Dissatisfaction with Nasal Tip Shape: Secondary Tip Maneuvers

Jeffrey S. Moyer, MD, MS

1 Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, University of Michigan, Ann Arbor, Michigan


Address for correspondence Jeffrey S. Moyer, MD, MS, FACS, Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, University of Michigan, 1500 E Medical Center Drive, TC1904, Ann Arbor, MI 48109 (e-mail: jmoyer@umich.edu).

Patients seeking revision surgery are significantly more challenging than patients undergoing primary rhinoplasty from both an anatomic as well as a psychological perspective. Scar contracture, impaired skin envelope quality, and missing alar cartilage with associated poor structural support make revision nasal tip surgery technically more difficult and unpredictable. The revision patient is also uniquely challenging since disappointment from their previous surgery or surgeries requires gaining their trust as well as understanding their motivating psychology.

Dissatisfaction with the nasal tip is a common compliant in patients seeking revision surgery after rhinoplasty. Revision rhinoplasty is more technically difficult and unpredictable given the frequent presence of scar contracture, impaired skin envelope quality, and missing alar cartilage. This article describes some of the more common causes for tip revision surgery and techniques to address these abnormalities.

Approach to the Revision Rhinoplasty Patient

Revision rhinoplasty rates in the literature are reported to be in the range of 5 to 15%. There are no studies clearly demonstrating the appropriate timing of revision surgery, but it is generally agreed that it should be at least 1 year from the previous surgery for most patients. This timing is particularly appropriate as it pertains to nasal tip revision. At 1 year after surgery, scar maturation has occurred and residual tip swelling will for the most part be minimized.

The initial diagnostic approach to the patient who is dissatisfied with the result of their previous rhinoplasty is to identify the cosmetic and functional flaws of the nose and reconciling these with the patient’s concerns. The surgeon will often identify more abnormalities than the patient and it is crucial that the surgeon have a clear understanding of the motivating factors for a patient to seek revision surgery so that an appropriate operative plan may be generated. Most patients will present with clinically significant aesthetic and/or functional abnormalities that can be addressed, but there are the occasional patients with unrealistic expectations or have body dysmorphic disorder (BDD) where surgical intervention should be avoided. A thorough, unhurried consultation will allow the surgeon the ability to gain insights into not only the anatomic abnormalities, but the psychological factors unique to that particular patient.

In those patients with clear anatomic problems, the cause of the abnormalities in the dissatisfied patient can be viewed through the framework of acts of commission and/or omission. Many of the issues seen in revision patients with tip abnormalities stems from excessive cartilage destruction with the attendant loss of structural support of the tip. Aggressive resection of the lower lateral
cartilages or quadrangular cartilage at the time of primary rhinoplasty can have devastating consequences in both near- and long-term aesthetic and functional results. The goal in revision surgery for these patients is reestablishing normal tip support and shape with techniques that can withstand the forces of healing and time. This stands in contrast to acts of omission where there was a failure to adequately address a patient’s tip concerns during the previous surgery. Examples of this would be persistent tip width and/or bulbosity that was either only partially addressed or not addressed at all. The surgical maneuvers required to address acts of either commission or omission in revision rhinoplasty are the same as that of primary rhinoplasty. The main difference is that the nose is often cartilage depleted in revision rhinoplasty and that significant thought must be given to the use of other sources of cartilage such as auricular or costal cartilage.

While this article is focused on patient dissatisfaction with the nasal tip and surgical techniques used to correct their underlying causes, the nose obviously cannot be viewed in such an isolated manner. Abnormalities often exist in the upper and middle third of the nose as well as in the lower third of the nose and a holistic approach must be used to achieve the ideal results.

**Techniques in Revision Tip Rhinoplasty**

The surgical techniques used in revision rhinoplasty are the same as the techniques used in primary rhinoplasty. The main difference is that certain techniques and maneuvers are used more commonly in revision cases given the inherent structural and functional problems found in these cases. Several of the larger series of revision rhinoplasty in the literature point out that nasal obstruction is quite common as a result of poor lateral nasal sidewall. In most revision patients, poor lateral wall support is from deficiencies of the lateral crura. This factor is also often associated with the poor aesthetic result in these patients. To address these issues, Guyuron in his series used alar rim grafts in 67% of revision cases, various tip grafts in 20 to 31%, columellar strut grafts in 25%, and lateral crural strut grafts in 10%. Toriumi points out that lateral crural strut grafts will maximally support the lateral wall and alar rim grafts will maximally support the external nasal valve.

