Suture Techniques for the Nasal Tip

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The authors use 5 basic suture techniques in tip plasty: transdomal, interdomal, lateral crural mattress, columnella-septal, and intercrural, incorporating these techniques into a simple algorithm to control tip cartilage shape. They then introduce the universal horizontal mattress suture, designed to control all undesirable nasal cartilage convexities/concavities, and provide a new suturing technique that can be applied in all patients in whom a change of cartilage shape, including tip cartilages, is desired. They also apply these suture techniques in patients undergoing closed and secondary rhinoplasty. (Aesthetic Surg J 2008;28:92–100.)

Featured Operative Technique

If rhinoplasty is arguably the most difficult operation in aesthetic plastic surgery, tip plasty has been described as its most difficult aspect. Traditional techniques of excision, scoring, and crushing cartilage to remove unwanted convexity or bulbosity have been associated with complications such as alar retraction, rim collapse, inspiratory breathing problems, and, most notably, supratip and polly beak deformities.

Suture techniques to control tip shape were created along with the first rhinoplasty procedures. Plastic surgeons, working in the 20s, used rather complicated stitch patterns to secure the tip complex to the caudal septum in an effort to prevent the tip from dropping after surgery. Over the decades, suture techniques were introduced intermittently, but to a limited extent. It was not until the early 80s that there was a surge in suture techniques to control tip shape. Tardy et al1 introduced one of the first techniques—a suture to reduce the width of the domes in the closed approach. Daniel2 popularized a dome control suture for the open approach. Tebbetts,3 more than anyone else at the time, suggested a change in our approach to cartilage control by suggesting non-destructive techniques. A number of suture techniques to control virtually every part of the nasal tip complex became available.4-18

The beginning rhinoplasty surgeon might be confused by the many nasal tip suture techniques available and the many different names used for essentially similar techniques. Here, I will provide a simple algorithm, using the most commonly understood terminology19 that can be applied to almost all types of nasal tips. I will also provide a new and basic technique of suturing that has general applicability to all situations in which the surgeon wants to change the shape of the cartilage.

It must be acknowledged that there are other such algorithms that also work very well. These include Daniel’s2 3-suture algorithm and the algorithm by Rohrich and Adams20 for the boxy tip and a more generalized algorithm by Guyuron and Behman.18

Because suture techniques are intended to change the shape of tip cartilages, the assumption is that there is cartilage of sufficient size and integrity to permit the application of suture techniques. When cartilage is missing or extraordinarily weak, grafting is necessary. Tip grafts, columnellar struts, spreader grafts, and lateral crural struts will not lose their significant roles in rhinoplasty simply because suture techniques are available.21

FUNDAMENTAL PRINCIPLES OF SUTURE TIP TECHNIQUES

Use a Model to Facilitate Suture Sculpting

Once the skin flap is reflected and the tip cartilages are visible, decisions have to be made about what to resect and what to contour with sutures. Fundamentally, tip plasty is biological sculpting, with cartilage used as the medium. For the beginning surgeon, this task can be daunting; having a model to reference makes the task much easier. Memorizing images of what should be drawn or sculpted, including lengths and angles, is reasonable but more tedious.

To facilitate sculpting, a model has been developed that constitutes a good approximation of what the tip cartilage framework should look like after a conventional tip plasty (Figure 1). The lateral crura are flat and 6 mm wide to minimize chances of inspiratory collapse. The dome is about 6 to 8 mm above the dorsum to compensate for the thick supratip skin.

The angle of domal divergence, defined as the angle made by the medial crura as they splay apart (as seen on basal view), is apparent.22 A separation of about 3 mm between the cephalic ends of the domes is evident, which should serve as a reminder that the domes are not to be squeezed together.
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Figure 1. A model facilitates the sculpting of tip cartilages by providing the approximate lengths, widths, and angles of an operated tip cartilage that has received cephalic trim of the lateral crus and narrowing of the domes. Note the following: (1) the tip is about 6 to 8 mm above the dorsum, (2) the angle of dome divergence as the axis of the domes separate, and (3) the domes do not touch one another; there is approximately a 3-mm separation between the cephalic end of the domes.

Leave a 6-mm Wide Lateral Crus
As a general rule for bulbous broad tips, it is best to excise part of the cephalic lateral crus so that the remaining lateral crus is 6 mm wide, a width sufficient for structural integrity, which also enables suture techniques to control unwanted convexity.

