contour between the nasal tip and alar lobule while maintaining alar margin support. Objective measurement of the rotational axis of the lateral crus between the DBS and the HTS has not been reported in the literature. To determine whether the DBS or HTS technique results in a more favorable rotational axis of the lateral crus as measured by the alar surface septal angle (ASSA). Open rhinoplasty with cephalic trim and placement of a DBS or HTS was performed in 6 cadaveric heads, for a total of 12 lower lateral cartilages at the VirtuOHSU Simulation and Surgical Training Center at Oregon Health and Science University (OHSU). ASSA measurements were taken at baseline and after placement of either a DBS or HTS. A total of 36 ASSA measurements were obtained. The median baseline ASSA prior to suture placement was 142 degrees (interquartile range [IQR]: 131.5–145 degrees), following DBS placement was 141 degrees (IQR: 33–150.5 degrees), and following HTS placement was 112 degrees (IQR: 108–117 degrees). There was no statistically significant difference of ASSA measurements between baseline and DBS placement ($p = 0.24$), but there was a statistically significant difference between baseline and HTS ($p < 0.0001$) and between DBS and HTS ($p < 0.0001$). The HTS technique creates a more favorable rotational axis of the lateral crus as compared with the DBS, as measured by the ASSA. This study provides objective data to support the use of the HTS for nasal tip contouring.

Keywords
- rhinoplasty
- nasal tip contour
- suture techniques

Proper management of the nasal tip is a key component to success in rhinoplasty.[1] The nasal tip is complex and intricate, with the lower lateral cartilages providing the principal source of structural support and contour.[2] Manipulation of the lower lateral cartilages by suture placement, cartilage resection, or tip grafts can be used to modify the nasal tip; however, the majority of cosmetic rhinoplasties utilize tip-modifying sutures.[3,4] Suture techniques allow precise changes in the shape and orientation of the lower lateral cartilages without the need for cartilage excision, additional graft material, increased operative time, or significant complexity.

The dome-binding and hemitransdomal sutures (DBS and HTS) are two techniques used to narrow a wide nasal tip. The classic DBS is a horizontal mattress suture placed on either side of where the new tip defining point is desired. This suture is often used to narrow a broad nasal tip and/or reduce lateral crural convexity. However, an unintended effect of this suture is an inferior descent of the caudal edge of the lateral crus and an anterior rotation of the cephalic edge. Additionally, patients with soft or weak lower lateral cartilages can develop a concavity of the lateral crus and buckling at the distal end.[1,5] The combination of these effects can lead

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to loss of cartilaginous support along the alar margin and a pinched appearance of the nasal tip, due to the dome region appearing isolated from the rest of the nose (►Fig. 1a–b). Some have described placing a DBS at the cephalic end of the dome to minimize the aforementioned effects; however, proper eversion of the lateral crus is not always achieved.[5]

An alternative suture technique is the HTS. This is a single interrupted stitch that is placed parallel to the cephalic margin of the intermediate crus that exits at the same level of the dome at the lateral crus. The principal effect is to evert the lateral crus while maintaining a straight caudal border with minimal to no concavity of the lateral crus.[6,7] This suture technique narrows the dome while creating a smooth transition between the nasal tip and the alar margin (►Fig. 1c–d).

The classic DBS and HTS have been well described in the literature, but there have been no objective head-to-head comparisons of the rotational angles of the lateral crus achieved with these techniques. To understand both the intended and unintended effects of suture placement, the lower lateral cartilages should be considered in their full three-dimensional configuration. Additionally, both the rotational and longitudinal axes should be evaluated[6,8] (►Fig. 2). One objective assessment used to evaluate the rotational axis of the lateral crura is the alar surface septal angle (ASSA).[8] This is the angle of rotation of the lateral crus surface in relation to the sagittal upper septal margin. The proposed ideal ASSA is 105 to 135 degrees, while more obtuse angles correspond with aesthetically and functionally unacceptable inversion of the caudal margin. To provide objective data regarding the rotational angles achieved by these two suture techniques, the current study was conducted. Cadaveric dissection was performed to measure the ASSA of the lateral crura achieved by using the DBS versus the HTS.

Methods

Cadaveric dissections were performed in the VirtuOHSU Simulation and Surgical Training Center at Oregon Health and Science University (OHSU). IRB exemption was obtained for this study. All dissections were performed by the senior author (F.C.). An open rhinoplasty approach was used in all specimens. Cephalic trim was performed to provide consistency in the size of the lower lateral cartilages between specimens: 7 mm in the vertical dimension was left at the

Fig. 1 Comparison of dome-binding suture (DBS) and hemitransdomal suture (HTS) in postoperative outcomes. **(a)** Note pinching of the nasal tip and isolation of the dome from the alar lobule following DBS. **(b)** Illustration of the concavity of the lateral crus following DBS. **(c)** Note smooth continuity between nasal tip and alar lobule following HTS. **(d)** Illustration shows improved rotation of the lateral crus without concavity following HTS. Note: White dots represent suture placement.

