The reality of cosmetic rhinoplasty is that the patient’s happiness with the result is determined primarily by the quality of the tip surgery, yet most surgeons feel that achieving consistently attractive tips is challenging, especially as the presenting deformity becomes more difficult. Fortunately, sequential advances have occurred in tip surgery that can now be combined into a new approach—the “designer tip”—wherein patients can obtain the tip they want and surgeons can achieve consistent results with a combination of open suture tip techniques and tip refinement grafts (TRG).

THE EVOLUTION OF TIP SURGERY
It is important to understand why the designer tip is a new approach to tip surgery; its principles integrate aesthetics, anatomy, and surgical techniques. In order to fully appreciate the development of this approach, an understanding of tip surgery evolution is essential. Historically, one can subdivide tip surgery into five eras.

Excisional Period
From 1935 to 1985, tip surgery consisted of excising, incising, or dividing the alar cartilages. The early results were often excellent, but bossa, sharp edges, and external valve collapse gradually occurred, especially under thin skin. The technique’s fatal flaw was division of the alar cartilage, which led to a loss of support and subsequently resulted in soft-tissue pollybeaks, retracted alar rims, and pinched tips. These noses, with their “surgically done” tip appearance, led directly to the tip graft era.

Closed Tip Graft
Sheen and Sheen and Sheen pioneered and promoted closed multilayer tip grafts. Initially, the technique was developed in order to restore tip shape and contour in overly-resected secondary noses. Subsequently, its application was extended to primary cases, achieving spectacular results with broad tips, alar malposition, and thick skin. As indicated by Constantian, there are intrinsic limitations with closed tip grafting. First, the grafts are placed subdermally, which risks visibility and causes telltale telangiectasia and “shrink wrapping” under thin skin. Second, the tips often look bigger and unaesthetic on anterior view, which is the most important view for the patient (in contrast to the oblique view favored by the surgeon). Third, the avoidance of columellar struts leads to excessive length in the infralobule and frequent use of premaxillary alloplastic implants, which are rarely used by other surgeons. Fourth, the technique can become quite radical, as it does in treating alar malposition, where the entire middle and lateral crura are excised and the final tip shape is totally dependent on the multilayer tip graft. Ultimately, the technique fell out of favor because less experienced surgeons were unable to replicate Sheen’s results.

Open Tip Structure Graft
Johnson and Toriumi developed the open structure tip graft by combining the open approach with Sheen’s tip graft and Anderson’s use of columellar struts. The technique offered a dramatic solution for difficult broad and overprojecting tips, especially those encased in thick skin. Modifications were made by the addition of “cap grafts” to maintain long-term projection and domal sutures rather than domal excision. Although Johnson and Toriumi were able to apply the technique to a wide variety of tip deformities, others moved on to tip suture...
techniques for several reasons. First, structural tip grafts, over time, can begin to show through the skin too much; the graft can also distort the infralobule. Second, the operation gives a “standard appearance” to the nose, which is not sufficiently flexible to meet a wide variety of patients’ aesthetic requests.

Open Tip Sutures
The author did his first open aesthetic tip suture in 1984 and published the technique in 1987,9 concurrent with the work of McCullough and English.10 The critical concept was the linkage between surface aesthetics, underlying anatomy, and surgical techniques.11 During the past 25 years, the author has continued to modify his technique and adopt sutures from other surgeons in his pursuit of achieving consistent results.12–14 It is the author’s opinion that open tip suture techniques are extremely flexible and incremental, which allows one to essentially continue suturing until the desired result is achieved. Because open tip suture techniques are currently the most-used tip technique, other surgeons have obviously found them to be effective and the results gratifying.15,16 As with all of rhinoplasty, the initial problem is gaining surgical judgment with regard to the sutures and their effect(s), both individually and in combination. Fortunately, the learning curve is not steep and the technique is both progressive and reproducible. The limiting factor has been the correlation between underlying anatomy and surface aesthetics. As skin thickness increases, the refined anatomic configuration is muted and not expressed through thicker skin. This challenge has led to the use of add-on grafts of excised alar cartilage.

Tip Refinement Grafts
Initially, the author used excised alar cartilage as “concealer” grafts to hide asymmetries and conceal bifidity in the infralobule.8 Gradually, these grafts were placed over the domes or in the infralobule to gain slightly more definition and even incremental increases in projection. Multiple shapes, layers, and combinations of grafts evolved over time, as did an expansion of indications. The results were dramatic in the assessment of both surgeon and patients. The result is a new type of tip graft: the TRG.

