Mattress Sutures to Remove Unwanted Convexity and Concavity of the Nasal Tip: 12-Year Follow-Up

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Abstract
Nasal tip bulbosity, or convexity, has been one of the most difficult problems to correct during rhinoplasty. Excision of cartilage from the cephalic part of the lateral crus has helped. However, complete correction of the deformity is not always possible with this maneuver alone. Suture techniques have also helped to improve outcomes. Twelve years ago, the lateral crus mattress suture was introduced as a way of converting the lateral crus to a flat, straight segment with resultant correction of the convexity. Since then, this suture technique has been employed in most primary and some secondary rhinoplasties and has stood the test of time. We report our experience with this technique, including a slight modification to facilitate its application when the cartilage is unusually narrow or when the original technique is difficult to complete. In addition, the suture technique for the less concave lateral crura is redescribed. It, too, has withstood the test of time.

Level of Evidence: 4

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Prior to 2002, we introduced a suture technique to reduce unwanted convexity of the lateral crus in correcting a broad nasal tip.1,2 Other methods available at the time included scoring, bruising cartilage, and placing stiffer straight grafts deep to the lateral crus, a task for which the lateral crus strut graft was especially useful.3 However, we found that horizontal mattress sutures provided a simple, atraumatic way to shape tip cartilage. This simple suture technique for controlling convexity and its inverse, concavity, was then extended to cartilage grafts (eg, ear cartilage) that required straightening before being used as a strut. It has also been applied to the horizontal and/or vertical component of L-shaped struts that are not completely straightened by the usual scoring methods. We report our experience with this technique and a slight modification.

Original Technique

Over the years, we have found horizontal mattress sutures to be a reliable means of straightening all types of cartilage. The only requirement was that the cartilage strip width be ≤10 mm. It is not possible, for example, to apply mattress sutures to the middle of a large, intact piece of cartilage, such as a deviated septum (ie, before removal of the central portion to create a columellar strut). Therefore, in most cases of bulbous nasal tip, the cephalic component of the lateral crus had to be removed, leaving a strip of cartilage that was approximately 6 mm wide. At the very least, an incision was made parallel to and 6 mm from the caudal

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border of the lateral crus, so that the cephalic component was an island with no attachment to the 6 mm-wide surgically created lateral crus. More often than not, a second—and occasionally a third—horizontal mattress suture was needed to straighten the cartilage. Removal of the convexity with lateral crus mattress sutures has the added benefit of increasing the over-length of the lateral crus, resulting in more tip projection.

Over the last 12 years, we have utilized mattress sutures to reduce lateral crus convexity in 282 patients (86% female) who were available for follow-up of ≥1 year (mean, 13.5, range 10–19 months). The method of placing the mattress sutures was considered important (Figure 1). The first bite (ie, the width between needle entry and exit) in the lateral crus, which should be as small as possible, was made with a small needle, such as a P-3 precision point needle. This bite was made perpendicular to the long axis of the lateral crus that was being straightened. The second bite, which was made approximately 5 mm to 6 mm from the first bite, was also perpendicular to the long axis of the cartilage. The thinner the cartilage, the smaller the distance should be between bites. However, if the distance between passes is too small, the convexity is not corrected. Conversely, if the distance between bites is too large, the lateral crus may buckle, causing a slight concavity. In 1 mm-thick septal cartilage, such as the horizontal component of the L-shaped septal strut, the gap can be as large as 8 mm to 10 mm. Trial and error was sometimes necessary with this 2-bite technique. The net result was dramatic control of convexity of the lateral crus and tip, especially from the basal view (Figure 2).

One negative feature of this mattress suture technique is that it is difficult to perform on a narrow lateral crus, which tends to be toward the posterior end and occasionally curls under in a very convex manner. Ideally, the gap between entry and exit of the suture should be close to 2 mm in such cases (ie, when this gap is larger, the mattress suture causes the lateral crus to roll in the cephalocaudal direction), but even with a small needle, such a small gap can sometimes be difficult to achieve. Notably, when removing convexity from cartilage grafts to make them usable for columellar struts (Figure 3A), we found that a 4-needle–pass technique permitted a very small gap between entry and exit of the suture. The technique was facilitated by easy access underneath this cartilage, unlike the lateral crus (Figure 3B). As a result, parallel sutures on the convex side of the cartilage could be approximately 2 mm apart (Figure 3C). The technique also could be applied to very narrow strips of cartilage, producing much straighter grafts (Figure 3D). Four passes took longer than 2 passes, but the benefit was well worth the effort.