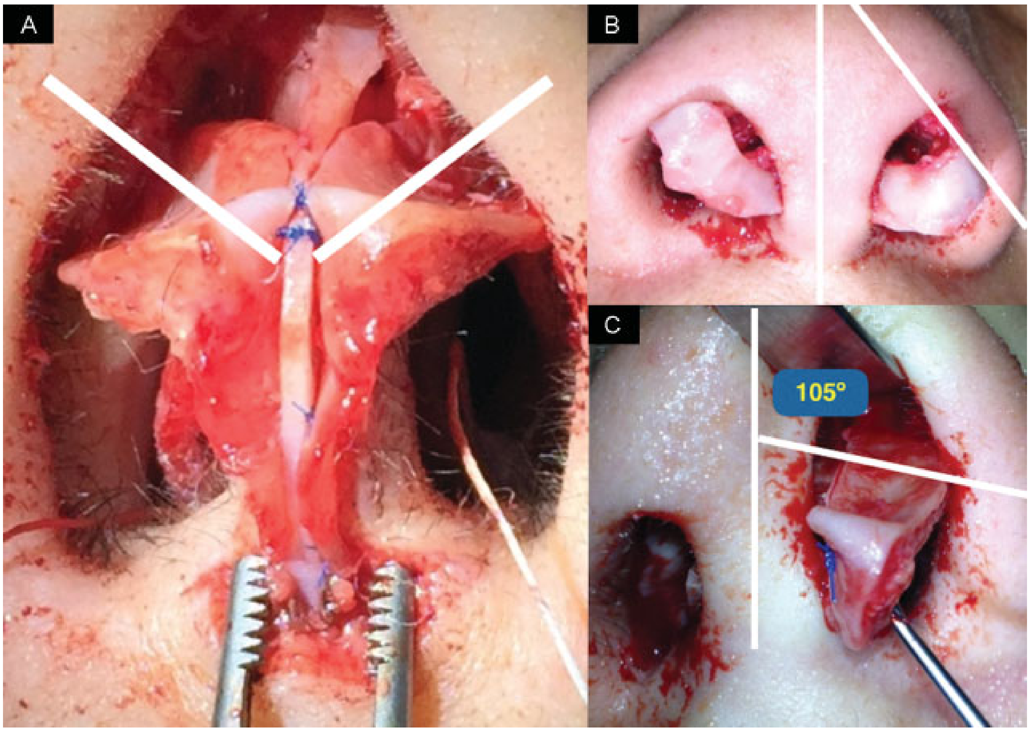

Fig. 2 The lateral crus has two axes: longitudinal and rotational. The hemitransdomal suture (HTS) improves the rotational axis. **(a)** Longitudinal axis of the lateral crura in relation to each other and the dorsal septum. **(b)** Rotational axis of the lateral crura prior to HTS placement. Note inversion of caudal margin. **(c)** Rotational axis of the lateral crura after HTS placement. Note eversion of caudal margin and how it approximates the same plane as the cephalic margin. Note: 105° represents approximate ASSA.

dome region and 9 mm was left at the middle region of the lateral crus.

Prior to any suture placement, the rotational angle of the alar surface of the lateral crus with respect to the anterior septal margin was measured using a goniometer. Next, a 5–0 Prolene suture was used to place a DBS. The ASSA measurement was recorded and the suture was removed. Then, a new 5–0 Prolene suture was used to place a HTS and the ASSA was measured again. A total of 6 cadaveric head specimens, for 12 lower lateral cartilages, were used. Three ASSA measurements for each lower lateral cartilage were obtained: at baseline, with a DBS, and with a HTS (►**Fig. 3**). This provided a total of 36 ASSA measurements.

To measure central tendency and dispersion, the interquartile range was used because the results were not normally distributed. Nonparametric analysis was performed and variables were analyzed using the Friedman's test. After this, post hoc analysis was performed and a *p*-value ≤ 0.05