THE DESIGNER TIP
Essentially, the author employs one of three tip operations, depending upon the severity of the presenting tip deformity. These include closed transcartilage excision (10%), open tip suture with or without TRG (85%), and open structure tip graft (5%). Closed tip excisional procedures are reserved for patients with an ideal tip or those who purely have excess volume. The open structure tip graft is employed for major tip deformities, ranging from underprojecting tips enshrouded in thick skin to major overprojecting tips that require domal excision and replacement with a tip graft. The vast majority of the author’s cases involve a “designer tip,” which implies achieving the specific tip configuration desired by the patient. It is the author’s firm belief that tip suture techniques, either with or without TRG, afford the surgeon this option.

Aesthetic/Anatomic Correlates
Sheen defined the ideal tip as having four tip points on oblique view; these create a tip diamond on anterior view (Figure 1). In a series of 25 open rhinoplasties, the tip surface aesthetics were marked, transferred to the underlying alar anatomy with a 25-gauge needle dipped in methylene blue (Figure 2), and the nose was then opened.11 The right and left dome-defining points (D) fell on the junction line between the domal segment and lateral crura. When it was present, the supratip breakpoint (S) correlated with the cephalic midline junction of the two alars. The columellar breakpoint (C) marked the junction between the medial and middle crura. Despite our obsession with the tip point (T) on lateral view, there is no anatomic correlate. As we progressed to devising surgical techniques to achieve specific aesthetic goals, the domal notch of the alar cartilage became a critical landmark. The lateral genu of the domal notch defines the junction between middle and lateral crura. Despite our obsession with the tip point (T) on lateral view, there is no anatomic correlate. As we progressed to devising surgical techniques to achieve specific aesthetic goals, the domal notch of the alar cartilage became a critical landmark. The lateral genu of the domal notch defines the junction between middle and lateral crura, which is the location of the dome-defining points. Therefore, domal creation sutures straddle the domal segment. In contrast, the medial genu of the middle crura may reflect Sheen’s columellar lobular junction point.

Tip Sutures
Fundamentally, individual tip sutures are designed to achieve a specific aesthetic goal while their combination
results in the specific desired tip. Although one selects only those sutures required to produce the desired shape, a maximum tip suture sequence would involve the following progression17 (Figure 3):

**Step 1.** Excision of excess cephalic lateral crura reduces tip volume and makes the remaining 6-mm rim strip more suturable.

**Step 2.** Insertion of a columellar strut and its fixation with a strut suture unifies the tip, increases projection, and prevents postoperative tip droop, especially on smiling.

**Step 3.** Domal creation sutures provide tip definition by accentuating a convex domal segment.

**Step 4.** An interdomal suture reduces tip width while formalizing the anatomic tip diamond.

**Step 5.** The domal equalization suture fine-tunes tip symmetry.

**Step 6.** The lateral crura convexity suture reduces convexity of the lateral crura.

**Step 7.** The tip position suture ensures a supratip break by elevating and rotating the tip.

Based on 25 years of experience and several thousand sutured tips, the author has developed a series of practical recommendations. First, the consistent use of a columellar strut is important. It promotes stability, symmetry, and projection while minimizing tip droop. It also prevents a plunging tip. With minimal effort, there is much to be gained in that regard. Absorbable sutures should also always be used to minimize infection. Dyed sutures are easier to see. Most problems occur from too much tension, not too little.

“domal notch” is the location for the domal creation suture, so learning to recognize it is an essential part of perfecting this technique. The middle crura should be “open” and the interdomal suture should not be tied too tight. The domal equalization suture improves symmetry and lowers the cephalic rim. The tip position suture creates supratip break, but care should also be taken not to tie it too tight. Surgeons should be prepared to perform alar rim grafts because they are often necessary.18 If the strut is too long and pushes down the columellar base, it should be shortened via a short transfixion incision. Each tip operation should...
Figure 4. The domal graft is designed to accentuate the dome-defining points and can be applied in multiple layers, depending upon skin thickness.

Figure 5. A, Intraoperative view of a 31-year-old woman showing improvement with tip sutures and enhancement with a domal tip refinement graft (B). Increased volume and definition of the intrinsic tip can be seen in the comparison between the preoperative (C) and one-year post-operative (D) photographs.
Figure 6. The shield graft increases tip definition and, in a double-layer configuration, can push the tip downward. D, Dome-defining point.