Addressing the septum is important in revision cases for both function as well as the aesthetics of the tip. A patient with poor tip support will unlikely be able to resist the postoperative forces of healing and scar contracture and maintain optimal tip shape, particularly when using the external surgical approach. Not only is the septum important functionally, but asymmetries or deformities of the tip can be caused by caudal septal abnormalities. For instance, a high anterior septal angle can cause polybeak deformity if it was not corrected at the time of surgery or if the tip is underprojected from loss of caudal septal support. Guyuron points out that in his series of 100 consecutive secondary rhinoplasty cases, 71% required septrhaphy.

The principles that are important in revision tip cases are establishing strong tip support by addressing the caudal septum and addressing lower lateral cartilage irregularities or deficiencies.

**Maintaining or Reestablishing Tip Support—The Importance of the Caudal Septum**

Poor tip support and deviations of the caudal septum are important causes of tip asymmetry. Failure to address these structural abnormalities at the primary rhinoplasty or in revision surgery makes correcting tip asymmetry difficult since the position of the tip defining points are “set” by establishing the location and strength of the caudal septum. Correcting caudal deviations as well establishing adequate tip support are centrally important in primary rhinoplasty, but it is particularly crucial in revision cases where previous excisional techniques have often caused the loss of alar cartilage volume or structural support which destabilized the support of the tip.

There have been many techniques described to address tip support. The columellar strut is a workhorse for some surgeons and is used frequently in primary rhinoplasty. Often in revision cases, the strength and/or caudal length of the “standard” columellar strut is inadequate. In these situations, a septal extension graft is often helpful to restore appropriate tip projection, position, and strength. A straight piece of septal cartilage, if available, is ideal for a columellar strut. However, in revision cases sufficient septal cartilage is frequently not available in sufficient quantities and costal cartilage can be used. The septal extension graft is placed at the caudal edge of the septal remnant and can either be overlapped or sutured end-to-end. Overlapping the cartilage in my own experience has resulted in narrowing the ipsilateral nasal airway. I prefer an end-to-end technique and typically use several figure-of-eight sutures to fix the extension graft to the caudal septal remnant. These sutures alone are rarely, if ever, sufficient to maintain the septal extension graft in a structurally solid position. In revision cases where spreader grafts are required for middle vault support, the grafts can be extended to the septal extension graft to add stability to the area. However, care should be taken to not overly widen the tip with this maneuver. Alternatively, a small piece of ethmoid bone or a 0.25-mm thick polydioxanone (PDS) miniplate can be used to help splint the caudal septum to the extension graft.

The tongue-in-groove technique can also be used alone or with a septal extension graft to enhance tip stability. This powerful technique, originally described by Kridel et al in 1999, has the ability to stabilize the nasal tip, alter tip projection and/or rotation, and establish a proper columellar-alar relationship. The key feature of the tongue-in-groove technique is the suturing of the medial crura of the lower lateral cartilages to a caudal septum that is structurally sound and in the correct position for optimal positioning of the tip-defining points. If the native septum is not adequate, a septal extension graft can provide a solid foundation for this maneuver.
Addressing Lower Lateral Cartilage Irregularities or Loss

Historically, the approach to the nasal tip has been a reductive exercise emphasizing cartilage removal to achieve tip refinement. Over the past 30 years, there has been a greater emphasis on maintaining structural tip support with the use of tip sutures, cartilage repositioning, and cartilage grafting to achieve aesthetic tip improvements. Aggressive cephalic resections and dome division of the lower lateral cartilages have evolved to more targeted resections with greater conservation of cartilage and maintenance of an intact alar cartilaginous strip.