**Alternative Method Recently Developed**

We subsequently realized that a 4-needle–pass technique might also work in the lateral crus and, if so, might allow more precise control of convexity. During the last year, we have applied this technique to many cases of lateral crus convexity when a mattress suture could not be easily executed with the 2-pass technique.

With this technique, the vestibular skin below the lower lateral cartilage should be infiltrated with local anesthetic before the suture is placed to create adequate space for passage of the needle. As seen in Figure 4A, the needle penetrates the convex lateral crus and then exits the side between the cartilage and vestibular skin. The needle is then inserted between the vestibular skin and cartilage and passed through the cartilage from its deep side through a hole that is about 2 mm from the first entry (Figure 4B). The third pass is made approximately 5 mm to 6 mm away, with the needle penetrating the lateral crus and then exiting the side between the cartilage and vestibular skin (Figure 4C). The fourth pass is completed when the needle slides between the vestibular skin and cartilage and passes through the cartilage from its deep side through a hole that is about 2 mm from the previous entry (Figure 4D).

At first, this technique may seem awkward; however, it will become apparent that the net result is complete and

![Figure 1](image1.png)

**Figure 1.** The lateral crus mattress suture to correct convexity of cartilage. On one side of the maximum convexity, a needle is passed perpendicular to the long axis of the lateral crus (after the cephalic component has been separated). The needle entry and exit are performed with 1 pass. A second pass is made approximately 5 mm to 6 mm from the first. As the knot is tightened, the convexity flattens. Often, a second or third mattress suture is needed in other areas of the lateral crus. Originally, nylon and 5-0 PDS sutures were applied; currently, 5-0 Vicryl sutures (Ethicon) are preferred.
easy control of the location, length, and width of the mattress suture. As a result, very precise flattening can be achieved as the knot is tied.

We also subsequently switched from polydioxanone (PDS) to Vicryl sutures (Ethicon, Somerville, NJ), primarily to avoid the often-visible wirelike effect with PDS. A softer suture also allows the skin to drape more naturally over the lateral crus. Admittedly, the PDS suture has the advantage of being less reactive when exposed on the vestibular skin. In addition, despite the lack of experimental evidence, there was a theoretical concern that a braided suture was more likely than an absorbable monofilament suture to evoke a bacterial response and more severe foul-odor reaction. However, this has not been a problem to date.

Figure 5 shows results of our alternative application of the mattress suture technique for a patient who presented with a bulbous nasal tip.

**Concavities Corrected with Mattress Sutures**

Concavities of the lateral crus are less common than convexities and are easier to correct with mattress sutures. Neu described a novel method in 1996. With our technique, the
Figure 3. Removal of convexity from much straighter cartilage graft such as a columellar strut (A) has always been performed with a 4-needle–pass technique. (B) This technique is preferable because of ease of access under the cartilage (unlike the lateral crus). (C) With this technique, parallel sutures on the convex side of the cartilage can be made approximately 2 mm apart. (D) This technique can also be applied to very narrow strips of cartilage, resulting in a much straighter cartilage graft.

Figure 4. The current 4-needle–pass technique. (A) The needle penetrates the convex lateral crus and then exits the side between the cartilage and vestibular skin. (B) The needle is then inserted between the vestibular skin and cartilage and passed through the cartilage from its deep side through a hole that is about 2 mm from the first entry. (C) Approximately 5 mm to 6 mm away, a third pass is made with the needle penetrating the lateral crus and then exiting on the side between the cartilage and vestibular skin. (D) The fourth pass is completed when the needle slides between the vestibular skin and cartilage and is passed through the cartilage from its deep side through a hole that is about 2 mm from the previous entry. Arrow is point to the smaller bite that we now use (2 mm).
Figure 5. This 30-year-old woman exhibited a broad nasal tip and convex lateral crus, as seen preoperatively from (A) front, (C) side, and (E) basal views. After cephalic trim of the lateral crus was performed, leaving a 6 mm-wide component, transdomal and interdomal sutures were applied. In addition, a lateral crus mattress suture (5-0 Vicryl; Ethicon) was placed as described in Figure 4. The patient also underwent humpectomy, modification of spreader flaps, and osteotomies. At 11 months postoperatively, the bulbosity of the tip had improved, as shown in (B) front, (D) side, and (F) basal views.
needle is passed parallel to, not perpendicular to, the lateral crus (which, as mentioned previously, should be approximately 6 mm wide; Figure 6). The needle exits approximately 5 mm to 6 mm from the entry site. The needle is then placed 2 mm from the exit site and passed in the opposite direction, parallel to the first pass. Tightening of the knot reduces the concavity. The appearance and net result are similar to those observed with the convex correction except that the two parallel 5- to 6-mm suture strands comprising the completed mattress suture are on the deep side of the cartilage (ie, between the cartilage and vestibular skin) instead of the convex surface of the lateral crus.