Figure 7. A, B, Intraoperative views of a 20-year-old woman with a very broad nasal lobule (C) that can be seen postoperatively. D, The achievement of a narrow tip is evident one year postoperatively. A double-layer shield graft was used.
Figure 8. The diamond graft increases the volume of the intrinsic tip and sets the tip off from the rest of the lobule. C, Columellar breakpoint; D, dome-defining points; I, infralobule point; S, supratip breakpoint; T, tip.

Figure 9. A, Intraoperative views of a 30-year-old woman. A diamond graft is being draped over the intrinsic tip (B). C, Preoperative view of the patient, who presented with a depressed nasal tip ensheathed in thick skin. D, Two years after the addition of a tip refinement graft. Note the patient's narrower, stronger, more defined nasal tip.
Figure 10. The folded tip refinement graft consists of a diamond graft that is then folded to create a second layer, which pushes the tip defining point caudal to the domes.

Figure 11. A, B, Intraoperative views of a 28-year-old woman. The folded graft produces a very distinct edge, with the tip point caudal to the domes. Even in patients with thick skin preoperatively (C), a folded tip refinement graft can produce dramatic tip definition. D, One year after placement of a folded tip refinement graft.
be recorded with intraoperative photographs and drawings on the operative diagram, and these should be referred to at every postoperative visit. Surgical cause and effect becomes most evident this way, so they are a valuable self-teaching tool for every surgeon. Based on the long-term follow-up data, tip sutures are highly effective in dealing with the majority of primary and even secondary tips that one encounters in a rhinoplasty practice.

**Tip Refinement Grafts**

TRG are small pieces of excised alar cartilage in various shapes that are added to a sutured tip. Although conceptually simple, these grafts represent a major advance in tip surgery. TRG differ from other types of tip grafts in that the majority of tip grafts are made from relatively rigid cartilage from the septum, concha, or rib. These rigid grafts have a dramatic interplay with the skin envelope, especially with regard to their subsequent visibility under thin skin. Surgically, rigid grafts are planned from the beginning of the operation to create the anatomical tip and they tend to be structural. In contrast, TRG are soft, pliable cartilage often covered with a thin, slippery perichondrium that results in minimal visibility under thin skin. TRG are essentially added on to a sutured tip to accentuate and refine the tip aesthetics. If suturing the tip is so effective, it may seem that TRG are unnecessary. Essentially, though, their usefulness arises from the need to achieve the desired surface aesthetics irrespective of wide variations in alar anatomy and skin envelope thickness. TRG allow the surgeon to fine-tune intrinsic tip volume, definition, and projection. Perhaps more importantly, they allow us to refine the facets of the tip diamond. For example, one can accentuate and caudally lower the dome-defining points (D) using a folded shield graft. A specific tip point (T) can be created using a deeper domal graft overlaid with a narrow diamond graft. The size, sharpness, and number of layers are altered depending upon the skin envelope. As a result, the surgeon can design the most subtle details of an aesthetic tip.

**TYPES OF TIP REFINEMENT GRAFTS**

While each of the most common TRG require different techniques and have different indications, all of these grafts have the following common characteristics: (1) they are made from excised alar cartilage; (2) they are shaped using sharp cuts without bruising or morselizing; (3) they are applied once tip suturing is completed; (4) they are sutured into place with 5-0 polydioxanone sutures; and (5) their effect on the surface aesthetics is evaluated by redraping the skin.

**Domal TRG**

These grafts are designed to accentuate the dome-defining points (Figure 4). They are relatively small (8 × 4 mm) and are placed over the domes, covering the domal cre-ation sutures. They are sutured at four points: the caudal and cephalic borders of the domal notches. Single- or double-layer grafts are used, depending upon the degree of definition desired. The primary indication for domal TRG is a patient who needs accentuated tip definition (D) and a subtle set-off relative to the dorsal line (Figure 5). The deep graft can be quite short, leading to more transverse convexity and creation of a distinct tip point (T). The inherent problems are very few. Visibility under extremely thin skin can be avoided by interposing a thin layer of fascia.

**Shield TRG**

These were the original concealer grafts used to hide tip asymmetries. Their shape was modified to have a distinct dorsal edge and they now resemble the more classic “golf tee” design (Figure 6). The shoulder of the graft is sutured to the domal notch, which ensures that the graft’s dorsal edge produces each of the dome-defining points (D). The most common variation is the use of “booster grafts” placed behind the shield graft to force even more definition, or in front of the graft to create more infralobular contour. Intraoperative, preoperative, and postoperative photographs of a patient who underwent tip grafting with this technique are shown in Figure 7.