Excessive removal of the lower lateral cartilages has led to many of the adverse findings seen in patients seeking revision rhinoplasty. A relatively common abnormality observed in revision cases are bossae (Fig. 2A, B). Bossae are the formation of visible edges of remnant cartilage that create a knob-like or knuckling appearance to the nasal tip. An early appearance of this disfigurement may be the result of overly aggressive tip suturing, while a late appearance is almost always a result of cartilage overresection that was unable to resist the scar contraction forces of healing. Most asymmetries seen in the revision rhinoplasty patient are a result of irregular and weak lower lateral cartilages that are poorly positioned (Fig. 3A, B). The techniques to address these abnormalities focuses on strengthening the cartilage and restoring appropriate shape and positioning of the tip defining points.

Lateral Crural Strut Grafts

Lateral crural strut grafts are a powerful surgical technique and has the ability to address many issues observed in revision rhinoplasty patients including malpositioned lower lateral cartilages causing asymmetry, an overly narrowed nasal tip, or alar retraction from excessive cartilage resection of the lower lateral cartilages (Fig. 4A, B). Other modifications of the nasal tip that can be achieved with lateral crural strut grafts are changes in projection, rotation, and nasal length. Lateral crural strut grafts can be extremely helpful in revision tip surgery when the lower lateral cartilage remnants are insufficient to achieve adequate tip definition and strength (Fig. 5A, B).

Lateral crural strut grafts are suture fixedated under the lower lateral cartilages (or their remnants) and extend from the intermediate crus just lateral to the dome into laterally and...
caudally positioned soft-tissue pockets along the alar sidewall\(^8,19,20\) (\(\text{Fig. 6A, B}\)). Lateral crural strut grafts are typically placed parallel to the cephalic edge of the lower lateral cartilage just lateral to the dome with the concave surface facing inward to maintain or improve the nasal airway. The size of the grafts is typically 3 to 4 mm in width and 15 to 25 mm in length\(^8\) and need to have the same dimensions on the left and right sides to prevent asymmetries. In addition, the creation of the lateral soft-tissue pockets to accommodate the grafts is important because their location can alter the alar base as well as vertical alar height. Poor positioning of the pockets may result in nostril asymmetry. Particularly in the revision patients who display asymmetric nostrils, appropriate positioning of the lateral crural struts can improve this asymmetry. It is important that the vestibular skin be carefully dissected away from the lower lateral cartilage remnant. Hydrodissection using local anesthesia can be helpful to facilitate this maneuver. In revision cases, vestibular skin dissection can be quite difficult given the previous surgery and resultant scarring that often occurs. It is not uncommon in revision cases, particularly when retracted alae are present, that there is insufficient vestibular skin. In such situations, a composite graft may be required at the time of marginal incision closure. It is important that the vestibular skin is splinted against the lateral crural strut graft at the time of wound closure to be sure that there is adequate apposition of the mucosa to the strut thereby eliminating dead space present that might cause thickening between the mucosa and graft postoperatively.

**Alar Rim Grafts**

First described by Troell et al in 2000,\(^{21}\) alar rim grafts are an important technique in revision tip surgery.\(^{10,22,23}\) Guyuron reported their use in 67% of revision cases and was the most frequent technique to address alar rim notching, concavity, or external valve collapse.\(^1\) Alar rim grafts are most useful in situations of mild to moderate (1–2 mm) alar rim notching\(^22\) and nostril asymmetries, but in more severe cases, lateral crural strut grafts are typically indicated. It is often unnecessary to use these grafts when lateral crural strut grafts are employed, but if the long axis of the repositioned lateral crus is still inadequate to correct nostril retraction, alar rim grafts can achieve the appearance of more caudal displacement.\(^19\) In most situations, there is little downside to employing alar rim grafts if there is not excessive caudal alar displacement and sufficient graft material is available.

Fig. 3 Tip asymmetry. (A) A 62-year-old woman with nasal obstruction and tip deformity with history of two previous rhinoplasties 38 years prior to presentation. (B) Intraoperative photograph of nasal tip cartilage showing loss of cartilage and irregularities.