Note the Delayed Effects of Sutures
Harris et al\[23\] noted that cartilage that is cut or scored will show signs of warping within 15 to 30 minutes. Similarly, cartilage that has been manipulated by sutures can show minor changes during the course of the operation. It takes time for the cartilage to reach a state of equilibrium. Therefore it is important to reexamine the sutured areas before closing the nose.

Follow Guidelines for Suture Type and Size
For many years the senior author (R.G.) believed that permanent sutures would be necessary to achieve a permanent effect on cartilage contour. That has simply not been proven true. Polydioxanone (PDS) sutures work just as well as permanent sutures and have the benefit of not causing stitch reactions (by protruding through the skin) or microabscesses that manifest as a bad odor not noted by the patient. As for suture size, 5-0 PDS is empirically the size of choice for tip cartilages.

Make Use of the Universal Horizontal Mattress Suture
Although there are many specific suture techniques to control the shape of tip cartilages, the general principle is to modify unwanted convexity or concavity.\[24,25\] A horizontal mattress suture will reduce unwanted curvature of any nasal cartilage (including the septum), provided the cartilage is not more than 10 mm wide (Figure 2). The first purchase must be made perpendicular to the long axis of the cartilage, and the second purchase must be made at 6 to 8 mm from the first purchase. For cartilages thicker than 0.5 to 1 mm, the interval between purchases should be closer to 10 mm. The benefit of controlling cartilage shape with sutures is enhanced by the fact that the strength of the sutured cartilage is increased. A single suture has been demonstrated to increase the strength of 0.5-mm thick-cartilage by approximately 50%. Scoring to achieve the same degree of cartilage control may work but drastically reduces the strength of the cartilage and runs the risk of collapsing it.

Lateral Crus Resection
Before any suture technique is begun, the cephalic part of the lateral crus needs to be resected, leaving the lateral crus at about 6 mm wide and amenable to suture techniques that can completely remove unwanted convexity. There are exceptions to this rule, such as when a patient has preexisting alar retraction or when the nose needs lengthening. In such cases, resecting any lateral crus is contraindicated. However, for average primary and occasional secondary nose surgery in which the nose has a broad, wide, or bulbous tip, narrowing is required and most easily accomplished when starting with a lateral crus that is about 6 mm wide. Although the actual dome can be closer to 4 mm, the main body of the lateral crus should be 6 mm so that it will not collapse and is amenable to manipulation by suture techniques.

THE 5 SUTURE ALGORITHM
There are 5 basic suture techniques used in tip plasty that the authors have found most useful.

Transdomal Suture
The transdomal suture is perhaps the single most important suture technique for bringing the tip cartilages under control (Figure 3). Local anesthesia, by hydrodissection, is applied deep to the cartilages to prevent the needle from penetrating the lining and causing suture exposure. Standing at the head of the patient’s bed, one simply grasps the dome with a Brown-Adson forceps, squeezes it gently, and applies a mattress suture, beginning on the medial side and applying deep to the cartilages to prevent the needle from penetrating the lining and causing suture exposure. It is easy to see that the domes have an axis and orientation — a cephalic and caudal end. The dome no longer looks like a small parachute as it did before resection of the cephalic lateral crus. The axes of the 2 domes form an angle of domal separation that is about 60 to 90 degrees. If for some reason the angle is abnormal, it can be altered by...
**Figure 2.** A horizontal mattress suture applied to the convex surface (A) of any cartilage strip that is 10 mm or less will remove most of the convexity (B) and give the cartilage increased strength (C).

**Figure 3.** A, The transdomal suture is a horizontal mattress suture that narrows the dome and therefore the nasal tip. B, Intraoperative view of transdomal suture of right tip as seen from the head of the bed. Note improvement to tip of width on the right side.

**Figure 4.** A, An interdomal suture brings the 2 tips together, prevents them from splaying, and contributes to the narrowing of the nasal tip. The purchase is made approximately 3 mm posterior to the domes. Usually the cephalic ends of the domes are allowed to be separate from one another by about 3 mm. B, Intraoperative view of interdomal suture.
removing the suture, regrasping the dome so that the axis angle is altered, and then reinserting the transdomal suture.

**Interdomal Suture**

The interdomal suture provides tip strength and symmetry (Figure 4). This stitch is particularly important if the domes are weak and tend to splay apart; however, the purpose of the interdomal suture is not to bring the domes in contact with each other.

As the model indicates, there is usually about 3 mm between the cephalic ends of the domes, a distance that is not absolute (Figure 4, A). If the domes are large and divergent, you might want less distance between the cephalic ends of the domes so that overall the tip is not too wide. To achieve that end, a 5-0 PDS suture (Ethicon, Somerville, NJ) is applied between the middle crura (on the cephalic side) and about 3 to 4 mm below (posterior) to the dome. The overall nasal tip width is controlled by the interdomal suture, as well as the transdomal sutures. In men, a wider tip width is planned for than in women, controlled by both the interdomal and transdomal sutures.