**Diamond TRG**

These grafts are diamond-shaped and cover the entire tip diamond (Figures 8 and 9). They are sutured at each domal notch, at the columellar breakpoint, and at the midline junction of the cephalic lateral crura. Essentially, with a diamond TRG, the surgeon is both defining and setting-off the tip from the adjacent lateral crura. One variation with this technique is in how the grafts themselves are made. The long graft continues down to the columellar breakpoint, while the short graft stops at the columellar lobular junction.

**Folded TRG**

These grafts have the same shape as a long diamond graft, but are folded at their widest point, with the shorter portion tucked behind (Figure 10). The graft is held in a projected position 1 to 2 mm above the dome; the graft’s shoulder is then sutured to the domal notch. The fixation suture penetrates both portions of the graft, which creates a forceful curved edge caudal to the domes. Essentially, this graft pushes the dome-defining points caudally, achieving both increased definition and projection (Figure 11). The skin is redraped and, if necessary, sutured in order to assess the graft’s impact. These grafts are extremely powerful and the major variation involves toning them down by dividing the graft along its dorsal edge.

**Combination TRG**

Any combination of these grafts can be used to achieve specific aesthetic goals (Figure 12). Because
Figure 12. Virtually any number and variation of tip refinement graft combinations is possible to accommodate the patient’s alar anatomy, skin envelope, and aesthetic goals.

Figure 13. Intraoperative views of a 33-year-old woman with a combination of a shield shape graft (A) for the infralobule, plus a dominant domal graft (B) for definition. C, Preoperative view of the patient who presented with a small, dependent intrinsic tip. D, Eighteen months after placement of this combination graft.
the shield graft is elevated to produce greater definition, a domal graft can be placed behind it as a “cap graft” to maintain tip set-off (Figure 13). Another important variation is the use of multiple shields and domal grafts to increase total tip volume. A domal graft can also be inserted first and then overlaid with a diamond graft to accentuate the tip diamond under thicker skin.

CLINICAL SERIES
In a review of 100 consecutive primary female cosmetic rhinoplasties, it is obvious that TRG placement has become a valuable solution for the difficult tip. Excluded from this study were male patients, because a closed approach is used in the majority of male patients, and ethnic patients (Asians and African Americans), because an open structure tip graft is used in more than 95% of cases in those ethnic groups. The following four tip operations were used in this series of female patients: closed transcartilaginous excision (3%), open tip suture (36%), open tip suture with TRG (59%), and open structure tip graft (2%). Of the 59 TRG, the different types and their frequency were as follows: domal (three), shield (22; 14 double and eight single), diamond (19), folded (eight), and combination (seven).

The applications were diverse. The single-layer shield graft was effective in concealing asymmetries and irregularities, while the double-layer shield provided both additional definition and length. The diamond graft offered increased definition of the entire tip diamond, especially under thick skin. As the need for a total volume increase occurred, the combination graft became the solution. There were relatively few (if any) tip revisions in this series, but one would anticipate the need for minor corrections in 3% to 5% by three years postoperatively.

OUTCOMES WITH TIP REFINEMENT GRAFTS
Relatively few problems are noted with TRG, primarily because they represent an extension of tip suturing techniques that have become relatively reproducible. The TRG are added to the sutured tip for refinement and to accentuate a specific tip characteristic. If their effect is counterproductive, the graft is removed without any adverse effect. If the skin is exceedingly thin, fascia is draped over the entire tip to minimize any “shrink wrap” effect. If the skin is thick or has limited contractility, additional grafts (either layers or types of grafts) are added. In a worst case scenario, the TRG and midline sutures are removed, followed by insertion of a rigid open structure tip graft.

CONCLUSIONS
This “designer tip” technique, wherein open suture techniques and TRG can be combined in a variety of ways, is a reliable option for providing highly customized patient results. Various TRG shapes include domal, shield, diamond, folded, or combination; these can be used with closed transcartilaginous excision, open tip suture, open tip suture with TRG, or open structure tip graft. With this technique, it is possible to alter in a very specific way the patient’s dome-defining points, tip point, projection, definition, and volume, as well as size and shape.

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The authors have no disclosures with respect to the contents of this article.

REFERENCES

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