Fig. 4 Lateral crural strut grafts. (A) Mucosa has been removed from the bilateral lateral crura. (B) Grafts are placed parallel to the cephalic edge of the lower lateral cartilage just lateral to the dome with the concave surface facing inward to maintain or improve the nasal airway. The size of the grafts is typically 3–4 mm in width and 15–25 mm in length.
Alar rim grafts are placed just prior to closure to prevent fracturing them with the manipulation in other portions of the rhinoplasty. The graft size is typically 3 mm wide and 1.5 cm long and should be symmetrically sized as with lateral crural strut grafts. A subcutaneous pocket is carefully dissected with sharp iris scissors caudal to the infracartilaginous incision and extends laterally to the alar lobule or base. The pocket should be as close to the caudal nostril margin as feasible.

Tip Grafts

Tip grafts are an option in certain revision rhinoplasty patients when there is a lack of tip definition, poor tip projection, and/or cartilage irregularities. Particularly in thick-skinned patients, the underlying anatomy of the tip cartilages is often muted and suture tip refinement is not adequate. Tip grafts have the capacity to alter the dome-defining points, projection, definition, volume, shape, and size of the tip. There are numerous variations of tip grafts that can be used, all with the common goal of improving tip refinement. The precise placement of the grafts will dictate which area of the tip is augmented or refined (tip and/or infratip). Two of the most common grafts are domal grafts (Fig. 7A) and shield grafts (Fig. 7B).

Domal or Peck grafts are small pieces of cartilage (4 x 8–9 mm) that are placed over the domes and can be stacked if suture tip modification does not achieve adequate definition. The grafts are beveled at their edges and are sutured to the underlying cartilage using absorbable sutures (or placed in a precise pocket using the endonasal technique). Peck describes the ability to achieve 2 to 6 mm of increased projection with his graft. In the thinner-skinned patient, a small layer of fascia can be placed over the grafts for added camouflage.

A shield tip graft can be used in those patients where there are significant tip asymmetries and there is a need to replace the dome-defining points rather than refine remnant cartilage. The graft was originally described by Sheen and was used in revision cases using the endonasal approach where there was soft tissue pollybeak deformity from overresection of the alar cartilages and loss of tip projection. The shape of the graft has the appearance of a “golf tee” and the graft’s placement will dictate the amount of projection that can be achieved. The tip-defining points are created by the width and dorsal edge of the graft.

The main problem with tip grafting is the possibility that the grafts become visible in the patient with thin skin when swelling subsides or the skin further attenuates with aging (or
from the effects of multiple surgeries). The use of fascia grafts may offset this problem in those patients at risk and should be strongly considered in revision patients with thin skin. Other problems with grafts are misplacement at the time of surgery or displacement postoperatively. Grafts can also resorb with time and result in changes to the original aesthetic result.

**Suture Tip Modification**

Suture tip modification is currently an important and common technique for tip refinement in both primary and revision rhinoplasty. The initial description of the modification of the nasal tip with sutures as an alternative to cartilage division was published by McCollough and English in 1985. This original description was quickly followed by two subsequent papers in 1987. One of the advantages of suture modification of the tip is the preservation of cartilage without the requirement to divide the alar cartilages or add tip grafts as was more commonly done prior to the 1980s. Another advantage is the reversibility of the sutures at the time of their placement if the desired changes are not achieved or there are unwanted secondary effects of the suture maneuver. Tip sutures are routinely combined with other tip modification techniques to achieve the preferred result. In revision rhinoplasty, suturing alone is sometimes not sufficient given the fact that the alar cartilages can be deficient and any cartilage that remains is frequently scarred and misshapen. There are numerous suture techniques in the literature and different surgeons often use different names and subtle variations to achieve similar modifications to the tip. A few of the more common sutures used in revision cases are described below.

