Evolving Techniques in Rhinoplasty

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ABSTRACT

Rhinoplasty is a highly complex procedure with a steep learning curve. Young physicians during advanced surgical training are imprinted with the techniques of their mentors. These methods are often initially favored. As the physician matures, early adopted methods then serve as the foundation from which differing individualized techniques are developed and employed. This article will examine the modifications and evolution of one surgeon’s rhinoplasty techniques and philosophies over the first 6 years of practice and how this relates to the changes that have occurred over the same time frame in his mentors’ practice.

KEYWORDS: Rhinoplasty, nasal tip, revision, nasal dorsum

Rhinoplasty remains one of the most difficult procedures to do well in plastic surgery. There are multiple dependent anatomic components, factors, and nuisances to negotiate and manage during surgery. Seemingly minor adjustments made at the time of surgery can result in dramatic changes years later. Those possessing an observant eye and a scientist’s curiosity cannot help but increase their learning experience. Young physicians who are fortunate to receive extensive training in nasal dynamics and surgery may benefit from a shortened but still steep learning curve. Those with little to no nasal training often need many years to understand and ultimately achieve consistency with rhinoplasty—hence, the seeming increase in rhinoplasty revisions. Revision rate data have been reported as being between 4 and 7% in experts1; however, on a whole, it is likely underreported. Few physicians report the rate of their own revisions, and many poor outcomes do not reveal themselves until decades after the procedure. Additionally, there is always a subjective component to a rhinoplasty, and ultimately our goal is to achieve patient satisfaction. All rhinoplasty surgeons recognize the common scenario of a happy patient and an unhappy doctor but there also exists the rare but least favorable situation of an unhappy patient and happy surgeon. This situation, often due to poor patient selection, dissipates as the maturing surgeon learns to become an expert in patient selection.

Similar to many of my facial plastic surgery colleagues reared in otolaryngology, my practice evolved to accommodate more advanced and difficult rhinoplasty primary procedures. My rate of patients referred for revision rhinoplasty has grown significantly from very few my first year to the current 50% of my rhinoplasty practice. As a student, I learned the right questions to ask and “how to listen” to these dissatisfied patients with poor outcomes. Like a private investigator cracking an unsolved mystery, each situation presents a case with clues as I attempt to piece together the previous surgeon’s steps to better understand the unique combination of maneuvers and individual anatomy that led to an unfavorable twist or curve. The knowledge gained is then banked and resourced during primary rhinoplasties. As I surgically mature, this expanding encyclopedia of rhinoplasty references becomes a valued asset.

Clearly, it must be recognized that techniques optimal in one surgeon’s hands may be different from what works in another’s. A young surgeon must learn...
from their mentor diagnostic skills and operative strategies behind the maneuvers employed. It is incumbent on the budding surgeon to absorb all this information, sift through it, and eventually find a favored technique(s) for achieving their own success. A genuine mentor has an educational responsibility to offer his or her thought processes so that the young surgeon will not only be led to the water but also learn how to fish. I have been fortunate to be trained by some of the giants of rhinoplasty. This certainly has greatly influenced the thinking and evolution of my current methods. As I operate weekly, I grow as a rhinoplasty surgeon. I never cease to uncover new and subtle clues with rhinoplasty that lead to a technique modification or an alternative way of looking at the same problem. As I review my first 6 years in practice, I can say with complete confidence that I will continue to build on a rising foundation of knowledge sure to change direction multiple times.

Below I have reported on some of the major changes I have made over the last 6 years. All of these modifications have resulted in significant changes to my outcomes.

**OPEN VERSUS CLOSED APPROACH**

Immediately following fellowship, I favored a closed technique for primary rhinoplasties. Specifically, seemingly straightforward rhinoplasty patients with symmetric bulbous tips and a mild dorsal convexity were relegated to a closed approach. I appreciated the ability to immediately witness on the table changes with an intact skin soft tissue envelope in place. Following surgery, patients liked the quick recovery and rare and minimal periorbital edema and bruising. Most patients returned to daily activities 5 to 7 days following surgery with no obvious signs of a rhinoplasty. Afterward, I patted myself on the back when the early referrals from happy patients and their impressed friends started to come in.

However, about a year later I started to see returning rhinoplasty patients with unexpected sequelae. Fortunately, it most often was not recognized by the patients, although on occasion it might have been. Either way I was really dissatisfied. Defects I recognized included: inverted V deformities, asymmetric sidewalls, loss of tip projection, recurvature of lower lateral cartilages, and asymmetry to the soft tissue triangles.