**Lateral Crural Mattress Suture**

The underside of the lateral crus is infiltrated with anesthesia and a horizontal mattress suture (5-0 PDS) is applied at the apex of the lateral crus convexity (Figure 5). Standing at the head of the patient’s bed, the lateral crus is grasped with a Brown-Adson forceps, and the needle is passed on one side of the forceps perpendicular to the long axis of the lateral crus. The lateral crus should be slightly folded around with the forceps so that the smallest possible purchase can be made with the needle. Typically, a C-3/P3 needle (Ethicon) is used.

A second purchase is made on the other side of the forceps at a distance of about 6 to 8 mm from the first purchase. The resulting knot is cinched until the convex crus flattens. Tying the knot too tightly may cause unwanted concavity of the lateral crus. There is frequently residual convexity in the posterior aspect of the lateral crus, which should, accordingly, receive a second mattress suture. Occasionally, a third mattress suture may be necessary to achieve a straight lateral crus. Each suture provides an approximately 30% increase in strength to the lateral crus.24,25

**Columella-Septal Suture**

The principle of the columella-septal (CS) suture is evident in similar suture techniques that also attempt to secure the tip cartilages to the caudal septum to effect both tip projection and rotation. With this suture technique, a large needle is passed between the leaves of the middle crura. (There are many fibers between the middle crura, allowing for very good purchase.)

The needle is then passed through the anterior septal angle, which is usually at a more anterior level to the CS entry (Figure 6). In recent years the senior author has noted that 2 bites of the anterior septal angle are preferable because, occasionally, a single suture may pull out. The needle is then passed back between the leaves of the middle crura. If there is a transfixion incision, a clamp is placed between the tip cartilages and caudal septum to prevent overtightening of the knot. As the knot is slowly tightened, it pulls the tip cartilage up against the caudal septum, correcting any existing hanging columella and also providing a small amount of tip projection. We emphasize “small amount” because the CS suture is not a replacement for the columellar strut. The CS suture should be thought of as a suture technique that fine tunes the position of the tip cartilages with respect to the caudal septum.

**Intercrural Suture**

Not infrequently the middle crura splay at their caudal ends yielding what will undoubtedly be a wide columella. When inserting a columellar strut, the middle crura also tend to separate or splay. Consequently, an intercrural suture, which is simply a mattress suture (referred to by Guyuron as a middle crus suture and by Daniel as a domal equalization suture) can be used to reduce the width of the cartilages in this location (Figure 7). A 5-0 PDS is used to take a purchase of the inside of the middle crura (from posterior to anterior) on one side and then another purchase on the contralateral side. The knot will be located between the middle crura. Care is taken not to tie the knot too tightly to avoid overly nar-
rowing the normal middle crus width. Again, use of a model helps to determine what is a normal width in this region. If a columellar strut has been placed between the middle crura the needle simply picks up the strut in its path from one middle crus to the other.

**UNIVERSAL HORIZONTAL MATTRESS SUTURE**

The universal horizontal mattress suture serves to control any strip of cartilage provided that it is not more than approximately 10 mm wide. This has been demonstrated in L-shaped struts of the septum. In terms of tip plasty there are 2 situations (other than the convex lateral crus) in which the horizontal mattress suture can be helpful:

**Tip Grafts**

Occasionally, aesthetic surgeons see patients in whom the tip graft of septal cartilage has been inadvertently overscored to lend some curvature. Fortunately, a horizontal mattress suture (5-0 PDS) applied to the scored (hyperconvex) side of such a damaged graft can completely correct it (Figure 8).

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**Figure 6.** A, Columella-septal suture. B, Intraoperative view. Two purchases of the anterior septal angle should be taken to achieve a good purchase. Also, care should be taken not to tie the knot too tightly because that action could cause columellar retraction.

**Figure 7.** A, The intercrural suture brings the caudal aspect of the tip cartilages together and therefore narrows the columella. The suture is applied at the middle crus level. Care is taken not to tie the knot too tightly and cause an overly narrow columella. B, Intraoperative view of needle being passed from one middle crus to the other.
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On occasion, you may attempt to use concha cavum for a tip graft but then discover that it is too convex. Under those circumstances, a horizontal mattress suture of 5-0 PDS is simply applied to the hyperconvex side, and the knot is tied tight until the hyperconvex graft is converted to a slightly convex graft.