*Intradomal sutures or dome creation sutures* (-Fig. 8) are horizontal mattress sutures placed independently in each dome region of the middle crura at the location of the desired tip-defining points. The technique originally described by Daniel is ideally suited for revision cases with the open approach since independent changes can be made to the left and right domes which can be an advantage over the techniques described by McCollough and English and Tardy where a single horizontal mattress suture is used to achieve tip definition. According to Daniel, the goal is to create a 3- to 4-mm, convex crura at the domal apex while concurrently creating greater concavity of the adjacent lateral crura. The goal is to place the suture such that the cephalic portion of the lateral crus is positioned lower than the caudal edge of the lateral crus to optimize dome refinement. Alar rim grafts can also be placed to optimize the transition from the ala to the tip. The *interdomal suture* (-Fig. 9) is a horizontal mattress suture that can be used to further narrow the dome. The suture is placed in the lobular segment of the middle crura adjacent to the intradomal sutures and not overly tightened. Care should be taken on its placement as the suture can overly narrow the tip and obliterate the divergence of the middle crura at the columellar–lobule angle and obliterate the aesthetically pleasing double break in this location. The *dome equalization suture* (-Fig. 10) as described by Daniel is particularly useful in revision cases to achieve both narrowing of the tip as well as symmetry. The suture is placed at the cephalic border of the domal segment and tightened until the two domal segments are gently touching. An advantage of this suture is that it tends to lower the cephalic edge of the cartilage below the tip-defining points established by the intradomal sutures (or natural dome defining points). The *lateral crural mattress* sutures

![Fig. 7](image1.png) **Tip grafting.** (A) Dome graft. (B) Shield graft.

![Fig. 8](image2.png) **Intradomal sutures.** (A) Base view of the tip. (B) Overhead view of the tip.
suture (Fig. 11) can be used to improve either convexity or concavity of the lateral crus depending on whether the suture is placed parallel (to correct concavity) or at a right angle (to correct convexity) to the caudal edge of the lateral crus. The suture was originally described by Gruber et al in 2005 and have published their 12-year follow-up in 2014. For convexity, the suture is epicentered around the area of maximal convexity and is placed 1 mm from the caudal border of the lateral crus and exits ~1 mm from the cephalic border. A parallel mattress suture is then placed from the cephalic border to the caudal border where the knot is tied in a more caudal location that is felt to be less visible. The most powerful straightening of the convexity (or concavity) of the lateral crus, however, will often be achieved with the lateral crural strut graft.

**The Skin-Soft Tissue Envelope and Scarring**

No discussion of revision rhinoplasty would be complete without discussing the impact that the skin-soft tissue envelope (SSTE) has on achieving the ideal result. Thick, sebaceous skin often makes achieving the ideal tip appearance extremely difficult since subtle changes to the nasal tip are often masked by the SSTE. Patients presenting for revision rhinoplasty with a thick SSTE should be counseled on the limitations of their unique anatomy and a realistic discussion should be undertaken regarding the degree of meaningful improvement that is achievable. Some authors advocate conservative nasal tip soft-tissue thinning while others use graft material to make exaggerated changes to the nasal tip that are visible through the thick SSTE. Thinning of obvious avascular scar in revision patients can also help with decreasing the thickness of the SSTE at the tip with potentially less risk to the SSTE than thinning of the soft tissue.
Revision rhinoplasty patients with a thin SSTE have the opposite problem of the patient with the thick SSTE. These patients often show very small detail of the cartilage underneath the attenuated SSTE. In addition, the vascular integrity of the tip skin can be tenuous in the multiply-revised nose. Fascia grafting in this population is often helpful along with meticulous attention to cartilage grafting and suturing to be sure that edges of grafts are beveled or hidden when possible.  

Conclusion

Revision rhinoplasty can be very challenging and requires the surgeon to carefully listen to the patient and develop a realistic plan that is readily achievable within the context of each surgeon’s skill set. Despite the complexity involved with these cases and the incorrect impression that these patients may be “difficult,” many studies have found that the majority of patients have legitimate concerns. Importantly, Constantian found that most revision rhinoplasty patients achieved satisfaction when their legitimate complaint was surgically addressed and this has been my own anecdotal experience. It is important to take a holistic view in revision rhinoplasty where both function and aesthetics are afforded equal consideration in operative planning. While the maneuvers described in this article are not exhaustive, hopefully they will provide the surgeon with a useful framework when approaching revision rhinoplasty patients who are unhappy with their previous surgery.

Financial Disclosure

None.

References