Concurrent referrals for revision rhinoplasty increased. I began to recognize patterns of defects in referred patients. I became an ardent student of the procedure, focused on what to look for and how to spot the patient at risk for a particular failing. Now, with acute perception and a detailed appreciation for nasal anatomy, I had a better idea of what I was studying. I was reminded of what one of my otolaryngology professors stated: “The eye cannot see what the mind does not know.” Like an opening window shade, my mind accurately saw and understood nasal intricacies.

I therefore elected to treat these patients through an open approach, which allowed greater visibility, better evaluation, and more room to perform difficult graft placements. My comfort with the open approach increased and I felt it afforded a more predictable result. I relegate ~80% of my primary rhinoplasty patients to the open approach. After 4 years of doing mostly open rhinoplasty, I felt I had learned many techniques well enough in an open approach that I could now translate that success and skill to a closed approach, especially in those with good nasal function. I wanted to avoid the minor but still present disadvantages of an open procedure: postoperative edema and healing tended to take longer to resolve than in a closed procedure, and noses tend to be bigger, longer. Additionally, I felt as though I could accurately insert many of the grafts I was routinely using in an open approach just as well through a closed approach. Utilizing many of the techniques I learned in the open procedure, I returned to performing more closed procedures but now utilized the techniques I learned through an open approach.

**THE CROOKED NOSE DEFORMITY**

Achieving a straight nasal dorsum is one of the most difficult things to do well in rhinoplasty. I am increasingly convinced that a straight dorsum is predicated more on a straight septum than the nasal bones or the bones of the ascending process of the maxilla. I rarely do multiple or aggressive osteotomies for a crooked nose. The first step is to undeniably diagnose the cause of the dorsal deviation, most ideally performed through an open approach. Skin is widely undermined and the upper lateral cartilages are detached from the septum. A septum free of its lateral attachments reveals its true nature and influence on the curvature of the dorsum. However, it is imperative regardless of using an open or closed approach to widely undermine laterally over the nose to surgically address the septum without “struggling in a hole.” The robust blood supply to the nasal skin and soft tissue allows for extended undermining without significant concern. However, caution is exercised to stay medial to intended lateral osteotomy sites. Intact periosteum and soft tissue over the nasal fractures aids splitting of the nasal bones following the controlled fracture.

If a septum is significantly curved, I have found the swinging door method rarely useful, and only so in a person with a deflected posterior septal angle. I don’t recommend septal weakening procedures or overly aggressive removal of the quadrangular cartilage; I believe these methods are inadequate and jeopardize nasal dorsal support. Most frequently the nasal deflection or curvature is due to a dorsally oriented septal curvature. My approach is to remove a strong piece of deep posterior
cephalic septum (5 mm by 15 mm) from near the bony junction and maxillary crest. This cartilage often has a thick, strong edge to it. I will use its curvature in a reversed manner and flip it over, suturing it to the cephalically curved dorsal septum. I will suture the two concave sides together to redirect the septum back to the midline. This acts very much like a strut or a splint (Fig. 1). This maneuver can be done quite easily in the open approach, and if the deviation is caudal near the anterior septal angle, it can also be done proficiently in the closed approach. If a septum is curved, fractured, or deviated beyond what can be repaired with a strut or splinting graft, I will remove the septum. I will carve and rebuild the septum ex vivo and replace it, securing it caudally to the maxillary crest and cephalically to a lip of cartilage preserved at the keystone area. At first, it can be quite unnerving to take out the septum, but it may be the only way in which to straighten the distal one third of a significantly deviated nose. The technique is beyond the scope of this article but is well described elsewhere.3

ACHIEVING A SMOOTH NASAL DORSUM
There are three distinct portions of the nasal dorsum that have to be addressed individually:

1. The bony nasal dorsum
2. The junction of the bony and cartilaginous dorsum
3. The cartilaginous nasal dorsum

Bony Nasal Dorsum
Following a conservative underresection of the bony dorsum with a Rubin osteotome, a rotating burr is used to finely drill down the dorsum to a smooth finish, often completed with a polishing diamond burr. I rarely use a rasp anymore because of emerging bony irregularities and rough bumps I noticed on the dorsum 2 to 3 years following a rasping procedure. Regardless of the approach (open versus closed) I will use the burr to finely drill and polish the bony nasal dorsum. The key maneuver is to widely undermine the skin, allowing the burr to fit in and also allowing an unobstructed view of the area being treated. In addition to wide undermining, the nostril edge has to be retracted by an assistant with a double-prong skin hook so as to not abrade the cutaneous lateral nasal sill with the rotating proximal drill bit.