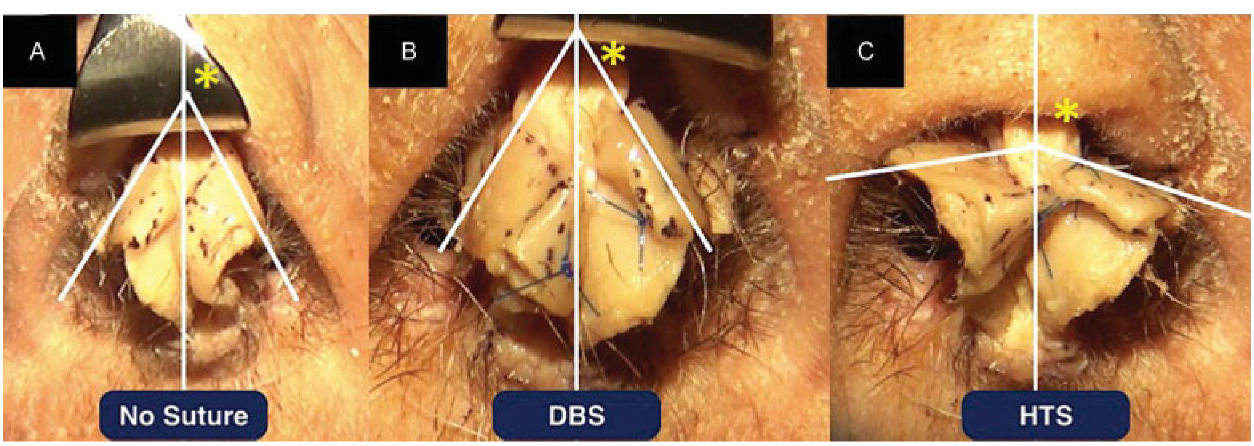

Fig. 3 Rotational axis measured by the alar surface septal angle (ASSA). White lines approximate surface of lateral crus and anterior septal margin. Yellow asterisk represents angle measured after dissection. **(a)** Orientation of the lower lateral cartilages (LLC) prior to suture placement. Note obtuse ASSA. **(b)** Orientation of the LLC following dome-binding suture (DBS) placement. Note obtuse ASSA. **(c)** Orientation of the LLC following hemitransdomal suture (HTS) placement. Note more favorable ASSA.

Table 1 Rotational axis of the lateral crus measured by the alar surface septal angle

	Baseline (no suture)	Dome-binding suture	Hemitransdomal suture
Cartilage no.			
1	144	156	113
2	143	161	111
3	125	135	118
4	121	131	117
5	146	148	99
6	152	149	112
7	141	130	105
8	135	135	103
9	143	147	117
10	147	152	120
11	130	132	112
12	133	134	111
Median [IQR]	142 [131.5–145]	141 [133–150.5]	112 [108–117]

Abbreviation: IQR, interquartile range.

was considered statistically significant. Statistical analysis was calculated using Stata (Version 11.2; StataCorp).

Results

For each suture technique (none, DBS, HTS), 12 ASSA measurements were obtained (►**Table 1**). The median ASSA prior to suture placement was 142 degrees (IQR: 131.5–145 degrees), following DBS placement was 141 degrees (IQR: 133–150.5 degrees), and following HTS placement was 112 degrees (IQR: 108–117 degrees). The Friedman's test was used to evaluate differences between paired groups and we observed a statistically significant difference between the two suture techniques ($p = 0.03$). With post hoc analysis, there was no statistically significant difference of ASSA measurements between baseline (without sutures) and DBS placement ($p = 0.24$). However, there was a statistically significant difference between ASSA measurements when comparing baseline and HTS ($p < 0.0001$) and when comparing DBS and HTS ($p < 0.0001$). Almost all ASSA measurements taken after HTS placement (11 out of 12, 91.7%) fell within the ideal ASSA range of 105 to 135 degrees. One measurement was 99 degrees, so was below the ideal minimum, but still provided adequate support at the alar margin.

Discussion

In this study, we found that use of the HTS leads to a more favorable rotational axis as measured by the ASSA. This angle is improved from baseline, when no suture is placed and improved in comparison with DBS placement. These differences were statistically significant. The rotational angles achieved by these two suture techniques have not previously been described or compared with each other directly in the literature.

Our data suggest that use of the HTS is preferable to the DBS, as the HTS results in a more favorable rotational angle of the lateral crus. The importance of having the caudal margin of the lateral crus lie close to the same level as the cephalic margin has been emphasized by many.[1,2,6–8] This orientation of the lateral crus leads to a well-supported alar lobule and alar margin, while maintaining a natural contour between the tip and alar lobule. As initially described, the ideal ASSA ranges from 105 to 135 degrees, with a more obtuse angle corresponding with unfavorable cosmetic and functional outcomes.[8]