DISTORTED LATERAL CRURA

Not uncommonly, patients complain of a bump inside the nose that is bothersome to the touch or interferes with their airway function. In such a case, the patient is referring to a curling of the posterior aspect of the lateral crus that protrudes into the vestibule. Although there are several ways to correct this problem, one of the easiest and most effective is to make an incision on both sides as well as the posterior side of the lateral crus. This delivers the posterior aspect of the entire lateral crus. Essentially, a composite flap of vestibular skin and lateral crus is delivered into the vestibule (Figure 9). A 5-0 PDS is applied on the convex side. A second horizontal mattress suture may be required to straighten out the lateral crus. The flap is simply returned to its bed.

Any suture technique executed in the open approach may also be executed in the closed (endonasal) approach. However, it is more difficult to do so, particularly if the tip cartilages are not adequately delivered. To deliver the tip cartilage, both an intercartilaginous and transfixion incision are needed along with a marginal incision that continues toward the inside of the upper columella. Dissection should be extensive as is necessary to allow the dome to be delivered through the nostril. Doing so makes it possible to apply transdomal and lateral crural mattress sutures (Figure 10). In general, a judgment about suture technique efficacy can only be made after the dome is replaced within the skin sleeve. However, a judgment about lateral crural mattress suture efficacy can be made by delivering the dome and then pressing down on it with the index finger to determine whether the lateral crus buckles easily. If so, another mattress suture or two may be necessary. Applying the intercrural suture requires the delivery of both domes through one nostril. The columellar-septal suture can be applied from the columellar rim incision by allowing the needle to penetrate between the leaves of the middle crura.

Figure 8. Excess curvature of a tip graft due to overscoring septal cartilage, or a naturally hyperconvex cavum concha graft, is corrected by a horizontal mattress suture applied to the convex surface.

Figure 9. If the posterior end of the lateral crus protrudes into the vestibule, it is corrected by releasing the entire posterior aspect of the lateral crus, (A) delivering it into the vestibule, and (B) applying a 5-0 PDS suture on its convex side to straighten it out.

Figure 10. In the closed (endonasal) approach, the lateral crural mattress suture can be used to remove tip convexity and bulbosity, provided that the tip is adequately delivered through the vestibule for proper exposure.

SUTURE ALGORITHM IN CLOSED (ENDONASAL) RHINOPLASTY
Figure 11. A, C, E. Preoperative views of a 35-year-old woman complaining of a broad bulbous tip. B, D, E. Postoperative views 13 months after transdomal, intercrural, and lateral crus mattress sutures and columella-septal suture techniques are used to control tip shape. Note that 4 of the 5 sutures in our recommended algorithm were used. With an open approach, the cephalic aspect of the lateral crus was resected, leaving a 6-mm lateral crus. A humpectomy with spreader flaps was also performed.
Figure 12. A, C, E, Preoperative views of a 23-year-old woman who complained of a broad ill-defined nasal tip. B, D, F, Postoperative views 20 months after transdomal, intercrural, lateral crural mattress suture, and columella-septal suture techniques are used to control tip shape. The patient also underwent humpexcision and received spreader flaps.
SUTURE TECHNIQUES IN SECONDARY RHINOPLASTY

When opening a nose in secondary surgery, there may be little anatomy to observe. Frequently, there is just a mass of scar tissue mixed in with cartilage, making it difficult to discern whether there is any substantial cartilage. The domes, often not identifiable, are one round mass. The distinction between the upper lateral crura and lower lateral crura is also blurred. Before proceeding with the recommended suture algorithm, it is essential to create a semblance of two arches as noted in the model (Figure 1). First, the caudal border of the lateral crus is identified as best as is possible. Then a line 6 mm parallel to that border is marked, and the scar tissue and cartilage that exist between it and the upper lateral cartilage are removed. That maneuver yields the semblance of lateral crus. Next, a number 15 knife is used to split the domal mass down the middle. No attempt is made to dissect out the middle crura (that would be far too tedious). Moreover, the resulting 2 halves will be strong enough, even if the division slices through one of the middle crura. The net result of the above maneuvers is 2 arches (often a mixture of scar and cartilage) that can now receive suture techniques. In most cases the scarred framework can be worked with just as in a primary situation. If, after placement of transdomal, interdomal, and lateral crural mattress sutures the tip still lacks support or definition a tip graft is applied. Postoperative tip shape has been improved because of suture techniques developed by various surgeons over the years. At the very least, the suture techniques have solidified the tip complex to better support a tip graft. Results are presented in Figures 11 and 12.

DISCLOSURES

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REFERENCES


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