Junction of the Bony and Cartilaginous Dorsum
Preventing the inverted V deformity is rather straightforward. The key point is to first diagnose the patient at risk for it. The inverted V deformity is most commonly seen following a rhinoplasty in patients exhibiting the triad of overprojection, prominent dorsal convexities, and thin skin. In patients at risk, an initially satisfying result may lead to disappointment years later when the inverted V deformity emerges. It is not unusual for the patient with an inverted V deformity to also complain of

Figure 1  (A) Inherent curvature of harvested septal cartilage is sutured to a deviated septum in a favorable manner. (B) A straighter, stronger septum is the result.
nasal obstruction. The cause of the inverted V deformity can be prevented with prophylactic maneuvers at the time of the rhinoplasty.

Intraoperatively to prevent the inverted V deformity, the surgeon’s primary focus area should be on the bony cartilaginous junction following hump reduction. Traditional teaching states that an inverted V deformity is secondary to collapse or disassociation of the upper lateral cartilages from their attachment to the nasal bones. Although this may contribute to the inverted V deformity, I have found that the inverted V deformity is mostly related to a space left between the bony nasal sidewalls and the nasal septum following resection of the dorsum (Fig. 2). Even when complete osteotomies are performed, allowing for closure of the open roof deformity, a minor space is still left that will reveal itself later as an inverted V deformity. I have found that following medial and lateral osteotomies, spreader grafts wedged between the septum and bony cartilaginous nasal sidewall junction have all but eliminated this sequela (Fig. 3). The grafts are secured to the cartilaginous nasal septum with a 5–0 polydioxanone (PDS) (Ethicon; subsidiary of Johnson & Johnson, Brunswick, NJ).

**SUTURE IN THE OPEN APPROACH**
If a closed approach is used, the grafts are placed into a precise pocket at the most dorsal edge of the cartilaginous septum extending back to the bony cartilaginous junction. Although creating this precise pocket in a closed approach through blind dissection can be a difficult surgical maneuver, the learning curve is shallow.

![Figure 2](image1.jpg) **Figure 2** Inverted V deformity resulting from an overresected nasal dorsum in a susceptible patient.

![Figure 3](image2.jpg) **Figure 3** Bilateral spreader grafts placed deep into the bony defect following dorsal resection prevent inverted V deformity.

**Cartilaginous Nasal Dorsum**
Overreduction of the upper lateral cartilages during cartilaginous dorsum resection can result in a foreshortened upper lateral cartilage susceptible to collapse, buckling, asymmetries, and airway compromise. My preference is to first separate the upper lateral cartilages from the nasal septum, then to sharply excise the isolated dorsal convexity of the nasal septum under direct vision. The unreamed upper lateral cartilages are allowed to fall back down on themselves. The medial borders are sutured to the nasal septum and together (Fig. 4). If overly redundant upper lateral cartilages are placing the patient at risk for a polly beak deformity, the medial borders of the upper lateral cartilages are conservatively trimmed before fixing them. However, the amount of upper lateral cartilage removed is much less than if the cartilaginous hump (upper lateral cartilages and dorsal nasal septum) are removed en bloc. Initial concerns of polly beak formation have been unfounded; rather, the
upper lateral cartilages fixed to the resected septum splay out and provide a natural concavity or boat shape to the dorsum, consistent with the native dorsal appearance but at a lower height.\textsuperscript{5}

**TIP**

Suturing to modify nasal tip position and shape is an accurate, reversible, and predictable method for altering the tip without losing support. Individual domes narrowed with a 5–0 PDS mattress suture are then secured together with a 5–0 Prolene (Ethicon) intercartilaginous suture. This method is performed both in the open and in the closed delivery approach. However, in the closed approach, to achieve better accuracy of the dome position in relation to each other, I now deliver both domes out through one nostril, so they can be sutured together precisely under direct vision. Afterward, they are
replaced back into their natural position. Care is exercised in those with a very bulbous tip. Bulbous tips with wide domal angles and excess lower lateral cartilage width also commonly have significant recurvature of the lateral crus. This often will extend back into the airway and place the patient at risk for nasal obstruction. The recurvature and potential for nasal obstruction will be accentuated following binding of the nasal tip domes together. Lateral crural extension overlay grafts secured to the most distal portion of the lower lateral cartilage, then extended out over the piriform aperture into a precise pocket will stabilize and keep this lateral segment from curving back again into the airway (Fig. 5). Ideally, the structural graft should be strong and of septal origin. Auricular cartilage rarely has the inherent strength to keep the lateral crus in an appropriate position.