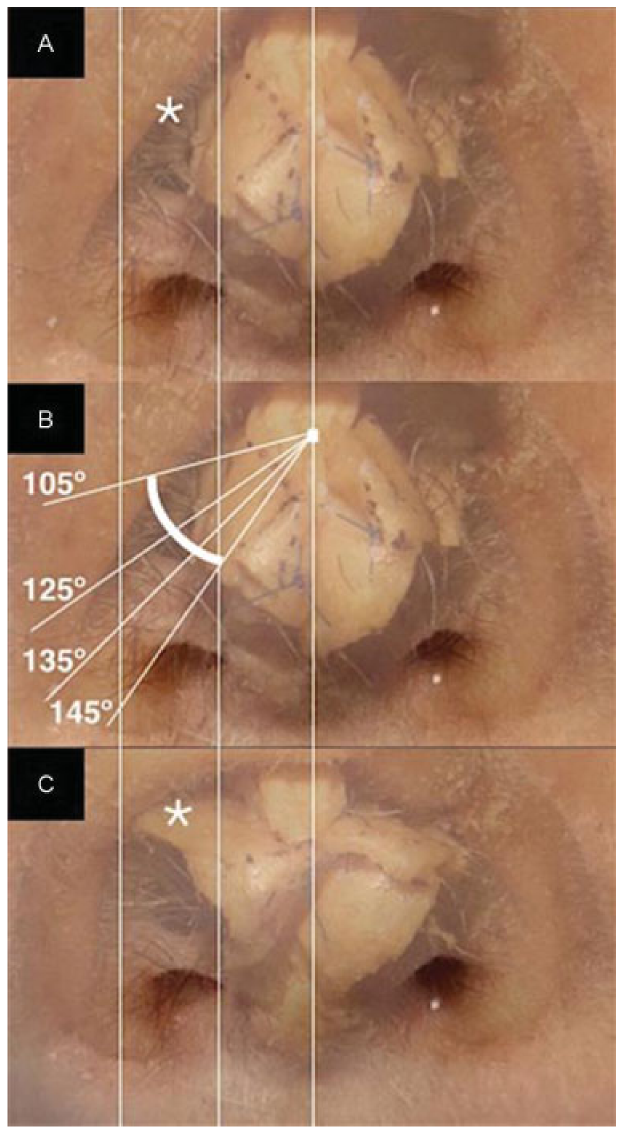

Fig. 4 Alar margin support using the dome-binding suture (DBS) versus the hemitransdomal suture (HTS) in cadaveric dissections. **(a)** Lack of cartilaginous support at the alar margin (white asterisk) using the DBS. **(b)** Schematic demonstrating how increasing the rotational angle of the lateral crus leads to inversion of the caudal margin and loss of support at the alar margin. **(c)** Note improvement of cartilaginous support (white asterisk) at the alar margin using the HTS due to the elevated position of the caudal margin of the lateral crus.

Based on our measurements, we propose that the ideal ASSA range should be slightly narrower, from 105 to 125 degrees. The more obtuse the ASSA, the more inverted the lateral crus becomes, and the less cartilage is present at the alar margin for support (►**Fig. 4**). As demonstrated in the schematic, at 135 degrees there is still not sufficient support at the alar margin. Based on these measurements and subjective analysis of cartilaginous support at the alar margin, we propose that the maximum ASSA considered ideal should be 125 degrees. In this study, all ASSA angles measured after HTS placement were less than 125 degrees.

The DBS is known to narrow the dome, but oftentimes leaves a pinched appearance of the dome, concavity of the lateral crus, and lack of support at the alar margin. Use of lateral crural strut grafts or alar rim grafts have been described to counter these effects; however these add additional time, complexity, and need for graft material to the operation. Dosanjh et al introduced the HTS as a technique that can narrow the cephalic aspect of a wide nasal tip while everting the caudal edge and maintaining a straight cephalic edge of the lateral crus.[5] Additionally, the concavity that can occur with a DBS is avoided when using the HTS. The HTS is simple to perform, easy to learn, and does not require the additional time or cartilage required for placing alar rim or lateral crural strut grafts. We recently reviewed 112 patients who underwent rhinoplasty with either DBS or HTS technique and found that more satisfactory outcomes were obtained using the HTS when objective comparison of nasal tip contours in the basal view were performed.[7]

This article provides additional objective data in support of the use of the HTS to narrow the nasal tip while maintaining a favorable rotational axis of the lateral crus. Strengths of this study include the objective measurement of angles in cadaveric specimens that underwent identical surgical techniques. Limitations include a small sample size of only 6 cadaver heads or 12 lower lateral cartilages. Additionally, only the ASSA was measured as opposed to other objective assessments. The ASSA was chosen as it was easy to measure and easy to reproduce. Other angles such as the lateral crural resting angle have been described.[6] However, this is the angle formed between the surface of the lateral crus and the upper lateral cartilage, and this angle can be affected by the configuration of the upper lateral cartilages.

Conclusion

Proper handling of the nasal tip is a key component to a successful cosmetic rhinoplasty. Several suture techniques have been described for narrowing a broad nasal tip. Results from this study demonstrate that the HTS puts the lateral crus in a more favorable orientation and results in an improved rotational axis as compared with the classic DBS. The HTS is a simple technique that is easy to learn, can be performed quickly, and is a valuable tool for creating a natural appearing, aesthetically pleasing nasal tip.

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