Results with this technique in a patient who presented with excess concavity at the anterior part of the lateral crus, just lateral to the domes, are shown in Figure 7.

**DISCUSSION**

The successful application of sutures to reshape nasal cartilage has been eloquently described by a number of surgeons. Tebbetts pioneered the concept of placing sutures to shape nasal tip cartilage and avoid cartilage-damaging techniques. Daniel developed a definition suture technique to control the width of the domes during the open approach that has been uniformly successful. In fact, to some extent, this technique can help reduce convexity of the lateral crus. Guyuron and Beymand reviewed many suture techniques to control the shape of the nasal tip. Toriumi and Checcone reviewed general restructuring of the nasal tip, and Ghavami et al provided an algorithm for suture techniques in tip shaping. Rohrich and Adams described the application of sutures for correction of a boxy tip, and Regalado-Briz utilized a special suture technique to reduce convexity while preserving the cephalic part of the lateral crus rather than discarding it, as is commonly done. Perkins and Sufyan recommended an alar-spanning suture similar to that of Tebbetts. Miller and Dayan recently suggested a suture technique similar to ours that also reduces lateral crus convexity. Finally, Neu introduced a suture technique conceptually similar to our approach to the concave lateral crus and with which he has had much success.

In the early years, we utilized nylon sutures because permanent stitches were thought to be necessary. (All nasal tip sutures were once nylon; then pds; now vicryl.) However, some patients complained of a foul smell coming from the nose, which we could only attribute to retained sutures that harbored bacteria. We switched to PDS sutures for several years and did not observe this problem. However, because PDS can be palpable and visible under thin skin, we eventually switched to Vicryl (Ethicon).

Because recurrence of cartilaginous deformity has not been an issue over the years, we have assumed that scar tissue is responsible for maintaining cartilage shape after the suture absorbs. Placement of 2, 3, and sometimes 4 mattress sutures has probably helped to flatten the lateral crus, particularly one that is convex from one end to the other. Once that flat contour is achieved, we have relied on the scar tissue to maintain it, as in suture otoplasty. In fact, suture control of the lateral crus is much easier to achieve than control of ear cartilage in otoplasty because the lateral crus is thinner (ie, only 0.5 mm).

Making the bite as small as 2 mm has prevented the lateral crus from exhibiting a noticeable return of cartilage deformity to its original shape. It has, however, prevented the lateral crus from exhibiting a slight convexity in the cephalocaudal direction, a problem that can occur if the bite is excessive. Care must also be taken to avoid making the entry-to-exit distance smaller than 2 mm, as this can result in torn cartilage. This has happened on more than one occasion. However, because the lateral crus is cut to an approximate width of 6 mm with our technique, there is room to place the suture caudal or cephalic to that torn region. Furthermore, one can always abort the suture technique and use a lateral crus strut.

In the case of asymmetry, the first priority is to straighten the lateral crus. Any discrepancy in length between the 2 lateral crura should be corrected by transecting the posterior end of the long crus, undermining the cartilage, and overlapping the 2 elements in a pants-over-vest fashion.
Figure 7. This 31-year-old man exhibited concavity of the lateral crus immediately lateral to the dome, as shown in (A) front, (C) side, and (E) basal views. After cephalic incision, leaving a 6 mm-wide lateral crus, a 5-0 Vicryl (Ethicon) mattress suture was applied to the lateral crus, as described in Figure 6. The patient also underwent an open approach, humpectomy, modification of spreader flaps, resection of the caudal border of the septum and nasal spine, a slight derotation, deprojection by release of the tip complex from the caudal septum, interdomal sutures, osteotomies, alar base excisions, chin augmentation, and submentoplasty. At 14 months postsurgery, the concavities adjacent to the tip had improved, as shown from the (B) front, (D) side, and (F) basal views.
CONCLUSIONS

The lateral crus mattress suture has been effective in controlling nasal tip bulbosity, or convexity. A minor modification was recently made to allow more precise placement of the suture. The techniques we describe here have allowed us to save the cartilage grafts for other purposes. We recommend the mattress suture technique to other surgeons based on long-term follow-up.

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