THE SOFT TISSUE TRIANGLE
The soft tissue triangle or the "Bermuda triangle of the nose" is the skin and soft tissue bordered by the domal angle superiorly and the nasal alar margin inferiorly. This area can be difficult to understand and if left unattended, strange and unpredictable occurrences can happen. There is an absence of cartilage directly under the area of soft tissue triangle, and the triangle's shape is relative and dependent on the position of the lower lateral cartilages. Alterations of the lower lateral cartilages and the intermediate crura, in particular, will have effects on the position, shape, and symmetry of the triangles. Those with prominent soft tissue triangles usually exhibit the triad of thin skin, an overprojected nose, and strong cephalically oriented lower lateral cartilages (Fig. 6). A routine cephalic trim coupled with domal binding sutures will place these patients at high risk for delayed postoperative notching, retraction, and almost certain asymmetry in the soft tissue triangles. In my hands, all patients exhibiting the above-described triad receive prophylactic cartilaginous grafts placed under the soft tissue triangle area, secured to the marginal rim of the intermediate crura with a 6-0 PDS suture (Fig. 7). This maneuver can be performed in either the open approach or the closed delivery approach. To further assure a natural angle, I will loosely place a cephalically oriented 6-0 Prolene intercartilaginous domal-binding suture between the domes. This tightly binds the cephalic portions of the domes but allows for a natural divergence between the caudal portions of the domes, which prevents too tight of an angle in the intermediate crura. An overacute domal angle will place
the soft tissue triangles at risk for notching. However, there now exists a space between the caudal portions of the nasal tip cartilages, and to prevent a noticeable biffity between the mildly splayed caudal tip domes, soft cartilage usually harvested from the cephalic margin is placed between the domes spanning over the expanse and secured on each side to each dome with 6-0 PDS suture. This allows for a tip narrowed from preoperative position, yet still leaves the natural curve of the tip in place; this doesn’t place undue forces on the soft tissue triangle (Fig. 8). A revision rhinoplasty, in which alar notching or retraction already exists, a strong piece of septal cartilage (3 x 15 mm) is placed into a precise pocket as an alar rim graft, extending medially through the soft tissue triangle to the nasal tip cartilages. This graft’s medial end may be loosely sutured to the skin envelope with a 6-0 PDS. Often this graft will be enough to reverse the notching and recreate the natural curve of the triangle. However, care is taken to make sure the alar retraction doesn’t extend out into the soft tissue triangle, where it can create a noticeable bump. In severe cases of alar notching, a composite ear cartilage graft harvested from the triangular fossa may be necessary to recreate the soft tissue triangle.

The soft tissue triangle is too often overlooked and is one of the most frequently pointed out deformities from a dissatisfied patient in a referred revision rhinoplasty situation. Its appearance is critical to maintaining the natural appearance of the nose. Recognizing the patient at risk, an accurate diagnosis and prophylactic measures in primary rhinoplasty is an important step to achieving a satisfying result in rhinoplasty.

**TIP CAMOUFLAGING**

Patients receiving a tip graft and those with thin skin are at high risk for postoperative tip irregularities and prominent leading edges from underlying domal cartilages. In these patients, soft tissue fascia and crushed cartilage are placed over the tip, camouflaging irregularities that can surface years later. Studies have proven the level to which the cartilage is crushed will have a bearing on its survival. Highly crushed cartilage has been reported to not survive. Although I significantly crush the tissue and cartilage, my experience has been that highly crushed cartilage survives, or at least meets my objective, by providing lasting softening and camouflaging effects to the tip.

**REVISION RHINOPLASTY**

Utilizing techniques and philosophies learned from the open approach, revision rhinoplasty can effectively and accurately be performed through a closed approach. Often a detailed history from a patient requesting rhinoplasty revision will reveal concerns of a minor nature. If nasal function is good, then a complete nasal reconstruction may be unnecessary or excessive. Consideration should be given to creating precise pockets and placing morselled cartilage into defined defects; this may be all that is required to achieve a satisfied patient. Despite my detailed consultation, following an open reconstructive revision rhinoplasty, I have experienced patients disappointed by the amount of swelling they experience. To achieve all my objectives, a majority of revision rhinoplasties are still performed through an open approach. However, I now explore both options with the patients, and I believe there is a subset of patients I can “make happy” utilizing a closed technique, foregoing an aggressive reconstructive procedure.

The nose, as the leading feature on the face, is a focal point to achieving a desirable esthetic makeup, but its competent functional contribution to healthy breathing is just as important. Fine attention to these details isolates rhinoplasty as one of the most difficult procedures to do well in plastic surgery. The learning curve is long and never ending, and for most, comfort with the procedure doesn’t come until having performed hundreds of them. It is a complex operation that requires mastery in multiple skill sets including surgical, esthetic, and creative. After reviewing my first 6 years in practice, the only thing I am sure of is that I will always be evaluating, reevaluating, and modifying the way I observe and perform rhinoplasty.

**REFERENCES**